1. Baseline performance for FR1

Table 1-1: PUSCH for eMBB for FR1

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Urban 4 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | | MCL | | | MIL | | MPL | | Key assumptions | |
| DDDSU | vivo | 0.7 | | 129.55 | | | 138.32 | | 107.59 | | 1 DMRS symbol for each hop | |
| Qualcomm | -13.5 | | 128 | | | 140.7 | | 110 | | 53 dBm power in downlink; LLS uses all 64 TXRUs | |
| CATT | -5.4 | | 132.1 | | | 140.87 | | 110.14 | | NLOS, O2I, 3kmph | |
| Panasonic | -4.7 | | 131.94 | | | 140.71 | | 109.98 | | w/o FH, 2 DMRS symbols | |
| NTT DOCOMO | -12.14 | | 155.58 | | | 167.63 | |  | | w/o FH/1 DMRS | |
| Intel | -3.80 | | 131.04 | | | 139.28 | | 108.55 | | 1 DMRS symbol for each hop | |
| Nokia/NSB | -0.14 | | 130.39 | | | 133.39 | | 102.66 | | O2I,  UE speed: 3 Km/h, 1 DMRS symbol for each hop | |
| -0.14 | | 130.39 | | | 133.39 | | 119.51 | | O2O,  UE speed: 30 Km/h, 1 DMRS symbol for each hop | |
| Xiaomi | -1.931 | | - | | | - | | 110.231 | | 1Mbps, the number of PRBs=30; Receive chains=2;  1 DMRS without multiplexing with data | |
| -5.717 | | - | | | - | | 114.017 | | 1Mbps, the number of PRBs=30; Receive chains=4;  1 DMRS without multiplexing with data | |
| Sharp | -3.00 | | 117.20 | | | 138.01 | | 115.55 | | 30 PRBs, MCS4 | |
| China Telecom | -3.3 | | 130.54 | | | 139.31 | | 108.58 | | 4 Rx chain; w/ intra-slot hopping; 1 DMRS for each hop; | |
| OPPO | 0.76 | | 130.91 | | | 139.68 | | 108.95 | | w/o FH/ 2 DMRS | |
| DDDSUDDSUU | vivo | -0.75 | | 131 | | | 139.77 | | 109.04 | | 1 DMRS symbol for each hop | |
| CATT | -6.6 | | 133.3 | | | 142.07 | | 111.34 | | NLOS, O2I, 3kmph | |
| Panasonic | -6.5 | | 133.74 | | | 142.51 | | 111.78 | | w/o FH, 2 DMRS symbols | |
| Samsung | -0.95 | | 116.16 | | | 139.98 | | 109.25 | | 30 PRBs | |
| Nokia/NSB | -2.27 | | 132.52 | | | 135.52 | | 104.79 | | O2I,  UE speed: 3 Km/h, 1 DMRS symbol for each hop | |
| -2.27 | | 132.52 | | | 135.52 | | 121.64 | | O2O,  UE speed: 30 Km/h, 1 DMRS symbol for each hop | |
| Xiaomi | -4.031 | | - | | | - | | 112.331 | | 1Mbps, the number of PRBs=30; Receive chains=2;  1 DMRS without multiplexing with data | |
| -7.418 | | - | | | - | | 115.718 | | 1Mbps, the number of PRBs=30; Receive chains=4;  1 DMRS without multiplexing with data | |
| ZTE | -7.07 | | 134.31 | | | 140.13 | | 108.97 | | 4Rx, 30RBs, 10% iBLER, Δ1=0, Δ2=2.95 | |
| Huawei, Hisilicon | -4.62 | |  | | | 142.38 | | 111.65 | |  | |
| Apple | -5.20 | | 131.94 | | | 140.71 | | 109.98 | | NLOS, O2I, 3kmph | |
| China Telecom | -4.7 | | 131.94 | | | 140.71 | | 109.98 | | 4 Rx chain; w/ intra-slot hopping; 1 DMRS for each hop; | |
| OPPO | -1.51 | | 133.18 | | | 141.95 | | 111.22 | | w/o FH/ 2 DMRS | |
| Others | Company 1 |  | |  | | |  | |  | |  | |
| Company 2 |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
| Urban 2.6 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | | MCL | | | MIL | | MPL | | Key assumptions | |
| DDDDDDDSUU | vivo | 0.74 | | 129.51 | | | 138.28 | | 107.55 | | 1 DMRS symbol for each hop | |
| CATT | -5.5 | | 132.2 | | | 140.97 | | 110.24 | | NLOS, O2I, 3kmph | |
| Sharp | -5 | | 119.20 | | | 140.01 | | 117.55 | | 30 PRBs, MCS2 | |
| ZTE | -4.85 | | 132.09 | | | 137.91 | | 108.87 | | 4Rx, 30RBs, 10% iBLER  Δ1=0, Δ2=2.95 | |
| Apple | -4.5 | | 131.24 | | | 140.01 | | 109.28 | | NLOS, O2I, 3kmph | |
| OPPO | 2.18 | | 129.49 | | | 138.26 | | 107.53 | | w/o FH/ 2 DMRS | |
| Others | Company 1 |  | |  | | |  | |  | |  | |
| Company 2 |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
| Rural 4 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| DDDSU | vivo | 0.21 | 138.79 | | 142.79 | 123.13 | | NLOS | | O2I | | 1 DMRS symbol for each hop |
| 0.37 | 138.63 | | 142.63 | 127.02 | | NLOS | | O2O | | 1 DMRS symbol for each hop |
| CATT | -3.7 | 130.40 | | 134.4 | 117.42 | | NLOS | | O2I | | UE speed:3kmph |
| -4.3 | 131.00 | | 135 | 121.52 | | NLOS | | O2O | | UE speed:120kmph |
| -6.4 | 133.10 | | 137.1 | 118.96 | | LOS | | O2I | | UE speed:3kmph |
| -6.6 | 133.30 | | 137.3 | 124.94 | | LOS | | O2O | | UE speed:120kmph |
| InterDigital | 2 | 119.86 | | 137.68 | 111.98 | | NLOS | | O2I | | 2 DMRS, no HARQ |
| Panasonic | -3.8 | 139.79 | | 143.79 | 126.81 | | NLOS | | O2I | | w/ FH, 2 DMRS symbols per hop |
| -3.9 | 139.89 | | 143.89 | 130.04 | | NLOS | | O2O | | w/ FH, 2 DMRS symbols per hop |
| NTT DOCOMO | -6.09 | 143.51 | | 155.55 |  | | LOS | | O2O | | w/o FH/2 DMRS |
| Xiaomi | -0.1 | - | | - | 125.48 | | NLOS | | O2I | | 100Kbps, the number of PRBs=4; Receive chains=2;  1 DMRS without multiplexing with data |
| -4.9 | - | | - | 130.28 | | NLOS | | O2I | | 100Kbps, the number of PRBs=4; Receive chains=4;  1 DMRS without multiplexing with data |
| Intel | -4.10 | 140.09 | | 144.85 | 127.22 | | NLOS | | O2I | | 1 DMRS symbol for each hop |
| -3.40 | 139.39 | | 144.15 | 128.54 | | NLOS | | O2O | | 2 DMRS symbol for each hop |
| Nokia/NSB | 0.81 | 138.19 | | 138.29 | 119.45 | | NLOS | | O2I | | UE speed: 3 Km/h, 1 DMRS symbol for each hop |
| -4.27 | 143.27 | | 143.37 | 126.45 | | LOS | | O2I | | UE speed: 3 Km/h, 1 DMRS symbol for each hop |
| 0.88 | 138.13 | | 138.23 | 122.55 | | NLOS | | O2O | | UE speed: 120 Km/h, 1 DMRS symbol for each hop |
| -4.02 | 143.02 | | 143.12 | 129.32 | | LOS | | O2O | | UE speed: 120 Km/h, 1 DMRS symbol for each hop |
| China Telecom | -3.3 | 139.29 | | 143.29 | 125.66 | | NLOS | | O2I | | 4 Rx chain; w/ intra-slot hopping; 1 DMRS for each hop; |
| -3.7 | 139.69 | | 143.69 | 128.08 | | NLOS | | O2O | | 4 Rx chain; w/ intra-slot hopping; 1 DMRS for each hop; |
| OPPO | -1.15 | 124.60 | | 143.65 | 126.02 | | NLOS | | O2I | | w/o FH/ 2 DMRS |
| -0.48 | 123.93 | | 142.98 | 127.37 | | NLOS | | O2O | | w/o FH/ 2 DMRS |
| -1.13 | 124.58 | | 143.63 | 126.11 | | LOS | | O2I | | w/o FH/ 2 DMRS |
| -1.39 | 124.84 | | 143.89 | 130.10 | | LOS | | O2O | | w/o FH/ 2 DMRS |
| DDDSUDDSUU | vivo | -1.24 | 140.24 | | 144.24 | 124.58 | | NLOS | | O2I | | 1 DMRS symbol for each hop |
| -0.83 | 139.83 | | 143.83 | 128.22 | | NLOS | | O2O | | 1 DMRS symbol for each hop |
| Panasonic | -5.5 | 141.49 | | 145.49 | 128.51 | | NLOS | | O2I | | w/ FH, 2 DMRS symbols per hop |
| -5.6 | 141.59 | | 145.59 | 131.74 | | NLOS | | O2O | | w/ FH, 2 DMRS symbols per hop |
| Samsung | -0.5 | 124.46 | | 143.51 | 131.3 | | NLOS | | O2I | | 4 PRBs |
| -0.85 | 124.81 | | 143.86 | 128.25 | | NLOS | | O2O | | 4 PRBs |
| Xiaomi | -1.5 | - | | - | 126.88 | | NLOS | | O2I | | 100Kbps, the number of PRBs=4; Receive chains=2;  1 DMRS without multiplexing with data |
| -6.3 | - | | - | 131.68 | | NLOS | | O2I | | 100Kbps, the number of PRBs=4; Receive chains=4;  1 DMRS without multiplexing with data |
| Nokia/NSB | -1.25 | 140.25 | | 140.35 | 121.51 | | NLOS | | O2I | | UE speed: 3 Km/h, 1 DMRS symbol for each hop |
| -6.08 | 145.08 | | 145.18 | 128.26 | | LOS | | O2I | | UE speed: 3 Km/h, 1 DMRS symbol for each hop |
| -1.28 | 140.28 | | 140.38 | 124.70 | | NLOS | | O2O | | UE speed: 120 Km/h, 1 DMRS symbol for eachhop |
| -5.90 | 144.90 | | 145.00 | 131.20 | | LOS | | O2O | | UE speed: 120 Km/h, 1 DMRS symbol for eachhop |
| ZTE | -5.23 | 141.22 | | 142.22 | 121.71 | | NLOS | | O2I | | 4Rx, 4RBs, 10% iBLER  Δ1=0, Δ2=3 |
| -5.4 | 141.39 | | 142.39 | 126.78 | | NLOS | | O2O | |
| Huawei, Hisilicon | -4.83 |  | | 146.57 | 126.91 | | NLoS | | O2I | |  |
| -5.30 |  | | 147.04 | 131.43 | | NLoS | | O2O | |  |
| China Telecom | -4.8 | 140.79 | | 144.79 | 127.16 | | NLOS | | O2I | | 4 Rx chain; w/ intra-slot hopping; 1 DMRS for each hop; |
| -4.7 | 140.69 | | 144.69 | 129.08 | | NLOS | | O2O | | 4 Rx chain; w/ intra-slot hopping; 1 DMRS for each hop; |
| OPPO | -1.53 | 124.98 | | 144.03 | 126.40 | | NLOS | | O2I | | w/o FH/ 2 DMRS |
| -1.03 | 124.48 | | 143.53 | 127.92 | | NLOS | | O2O | | w/o FH/ 2 DMRS |
| -1.68 | 125.13 | | 144.18 | 126.66 | | LOS | | O2I | | w/o FH/ 2 DMRS |
| -1.91 | 125.36 | | 144.41 | 130.62 | | LOS | | O2O | | w/o FH/ 2 DMRS |
| Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
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|  |  |  | |  |  | |  | |  | |  |
| Rural 2.6 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| DDDSU | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| DDDSUDDSUU | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Others | vivo | 0.1 | 138.9 | | 142.9 | 123.24 | | NLOS | | O2I | | DDDDDDDSUU,  1 DMRS symbol for each hop |
| 0.03 | 138.97 | | 142.97 | 127.36 | | NLOS | | O2O | | DDDDDDDSUU,  1 DMRS symbol for each hop |
| CATT | -3.8 | 130.50 | | 134.5 | 117.52 | | NLOS | | O2I | | DDDDDDDSUU  UE speed:3kmph |
| -4.3 | 131.00 | | 135 | 121.52 | | NLOS | | O2O | | DDDDDDDSUU  UE speed:120kmph |
| -6.4 | 133.10 | | 137.1 | 118.96 | | LOS | | O2I | | DDDDDDDSUU  UE speed:3kmph |
| -6.6 | 133.30 | | 137.3 | 124.94 | | LOS | | O2O | | DDDDDDDSUU  UE speed:120kmph |
| ZTE | -4.2 | 140.19 | | 141.19 | 121.3 | | NLOS | | O2I | | DDDDDDDSUU  4Rx, 4RBs, 10% iBLER  Δ1=0, Δ2=3 |
| -4.63 | 140.62 | | 141.62 | 126.01 | | NLOS | | O2O | |
| OPPO | 1.27 | 122.18 | | 141.23 | 123.60 | | NLOS | | O2I | | DDDDDDSUU, w/o FH/ 2 DMRS |
| 1.35 | 122.10 | | 141.15 | 125.54 | | NLOS | | O2O | | DDDDDDSUU, w/o FH/ 2 DMRS |
| -1.14 | 124.59 | | 143.64 | 126.12 | | LOS | | O2I | | DDDDDDSUU, w/o FH/ 2 DMRS |
| 0.12 | 123.33 | | 142.38 | 128.59 | | LOS | | O2O | | DDDDDDSUU, w/o FH/ 2 DMRS |
| Rural 2 GHz FDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| UUUUU | vivo | -3.91 | 130.87 | | 146.91 | 129.28 | | NLOS | | O2I | | 1 DMRS symbol for each hop |
| -3.51 | 130.47 | | 146.51 | 130.9 | | NLOS | | O2O | | 1 DMRS symbol for each hop |
| CATT | -6.2 | 132.66 | | 148.7 | 131.07 | | NLOS | | O2I | | UE speed:3kmph |
| -6.5 | 132.96 | | 149 | 133.39 | | NLOS | | O2O | | UE speed:120kmph |
| -8.1 | 134.56 | | 150.6 | 133.08 | | LOS | | O2I | | UE speed:3kmph |
| -8.8 | 135.26 | | 151.3 | 137.51 | | LOS | | O2O | | UE speed:120kmph |
| Panasonic | -2.2 | 129.16 | | 145.20 | 127.57 | | NLOS | | O2I | | w/ FH, 2 DMRS symbols per hop |
| -2.4 | 129.36 | | 145.40 | 129.79 | | NLOS | | O2O | | w/ FH, 2 DMRS symbols per hop |
| Samsung | -2.7 | 129.67 | | 145.71 | 128.08 | | NLOS | | O2I | | 4 PRBs |
| -2 | 128.97 | | 145.01 | 129.40 | | NLOS | | O2O | | 4 PRBs |
| Nokia/NSB | -4.59 | 131.55 | | 140.41 | 121.57 | | NLOS | | O2I | | UE speed: 3 Km/h, 1 DMRS symbol for each hop |
| -6.50 | 133.46 | | 142.31 | 125.39 | | LOS | | O2I | | UE speed: 3 Km/h, 1 DMRS symbol for each hop |
| -4.63 | 131.59 | | 140.44 | 124.76 | | NLOS | | O2O | | UE speed: 120 Km/h, 1 DMRS symbol for each hop |
| -6.00 | 132.96 | | 141.81 | 128.01 | | LOS | | O2O | | UE speed: 120 Km/h, 1 DMRS symbol for each hop |
| ZTE | -4.2 | 140.19 | | 141.19 | 117.55 | | NLOS | | O2I | | 2Rx, 4RBs, 10% iBLER  Δ1=0, Δ2=3.98 |
| -4.63 | 140.62 | | 141.62 | 126.01 | | NLOS | | O2O | |
| Huawei, Hisilicon | -5.6 |  | |  | 126.71 | | NLoS | | O2I | |  |
| -6.25 |  | |  | 130.38 | | NLoS | | O2O | |
| China Telecom | -6.3 | 133.26 | | 146.29 | 128.66 | | NLOS | | O2I | | 4 Rx chain; w/ intra-slot hopping; 1 DMRS for each hop; |
| -6.1 | 133.06 | | 146.09 | 130.48 | | NLOS | | O2O | | 4 Rx chain; w/ intra-slot hopping; 1 DMRS for each hop; |
| OPPO | -3.18 | 129.64 | | 145.68 | 128.05 | | NLOS | | O2I | | w/o FH/ 2 DMRS |
| -2.77 | 129.23 | | 145.27 | 129.66 | | NLOS | | O2O | | w/o FH/ 2 DMRS |
| -5.14 | 131.60 | | 147.64 | 130.12 | | LOS | | O2I | | w/o FH/ 2 DMRS |
| -3.61 | 130.07 | | 146.11 | 132.32 | | LOS | | O2O | | w/o FH/ 2 DMRS |
| Rural 700 MHz FDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| UUUUU | vivo | -7.49 | 134.45 | | 144.47 | 126.84 | | NLOS | | O2I | | 1 DMRS symbol for each hop |
| -7.37 | 134.33 | | 144.35 | 128.74 | | NLOS | | O2O | | 1 DMRS symbol for each hop |
| Qualcomm | -11 | 136.5 | | 149.5 | 131.9 | | NLOS | | O2O | | 3kmph |
| CATT | -6.5 | 132.96 | | 145.99 | 128.36 | | NLOS | | O2I | | UE speed:3kmph |
| -6.4 | 132.86 | | 145.89 | 130.28 | | NLOS | | O2O | | UE speed:120kmph |
| -7.9 | 134.36 | | 147.39 | 129.87 | | LOS | | O2I | | UE speed:3kmph |
| -4 | 130.46 | | 148.29 | 134.5 | | LOS | | O2O | | UE speed:120kmph |
| Panasonic | -2.3 | 129.26 | | 142.29 | 124.66 | | NLOS | | O2I | | w/ FH, 2 DMRS symbols per hop |
| -2.5 | 129.46 | | 142.49 | 126.88 | | NLOS | | O2I | | w/ FH, 2 DMRS symbols per hop |
| Intel | -3.10 | 130.06 | | 146.10 | 128.47 | | NLOS | | O2I | | w/ FH |
| -3.60 | 130.56 | | 146.60 | 130.99 | | NLOS | | O2O | | w/ FH |
| Nokia/NSB | -4.66 | 131.62 | | 138.97 | 120.13 | | NLOS | | O2I | | UE speed: 3 Km/h, 1 DMRS symbol for each hop |
| -6.50 | 133.46 | | 140.81 | 123.89 | | LOS | | O2I | | UE speed: 3 Km/h, 1 DMRS symbol for each hop |
| -4.66 | 131.62 | | 138.97 | 123.29 | | NLOS | | O2O | | UE speed: 120 Km/h, 1 DMRS symbol for each hop |
| -6.00 | 132.96 | | 140.31 | 126.51 | | LOS | | O2O | | UE speed: 120 Km/h, 1 DMRS symbol for each hop |
| ZTE | -3.26 | 130.22 | | 139.39 | 123.78 | | NLOS | | O2O | | 2Rx, 4RBs, 10% iBLER  Δ1=0,Δ2=3.86 |
| Apple | -7.2 | 133.66 | | 143.68 | 126.05 | | NLOS | | O2I | | 3kmph |
| OPPO | -3.48 | 134.91 | | 147.94 | 130.31 | | NLOS | | O2I | | w/o FH/ 2 DMRS |
| -3.21 | 134.64 | | 147.67 | 132.06 | | NLOS | | O2O | | w/o FH/ 2 DMRS |
| -4.93 | 136.36 | | 149.39 | 131.87 | | LOS | | O2I | | w/o FH/ 2 DMRS |
| -4.25 | 135.68 | | 148.71 | 134.92 | | LOS | | O2O | | w/o FH/ 2 DMRS |
| Rural with long distance 700 MHz FDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| UUUUU | vivo | -8.22 | 135.18 | | 145.2 | 127.68 | | LOS | | O2I | | 1 DMRS symbol for each hop |
| -8.32 | 135.28 | | 145.3 | 131.51 | | LOS | | O2O | | 1 DMRS symbol for each hop |
| CATT | -8.8 | 135.26 | | 148.29 | 134.5 | | LOS | | O2O | | UE speed:120kmph |
| Samsung | -7.8 | 134.77 | | 147.80 | 134.01 | | LOS | | O2O | | 4 PRBs |
| Intel | -5.50 | 132.46 | | 148.50 | 134.71 | | LOS | | O2O | | 120km/h |
| ZTE | -6.18 | 133.14 | | 142.31 | 128.52 | | LOS | | O2O | | 2Rx, 4RBs, 10% iBLER  Δ1=0,Δ2=3.86 |
| Huawei, Hisilicon | -8.3 |  | |  | 131.49 | | LoS | | O2O | |  |
| China Telecom | -11.15 | 138.11 | | 148.13 | 134.34 | | LOS | | O2O | | 4 Rx chain; w/ intra-slot hopping; 1 DMRS for each hop; |
| OPPO | -5.07 | 136.50 | | 149.53 | 131.90 | | NLOS | | O2I | | w/o FH/ 2 DMRS |
| -4.19 | 135.62 | | 148.65 | 133.04 | | NLOS | | O2O | | w/o FH/ 2 DMRS |
| -5.18 | 136.61 | | 149.64 | 132.12 | | LOS | | O2I | | w/o FH/ 2 DMRS |
| -4.37 | 135.80 | | 148.83 | 135.04 | | LOS | | O2O | | w/o FH/ 2 DMRS |
| Rural with long distance 4 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| DDDSU | vivo | -4.04 | 143.04 | | 147.04 | 127.49 | | LOS | | O2I | | 1 DMRS symbol for each hop |
| -3.06 | 142.06 | | 146.06 | 132.27 | | LOS | | O2O | | 1 DMRS symbol for each hop |
| CATT | -6.5 | 133.2 | | 137.2 | 124.84 | | LOS | | O2O | | UE speed:120kmph |
| IITH, IITM, CEWIT, Reliance Jio, Tejas Networks | -2.31 | 129.53 | | 136.58 | 126.71 | | LOS | | O2O | | QPSK |
| -5.95 | 131.41 | | 138.46 | 128.59 | | LOS | | O2O | | Pi/2 BPSK with Pmax=23 dBm |
| -5.95 | 134.41 | | 141.46 | 131.59 | | LOS | | O2O | | Pi/2 BPSK with Pmax=26, average power is 23 dBm |
| OPPO | -0.36 | 123.81 | | 142.86 | 125.23 | | NLOS | | O2I | | w/o FH/ 2 DMRS |
| -1.26 | 124.71 | | 143.76 | 128.15 | | NLOS | | O2O | | w/o FH/ 2 DMRS |
| -0.92 | 124.37 | | 143.42 | 125.90 | | LOS | | O2I | | w/o FH/ 2 DMRS |
| -1.51 | 124.96 | | 144.01 | 130.22 | | LOS | | O2O | | w/o FH/ 2 DMRS |
| DDDSUDDSUU | vivo | -5.33 | 144.33 | | 148.33 | 128.78 | | LOS | | O2I | | 1 DMRS symbol for each hop |
| -4.48 | 143.48 | | 147.48 | 133.69 | | LOS | | O2O | | 1 DMRS symbol for each hop |
| CATT | -7.4 | 134.1 | | 138.1 | 125.74 | | LOS | | O2O | | UE speed:120kmph |
| OPPO | -1.38 | 124.83 | | 143.88 | 126.25 | | NLOS | | O2I | | w/o FH/ 2 DMRS |
| -1.65 | 125.10 | | 144.15 | 128.54 | | NLOS | | O2O | | w/o FH/ 2 DMRS |
| -1.69 | 125.14 | | 144.19 | 126.67 | | LOS | | O2I | | w/o FH/ 2 DMRS |
| -1.90 | 125.35 | | 144.40 | 130.61 | | LOS | | O2O | | w/o FH/ 2 DMRS |
| Others | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |

Table 1-2: PUSCH for VoIP for FR1

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Urban 4 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | | MCL | | | MIL | | MPL | | Key assumptions | |
| DDDSU | vivo | -6 | | 144.5 | | | 153.27 | | 122.54 | | 20ms period,2 repetitions, 4 HARQ transmission times | |
| Qualcomm | -18 | | 141.5 | | | 154.2 | | 123.5 | | See Tdoc for details | |
| CATT | -6.8 | | 142.25 | | | 151.02 | | 120.29 | | NLOS, O2I, 3kmph  w/ repetition | |
| Panasonic | -7.9 | | 143.39 | | | 152.16 | | 121.43 | | w/o repetition, w/ HARQ (max. No. of reTx = 8) | |
| NTT DOCOMO | -18.16 | | 155.58 | | | 167.62 | |  | | w FH/1 DMRS | |
| Intel | -9.70 | | 145.19 | | | 153.43 | | 122.70 | | 4 repetitions and 2 HARQ retransmission | |
| China Telecom | -3.5 | | 138.99 | | | 147.76 | | 117.03 | | 4 Rx chain; w/ intra-slot hopping; 1 DMRS for each hop; 2 (re)transmission/repetition; | |
| -4.3 | | 142.80 | | | 151.57 | | 120.84 | | 2 Rx chain; w/ intra-slot hopping; 1 DMRS for each hop; 8 (re)transmission/repetition; | |
| OPPO | -2.40 | | 134.07 | | | 142.84 | | 112.11 | | w/ repetition, w/o HARQ (reTx = 8) | |
| DDDSUDDSUU | vivo | -7.71 | | 146.21 | | | 154.98 | | 124.25 | | 20ms period,2 repetitions, 6 HARQ transmission times | |
| CATT | -7.5 | | 142.25 | | | 151.72 | | 120.99 | | NLOS, O2I, 3kmph  w/ repetition | |
| Panasonic | -8.8 | | 144.29 | | | 153.06 | | 122.33 | | w/o repetition, w/ HARQ (max. No. of reTx = 8) | |
| Samsung | -3.9 | | 127.36 | | | 151.18 | | 120.45 | | The max # of HARQ: 4/ Latency: 50 ms/ Repetition type A | |
| -5.9 | | 129.36 | | | 153.18 | | 122.45 | | The max # of HARQ: 4/ Latency: 50 ms/ Repetition type B | |
| Nokia/NSB | -8.50 | | 147.00 | | | 150.00 | | 119.27 | | O2I, UE speed: 3 km/h, 1 DMRS symbol for each hop | |
| -9.00 | | 147.50 | | | 150.50 | | 136.62 | | O2O, UE speed: 30 km/h, 1 DMRS symbol for each hop | |
| ZTE | -7.66 | | 143.15 | | | 148.97 | | 117.81 | | 4Rx, 4RBs, 3 repetitions + 4 (re)-transmissions, 2% rBLER  Receiver antenna array gain:  Δ1=0, Δ2=2.95 | |
| Huawei, Hisilicon | -1 | |  | | | 147.51 | | 116.78 | | Three values correspond to no rep, no retrains,  Metric: 2% rBLER | |
| -9.1 | |  | | | 155.61 | | 124.88 | | 4 rep, 3 retrans without frequency hopping,  Metric: 2% rBLER | |
| -9.75 | |  | | | 156.26 | | 125.35 | | 4 rep, 3 retrans with frequency hopping,  Metric: 2% rBLER | |
| China Telecom | -4.5 | | 139.99 | | | 148.76 | | 118.03 | | 4 Rx chain; w/ intra-slot hopping; 1 DMRS for each hop;3 (re)transmission/repetition; | |
| -5.15 | | 143.65 | | | 152.42 | | 121.69 | | 2 Rx chain; w/ intra-slot hopping; 1 DMRS for each hop;12 (re)transmission/repetition; | |
| OPPO | -3.95 | | 135.62 | | | 144.39 | | 113.66 | | w/ repetition, w/o HARQ (reTx = 12) | |
| Others | Company 1 |  | |  | | |  | |  | |  | |
| Company 2 |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
| Urban 2.6 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | | MCL | | | MIL | | MPL | | Key assumptions | |
| DDDDDDDSUU | vivo | -7.61 | | 146.11 | | | 154.88 | | 124.15 | | 20ms period,2 repetitions, 4 HARQ transmission times | |
| CATT | -6.5 | | 141.95 | | | 150.72 | | 119.99 | | NLOS, O2I, 3kmph  w/ repetition | |
| ZTE | -6.98 | | 142.47 | | | 148.29 | | 119.25 | | 4Rx,4RBs, 2 repetitions + 4 (re)-transmissions, 2% rBLER  Δ1=0, Δ2=2.95 | |
| OPPO | -2.33 | | 134.00 | | | 142.77 | | 112.04 | | w/ repetition, w/o HARQ (reTx = 8) | |
| Others | Company 1 |  | |  | | |  | |  | |  | |
| Company 2 |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
| Rural 4 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| DDDSU | vivo | -6 | 144.5 | | 148.5 | 128.84 | | NLOS | | O2I | | 20ms period,2 repetitions, 4 HARQ transmission times |
| -7.45 | 145.95 | | 149.95 | 134.34 | | NLOS | | O2O | | 20ms period,2 repetitions, 4 HARQ transmission times |
| CATT | -6.6 | 142.05 | | 146.05 | 129.07 | | NLOS | | O2I | | UE speed:3kmph  w/ repetition |
| -10.9 | 146.35 | | 150.35 | 136.87 | | NLOS | | O2O | | UE speed:120kmph  w/ repetition |
| -8.4 | 143.85 | | 147.85 | 129.71 | | LOS | | O2I | | UE speed:3kmph  w/ repetition |
| -12.8 | 148.25 | | 152.25 | 139.89 | | LOS | | O2O | | UE speed:120kmph  w/ repetition |
| InterDigital | -3.5 | 125.36 | | 143.19 | 117.49 | | NLOS | | O2I | | 20ms, 2 repetitions, 4 retransmissions |
| -5.3 | 127.17 | | 144.99 | 119.28 | | NLOS | | O2I | | 50ms, 2 HARQ processes, 2 repetitions, 5 retransmissions |
| -7.3 | 129.17 | | 146.99 | 121.29 | | NLOS | | O2I | | 50ms, 1 HARQ process, 2 repetitions, 10 retransmissions |
| -7.7 | 129.56 | | 147.39 | 121.69 | | NLOS | | O2I | | 100ms, 2 HARQ process, 2 repetitions, 10 retransmissions |
| -9.7 | 131.57 | | 149.38 | 123.69 | | NLOS | | O2I | | 100ms, 1 HARQ process, 2 repetitions, 20 retransmissions |
| Panasonic | -7.9 | 143.39 | | 147.39 | 130.41 | | NLOS | | O2I | | w/o repetition, w/ HARQ (max No. of reTx = 8) |
| -11.3 | 146.79 | | 150.79 | 136.94 | | NLOS | | O2O | | w/o repetition, w/ HARQ (max No. of reTx = 8) |
| NTT DOCOMO | -18.02 | 155.44 | | 167.48 |  | | LOS | | O2O | | w FH/2 DMRS |
| Intel | -9.70 | 145.19 | | 149.95 | 132.32 | | NLOS | | O2I | | 4 repetitions and 2 HARQ retransmission |
| -11.00 | 146.49 | | 151.25 | 135.64 | | NLOS | | O2O | | 4 repetitions and 2 HARQ retransmission |
| China Telecom | -4.6 | 140.09 | | 144.09 | 128.48 | | NLOS | | O2O | | 4 Rx chain; w/ intra-slot hopping; 1 DMRS for each hop; 2 (re)transmission/repetition; |
| -7.40 | 145.90 | | 149.90 | 134.29 | | NLOS | | O2O | | 2 Rx chain; w/ intra-slot hopping; 1 DMRS for each hop; 8 (re)transmission/repetition; |
| -3.5 | 138.99 | | 142.99 | 125.36 | | NLOS | | O2I | | 4 Rx chain; w/ intra-slot hopping; 1 DMRS for each hop; 2 (re)transmission/repetition; |
| -4.3 | 142.80 | | 146.80 | 129.17 | | NLOS | | O2I | | 2 Rx chain; w/ intra-slot hopping; 1 DMRS for each hop; 8 (re)transmission/repetition; |
| OPPO | -2.40 | 125.85 | | 144.90 | 127.27 | | NLOS | | O2I | | w/ repetition, w/o HARQ (reTx = 8) |
| -8.89 | 132.34 | | 151.39 | 135.78 | | NLOS | | O2O | | w/ repetition, w/o HARQ (reTx = 8) |
| -5.37 | 128.82 | | 147.87 | 130.35 | | LOS | | O2I | | w/ repetition, w/o HARQ (reTx = 8) |
| -9.61 | 133.06 | | 152.11 | 138.32 | | LOS | | O2O | | w/ repetition, w/o HARQ (reTx = 8) |
| DDDSUDDSUU | vivo | -7.72 | 146.22 | | 150.22 | 130.56 | | NLOS | | O2I | | 20ms period,2 repetitions, 6 HARQ transmission times |
| -8.99 | 147.49 | | 151.49 | 135.88 | | NLOS | | O2O | | 20ms period,2 repetitions, 6 HARQ transmission times |
| Panasonic | -8.8 | 144.29 | | 148.29 | 131.31 | | NLOS | | O2I | | w/o repetition, w/ HARQ (max No. of reTx = 8) |
| -11.0 | 146.49 | | 150.49 | 136.64 | | NLOS | | O2O | | w/o repetition, w/ HARQ (max No. of reTx = 8) |
| Samsung | -3.9 | 127.36 | | 146.41 | 128.78 | | NLOS | | O2I | | The max # of HARQ: 4/ Latency: 50 ms/ Repetition type A |
| -5.9 | 129.36 | | 148.41 | 130.78 | | NLOS | | O2I | | The max # of HARQ: 4/ Latency: 50 ms/ Repetition type B |
| -6.9 | 130.36 | | 149.41 | 133.80 | | NLOS | | O2O | | The max # of HARQ: 4/ Latency: 50 ms/ Repetition type A |
| -7.6 | 131.06 | | 150.11 | 134.50 | | NLOS | | O2O | | The max # of HARQ: 4/ Latency: 50 ms/ Repetition type B |
| Huawei, Hisilicon | -4.83 |  | | 142.74/150.84/151.49 | 123.08/131.18/131.83 | | NLoS | | O2I | | Three values correspond to no rep, no retrans/ 4 rep, 3 retrans without frequency hopping/ 4 rep, 3 retrans with frequency hopping, respectively.  Metric: 2% rBLER |
| -5.30 |  | | 142.49/153.89/153.99 | 126.88/138.28/138.38 | | NLoS | | O2O | |
| Nokia/NSB | -8.50 | 147.00 | | 147.10 | 128.26 | | NLOS | | O2I | | UE speed: 3 Km/h, 1 DMRS symbol for each hop |
| -10.00 | 148.50 | | 148.60 | 131.68 | | LOS | | O2I | | UE speed: 3 Km/h, 1 DMRS symbol for each hop |
| -8.83 | 147.33 | | 147.43 | 131.75 | | NLOS | | O2O | | UE speed: 120 Km/h, 1 DMRS symbol for each hop |
| -10.00 | 148.50 | | 148.60 | 134.80 | | LOS | | O2O | | UE speed: 120 Km/h, 1 DMRS symbol for each hop |
| China Telecom | -6.3 | 141.79 | | 145.79 | 130.18 | | NLOS | | O2O | | 4 Rx chain; w/ intra-slot hopping; 1 DMRS for each hop;3 (re)transmission/repetition; |
| -8.7 | 147.20 | | 151.20 | 135.59 | | NLOS | | O2O | | 2 Rx chain; w/ intra-slot hopping; 1 DMRS for each hop;12 (re)transmission/repetition; |
| -4.5 | 139.99 | | 143.99 | 126.36 | | NLOS | | O2I | | 4 Rx chain; w /intra-slot hopping; 1 DMRS for each hop;3 (re)transmission/repetition; |
| -5.15 | 143.65 | | 147.65 | 130.02 | | NLOS | | O2I | | 2 Rx chain; w/ intra-slot hopping; 1 DMRS for each hop;12 (re)transmission/repetition; |
| OPPO | -3.95 | 127.40 | | 146.45 | 128.82 | | NLOS | | O2I | | w/ repetition, w/o HARQ (reTx = 12) |
| -11.72 | 135.17 | | 154.22 | 138.61 | | NLOS | | O2O | | w/ repetition, w/o HARQ (reTx = 12) |
| -6.85 | 130.30 | | 149.35 | 131.83 | | LOS | | O2I | | w/ repetition, w/o HARQ (reTx = 12) |
| -12.48 | 135.93 | | 154.98 | 141.19 | | LOS | | O2O | | w/ repetition, w/o HARQ (reTx = 12) |
| Others | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Rural 2.6 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| DDDSU | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| DDDSUDDSUU | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Others | vivo | -7.61 | 146.11 | | 150.11 | 130.45 | | NLOS | | O2I | | DDDDDDDSUU, 20ms period,2 repetitions, 4 HARQ transmission times |
| -7.61 | 146.11 | | 150.11 | 134.5 | | NLOS | | O2O | | DDDDDDDSUU, 20ms period,2 repetitions, 4 HARQ transmission times |
| CATT | -6.4 | 141.85 | | 145.85 | 128.87 | | NLOS | | O2I | | DDDDDDDSUU  UE speed:3kmph  w/ repetition |
| -10.5 | 145.95 | | 149.95 | 136.47 | | NLOS | | O2O | | DDDDDDDSUU  UE speed:120kmph  w/ repetition |
| -8.4 | 143.85 | | 147.85 | 129.71 | | LOS | | O2I | | DDDDDDDSUU  UE speed:3kmph  w/ repetition |
| -12.8 | 148.25 | | 152.25 | 139.89 | | LOS | | O2O | | DDDDDDDSUU  UE speed:120kmph  w/ repetition |
| OPPO | -2.96 | 126.41 | | 145.46 | 127.83 | | NLOS | | O2I | | DDDDDDDSUU  w/ repetition, w/o HARQ (reTx = 8) |
| -7.22 | 130.67 | | 149.72 | 134.11 | | NLOS | | O2O | | DDDDDDDSUU  w/ repetition, w/o HARQ (reTx = 8) |
| -5.52 | 128.97 | | 148.02 | 130.50 | | LOS | | O2I | | DDDDDDDSUU  w/ repetition, w/o HARQ (reTx = 8) |
| -9.85 | 133.30 | | 152.35 | 138.56 | | LOS | | O2O | | DDDDDDDSUU  w/ repetition, w/o HARQ (reTx = 8) |
| Rural 2 GHz FDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| UUUUU | vivo | -10.42 | 136.88 | | 152.92 | 135.29 | | NLOS | | O2I | | 20ms period,4 repetitions, 4 HARQ transmission times |
| -11.6 | 138.06 | | 154.1 | 138.49 | | NLOS | | O2O | | 20ms period,4 repetitions, 4 HARQ transmission times |
| CATT | -7.8 | 134.26 | | 150.3 | 132.67 | | NLOS | | O2I | | UE speed:3kmph  w/ repetition |
| -10.45 | 136.91 | | 152.94 | 137.34 | | NLOS | | O2O | | UE speed:120kmph  w/ repetition |
| -9.6 | 136.06 | | 152.1 | 134.58 | | LOS | | O2I | | UE speed:3kmph  w/ repetition |
| -13.5 | 139.96 | | 156 | 142.21 | | LOS | | O2O | | UE speed:120kmph  w/ repetition |
| Panasonic | -3.6 | 130.06 | | 146.10 | 128.47 | | NLOS | | O2I | | w/ 2 repetitions, w/ HARQ (max No. of reTx = 8) |
| -8.8 | 135.26 | | 151.30 | 135.69 | | NLOS | | O2O | | w/ 2 repetitions, w/ HARQ (max No. of reTx = 8) |
| Samsung | -4.55 | 131.02 | | 147.06 | 129.43 | | NLOS | | O2I | | The # of repetition: 4/ The max # of HARQ tx: 5/ Latency: 32 ms/ Repetition type A |
| -8.7 | 135.17 | | 151.21 | 135.60 | | NLOS | | O2O | | The # of repetition: 4/ The max # of HARQ tx: 5/ Latency: 32 ms/ Repetition type A |
| Nokia/NSB | -8.75 | 135.21 | | 144.06 | 125.22 | | NLOS | | O2I | | UE speed: 3 Km/h, 1 DMRS symbol for each hop |
| -10.50 | 136.96 | | 145.81 | 128.89 | | LOS | | O2I | | UE speed: 3 Km/h, 1 DMRS symbol for each hop |
| -8.50 | 134.96 | | 143.81 | 128.13 | | NLOS | | O2O | | UE speed: 120 Km/h, 1 DMRS symbol for each hop |
| -10.50 | 136.96 | | 145.81 | 132.01 | | LOS | | O2O | | UE speed: 120 Km/h, 1 DMRS symbol for each hop |
| Huawei, Hisilicon | -5.6 |  | | 140.49/148.34/148.94 | 121.86/129.71/130.31 | | NLoS | | O2I | | Three values correspond to no rep, no retrans/ 4 rep, 3 retrans without frequency hopping/ 4 rep, 3 retrans with frequency hopping, respectively.  Metric: 2% rBLER |
| -6.25 |  | | 140.59/151.99/152.14 | 124.98/136.38/136.53 | | NLoS | | O2O | |
| ZTE | -7.68 | 134.14 | | 146.20 | 126.74 | | NLOS | | O2I | | 2Rx, 4RBs, 8 repetitions + 4 (re)-transmissions, 2% rBLER  Δ1=0,Δ2=3.98 |
| -10.79 | 137.25 | | 149.31 | 133.70 | | NLOS | | O2O | |
| China Telecom | -7.0 | 133.46 | | 146.49 | 130.88 | | NLOS | | O2O | | 4 Rx chain; w/ intra-slot hopping; 1 DMRS for each hop;8 (re)transmission/repetition; |
| -6.3 | 132.76 | | 148.80 | 133.19 | | NLOS | | O2O | | 2 Rx chain; w/ intra-slot hopping; 1 DMRS for each hop;16 (re)transmission/repetition; |
| -6.9 | 134.36 | | 146.39 | 128.76 | | NLOS | | O2I | | 4 Rx chain; w/ intra-slot hopping; 1 DMRS for each hop;8 (re)transmission/repetition; |
| -6.1 | 132.56 | | 148.60 | 130.97 | | NLOS | | O2I | | 2 Rx chain; w/ intra-slot hopping; 1 DMRS for each hop;16 (re)transmission/repetition; |
| OPPO | -4.29 | 130.75 | | 146.79 | 129.16 | | NLOS | | O2I | | w/ repetition, w/o HARQ (reTx = 12) |
| -9.77 | 136.23 | | 152.27 | 136.66 | | NLOS | | O2O | | w/ repetition, w/o HARQ (reTx = 12) |
| -6.84 | 133.30 | | 149.34 | 131.82 | | LOS | | O2I | | w/ repetition, w/o HARQ (reTx = 12) |
| -10.18 | 136.64 | | 152.68 | 138.89 | | LOS | | O2O | | w/ repetition, w/o HARQ (reTx = 12) |
| Rural 700 MHz FDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| UUUUU | vivo | -12.44 | 138.9 | | 148.92 | 131.29 | | NLOS | | O2I | | 20ms period,4 repetitions, 4 HARQ transmission times |
| -14.44 | 140.9 | | 150.92 | 135.31 | | NLOS | | O2O | | 20ms period,4 repetitions, 4 HARQ transmission times |
| Qualcomm | -9 | 135.5 | | 148.5 | 130.9 | | NLOS | | O2O | | See Tdoc for details |
| CATT | -7.5 | 133.96 | | 146.99 | 129.36 | | NLOS | | O2I | | UE speed:3kmph  w/ repetition |
| -11.9 | 138.36 | | 151.39 | 135.78 | | NLOS | | O2O | | UE speed:120kmph  w/ repetition |
| -8.8 | 135.26 | | 148.29 | 130.77 | | LOS | | O2I | | UE speed:3kmph  w/ repetition |
| -11.9 | 138.36 | | 153.09 | 139.3 | | LOS | | O2O | | UE speed:120kmph  w/ repetition |
| InterDigital | -5.6 | 133.49 | | 140.52 | 122.63 | | NLOS | | O2I | | 50ms, 4 repetitions, 3 HARQ processes, 5 retransmissions |
| -7.6 | 135.49 | | 142.52 | 124.64 | | NLOS | | O2I | | 100ms, 4 repetitions, 3 HARQ processes, 9 retransmissions |
| Panasonic | -1.3 | 127.76 | | 140.79 | 123.16 | | NLOS | | O2I | | w/ 2 repetitions, w/ HARQ (max No. of reTx = 8) |
| -9.8 | 136.26 | | 149.29 | 133.68 | | NLOS | | O2O | | w/ 2 repetitions, w/ HARQ (max No. of reTx = 8) |
| Intel | -5.00 | 131.46 | | 147.50 | 129.87 | | NLOS | | O2I | | 4 repetitions and 2 HARQ retransmission |
| -7.00 | 133.46 | | 149.50 | 133.89 | | NLOS | | O2O | | 4 repetitions and 2 HARQ retransmission |
| Nokia/NSB | -8.70 | 135.16 | | 142.51 | 123.67 | | NLOS | | O2I | | UE speed: 3 Km/h, 1 DMRS symbol for each hop |
| -10.50 | 136.96 | | 144.31 | 127.39 | | LOS | | O2I | | UE speed: 3 Km/h, 1 DMRS symbol for each hop |
| -8.75 | 135.21 | | 142.56 | 126.88 | | NLOS | | O2O | | UE speed: 120 Km/h, 1 DMRS symbol for each hop |
| -10.50 | 136.96 | | 144.31 | 130.51 | | LOS | | O2O | | UE speed: 120 Km/h, 1 DMRS symbol for each hop |
| ZTE | -11.68 | 138.14 | | 147.31 | 131.70 | | NLOS | | O2O | | 2Rx, 4RBs, 8 repetitions + 4 (re)-transmissions, 2% rBLER  Δ1=0,Δ2=3.86 |
| OPPO | -4.11 | 135.54 | | 148.57 | 130.94 | | NLOS | | O2I | | w/ repetition, w/o HARQ (reTx = 12) |
| -9.07 | 140.50 | | 153..53 | 137..92 | | NLOS | | O2O | | w/ repetition, w/o HARQ (reTx = 12) |
| -6.86 | 138.29 | | 151.32 | 133.80 | | LOS | | O2I | | w/ repetition, w/o HARQ (reTx = 12) |
| -9.61 | 141.04 | | 154.07 | 140.28 | | LOS | | O2O | | w/ repetition, w/o HARQ (reTx = 12) |
| Rural with long distance 700 MHz FDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| UUUUU | vivo | -13.38 | 139.84 | | 149.86 | 132.34 | | LOS | | O2I | | 20ms period,4 repetitions, 4 HARQ transmission times |
| -15.12 | 141.58 | | 151.6 | 137.81 | | LOS | | O2O | | 20ms period,4 repetitions, 4 HARQ transmission times |
| CATT | -13.6 | 140.06 | | 153.09 | 139.3 | | LOS | | O2O | | speed:120kmph  w/ repetition |
| Samsung | -15 | 141.47 | | 154.50 | 140.71 | | LOS | | O2O | | The # of repetition: 4/ The max # of HARQ tx: 5/ Latency: 32 ms/ Repetition type A |
| Intel | -8.80 | 135.26 | | 151.30 | 137.51 | | LOS | | O2O | | 4 repetitions and 2 HARQ retransmission |
| ZTE | -12.05 | 138.51 | | 147.68 | 133.89 | | LOS | | O2O | | 2Rx, 4RBs, 8 repetitions + 4 (re)-transmissions, 2% rBLER  Δ1=0,Δ2=3.86 |
| Huawei, Hisilicon | -8.3 |  | | 141.23/149.28/149.28 | 127.44/135.49/135.49 | | LoS | | O2O | |  |
| China Telecom | -13.3 | 140.26 | | 150.28 | 136.49 | | LOS | | O2O | | 4 Rx chain; w/ intra-slot hopping; 1 DMRS for each hop;8 (re)transmission/repetition; |
| OPPO | -6.34 | 137.77 | | 150.80 | 133.17 | | NLOS | | O2I | | w/ repetition, w/o HARQ (reTx = 12) |
| -9.40 | 140.83 | | 153.86 | 138.25 | | NLOS | | O2O | | w/ repetition, w/o HARQ (reTx = 12) |
| -7.37 | 138.80 | | 151.83 | 134.31 | | LOS | | O2I | | w/ repetition, w/o HARQ (reTx = 12) |
| -9.68 | 141.11 | | 154.14 | 140.35 | | LOS | | O2O | | w/ repetition, w/o HARQ (reTx = 12) |
| Rural with long distance 4 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| DDDSU | vivo | -13.11 | 151.61 | | 155.61 | 136.06 | | LOS | | O2I | | 20ms period,2 repetitions, 4 HARQ transmission times |
| -14.24 | 152.74 | | 156.74 | 142.95 | | LOS | | O2O | | 20ms period,2 repetitions, 4 HARQ transmission times |
| CATT | -12.2 | 147.65 | | 151.65 | 139.29 | | LOS | | O2O | | speed:120kmph  w/ repetition |
| IITH, IITM, CEWIT, Reliance Jio, Tejas Networks | -9.3 | 133.51 | | 140.56 | 130.69 | | LOS | | O2O | | QPSK |
| -13.5 | 137.71 | | 144.76 | 134.89 | | LOS | | O2O | | Pi/2 BPSK with Pmax=23 dBm |
| -13.5 | 140.71 | | 147.76 | 137.89 | | LOS | | O2O | | Pi/2 BPSK with Pmax=26, average power is 23 dBm |
| OPPO | -4.09 | 127.54 | | 146.59 | 128.96 | | NLOS | | O2I | | w/ repetition, w/o HARQ (reTx = 8) |
| -9.55 | 133.00 | | 152.05 | 136.44 | | NLOS | | O2O | | w/ repetition, w/o HARQ (reTx = 8) |
| -5.34 | 128.79 | | 147.84 | 130.32 | | LOS | | O2I | | w/ repetition, w/o HARQ (reTx = 8) |
| -9.58 | 133.03 | | 152.08 | 138.29 | | LOS | | O2O | | w/ repetition, w/o HARQ (reTx = 8) |
| DDDSUDDSUU | vivo | -13.11 | 151.61 | | 155.61 | 136.06 | | LOS | | O2I | | 20ms period,2 repetitions, 4 HARQ transmission times |
| -14.24 | 152.74 | | 156.74 | 142.95 | | LOS | | O2O | | 20ms period,2 repetitions, 4 HARQ transmission times |
| CATT | -13.1 | 148.55 | | 152.55 | 140.19 | | LOS | | O2O | | speed:120kmph  w/ repetition |
| OPPO | -5.58 | 129.03 | | 148.08 | 130.45 | | NLOS | | O2I | | w/ repetition, w/o HARQ (reTx = 12) |
| -12.36 | 135.81 | | 154.86 | 139.25 | | NLOS | | O2O | | w/ repetition, w/o HARQ (reTx = 12) |
| -6.88 | 130.33 | | 149.38 | 131.86 | | LOS | | O2I | | w/ repetition, w/o HARQ (reTx = 12) |
| -12.40 | 135.85 | | 154.90 | 141.11 | | LOS | | O2O | | w/ repetition, w/o HARQ (reTx = 12) |
| Others | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |

[Table 1-2a: PUSCH for CSI for FR1]

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Urban 4 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | | MCL | | | MIL | | MPL | | Key assumptions | |
| DDDSU | Company 1 |  | |  | | |  | |  | |  | |
| Company 2 |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
| DDDSUDDSUU | Company 1 |  | |  | | |  | |  | |  | |
| Company 2 |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
| Others | Company 1 |  | |  | | |  | |  | |  | |
| Company 2 |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
| Urban 2.6 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | | MCL | | | MIL | | MPL | | Key assumptions | |
| DDDDDDDSUU | Company 1 |  | |  | | |  | |  | |  | |
| Company 2 |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
| Others | Company 1 |  | |  | | |  | |  | |  | |
| Company 2 |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
| Rural 4 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| DDDSU | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| DDDSUDDSUU | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Others | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Rural 2.6 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| DDDSU | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| DDDSUDDSUU | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Others | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Rural 2 GHz FDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| UUUUU | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Rural 700 MHz FDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| UUUUU | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Rural with long distance 700 MHz FDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| UUUUU | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Rural with long distance 4 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| DDDSU | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| DDDSUDDSUU | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Others | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |

Table 1-3: PUCCH for FR1

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Urban 4 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | | MCL | | | MIL | | MPL | | Key assumptions | |
| DDDSU | vivo | -6.08 | | 147.52 | | | 156.29 | | 122.48 | | Format 1 No repetition | |
| -3.55 | | 144.99 | | | 153.76 | | 119.95 | | Format 3 11bits No repetition 2 DMRS symbols | |
| Qualcomm | -20.5 | | 146.9 | | | 159.7 | | 125.9 | | PF1 2 bits | |
| Qualcomm | -18 | | 144.4 | | | 157.2 | | 123.4 | | PF3 11 bits | |
| Qualcomm | -16.5 | | 142.9 | | | 155.7 | | 121.9 | | PF3 22 bits | |
| CATT | -9.15 | | 147.55 | | | 156.32 | | 122.51 | | NLOS, O2I, 3kmph  PUCCH PF1 | |
| Panasonic | -9.5 | | 147.94 | | | 156.71 | | 122.90 | | PF1 2 bits | |
| -8.0 | | 146.44 | | | 155.21 | | 121.40 | | PF3 11 bits | |
| -4.1 | | 142.54 | | | 151.31 | | 117.50 | | PF3 22 bits | |
| Samsung | -7.95 | | 134.36 | | | 158.18 | | 124.37 | | PF1\_2 bits | |
| -7.65 | | 134.06 | | | 157.88 | | 124.07 | | PF3\_4 bits | |
| -4.65 | | 131.06 | | | 154.88 | | 121.07 | | PF3\_11 bits | |
| -1.55 | | 127.96 | | | 151.78 | | 117.97 | | PF3\_22 bits | |
| NTT DOCOMO | -12.89 | | 156.33 | | | 168.38 | |  | | Format 1 | |
| -12.14 | | 155.58 | | | 167.63 | |  | | Format 3 22bits | |
| Xiaomi | 1.5 | | - | | | - | | 114.91 | | Format 3 22bits, no repetition | |
| -2.1 | | - | | | - | | 118.51 | | Format 3 11bits, no repetition | |
| Intel | -9.80 | | 148.24 | | | 156.48 | | 122.67 | | PF1 1 bit | |
| -8.60 | | 147.04 | | | 155.28 | | 121.47 | | PF3-11bits | |
| -6.00 | | 144.44 | | | 152.68 | | 118.87 | | PF3-22bits | |
| Sharp | -1.00 | | 130.47 | | | 151.28 | | 125.74 | | format 3, 22 bits | |
| ZTE | -10.3 | | 148.74 | | | 154.56 | | 120.32 | | 2bits, 4Rx,  Δ1=0, Δ2=2.95 | |
| -8.57 | | 147.01 | | | 152.83 | | 118.59 | | 11bits, 4Rx, additional DMRS,  Δ1=0, Δ2=2.95, | |
| -6.05 | | 144.49 | | | 150.31 | | 116.07 | | 22bits, 4Rx, additional DMRS,  Δ1=0, Δ2=2.95, | |
| OPPO | -6.83 | | 149.27 | | | 158.04 | | 124.23 | | Format 1 | |
| -3.84 | | 146.28 | | | 155.05 | | 121.24 | | Format 3 11bits | |
| -4.01 | | 146.45 | | | 155.22 | | 121.41 | | Format 3 22bits | |
|  |  | |  | | |  | |  | |  | |
| DDDSUDDSUU | vivo | -6.08 | | 147.52 | | | 156.29 | | 122.48 | | Format 1 No repetition | |
| -3.55 | | 144.99 | | | 153.76 | | 119.95 | | Format 3 11bits No repetition 2 DMRS symbols | |
| CATT | -9.15 | | 147.55 | | | 156.32 | | 122.51 | | NLOS, O2I, 3kmph  PUCCH PF1 | |
| Xiaomi | 1.5 | | - | | | - | | 114.91 | | Format 3 22bits,no repetition | |
| -2.1 | | - | | | - | | 118.51 | | Format 3 11bits,no repetition | |
| Nokia/NSB | -1.50 | | 142.95 | | | 145.95 | | 112.12 | | O2I, Format 1 | |
| -1.00 | | 142.45 | | | 145.45 | | 128.35 | | O2O, Format 1 | |
| 0.00 | | 141.45 | | | 144.45 | | 110.62 | | O2I, Format 3 | |
| -0.13 | | 141.57 | | | 144.57 | | 127.47 | | O2O, Format 3 | |
| Huawei, Hisilicon | -10.3 | |  | | | 159.76 | | 125.95 | | Format 1 with 2bits | |
| -7.9 | |  | | | 157.36 | | 123.55 | | Format 3 with 11bits | |
| -6 | |  | | | 155.46 | | 121.65 | | Format 3 with 22bits | |
|  | -7.9 | |  | | | 157.36 | | 123.55 | | Format 3 with 11bits | |
| -8.57 | | 147.01 | | | 152.83 | | 118.59 | | 11bits, 4Rx, additional DMRS,  Δ1=0, Δ2=2.95 | |
| -6.05 | | 144.49 | | | 150.31 | | 116.07 | | 22bits, 4Rx, additional DMRS,  Δ1=0, Δ2=2.95 | |
| China Telecom | -5.9 | | 167.17 | | | 156.12 | | 122.31 | | 2 Rx; Format 1; w/o repetition | |
| -4.7 | | 159.95 | | | 151.91 | | 118.10 | | 4 Rx; Format 3, 22bits; w/ intra-slot hopping; w/o repetition; 4 DMRS symbols | |
| Apple | -3.2 | | 141.64 | | | 150.41 | | 116.60 | | Format 3 22bits NLOS O2I, 3kmph | |
|  |  |  | |  | | |  | |  | |  | |
|  |  |  | |  | | |  | |  | |  | |
| Others | Company 1 |  | |  | | |  | |  | |  | |
| Company 2 |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
| Urban 2.6 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | | MCL | | | MIL | | MPL | | Key assumptions | |
| DDDDDDDSUU | vivo | -6 | | 147.45 | | | 156.22 | | 122.41 | | Format 1 No repetition | |
| -3.41 | | 144.86 | | | 153.63 | | 119.82 | | Format 3 11bits No repetition 2 DMRS symbols | |
| CATT | -9.1 | | 147.5 | | | 156.27 | | 122.46 | | NLOS, O2I, 3kmph  PUCCH PF1 | |
| ZTE | -10.34 | | 148.78 | | | 154.60 | | 122.48 | | 2bits, 4Rx,  Δ1=0, Δ2=2.95 | |
| -8.6 | | 147.04 | | | 152.86 | | 120.74 | | 11bits, 4Rx, additional DMRS,  Δ1=0, Δ2=2.95 | |
| -6.08 | | 144.52 | | | 150.34 | | 118.22 | | 22bits, 4Rx, additional DMRS,  Δ1=0, Δ2=2.95 | |
| Apple | -3.2 | | 141.64 | | | 150.41 | | 116.60 | | Format 3 22bits  NLOS O2I, 3kmph | |
| OPPO | -6.73 | | 149.17 | | | 157.94 | | 124.13 | | Format 1 | |
| -3.86 | | 146.30 | | | 155.07 | | 121.26 | | Format 3 11bits | |
| -3.99 | | 146.43 | | | 155.20 | | 121.39 | | Format 3 22bits | |
|  |  | |  | | |  | |  | |  | |
|  |  |  | |  | | |  | |  | |  | |
| Others | Company 1 |  | |  | | |  | |  | |  | |
| Company 2 |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
| Rural 4 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| DDDSU | vivo | -6.08 | 147.52 | | 151.52 | 128.54 | | NLOS | | O2I | | Format 1 No repetition |
| -3.55 | 144.99 | | 148.99 | 126.01 | | NLOS | | O2I | | Format 3 11bits No repetition 2 DMRS symbols |
| -6.09 | 147.54 | | 151.54 | 132.09 | | NLOS | | O2O | | Format 1 No repetition |
| -3.55 | 144.99 | | 148.99 | 129.54 | | NLOS | | O2O | | Format 3 11bits No repetition 2 DMRS symbols |
| CATT | -9.15 | 147.55 | | 151.55 | 131.49 | | NLOS | | O2I | | UE speed:3kmph  PUCCH PF1 |
| CATT | -9.35 | 147.75 | | 151.75 | 134.68 | | NLOS | | O2O | | UE speed:120kmph  PUCCH PF1 |
| CATT | -11.47 | 149.87 | | 153.87 | 132.97 | | LOS | | O2I | | UE speed:3kmph  PUCCH PF1 |
| CATT | -11.53 | 149.93 | | 153.93 | 138.82 | | LOS | | O2O | | UE speed:120kmph  PUCCH PF1 |
| InterDigital | -5.45 | 136.28 | | 154.11 | 124.65 | | NLOS | | O2I | | PF1 2 bits, UE speed = 3km/hr |
| -1.7 | 132.53 | | 150.35 | 120.91 | | NLOS | | O2I | | PF3 22 bits, UE speed = 3km/hr |
| Panasonic | -9.5 | 147.94 | | 151.94 | 131.88 | | NLOS | | O2I | | PF1 2 bits |
| -8.0 | 146.44 | | 150.44 | 130.38 | | NLOS | | O2I | | PF3 11 bits |
| -4.1 | 142.54 | | 146.54 | 126.48 | | NLOS | | O2I | | PF3 22 bits |
| -9.8 | 148.24 | | 152.24 | 135.17 | | NLOS | | O2O | | PF1 2 bits |
| -8.2 | 146.54 | | 150.64 | 133.57 | | NLOS | | O2O | | PF3 11 bits |
| -4.1 | 142.54 | | 146.54 | 129.47 | | NLOS | | O2O | | PF3 22 bits |
| Samsung | -7.95 | 134.36 | | 153.41 | 132.46 | | NLOS | | O2I | | PF1\_2 bits |
| -7.65 | 134.06 | | 153.11 | 132.16 | | NLOS | | O2I | | PF3\_4 bits |
| -4.65 | 131.06 | | 150.11 | 129.16 | | NLOS | | O2I | | PF3\_11 bits |
| -1.55 | 127.96 | | 147.01 | 126.06 | | NLOS | | O2I | | PF3\_22 bits |
| -7.95 | 134.36 | | 153.41 | 133.96 | | NLOS | | O2O | | PF1\_2 bits |
| -7.65 | 134.06 | | 153.11 | 133.66 | | NLOS | | O2O | | PF3\_4 bits |
| -4.65 | 131.06 | | 150.11 | 130.66 | | NLOS | | O2O | | PF3\_11 bits |
| -1.55 | 127.96 | | 147.01 | 127.56 | | NLOS | | O2O | | PF3\_22 bits |
| NTT DOCOMO | -12.82 | 156.26 | | 168.31 |  | | LOS | | O2O | | Format 1 |
| -12.06 | 155.50 | | 167.55 |  | |  | |  | | Format 3 22bits |
| Intel | -9.80 | 148.24 | | 153.00 | 132.05 | | NLOS | | O2I | | PF1 |
| Intel | -8.60 | 147.04 | | 151.80 | 130.85 | | NLOS | | O2I | | PF3-11bits |
| Intel | -6.00 | 144.44 | | 149.20 | 128.25 | | NLOS | | O2I | | PF3-22bits |
| Intel | -8.20 | 146.64 | | 151.40 | 131.95 | | NLOS | | O2O | | PF1 |
| Intel | -8.40 | 146.84 | | 151.60 | 132.15 | | NLOS | | O2O | | PF3-11bits |
| Intel | -5.70 | 144.14 | | 148.90 | 129.45 | | NLOS | | O2O | | PF3-22bits |
| OPPO | -6.58 | 144.03 | | 157.06 | 136.11 | | NLOS | | O2I | | Format 1 |
| -4.53 | 141.98 | | 155.01 | 134.06 | | NLOS | | O2I | | Format 3 11bits |
| -3.79 | 141.24 | | 154.27 | 133.32 | | NLOS | | O2I | | Format 3 22bits |
| -6.69 | 144.14 | | 157.17 | 137.72 | | NLOS | | O2O | | Format 1 |
| -4.55 | 142.00 | | 155.03 | 135.58 | | NLOS | | O2O | | Format 3 11bits |
| -3.81 | 141.26 | | 154.29 | 134.84 | | NLOS | | O2O | | Format 3 22bits |
| DDDSUDDSUU | vivo | -6.08 | 147.52 | | 151.52 | 128.54 | | NLOS | | O2I | | Format 1 No repetition |
| -3.55 | 144.99 | | 148.99 | 126.01 | | NLOS | | O2I | | Format 3 11bits No repetition 2 DMRS symbols |
| -6.09 | 147.54 | | 151.54 | 132.09 | | NLOS | | O2O | | Format 1 No repetition |
| -3.55 | 144.99 | | 148.99 | 129.54 | | NLOS | | O2O | | Format 3 11bits No repetition 2 DMRS symbols |
| Nokia/NSB | -1.50 | 142.95 | | 143.05 | 120.51 | | NLOS | | O2I | | UE speed: 3 Km/h, Format 1 |
| -5.50 | 146.95 | | 147.05 | 127.03 | | LOS | | O2I | | UE speed: 3 Km/h, Format 1 |
| -2.75 | 144.20 | | 144.30 | 124.82 | | NLOS | | O2O | | UE speed: 120 Km/h, Formt 1 |
| -5.00 | 146.45 | | 146.55 | 129.51 | | LOS | | O2O | | UE speed: 120 Km/h, Formt 1 |
| 0.00 | 141.45 | | 141.55 | 119.01 | | NLOS | | O2I | | UE speed: 3 Km/h, Format 3 |
| -4.63 | 146.07 | | 146.17 | 126.15 | | LOS | | O2I | | UE speed: 3 Km/h, Format 3 |
| 0.00 | 141.45 | | 141.55 | 122.07 | | NLOS | | O2O | | UE speed: 120 Km/h, Format 3 |
| -4.56 | 146.01 | | 146.11 | 129.07 | | LOS | | O2O | | UE speed: 120 Km/h, Format 3 |
| ZTE | -10.3 | 148.74 | | 149.74 | 125.91 | | NLOS | | O2I | | 2bits, 4Rx,  Δ1=0, Δ2=3 |
| -10.3 | 148.74 | | 149.74 | 130.29 | | NLOS | | O2O | |
| -8.57 | 147.01 | | 148.01 | 124.18 | | NLOS | | O2I | | 11bits, 4Rx, additional DMRS,  Δ1=0, Δ2=3 |
| -8.6 | 147.04 | | 148.04 | 128.59 | | NLOS | | O2O | |
| -6.05 | 144.49 | | 145.49 | 121.66 | | NLOS | | O2I | | 22bits, 4Rx, additional DMRS,  Δ1=0, Δ2=3 |
| -6.1 | 144.54 | | 145.54 | 126.09 | | NLOS | | O2O | |
| Huawei, Hisilicon | -10.3 |  | | 154.99 | 132.01 | | NLoS | | O2I | | Format 1 with 2bits |
| -10.3 |  | | 154.99 | 135.54 | | NLoS | | O2O | | Format 1 with 2bits |
| -7.9 |  | | 152.59 | 129.61 | | NLoS | | O2I | | Format 3 with 11bits |
| -7.8 |  | | 152.49 | 133.04 | | NLoS | | O2O | | Format 3 with 11bits |
| -6 |  | | 150.69 | 127.71 | | NLoS | | O2I | | Format 3 with 22bits |
| China Telecom | -5.9 | 162.40 | | 151.35 | 130.4 | | NLOS | | O2I | | 2 Rx; Format 1; w/o repetition; |
| -5.8 | 162.30 | | 151.25 | 131.80 | | NLOS | | O2O | | 2 Rx; Format 1; w/o repetition; |
| -4.7 | 155.18 | | 147.14 | 126.19 | | NLOS | | O2I | | 4Rx; Format 3, 22bits; w/ intra-slot hopping; w/o repetition; 4 DMRS symbols |
| -5.1 | 155.58 | | 147.54 | 128.09 | | NLOS | | O2O | | 4Rx; Format 3, 22bits; w/ intra-slot hopping; w/o repetition; 4 DMRS symbols |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Rural 2.6 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| DDDSU | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| DDDSUDDSUU | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Others | vivo | -6 | 147.45 | | 151.45 | 128.47 | | NLOS | | O2I | | DDDDDDDSUU  Format 1 No repetition |
| -3.4 | 144.85 | | 148.85 | 125.87 | | NLOS | | O2I | | DDDDDDDSUU  Format 3 11bits No repetition 2 DMRS symbols |
| -5.66 | 147.11 | | 151.11 | 131.66 | | NLOS | | O2O | | DDDDDDDSUU  Format 1 No repetition |
| -3.52 | 144.97 | | 148.97 | 129.52 | | NLOS | | O2O | | DDDDDDDSUU  Format 3 11bits No repetition 2 DMRS symbols |
| CATT | -9.1 | 147.50 | | 151.50 | 131.44 | | NLOS | | O2I | | DDDDDDDSUU  UE speed:3kmph  PUCCH PF1 |
| -9.15 | 147.55 | | 151.55 | 134.48 | | NLOS | | O2O | | DDDDDDDSUU  UE speed:120kmph  PUCCH PF1 |
| -12.16 | 150.56 | | 154.56 | 133.66 | | LOS | | O2I | | DDDDDDDSUU  UE speed:3kmph  PUCCH PF1 |
| -12.2 | 150.60 | | 154.6 | 139.49 | | LOS | | O2O | | DDDDDDDSUU  UE speed:120kmph  PUCCH PF1 |
| ZTE | -10.34 | 148.78 | | 149.78 | 126.57 | | NLOS | | O2I | | DDDDDDDSUU  2bits, 4Rx,  Δ1=0, Δ2=3 |
| -10.3 | 148.74 | | 149.74 | 130.29 | | NLOS | | O2O | |
| -8.6 | 147.04 | | 148.04 | 124.83 | | NLOS | | O2I | | DDDDDDDSUU  22bits, 4Rx, additional DMRS,  Δ1=0, Δ2=3 |
| -8.6 | 147.04 | | 148.04 | 128.59 | | NLOS | | O2O | |
| -6.08 | 144.52 | | 145.52 | 122.31 | | NLOS | | O2I | | DDDDDDDSUU  22bits, 4Rx, additional DMRS,  Δ1=0, Δ2=3 |
| -6.08 | 144.52 | | 145.52 | 126.07 | | NLOS | | O2O | |
|  |  |  |  | |  |  | |  | |  | |  |
| Rural 2 GHz FDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| UUUUU | vivo | -6.96 | 136.37 | | 152.41 | 131.46 | | NLOS | | O2I | | Format 1 No repetition |
| -4.14 | 133.55 | | 149.59 | 128.64 | | NLOS | | O2I | | Format 3 11bits No repetition 2 DMRS symbols |
| -6.74 | 136.14 | | 152.18 | 132.73 | | NLOS | | O2O | | Format 1 No repetition |
| -3.92 | 133.33 | | 149.37 | 129.92 | | NLOS | | O2O | | Format 3 11bits No repetition 2 DMRS symbols |
| CATT | -6.1 | 135.51 | | 151.55 | 130.6 | | NLOS | | O2I | | UE speed:3kmph  PUCCH PF1 |
| -6.1 | 135.51 | | 151.55 | 132.1 | | NLOS | | O2O | | UE speed:120kmph  PUCCH PF1 |
| -11.54 | 140.95 | | 156.99 | 136.2 | | LOS | | O2I | | UE speed:3kmph  PUCCH PF1 |
| -11.55 | 140.96 | | 157 | 139.94 | | LOS | | O2O | | UE speed:120kmph  PUCCH PF1 |
| Panasonic | -10.2 | 139.61 | | 155.65 | 134.70 | | NLOS | | O2I | | PF1 2 bits |
| -7.9 | 137.31 | | 153.35 | 132.40 | | NLOS | | O2I | | PF3 11 bits |
| -4.0 | 133.41 | | 149.45 | 128.50 | | NLOS | | O2I | | PF3 22 bits |
| -10.0 | 139.41 | | 155.45 | 136.00 | | NLOS | | O2O | | PF1 2 bits |
| -8.4 | 137.81 | | 153.85 | 134.40 | | NLOS | | O2O | | PF3 11 bits |
| -4.4 | 133.81 | | 149.85 | 130.40 | | NLOS | | O2O | | PF3 22 bits |
| Samsung | -7.95 | 137.37 | | 153.41 | 132.46 | | NLOS | | O2I | | PF1\_2 bits |
| -7.65 | 137.07 | | 153.11 | 132.16 | | NLOS | | O2I | | PF3\_4 bits |
| -4.65 | 134.07 | | 150.11 | 129.16 | | NLOS | | O2I | | PF3\_11 bits |
| -1.55 | 130.97 | | 147.01 | 126.06 | | NLOS | | O2I | | PF3\_22 bits |
| -7.95 | 137.37 | | 153.41 | 133.96 | | NLOS | | O2O | | PF1\_2 bits |
| -7.65 | 137.07 | | 153.11 | 133.66 | | NLOS | | O2O | | PF3\_4 bits |
| -4.65 | 134.07 | | 150.11 | 130.66 | | NLOS | | O2O | | PF3\_11 bits |
| -1.55 | 130.97 | | 147.01 | 127.56 | | NLOS | | O2O | | PF3\_22 bits |
| Nokia/NSB | -2.50 | 131.91 | | 140.76 | 118.22 | | NLOS | | O2I | | UE speed: 3 Km/h, Format 1 |
| -5.50 | 134.91 | | 143.76 | 123.74 | | LOS | | O2I | | UE speed: 3 Km/h, Format 1 |
| 0.00 | 129.41 | | 138.26 | 118.78 | | NLOS | | O2O | | UE speed: 120 Km/h, Format 1 |
| -5.00 | 134.41 | | 143.26 | 126.22 | | LOS | | O2O | | UE speed: 120 Km/h, Format 1 |
| -1.13 | 130.53 | | 139.38 | 116.84 | | NLOS | | O2I | | UE speed: 3 Km/h, Format 3 |
| -4.81 | 134.22 | | 143.07 | 123.05 | | LOS | | O2I | | UE speed: 3 Km/h, Format 3 |
| 1.88 | 127.53 | | 136.38 | 116.90 | | NLOS | | O2O | | UE speed: 120 Km/h, Format 3 |
| -4.75 | 134.16 | | 143.01 | 125.97 | | LOS | | O2O | | UE speed: 120 Km/h, Format 3 |
| Huawei, Hisilicon | -10.1 |  | | 152.79 | 130.84 | | NLoS | | O2I | | Format 1 with 2bits |
| -10.05 |  | | 152.74 | 133.29 | | NLoS | | O2O | | Format 1 with 2bits |
| -7.6 |  | | 150.29 | 128.34 | | NLoS | | O2I | | Format 3 with 11bits |
| -7.55 |  | | 150.24 | 130.79 | | NLoS | | O2O | | Format 3 with 11bits |
| -5.75 |  | | 148.44 | 126.49 | | NLoS | | O2I | | Format 3 with 22bits |
| -5.5 |  | | 148.19 | 128.74 | | NLoS | | O2O | | Format 3 with 22 bits |
| ZTE | -6.1 | 135.51 | | 147.57 | 124.79 | | NLOS | | O2I | | 2bits,2Rx,  Δ1=0, Δ2=3.98 |
| -6.1 | 135.51 | | 147.57 | 128.12 | | NLOS | | O2O | |
| -4.1 | 133.51 | | 145.57 | 122.79 | | NLOS | | O2I | | 11bits, 2Rx, additional DMRS,  Δ1=0, Δ2=3.98 |
| -4.07 | 133.48 | | 145.54 | 126.09 | | NLOS | | O2O | |
| -1.27 | 130.68 | | 142.74 | 119.96 | | NLOS | | O2I | | 11bits, 2Rx, additional DMRS,  Δ1=0, Δ2=3.98 |
| -1.58 | 130.99 | | 143.05 | 123.60 | | NLOS | | O2O | |
| China Telecom | -5.9 | 147.35 | | 151.35 | 130.40 | | NLOS | | O2I | | 2 Rx; Format 1; w/o repetition; |
| -5.8 | 147.25 | | 151.25 | 131.80 | | NLOS | | O2O | | 2 Rx; Format 1; w/o repetition; |
| -4.8 | 140.23 | | 144.23 | 123.28 | | NLOS | | O2I | | 4Rx; Format 3, 22bits; w/ intra-slot hopping; w/o repetition; 4 DMRS symbols |
| -5.1 | 140.53 | | 144.53 | 125.08 | | NLOS | | O2O | | 4Rx; Format 3, 22bits; w/ intra-slot hopping; w/o repetition; 4 DMRS symbols |
| OPPO | -6.97 | 136.38 | | 152.42 | 131.47 | | NLOS | | O2I | | PF1\_2 bits |
| -4.34 | 133.35 | | 149.39 | 128.44 | | NLOS | | O2I | | PF3\_11 bits |
| -3.43 | 132.84 | | 155.96 | 127.93 | | NLOS | | O2I | | PF3\_22 bits |
| -6.97 | 136.38 | | 152.42 | 131.47 | | NLOS | | O2O | | PF1\_2 bits |
| -4.35 | 133.36 | | 149.40 | 128.45 | | NLOS | | O2O | | PF3\_11 bits |
| -3.47 | 132.88 | | 148.92 | 127.97 | | NLOS | | O2O | | PF3\_22 bits |
| Rural 700 MHz FDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| UUUUU | vivo | -10.86 | 140.27 | | 150.29 | 129.34 | | NLOS | | O2I | | Format 1 No repetition |
| -8.02 | 137.43 | | 147.45 | 126.5 | | NLOS | | O2I | | Format 3 11bits No repetition 2 DMRS symbols |
| -10.77 | 140.18 | | 150.2 | 130.75 | | NLOS | | O2O | | Format 1 No repetition |
| -7.98 | 137.39 | | 147.41 | 127.96 | | NLOS | | O2O | | Format 3 11bits No repetition 2 DMRS symbols |
| Qualcomm | -10.5 | 140 | | 153 | 132 | | NLOS | | O2O | | PF1 2 bits |
| -7 | 136.5 | | 149.5 | 128.5 | | NLOS | | O2O | | PF3 11 bits |
| -4 | 134 | | 147 | 126 | | NLOS | | O2O | | PF3 22 bits |
| CATT | -11.5 | 140.91 | | 153.94 | 132.99 | | NLOS | | O2I | | UE speed:3kmph  PUCCH PF1 |
| -9.2 | 138.61 | | 151.64 | 132.19 | | NLOS | | O2O | | UE speed:120kmph  PUCCH PF1 |
| -11.5 | 140.91 | | 153.94 | 133.15 | | LOS | | O2I | | UE speed:3kmph  PUCCH PF1 |
| -9.62 | 139.03 | | 153.99 | 136.93 | | LOS | | O2O | | UE speed:120kmph  PUCCH PF1 |
| InterDigital | -2 | 138.85 | | 145.88 | 125.68 | | NLOS | | O2I | | PF3 22 bits with UE speed = 3km/hr |
| Panasonic | -10.2 | 139.61 | | 152.64 | 131.69 | | NLOS | | O2I | | PF1 2 bits |
| -7.8 | 137.21 | | 150.24 | 129.29 | | NLOS | | O2I | | PF3 11 bits |
| -3.8 | 133.21 | | 146.24 | 125.29 | | NLOS | | O2I | | PF3 22 bits |
| -9.9 | 139.31 | | 152.34 | 132.89 | | NLOS | | O2O | | PF1 2 bits |
| -8.4 | 137.81 | | 150.84 | 131.39 | | NLOS | | O2O | | PF3 11 bits |
| -4.4 | 133.81 | | 146.84 | 127.39 | | NLOS | | O2O | | PF3 22 bits |
| Intel | -3.90 | 133.31 | | 149.35 | 128.40 | | NLOS | | O2I | | PF1 |
| -4.20 | 133.61 | | 149.65 | 128.70 | | NLOS | | O2I | | PF3-11bits |
| -1.50 | 130.91 | | 146.95 | 126.00 | | NLOS | | O2I | | PF3-22bits |
| -3.70 | 133.11 | | 149.15 | 129.70 | | NLOS | | O2O | | PF1 |
| -4.30 | 133.71 | | 149.75 | 130.30 | | NLOS | | O2O | | PF3-11bits |
| -1.60 | 131.01 | | 147.05 | 127.60 | | NLOS | | O2O | | PF3-22bits |
| Nokia/NSB | -2.50 | 131.91 | | 139.26 | 116.72 | | NLOS | | O2I | | UE speed: 3 Km/h, Format 1 |
| -5.50 | 134.91 | | 142.26 | 122.24 | | LOS | | O2I | | UE speed: 3 Km/h, Format 1 |
| -1.00 | 130.41 | | 137.76 | 118.28 | | NLOS | | O2O | | UE speed: 120 Km/h, Format 1 |
| -5.25 | 134.66 | | 142.01 | 124.97 | | LOS | | O2O | | UE speed: 120 Km/h, Format 1 |
| -1.25 | 130.66 | | 138.01 | 115.47 | | NLOS | | O2I | | UE speed: 3 Km/h, Format 3 |
| -4.81 | 134.22 | | 141.57 | 121.55 | | LOS | | O2I | | UE speed: 3 Km/h, Format 3 |
| 0.25 | 129.16 | | 136.51 | 117.03 | | NLOS | | O2O | | UE speed: 120 Km/h, Format 3 |
| -4.75 | 134.16 | | 141.51 | 124.47 | | LOS | | O2O | | UE speed: 120 Km/h, Format 3 |
| ZTE | -6.02 | 135.43 | | 144.60 | 125.15 | | NLOS | | O2O | | 2bits,2Rx,  Δ1=0, Δ2=3.86 |
| -3.97 | 133.38 | | 142.55 | 123.10 | | NLOS | | O2O | | 11bits,2Rx,  additional DMRS,  Δ1=0, Δ2=3.86 |
| -1.26 | 130.67 | | 139.84 | 120.39 | | NLOS | | O2O | | 22bits,2Rx,  additional DMRS,  Δ1=0, Δ2=3.86 |
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| Rural with long distance 700 MHz FDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| UUUUU | vivo | -11.56 | 140.97 | | 150.99 | 130.2 | | LOS | | O2I | | Format 1 No repetition |
| -9.58 | 138.98 | | 149 | 128.21 | | LOS | | O2I | | Format 3 11bits No repetition 2 DMRS symbols |
| -11.68 | 141.09 | | 151.11 | 134.05 | | LOS | | O2O | | Format 1 No repetition |
| -9.48 | 138.88 | | 148.9 | 131.84 | | LOS | | O2O | | Format 3 11bits No repetition 2 DMRS symbols |
| CATT | -11.44 | 140.85 | | 153.88 | 136.82 | | LOS | | O2O | | UE speed:120kmph  PUCCH PF1 |
| Samsung | -10.10 | 139.52 | | 152.55 | 135.49 | | LOS | | O2O | | PF1\_2 bits |
| -10.20 | 139.62 | | 152.65 | 135.59 | | LOS | | O2O | | PF3\_4 bits |
| -8 | 137.42 | | 150.45 | 133.39 | | LOS | | O2O | | PF3\_11 bits |
| -5.1 | 134.52 | | 147.55 | 130.49 | | LOS | | O2O | | PF3\_22 bits |
| Intel | -7.70 | 137.11 | | 153.15 | 136.09 | | LOS | | O2O | | PF1 |
| -7.70 | 137.11 | | 153.15 | 136.09 | | LOS | | O2O | | PF3-11bits |
| -5.10 | 134.51 | | 150.55 | 133.49 | | LOS | | O2O | | PF3-22bits |
| Huawei, Hisilicon | -9.3 |  | | 149.23 | 134.23 | | LoS | | O2O | | Format 1 with 2 bits |
| -7.3 |  | | 147.23 | 132.23 | | LoS | | O2O | | Format 3 with 11 bits |
| -8.3 |  | | 144.43 | 129.43 | | LoS | | O2O | | Format 3 with 22 bits |
| China Telecom | -13.8 | 152.24 | | 156.24 | 139.18 | | LOS | | O2O | | 2 Rx; Format 1; w/o repetition |
| ZTE | -8.45 | 137.86 | | 147.03 | 132.03 | | LOS | | O2O | | 2bits,2Rx,  Δ1=0, Δ2=3.86 |
| -7.37 | 136.78 | | 145.95 | 130.95 | | LOS | | O2O | | 11bits,2Rx,  additional DMRS, Δ1=0, Δ2=3.86 |
| -4.93 | 134.34 | | 143.51 | 128.51 | | LOS | | O2O | | 22bits,2Rx,  additional DMRS, Δ1=0, Δ2=3.86 |
| Rural with long distance 4 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| DDDSU | vivo | -7.65 | 149.09 | | 153.09 | 130.27 | | LOS | | O2I | | Format 1 No repetition |
| -6.55 | 148 | | 152 | 129.18 | | LOS | | O2I | | Format 3 11bits No repetition 2 DMRS symbols |
| -7.58 | 149.03 | | 153.03 | 135.97 | | LOS | | O2O | | Format 1 No repetition |
| -6.53 | 147.97 | | 151.97 | 134.91 | | LOS | | O2O | | Format 3 11bits No repetition 2 DMRS symbols |
| CATT | -11.5 | 149.9 | | 153.9 | 138.79 | | LOS | | O2O | | UE speed:120kmph  PUCCH PF1 |
| DDDSUDDSUU | vivo | -7.65 | 149.09 | | 153.09 | 130.27 | | LOS | | O2I | | Format 1 No repetition |
| -6.55 | 148 | | 152 | 129.18 | | LOS | | O2I | | Format 3 11bits No repetition 2 DMRS symbols |
| -7.58 | 149.03 | | 153.03 | 135.97 | | LOS | | O2O | | Format 1 No repetition |
| -6.53 | 147.97 | | 151.97 | 134.91 | | LOS | | O2O | | Format 3 11bits No repetition 2 DMRS symbols |
| CATT | -11.5 | 149.9 | | 153.9 | 138.79 | | LOS | | O2O | | UE speed:120kmph  PUCCH PF1 |
| Others | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
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Table 1-4: SSB for FR1

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Urban 4 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | | MCL | | | MIL | | MPL | | Key assumptions | |
| DDDSU | vivo | -11.62 | | 154.66 | | | 160.78 | | 126.97 | | The correction factor for BF gain of broadcast channel is 8 dB | |
| Qualcomm | -15.4 | | 151.4 | | | 163.2 | | 129.4 | | 53 dBm downlink power. See Tdoc for addl. details | |
| Qualcomm | -15.4 | | 142.4 | | | 154.2 | | 120.4 | | 44 dBm downlink power. See Tdoc for addl. details | |
| CATT | -9.05 | | 148.04 | | | 156.81 | | 126.08 | | NLOS, O2I, 3kmph | |
| Intel | -11.20 | | 159.23 | | | 163.29 | | 129.48 | |  | |
| Sharp | -11.00 | | 146.49 | | | 159.52 | | 133.98 | | 8 Tx beams | |
| DDDSUDDSUU | vivo | -11.62 | | 154.66 | | | 160.78 | | 126.97 | | The correction factor for BF gain of broadcast channel is 8 dB | |
| CATT | -9.05 | | 148.04 | | | 156.81 | | 126.08 | | NLOS, O2I, 3kmph | |
| Nokia/NSB | -12.70 | | 163.74 | | | 161.74 | | 131.01 | | NLOS/O2I | |
| ZTE | -12.7 | | 150.30 | | | 156.12 | | 121.88 | | 32bits, 4Rx, DL PSD =33dBm, 1% BLER,  Δ1+ Δ2=13.38 | |
| Others | Company 1 |  | |  | | |  | |  | |  | |
| Company 2 |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
| Urban 2.6 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | | MCL | | | MIL | | MPL | | Key assumptions | |
| DDDDDDDSUU | vivo | -11.6 | | 154.64 | | | 160.76 | | 126.95 | | The correction factor for BF gain of broadcast channel is 8 dB | |
| CATT | -8.95 | | 147.94 | | | 156.71 | | 125.98 | | NLOS, O2I, 3kmph | |
| ZTE | -12.98 | | 150.58 | | | 156.40 | | 124.28 | | 32bits, 4Rx, DL PSD =33dBm, 1% BLER,  Δ1+ Δ2=13.38, | |
|  |  | |  | | |  | |  | |  | |
| Others | Company 1 |  | |  | | |  | |  | |  | |
| Company 2 |  | |  | | |  | |  | |  | |
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|  |  | |  | | |  | |  | |  | |
| Rural 4 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| DDDSU | vivo | -11.62 | 154.66 | | 156.01 | 133.03 | | NLOS | | O2I | | The correction factor for BF gain of broadcast channel is 8 dB |
| -11.48 | 154.52 | | 155.87 | 136.42 | | NLOS | | O2O | |
| CATT | -9.05 | 148.04 | | 152.04 | 135.06 | | NLOS | | O2I | | UE speed:3kmph  PUCCH PF1 |
| Intel | -11.20 | 159.23 | | 160.02 | 139.07 | | NLOS | | O2I | | 3km/h |
| -11.20 | 159.23 | | 160.02 | 140.57 | | NLOS | | O2O | | 120km/h |
| Sharp | -9.5 | 144.99 | | 158.02 | 131.59 | | NLOS | | O2I | | 8 Tx beams |
| DDDSUDDSUU | vivo | -11.62 | 154.66 | | 156.01 | 133.03 | | NLOS | | O2I | | The correction factor for BF gain of broadcast channel is 8 dB |
| -11.48 | 154.52 | | 155.87 | 136.42 | | NLOS | | O2O | |
| ZTE | -12.68 | 156.55 | | 157.55 | 133.72 | | NLOS | | O2I | | 32bits, 4Rx, DL PSD =33dBm, 1% BLER,  Δ1+ Δ2=10.17 |
| -14.94 | 158.81 | | 159.81 | 140.36 | | NLOS | | O2O | |
| Others | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Rural 2.6 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| DDDSU | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| DDDSUDDSUU | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Others | vivo | -11.97 | 155.01 | | 156.36 | 133.38 | | NLOS | | O2I | | DDDDDDDSUU  The correction factor for BF gain of broadcast channel is 8 dB |
| -11.7 | 154.74 | | 156.09 | 136.64 | | NLOS | | O2O | |
| CATT | -8.95 | 147.94 | | 151.94 | 134.96 | | NLOS | | O2I | | DDDDDDDSUU  UE speed:3kmph  PUCCH PF1 |
| ZTE | -12.99 | 156.86 | | 157.86 | 134.65 | | NLOS | | O2I | | 32bits, 4Rx, DL PSD =33dBm, 1% BLER,  Δ1+ Δ2=10.17 |
| -15.95 | 159.82 | | 160.82 | 141.37 | | NLOS | | O2O | |
| Rural 2 GHz FDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| UUUUU | vivo | -12.7 | 151.69 | | 157.08 | 136.13 | | NLOS | | O2I | | The correction factor for BF gain of broadcast channel is 8 dB |
| 13.2 | 152.19 | | 157.58 | 138.13 | | NLOS | | O2O | |
| CATT | -10.46 | 149.45 | | 162.48 | 144.85 | | NLOS | | O2I | | UE speed:3kmph  PUCCH PF1 |
| ZTE | -7.47 | 146.46 | | 152.71 | 129.93 | | NLOS | | O2I | | 32bits, 2Rx, DL PSD =36dBm, 1% BLER,  Δ1=0,Δ2=9.79 |
| -10.04 | 149.03 | | 155.28 | 135.83 | | NLOS | | O2O | |
| Rural 700 MHz FDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| UUUUU | vivo | -9.79 | 148.78 | | 159.16 | 138.21 | | NLOS | | O2I | | The correction factor for BF gain of broadcast channel is 0 dB |
| -10.54 | 149.53 | | 159.91 | 140.46 | | NLOS | | O2O | |
| Qualcomm | -12.8 | 151.8 | | 164.8 | 143.9 | | NLOS | | O2O | | Qualcomm |
| CATT | -10.03 | 149.02 | | 159.04 | 141.41 | | NLOS | | O2I | | UE speed:3kmph  PUCCH PF1 |
| Intel | -10.70 | 149.69 | | 162.72 | 141.77 | | NLOS | | O2I | | 3km/h |
| -11.80 | 150.79 | | 163.82 | 144.37 | | NLOS | | O2O | | 120km/h |
| ZTE | -9.41 | 148.40 | | 153.88 | 134.43 | | NLOS | | O2O | | 32bits, 2Rx, DL PSD =36dBm, 1% BLER,  Δ1=0,Δ2=7.55 |
|  |  |  | |  |  | |  | |  | |  |
| Rural with long distance 700 MHz FDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| UUUUU | vivo | -11.94 | 150.93 | | 161.31 | 140.52 | | LOS | | O2I | | The correction factor for BF gain of broadcast channel is 0 dB |
| -12.28 | 151.27 | | 161.65 | 144.59 | | LOS | | O2O | |
| CATT | -11.62 | 150.61 | | 160.63 | 146.84 | | LOS | | O2O | | speed:120kmph |
| Intel | -14.50 | 153.49 | | 166.52 | 149.46 | | LOS | | O2O | | 120km/h |
| ZTE | -11.6 | 150.59 | | 156.07 | 141.07 | | LOS | | O2O | | 32bits, 2Rx, DL PSD =36dBm, 1% BLER,  Δ1=0,Δ2=7.55 |
| Rural with long distance 4 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| DDDSU | vivo | -14.56 | 157.6 | | 158.95 | 136.13 | | LOS | | O2I | | The correction factor for BF gain of broadcast channel is 8 dB |
| -14.24 | 152.74 | | 156.74 | 142.95 | | LOS | | O2O | |
| CATT | -14.2 | 153.19 | | 157.19 | 144.83 | | LOS | | O2O | | speed:120kmph |
|  |  |  | |  |  | |  | |  | |  |
| DDDSUDDSUU | vivo | -14.56 | 157.6 | | 158.95 | 136.13 | | LOS | | O2I | | The correction factor for BF gain of broadcast channel is 8 dB |
| -14.24 | 152.74 | | 156.74 | 142.95 | | LOS | | O2O | |
| CATT | -14.2 | 153.19 | | 157.19 | 144.83 | | LOS | | O2O | | speed:120kmph |
|  |  |  | |  |  | |  | |  | |  |
| Others | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |

Table 1-5: PRACH for FR1

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Urban 4 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | | MCL | | | MIL | | MPL | | Key assumptions | |
| DDDSU | vivo | -10.19 | | 140.85 | | | 149.62 | | 115.81 | | Format B4 | |
| -8.19 | | 144.87 | | | 153.64 | | 119.83 | | Format 0 | |
| Qualcomm | -29 | | 144.8 | | | 157.5 | | 123.7 | | Format B4 | |
| CATT | -15.08 | | 144.83 | | | 153.6 | | 119.79 | | NLOS, O2I, 3kmph  Format 0 | |
| -17.06 | | 143.83 | | | 152.6 | | 118.79 | | NLOS, O2I, 3kmph  Format B4 | |
| Sharp | -14 | | 132.68 | | | 153.49 | | 127.95 | | Format B4 | |
| DDDSUDDSUU | vivo | -10.19 | | 140.85 | | | 149.62 | | 115.81 | | Format B4 | |
| -8.19 | | 144.87 | | | 153.64 | | 119.83 | | Format 0 | |
| CATT | -15.08 | | 144.83 | | | 153.6 | | 119.79 | | NLOS, O2I, 3kmph  Format 0 | |
| -17.06 | | 143.83 | | | 152.6 | | 118.79 | | NLOS, O2I, 3kmph  Format B4 | |
| Nokia/NSB | -12.56 | | 146.29 | | | 144.29 | | 113.56 | | O2I, Format B4 | |
| ZTE | -13.1 | | 140.74 | | | 146.56 | | 112.32 | | 4Rx, F-B4, PMD=1%  Δ1=0,Δ2=2.95. | |
| Others | Company 1 |  | |  | | |  | |  | |  | |
| Company 2 |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
| Urban 2.6 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | | MCL | | | MIL | | MPL | | Key assumptions | |
| DDDDDDDSUU | vivo | -10.25 | | 140.91 | | | 149.68 | | 115.87 | | Format B4 | |
| -8.17 | | 144.85 | | | 153.62 | | 119.81 | | Format 0 | |
| CATT | -15.06 | | 144.81 | | | 153.58 | | 119.77 | | NLOS, O2I, 3kmph  Format 0 | |
| -16.58 | | 143.35 | | | 152.12 | | 118.31 | | NLOS, O2I, 3kmph  Format B4 | |
| ZTE | -13.07 | | 140.71 | | | 146.53 | | 114.41 | | 4Rx, F-B4, PMD=1%  Δ1=0,Δ2=2.95. | |
| Others | Company 1 |  | |  | | |  | |  | |  | |
| Company 2 |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
| Rural 4 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| DDDSU | vivo | -10.19 | 140.85 | | 144.85 | 121.87 | | NLOS | | O2I | | Format B4 |
| -8.19 | 144.87 | | 148.87 | 125.89 | | NLOS | | O2I | | Format 0 |
| -10.77 | 141.43 | | 145.43 | 125.98 | | NLOS | | O2O | | Format B4 |
| -7.53 | 144.21 | | 148.21 | 128.76 | | NLOS | | O2O | | Format 0 |
| CATT | -15.08 | 148.83 | | 152.83 | 132.77 | | NLOS | | O2I | | UE speed:3kmph  Format 0 |
| -15.52 | 149.27 | | 153.27 | 136.20 | | NLOS | | O2O | | UE speed:120kmph  Format 0 |
| -18.38 | 152.13 | | 156.13 | 135.23 | | LOS | | O2I | | UE speed:3kmph  Format 0 |
| -17.35 | 151.10 | | 155.10 | 139.99 | | LOS | | O2O | | UE speed:120kmph  Format 0 |
| -17.06 | 147.83 | | 151.83 | 131.77 | | NLOS | | O2I | | UE speed:3kmph  Format B4 |
| -17.7 | 148.47 | | 152.47 | 135.40 | | NLOS | | O2O | | UE speed:120kmph  Format B4 |
| -20.02 | 150.79 | | 154.79 | 133.89 | | LOS | | O2I | | UE speed:3kmph  Format B4 |
| -19.82 | 150.59 | | 154.59 | 139.48 | | LOS | | O2O | | UE speed:120kmph  Format B4 |
| Sharp | -18 | 136.68 | | 152.72 | 126.29 | | NLOS | | O2I | | format B4 |
| DDDSUDDSUU | vivo | -10.19 | 140.85 | | 144.85 | 121.87 | | NLOS | | O2I | | Format B4 |
| -8.19 | 144.87 | | 148.87 | 125.89 | | NLOS | | O2I | | Format 0 |
| -10.77 | 141.43 | | 145.43 | 125.98 | | NLOS | | O2O | | Format B4 |
| -7.53 | 144.21 | | 148.21 | 128.76 | | NLOS | | O2O | | Format 0 |
| Nokia/NSB | -12.92 | 146.65 | | 142.75 | 123.91 | | NLOS | | O2I | | UE speed: 3 Km/h, Format B4 |
| -20.06 | 153.79 | | 149.89 | 132.97 | | LOS | | O2I | | UE speed: 3 Km/h, Format B4 |
| -12.05 | 145.78 | | 141.88 | 126.20 | | NLOS | | O2O | | UE speed: 120 Km/h, Format B4 |
| -19.80 | 153.53 | | 149.63 | 135.83 | | LOS | | O2O | | UE speed: 120 Km/h, Format B4 |
| ZTE | -13.1 | 140.74 | | 141.74 | 117.91 | | NLOS | | O2I | | 4Rx, F-B4, PMD=1%  Δ1=0,Δ2=3. |
| -13.25 | 140.89 | | 141.89 | 122.44 | | NLOS | | O2O | |
| Others | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Rural 2.6 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| DDDSU | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| DDDSUDDSUU | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Others | vivo | -10.25 | 140.91 | | 144.91 | 121.93 | | NLOS | | O2I | | DDDDDDDSUU  Format B4 |
| -8.17 | 144.85 | | 148.85 | 125.87 | | NLOS | | O2I | | DDDDDDDSUU  Format 0 |
| -10.4 | 141.06 | | 145.06 | 125.61 | | NLOS | | O2O | | DDDDDDDSUU  Format B4 |
| -8.09 | 144.77 | | 148.77 | 129.32 | | NLOS | | O2O | | DDDDDDDSUU  Format 0 |
| CATT | -15.06 | 148.81 | | 152.81 | 132.75 | | NLOS | | O2I | | DDDDDDDSUU  UE speed:3kmph  Format 0 |
| -14.96 | 148.71 | | 152.71 | 135.64 | | NLOS | | O2O | | DDDDDDDSUU  UE speed:120kmph  Format 0 |
| -18.4 | 152.15 | | 149.17 | 135.25 | | LOS | | O2I | | DDDDDDDSUU  UE speed:3kmph  Format 0 |
| -17.57 | 151.32 | | 155.32 | 140.21 | | LOS | | O2O | | DDDDDDDSUU  UE speed:120kmph  Format 0 |
| -16.58 | 147.35 | | 151.35 | 131.29 | | NLOS | | O2I | | DDDDDDDSUU  UE speed:3kmph  Format B4 |
| -17.22 | 147.99 | | 151.99 | 134.92 | | NLOS | | O2O | | DDDDDDDSUU  UE speed:120kmph  Format B4 |
| -20.24 | 151.01 | | 151.01 | 134.11 | | LOS | | O2I | | DDDDDDDSUU  UE speed:3kmph  Format B4 |
| -17.99 | 148.76 | | 152.76 | 137.65 | | LOS | | O2O | | DDDDDDDSUU  UE speed:120kmph  Format B4 |
| ZTE | -13.07 | 140.71 | | 141.71 | 118.5 | | NLOS | | O2I | | DDDDDDDSUU  4Rx, F-B4, PMD=1%  Δ1=0,Δ2=3. |
| -13.26 | 140.90 | | 141.90 | 122.45 | | NLOS | | O2O | |
| Rural 2 GHz FDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| UUUUU | vivo | -9.7 | 128.31 | | 144.36 | 123.41 | | NLOS | | O2I | | Format B4 |
| -8.52 | 130.14 | | 146.19 | 125.24 | | NLOS | | O2I | | Format 0 |
| -10.11 | 128.72 | | 144.77 | 125.32 | | NLOS | | O2O | | Format B4 |
| -8.22 | 129.84 | | 145.88 | 126.43 | | NLOS | | O2O | | Format 0 |
| CATT | -14.76 | 136.51 | | 152.55 | 131.6 | | NLOS | | O2I | | UE speed:3kmph  Format 0 |
| -15.47 | 137.22 | | 153.26 | 133.81 | | NLOS | | O2O | | UE speed:120kmph  Format 0 |
| -18.23 | 139.98 | | 156.02 | 135.23 | | LOS | | O2I | | UE speed:3kmph  Format 0 |
| -17.37 | 139.12 | | 155.16 | 138.1 | | LOS | | O2O | | UE speed:120kmph  Format 0 |
| -16.92 | 135.69 | | 151.73 | 130.78 | | NLOS | | O2I | | UE speed:3kmph  Format B4 |
| -17.56 | 136.33 | | 152.37 | 132.92 | | NLOS | | O2O | | UE speed:120kmph  Format B4 |
| -19.97 | 138.74 | | 154.78 | 133.99 | | LOS | | O2I | | UE speed:3kmph  Format B4 |
| -19.86 | 138.63 | | 154.67 | 137.61 | | LOS | | O2O | | UE speed:120kmph  Format B4 |
| Nokia/NSB | -12.69 | 134.38 | | 140.33 | 121.49 | | NLOS | | O2I | | UE speed: 3 Km/h, Format B4 |
| -19.95 | 141.64 | | 147.59 | 130.67 | | LOS | | O2I | | UE speed: 3 Km/h, Format B4 |
| -13.31 | 135.00 | | 140.95 | 125.27 | | NLOS | | O2O | | UE speed: 120 Km/h, Format B4 |
| -19.73 | 141.42 | | 147.37 | 133.57 | | LOS | | O2O | | UE speed: 120 Km/h, Format B4 |
| ZTE | -11.52 | 130.13 | | 136.38 | 113.60 | | NLOS | | O2I | | 2Rx, F-B4, PMD=1%  Δ1=0,Δ2=9.79. |
| -10.84 | 129.45 | | 135.70 | 116.25 | | NLOS | | O2O | |
| Rural 700 MHz FDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| UUUUU | vivo | -13.55 | 132.16 | | 142.18 | 121.23 | | NLOS | | O2I | | Format B4 |
| -13.88 | 135.5 | | 145.52 | 124.57 | | NLOS | | O2I | | Format 0 |
| -13.84 | 132.45 | | 142.47 | 123.02 | | NLOS | | O2O | | Format B4 |
| -13.92 | 135.54 | | 145.36 | 126.11 | | NLOS | | O2O | | Format 0 |
| Qualcomm | -17.6 | 139.4 | | 152.4 | 131.4 | | NLOS | | O2O | | Format 0 |
| CATT | -14.55 | 136.3 | | 149.33 | 128.38 | | NLOS | | O2I | | UE speed:3kmph  Format 0 |
| -14.8 | 136.55 | | 149.58 | 130.13 | | NLOS | | O2O | | UE speed:120kmph  Format 0 |
| -18.47 | 140.22 | | 153.25 | 132.46 | | LOS | | O2I | | UE speed:3kmph  Format 0 |
| -17.98 | 139.73 | | 152.76 | 135.7 | | LOS | | O2O | | UE speed:120kmph  Format 0 |
| -16.95 | 135.72 | | 148.7 | 127.8 | | NLOS | | O2I | | UE speed:3kmph  Format B4 |
| -17.1 | 135.87 | | 148.9 | 129.45 | | NLOS | | O2O | | UE speed:120kmph  Format B4 |
| -19.39 | 138.16 | | 151.19 | 130.4 | | LOS | | O2I | | UE speed:3kmph  Format B4 |
| -19.96 | 138.73 | | 151.76 | 134.7 | | LOS | | O2O | | UE speed:120kmph  Format B4 |
| Nokia/NSB | -10.00 | 134.82 | | 140.57 | 121.73 | | NLOS | | O2I | | UE speed: 3 Km/h, Format 0 |
| -16.78 | 141.60 | | 147.35 | 130.43 | | LOS | | O2I | | UE speed: 3 Km/h, Format 0 |
| -11.38 | 136.20 | | 141.95 | 126.27 | | NLOS | | O2O | | UE speed: 120 Km/h, Format 0 |
| -16.70 | 141.52 | | 147.27 | 133.47 | | LOS | | O2O | | UE speed: 120 Km/h, Format 0 |
| ZTE | -10.93 | 129.54 | | 135.02 | 115.57 | | NLOS | | O2O | | 2Rx, F-B4, PMD=1%  Δ1=0,Δ2=7.55. |
| Rural with long distance 700 MHz FDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| UUUUU | vivo | -18.64 | 137.52 | | 147.27 | 126.48 | | LOS | | O2I | | Format B4 |
| -18.47 | 140.09 | | 150.11 | 129.32 | | LOS | | O2I | | Format 0 |
| -18.58 | 137.19 | | 147.21 | 130.15 | | LOS | | O2O | | Format B4 |
| -18.22 | 139.84 | | 149.86 | 132.8 | | LOS | | O2O | | Format 0 |
| CATT | -17.82 | 139.57 | | 152.6 | 135.54 | | LOS | | O2O | | UE speed:120kmph  Format 0 |
| -19.72 | 138.49 | | 151.52 | 134.46 | | LOS | | O2O | | UE speed:120kmph  Format B4 |
| ZTE | -13.7 | 132.31 | | 137.79 | 122.79 | | LOS | | O2O | | 2Rx, F-B4, PMD=1%  Δ1=0,Δ2=7.55 |
| Rural with long distance 4 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| DDDSU | vivo | -15.53 | 146.19 | | 150.19 | 127.37 | | LOS | | O2I | | Format B4 |
| -14.59 | 151.27 | | 155.27 | 132.45 | | LOS | | O2I | | Format 0 |
| -15.53 | 146.19 | | 150.19 | 133.13 | | LOS | | O2O | | Format B4 |
| -12.49 | 149.17 | | 153.17 | 136.11 | | LOS | | O2O | | Format 0 |
| CATT | -17.38 | 151.13 | | 155.13 | 140.02 | | LOS | | O2O | | UE speed:120kmph  Format 0 |
| -19.85 | 150.62 | | 154.62 | 139.51 | | LOS | | O2O | | UE speed:120kmph  Format B4 |
| DDDSUDDSUU | vivo | -15.53 | 146.19 | | 150.19 | 127.37 | | LOS | | O2I | | Format B4 |
| -14.59 | 151.27 | | 155.27 | 132.45 | | LOS | | O2I | | Format 0 |
| -15.53 | 146.19 | | 150.19 | 133.13 | | LOS | | O2O | | Format B4 |
| -12.49 | 149.17 | | 153.17 | 136.11 | | LOS | | O2O | | Format 0 |
| CATT | -17.38 | 151.13 | | 155.13 | 140.02 | | LOS | | O2O | | UE speed:120kmph  Format 0 |
| -19.85 | 150.62 | | 154.62 | 139.51 | | LOS | | O2O | | UE speed:120kmph  Format B4 |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Others | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |

Table 1-6: PDCCH of Msg.2 for FR1

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Urban 4 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | | MCL | | | MIL | | MPL | | Key assumptions | |
| DDDSU | vivo | -8.49 | | 151.53 | | | 157.65 | | 123.84 | | The correction factor for BF gain of broadcast channel is 8 dB | |
| Qualcomm | -11.5 | | 147.5 | | | 159.3 | | 125.5 | | 53 dBm DL Tx power. See Tdoc for addl. Details. | |
| Qualcomm | -11.5 | | 138.5 | | | 150.3 | | 116.5 | | 44 dBm DL Tx power. See Tdoc for addl. Details. | |
| Sharp | -7.50 | | 143.49 | | | 167.31 | | 141.77 | | REG bundle size = 6 | |
| DDDSUDDSUU | vivo | -8.49 | | 151.53 | | | 157.65 | | 123.84 | | The correction factor for BF gain of broadcast channel is 8 dB | |
| ZTE | -11.4 | | 149.00 | | | 154.82 | | 120.58 | | 40bits, 4Rx, DL PSD =33dBm, 1% BLER,  Δ1+ Δ2=13.38, | |
| Apple | -8.7 | | 154.74 | | | 163.51 | | 129.70 | | Antenna gain correction factor is 2dB | |
|  |  | |  | | |  | |  | |  | |
| Others | Company 1 |  | |  | | |  | |  | |  | |
| Company 2 |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
| Urban 2.6 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | | MCL | | | MIL | | MPL | | Key assumptions | |
| DDDDDDDSUU | vivo | -8.46 | | 151.5 | | | 157.62 | | 123.81 | | The correction factor for BF gain of broadcast channel is 8 dB | |
| ZTE | -11.63 | | 149.23 | | | 155.05 | | 122.93 | | 40bits, 4Rx, DL PSD =33dBm, 1% BLER,  Δ1+ Δ2=13.38, | |
| Apple | -8.6 | | 154.64 | | | 163.41 | | 129.60 | | Antenna gain correction factor is 2dB | |
|  |  | |  | | |  | |  | |  | |
| Others | Company 1 |  | |  | | |  | |  | |  | |
| Company 2 |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
| Rural 4 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| DDDSU | vivo | -8.49 | 151.53 | | 157.65 | 123.84 | | NLOS | | O2I | | The correction factor for BF gain of broadcast channel is 8 dB |
| -8.51 | 151.55 | | 152.9 | 133.45 | | NLOS | | O2O | |
| Sharp | -7 | 142.99 | | 156.02 | 129.59 | | NLOS | | O2I | | REG bundle size = 6 |
|  |  |  | |  |  | |  | |  | |  |
| DDDSUDDSUU | vivo | -8.49 | 151.53 | | 157.65 | 123.84 | | NLOS | | O2I | | The correction factor for BF gain of broadcast channel is 8 dB |
| -8.51 | 151.55 | | 152.9 | 133.45 | | NLOS | | O2O | |
| ZTE | -11.44 | 155.31 | | 156.31 | 132.48 | | NLOS | | O2I | | 40bits, 4Rx, DL PSD =33dBm, 1% BLER,  Δ1+ Δ2=10.17 |
| -11.49 | 155.36 | | 156.36 | 136.91 | | NLOS | | O2O | |
| Others | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Rural 2.6 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| DDDSU | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| DDDSUDDSUU | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Others | vivo | -8.46 | 151.5 | | 152.85 | 129.87 | | NLOS | | O2I | | DDDDDDDSUU  The correction factor for BF gain of broadcast channel is 8 dB |
| -8.48 | 151.52 | | 152.87 | 133.42 | | NLOS | | O2O | |
| ZTE | -11.64 | 155.51 | | 156.51 | 123.3 | | NLOS | | O2I | | DDDDDDDSUU  40bits, 4Rx, DL PSD =33dBm, 1% BLER,  Δ1+ Δ2=10.17 |
| -11.61 | 155.48 | | 156.48 | 137.03 | | NLOS | | O2O | |
| Rural 2 GHz FDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| UUUUU | vivo | -9.27 | 148.26 | | 153.65 | 132.7 | | NLOS | | O2I | | The correction factor for BF gain of broadcast channel is 8 dB |
| -9.44 | 148.43 | | 153.82 | 134.37 | | NLOS | | O2O | |
| ZTE | -8.43 | 147.42 | | 153.67 | 130.89 | | NLOS | | O2I | | 40bits, 2Rx, DL PSD =36dBm, 1% BLER,  Δ1=0 Δ2=9.79 |
| -8.41 | 147.40 | | 153.65 | 134.20 | | NLOS | | O2O | |
| Rural 700 MHz FDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| UUUUU | vivo | -5.62 | 144.61 | | 154.99 | 134.04 | | NLOS | | O2I | | The correction factor for BF gain of broadcast channel is 0 dB |
| -5.93 | 144.92 | | 155.3 | 135.85 | | NLOS | | O2O | |
| Qualcomm | -9 | 148 | | 161 | 140 | | NLOS | | O2O | |  |
| ZTE | -7.43 | 146.42 | | 151.90 | 132.45 | | NLOS | | O2O | | 40bits, 2Rx, DL PSD =36dBm, 1% BLER,  Δ1=0 Δ2=7.55 |
| Apple | -8.70 | 147.69 | | 157.71 | 136.76 | | NLOS | | O2I | | Antenna gain correction factor is 0dB |
| Rural with long distance 700 MHz FDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| UUUUU | vivo | -9.12 | 148.11 | | 158.49 | 137.7 | | LOS | | O2I | | The correction factor for BF gain of broadcast channel is 0 dB |
| -9.09 | 148.08 | | 158.46 | 141.4 | | LOS | | O2O | |
| ZTE | -7.68 | 146.67 | | 152.15 | 137.15 | | LOS | | O2O | | 40bits, 2Rx, DL PSD =36dBm, 1% BLER,  Δ1=0 Δ2=7.55 |
|  |  |  | |  |  | |  | |  | |  |
| Rural with long distance 4 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| DDDSU | vivo | -11.63 | 154.67 | | 156.02 | 133.2 | | LOS | | O2I | | The correction factor for BF gain of broadcast channel is 8 dB |
| -11.59 | 162.63 | | 163.98 | 146.92 | | LOS | | O2O | |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| DDDSUDDSUU | vivo | -11.63 | 154.67 | | 156.02 | 133.2 | | LOS | | O2I | | The correction factor for BF gain of broadcast channel is 8 dB |
| -11.59 | 162.63 | | 163.98 | 146.92 | | LOS | | O2O | |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Others | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |

Table 1-6a: PDSCH for Msg.2 for FR1

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Urban 4 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | | MCL | | | MIL | | MPL | | Key assumptions | |
| DDDSU | vivo | -7.92 | | 150.96 | | | 157.08 | | 126.35 | | The correction factor for BF gain of broadcast channel is 8 dB | |
| Qualcomm | -13 | | 149 | | | 160.8 | | 130 | | 53 dBm DL Tx Power. See Tdoc for addl details. | |
| Qualcomm | -13 | | 140 | | | 151.8 | | 121 | | 44 dBm DL Tx Power. See Tdoc for addl details. | |
| Intel | -6.94 | | 154.97 | | | 159.03 | | 128.30 | |  | |
| Sharp | -12 | | 147.49 | | | 160.52 | | 138.06 | | Scaling factor = 0.25 | |
| DDDSUDDSUU | vivo | -7.92 | | 150.96 | | | 157.08 | | 126.35 | | The correction factor for BF gain of broadcast channel is 8 dB | |
| Apple | -5.2 | | 151.24 | | | 160.01 | | 129.28 | | 3RPBs | |
|  |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
| Others | Company 1 |  | |  | | |  | |  | |  | |
| Company 2 |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
| Urban 2.6 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | | MCL | | | MIL | | MPL | | Key assumptions | |
| DDDDDDDSUU | vivo | -7.98 | | 151.02 | | | 157.14 | | 126.41 | | The correction factor for BF gain of broadcast channel is 8 dB | |
| Apple | -5 | | 151.04 | | | 159.81 | | 129.08 | | 3RPB | |
|  |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
| Others | Company 1 |  | |  | | |  | |  | |  | |
| Company 2 |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
| Rural 4 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| DDDSU | vivo | -7.92 | 150.96 | | 152.31 | 132.65 | | NLOS | | O2I | | The correction factor for BF gain of broadcast channel is 8 dB |
| -7.68 | 150.72 | | 152.07 | 136.46 | | NLOS | | O2O | |
| Intel | -6.94 | 154.97 | | 155.76 | 138.13 | | NLOS | | O2I | |  |
| Intel | -6.97 | 155.00 | | 155.79 | 140.18 | | NLOS | | O2O | |  |
| Sharp | -12 | 147.49 | | 160.52 | 137.41 | | NLOS | | O2I | | Scaling factor = 0.25 |
| DDDSUDDSUU | vivo | -7.92 | 150.96 | | 152.31 | 132.65 | | NLOS | | O2I | | The correction factor for BF gain of broadcast channel is 8 dB |
| -7.68 | 150.72 | | 152.07 | 136.46 | | NLOS | | O2O | |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Others | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Rural 2.6 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| DDDSU | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| DDDSUDDSUU | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Others | vivo | -7.98 | 151.02 | | 152.37 | 132.71 | | NLOS | | O2I | | DDDDDDDSUU  The correction factor for BF gain of broadcast channel is 8 dB |
| -7.78 | 150.82 | | 152.17 | 136.56 | | NLOS | | O2O | |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Rural 2 GHz FDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| UUUUU | vivo | -8.18 | 147.17 | | 152.56 | 134.93 | | NLOS | | O2I | | The correction factor for BF gain of broadcast channel is 8 dB |
| -7.85 | 146.84 | | 152.23 | 136.62 | | NLOS | | O2O | |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Rural 700 MHz FDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| UUUUU | vivo | -3.46 | 142.45 | | 149.82 | 132.19 | | NLOS | | O2I | | The correction factor for BF gain of broadcast channel is 0 dB |
| -3.47 | 142.46 | | 149.83 | 134.22 | | NLOS | | O2O | |
| Qualcomm | -10 | 149 | | 162 | 144.4 | | NLOS | | O2O | |  |
| Intel | -3.00 | 141.99 | | 155.02 | 137.39 | | NLOS | | O2I | |  |
| Intel | -3.00 | 141.99 | | 155.02 | 139.41 | | NLOS | | O2O | |  |
| Apple | -2.6 | 141.59 | | 151.61 | 133.98 | | NLOS | | O2I | |  |
| Rural with long distance 700 MHz FDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| UUUUU | vivo | -8.35 | 147.34 | | 154.71 | 137.19 | | LOS | | O2I | | The correction factor for BF gain of broadcast channel is 0 dB |
| -8.1 | 147.09 | | 154.46 | 140.67 | | LOS | | O2O | |
| Intel | -3.20 | 142.19 | | 155.22 | 141.43 | | LOS | | O2O | |  |
|  |  |  | |  |  | |  | |  | |  |
| Rural with long distance 4 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| DDDSU | vivo | -10 | 153.04 | | 154.39 | 134.84 | | LOS | | O2I | | The correction factor for BF gain of broadcast channel is 8 dB |
| -9.51 | 152.55 | | 153.9 | 140.11 | | LOS | | O2O | |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| DDDSUDDSUU | vivo | -10 | 153.04 | | 154.39 | 134.84 | | LOS | | O2I | | The correction factor for BF gain of broadcast channel is 8 dB |
| -9.51 | 152.55 | | 153.9 | 140.11 | | LOS | | O2O | |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Others | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |

Table 1-7: PUSCH of Msg.3 for FR1

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Urban 4 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | | MCL | | | MIL | | MPL | | Key assumptions | |
| DDDSU | vivo | -2.03 | | 143.54 | | | 152.32 | | 121.59 | | 2 DMRS symbols for each hop | |
| Qualcomm | -16.5 | | 143 | | | 155.7 | | 125 | | See Tdoc for details | |
| CATT | -5 | | 143.46 | | | 152.23 | | 121.5 | | NLOS, O2I, 3kmph | |
| Panasonic | -5.9 | | 144.90 | | | 153.67 | | 122.94 | |  | |
| Intel | -6.30 | | 145.30 | | | 152.37 | | 121.64 | | 3 DMRS symbols | |
| Sharp | -3.5 | | 129.46 | | | 150.27 | | 127.81 | |  | |
| DDDSUDDSUU | vivo | -2.03 | | 143.54 | | | 152.32 | | 121.59 | | 2 DMRS symbols for each hop | |
| CATT | -5 | | 143.46 | | | 152.23 | | 121.5 | | NLOS, O2I, 3kmph | |
| ZTE | -7.33 | | 145.83 | | | 151.65 | | 120.49 | | 4Rx, 56bits, 2RBs, 10% iBLER,  Δ1=0, Δ2=2.95 | |
| Huawei, Hisilicon | -6.4 | |  | | | 155.92 | | 125.19 | | No FH | |
| -6.7 | |  | | | 156.22 | | 125.49 | | FH | |
| Apple | -5.5 | | 142 | | | 150.77 | | 120.4 | | NLOS, O2I, 3kmph | |
| Others | Company 1 |  | |  | | |  | |  | |  | |
| Company 2 |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
| Urban 2.6 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | | MCL | | | MIL | | MPL | | Key assumptions | |
| DDDDDDDSUU | vivo | -2.22 | | 143.73 | | | 152.5 | | 121.77 | | 2 DMRS symbols for each hop | |
| CATT | -5.3 | | 143.76 | | | 152.53 | | 121.8 | | NLOS, O2I, 3kmph | |
| ZTE | -7.06 | | 145.56 | | | 151.38 | | 122.34 | | 4Rx, 56bits, 2RBs, 10% iBLER,  Δ1=0, Δ2=2.95 | |
|  |  | |  | | |  | |  | |  | |
| Others | Company 1 |  | |  | | |  | |  | |  | |
| Company 2 |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
| Rural 4 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| DDDSU | vivo | -2.03 | 143.54 | | 147.54 | 127.88 | | NLOS | | O2I | | 2 DMRS symbols for each hop |
| -2.21 | 143.72 | | 147.72 | 132.11 | | NLOS | | O2O | | 2 DMRS symbols for each hop |
| CATT | -5 | 143.46 | | 147.46 | 130.48 | | NLOS | | O2I | | UE speed:3kmph |
| -5 | 143.46 | | 147.46 | 133.98 | | NLOS | | O2O | | UE speed:120kmph |
| -6.9 | 145.36 | | 149.36 | 131.22 | | LOS | | O2I | | UE speed:3kmph |
| -7.3 | 145.76 | | 149.76 | 137.40 | | LOS | | O2O | | UE speed:120kmph |
| Panasonic | -5,9 | 144.90 | | 148.90 | 131.92 | | NLOS | | O2I | |  |
| -5.9 | 144.90 | | 148.90 | 135.05 | | NLOS | | O2O | |  |
| Intel | -6.30 | 145.30 | | 149.10 | 131.47 | | NLOS | | O2I | | 3 DMRS symbols |
| Intel | -6.30 | 145.30 | | 149.10 | 133.49 | | NLOS | | O2O | | 3 DMRS symbols |
| Sharp | -4 | 129.96 | | 146.00 | 122.89 | | NLOS | | O2I | |  |
| DDDSUDDSUU | vivo | -2.03 | 143.54 | | 147.54 | 127.88 | | NLOS | | O2I | | 2 DMRS symbols for each hop |
| -2.22 | 143.73 | | 147.73 | 132.12 | | NLOS | | O2O | | 2 DMRS symbols for each hop |
| Huawei, Hisilicon | -6.4 |  | | 151.15/ | 131.49 | | NLOS | | O2I | | No FH |
| -6 |  | | 150.75 | 135.14 | | NLoS | | O2O | | No FH |
| -6.7 |  | | 151.45 | 131.79 | | NLoS | | O2I | | FH |
| -6.1 |  | | 150.85 | 135.24 | | NLoS | | O2O | | FH |
| ZTE | -7.33 | 145.83 | | 146.83 | 126.32 | | NLOS | | O2I | | 4Rx, 56bits, 2RBs, 10% iBLER,  Δ1=0, Δ2=3 |
| -8.01 | 146.51 | | 147.51 | 131.90 | | NLOS | | O2O | |
| Others | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Rural 2.6 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| DDDSU | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| DDDSUDDSUU | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Others | vivo | -2.22 | 143.73 | | 147.73 | 128.07 | | NLOS | | O2I | | DDDDDDDSUU 2 DMRS symbols for each hop |
| -2.33 | 143.84 | | 147.84 | 132.23 | | NLOS | | O2O | | DDDDDDDSUU 2 DMRS symbols for each hop |
| CATT | -5.4 | 143.86 | | 147.86 | 130.88 | | NLOS | | O2I | | DDDDDDDSUU  UE speed:3kmph |
| -5 | 143.46 | | 147.46 | 133.98 | | NLOS | | O2O | | DDDDDDDSUU  UE speed:120kmph |
| -6.9 | 145.36 | | 149.36 | 131.22 | | LOS | | O2I | | DDDDDDDSUU  UE speed:3kmph |
| -7.3 | 145.76 | | 149.76 | 137.40 | | LOS | | O2O | | DDDDDDDSUU  UE speed:120kmph |
| ZTE | -7.06 | 145.56 | | 146.56 | 126.67 | | NLOS | | O2I | | DDDDDDDSUU  4Rx, 56bits, 2RBs, 10% iBLER,  Δ1=0, Δ2=3 |
| -7.68 | 146.18 | | 147.18 | 131.57 | | NLOS | | O2O | |
| Rural 2 GHz FDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| UUUUU | vivo | -3.47 | 132.94 | | 148.98 | 131.35 | | NLOS | | O2I | | 2 DMRS symbols for each hop |
| -3.11 | 132.58 | | 148.62 | 133.01 | | NLOS | | O2O | | 2 DMRS symbols for each hop |
| CATT | -5.8 | 135.27 | | 151.31 | 133.68 | | NLOS | | O2I | | UE speed:3kmph |
| -5 | 134.47 | | 150.51 | 134.9 | | NLOS | | O2O | | UE speed:120kmph |
| -7 | 134.88 | | 152.51 | 134.99 | | LOS | | O2I | | UE speed:3kmph |
| -7.3 | 136.77 | | 152.81 | 139.02 | | LOS | | O2O | | UE speed:120kmph |
| Panasonic | -1.9 | 131.87 | | 147.91 | 130.28 | | NLOS | | O2I | |  |
| -1.6 | 131.57 | | 147.61 | 132.00 | | NLOS | | O2O | |  |
| Huawei, Hisilicon | -6.5 |  | | 149.25 | 130.62 | | NLOS | | O2I | | No FH |
| -6.25 |  | | /149.00 | /133.39 | | NLOS | | O2O | | No FH |
| -6.8 |  | | 149.55 | 130.92 | | NLOS | | O2I | | FH |
| -6.35 |  | | 149.10 | 133.49 | | NLOS | | O2O | | FH |
| ZTE | -3.04 | 132.51 | | 138.76 | 119.30 | | NLOS | | O2I | | 2Rx, 56bits, 2RBs, 10% iBLER,  Δ1=0,Δ2=9.79 |
| -3.16 | 132.63 | | 138.88 | 123.27 | | NLOS | | O2O | |
| Rural 700 MHz FDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| UUUUU | vivo | -6.81 | 136.28 | | 146.3 | 128.67 | | NLOS | | O2I | | 2 DMRS symbols for each hop |
| -6.76 | 136.23 | | 146.25 | 130.64 | | NLOS | | O2O | | 2 DMRS symbols for each hop |
| Qualcomm | -6 | 135.5 | | 148.5 | 130.9 | | NLOS | | O2O | |  |
| CATT | -6.2 | 135.67 | | 148.7 | 131.07 | | NLOS | | O2I | | UE speed:3kmph |
| -5 | 134.47 | | 147.5 | 131.89 | | NLOS | | O2O | | UE speed:120kmph |
| -7.4 | 136.87 | | 149.9 | 132.38 | | LOS | | O2I | | UE speed:3kmph |
| -8.8 | 138.27 | | 150 | 136.21 | | LOS | | O2O | | UE speed:120kmph |
| Panasonic | -2.1 | 132.07 | | 145.10 | 127.47 | | NLOS | | O2I | |  |
| -1.9 | 131.87 | | 144.90 | 129.29 | | NLOS | | O2O | |  |
| Intel | -3.00 | 132.97 | | 149.01 | 131.38 | | NLOS | | O2I | | 3 DMRS symbols |
| Intel | -3.00 | 132.97 | | 149.01 | 133.40 | | NLOS | | O2O | | 3 DMRS symbols |
| ZTE | -3.47 | 132.94 | | 138.42 | 122.81 | | NLOS | | O2O | | 2Rx, 56bits, 2RBs, 10% iBLER,  Δ1=0,Δ2=7.55 |
| Rural with long distance 700 MHz FDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| UUUUU | vivo | -6.92 | 136.39 | | 146.41 | 128.89 | | LOS | | O2I | | 2 DMRS symbols for each hop |
| -7 | 136.47 | | 146.49 | 132.7 | | LOS | | O2O | | 2 DMRS symbols for each hop |
| CATT | -7.5 | 136.97 | | 150 | 136.21 | | LOS | | O2O | | UE speed:120kmph |
| Intel | -5.10 | 135.07 | | 151.11 | 137.32 | | LOS | | O2O | | 3 DMRS symbols |
| ZTE | -6.4 | 135.87 | | 141.35 | 127.56 | | LOS | | O2O | | 2Rx, 56bits, 2RBs, 10% iBLER,  Δ1=0,Δ2=7.55 |
| Huawei, Hisilicon | -8.7 |  | | 148.69 | 134.90 | | LOS | | O2O | | No FH |
| -8.9 |  | | 148.89 | 135.10 | | LOS | | O2O | | FH |
|  |  |  | |  |  | |  | |  | |  |
| Rural with long distance 4 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| DDDSU | vivo | -5.46 | 146.97 | | 150.97 | 131.42 | | LOS | | O2I | | 2 DMRS symbols for each hop |
| -4.99 | 146.5 | | 150.5 | 136.71 | | LOS | | O2O | | 2 DMRS symbols for each hop |
| CATT | -7.4 | 145.86 | | 149.86 | 137.5 | | LOS | | O2O | | UE speed:120kmph |
|  |  |  | |  |  | |  | |  | |  |
| DDDSUDDSUU | vivo | -5.46 | 146.97 | | 150.97 | 131.42 | | LOS | | O2I | | 2 DMRS symbols for each hop |
| -4.99 | 146.5 | | 150.5 | 136.71 | | LOS | | O2O | | 2 DMRS symbols for each hop |
| CATT | -7.4 | 145.86 | | 149.86 | 137.5 | | LOS | | O2O | | UE speed:120kmph |
|  |  |  | |  |  | |  | |  | |  |
| Others | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |

Table 1-8: PDSCH of Msg.4 for FR1

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Urban 4 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | | MCL | | | MIL | | MPL | | Key assumptions | |
| DDDSU | vivo | -9.44 | | 152.48 | | | 158.6 | | 127.87 | | MCS0  The correction factor for BF gain of broadcast channel is 8 dB | |
| Intel | -8.71 | | 157.24 | | | 161.30 | | 130.57 | |  | |
| Sharp | -7.5 | | 142.99 | | | 156.02 | | 133.56 | | 8 Tx beams | |
|  |  | |  | | |  | |  | |  | |
| DDDSUDDSUU | vivo | -9.44 | | 152.48 | | | 158.6 | | 127.87 | | MCS0  The correction factor for BF gain of broadcast channel is 8 dB | |
| ZTE | -12.61 | | 150.21 | | | 156.03 | | 124.87 | | 1000bits, 36RBs, MCS0, 4Rx, DL PSD =33dBm, 10% BLER,  Δ1+ Δ2=13.38 | |
| Apple | -8.1 | | 154.14 | | | 162.91 | | 132.18 | | NLOS O2I | |
|  |  | |  | | |  | |  | |  | |
| Others | Company 1 |  | |  | | |  | |  | |  | |
| Company 2 |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
| Urban 2.6 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | | MCL | | | MIL | | MPL | | Key assumptions | |
| DDDDDDDSUU | vivo | -9.48 | | 152.52 | | | 158.64 | | 127.91 | | MCS0  The correction factor for BF gain of broadcast channel is 8 dB | |
| ZTE | -12.74 | | 150.34 | | | 156.16 | | 127.12 | | 1000bits, 36RBs, MCS0, 4Rx, DL PSD =33dBm, 10% BLER,  Δ1+ Δ2=13.38 | |
| Apple | -8.3 | | 154.34 | | | 163.11 | | 132.38 | | NLOS O2I | |
|  |  | |  | | |  | |  | |  | |
| Others | Company 1 |  | |  | | |  | |  | |  | |
| Company 2 |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
| Rural 4 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| DDDSU | vivo | -9.44 | 152.48 | | 153.83 | 134.17 | | NLOS | | O2I | | MCS0  The correction factor for BF gain of broadcast channel is 8 dB |
| --9.25 | 152.29 | | 153.64 | 138.03 | | NLOS | | O2O | |
| Intel | -8.71 | 157.24 | | 158.03 | 140.40 | | NLOS | | O2I | | 2 DMRS symbols |
| Intel | -8.44 | 156.97 | | 157.76 | 142.15 | | NLOS | | O2O | | 2 DMRS symbols |
| Sharp | -7.5 | 142.99 | | 156.02 | 132.91 | | NLOS | | O2I | | 8 Tx beams |
| DDDSUDDSUU | vivo | -9.44 | 152.48 | | 153.83 | 134.17 | | NLOS | | O2I | | MCS0  The correction factor for BF gain of broadcast channel is 8 dB |
| --9.2 | 152.24 | | 153.59 | 137.98 | | NLOS | | O2O | |
| ZTE | -12.45 | 156.32 | | 157.32 | 136.81 | | NLOS | | O2I | | 1000bits, 36RBs, MCS0, 4Rx, DL PSD =33dBm, 10% BLER,  Δ1+ Δ2=10.17 |
| -8.46 | 152.33 | | 153.33 | 137.72 | | NLOS | | O2O | | 1000bits, 40RBs, MCS0, 4Rx, DL PSD =33dBm, 10% BLER,  Δ1+ Δ2=10.17 |
| Others | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Rural 2.6 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| DDDSU | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| DDDSUDDSUU | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Others | vivo | -9.48 | 152.52 | | 153.87 | 134.21 | | NLOS | | O2I | | DDDDDDDSUU MCS0  The correction factor for BF gain of broadcast channel is 8 dB |
| -9.24 | 152.28 | | 153.63 | 138.02 | | NLOS | | O2O | |
| ZTE | -12.81 | 156.68 | | 157.68 | 137.79 | | NLOS | | O2I | | DDDDDDDSUU MCS0  1000bits, 36RBs, MCS0, 4Rx, DL PSD =33dBm, 10% BLER,  Δ1+ Δ2=10.17 |
| -8.49 | 152.36 | | 153.36 | 137.75 | | NLOS | | O2O | | DDDDDDDSUU MCS0  1000bits, 40RBs, MCS0, 4Rx, DL PSD =33dBm, 10% BLER,  Δ1+ Δ2=10.17 |
| Rural 2 GHz FDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| UUUUU | vivo | -8.92 | 147.91 | | 153.3 | 135.67 | | NLOS | | O2I | | MCS0  The correction factor for BF gain of broadcast channel is 8 dB |
| -8.92 | 147.91 | | 153.3 | 137.69 | | NLOS | | O2O | |
| ZTE | -8.56 | 147.55 | | 153.80 | 134.34 | | NLOS | | O2I | | 1000bits, 18RBs, MCS0, 4Rx, DL PSD =36dBm, 10% BLER,  Δ1+ Δ2=9.79 |
| -5.35 | 144.34 | | 150.59 | 134.98 | | NLOS | | O2O | | 1000bits, 20RBs, MCS0, 4Rx, DL PSD =36dBm, 10% BLER,  Δ1+ Δ2=9.79 |
| Rural 700 MHz FDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| UUUUU | vivo | -4.89 | 143.88 | | 151.25 | 133.62 | | NLOS | | O2I | | MCS0  The correction factor for BF gain of broadcast channel is 0 dB |
| -4.65 | 143.64 | | 151.01 | 135.4 | | NLOS | | O2O | |
| Intel | -5.60 | 145.09 | | 158.12 | 140.49 | | NLOS | | O2I | | 2 DMRS symbols |
| Intel | -5.50 | 144.99 | | 158.02 | 142.41 | | NLOS | | O2O | | 2 DMRS symbols |
| ZTE | -5.75 | 144.74 | | 150.22 | 134.61 | | NLOS | | O2O | | 1000bits, 20RBs, MCS0, 4Rx, DL PSD =36dBm, 10% BLER,  Δ1+ Δ2=7.55 |
| Apple | -6.7 | 145.69 | | 155.71 | 138.08 | | NLOS | | O2I | |  |
| Rural with long distance 700 MHz FDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| UUUUU | vivo | -8.71 | 147.7 | | 155.07 | 137.55 | | LOS | | O2I | | MCS0  The correction factor for BF gain of broadcast channel is 0 dB |
| -8.11 | 147.1 | | 154.47 | 140.68 | | LOS | | O2O | |
| Intel | -6.00 | 145.49 | | 158.52 | 144.73 | | LOS | | O2O | | 2 DMRS symbols |
| ZTE | -5.76 | 144.75 | | 150.23 | 136.44 | | LOS | | O2O | | 1000bits, 20RBs, MCS0, 4Rx, DL PSD =36dBm,  Δ1+ Δ2=7.55 |
| Rural with long distance 4 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| DDDSU | vivo | -10.44 | 153.48 | | 154.83 | 135.28 | | LOS | | O2I | | MCS0  The correction factor for BF gain of broadcast channel is 8 dB |
| -9.79 | 152.83 | | 154.18 | 140.39 | | LOS | | O2O | |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| DDDSUDDSUU | vivo | -10.44 | 153.48 | | 154.83 | 135.28 | | LOS | | O2I | | MCS0  The correction factor for BF gain of broadcast channel is 8 dB |
| -9.79 | 152.83 | | 154.18 | 140.39 | | LOS | | O2O | |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Others | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |

[Table 1-8a: PDSCH with HARQ-ACK for Msg.4 for FR1]

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Urban 4 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | | MCL | | | MIL | | MPL | | Key assumptions | |
| DDDSU | Sharp | -12 | | 131.40 | | | 147.44 | | 121.01 | | format 1, 1 bit | |
| ZTE | -11.60 | | 150.04 | | | 155.86 | | 121.62 | | PF1 with 1bit, 4Rx,  Δ1=0, Δ2=2.95 | |
|  |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
| DDDSUDDSUU | Company 1 |  | |  | | |  | |  | |  | |
| Company 2 |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
| Others | Company 1 |  | |  | | |  | |  | |  | |
| Company 2 |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
| Urban 2.6 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | | MCL | | | MIL | | MPL | | Key assumptions | |
| DDDDDDDSUU | ZTE | -11.76 | | 150.20 | | | 156.02 | | 123.90 | | PF1 with 1bit, 4Rx,  Δ1=0, Δ2=2.95 | |
| Company 2 |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
| Others | Company 1 |  | |  | | |  | |  | |  | |
| Company 2 |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
| Rural 4 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| DDDSU | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| DDDSUDDSUU | ZTE | -11.60 | 150.04 | | 151.04 | 127.21 | | NLOS | | O2I | | PF1 with 1bit, 4Rx,  Δ1=0, Δ2=3 |
| -11.65 | 150.09 | | 151.09 | 131.64 | | NLOS | | O2O | |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Others | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Rural 2.6 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| DDDSU | ZTE | -11.76 | 150.20 | | 151.20 | 127.99 | | NLOS | | O2I | | PF1 with 1bit, 4Rx,  Δ1=0, Δ2=3 |
| -11.67 | 150.11 | | 151.11 | 131.66 | | NLOS | | O2O | |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| DDDSUDDSUU | ZTE | -11.76 | 150.20 | | 151.20 | 127.99 | | NLOS | | O2I | | PF1 with 1bit, 4Rx,  Δ1=0, Δ2=3 |
| -11.67 | 150.11 | | 151.11 | 131.66 | | NLOS | | O2O | |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Others |  |  |  | |  |  | |  | |  | |  |
|  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Rural 2 GHz FDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| UUUUU | ZTE | -7.53 | 136.94 | | 143.19 | 120.41 | | NLOS | | O2I | | PF1 with 1bit, 2Rx,  Δ1=0,Δ2=9.79 |
| -7.52 | 136.93 | | 143.18 | 123.73 | | NLOS | | O2O | |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Rural 700 MHz FDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| UUUUU | ZTE | -7.49 | 136.90 | | 142.38 | 122.93 | | NLOS | | O2O | | PF1 with 1bit, 2Rx,  Δ1=0,Δ2=7.55 |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Rural with long distance 700 MHz FDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| UUUUU | ZTE | -10.65 | 140.06 | | 145.54 | 130.54 | | LOS | | O2O | | PF1 with 1bit, 2Rx,  Δ1=0,Δ2=7.55 |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Rural with long distance 4 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| DDDSU | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| DDDSUDDSUU | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Others | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |

Table 1-9: PDCCH for FR1

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Urban 4 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | | MCL | | | MIL | | MPL | | Key assumptions | |
| DDDSU | vivo | -8.5 | | 159.54 | | | 165.66 | | 131.85 | |  | |
| CATT | -9.64 | | 148.63 | | | 157.4 | | 123.59 | | NLOS, O2I, 3kmph | |
| Panasonic | -11.1 | | 130/13 | | | 158.90 | | 125.09 | |  | |
| Samsung | -11.25 | | 138.27 | | | 165.11 | | 131.30 | | 48 PRBs | |
| NTT DOCOMO | -10.92 | | 152.77 | | | 161.54 | |  | | 24 dBm/MHz | |
| -10.92 | | 161.77 | | | 170.54 | |  | | 33 dBm/MHz | |
| Intel | -10.00 | | 158.03 | | | 163.26 | | 129.45 | |  | |
| Sharp | -7.50 | | 143.49 | | | 167.31 | | 141.77 | | REG bundle size = 6 | |
| OPPO | -12.55 | | 153.55 | | | 162.32 | | 128.51 | |  | |
| DDDSUDDSUU | vivo | -8.5 | | 159.54 | | | 165.66 | | 131.85 | |  | |
| CATT | -9.64 | | 148.63 | | | 157.4 | | 123.59 | | NLOS, O2I, 3kmph | |
| Nokia/NSB | -8.56 | | 159.60 | | | 162.60 | | 128.77 | | NLOS/O2I | |
| -8.38 | | 159.42 | | | 162.42 | | 145.32 | | NLOS/O2O | |
| ZTE | -11.4 | | 159.43 | | | 165.25 | | 131.01 | | 4Rx, DL PSD =33dBm,  Δ1=0, Δ2=2.95 | |
| Huawei, Hisilicon | -9.8 | |  | | | 163.71 | | 129.90 | |  | |
| Apple | -8.7 | | 156.74 | | | 165.51 | | 131.70 | | NLOS, O2I, 3kmph | |
| Others | Company 1 |  | |  | | |  | |  | |  | |
| Company 2 |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
| Urban 2.6 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | | MCL | | | MIL | | MPL | | Key assumptions | |
| DDDDDDDSUU | vivo | -8.42 | | 159.46 | | | 165.58 | | 131.77 | |  | |
| CATT | -9.89 | | 148.88 | | | 157.65 | | 123.84 | | NLOS, O2I, 3kmph | |
| ZTE | -11.63 | | 159.66 | | | 165.48 | | 133.36 | | 4Rx, DL PSD =33dBm,  Δ1=0, Δ2=2.95 | |
| Apple | -8.6 | | 156.64 | | | 165.41 | | 131.6 | | NLOS, O2I, 3kmph | |
| OPPO | -12.51 | | 154.95 | | | 163.72 | | 129.91 | |  | |
| Others | Company 1 |  | |  | | |  | |  | |  | |
| Company 2 |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
| Rural 4 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| DDDSU | vivo | -8.5 | 159.54 | | 160.89 | 137.91 | | NLOS | | O2I | |  |
| -8.46 | 159.5 | | 160.85 | 141.4 | | NLOS | | O2O | |  |
| CATT | -9.64 | 148.63 | | 152.63 | 132.57 | | NLOS | | O2I | | UE speed:3kmph |
| -10.37 | 149.36 | | 153.36 | 136.29 | | NLOS | | O2O | | UE speed:120kmph |
| -11.15 | 150.14 | | 154.14 | 133.24 | | LOS | | O2I | | UE speed:3kmph |
| -11.71 | 150.70 | | 154.7 | 139.59 | | LOS | | O2O | | UE speed:120kmph |
| InterDigital | -8.5 | 140.16 | | 151.96 | 122.52 | | NLOS | | O2I | | UE speed = 3km/hr |
| Panasonic | -11.1 | 150.13 | | 154.13 | 134.07 | | NLOS | | O2I | |  |
| -11.1 | 150.13 | | 154.13 | 137.06 | | NLOS | | O2O | |  |
| Samsung | -11.30 | 154.52 | | 159.53 | 138.58 | | NLOS | | O2I | | 48 PRBs |
| -11.20 | 154.42 | | 159.43 | 139.98 | | NLOS | | O2O | | 48 PRBs |
| NTT DOCOMO | -12.02 | 153.87 | | 162.64 |  | | LOS | | O2O | | 24 dBm/MHz |
| -12.02 | 162.87 | | 171.64 |  | | LOS | | O2O | | 33 dBm/MHz |
| Intel | -10.00 | 158.03 | | 159.78 | 138.83 | | NLOS | | O2I | |  |
| Intel | -10.00 | 158.03 | | 159.78 | 140.33 | | NLOS | | O2O | |  |
| Sharp | -7 | 142.99 | | 162.04 | 135.61 | | NLOS | | O2I | | REG bundle size = 6 |
| OPPO | -12.55 | 153.55 | | 172.60 | 151.65 | | NLOS | | O2I | |  |
| -12.47 | 153.47 | | 172.52 | 153.07 | | NLOS | | O2O | |  |
| -11.33 | 152.33 | | 171.38 | 150.43 | | LOS | | O2I | |  |
| -11.23 | 152.23 | | 171.28 | 151.83 | | LOS | | O2O | |  |
| DDDSUDDSUU | vivo | -8.5 | 159.54 | | 160.89 | 137.91 | | NLOS | | O2I | |  |
| -8.47 | 159.51 | | 160.86 | 141.41 | | NLOS | | O2O | |  |
| Nokia/NSB | -8.56 | 159.60 | | 159.70 | 137.16 | | NLOS | | O2I | | UE speed: 3 Km/h |
| -9.56 | 160.60 | | 160.70 | 140.68 | | LOS | | O2I | | UE speed: 3 Km/h |
| -8.38 | 159.42 | | 159.52 | 140.04 | | NLOS | | O2O | | UE speed: 120 Km/h |
| -9.50 | 160.54 | | 160.64 | 143.60 | | LOS | | O2O | | UE speed: 120 Km/h |
| Huawei, Hisilicon | -9.8 |  | | 158.94 | 135.96 | | NLOS | | O2I | |  |
| -9.7 |  | | 158.84 | 139.39 | | NLOS | | O2O | |  |
| ZTE | -11.44 | 162.48 | | 163.48 | 139.65 | | NLOS | | O2I | | 4Rx, DL PSD =33dBm,  Δ1=0, Δ2=3, |
| -11.49 | 162.53 | | 163.53 | 144.08 | | NLOS | | O2O | |
| Others | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Rural 2.6 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| DDDSU | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| DDDSUDDSUU | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Others | vivo | -8.42 | 159.46 | | 160.81 | 137.83 | | NLOS | | O2I | | DDDDDDDSUU |
| -8.09 | 144.77 | | 148.77 | 129.32 | | NLOS | | O2O | | DDDDDDDSUU |
| CATT | -9.89 | 148.88 | | 152.88 | 132.82 | | NLOS | | O2I | | DDDDDDDSUU  UE speed:3kmph |
| -10.32 | 149.31 | | 153.31 | 136.24 | | NLOS | | O2O | | DDDDDDDSUU  UE speed:120kmph |
| -11.62 | 150.61 | | 154.61 | 133.71 | | LOS | | O2I | | DDDDDDDSUU  UE speed:3kmph |
| -11.48 | 150.47 | | 154.47 | 139.36 | | LOS | | O2O | | DDDDDDDSUU  UE speed:120kmph |
| ZTE | -11.64 | 162.68 | | 163.68 | 140.47 | | NLOS | | O2I | | DDDDDDDSUU  4Rx, DL PSD =33dBm, 1% BLER,  Δ1=0, Δ2=3 |
| -11.61 | 162.65 | | 163.65 | 144.20 | | NLOS | | O2O | |
| OPPO | -12.51 | 153.51 | | 172.56 | 151.61 | | NLOS | | O2I | |  |
| -12.50 | 153.50 | | 172.55 | 153.10 | | NLOS | | O2O | |  |
| -11.34 | 152.34 | | 171.39 | 150.44 | | LOS | | O2I | |  |
| -11.34 | 152.34 | | 171.39 | 151.94 | | LOS | | O2O | |  |
| Rural 2 GHz FDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| UUUUU | vivo | -9.33 | 148.32 | | 161.71 | 140.76 | | NLOS | | O2I | |  |
| -9.32 | 148.31 | | 161.7 | 142.25 | | NLOS | | O2O | |  |
| CATT | -9.9 | 150.9 | | 161.92 | 140.97 | | NLOS | | O2I | | UE speed:3kmph |
| -10.45 | 149.44 | | 162.47 | 143.02 | | NLOS | | O2O | | UE speed:120kmph |
| -11.83 | 152.83 | | 163.85 | 143.06 | | LOS | | O2I | | UE speed:3kmph |
| -11.81 | 150.8 | | 163.83 | 146.77 | | LOS | | O2O | | UE speed:120kmph |
| Panasonic | -7.9 | 146.88 | | 162.92 | 141.97 | | NLOS | | O2I | |  |
| -7.6 | 146.58 | | 162.62 | 143.17 | | NLOS | | O2O | |  |
| Samsung | -11.40 | 151.58 | | 168.63 | 147.68 | | NLOS | | O2I | | 48 PRBs |
| -11.40 | 151.58 | | 168.63 | 149.18 | | NLOS | | O2O | | 48 PRBs |
| Nokia/NSB | -6.00 | 144.99 | | 153.84 | 131.30 | | NLOS | | O2I | | UE speed: 3 Km/h |
| -8.13 | 147.11 | | 155.97 | 135.95 | | LOS | | O2I | | UE speed: 3 Km/h |
| -5.75 | 144.74 | | 153.59 | 134.11 | | NLOS | | O2O | | UE speed: 120 Km/h |
| -8.06 | 147.05 | | 155.90 | 138.86 | | LOS | | O2O | | UE speed: 120 Km/h |
| Huawei, Hisilicon | -9.9 |  | | 162.02 | 140.07 | | NLOS | | O2I | |  |
| -9.8 |  | | 161.92 | 142.47 | | NLOS | | O2O | |  |
| ZTE | -8.43 | 147.42 | | 159.48 | 136.70 | | NLOS | | O2I | | 4Rx, DL PSD =36dBm,  Δ1=0, Δ2=3.98 |
| -8.41 | 147.40 | | 159.46 | 140.01 | | NLOS | | O2O | |
| OPPO | -8.95 | 149.95 | | 162.98 | 142.03 | | NLOS | | O2I | |  |
| -9.05 | 150.05 | | 163.08 | 143.63 | | NLOS | | O2O | |  |
| -3.86 | 144.86 | | 157.89 | 136.94 | | LOS | | O2I | |  |
| -4.07 | 145.07 | | 158.10 | 138.65 | | LOS | | O2O | |  |
| Rural 700 MHz FDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| UUUUU | vivo | -5.73 | 144.72 | | 155.1 | 134.15 | | NLOS | | O2I | |  |
| -6.13 | 145.12 | | 155.5 | 136.05 | | NLOS | | O2O | |  |
| CATT | -7.65 | 146.64 | | 156.66 | 135.71 | | NLOS | | O2I | | UE speed:3kmph |
| -7.15 | 148.15 | | 156.16 | 136.71 | | NLOS | | O2O | | UE speed:120kmph |
| -9.61 | 148.6 | | 158.62 | 137.83 | | LOS | | O2I | | UE speed:3kmph |
| -11.55 | 158.98 | | 158.18 | 141.12 | | LOS | | O2O | | UE speed:120kmph |
| InterDigital | -6.2 | 138.82 | | 148.85 | 127.23 | | NLOS | | O2I | | UE speed = 3km/hr |
| Panasonic | -7.9 | 146.88 | | 159.91 | 138.96 | | NLOS | | O2I | |  |
| -7.1 | 146.08 | | 159.11 | 139.66 | | NLOS | | O2O | |  |
| Intel | -6.80 | 145.79 | | 158.82 | 137.87 | | NLOS | | O2I | |  |
| Intel | -6.90 | 145.89 | | 158.92 | 139.47 | | NLOS | | O2O | |  |
| Nokia/NSB | -6.00 | 144.99 | | 152.34 | 129.80 | | NLOS | | O2I | | UE speed: 3 Km/h |
| -8.13 | 147.11 | | 154.47 | 134.45 | | LOS | | O2I | | UE speed: 3 Km/h |
| -5.75 | 144.74 | | 152.09 | 132.61 | | NLOS | | O2O | | UE speed: 120 Km/h |
| -8.06 | 147.05 | | 154.40 | 137.36 | | LOS | | O2O | | UE speed: 120 Km/h |
| ZTE | -7.43 | 146.42 | | 155.59 | 136.14 | | NLOS | | O2O | | 4Rx, DL PSD =36dBm,  Δ1=0, Δ2=3.86 |
| Apple | -8.7 | 147.69 | | 157.71 | 136.76 | | NLOS | | O2I | | 3kmph |
| OPPO | -8.96 | 149.96 | | 162.99 | 142.04 | | NLOS | | O2I | |  |
| -9.02 | 150.02 | | 163.05 | 143.60 | | NLOS | | O2O | |  |
| -3.88 | 144.88 | | 157.91 | 136.96 | | LOS | | O2I | |  |
| -3.91 | 144.91 | | 157.94 | 138.46 | | LOS | | O2O | |  |
| Rural with long distance 700 MHz FDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| UUUUU | vivo | -9.18 | 148.17 | | 158.55 | 137.76 | | LOS | | O2I | |  |
| -9.07 | 148.06 | | 158.44 | 141.38 | | LOS | | O2O | |  |
| CATT | -8.8 | 147.79 | | 157.81 | 140.75 | | LOS | | O2O | | UE speed:120kmph |
| Samsung | -12.30 | 152.48 | | 163.51 | 146.45 | | NLOS | | O2O | | 48 PRBs |
| Intel | -7.70 | 146.69 | | 159.72 | 142.66 | | LOS | | O2O | |  |
| ZTE | -7.68 | 146.67 | | 155.84 | 140.84 | | LOS | | O2O | | 4Rx, DL PSD =36dBm,  Δ1=0, Δ2=3.86 |
| Huawei, Hisilicon | -9.0 |  | | 161.11 | 146.11 | | LOS | | O2O | |  |
|  |  |  | |  |  | |  | |  | |  |
| Rural with long distance 4 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| DDDSU | vivo | -11.69 | 162.73 | | 164.08 | 141.26 | | LOS | | O2I | |  |
| -11.59 | 162.63 | | 163.98 | 146.92 | | LOS | | O2O | |  |
| CATT | -11.4 | 150.39 | | 154.39 | 139.28 | | LOS | | O2O | | UE speed:120kmph |
| OPPO | -11.76 | 152.76 | | 171.81 | 150.86 | | NLOS | | O2I | |  |
| -11.61 | 152.61 | | 171.66 | 152.21 | | NLOS | | O2O | |  |
| -11.36 | 152.36 | | 171.41 | 150.46 | | LOS | | O2I | |  |
| -11.26 | 152.26 | | 171.31 | 151.86 | | LOS | | O2O | |  |
| DDDSUDDSUU | vivo | -11.69 | 162.73 | | 164.08 | 141.26 | | LOS | | O2I | |  |
| -11.59 | 162.63 | | 163.98 | 146.92 | | LOS | | O2O | |  |
| CATT | -11.4 | 150.39 | | 154.39 | 139.28 | | LOS | | O2O | | UE speed:120kmph |
|  |  |  | |  |  | |  | |  | |  |
| Others | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
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Table 1-10: PDSCH for eMBB for FR1

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Urban 4 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | | MCL | | | MIL | | MPL | | Key assumptions | |
| DDDSU | vivo | -4.78 | | 156.32 | | | 162.44 | | 131.71 | | 90RB, MCS4 | |
| Qualcomm | -10 | | 146 | | | 157.8 | | 127 | | 53 dBm DL Tx Power | |
| Qualcomm | -10 | | 137 | | | 148.8 | | 118 | | 44 dBm DL Tx Power | |
| CATT | -8.8 | | 147.79 | | | 156.56 | | 125.83 | | NLOS, O2I, 3kmph | |
| Panasonic | -5.5 | | 145.03 | | | 153.80 | | 123.07 | | 155 RBs, MCS3 | |
| NTT DOCOMO | -4.93 | | 146.78 | | | 155.55 | |  | | 24 dBm/MHz | |
| -4.93 | | 155.78 | | | 164.55 | |  | | 33 dBm/MHz | |
| Intel | -4.51 | | 153.04 | | | 158.27 | | 127.54 | | MCS = 4, 118 PRBs | |
| Nokia/NSB | -6.00 | | 157.54 | | | 160.54 | | 129.81 | | NLOS/O2I | |
| -6.00 | | 157.54 | | | 160.54 | | 146.66 | | NLOS/O2O | |
| Sharp | -7 | | 142.49 | | | 166.31 | | 143.85 | | MCS0 | |
| OPPO | -5.38 | | 146.38 | | | 155.15 | | 124.42 | | 100RB, MCS5 | |
| DDDSUDDSUU | vivo | -4.7 | | 156.24 | | | 162.36 | | 131.63 | | 106RB, MCS4 | |
| CATT | -7.8 | | 146.79 | | | 155.56 | | 124.83 | | NLOS, O2I, 3kmph | |
| Panasonic | -4.7 | | 144.23 | | | 153.00 | | 122.27 | | 155 RBs, MCS4 | |
| Samsung | -3.3 | | 130.82 | | | 157.66 | | 126.93 | | 90 PRBs | |
| Nokia/NSB | -5.50 | | 157.04 | | | 160.04 | | 129.31 | | NLOS/O2I | |
| -5.88 | | 157.42 | | | 160.42 | | 146.54 | | NLOS/O2O | |
| ZTE | -10.95 | | 159.48 | | | 165.30 | | 134.14 | | 246RBs, MCS0, 4Rx, DL PSD =33dBm, 10% iBLER,  Δ1=0, Δ2=2.95 | |
| Huawei, Hisilicon | -4.5 | |  | | | 163.56 | | 132.83 | |  | |
| Apple | -8.1 | | 156.14 | | | 164.91 | | 134.18 | | NLOS, O2I, 3kmph | |
| OPPO | -4.43 | | 145.43 | | | 154.20 | | 123.47 | | 100RB, MCS6 | |
| Others | Company 1 |  | |  | | |  | |  | |  | |
| Company 2 |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
| Urban 2.6 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | | MCL | | | MIL | | MPL | | Key assumptions | |
| DDDDDDDSUU | vivo | -4.79 | | 156.33 | | | 162.45 | | 131.72 | | 90RB,MCS4 | |
| CATT | -8.8 | | 147.79 | | | 156.56 | | 125.83 | | NLOS, O2I, 3kmph | |
| ZTE | -9.63 | | 158.16 | | | 163.98 | | 134.94 | | 246RBs, MCS0, 4Rx, DL PSD =33dBm, 10% iBLER,  Δ1=0, Δ2=2.95 | |
| Apple | -9.1 | | 157.14 | | | 165.91 | | 135.18 | | NLOS, O2I, 3kmph | |
| OPPO | -6.40 | | 156.40 | | | 165.17 | | 134.44 | | 100RB, MCS4 | |
| Others | Company 1 |  | |  | | |  | |  | |  | |
| Company 2 |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
|  |  | |  | | |  | |  | |  | |
| Rural 4 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| DDDSU | vivo | -3.71 | 155.25 | | 156.6 | 136.94 | | NLOS | | O2I | | 9RB, MCS4 |
|  | -3.46 | 155 | | 156.35 | 140.74 | | NLOS | | O2O | | 9RB, MCS4 |
| CATT | -12.56 | 151.55 | | 155.55 | 138.57 | | NLOS | | O2I | | UE speed:3kmph |
| -13.8 | 152.79 | | 156.79 | 138.65 | | LOS | | O2I | | UE speed:3kmph |
| Panasonic | -4.8 | 144.33 | | 148.33 | 131.35 | | NLOS | | O2I | | 16 RBs, MCS3 |
| -6.0 | 145.53 | | 149.53 | 135.68 | | NLOS | | O2O | | 16 RBs, MCS3 |
| NTT DOCOMO | -3.59 | 145.44 | | 154.21 |  | | LOS | | O2O | | 24 dBm/MHz |
| -3.59 | 154.44 | | 163.21 |  | | LOS | | O2O | | 33 dBm/MHz |
| Intel | -4.66 | 153.19 | | 154.94 | 137.31 | | NLOS | | O2I | | 14 PRBs, MCS = 3 |
| Intel | -4.94 | 153.47 | | 155.22 | 139.61 | | NLOS | | O2O | | 14 PRBs, MCS = 4 |
| Nokia/NSB | -10.00 | 161.54 | | 161.64 | 142.80 | | NLOS | | O2I | | UE speed: 3 Km/h |
| -10.50 | 162.04 | | 162.14 | 145.22 | | LOS | | O2I | | UE speed: 3 Km/h |
| -10.00 | 161.54 | | 161.64 | 145.96 | | NLOS | | O2O | | UE speed: 120 Km/h |
| -10.50 | 162.04 | | 162.14 | 148.34 | | LOS | | O2O | | UE speed: 120 Km/h |
| OPPO | -5.24 | 146.24 | | 165.29 | 147.66 | | NLOS | | O2I | | 20RB, MCS2 |
| -6.57 | 147.57 | | 166.62 | 147.57 | | NLOS | | O2O | | 20RB, MCS2 |
| -6.13 | 147.13 | | 166.18 | 148.55 | | LOS | | O2I | | 20RB, MCS2 |
| -6.94 | 147.94 | | 166.99 | 149.36 | | LOS | | O2O | | 20RB, MCS2 |
| DDDSUDDSUU | vivo | -4.23 | 155.77 | | 157.12 | 137.46 | | NLOS | | O2I | | DDDDDDDSUU, 10RB, MCS4 |
| -3.94 | 155.48 | | 156.83 | 141.22 | | NLOS | | O2O | | DDDDDDDSUU, 10RB, MCS4 |
| Panasonic | -4.1 | 143.63 | | 147.63 | 130.65 | | NLOS | | O2I | | 16 RBs, MCS4 |
| -5.2 | 144.73 | | 148.73 | 134.88 | | NLOS | | O2O | | 16 RBs, MCS4 |
| Samsung | -2.65 | 146.37 | | 151.38 | 133.75 | | NLOS | | O2I | | 10 PRBs |
| -2.95 | 146.67 | | 151.68 | 136.07 | | NLOS | | O2O | | 10 PRBs |
| Nokia/NSB | -10.00 | 161.54 | | 161.64 | 142.80 | | NLOS | | O2I | | UE speed: 3 Km/h |
| -10.50 | 162.04 | | 162.14 | 145.22 | | LOS | | O2I | | UE speed: 3 Km/h |
| -10.00 | 161.54 | | 161.64 | 145.96 | | NLOS | | O2O | | UE speed: 120 Km/h |
| -10.50 | 162.04 | | 162.14 | 148.34 | | LOS | | O2O | | UE speed: 120 Km/h |
| Huawei, Hisilicon | -4 |  | | 158.29 | 138.63 | | NLOS | | O2I | |  |
| -4.35 |  | | 158.64 | 143.03 | | NLOS | | O2O | |  |
| ZTE | -12.5 | 164.04 | | 165.04 | 144.53 | | NLOS | | O2I | | 40RBs, MCS0, 4Rx, DL PSD =33dBm, 10% iBLER,  Δ1=0, Δ2=3 |
| -8.59 | 160.13 | | 161.13 | 145.52 | | NLOS | | O2O | |
| OPPO | -4.16 | 145.16 | | 164.21 | 146.58 | | NLOS | | O2I | | 20RB, MCS3 |
| -5.79 | 146.79 | | 165.84 | 148.21 | | NLOS | | O2O | | 20RB, MCS3 |
| -5.32 | 146.32 | | 165.37 | 147.74 | | LOS | | O2I | | 20RB, MCS3 |
| -5.38 | 146.38 | | 165.43 | 147.80 | | LOS | | O2O | | 20RB, MCS3 |
| Others | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Rural 2.6 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| DDDSU | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| DDDSUDDSUU | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
| Others | vivo | -3.76 | 155.3 | | 156.65 | 136.99 | | NLOS | | O2I | | DDDDDDDSUU, 9RB, MCS4 |
| -3.56 | 155.1 | | 156.45 | 140.84 | | NLOS | | O2O | | DDDDDDDSUU, 9RB, MCS4 |
| CATT | -12.6 | 151.59 | | 155.59 | 138.61 | | NLOS | | O2I | | UE speed:3kmph |
| -13.72 | 152.71 | | 156.71 | 138.57 | | LOS | | O2I | | UE speed:3kmph |
| ZTE | -12.84 | 164.38 | | 165.38 | 145.49 | | NLOS | | O2I | | 40RBs, MCS0, 4Rx, DL PSD =33dBm, 10% iBLER,  Δ1=0, Δ2=3 |
| -8.63 | 160.17 | | 161.17 | 145.56 | | NLOS | | O2O | |
| OPPO | -5.32 | 146.32 | | 165.37 | 147.74 | | NLOS | | O2I | | DDDDDDDSUU, 20RB, MCS1 |
| -5.30 | 146.30 | | 165.35 | 147.72 | | NLOS | | O2O | | DDDDDDDSUU, 20RB, MCS1 |
| -6.30 | 147.30 | | 166.35 | 148.72 | | LOS | | O2I | | DDDDDDDSUU, 20RB, MCS1 |
| -4.53 | 145.53 | | 164.58 | 146.95 | | LOS | | O2O | | DDDDDDDSUU, 20RB, MCS1 |
| Rural 2 GHz FDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| UUUUU | vivo | -3.71 | 143.2 | | 156.59 | 138.96 | | NLOS | | O2I | | 12RB, MCS4 |
| -3.74 | 143.23 | | 156.62 | 141.01 | | NLOS | | O2O | | 12RB, MCS4 |
| CATT | -11.86 | 150.85 | | 163.88 | 146.25 | | NLOS | | O2I | | UE speed:3kmph |
| -12.56 | 151.55 | | 164.58 | 147.06 | | LOS | | O2I | | UE speed:3kmph |
| Panasonic | 0.2 | 139.28 | | 155.32 | 137.69 | | NLOS | | O2I | | 16 RBs, MCS4 |
| 1.2 | 138.28 | | 154.32 | 138.71 | | NLOS | | O2O | | 16 RBs, MCS4 |
| Samsung | -1.6 | 142.28 | | 159.33 | 141.70 | | NLOS | | O2I | | 10 PRBs |
| -1.9 | 142.58 | | 159.63 | 144.02 | | NLOS | | O2O | | 10 PRBs |
| Nokia/NSB | -7.73 | 147.22 | | 156.07 | 137.23 | | NLOS | | O2I | | UE speed: 3 Km/h |
| -9.00 | 148.49 | | 157.34 | 140.42 | | LOS | | O2I | | UE speed: 3 Km/h |
| -7.65 | 147.14 | | 155.99 | 140.31 | | NLOS | | O2O | | UE speed: 120 Km/h |
| -8.80 | 148.29 | | 157.15 | 143.35 | | LOS | | O2O | | UE speed: 120 Km/h |
| Huawei, Hisilicon | -4.25 |  | | 159.52 | 140.89 | | NLOS | | O2I | |  |
| -4.6 |  | | 159.87 | 144.26 | | NLOS | | O2O | |  |
| ZTE | -8.66 | 148.15 | | 160.21 | 140.75 | | NLOS | | O2I | | 40RBs, MCS0, 2Rx, DL PSD =36dBm, 10% iBLER,  Δ1=0, Δ2=3.98 |
| -5.48 | 144.97 | | 157.03 | 141.42 | | NLOS | | O2O | |
| OPPO | -4.06 | 145.06 | | 161.10 | 143.47 | | NLOS | | O2I | | 20RB, MCS3 |
| -3.30 | 144.30 | | 160.34 | 142.71 | | NLOS | | O2O | | 20RB, MCS3 |
| -4.90 | 145.90 | | 161.94 | 144.31 | | LOS | | O2I | | 20RB, MCS3 |
| -2.70 | 143.70 | | 159.74 | 142.11 | | LOS | | O2O | | 20RB, MCS3 |
| Rural 700 MHz FDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| UUUUU | vivo | 1.1 | 138.39 | | 145.76 | 128.13 | | NLOS | | O2I | | 12RB, MCS4 |
| 0.51 | 138.98 | | 146.35 | 130.74 | | NLOS | | O2O | | 12RB, MCS4 |
| Qualcomm | -11 | 150 | | 163 | 145.4 | | NLOS | | O2O | | See Tdoc for details. |
| CATT | -9.3 | 148.29 | | 158.31 | 140.68 | | NLOS | | O2I | | UE speed:3kmph |
| -9.9 | 148.89 | | 158.91 | 141.39 | | LOS | | O2I | | UE speed:3kmph |
| InterDigital | -0.8 | 137.93 | | 147.96 | 130.08 | | NLOS | | O2I | | UE speed = 3km/hr, 2 DMRS |
| Panasonic | 0.5 | 138.98 | | 152.01 | 134.38 | | NLOS | | O2I | | 16 RBs, MCS4 |
| -0.1 | 139.58 | | 152.61 | 137.00 | | NLOS | | O2O | | 16 RBs, MCS4 |
| Intel | -0.30 | 139.79 | | 152.82 | 135.19 | | NLOS | | O2I | | 14 PRBs, MCS = 4 |
| Intel | -1.40 | 140.89 | | 153.92 | 138.31 | | NLOS | | O2O | | 17 PRBs, MCS = 4, |
| Nokia/NSB | -7.50 | 146.99 | | 154.34 | 135.50 | | NLOS | | O2I | | UE speed: 3 Km/h |
| -9.00 | 148.49 | | 155.84 | 138.92 | | LOS | | O2I | | UE speed: 3 Km/h |
| -7.71 | 147.20 | | 154.55 | 138.87 | | NLOS | | O2O | | UE speed: 120 Km/h |
| -9.00 | 148.49 | | 155.84 | 142.04 | | LOS | | O2O | | UE speed: 120 Km/h |
| ZTE | -5.87 | 145.36 | | 154.53 | 138.92 | | NLOS | | O2O | | 40RBs, MCS0, 2Rx, DL PSD =36dBm, 10% iBLER,  Δ1=0, Δ2=3.86 |
| Apple | -6.9 | 145.89 | | 155.91 | 138.28 | | NLOS | | O2I | | 3kmph |
| OPPO | -3.68 | 144.68 | | 157.71 | 140.08 | | NLOS | | O2I | | 20RB, MCS3 |
| -3.67 | 144.67 | | 157.70 | 140.07 | | NLOS | | O2O | | 20RB, MCS3 |
| -5.63 | 146.63 | | 159.66 | 142.03 | | LOS | | O2I | | 20RB, MCS3 |
| -3.45 | 144.45 | | 157.48 | 139.85 | | LOS | | O2O | | 20RB, MCS3 |
| Rural with long distance 700 MHz FDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| UUUUU | vivo | -2.95 | 142.44 | | 149.81 | 132.29 | | LOS | | O2I | | 12RB, MCS4 |
| -3 | 142.49 | | 149.86 | 136.07 | | LOS | | O2O | | 12RB, MCS4 |
| CATT | -12.8 | 151.79 | | 161.81 | 148.02 | | LOS | | O2O | | UE speed:120kmph |
| Samsung | -4.9 | 145.58 | | 156.61 | 142.82 | | LOS | | O2O | | 10 PRBs |
| Intel | -1.80 | 141.29 | | 154.32 | 140.53 | | LOS | | O2O | | 17 PRBs, MCS = 4 |
| ZTE | -5.85 | 145.34 | | 154.51 | 140.72 | | LOS | | O2O | | 40RBs, MCS0, 2Rx, DL PSD =36dBm, 10% iBLER,  Δ1=0, Δ2=3.86 |
| Huawei, Hisilicon | -1.75 |  | | 154.26 | 140.47 | | LOS | | O2O | |  |
| OPPO | -4.65 | 145.65 | | 158.68 | 141.05 | | NLOS | | O2I | |  |
| -3.31 | 144.31 | | 157.34 | 139.71 | | NLOS | | O2O | |  |
| -5.65 | 146.65 | | 159.68 | 142.05 | | LOS | | O2I | |  |
| -3.45 | 144.45 | | 157.48 | 139.85 | | LOS | | O2O | |  |
|  |  |  | |  |  | |  | |  | |  |
| Rural with long distance 4 GHz TDD | | | | | | | | | | | | |
| Frame structure | Company name | The required SNR | MCL | | MIL | MPL | | LOS/ NLOS | | O2I/ O2O | | Key assumptions |
| DDDSU | vivo | -5.03 | 156.57 | | 157.92 | 138.37 | | LOS | | O2I | | 9RB, MCS4 |
| -4.54 | 156.08 | | 157.43 | 143.64 | | LOS | | O2I | | 9RB, MCS4 |
| OPPO | -4.72 | 145.72 | | 164.77 | 147.14 | | NLOS | | O2I | | 20RB, MCS2 |
| -5.98 | 146.98 | | 166.03 | 148.40 | | NLOS | | O2O | | 20RB, MCS2 |
| -6.04 | 147.04 | | 166.09 | 148.46 | | LOS | | O2I | | 20RB, MCS2 |
| -5.98 | 146.98 | | 166.03 | 148.40 | | LOS | | O2O | | 20RB, MCS2 |
|  |  |  | |  |  | |  | |  | |  |
| DDDSUDDSUU | vivo | -5.87 | 157.41 | | 158.76 | 139.21 | | LOS | | O2I | | 10RB, MCS4 |
| -5.44 | 156.98 | | 158.33 | 144.54 | | LOS | | O2O | | 10RB, MCS4 |
| CATT | -12.8 | 151.79 | | 155.79 | 143.43 | | LOS | | O2O | | UE speed:120kmph |
| OPPO | -4.03 | 145.03 | | 164.08 | 146.45 | | NLOS | | O2I | | 20RB, MCS3 |
| -5.35 | 146.35 | | 165.40 | 147.77 | | NLOS | | O2O | | 20RB, MCS3 |
| -5.12 | 146.12 | | 165.17 | 147.54 | | LOS | | O2I | | 20RB, MCS3 |
| -5.52 | 146.52 | | 165.57 | 147.94 | | LOS | | O2O | | 20RB, MCS3 |
| Others | Company 1 |  |  | |  |  | |  | |  | |  |
| Company 2 |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |
|  |  |  | |  |  | |  | |  | |  |

2）Baseline performance for FR2

Table 2-1: PUSCH for eMBB for FR2

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Indoor 28 GHz TDD | | | | | | |
| Frame structure | Company name | The required SNR | MCL | MIL | MPL | Key assumptions |
| DDDSU | vivo | 1.69 | 98.8 | 128.88 | 123.68 | 1 DMRS symbol for each hop |
| Qcom  23dBm UE | -1.2 | 111.2 | 144.3 |  |  |
| Qcom  12dBm UE | -1.2 | 100.2 | 133.3 |  |  |
| CATT | 0.8 | 100.85 | 134.94 | 133.25 | TDLA-3kmph |
| Samsung | 2.4 | 95.78 | 122.84 | 121.93 | 30 PRBs |
| NTT DOCOMO | -3.33 | 139.84 | 144.84 |  |  |
| Xiaomi | -1 | - | - | - | 1T2R, 1 DMRS without multiplexing with data |
| Intel | 1.70 | 106.28 | 133.40 | 128.20 | TDL-A 3km/h |
| ZTE | 4.34 | 100.67 | 128.28 | 123.80 | 2Rx, 30RBs, 10% iBLER  Δ1=0, Δ2+Δ3=5.47 |
| Huawei, HiSilicon | -22.07 |  |  | UE EIRP 23 dBm: 123.23  UE EIRP 34 dBm: 134.23 | DFT-s-OFDM, 30 RB, 2T2R, CDL-A;  Type I with 1 additional DMRS, 1 DMRS symbol; |
| OPPO | 2.86 | 97.63 | 127.71 | 122.51 | TDLA-3kmph |
|  |  |  |  |  |  |  |
| DDSU | vivo | 0.98 | 99.51 | 129.59 | 124.39 | 1 DMRS symbol for each hop |
| CATT | 0 | 101.65 | 135.74 | 134.05 | TDLA-3kmph |
| OPPO | 1.95 | 98.54 | 128.62 | 123.42 | TDLA-3kmph |
|  |  |  |  |  |  |
| Others | Company 1 |  |  |  |  |  |
| Company 2 |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| Urban 28 GHz TDD | | | | | | |
| Frame structure | Company name | The required SNR | MCL | MIL | MPL | Key assumptions |
| DDDSU | vivo | 1.57 | 95.86 | 131.96 | 102.62 | 1 DMRS symbol for each hop, O2I |
| 1.66 | 95.78 | 131.87 | 118.02 | 1 DMRS symbol for each hop, O2O |
| Qcom  23dBm UE | -1.2 | 111.2 | 147.3 |  |  |
| Qcom  12dBm UE | -1.2 | 100.2 | 136.3 |  |  |
| CATT | 0.9 | 96.78 | 133.38 | 101.76 | TDLA-3kmph |
| 0.5 | 97.18 | 134.28 | 121.92 | TDLA-30kmph |
| Samsung | 3.2 | 94.98 | 125.05 | 90.28 | 30 PRBs / Velocity: 3 km/h |
| 3.2 | 94.98 | 125.05 | 111.20 | 30 PRBs/ Velocity: 30 km/h |
| NTT DOCOMO | 0.18 | 136.33 | 141.33 |  |  |
| Xiaomi | -1.34 | - | - | - | 1T2R; 1 DMRS without multiplexing with data |
| Intel | 2.30 | 105.68 | 138.50 | 124.65 | TDL-A 100ns |
| Nokia/NSB | 0.00 | 108.44 | 135.91 | 103.33 | NLOS/O2I, UE speed: 3 km/h, 1 DMRS symbol for each hop, RRC-connected |
| 0.31 | 108.12 | 135.60 | 121.72 | NLOS/O2O, UE speed: 30 km/h, 1 DMRS symbol for each hop, RRC-connected |
| Huawei, HiSilicon | O2O: -22.28 |  |  | UE EIRP 23 dBm (O2O): 117.78  UE EIRP 34 dBm (O2O): 128.78 | DFT-s-OFDM, 30 RB, 2T2R, CDL-A;  Type I with 1 additional DMRS, 1 DMRS symbol; |
| O2I: -23.77 |  |  | UE EIRP 23 dBm (O2I): 88.77  UE EIRP 34 dBm (O2I): 99.77 |
| ZTE | 3.61 | 106.38 | 135.48 | 96.86 | 2Rx, 30RBs, O2I, 10% iBLER  Δ1=0, Δ2+Δ3=6.99, |
| 6.44 | 103.91 | 133.01 | 119.53 | 2Rx, 30RBs, O2O, 10% iBLER  Δ1=0, Δ2+Δ3=6.99. |
| OPPO | 2.73 | 94.70 | 130.80 | 101.46 | O2I, w/o FH/ 2 DMRS |
| 3.51 | 93.92 | 130.02 | 100.68 | O2O, w/o FH/ 2 DMRS |
| DDSU | vivo | 0.64 | 96.8 | 132.89 | 103.55 | 1 DMRS symbol for each hop, O2I |
| 0.93 | 96.51 | 132.6 | 118.75 | 1 DMRS symbol for each hop, O2O |
| CATT | 0 | 97.68 | 134.78 | 103.16 | TDLA-3kmph |
| -0.7 | 98.98 | 135.48 | 123.12 | TDLA-30kmph |
| Nokia/NSB | -1.23 | 109.67 | 137.14 | 104.56 | NLOS/O2I, UE speed: 3 km/h, 1 DMRS symbol for each hop, RRC-connected |
| -0.97 | 109.41 | 136.88 | 123.00 | NLOS/O2O, UE speed: 30 km/h, 1 DMRS symbol for each hop, RRC-connected |
| Others | Company 1 |  |  |  |  |  |
| Company 2 |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| Suburban 28 GHz TDD | | | | | | |
| Frame structure | Company name | The required SNR | MCL | MIL | MPL | Key assumptions |
| DDDSU | CATT | -6 | 103.68 | 140.78 | 109.16 | TDLA-3kmph |
| -6 | 103.68 | 140.78 | 128.42 | TDLA-30kmph |
| Samsung | 0.1 | 112.85 | 142.92 | 108.15 | 1 PRBs/ Velocity: 3 km/h |
| -0.25 | 113.20 | 143.27 | 129.42 | 1 PRBs/ Velocity: 30 km/h |
| -1.2 | 125.16 | 155.23 | 141.38 | 1 PRBs/ Velocity: 120 km/h |
| Xiaomi | -2.5 | - | - | - | 1T2R; 1 DMRS without multiplexing with data |
| OPPO | -6.84 | 104.52 | 141.62 | 110 | O2I, w/o FH/ 2 DMRS |
| -6.09 | 103.77 | 140.87 | 128.51 | O2O, w/o FH/ 2 DMRS |
| DDSU | CATT | -6 | 103.68 | 140.78 | 109.16 | TDLA-3kmph |
| -6 | 103.68 | 140.78 | 128.42 | TDLA-30kmph |
| OPPO | -7.20 | 104.88 | 141.98 | 110.36 | O2I, w/o FH/ 2 DMRS |
| -6.55 | 104.23 | 141.33 | 128.97 | O2O, w/o FH/ 2 DMRS |
| Others | Company 1 |  |  |  |  |  |
| Company 2 |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

Table 2-2: PUSCH for VoIP for FR2

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Indoor 28 GHz TDD | | | | | | |
| Frame structure | Company name | The required SNR | MCL | MIL | MPL | Key assumptions |
| DDDSU | vivo | -11.42 | 120.16 | 150.25 | 145.05 | 20ms period,4 repetitions, 4 HARQ transmission times |
| CATT | -5.8 | 116.2 | 150.29 | 148.6 | TDLA-3kmph  w/ repetition |
| Samsung | -6.8 | 113.73 | 140.79 | 139.88 | The max # of HARQ tx: 32/ Latency: 51 ms/ Repetition type A |
| -7.55 | 114.48 | 141.54 | 140.63 | The max # of HARQ tx: 32/ Latency: 51 ms/ Repetition type B |
| NTT DOCOMO | -15.80 | 161.06 | 166.06 |  |  |
| Intel | -8.30 | 124.53 | 151.66 | 146.46 | 4 repetitions and 2 HARQ retransmission |
| OPPO | -7.94 | 116.68 | 146.77 | 141.57 | O2I w/ repetition, w/o HARQ (reTx = 32) |
| DDSU | vivo | -11.42 | 120.16 | 150.25 | 145.05 | 20ms period,4 repetitions, 4 HARQ transmission times |
| CATT | -5.8 | 116.2 | 150.29 | 148.6 | TDLA-3kmph w/ repetition |
| OPPO | -7.54 | 116.28 | 146.37 | 141.17 | O2I w/ repetition, w/o HARQ (reTx = 32) |
|  |  |  |  |  |  |
| Others | Company 1 |  |  |  |  |  |
| Company 2 |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| Urban 28 GHz TDD | | | | | | |
| Frame structure | Company name | The required SNR | MCL | MIL | MPL | Key assumptions |
| DDDSU | vivo | -9.41 | 115.1 | 151.19 | 121.85 | 20ms period,4 repetitions, 4 HARQ transmission times, O2I |
| -10.95 | 116.64 | 152.73 | 138.88 | 20ms period,4 repetitions, 4 HARQ transmission times, O2O |
| CATT | -5.8 | 112.23 | 149.33 | 117.71 | TDLA-3kmph w/ repetition |
| -10 | 116.43 | 153.53 | 141.17 | TDLA-30kmph w/ repetition |
| Samsung | -6.6 | 113.53 | 143.60 | 108.83 | The max # of HARQ tx: 32 /Velocity: 3 km/h/ Latency: 51 ms/ Repetition type A |
| -8.4 | 115.33 | 145.40 | 131.55 | The max # of HARQ tx: 32/ Velocity: 30 km/h/ Latency: 51 ms/ Repetition type A |
| -7.4 | 114.33 | 144.40 | 109.63 | The max # of HARQ tx: 32/ Velocity: 3 km/h/ Latency: 51 ms/ Repetition type B |
| -8.75 | 115.68 | 145.75 | 131.90 | The max # of HARQ tx: 32/ Velocity: 30 km/h/ Latency: 51 ms/ Repetition type B |
| NTT DOCOMO | -15.64 | 160.91 | 165.91 |  |  |
| Intel | -8.40 | 124.63 | 157.45 | 143.60 | 4 repetitions and 2 HARQ retransmission |
| OPPO | -7.46 | 113.15 | 149.24 | 119.9 | O2I w/ repetition, w/o HARQ (reTx = 32) |
| -10.56 | 116.25 | 152.34 | 138.49 | O2O w/ repetition, w/o HARQ (reTx = 32) |
| DDSU | vivo | -9.41 | 115.1 | 151.19 | 121.85 | 20ms period,4 repetitions, 4 HARQ transmission times, O2I |
| -10.95 | 116.64 | 152.73 | 138.88 | 20ms period,4 repetitions, 4 HARQ transmission times, O2O |
| CATT | -5.8 | 112.23 | 149.33 | 117.71 | TDLA-3kmph w/ repetition |
| -10 | 116.43 | 153.53 | 141.17 | TDLA-30kmph w/ repetition |
| Nokia/NSB | -8.83 | 125.52 | 152.99 | 120.41 | NLOS/O2I, UE speed: 3 km/h, 1 DMRS symbol for each hop, RRC-connected |
| -8.86 | 125.55 | 153.02 | 139.14 | NLOS/O2O, UE speed: 30 km/h, 1 DMRS symbol for each hop, RRC-connected |
| OPPO | -7.46 | 113.15 | 149.24 | 119.9 | O2I w/ repetition, w/o HARQ (reTx = 32) |
| -10.56 | 116.25 | 152.34 | 138.49 | O2O w/ repetition, w/o HARQ (reTx = 32) |
| Others | Company 1 |  |  |  |  |  |
| Company 2 |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| Suburban 28 GHz TDD | | | | | | |
| Frame structure | Company name | The required SNR | MCL | MIL | MPL | Key assumptions |
| DDDSU | CATT | -5.8 | 112.23 | 149.33 | 117.71 | TDLA-3kmph w/ repetition |
| -10 | 116.43 | 153.53 | 141.17 | TDLA-30kmph w/ repetition |
| Samsung | -6.6 | 113.53 | 143.60 | 108.83 | The max # of HARQ tx: 32/ Velocity: 3 km/h/ Latency: 51 ms/ Repetition type A |
| -8.40 | 115.33 | 145.40 | 131.55 | The max # of HARQ tx: 32/ Velocity: 30 km/h/ Latency: 51 ms/ Repetition type A |
| -6.76 | 113.69 | 143.76 | 129.91 | The max # of HARQ tx: 32/ Velocity: 120 km/h/ Latency: 51 ms/ Repetition type A |
| -7.4 | 114.33 | 144.40 | 109.63 | The max # of HARQ tx: 32/ Velocity: 3 km/h/ Latency: 51 ms/ Repetition type B |
| -8.75 | 115.68 | 145.75 | 131.90 | The max # of HARQ tx: 32/ Velocity: 30 km/h/ Latency: 51 ms/ Repetition type B |
| -6.8 | 113.73 | 143.80 | 129.95 | The max # of HARQ tx: 32/ Velocity: 120 km/h/ Latency: 51 ms/ Repetition type B |
| OPPO | -7.46 | 113.89 | 150.99 | 119.37 | O2I w/ repetition, w/o HARQ (reTx = 32) |
| -10.57 | 117 | 154.1 | 141.74 | O2O w/ repetition, w/o HARQ (reTx = 32) |
| DDSU | Company 1 |  |  |  |  |  |
| Company 2 |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| Others | Company 1 |  |  |  |  |  |
| Company 2 |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

[Table 2-2a: PUSCH for CSI for FR2]

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Indoor 28 GHz TDD | | | | | | |
| Frame structure | Company name | The required SNR | MCL | MIL | MPL | Key assumptions |
| DDDSU | Company 1 |  |  |  |  |  |
| Company 2 |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| DDSU | Company 1 |  |  |  |  |  |
| Company 2 |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| Others | Company 1 |  |  |  |  |  |
| Company 2 |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| Urban 28 GHz TDD | | | | | | |
| Frame structure | Company name | The required SNR | MCL | MIL | MPL | Key assumptions |
| DDDSU | Company 1 |  |  |  |  |  |
| Company 2 |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| DDSU | Company 1 |  |  |  |  |  |
| Company 2 |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| Others | Company 1 |  |  |  |  |  |
| Company 2 |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| Suburban 28 GHz TDD | | | | | | |
| Frame structure | Company name | The required SNR | MCL | MIL | MPL | Key assumptions |
| DDDSU | Company 1 |  |  |  |  |  |
| Company 2 |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| DDSU | Company 1 |  |  |  |  |  |
| Company 2 |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| Others | Company 1 |  |  |  |  |  |
| Company 2 |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

Table 2-3: PUCCH for FR2

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Indoor 28 GHz TDD | | | | | | |
| Format type | Company name | The required SNR | MCL | MIL | MPL | Key assumptions |
| Format 1 | vivo | -6.1 | 120.86 | 150.94 | 142.44 | Format 1 No repetition |
| Qcom  23dBm UE | -10.5 | 138.9 | 172 |  |  |
| Qcom  12dBm UE | -10.5 | 127.9 | 161 |  |  |
| CATT | -6.55 | 122.97 | 156.07 | 153.38 | TDLA-3kmph  DDDSU  PF1 |
| InterDigital | -5 | 123.41 | 157.5 |  |  |
| Samsung | -7.5 | 116.87 | 143.94 | 141.14 | 2 bits |
| NTT DOCOMO | -9.61 | 160.89 | 165.89 |  |  |
| Intel | -4.50 | 124.24 | 151.37 | 146.17 | No repetition |
| ZTE | -3.45 | 125.62 | 153.23 | 145.67 | 2bits, 2Rx,  Δ1=0, Δ2+Δ3=5.47 |
| OPPO | -5.83 | 120.59 | 150.67 | 142.17 |  |
| Format 3 | vivo | -4.41 | 119.18 | 149.26 | 140.76 | Format 3 11bits No repetition |
| -1.13 | 115.9 | 145.98 | 137.48 | Format 3 22bits |
| Qcom  23dBm UE | 0.5 | 127.9 | 161 |  | 11-bits |
| Qcom  12dBm UE | 0.5 | 116.9 | 150 |  | 11-bits |
| CATT | -5.34 | 121.76 | 155.86 | 153.17 | TDLA-3kmph  DDDSU  11bits/rep=2 |
| -2.92 | 119.34 | 153.44 | 150.75 | TDLA-3kmph  DDDSU  22bits/rep=2 |
| InterDigital | -0.4 | 118.81 | 151.90 | 144.40 | 22 bits |
| Samsung | -2.55 | 111.92 | 138.99 | 136.19 | 11 bits |
| -0.315 | 109.69 | 136.75 | 133.95 | 22 bits |
| NTT DOCOMO | -9.43 | 160.71 | 165.71 |  | 22 bits |
| Xiaomi | -1.8 | - | - | - | 11-bits,1T2R, no repetition |
| 1 | - | - | - | 22-bits,1T2R, no repetition |
| Intel | -4.80 | 124.54 | 151.67 | 146.47 | 11 bits |
| Intel | -1.70 | 121.44 | 148.57 | 143.37 | 22bits |
| ZTE | -0.90 | 123.07 | 150.68 | 143.12 | 11bits, 2Rx, additional DMRS  Δ1=0, Δ2+Δ3=5.47 |
| 1.71 | 120.46 | 148.07 | 140.51 | 22bits, 2Rx, additional DMRS  Δ1=0, Δ2+Δ3=5.47 |
| OPPO | -2.83 | 117.6 | 147.68 | 139.18 |  |
| -0.74 | 115.51 | 145.59 | 137.09 |  |
| Urban 28 GHz TDD | | | | | | |
| Format type | Company name | The required SNR | MCL | MIL | MPL | Key assumptions |
| Format 1 No repetition | vivo | -5.84 | 114.84 | 150.93 | 117.89 | Format 1 No repetition, O2I |
| -6.15 | 115.14 | 151.23 | 134.16 | Format 1 No repetition, O2O |
| Qcom  23dBm UE | -9 | 137.4 | 173.5 |  |  |
| Qcom  12dBm UE | -9 | 126.4 | 162.5 |  |  |
| CATT | -5.4 | 114.77 | 154.89 | 119.83 | TDLA-3kmph  DDDSU  PF1 |
| -5.86 | 115.23 | 155.35 | 140.24 | TDLA-30kmph  DDDSU  PF1 |
| Samsung | -7.4 | 114.33 | 144.40 | 109.63 | 2 bits/ Velocity: 3 km/h |
| -7 | 116.37 | 146.45 | 129.38 | 2 bits/ Velocity: 30 km/h |
| NTT DOCOMO | -8.73 | 160.01 | 165.01 |  |  |
| Intel | -2.50 | 122.24 | 155.06 | 141.21 | No repetition |
| Nokia/NSB | -1.75 | 121.74 | 149.22 | 113.54 | NLOS/O2I, UE speed: 3 km/h, RRC-connected |
| -0.50 | 120.49 | 147.97 | 130.87 | NLOS/O2O, UE speed: 30 km/h, RRC-connected |
| ZTE | -4.13 | 129.02 | 158.12 | 116.42 | 2bits, 2Rx, O2I  Δ1=0, Δ2+Δ3=6.99 |
| -4.70 | 130.15 | 159.25 | 142.69 | 2bits, 2Rx, O2O  Δ1=0, Δ2+Δ3=6.99 |
| OPPO | -4.97 | 113.97 | 150.06 | 117.02 |  |
| -2.53 | 111.52 | 147.61 | 130.54 |  |
| Format 3 | vivo | -4.09 | 113.08 | 149.17 | 116.13 | Format 3 11bits No repetition, O2I |
| -0.88 | 109.87 | 145.97 | 112.93 | Format 3 22bits, O2O |
| -4.25 | 113.25 | 149.34 | 132.27 | Format 3 11bits No repetition, O2O |
| -0.87 | 109.87 | 145.96 | 128.89 | Format 3 22bits, O2O |
| Qcom  23dBm UE | 2 | 126.4 | 162.5 |  | 11 bits |
| Qcom  12dBm UE | 2 | 115.4 | 151.5 |  | 11 bits |
| CATT | -5.25 | 114.62 | 154.74 | 119.68 | TDLA-3kmph  DDDSU  11bits/rep=2 |
| -3.3 | 112.67 | 152.79 | 117.73 | TDLA-3kmph  DDDSU  22bits/rep=2 |
| -7.32 | 116.69 | 156.81 | 141.7 | TDLA-30kmph  DDDSU  11bits/rep=2 |
| -5.56 | 114.93 | 155.05 | 139.94 | TDLA-30kmph  DDDSU  22bits/rep=2 |
| Samsung | -0.35 | 109.72 | 139.80 | 101.95 | 11 bits/ Velocity: 3 km/h |
| -0.315 | 109.69 | 139.76 | 101.91 | 22 bits/ Velocity: 3 km/h |
| -2.2 | 111.57 | 141.65 | 124.58 | 11 bits/ Velocity: 30 km/h |
| -0.39 | 109.76 | 139.84 | 122.77 | 22 bits/ Velocity: 30 km/h |
| NTT DOCOMO | -8.74 | 160.02 | 165.02 |  | 22 bits |
| Intel | -4.40 | 124.14 | 156.96 | 143.11 | 11 bits |
| Intel | -1.50 | 121.24 | 154.06 | 140.21 | 22 bits |
| Nokia/NSB | -1.25 | 121.24 | 148.72 | 113.04 | NLOS/O2I, UE speed: 3 km/h, RRC-connected |
| -1.13 | 121.12 | 148.59 | 131.49 | NLOS/O2O, UE speed: 30 km/h, RRC-connected |
| ZTE | -1.14 | 126.03 | 155.13 | 113.43 | 11bits, 2Rx, additional DMRS  Δ1=0, Δ2+Δ3=6.99, O2I |
| -2.40 | 127.85 | 156.95 | 140.39 | 11bits, 2Rx, additional DMRS  Δ1=0, Δ2+Δ3=6.99, O2O |
| 1.33 | 123.56 | 152.66 | 110.96 | 22bits, 2Rx, additional DMRS  Δ1=0, Δ2+Δ3=6.99, O2I |
| 0.10 | 125.35 | 154.45 | 137.89 | 22bits, 2Rx, additional DMRS  Δ1=0, Δ2+Δ3=6.99, O2O |
| OPPO | -3.83 | 112.82 | 148.91 | 115.87 | 11bits O2I |
| -3.91 | 112.91 | 149 | 131.93 | 11bits O2O |
| -0.23 | 109.22 | 145.32 | 112.28 | 22bits O2I |
| -0.21 | 109.21 | 145.3 | 128.23 | 22bits O2O |
| Suburban 28 GHz TDD | | | | | | |
| Format type | Company name | The required SNR | MCL | MIL | MPL | Key assumptions |
| Format 1 No repetition | CATT | -5.5 | 114.87 | 154.99 | 119.93 | TDLA-3kmph  DDDSU  PF1 |
| -5.61 | 114.98 | 155.1 | 139.99 | TDLA-30kmph  DDDSU  PF1 |
| Samsung | -7.04 | 116.41 | 146.48 | 108.63 | 2 bits/ Velocity: 3 km/h |
| -7.09 | 116.46 | 146.54 | 129.47 | 2 bits/ Velocity: 30 km/h |
| -6.98 | 116.35 | 146.42 | 129.35 | 2 bits/ Velocity: 120 km/h |
|  |  |  |  |  |  |
| Format 3 | CATT | -5.32 | 114.69 | 154.81 | 119.75 | TDLA-3kmph  DDDSU  11bits/rep=2 |
| -2.93 | 112.3 | 152.42 | 117.36 | TDLA-3kmph  DDDSU  22bits/rep=2 |
| -7.33 | 116.7 | 156.82 | 141.71 | TDLA-30kmph  DDDSU  11bits/rep=2 |
| -5.4 | 114.77 | 154.89 | 139.78 | TDLA-30kmph  DDDSU  22bits/rep=2 |
| Samsung | -0.35 | 109.72 | 139.80 | 101.95 | 11 bits/ Velocity: 3 km/h |
| -2.26 | 111.63 | 141.71 | 124.64 | 11 bits/ Velocity: 30 km/h |
| -2.7 | 112.07 | 142.15 | 125.08 | 11 bits/ Velocity: 120 km/h |
| -0.32 | 109.69 | 139.76 | 101.91 | 22 bits/ Velocity: 3 km/h |
| -0.39 | 109.76 | 139.84 | 122.77 | 22 bits/ Velocity: 30 km/h |
| -0.518 | 109.89 | 139.96 | 122.89 | 22 bits/ Velocity: 120 km/h |
|  |  |  |  |  |  |

Table 2-4: SSB for FR2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Indoor 28 GHz TDD | | | | | |
| Company name | The required SNR | MCL | MIL | MPL | Key assumptions |
| vivo | -10.6 | 115.19 | 136.79 | 128.29 | The correction factor for BF gain of broadcast channel is 5 dB |
| CATT | -9.64 | 133.85 | 163.93 | 162.24 | TDLA-3kmph  DDDSU |
| Intel | -10.90 | 134.78 | 152.04 | 146.84 |  |
| ZTE | -6.55 | 100.84 | 121.72 | 114.16 | 32bits, 2Rx, 1% BLER,  Δ1=0, Δ2+Δ2=12.19 |
| Huawei, HiSilicon | -29.71 |  |  | UE EIRP 23 dBm: 129.31  UE EIRP 34 dBm: 134.31 | For UE EIRP = 23 dBm, UE Rx antenna gain correction factor is assumed to be 5 dB (11bis-b). |
| Urban 28 GHz TDD | | | | | |
| Company name | The required SNR | MCL | MIL | MPL | Key assumptions |
| vivo | -8.03 | 128.91 | 153.93 | 120.89 | O2I  The correction factor for BF gain of broadcast channel is 8 dB |
| -8.03 | 128.91 | 155.93 | 136.86 | O2O  The correction factor for BF gain of broadcast channel is 8 dB |
| CATT | -9.56 | 133.55 | 165.63 | 134.01 | TDLA-3kmph  DDDSU |
| -8.64 | 131.63 | 164.71 | 152.35 | TDLA-30kmph  DDDSU |
| Intel | -10.20 | 151.08 | 172.45 | 158.60 |  |
| Nokia/NSB | -8.24 | 129.12 | 152.09 | 119.51 | NLOS/O2I, UE speed: 3 km/h, RRC-idle |
| Huawei, HiSilicon | O2O: -26.33 |  |  | UE EIRP 23 dBm (O2O): 137.28  UE EIRP 34 dBm (O2O): 142.28 | For UE EIRP = 23 dBm, UE Rx antenna gain correction factor is assumed to be 5 dB (11bis-b). |
| O2I: -27.90 |  |  | UE EIRP 23 dBm (O2I): 108.35  UE EIRP 34 dBm (O2I): 113.35 |
| ZTE | -6.70 | 127.86 | 149.52 | 107.82 | 32bits, 2Rx, 1% BLER,  Δ1=0, Δ2+Δ2=14.43, O2I |
| -9.11 | 129.72 | 151.38 | 134.82 | 32bits, 2Rx, 1% BLER,  Δ1=0, Δ2+Δ2=14.43, O2O |
| Suburban 28 GHz TDD | | | | | |
| Company name | The required SNR | MCL | MIL | MPL | Key assumptions |
| CATT | -9.56 | 132.55 | 165.63 | 134.01 | TDLA-3kmph  DDDSU |
| -8.64 | 131.63 | 164.71 | 152.35 | TDLA-30kmph  DDDSU |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

Table 2-5: PRACH for FR2

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Indoor 28 GHz TDD | | | | | | |
| Format type | Company name | The required SNR | MCL | MIL | MPL | Key assumptions |
| Format B4 | vivo | -10.35 | 114.32 | 139.4 | 130.9 | The correction factor for BF gain of broadcast channel is 5 dB |
| Qcom  23dBm UE | -12 | 129.8 | 156.9 |  |  |
| Qcom  12dBm UE | -12 | 118.8 | 145.9 |  |  |
| Intel | -9.80 | 118.91 | 145.20 | 140.00 |  |
| ZTE | -9.82 | 124.51 | 145.40 | 137.84 | 2Rx, PMD=1%  Δ1=0,Δ2+Δ2=12.19 |
| Format C2 | Huawei, HiSilicon | -28.72 |  |  | UE EIRP 23 dBm: 130.35  UE EIRP 34 dBm: 141.35 | SCS = 120 kHz; |
| Company 2 |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| Urban 28 GHz TDD | | | | | | |
| Format type | Company name | The required SNR | MCL | MIL | MPL | Key assumptions |
| Format B4 | vivo | -9.25 | 107.45 | 135.54 | 102.5 | O2I  The correction factor for BF gain of broadcast channel is 8 dB |
| -9.38 | 107.58 | 135.68 | 118.61 | O2O  The correction factor for BF gain of broadcast channel is 8 dB |
| Qcom  23dBm UE | -12 | 129.8 | 159.9 |  |  |
| Qcom  12dBm UE | -12 | 118.8 | 148.9 |  |  |
| Intel | -8.60 | 117.71 | 148.11 | 134.26 |  |
| Nokia/NSB | -11.66 | 123.57 | 146.54 | 113.96 | NLOS/O2I, UE speed: 3 km/h, RRC-idle |
| -11.09 | 123.01 | 145.98 | 132.10 | NLOS/O2O, UE speed: 30 km/h, RRC-idle |
| ZTE | -10.10 | 125.27 | 146.93 | 105.23 | 2Rx, PMD=1%  Δ1=0,Δ2+Δ2=14.43O2I |
| -10.22 | 125.63 | 147.29 | 130.73 | 2Rx, PMD=1%  Δ1=0,Δ2+Δ2=14.43O2O |
| Format C2 | Huawei, HiSilicon | O2O: -26.54 |  |  | UE EIRP 23 dBm (O2O): 122.52  UE EIRP 34 dBm (O2O): 133.52 | SCS = 120 kHz; |
| O2I: -29.75 |  |  | UE EIRP 23 dBm (O2I): 95.22  UE EIRP 34 dBm (O2I): 106.22 |
| Company 2 |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| Suburban 28 GHz TDD | | | | | | |
| Format type | Company name | The required SNR | MCL | MIL | MPL | Key assumptions |
| Format B4 | Company 1 |  |  |  |  |  |
| Company 2 |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| Format C2 | Company 1 |  |  |  |  |  |
| Company 2 |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

Table 2-6: PDCCH of Msg.2 for FR2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Indoor 28 GHz TDD | | | | | |
| Company name | The required SNR | MCL | MIL | MPL | Key assumptions |
| vivo | -6.31 | 110.89 | 132.49 | 123.99 | The correction factor for BF gain of broadcast channel is 5 dB |
| Qcom | -7.5 | 117.5 | 132.6 |  |  |
| Intel | -7.60 | 131.48 | 148.74 | 143.54 |  |
| ZTE | -7.97 | 102.26 | 123.14 | 115.58 | 40bits, 2Rx, 1% BLER,  Δ1=0, Δ2+Δ2=12.19 |
| Urban 28 GHz TDD | | | | | |
| Company name | The required SNR | MCL | MIL | MPL | Key assumptions |
| vivo | -5.49 | 126.36 | 151.39 | 118.35 | O2I  The correction factor for BF gain of broadcast channel is 8 dB |
| -5.38 | 126.26 | 151.28 | 134.21 | O2O  The correction factor for BF gain of broadcast channel is 8 dB |
| Qcom | -10 | 137 | 152.1 |  |  |
| Intel | -5.20 | 146.08 | 167.45 | 153.60 |  |
| ZTE | -8.10 | 129.26 | 150.92 | 109.22 | 40bits, 2Rx, 1% BLER, Δ1=0, Δ2+Δ2=14.43, O2I |
| -7.83 | 128.44 | 150.10 | 133.54 | 40bits, 2Rx, 1% BLER, Δ1=0, Δ2+Δ2=14.43, O2O |
| Suburban 28 GHz TDD | | | | | |
| Company name | The required SNR | MCL | MIL | MPL | Key assumptions |
| Company 1 |  |  |  |  |  |
| Company 2 |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

Table 2-6a: PDSCH of Msg.2 for FR2

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Indoor 28 GHz TDD | | | | | | |
| Frame structure | Company name | The required SNR | MCL | MIL | MPL | Key assumptions |
| DDDSU | vivo | -4.49 | 109.08 | 130.68 | 125.48 | The correction factor for BF gain of broadcast channel is 5 dB |
| Intel | -3.10 | 126.98 | 144.24 | 139.04 |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| DDSU | vivo | -4.49 | 109.08 | 130.68 | 125.48 | The correction factor for BF gain of broadcast channel is 5 dB |
| Company 2 |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| Others | Company 1 |  |  |  |  |  |
| Company 2 |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| Urban 28 GHz TDD | | | | | | |
| Frame structure | Company name | The required SNR | MCL | MIL | MPL | Key assumptions |
| DDDSU | vivo | -4.49 | 125.36 | 150.39 | 121.05 | O2I  The correction factor for BF gain of broadcast channel is 8 dB |
| -4.03 | 124.91 | 149.93 | 136.08 | O2O  The correction factor for BF gain of broadcast channel is 8 dB |
| Intel | -2.90 | 143.78 | 165.15 | 151.30 |  |
|  |  |  |  |  |  |
| DDSU | vivo | -4.49 | 125.36 | 150.39 | 121.05 | O2I  The correction factor for BF gain of broadcast channel is 8 dB |
| -4.03 | 124.91 | 149.93 | 136.08 | O2O  The correction factor for BF gain of broadcast channel is 8 dB |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| Others | Company 1 |  |  |  |  |  |
| Company 2 |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| Suburban 28 GHz TDD | | | | | | |
| Frame structure | Company name | The required SNR | MCL | MIL | MPL | Key assumptions |
| DDDSU | Company 1 |  |  |  |  |  |
| Company 2 |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| DDSU | Company 1 |  |  |  |  |  |
| Company 2 |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| Others | Company 1 |  |  |  |  |  |
| Company 2 |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

Table 2-7: PUSCH of Msg.3 for FR2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Indoor 28 GHz TDD | | | | | |
| Company name | The required SNR | MCL | MIL | MPL | Key assumptions |
| vivo | -2.98 | 114.73 | 139.81 | 134.61 | 2 DMRS symbols for each hop  The correction factor for BF gain of broadcast channel is 5 dB |
| Qcom  23dBm UE | -4.6 | 127 | 154.1 |  |  |
| Qcom  12dBm UE | -4.6 | 116 | 143.1 |  |  |
| CATT | -1.6 | 115.01 | 149.11 | 147.42 | TDLA-3kmph  DDDSU |
| Intel | -2.80 | 122.54 | 148.84 | 143.64 | TDLA-3kmph |
| ZTE | -2.01 | 120.93 | 141.82 | 137.34 | 4Rx, 56bits, 2RBs, 10% iBLER,  Δ1=0, Δ2+ Δ3=12.19 |
| Huawei, HiSilicon | -25.95 |  |  | UE EIRP 23 dBm: 135.87  UE EIRP 34 dBm: 146.87 | DFT-s-OFDM, 30 RB, 2T2R, CDL-A;  Type I with 1 additional DMRS, 1 DMRS symbol; |
| Urban 28 GHz TDD | | | | | |
| Company name | The required SNR | MCL | MIL | MPL | Key assumptions |
| vivo | -1.9 | 110.6 | 138.69 | 109.35 | 2 DMRS symbols for each hop, O2I  The correction factor for BF gain of broadcast channel is 8 dB |
| -1.93 | 110.63 | 138.72 | 124.87 | 2 DMRS symbols for each hop, O2O  The correction factor for BF gain of broadcast channel is 8 dB |
| Qcom  23dBm UE | -4.6 | 127 | 157.1 |  |  |
| Qcom  12dBm UE | -4.6 | 116 | 146.1 |  |  |
| CATT | -1.6 | 111.04 | 148.14 | 116.52 | TDLA-3kmph  DDDSU |
| CATT | -1.3 | 110.74 | 147.84 | 135.48 | TDLA-30kmph  DDDSU |
| Intel | -3.00 | 122.74 | 153.15 | 139.30 | TDLA-30kmph |
| Huawei, HiSilicon | O2O: -23.21 |  |  | UE EIRP 23 dBm (O2O): 127.48  UE EIRP 34 dBm (O2O): 138.48 | DFT-s-OFDM, 30 RB, 2T2R, CDL-A;  Type I with 1 additional DMRS, 1 DMRS symbol; |
| O2I: -24.52 |  |  | UE EIRP 23 dBm (O2I): 98.28  UE EIRP 34 dBm (O2I): 109.28 |
| ZTE | -2.64 | 123.33 | 144.98 | 106.36 | 4Rx, 56bits, 2RBs, 10% iBLER,  Δ1=0, Δ2+ Δ3=14.43, O2I |
| -2.89 | 125.06 | 146.72 | 133.24 | 4Rx, 56bits, 2RBs, 10% iBLER,  Δ1=0, Δ2+ Δ3=14.43, O2O |
| Suburban 28 GHz TDD | | | | | |
| Company name | The required SNR | MCL | MIL | MPL | Key assumptions |
| CATT | -1.6 | 111.04 | 148.14 | 116.52 | TDLA-3kmph  DDDSU |
| CATT | -1.3 | 110.74 | 147.84 | 135.48 | TDLA-30kmph  DDDSU |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

Table 2-8: PDSCH of Msg.4 for FR2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Indoor 28 GHz TDD | | | | | |
| Company name | The required SNR | MCL | MIL | MPL | Key assumptions |
| vivo | -5.84 | 110.43 | 132.03 | 126.83 | MCS0  The correction factor for BF gain of broadcast channel is 5 dB |
| Qcom | -4.7 | 114.7 | 129.8 |  | Open-loop precoder |
| Intel | -2.50 | 126.88 | 144.14 | 138.94 |  |
| ZTE | -7.12 | 101.41 | 122.29 | 117.81 | 60RBs, MCS0, 2Rx, 10% BLER,  Δ1=0, Δ2+Δ3=12.17 |
| Urban 28 GHz TDD | | | | | |
| Company name | The required SNR | MCL | MIL | MPL | Key assumptions |
| vivo | -5.83 | 126.71 | 151.73 | 122.39 | MCS0, O2I  The correction factor for BF gain of broadcast channel is 8 dB |
| -4.91 | 125.79 | 150.81 | 136.96 | MCS0, O2O  The correction factor for BF gain of broadcast channel is 8 dB |
| Qcom | -6.1 | 133.1 | 148.2 |  | Open-loop precoder |
| Intel | -2.10 | 143.48 | 164.85 | 151.00 |  |
| ZTE | -5.47 | 126.63 | 148.29 | 109.67 | 60RBs, MCS0, 2Rx, 10% BLER,  Δ1=0, Δ2+Δ3=14.43, O2I |
| -3.27 | 123.88 | 145.54 | 132.06 | 60RBs, MCS0, 2Rx, 10% BLER,  Δ1=0, Δ2+Δ3=14.43, O2O |
| Suburban 28 GHz TDD | | | | | |
| Company name | The required SNR | MCL | MIL | MPL | Key assumptions |
| Company 1 |  |  |  |  |  |
| Company 2 |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

[Table 2-8a: PDSCH with HARQ-ACK for Msg.4 for FR2]

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Indoor 28 GHz TDD | | | | | | |
| Frame structure | Company name | The required SNR | MCL | MIL | MPL | Key assumptions |
| DDDSU | ZTE | -5.35 | 127.52 | 148.41 | 140.85 | PF1 with 1bit, 2Rx,  Δ1=0, Δ2+Δ3=12.17 |
| Company 2 |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| DDSU | Company 1 |  |  |  |  |  |
| Company 2 |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| Others | Company 1 |  |  |  |  |  |
| Company 2 |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| Urban 28 GHz TDD | | | | | | |
| Frame structure | Company name | The required SNR | MCL | MIL | MPL | Key assumptions |
| DDDSU | ZTE | -5.80 | 130.69 | 152.35 | 110.65 | PF1 with 1bit, 2Rx,  Δ1=0, Δ2+Δ3=14.43, O2I |
| -6.35 | 131.80 | 153.46 | 136.90 | PF1 with 1bit, 2Rx,  Δ1=0, Δ2+Δ3=14.43, O2O |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| DDSU | Company 1 |  |  |  |  |  |
| Company 2 |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| Others | Company 1 |  |  |  |  |  |
| Company 2 |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| Suburban 28 GHz TDD | | | | | | |
| Frame structure | Company name | The required SNR | MCL | MIL | MPL | Key assumptions |
| DDDSU | Company 1 |  |  |  |  |  |
| Company 2 |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| DDSU | Company 1 |  |  |  |  |  |
| Company 2 |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| Others | Company 1 |  |  |  |  |  |
| Company 2 |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

Table 2-9: PDCCH for FR2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Indoor 28 GHz TDD | | | | | |
| Company name | The required SNR | MCL | MIL | MPL | Key assumptions |
| vivo | -6.31 | 110.89 | 137.49 | 128.99 |  |
| Qcom | -7.5 | 117.5 | 138.6 |  |  |
| CATT | -6.71 | 130.92 | 164 | 161.31 | TDLA-3kmph  DDDSU |
| Samsung | -7.73 | 113.72 | 143.79 | 140.99 | 48 PRBs |
| NTT DOCOMO | -11.14 | 122.50 | 146.56 |  |  |
| Xiaomi | -9.6 | - | - | - | 66 RBs, TDL-A, NLoS, 3 km/h |
| Intel | -7.60 | 131.48 | 149.57 | 144.37 |  |
| ZTE | -7.97 | 101.60 | 129.21 | 121.65 | 48RBs, 2Rx, Δ1=0, Δ2+ Δ2=5.47 |
| OPPO | -8.17 | 112.75 | 139.35 | 130.85 |  |
| Urban 28 GHz TDD | | | | | |
| Company name | The required SNR | MCL | MIL | MPL | Key assumptions |
| vivo | -5.49 | 126.36 | 159.39 | 126.35 | O2I |
| -5.38 | 126.26 | 159.28 | 142.21 | O2O |
| Qcom | -10 | 137 | 158.1 |  |  |
| CATT | -6.4 | 139.39 | 165.48 | 130.42 | TDLA-3kmph  DDDSU |
| -6.89 | 129.88 | 165.97 | 150.86 | TDLA-30kmph  DDDSU |
| Samsung | -7.88 | 130.87 | 163.95 | 126.10 | 48 PRBs/ Velocity: 3km/h |
| -7.88 | 130.87 | 163.95 | 146.88 | 48 PRBs / Velocity: 30km/h |
| NTT DOCOMO | -10.36 | 138.73 | 162.79 |  |  |
| Xiaomi | -7.9 | - | - | - | 66 RBs, TDL-A, NLoS, 3 km/h |
| Intel | -5.20 | 146.08 | 169.86 | 156.01 |  |
| Nokia/NSB | -4.00 | 124.88 | 152.35 | 116.67 | NLOS/O2I, UE speed: 3 km/h, RRC-connected |
| -5.13 | 126.00 | 153.47 | 136.37 | NLOS/O2O, UE speed: 30 km/h, RRC-connected |
| ZTE | -8.10 | 129.86 | 158.96 | 117.26 | 48RBs, 2Rx, Δ1=0, Δ2+ Δ2=6.99, O2I |
| -7.83 | 129.30 | 158.40 | 141.84 | 48RBs, 2Rx, Δ1=0, Δ2+ Δ2=6.99, O2O |
| OPPO | -9.05 | 142.04 | 168.13 | 133.07 | O2I |
| -8.95 | 131.94 | 168.03 | 152.92 | O2O |
| Suburban 28 GHz TDD | | | | | |
| Company name | The required SNR | MCL | MIL | MPL | Key assumptions |
| CATT | -6.4 | 129.39 | 165.48 | 130.42 | TDLA-3kmph  DDDSU |
| -6.89 | 129.88 | 165.97 | 150.86 | TDLA-30kmph  DDDSU |
| Samsung | -7.88 | 130.87 | 163.95 | 126.10 | 48 PRBs/ Velocity: 3km/h |
| -7.88 | 130.87 | 163.95 | 146.88 | 48 PRBs/ Velocity: 30km/h |
| -7.93 | 130.92 | 164 | 146.93 | 48 PRBs/ Velocity: 120km/h |
| OPPO | -9.05 | 142.04 | 168.13 | 133.07 | O2I |
| -8.95 | 131.94 | 168.03 | 152.92 | O2O |

Table 2-10: PDSCH for eMBB for FR2

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Indoor 28 GHz TDD | | | | | | |
| Frame structure | Company name | The required SNR | MCL | MIL | MPL | Key assumptions |
| DDDSU | vivo | -1.79 | 106.87 | 133.47 | 128.27 | 66RB, MCS4 |
| Qcom | -3.5 | 113.5 | 134.6 |  | SVD precoder |
| CATT | -1.56 | 125.77 | 158.85 | 157.16 | TDLA-3kmph |
| Samsung | 2.1 | 104.39 | 134.46 | 133.55 | 50 PRBs |
| NTT DOCOMO | -2.95 | 114.31 | 138.37 |  |  |
| Intel | -0.10 | 124.48 | 142.57 | 137.37 | MCS = 5, 60 PRBs |
| ZTE | -1.88 | 96.01 | 123.62 | 119.14 | 231RBs, MCS0, 2Rx, 10% iBLER,  Δ1=0, Δ2+Δ2=5.47 |
| Huawei, HiSilicon | -24.66 |  |  | UE EIRP 23 dBm: 125.77  UE EIRP 34 dBm: 130.77 | Type I DMRS, 1 DMRS symbol;  For UE EIRP = 23 dBm, UE Rx antenna gain correction factor is assumped to be 5 dB (11bis-b). |
| OPPO | -2.52 | 126.73 | 159.81 | 158.12 | 66RB, MCS5 |
|  |  |  |  |  |  |  |
| DDSU | vivo | -1.59 | 106.68 | 133.28 | 128.08 | 66RB, MCS4 |
| CATT | -0.45 | 124.66 | 157.74 | 156.05 | TDLA-3kmph |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| Others | Company 1 |  |  |  |  |  |
| Company 2 |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| Urban 28 GHz TDD | | | | | | |
| Frame structure | Company name | The required SNR | MCL | MIL | MPL | Key assumptions |
| DDDSU | vivo | -2.09 | 123.47 | 156.49 | 127.15 | 66RB, MCS4, O2I |
| -1.66 | 123.03 | 156.06 | 142.21 | 66RB, MCS4, O2O |
| Qcom | -4.5 | 131.5 | 152.6 |  | SVD precoder |
| CATT | -1.3 | 124.29 | 160.38 | 128.76 | TDLA-3kmph |
| -0.5 | 123.49 | 159.58 | 147.22 | TDLA-30kmph |
| Samsung | 3.05 | 120.44 | 153.52 | 118.75 | 50 PRBs/ Velocity: 3 km/h |
| 3.05 | 120.44 | 153.52 | 139.67 | 50 PRBs/ Velocity: 30 km/h |
| NTT DOCOMO | -3.01 | 131.37 | 155.44 |  |  |
| Intel | -0.30 | 141.68 | 165.46 | 151.61 | MCS = 5, 60 PRBs |
| Nokia/NSB | 0.97 | 120.41 | 147.88 | 115.30 | NLOS/O2I, UE speed: 3 km/h, RRC-connected |
| 0.47 | 120.91 | 148.38 | 134.50 | NLOS/O2O, UE speed: 30 km/h, RRC-connected |
| Huawei, HiSilicon | O2O: -23.08 |  |  | UE EIRP 23 dBm (O2O): 135.54  UE EIRP 34 dBm (O2O): 140.54 | Type I DMRS, 1 DMRS symbol;  For UE EIRP = 23 dBm, UE Rx antenna gain correction factor is assumped to be 5 dB (11bis-b). |
| O2I: -23.85 |  |  | UE EIRP 23 dBm (O2I): 105.80  UE EIRP 34 dBm (O2I): 110.80 |
| ZTE | 1.35 | 120.91 | 150.01 | 111.39 | 231RBs, MCS0, 2Rx, 10% iBLER,  Δ1=0, Δ2+Δ2=6.99, O2I |
| 7.58 | 114.39 | 143.49 | 130.01 | 231RBs, MCS0, 2Rx, 10% iBLER,  Δ1=0, Δ2+Δ2=6.99, O2O |
| OPPO | -2.38 | 125.37 | 161.46 | 129.84 | 66RB, MCS5 |
| -1.28 | 124.27 | 160.36 | 148 | 66RB, MCS5 |
| DDSU | vivo | -1.59 | 122.97 | 155.99 | 126.65 | 66RB, MCS4, O2I |
| -1.47 | 122.85 | 155.87 | 142.02 | 66RB, MCS4, O2O |
| CATT | -0.3 | 123.29 | 159.38 | 127.76 | TDLA-3kmph |
| -0.5 | 123.49 | 159.58 | 147.22 | TDLA-30kmph |
| Nokia/NSB | 1.81 | 119.56 | 147.04 | 114.46 | NLOS/O2I, UE speed: 3 km/h, RRC-connected |
| 1.41 | 119.97 | 147.44 | 133.56 | NLOS/O2O, UE speed: 30 km/h, RRC-connected |
| Others | Company 1 |  |  |  |  |  |
| Company 2 |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| Suburban 28 GHz TDD | | | | | | |
| Frame structure | Company name | The required SNR | MCL | MIL | MPL | Key assumptions |
| DDDSU | CATT | -7.4 | 130.39 | 166.48 | 134.86 | TDLA-3kmph |
| -7.2 | 130.19 | 166.28 | 153.92 | TDLA-30kmph |
| Samsung | 4.5 | 118.99 | 152.07 | 117.30 | 50 PRBs/ Velocity: 3 km/h |
| 4.9 | 118.59 | 151.67 | 137.82 | 50 PRBs/ Velocity: 30 km/h |
| 4.15 | 119.34 | 152.42 | 138.57 | 50 PRBs/ Velocity: 120 km/h |
| OPPO | -9.41 | 132.4 | 168.49 | 136.87 | 20RB, MCS0 |
| -8.69 | 131.68 | 167.77 | 155.41 | 20RB, MCS0 |
| DDSU | CATT | -7.4 | 130.39 | 166.48 | 134.86 | TDLA-3kmph |
| -7.2 | 130.19 | 166.28 | 153.92 | TDLA-30kmph |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| Others | Company 1 |  |  |  |  |  |
| Company 2 |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |