3GPP TSG-RAN WG1 #84
St Julian's, Malta, February 15 –19, 2016

R1-160846

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Street Microcell Channel Measurements at 2.44, 14.8 & 58.68 GHz

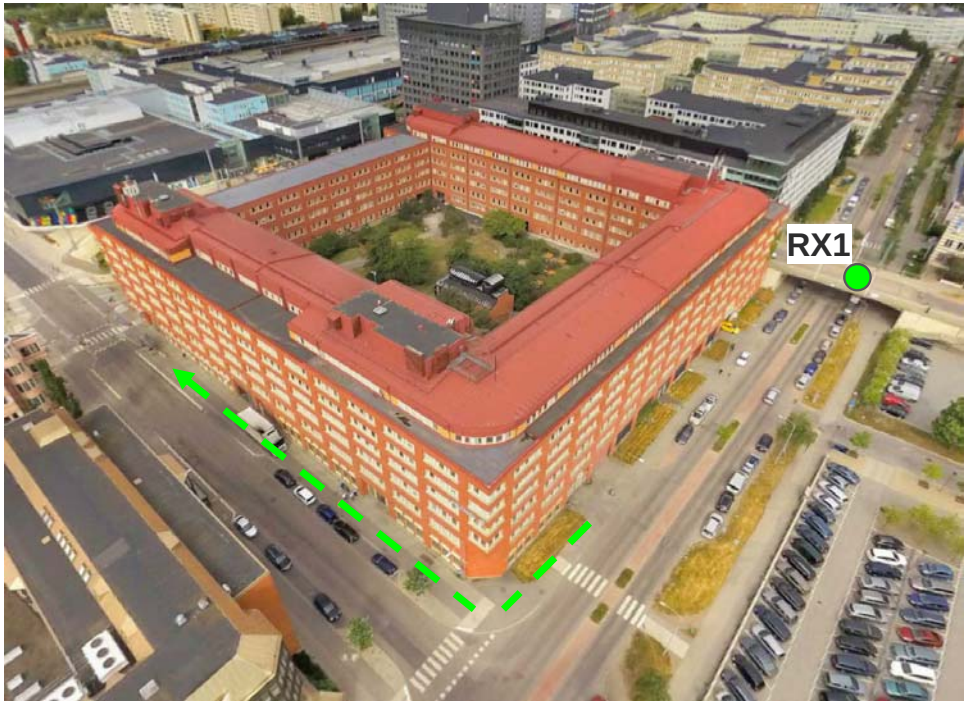
Background

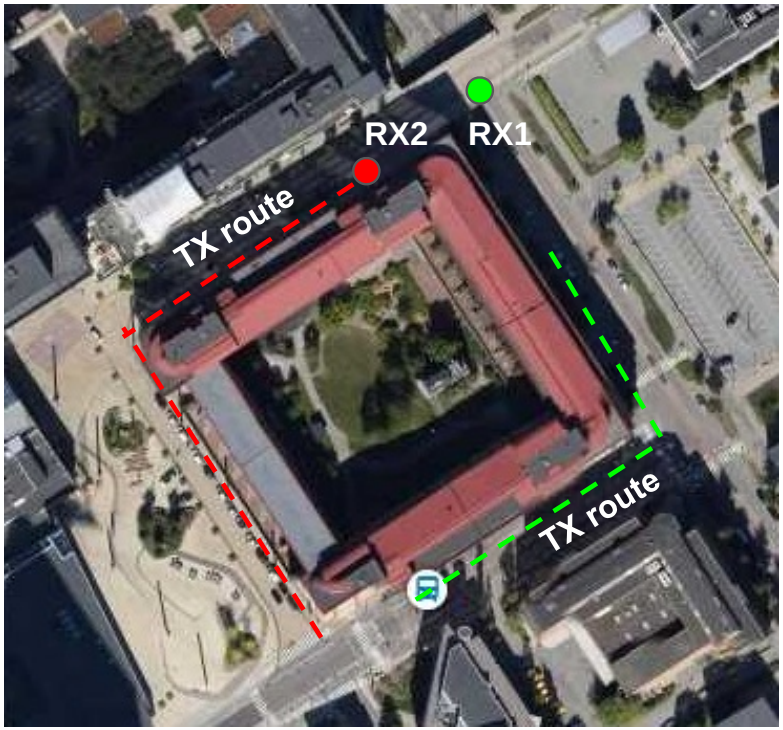
- Multi frequency street microcell measurements in LOS and NLOS have been performed in order to provide a solid experimental basis for the 5G channel modelling of corresponding scenario

- The research leading to these results received funding from the European Commission H2020 programme under grant agreement n°671650 (mmMAGIC project).

Measurement Scenario

- Two measurement routes:
  - RX1 fixed + green TX route
  - RX2 fixed + red TX route

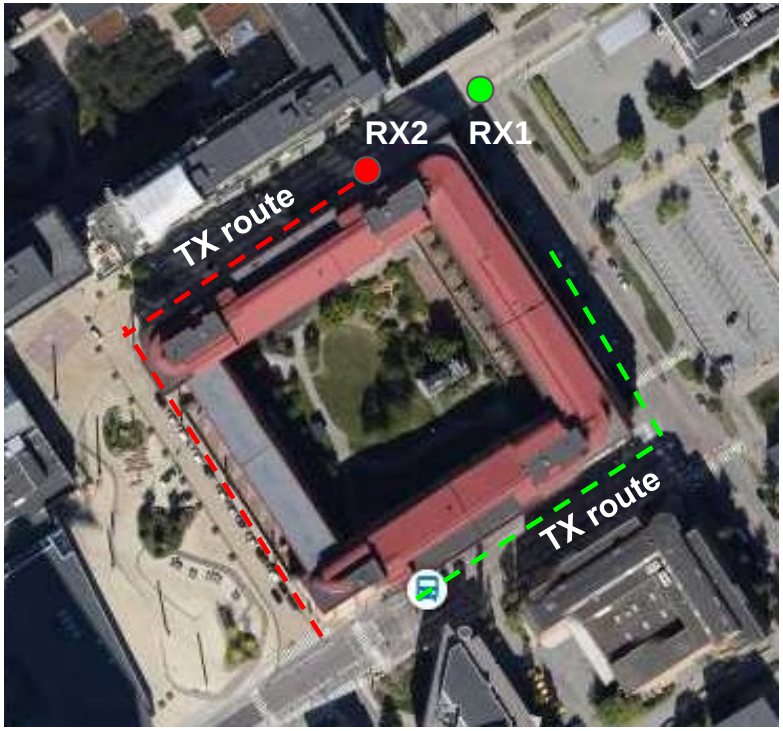




100 m

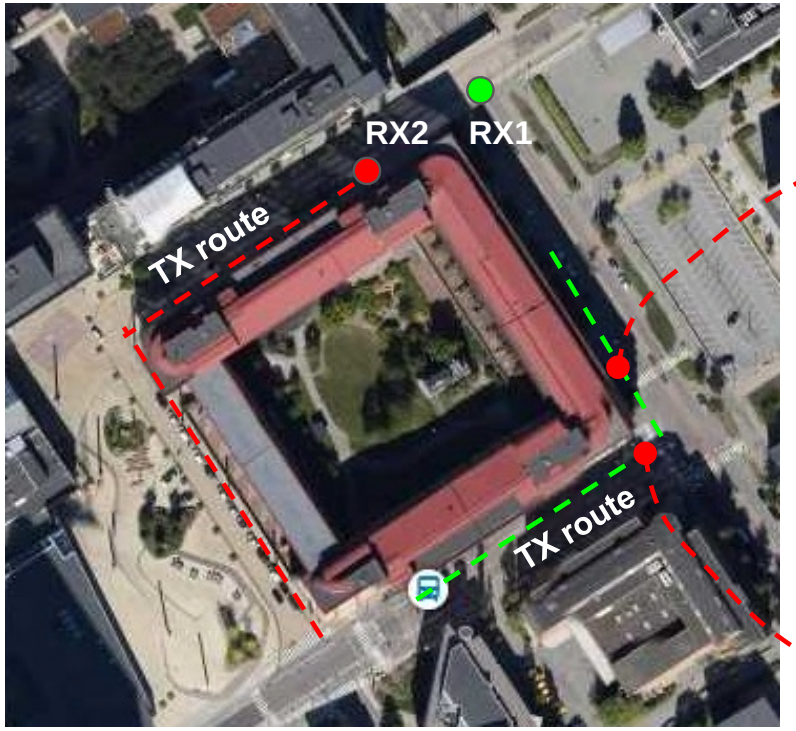
Outdoor Measurements

- Street Microcell
- LOS and NLOS
- 2.44, 14.8 & 58.8 GHz
- RX1 5m height
- RX2 1.5 m height
- TX 1.5m height
- 2 dBi dipole antennas used both at TX and RX



100 m

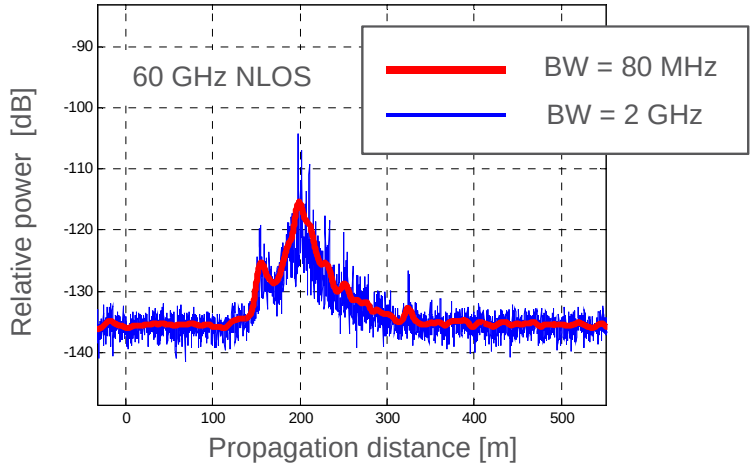
TX Locations

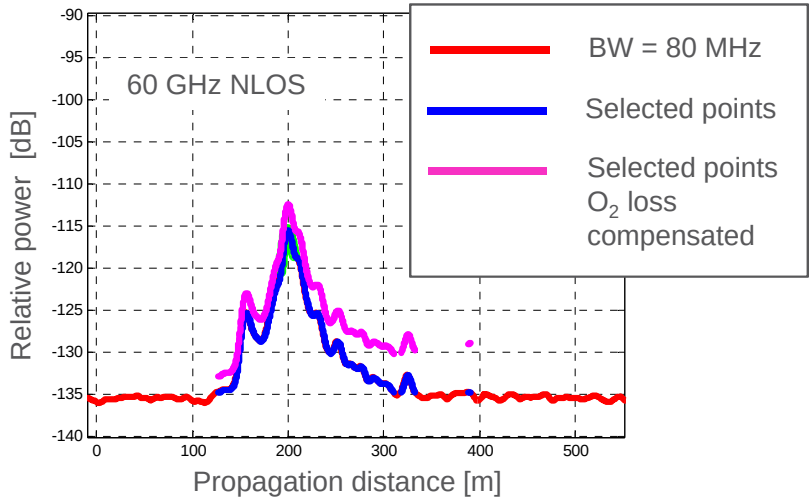


100 m

Methodology and Problems

- Decreasing measurement SNR with increasing frequency is common
- Noise power should be subtracted from measured received power value!
- Analysis should be adopted to BW
  - Max value relative noise floor BW dependent
- Problematic to use directive antennas for increased gain
  - Significant paths may be outside main lobe





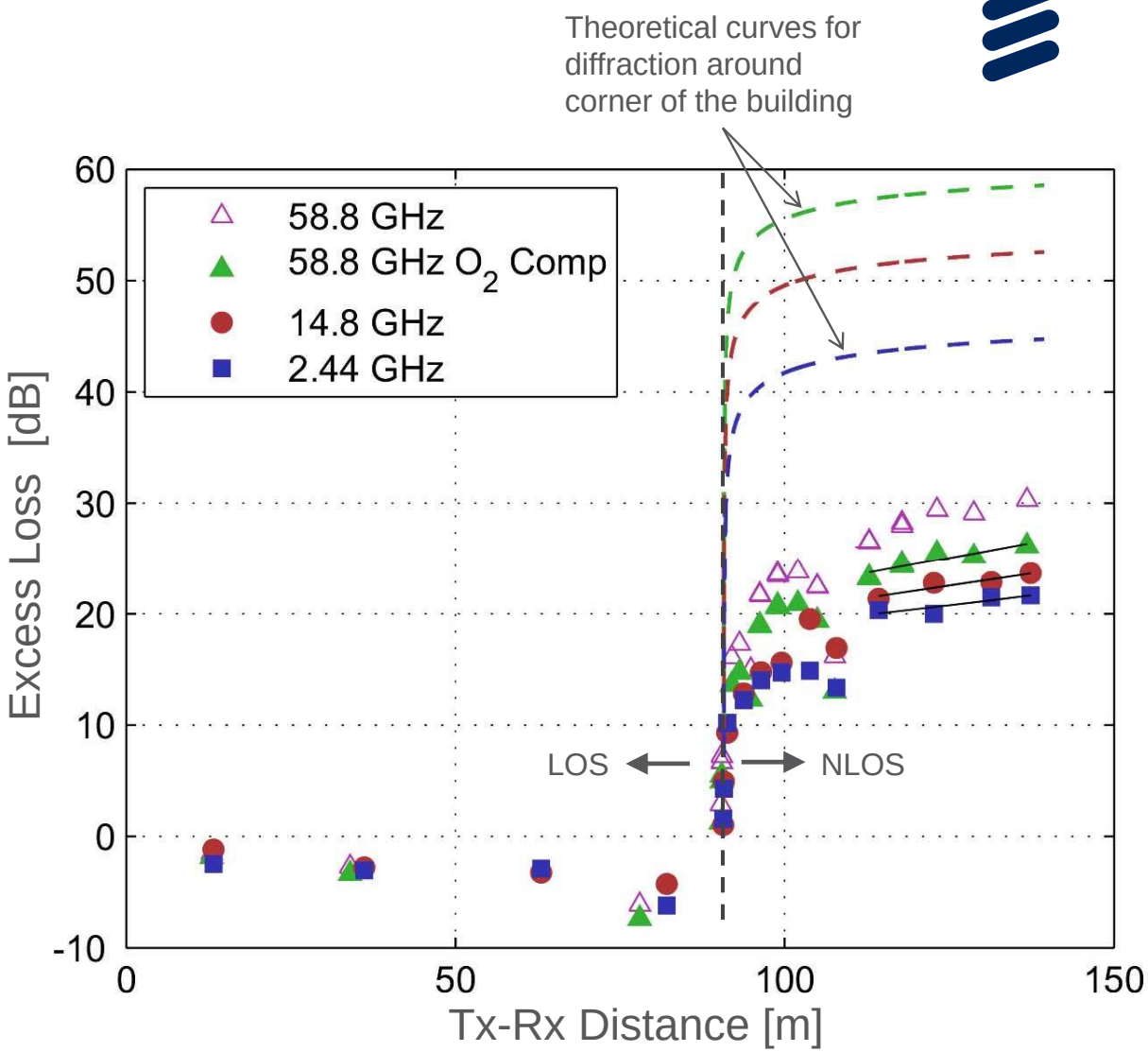
Same antenna pattern, BW and dynamic range required when comparing different measurements e.g. at different frequencies!"

Excess loss RX2

- Loss in excess of free space loss shown
- Bandwidth filtered to 80 MHz for all frequencies
- Same dynamic range (>10 dB) used for all frequencies
- Negative loss in LOS region due to multipath gain

Diffraction contribution to received signal not significant!

The frequency dependency in NLOS is weak!

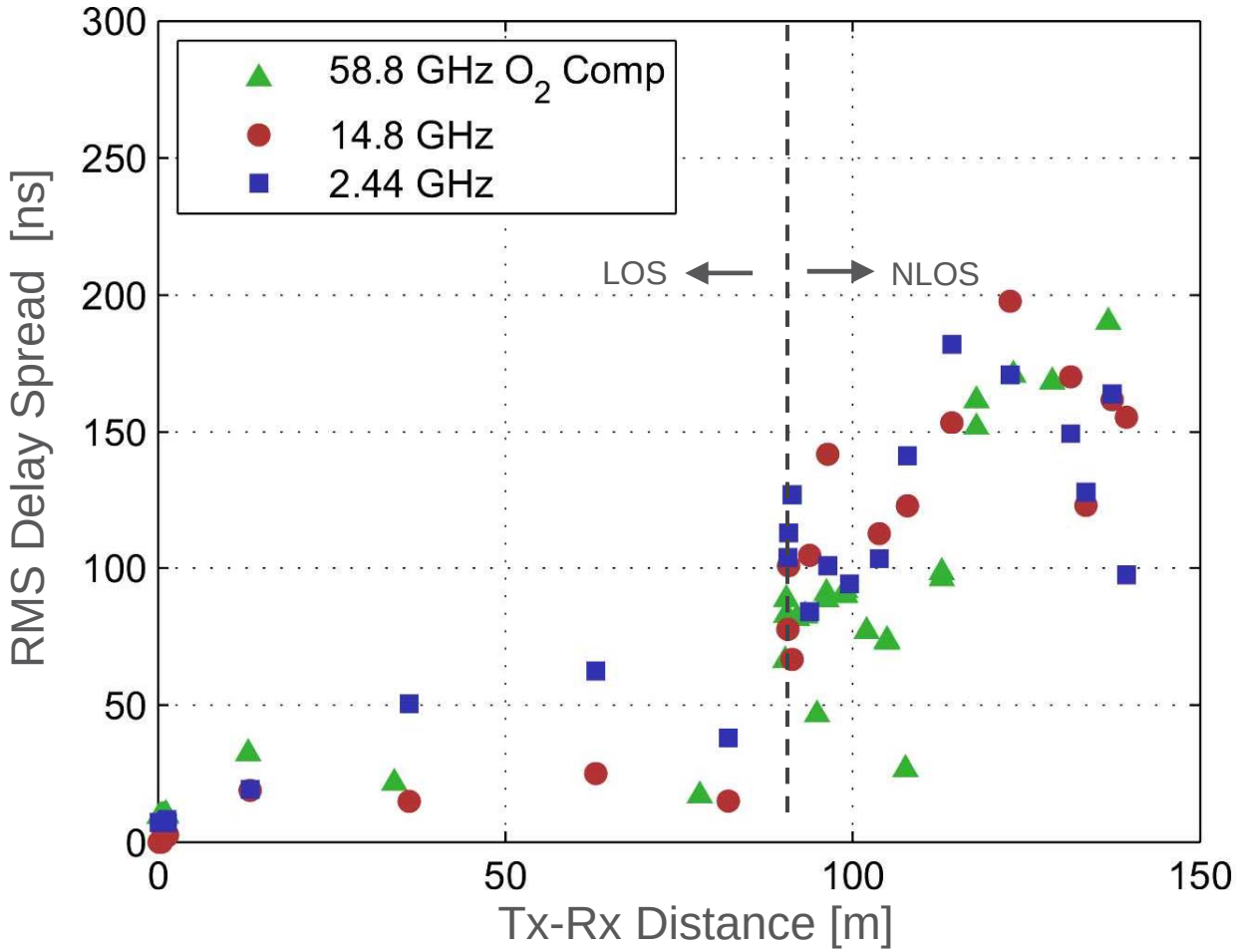


Delay Spread RX2

- Power delay profile data used
- Data in region 0-20 dB below peak and 3 dB above noise floor used
- Bandwidth filtered to 80 MHz for all frequencies
- RMS delay spread shown

Delay spread similar at all frequencies!

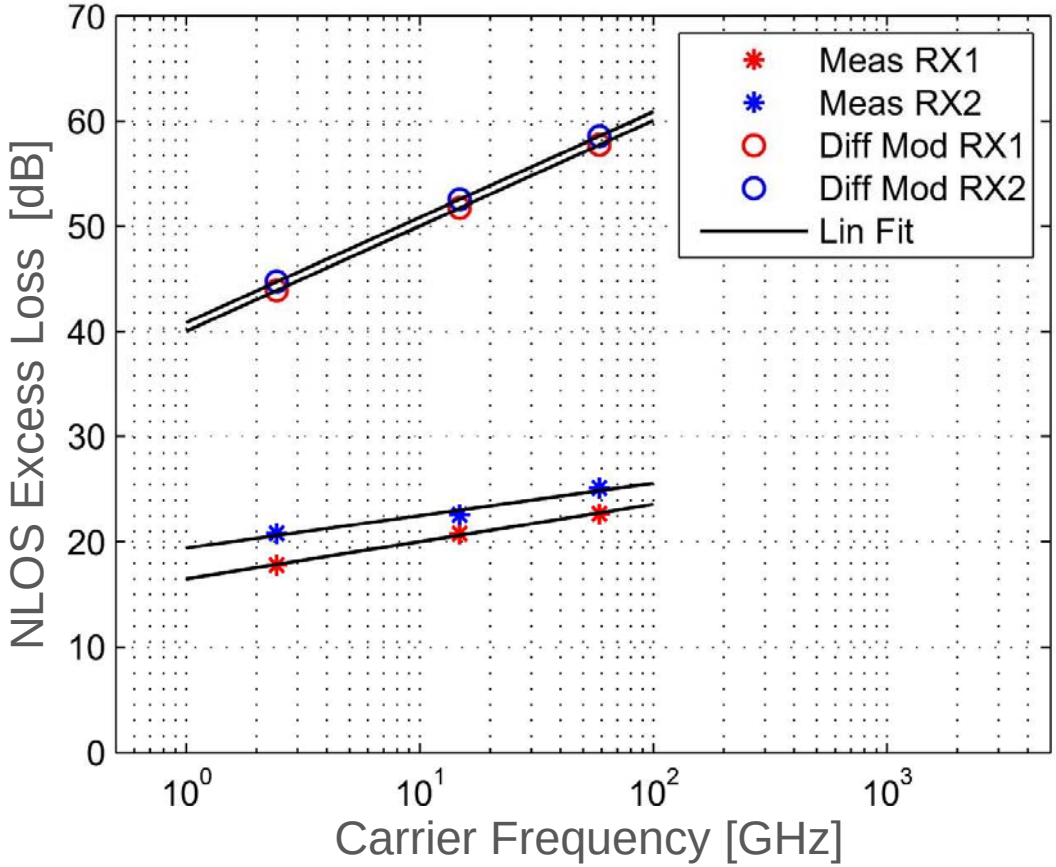
- *20-50 ns in LOS*
- *75-200 ns in NLOS*



Excess loss RX2

- The loss in excess of free space loss is shown in the graph
- Frequency dependency of NLOS Excess Loss
  - 3.5 Log(f) for RX1
  - 3.0 Log(f) for RX2
- Reflected/scattered paths dominates over diffraction in NLOS as received signal is orders of magnitude stronger than expected from diffraction around corner

Frequency dependency of path-loss has a $23\log(f)$ *dependency which is only slightly stronger than the free space dependency of* $20\log(f)$



Conclusions

Care must be taken when comparing different measurements

- *The same antenna pattern, BW and dynamic range required when comparing different measurements e.g. at different frequencies*

For propagation along streets (Urban Street Microcell) the following is found

- *Diffraction contribution negligible in NLOS*
- *Results support that the main propagation mechanisms are specular reflections and scattering by objects*
- *Excess path-loss have only small frequency dependency*
- *Delay spread does not show any significant frequency dependency*

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