

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

R1-160848

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Agenda Item: 7.3.5.4
Document for: Discussion and decision



BLOCKING LOSS MEASUREMENTS

INTRODUCTION



- › Most channel measurements do not consider obstacles close to the terminal antenna
 - Often car roof antennas are used, or equipment is kept some distance from obstacles

- › The path loss may be more severe than such measurements indicate
 - Additional blocking losses due to nearby objects may be required
 - Will such blocking losses become more severe at higher frequencies?

- › This contribution describes some outdoor street level blocking loss measurements at 15GHz
 - The purpose of the measurements is to get some hands on experience of how severe the blocking losses can be at higher frequencies

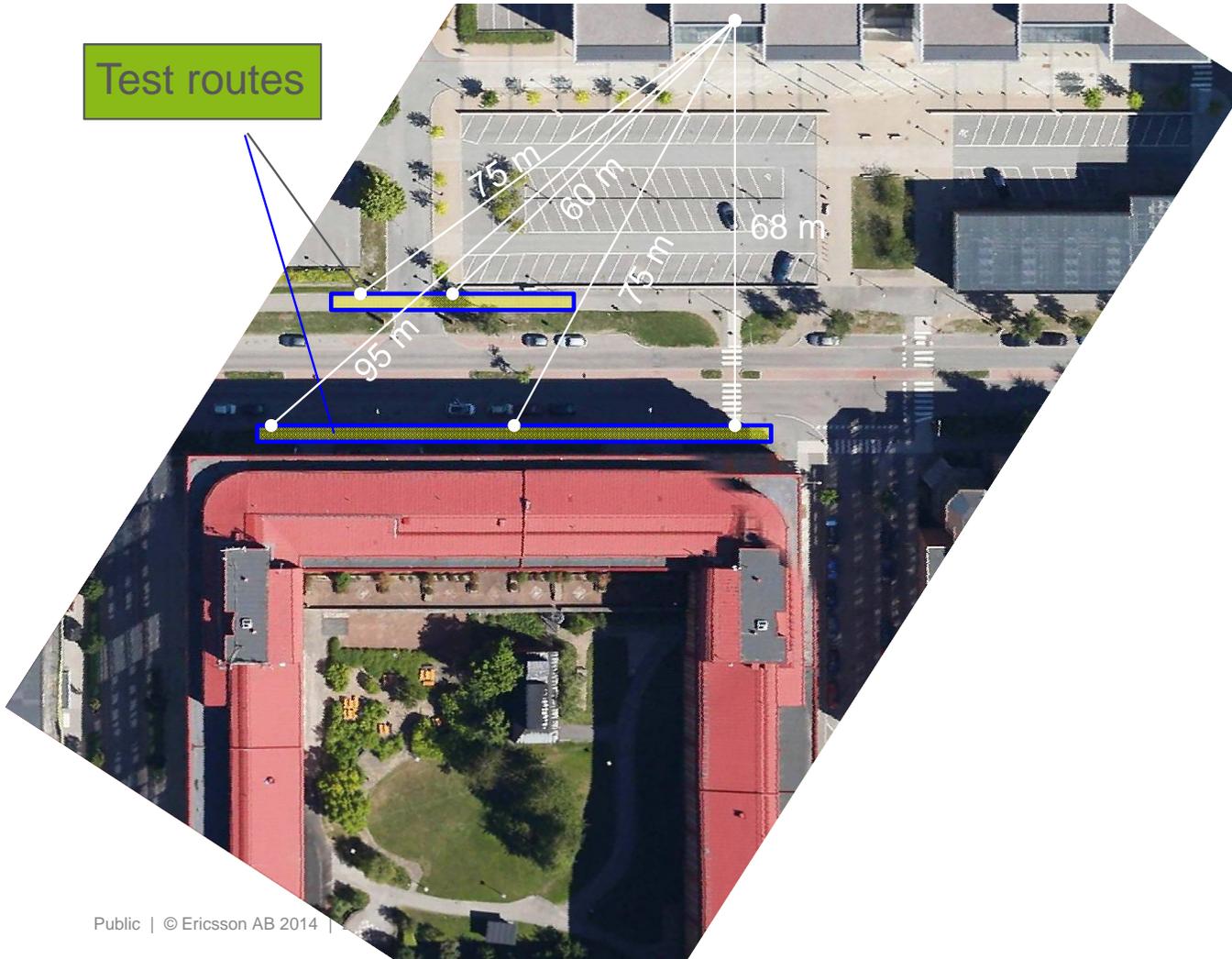
TRIAL AREA OVERVIEW



TEST AREA OVERVIEW



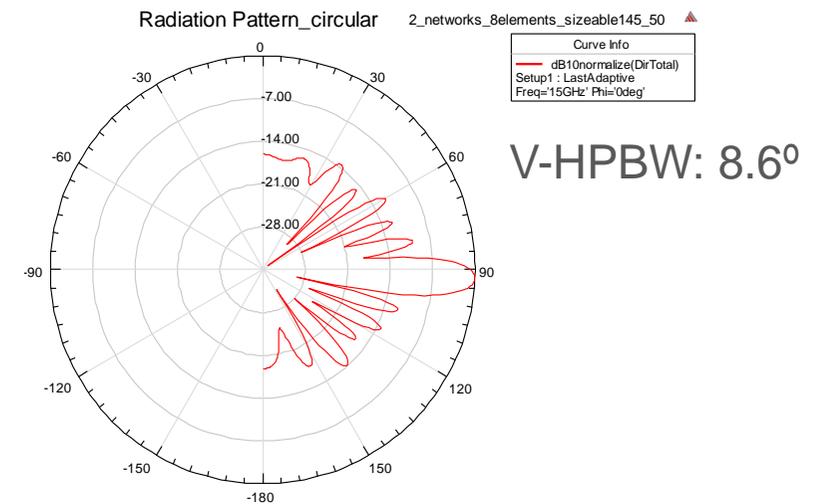
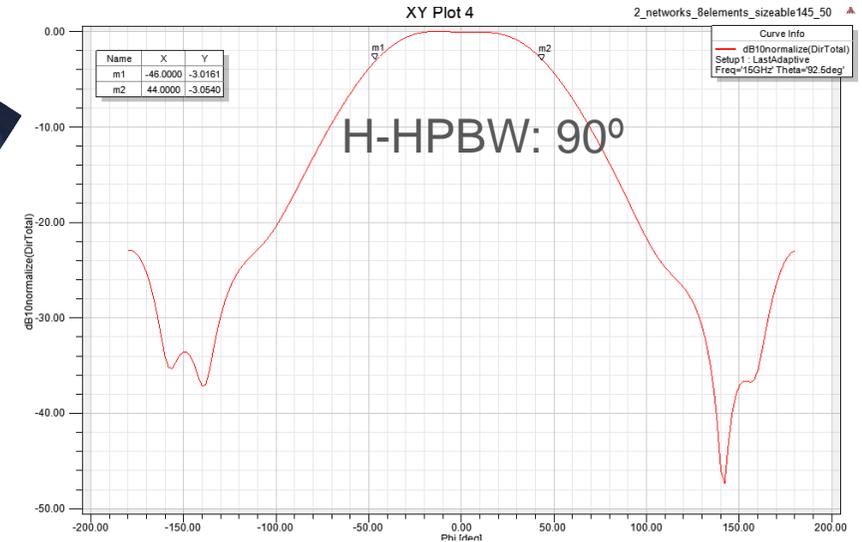
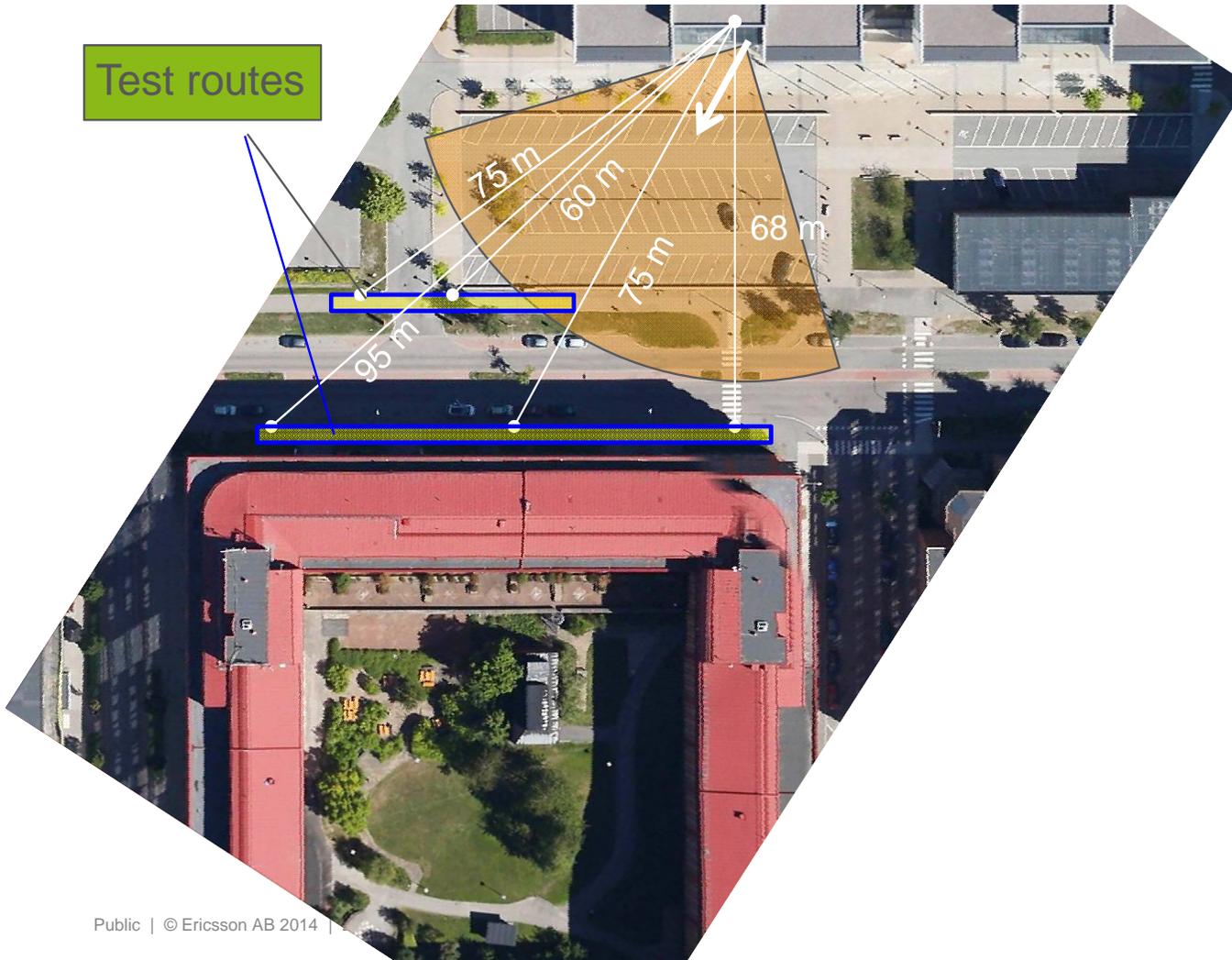
Test routes



TP ANTENNA INFORMATION



Test routes

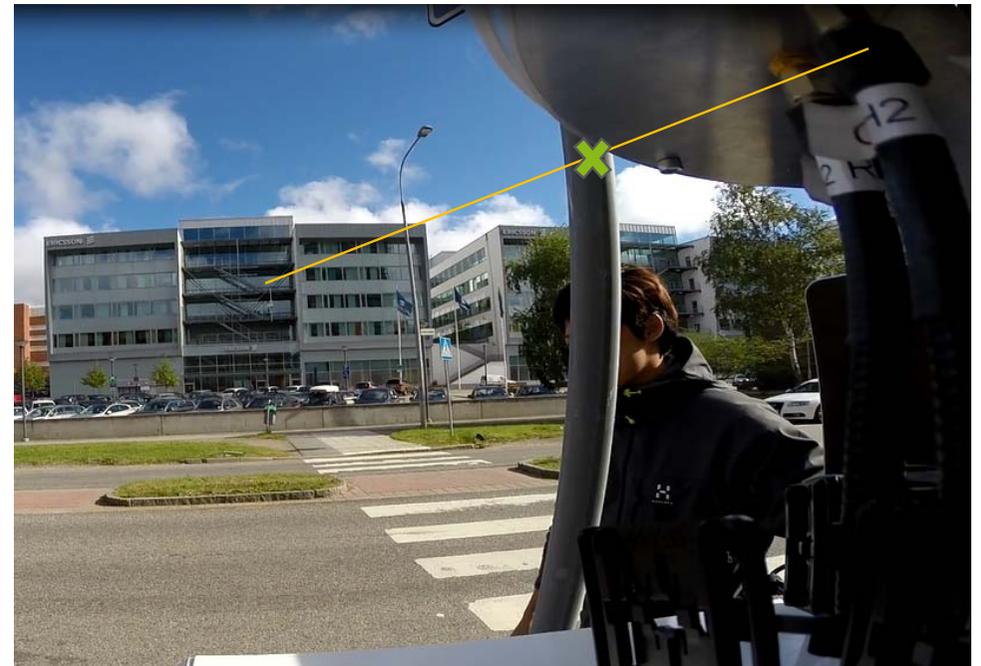


TERMINAL ANTENNA

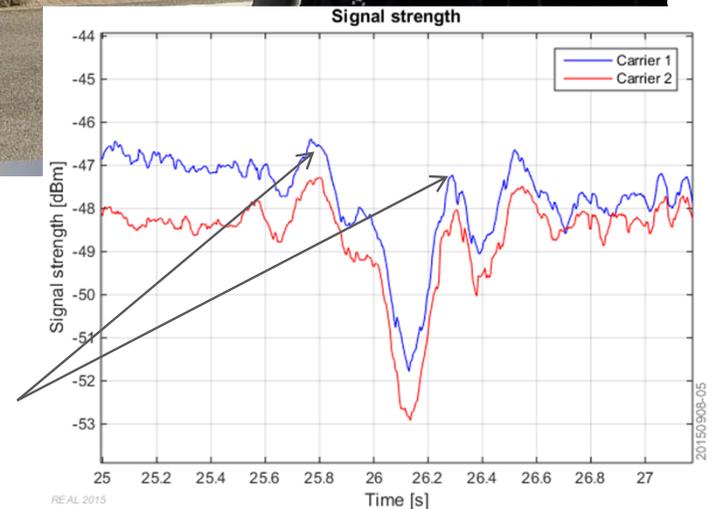
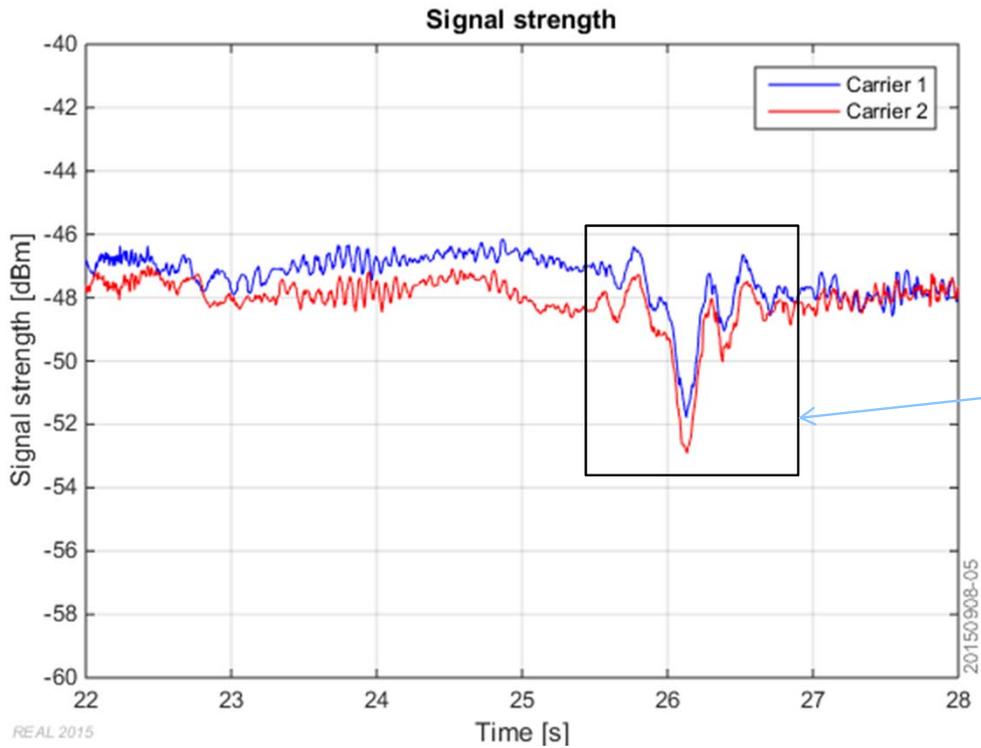


- › Omnidirectional coverage
- › Antenna position about 1.5 m above ground
 - More exposed to obstacles compared to e.g. a car roof mounted antenna
- › Walk speed typically 0.5 m/s
- › On-board GoPro camera facing TP2 antenna/Ki04 building
 - I.e. perpendicular to the walk direction
 - Synchronized with measurement logs

TRAFFIC SIGN POLE

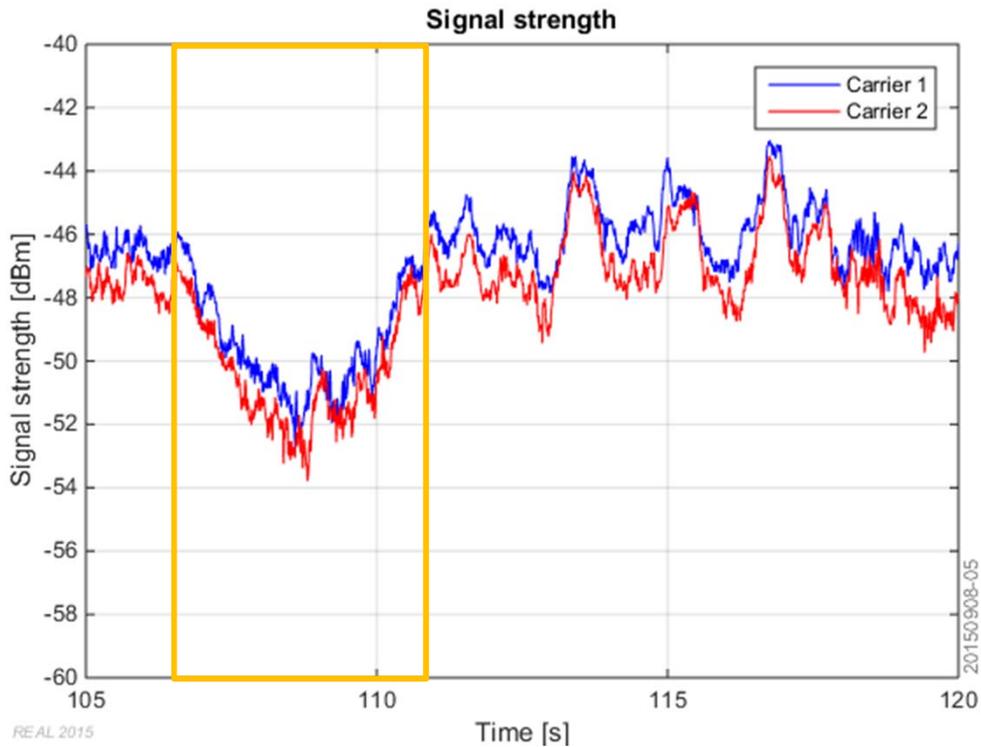


TRAFFIC SIGN POLE



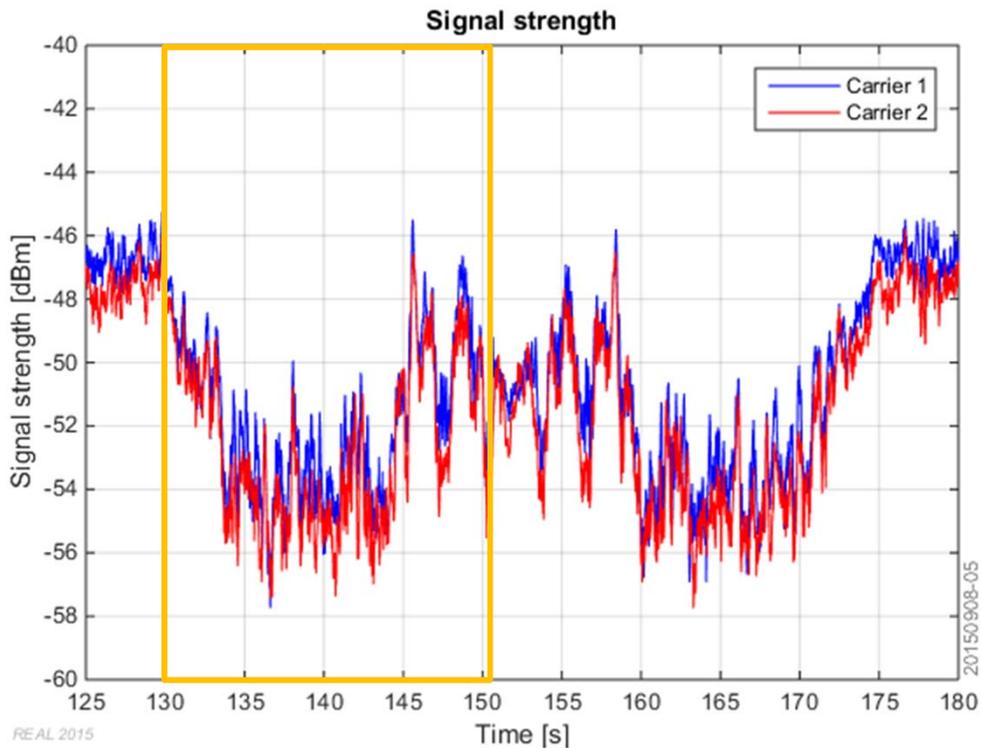
- › 4 dB loss from ~60 mm traffic sign pole (at ~1 m)
- › Scattering effects in regions immediately before/after

SHADOWING FROM SMALLER TREE



- › About 5 dB attenuation due to a tree blocking LOS between TP and UE antenna
 - A tree with $\varnothing 15$ cm at 65 m from TP will shadow/block a ~ 17 cm “strip” at 75 m from TP (i.e. at UE antenna position), compare to 60 mm traffic sign pole

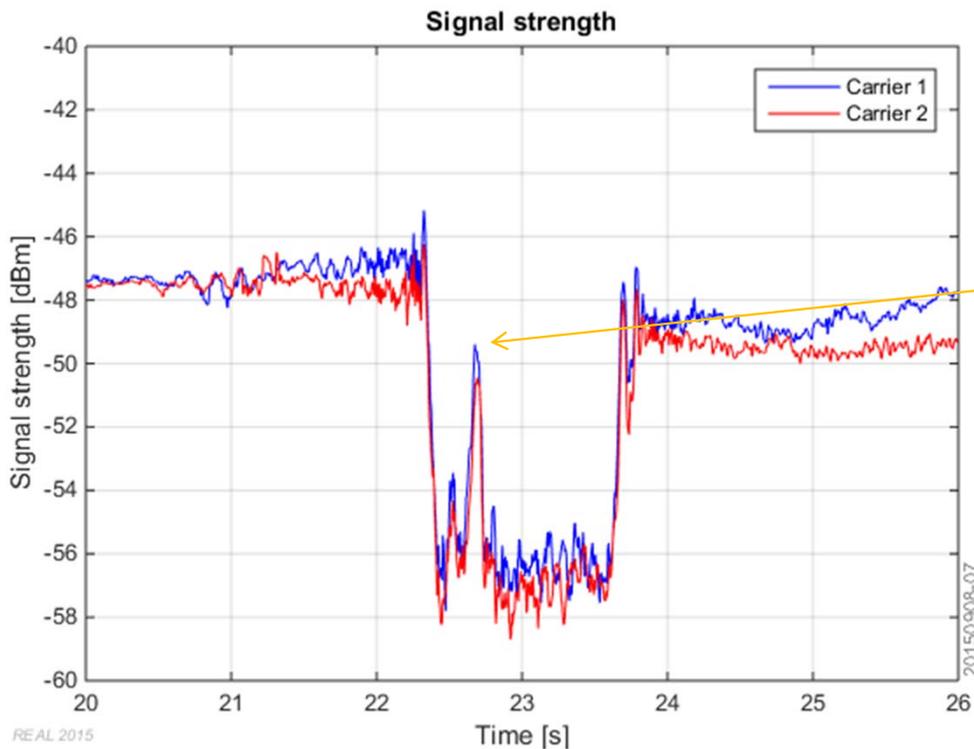
SHADOWING FROM BIGGER TREE



- › Light pole and bigger birch tree
 - About 7 dB signal attenuation loss
- › Impact from truck roof?

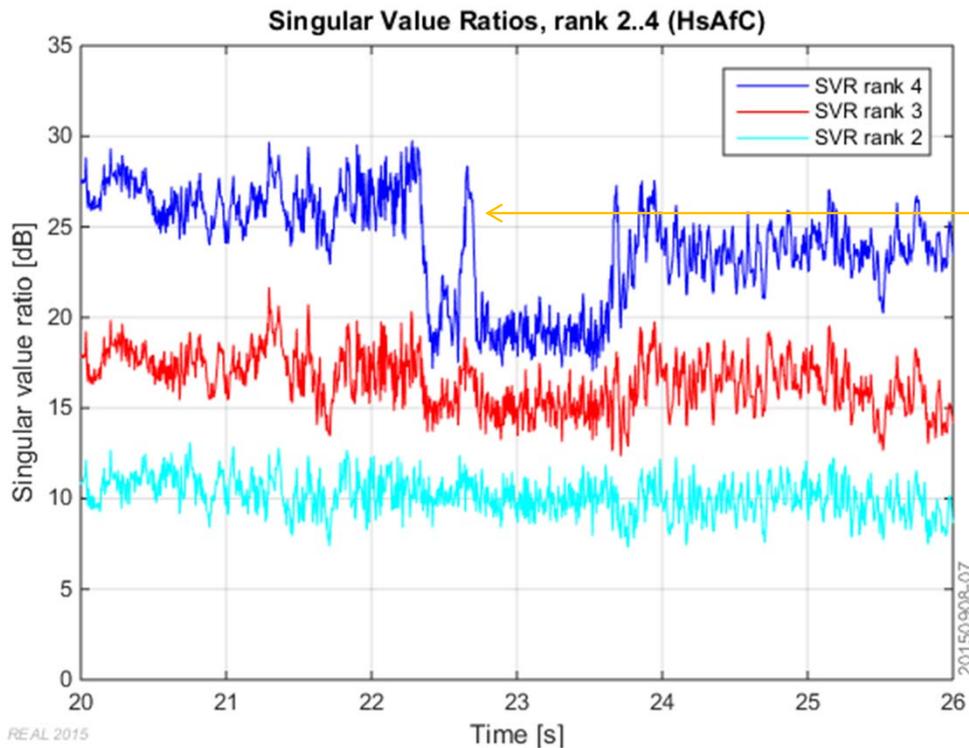


SHADOWING BY GARBAGE TRUCK



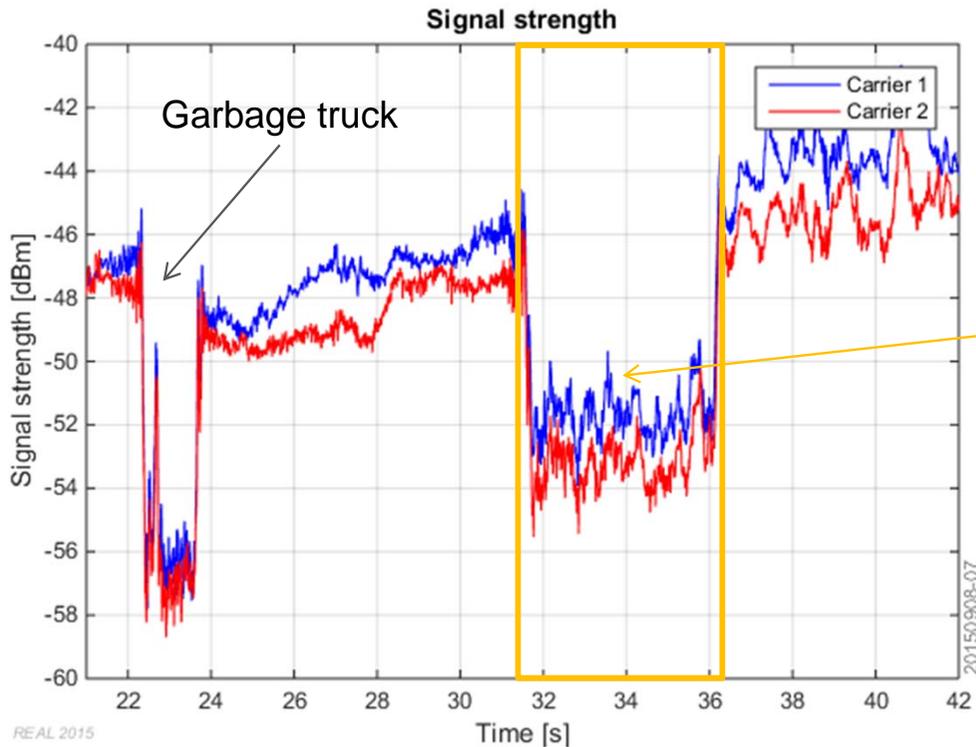
- › Garbage truck passing by blocking LOS between UE permobile and TP antennas
 - Signal attenuated 8-10 dB
 - Gap between drivers compartment and trash bin observable

SHADOWING BY GARBAGE TRUCK



- › Improved channel richness when direct path is blocked
 - Lower singular value ratios in 4x4 MIMO channel
 - Also observed to a lesser extent in the other blocked examples

SHADOWING FROM SMALLER TRUCK

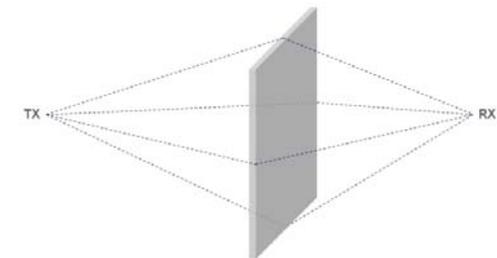


- › Small truck passing by 8 s later (temporally stopped at crosswalk)
 - Signal attenuated by 6-7 dB
 - Less metal in storage compartment compared to the garbage truck?

CONCLUSIONS



- › Rather limited blocking losses in LOS conditions at 15 GHz
 - 5-7 dB from single tree
 - 6-10 dB from trucks (including a large metallic garbage truck)
- › Blocking only in some directions, multipath from other directions probably not affected
 - In LOS, blocking of direct path increases channel richness
 - Likely even smaller impact in NLOS where no strong direct path exists
- › This kind of blocking can probably be considered to be part of the modeled “shadow fading”
 - The level of the loss at 15 GHz does not seem to be very different from cellular frequencies
 - Exception: the change to the directional characteristics and the delay spread in the channel may need to be modeled explicitly (at any frequency). Also, the rate of change of the power will likely be frequency-dependent (higher frequencies => more rapid transitions)
 - The METIS blocking and scattering model is an attractive alternative to consider





ERICSSON