RAN4#79 R4-164434
Nanjing, China, 23-27 May 2016

MBS Measurement Accuracy Justification

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Summary of Methodology

- Base requirements on TS 36.171 A-GNSS (position) performance requirements to establish MBS measurement accuracy requirements.

- Use HDOP to convert from position to measurement accuracy requirement based on:

$$\text{HDOP}=\frac{\Delta(\text{position})}{\Delta(\text{measurements})}$$

  - Worst case A-GNSS HDOP of 1.6 used for analysis since it maps to the most stringent requirements on accuracy, suggesting what is achievable in UE implementations today.

- Assume that the SNR for A-GNSS and MBS are similar (post processing) to enable a minimum level of performance.

  - Note A-GNSS satellite signals are weaker than MBS signals at the receiver, but A-GNSS receivers incorporate additional integration to achieve the needed post-processing SNR.

- Account for difference in confidence levels in the specifications. MBS specification uses 90th percentile (as does 36.133) while A-GNSS specification uses 95th percentile.

  - 95th percentile = +/- 1.96σ, 90th percentile = +/- 1.645σ

Summary of TS 36.171

- A-GNSS accuracy requirements expressed in terms of position accuracy
  - Sensitivity position accuracy: 100 m
  - Nominal positon accuracy: 30 m
- HDOP: range is 1.1 to 1.6 for Sensitivity, Nominal.
- 95th percentile used

Sensitivity Scenario

- GNSS position accuracy requirement = 100m
- Accounting for HDOP=1.6, GNSS measurement accuracy requirement = 100m/1.6 = 62.5m
- MBS equivalent measurement accuracy requirement = 62.5 *1.645σ/1.96σ= 52.5m ~ 50m
- MBS measurement accuracy in units of ms = 50m/299792458m/s ~ 1.6678 X 10^{-4} ms

Nominal Accuracy

- GNSS position accuracy requirement = 30m
- Accounting for HDOP=1.6, GNSS measurement accuracy requirement = 30m/1.6 = 18.75m
- MBS equivalent measurement accuracy requirement = 18.75 * 1.645σ/1.96σ = 15.74m ~ 15m
- MBS measurement accuracy in units of ms = 15m/299792458m/s= 5.0035 x 10^{-5} ms

Conclusions

- Given that A-GNSS receivers can meet 100 meters of position accuracy in Sensitivity tests and 30 m of position accuracy in Nominal tests, it is reasonable to infer that a 2 MHz MBS receiver can meet 1.6678×10^{-4} ms and 5.0035×10^{-5} ms at Sensitivity and Nominal respectively.