**3GPP TSG RAN WG1 Meeting #107-e R1-2111376**

**e-Meeting, November 11th – 19th, 2021**

**Agenda Item: 8.15**

**Source: Moderator (MediaTek)**

**Title: Summary of [107-e-R17-RRC-IoT-NTN] Email discussion on Rel-17 RRC parameters for NB-IoT/eMTC support for NTN**

**Document for: Discussion**

# Introduction

There was a preliminary email discussion on RRC parameters for NB-IoT/eMTC to support NTN [4]. RRC parameters pertinent for IoT NTN will be further discussed in RAN1#106bis-e.

This document is the Summary of [107-e-R17-RRC-IoT-NTN] Email discussion on Rel-17 RRC parameters for IoT over NTN – Gilles (MediaTek)

* Email discussion to start on November 15

# Time and frequency synchronization

## Related RRC parameters

Based on the agreements to date (up to RAN1#107-e) and the companies proposals submitted to RAN1#107 -e, a preliminary list of RRC parameters for Rel-17 IoT NTN and related to 8.15.1 Enhancements to time and frequency synchronization is provided below:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **WI code** | **Sub-feature group** | **RAN1 specification** | **Section** | **RAN2 Parant IE** | **RAN2 ASN.1 name** | **Parameter name in the spec** | **New or existing?** | **Parameter name in the text** | **Description** | **Value range** | **Default value aspect** | **Per (UE, cell, TRP, …)** | **UE-specific or Cell-specific** | **Specification** | **Comment** | | **Status** |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / UE pre-compensation for UL synchronization | 36.213 |  |  |  | ULPre-compensation-NB-r17 | new | UL Time Pre-compensation-NB-r17 | If set, UE does the following: 1. UE specific TA calculation on the service link in RRC\_IDLE / RRC\_CONNECTED state based on its GNSS-acquired position and the serving satellite ephemeris. 2. UE-specific calculation frequency pre-compensation to counter shift the Doppler experienced on the service link in RRC\_IDLE / RRC\_CONNECTED state based on its GNSS-acquired position and the serving satellite ephemeris. | [0, 1] | 0 | Cell | Cell-specific | 36.331 | For NB-IoT Configuration parameter used in the specifications. If it is set, operations related to UE pre-compensation for UL synchronization apply. | | New-stable |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / UE pre-compensation for UL synchronization | 36.213 |  |  |  | NTACommon-NB-r17 | new | NTA common-NB-r17 | NTACommon is a network-controlled common TA, and may include any timing offset considered necessary by the network. NTACommon with value of 0 is supported. | [0, ..., 8316827]. 32.55208 ×10-3 μs, 23 bits | 0 | Cell | Cell-specific | 36.331 | For NB-IoT Ts=32.55208 µs (TS 36.211), field is 23 bits | | New-stable |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / UE pre-compensation for UL synchronization | 36.213 |  |  |  | NTACommonDrift-NB-r17 | new | NTA commonDrift-NB-r17 | NTACommonDrift is a network-controlled common TA, and may include any timing offset considered necessary by the network. NTACommon with value of 0 is supported. | [- 261935, …, + 261935 (i.e: -53.33 μs/s… +53.33 μs/s)]. 0.2×10-3 μs/s, 19 bits | 0 | Cell | Cell-specific | 36.331 | For NB-IoT  field is 19 bits TBC | | New-stable |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / UE pre-compensation for UL synchronization | 36.213 |  |  |  | NTACommonDriftVariation-NB-r17 | new | NTA common-NB-r17 | NTACommonDriftVariation is a network-controlled common TA, and may include any timing offset considered necessary by the network. NTACommon with value of 0 is supported. | [0, ..., 29479]. 0.2×10-4 μs/s2, 15 bits | 0 | Cell | Cell-specific | 36.331 | For NB-IoT  , field is 15 bits TBC | | New-stable |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / UE pre-compensation for UL synchronization | 36.213 |  |  |  | TACommonThirdOrder-NB-r17 | new | NTA common-NB-r17 | TACommonThirdOrder is a network-controlled common TA, and may include any timing offset considered necessary by the network. NTACommon with value of 0 is supported. | [-4912, …, +4912]. 0.3×10-5 μs/s3, 14 bits | 0 | Cell | Cell-specific | 36.331 | For NB-IoT field is 14 bits TBC | | New-stable |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / UE pre-compensation for UL synchronization | 36.213 |  |  |  | ServingSatelliteEphemerisStateVectorX-NB-r17 | new | ServingSatelliteEphemerisStateVectorX-NB-r17 | Indicate the X-coordinate of serving Satellite position state vector in ECEF (m) | +/- 42 200 km, 1.3 m granularity, 78 bits | 0 | Per Cell | Cell-specific | 36.331 | For NB-IoT | | New-stable |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / UE pre-compensation for UL synchronization | 36.213 |  |  |  | ServingSatelliteEphemerisStateVectorY-NB-r17 | new | ServingSatelliteEphemerisStateVectorY-NB-r17 | Indicate the Y-coordinate of serving Satellite position state vector in ECEF (m) | +/- 42 200 km, 1.3 m granularity, 78 bits | 0 | Per Cell | Cell-specific | 36.331 | For NB-IoT | | New-stable |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / UE pre-compensation for UL synchronization | 36.213 |  |  |  | ServingSatelliteEphemerisStateVectorZ-NB-r17 | new | ServingSatelliteEphemerisStateVectorZ-NB-r17 | Indicate the Z-coordinate of serving Satellite position state vector in ECEF (m) | +/- 42 200 km, 1.3 m granularity, 78 bits |  | Per Cell | Cell-specific | 36.331 | For NB-IoT | | New-stable |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / UE pre-compensation for UL synchronization | 36.213 |  |  |  | ServingSatelliteEphemerisStateVectorXv-NB-r17 | new | ServingSatelliteEphemerisStateVectorXv-NB-r17 | Indicate the X-coordinate of serving Satellite velocity state vector in ECEF (m/s) | +/- 8000 m/s, granularity 0.06 m/s, 54 bits | 0 | Per Cell | Cell-specific | 36.331 | For NB-IoT | | New-stable |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / UE pre-compensation for UL synchronization | 36.213 |  |  |  | ServingSatelliteEphemerisStateVectorYv-NB-r17 | new | ServingSatelliteEphemerisStateVectorYv-NB-r17 | Indicate the Y-coordinate of serving Satellite velocity state vector in ECEF (m/s) | +/- 8000 m/s, granularity 0.06 m/s, 54 bits | 0 | Per Cell | Cell-specific | 36.331 | For NB-IoT | | New-stable |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / UE pre-compensation for UL synchronization | 36.213 |  |  |  | ServingSatelliteEphemerisStateVectorZv-NB-r17 | new | ServingSatelliteEphemerisStateVectorZv-NB-r17 | Indicate the Z-coordinate of serving Satellite velocity state vector in ECEF (m/s) | +/- 8000 m/s, granularity 0.06 m/s, 54 bits | 0 | Per Cell | Cell-specific | 36.331 | For NB-IoT | | New-stable |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / UE pre-compensation for UL synchronization | 36.213 |  |  |  | ServingSatelliteEphemerisSemiMajorAxis-NB-r17 | new | ServingSatelliteEphemerisSemiMajorAxis-NB-r17 | Indicate the following ephemeris orbital parameter for the serving satellite: | [6500, 43000] km, 33 bits | 0 | Per Cell | Cell-specific | 36.331 | For NB-IoT | | New-stable |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / UE pre-compensation for UL synchronization | 36.213 |  |  |  | ServingSatelliteEphemerisEccentricityE-NB-r17 | new | ServingSatelliteEphemerisEccentricityE-NB-r17 | Indicate the following ephemeris orbital parameter for the serving satellite: - Eccentricity e | ≤ 0.015, 19 bits | 0 | Per Cell | Cell-specific | 36.331 | For NB-IoT | | New-stable |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / UE pre-compensation for UL synchronization | 36.213 |  |  |  | ServingSatelliteEphemerisArgumentOfPeriapsis-NB-r17 | new | ServingSatelliteEphemerisArgumentOfPeriapsis-NB-r17 | Indicate the following ephemeris orbital parameter for the serving satellite: - Argument of periapsis ω [rad] | [0, 2π], 24 bits | 0 | Per Cell | Cell-specific | 36.331 | For NB-IoT | | New-stable |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / UE pre-compensation for UL synchronization | 36.213 |  |  |  | ServingSatellite EphemerisLongitudeOfAscendingNode-NB-r17 | new | ServingSatellite EphemerisLongitudeOfAscendingNode-NB-r17 | Indicate the following ephemeris orbital parameter for the serving satellite: - Longitude of ascending node Ω [degrees] | [0, 2π], 21 bits | 0 | Per Cell | Cell-specific | 36.331 | For NB-IoT | | New-stable |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / UE pre-compensation for UL synchronization | 36.213 |  |  |  | ServingSatelliteEphemerisInclinationI-NB-r17 | new | ServingSatelliteEphemerisInclinationI-NB-r17 | Indicate the following ephemeris orbital parameter for the serving satellite: - Inclination i [degree] | [-π/2, + π/2 ], 20 bits | 0 | Per Cell | Cell-specific | 36.331 | For NB-IoT | | New-stable |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / UE pre-compensation for UL synchronization | 36.213 |  |  |  | ServingSatelliteEphemerisMeanAnomalyM-NB-r17 | new | ServingSatelliteEphemerisMeanAnomalyM-NB-r17 | Indicate the following ephemeris orbital parameter for the serving satellite: - Mean anomaly M [rad] at epoch time to | [0, 2π], 24 bits | 0 | Per Cell | Cell-specific | 36.331 | For NB-IoT | | New-stable |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / UL-Synchronization Validity | 36.213 |  |  |  | ntnServingSatULSyncValidityDuration-NB-r17 | new | ntnServingSatULSyncValidityDuration-NB-r17 | The serving satellite ephemeris and common TA related parameters are signalled in the same SIB message and have the same epoch time. A single validity duration for both serving satellite ephemeris and common TA related parameters is broadcast on the SIB. Validity timer for UL synchronization should be started/restarted with configured timer validity duration at the epoch time of the assistance information. | [Extend range for GEO: up to 2 hours]  [5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 120, 180, 240] | 0 | Cell | Cell-specific | 36.331 | For NB-IoT | | New-stable |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / UL synchronization-Transmission-IoT NTN | 36.213 |  |  |  | TransmissionDurationNPRACH-NB-r17 | new | TransmissionDurationNPRACH-NB-r17 | Configuration of UL transmission segment is indicated on SIB | Format 0 and 1: [2.4.(TCP+TSEQ), 4.4.(TCP+TSEQ), 8.4.(TCP+TSEQ), 16.4.(TCP+TSEQ), 32.4.(TCP+TSEQ), 64.4.(TCP+TSEQ)]  -Format 2:  [1.6.(TCP+TSEQ), 2.6.(TCP+TSEQ), 4.6.(TCP+TSEQ), 8.6.(TCP+TSEQ), 16.6.(TCP+TSEQ) ] | 0 | TBD | TBD | 36.331 | For NB-IoT | New-stable | |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / UL synchronization-Transmission-IoT NTN | 36.213 |  |  |  | TransmissionDurationNPUSCH-NB-r17 | new | TransmissionDurationNPUSCH-NB-r17 | Configuration of UL transmission segment is indicated on SIB and reconfigured by RRC signalling in RRC\_CONNECTED | [2 ms, 4 ms, 8 ms, 16 ms, 32 ms, 64 ms, 128 ms, 256 ms ] | 0 | TBD | TBD | 36.331 | For NB-IoT | New-stable | |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / UE pre-compensation for UL synchronizationUplink Time pre-compensation | 36.213 |  |  |  | ULPre-compensation-r17 | new | UL Time Pre-compensation-r17 | If set, UE does the following: 1. UE specific TA calculation on the service link in RRC\_IDLE / RRC\_CONNECTED state based on its GNSS-acquired position and the serving satellite ephemeris. 2. UE-specific calculation frequency pre-compensation to counter shift the Doppler experienced on the service link in RRC\_IDLE / RRC\_CONNECTED state based on its GNSS-acquired position and the serving satellite ephemeris. | [0, 1] | 0 | Cell | Cell-specific | 36.331 | For eMTC, Configuration parameter used in the specifications. If it is set, operations related to UE pre-compensation for UL synchronization apply. | New-stable | |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / UE pre-compensation for UL synchronization | 36.213 |  |  |  | NTACommon-r17 | new | NTA common-r17 | NTACommon is a network-controlled common TA, and may include any timing offset considered necessary by the network. NTACommon with value of 0 is supported. | [0, ..., 8316827]. 32.55208 ×10-3 μs, 23 bits | 0 | Cell | Cell-specific | 36.331 | For eMTC  Ts=32.55208 µs (TS 36.211), field is 23 bits | New-stable | |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / UE pre-compensation for UL synchronization | 36.213 |  |  |  | NTACommonDrift-r17 | new | NTA commonDrift-r17 | NTACommonDrift is a network-controlled common TA, and may include any timing offset considered necessary by the network. NTACommon with value of 0 is supported. | [- 261935, …, + 261935  (i.e: -53.33 μs/s… +53.33 μs/s)]. 0.2×10-3 μs/s, 19 bits | 0 | Cell | Cell-specific | 36.331 | For eMTC, field is 19 bits TBC | New-stable | |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / UE pre-compensation for UL synchronization | 36.213 |  |  |  | NTACommonDriftVariation-r17 | new | NTA common-r17 | NTACommonDriftVariation is a network-controlled common TA, and may include any timing offset considered necessary by the network. NTACommon with value of 0 is supported. | [0, ..., 29479]. 0.2×10-4 μs/s2, 15 bits | 0 | Cell | Cell-specific | 36.331 | For eMTC, field is 15 bits TBC | New-stable | |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / UE pre-compensation for UL synchronization | 36.213 |  |  |  | TACommonThirdOrder-r17 | new | NTA common-r17 | TACommonThirdOrder is a network-controlled common TA, and may include any timing offset considered necessary by the network. NTACommon with value of 0 is supported. | [-4912, …, +4912]. 0.3×10-5 μs/s3, 14 bits | 0 | Cell | Cell-specific | 36.331 | For eMTC, field is 14 bits TBC | New-stable | |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / UE pre-compensation for UL synchronizationUplink Time pre-compensation | 36.213 |  |  |  | ServingSatelliteEphemerisStateVectorX-r17 | new | ServingSatelliteEphemerisStateVectorX-r17 | Indicate the X-coordinate of serving Satellite position state vector in ECEF (m) | +/- 42 200 km, 1.3 m granularity, 78 bits | 0 | Per Cell | Cell-specific | 36.331 | For eMTC, | New-stable | |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / UE pre-compensation for UL synchronizationUplink Time pre-compensation | 36.213 |  |  |  | ServingSatelliteEphemerisStateVectorY-r17 | new | ServingSatelliteEphemerisStateVectorY-r17 | Indicate the Y-coordinate of serving Satellite position state vector in ECEF (m) | +/- 42 200 km, 1.3 m granularity, 78 bits | 0 | Per Cell | Cell-specific | 36.331 | For eMTC | New-stable | |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / UE pre-compensation for UL synchronizationUplink Time pre-compensation | 36.213 |  |  |  | ServingSatelliteEphemerisStateVectorZ-r17 | new | ServingSatelliteEphemerisStateVectorZ-r17 | Indicate the Z-coordinate of serving Satellite position state vector in ECEF (m) | +/- 42 200 km, 1.3 m granularity, 78 bits |  | Per Cell | Cell-specific | 36.331 | For eMTC | New-stable | |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / UE pre-compensation for UL synchronizationUplink Time pre-compensation | 36.213 |  |  |  | ServingSatelliteEphemerisStateVectorXv-r17 | new | ServingSatelliteEphemerisStateVectorXv-r17 | Indicate the X-coordinate of serving Satellite velocity state vector in ECEF (m/s) | +/- 8000 m/s, granularity 0.06 m/s, 54 bits | 0 | Per Cell | Cell-specific | 36.331 | For eMTC | New-stable | |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / UE pre-compensation for UL synchronizationUplink Time pre-compensation | 36.213 |  |  |  | ServingSatelliteEphemerisStateVectorYv-NB-r17 | new | ServingSatelliteEphemerisStateVectorYv-r17 | Indicate the Y-coordinate of serving Satellite velocity state vector in ECEF (m/s) | +/- 8000 m/s, granularity 0.06 m/s, 54 bits | 0 | Per Cell | Cell-specific | 36.331 | For eMTC | New-stable | |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / UE pre-compensation for UL synchronizationUplink Time pre-compensation | 36.213 |  |  |  | ServingSatelliteEphemerisStateVectorZv-NB-r17 | new | ServingSatelliteEphemerisStateVectorZv-r17 | Indicate the Z-coordinate of serving Satellite velocity state vector in ECEF (m/s) | +/- 8000 m/s, granularity 0.06 m/s, 54 bits | 0 | Per Cell | Cell-specific | 36.331 | For eMTC | New-stable | |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / UE pre-compensation for UL synchronizationUplink Time pre-compensation | 36.213 |  |  |  | ServingSatelliteEphemerisSemiMajorAxis-NB-r17 | new | ServingSatelliteEphemerisSemiMajorAxis-r17 | Indicate the following ephemeris orbital parameter for the serving satellite: | [6500, 43000] km, 33 bits | 0 | Per Cell | Cell-specific | 36.331 | For eMTC | New-stable | |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / UE pre-compensation for UL synchronizationUplink Time pre-compensation | 36.213 |  |  |  | ServingSatelliteEphemerisEccentricityE-NB-r17 | new | ServingSatelliteEphemerisEccentricityE-r17 | Indicate the following ephemeris orbital parameter for the serving satellite: - Eccentricity e | ≤ 0.015, 19 bits | 0 | Per Cell | Cell-specific | 36.331 | For eMTC | New-stable | |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / UE pre-compensation for UL synchronizationUplink Time pre-compensation | 36.213 |  |  |  | ServingSatelliteEphemerisArgumentOfPeriapsis-r17 | new | ServingSatelliteEphemerisArgumentOfPeriapsis-r17 | Indicate the following ephemeris orbital parameter for the serving satellite: - Argument of periapsis ω [rad] | [0, 2π], 24 bits | 0 | Per Cell | Cell-specific | 36.331 | For eMTC | New-stable | |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / UE pre-compensation for UL synchronizationUplink Time pre-compensation | 36.213 |  |  |  | ServingSatellite EphemerisLongitudeOfAscendingNode-r17 | new | ServingSatellite EphemerisLongitudeOfAscendingNode-r17 | Indicate the following ephemeris orbital parameter for the serving satellite: - Longitude of ascending node Ω [degrees] | [0, 2π], 21 bits | 0 | Per Cell | Cell-specific | 36.331 | For eMTC | New-stable | |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / UE pre-compensation for UL synchronizationUplink Time pre-compensation | 36.213 |  |  |  | ServingSatelliteEphemerisInclinationI-r17 | new | ServingSatelliteEphemerisInclinationI-r17 | Indicate the following ephemeris orbital parameter for the serving satellite: - Inclination i [degree] | [-π/2, + π/2 ], 20 bits | 0 | Per Cell | Cell-specific | 36.331 | For eMTC | New-stable | |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / UE pre-compensation for UL synchronizationUplink Time pre-compensation | 36.213 |  |  |  | ServingSatelliteEphemerisMeanAnomalyM-r17 | new | ServingSatelliteEphemerisMeanAnomalyM-r17 | Indicate the following ephemeris orbital parameter for the serving satellite: - Mean anomaly M [rad] at epoch time to | [0, 2π], 24 bits | 0 | Per Cell | Cell-specific | 36.331 | For eMTC | New-stable | |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / UE pre-compensation for UL synchronizationUplink Time pre-compensation | 36.213 |  |  |  | ntnServingSatULSyncValidityDuration-NB-r17 | new | ntnServingSatULSyncValidityDuration-NB-r17 | The serving satellite ephemeris and common TA related parameters are signalled in the same SIB message and have the same epoch time. A single validity duration for both serving satellite ephemeris and common TA related parameters is broadcast on the SIB. Validity timer for UL synchronization should be started/restarted with configured timer validity duration at the epoch time of the assistance information. | [Extend range for GEO: up to 2 hours]  [5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 120, 180, 240] | 0 | Per Cell | Cell-specific | 36.331 | For eMTC, | New-stable | |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / UE pre-compensation for UL synchronizationUplink Time pre-compensation | 36.213 |  |  |  | TransmissionDurationPRACH-r17 | new | TransmissionDurationPRACH-r17 | Configuration of UL transmission segment is indicated on SIB | (TCP+TSEQ+TGP), 2\*(TCP+TSEQ+TGP), 4\*(TCP+TSEQ+TGP), 8\*(TCP+TSEQ+TGP), 16\*(TCP+TSEQ+TGP), 32\*(TCP+TSEQ+TGP), 64\*(TCP+TSEQ+TGP), 128\*(TCP+TSEQ+TGP) | 0 | Per Cell | Cell-specific | 36.331 | For eMTC | New-stable | |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / UE pre-compensation for UL synchronizationUplink Time pre-compensation | 36.213 |  |  |  | TransmissionDurationPUSCH-r17 | new | TransmissionDurationPUSCH-r17 | Configuration of UL transmission segment is indicated on SIB and reconfigured by RRC signalling in RRC\_CONNECTED | • Full-PRB allocation (unit: subframes): 2 4 8 16 32 64 128 256  • Sub-PRB allocation (unit: resource units): 1 2 4 8 16 32 64 128 | 0 | Per Cell | Cell-specific | 36.331 | For eMTC, | New-stable | |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / UE pre-compensation for UL synchronizationUplink Time pre-compensation | 36.213 |  |  |  | TransmissionDurationPUCCH-r17 | new | TransmissionDurationPUCCH-r17 | Configuration of UL transmission segment is indicated on SIB and reconfigured by RRC signalling in RRC\_CONNECTED | (unit: subframes): 2 4 8 16 32 64 128 | 0 | Per Cell | Cell-specific | 36.331 | For eMTC, | New-stable | |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |

## Company views

MODERATOR NOTE: TBA

**Moderator]:**

Companies are encouraged to provide comments on revised RRC parameters list (section 3.1):

|  |  |
| --- | --- |
| **Companies** | **Comments** |
|  |  |
|  |  |
|  |  |
|  |  |

## Updated list of RRC parameters based on company views (First round of email discussions)

## Updated list of RRC parameters based on company views (Second round of email discussions)

# Enhancements on 8.15.2 Timing relationship enhancements

## Related RRC parameters

Based on the agreements to date (up to RAN1#107-e) and the companies proposals submitted to RAN1#107-e, a preliminary list of RRC parameters for Rel-17 IoT NTN and related to 8.15.2 Timing relationship enhancements is provided below:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **WI code** | | **Sub-feature group** | **RAN1 specification** | **Section** | **RAN2 Parant IE** | **RAN2 ASN.1 name** | **Parameter name in the spec** | **New or existing?** | **Parameter name in the text** | **Description** | **Value range** | **Default value aspect** | **Per (UE, cell, TRP, …)** | **UE-specific or Cell-specific** | **Specification** | **Comment** | **Status** |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / Timing relationships enhancements | | 36.213 |  |  |  | CellSpecificKoffset-NB -r17 | new | CellSpecificKoffset-NB -r17 | The K\_offset is a scheduling offset used for the timing relationships in RRC\_IDLE or RRC\_CONNECTED  For NB-IoT NTN, support cell-specific Koffset configuration for use during initial access.  For NB-IoT NTN, with respect to the granularity, configuration, indication and update of K\_Offset, the mechanisms concluded in NR-NTN shall be taken as baseline | (0...X) X is TBD | 0 | Per Cell | Cell-specific, | 36.331 | For NB-IoT The Koffset is used for - For NB-IoT, on receiving UL grant on DCI format N0 in subframe n, NPUSCH Format 1 is transmitted with a delay of Koffset as compared to transmission as per current specification. - For NB-IoT, on receiving a NPDSCH with a RAR message that ends in subframe n, the corresponding Msg3 is transmitted on NPUSCH format 1, with a delay of Koffset as compared to transmission as per current specification. - For NB-IoT, a UE upon detection of a NPDSCH transmission for which it should provide an ACK/NACK feedback, shall transmit the HARQ ACK/NACK with a delay of Koffset as compared to transmission as per current specification. - For NB-IoT, on receiving a timing advance command ending in DL subframe n, the corresponding adjustment of the uplink transmission timing by the received time advance shall be delayed by Koffset as compared to current specification.  -In IoT NTN, for a random access procedure initiated by a NPDCCH order, the UE shall delay the transmission of the random access preamble by Koffset as compared to the current specification.  For IoT NTN, no modifications are needed for the calculation in NR NTN for estimate of UE-eNB RTT. Granularity, periodicy for update of Koffset, contents of UE-specific Koffset are FFS | New-stable |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / Timing relationships enhancements | | 36.213 |  |  |  | UESpecificKoffset-NB -r17 | new | UESpecificKoffset-NB -r17 | The K\_offset is a scheduling offset used for the timing relationships in RRC\_IDLE or RRC\_CONNECTED  For NB-IoT NTN, support the use of UE-specific Koffset in CONNECTED mode.  For NB-IoT NTN, with respect to the granularity, configuration, indication and update of K\_Offset, the mechanisms concluded in NR-NTN shall be taken as baseline | (0...X) X is TBD | 0 | Per UE | UE-specific | 36.331 | For NB-IoT The Koffset is used for - For NB-IoT, on receiving UL grant on DCI format N0 in subframe n, NPUSCH Format 1 is transmitted with a delay of Koffset as compared to transmission as per current specification. - For NB-IoT, on receiving a NPDSCH with a RAR message that ends in subframe n, the corresponding Msg3 is transmitted on NPUSCH format 1, with a delay of Koffset as compared to transmission as per current specification. - For NB-IoT, a UE upon detection of a NPDSCH transmission for which it should provide an ACK/NACK feedback, shall transmit the HARQ ACK/NACK with a delay of Koffset as compared to transmission as per current specification. - For NB-IoT, on receiving a timing advance command ending in DL subframe n, the corresponding adjustment of the uplink transmission timing by the received time advance shall be delayed by Koffset as compared to current specification.  -In IoT NTN, for a random access procedure initiated by a NPDCCH order, the UE shall delay the transmission of the random access preamble by Koffset as compared to the current specification.  For IoT NTN, no modifications are needed for the calculation in NR NTN for estimate of UE-eNB RTT. Granularity, periodicy for update of Koffset, contents of UE-specific Koffset are FFS | New-stable |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / Timing relationships enhancements | | 36.213 |  |  |  | K\_mac-NB-r17 | new | K\_mac-NB-r17 | K\_mac is a scheduling offset provided by network if downlink and uplink frame timing are not aligned at gNB. It is needed for UE action and assumption on downlink configuration. | (0…Y) Y is TBD | 0 | Per Cell | Cell-specific | 36.331 | For NB-IoT NR NTN -The information of K\_mac is carried in system information. -The unit of K\_mac is number of slots for a given subcarrier spacing. · FFS: one subcarrier spacing value or different subcarrier spacing values for different scenarios.  For NB-IoT, if the UE has initiated an NPUSCH transmission using pre-configured uplink resources ending in subframe n, the UE shall start or restart to monitor the NPDCCH from DL subframe n+4+K\_mac (where K\_mac is defined as in NR-NTN). | New-Unstable |
| LTE\_NBIOT\_eMTC\_NTN | TAreport-IoT NTN | |  |  |  |  | TA\_Report-NB-r17 | new | TA\_Report-NB-r17 | UE-specific TA reporting is supported in IoT-NTN  · FFS: Detailed contents of report | TBD | 0 | Per UE | UE-specific | 36.331 | For NB-IoT NR NTN agreed the granularity of the reported TA is slot. • FFS how to round TA value to slot level granularity | New-stable |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / Timing relationships enhancements | | 36.213 |  |  |  | CellSpecificKoffset-r17 | new | CellSpecificKoffset-r17 | The K\_offset is a scheduling offset used for the timing relationships in RRC\_IDLE or RRC\_CONNECTED  For eMTC NTN, support cell-specific Koffset configuration for use during initial access.  For eMTC NTN, with respect to the granularity, configuration, indication and update of K\_Offset, the mechanisms concluded in NR-NTN shall be taken as baseline | (0...X) X is TBD | 0 | Per Cell | Cell-specific | 36.331 | The Koffset is used for -For eMTC, on receiving an UL grant via MPDCCH that ends in DL subframe n, PUSCH is transmitted with a delay of Koffset as compared to transmission as per current specification -For eMTC, on receiving a RAR in a PDSCH that ends in subframe n, PUSCH for Msg3 is transmitted with a delay of Koffset as compared to transmission as per current specification. -For eMTC, when an MPDCCH ending in subframe n activates UL SPS, the time of the first subframe in which the UE is allowed to transmit SPS-PUSCH is delayed by Koffset as compared to transmission per current specification. -For eMTC, on reception of a PDSCH ending in subframe n, the corresponding HARQ-ACK feedback on PUCCH is transmitted with a delay of Koffset as compared to transmission as per current specification. -For eMTC, for an MPDCCH received in subframe n that triggers aperiodic SRS transmission, SRS is transmitted with a delay of Koffset as compared to transmission as per current specification. -For eMTC, on receiving a timing advance command ending in subframe n, the corresponding adjustment of the uplink transmission timing by the received time advance shall be delayed by Koffset as compared to current specification. -In IoT NTN, for a random access procedure initiated by a MPDCCH order, the UE shall delay the transmission of the random access preamble by Koffset as compared to the current specification. -For eMTC in IoT NTN, if the UE determines that a preamble retransmission is necessary, the choice of a suitable preamble retransmission subframe shall be delayed by Koffset as compared to current specifications.  For IoT NTN, no modifications are needed for the calculation in NR NTN for estimate of UE-eNB RTT. Granularity, periodicy for update of Koffset, contents of UE-specific Koffset are FFS | New-stable |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / Timing relationships enhancements | | 36.213 |  |  |  | UESpecificKoffset-r17 | new | UESpecificKoffset-r17 | The K\_offset is a scheduling offset used for the timing relationships in RRC\_IDLE or RRC\_CONNECTED  For eMTC NTN, support the use of UE-specific Koffset in CONNECTED mode.  For eMTC NTN, with respect to the granularity, configuration, indication and update of K\_Offset, the mechanisms concluded in NR-NTN shall be taken as baseline | (0...X) X is TBD | 0 | Per UE | UE-specific | 36.331 | The Koffset is used for -For eMTC, on receiving an UL grant via MPDCCH that ends in DL subframe n, PUSCH is transmitted with a delay of Koffset as compared to transmission as per current specification -For eMTC, on receiving a RAR in a PDSCH that ends in subframe n, PUSCH for Msg3 is transmitted with a delay of Koffset as compared to transmission as per current specification. -For eMTC, when an MPDCCH ending in subframe n activates UL SPS, the time of the first subframe in which the UE is allowed to transmit SPS-PUSCH is delayed by Koffset as compared to transmission per current specification. -For eMTC, on reception of a PDSCH ending in subframe n, the corresponding HARQ-ACK feedback on PUCCH is transmitted with a delay of Koffset as compared to transmission as per current specification. -For eMTC, for an MPDCCH received in subframe n that triggers aperiodic SRS transmission, SRS is transmitted with a delay of Koffset as compared to transmission as per current specification. -For eMTC, on receiving a timing advance command ending in subframe n, the corresponding adjustment of the uplink transmission timing by the received time advance shall be delayed by Koffset as compared to current specification. -In IoT NTN, for a random access procedure initiated by a MPDCCH order, the UE shall delay the transmission of the random access preamble by Koffset as compared to the current specification. -For eMTC in IoT NTN, if the UE determines that a preamble retransmission is necessary, the choice of a suitable preamble retransmission subframe shall be delayed by Koffset as compared to current specifications.  For IoT NTN, no modifications are needed for the calculation in NR NTN for estimate of UE-eNB RTT. Granularity, periodicy for update of Koffset, contents of UE-specific Koffset are FFS | New-stable |
| LTE\_NBIOT\_eMTC\_NTN | Basic IoT over NTN support / Timing relationships enhancements | | 36.213 |  |  |  | K\_mac-r17 | new | K\_mac-r17 | K\_mac is a scheduling offset provided by network if downlink and uplink frame timing are not aligned at gNB. It is needed for UE action and assumption on downlink configuration. | (0…Y) Y is TBD | 0 | Per Cell | Cell-specific | 36.331 | NR NTN -The information of K\_mac is carried in system information. -The unit of K\_mac is number of slots for a given subcarrier spacing. · FFS: one subcarrier spacing value or different subcarrier spacing values for different scenarios.  For eMTC, if the UE has initiated an PUSCH transmission using pre-configured uplink resources ending in subframe n, the UE shall start or restart to monitor the MPDCCH from DL subframe n+4+K\_mac (where K\_mac is defined as in NR-NTN). | New-Unstable |
|  | TAreport-IoT NTN | |  |  |  |  | TA\_Report-r17 | new | TA\_Report-r17 | UE-specific TA reporting is supported in IoT-NTN  · FFS: Detailed contents of report | TBD | 0 | Per UE | UE-specific | 36.331 | NR NTN agreed the granularity of the reported TA is slot. • FFS how to round TA value to slot level granularity | New-stable |

## Company views

TBA

MODERATOR NOTE: TBA

**Moderator]:**

Companies are encouraged to provide comments on revised RRC parameters list (section 3.1):

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| **Companies** | **Comments** |
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## Updated list of RRC parameters based on company views (First round of email discussions)

TBA

## Updated list of RRC parameters based on company views (Second round of email discussions)

**TBA**

3.3):

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| **Companies** | **Comments** |
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# Reference

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|  | 1. R1-2108672 List of RRC parameter for Rel-17 IoT-NTN, up to RAN1 #106-e, Moderator (MediaTek), RAN1#106-e, August 2021 2. R1-2110629 List of RRC parameter for Rel-17 IoT-NTN, up to RAN1 #106bis-e, Moderator (MediaTek), RAN1#106bis-e, October 2021 3. R1-2110628 Summary of [10bis-e-R17-RRC-IoT-NTN] Email discussion on Rel-17 RRC parameters for NB-IoT/eMTC support for NTN, Moderator (MediaTek), RAN1#106bis-e, October 2021 |
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