<u>Qualcomm input for AECS-11 Meeting</u>

I. GNSS requirements

As indicated during the 10th AECS meeting, Qualcomm had the opportunity to involve further experts who reviewed the current GNSS requirements. We would like to ask for the following minor but important changes in the current draft file "AECS-02-02-r5 (Secretariat) Draft regulation after 9th meeting.docx":

1) Section 3.2.7 to 3.2.10

> **- Removal of Sections 3.2.7, 3.2.8 and 3.2.9**
> **- Replace content of Section 3.2.10 by the following text**
> *Calculate horizontal coordinates error between position estimate and ground truth at 0.5 circular error probability (CEP) with 0.95 confidence level.*

Justification:
We believe that there is no need for an assumption of an error distribution. I.e. that better than 95% of samples are within the required distance of the true position.
In fact, for the theoretical case of Gaussian distributed range errors, the horizontal errors have a Rayleigh distribution. Hence, we'd recommend to delete these sections and to introduce the commonly accepted circular error probability (CEP) as the appropriate metric.

2) Section 7.2.4 and 17.2.4

> *The AECS shall be able to provide positioning information in WGS-84 coordinate systems.*

Justification:
The removal of PZ-90 requirement was already agreed during the last AECS meetings but was not yet reflected in the latest draft

3) Section 7.2.5 and Section 17.2.5

> *Horizontal position error shall not exceed:*
> *- under open sky conditions: 15 m CEP at confidence level 0.95 with Position Dilution of Precision (PDOP) between 2 and 2.5;*
> *- in urban canyon conditions: 40 m CEP at confidence level 0.95 with Position Dilution of Precision (PDOP) between 3.5 and 4.*

Justification:
To ensure testability upper and lower PDOP bounds are needed. PDOP values >4 are typically not used in related test scenarios.

4) Section 7.2.7 and 17.2.7

> *- Re-acquisition of GNSS signals and calculation of the navigation solution is possible and does not exceed 60s at signal level on the antenna input of the AECD of minus 150 dBm.*

Justification:
The increase in re-acquisition time has already been agreed during last AECS meetings but was not yet reflected in the latest draft

5) Section 7.2.11 and 17.2.11

> *The GNSS fix incorporated into the MSD shall not be older than 1s.*

Justification:
These additional sections need to be introduced to limit the age of the time position fix at the time of the eCall incident incorporated into the MSD.

6) Annex 8 Section 3.1.3, Table 5 and Section 3.3.1, Table 6

PDOP value = 2 - 2.5 in the test time interval

Justification:
To ensure testability upper and lower PDOP bounds are needed.

7) Annex 8 Section 3.4.1, Table 7

PDOP value = 3.5 - 4 in the test time interval

Justification:
To ensure testability upper and lower PDOP bounds are needed. PDOP values >4 are typically not used in related test scenarios.

The proposed changed were already incorporated in the attached document.

AECS-02-02-r5 (Secretariat) Draft regulation after 9th meeting_Qualcomm_GNSS.docx

II. Antenna requirements

During the 10th AECS meeting, Qualcomm presented the impact of antenna performance and was asked to provide text proposals for proper antenna requirements in the draft regulation, which are given below (section numbers still need to be adapted). Main objective here is to provide minimal requirements to close the current liability gap between the IVS module and its integration into the car. The relative term 'gain' is used instead of the commonly employed absolute TIS/TRP metrics because we think that the latter could get too complex as it may require distinguishing between different NAD/GNSS technologies.

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2. Definition - General
2.x "Antenna System" means a system integrated into a vehicle that is composed of one or multiple antennas, combiners/splitters and connecting cables build into the car in order to transmit and receive radio signals for a mounted communication and/or GNSS device.

PART II
16 Requirements
16.y Antenna System
    A properly designed antenna system shall be installed according to the state-of-art assumed by mobile network and GNSS operators for car environments in order to allow optimal transmission and reception of radio signals in the dedicated frequency ranges. The antenna systems shall at least comply to the minimum performance requirements according to paragraph 17.z.

17 Performance Requirements
17.z Antenna System
    The average antenna system gain shall achieve minimum 3dBd or more compared to an external dipole-antenna. The antenna system shall be crash resistant or provide enough redundancy to achieve the minimum performance. The manufacturer shall provide the type-approval authority with an explanation and technical documentation which shows, in overall terms, how this is achieved, e.g. by providing measured or simulated radiation patterns of the mounted antenna system. This documentation shall be maintained by the manufacturer and shall be made open for inspection by the technical service at the time of the type approval.

PART III
26.xx Antenna System performance
    The antenna system shall comply to the requirements according to 16.y and 17.z