

Automatic Emergency Call Systems

Navigation module requirements and test methods (Annex 9)

1. Background

The Europe Commission (EC) considers the provision of accurate and reliable positioning information as an essential element of the effective operation of the eCall in-vehicle system. In this sense, the compatibility with EGNOS (the European Satellite Augmentation system) and Galileo (the European GNSS) is a requirement of the European Commission type approval regulation proposal for the eCall in-vehicle system.

The Automatic Emergency Call System (AECS) will deliver a critical service for citizens' safety. For this reason, the EC considers that AECS navigation module should provide an accurate and reliable position making use of multiple GNSS, including the European navigation infrastructure Galileo. In addition the EC encourages the use of a satellite augmentation system, such as EGNOS, wherever available.

2. Proposed Approach (Navigation module requirements and Annex 9)

- Navigation module requirements: multiple GNSS is an essential requirement for an accurate and robust position of the accident. A GNSS system that is under civil control should be included in the multiple GNSS, to ensure the best availability of the signal in every region and under every condition.
- EC eCall legislative proposal is requiring EGNOS and Galileo: Galileo specifications should also be added to the "Test Methods for the navigation module" of Annex 9 (necessary data provided in the amended document).

3. Technical argumentations

3.1 Why GNSS?

In outdoor environments, such as the ones in which road accidents normally happen, satellite navigation systems are today and will continue to be in the future the most efficient and accurate way to calculate the position. This is supported by scientific and technical literature, by years of satellite navigation use in vehicles, ships and phones as the primary location methods. Even the very conservative and safety driven aviation community is shifting to GNSS. For this reason, both Russia ERA-Glonass and European Union eCall require satellite navigation. In the United States 911 emergency caller location, handset techniques typically use GNSS that is considered the best methods in outdoor situations and the European Commission is considering as well the possibility to require GNSS based caller location in 112 emergency calls from mobile phones. GNSS can be complemented with other sensors or network based techniques, but the public owned and free of charge GNSS signals are the core of location services.

3.2 Why multiple GNSS?

Since 2011, when the first multi GNSS devices appeared in the market, combining GPS and Glonass, the advantages of having more satellites in view, especially in urban environments became clear:

- ✓ When buildings block the signal and reduce the number of visible satellites, the availability of more constellations ensures a much more accurate final position,
- ✓ Having more satellites in view has beneficial effect on reducing the time to the first fix, and
- ✓ The robustness of the position is improved, and even if a satellite or constellation is not available or providing incorrect data, a reasonable accuracy will continue to be provided.

This is confirmed by the fact that all manufacturers of consumer and automotive GNSS chipsets and receivers choose multi GNSS as baseline of their current products.

It is important to ensure that the receivers are able to process multi GNSS systems: this will ensure that, also in case one GNSS constellation is temporarily not available (e.g. outage of Glonass happened in April 2014), the other ones can continue to ensure the advantages of multi GNSS described above.

3.3 Specific advantages of European GNSS (Galileo and EGNOS)

Galileo

- ✓ Galileo is a worldwide navigation system under civil and public control¹ : this permits unique features such as a guarantee of service for the civilian users and specific assistance to users and developers via the Galileo Service Center. The open signal (standard precision) is free of charge.
- ✓ Galileo is starting its Early Operational Services in 2014/2015. From this date, the users will start benefitting from the availability of Galileo satellites, and in particular of its contribution to the “multi GNSS” and of its intrinsic advantages described hereafter.
- ✓ Already now 4 operational satellites have been validated and Galileo compatibility is rapidly becoming common practice in mass market and professional receivers (around 40 % of chipsets/receivers models are now Galileo compatible).
- ✓ Galileo is interoperable with GPS and ensure a seamless and optimised synergy in the calculation of the position (e.g. simple radio frequency front end in receivers, using the same CDMA standard, exchange of time difference between GPS and Galileo, etc.). This interoperability is supported by agreements between the European Union and the United States.
- ✓ Galileo provides a larger and stronger open standard precision navigation signal (wider band), compared to other GNSS, and this is expected to be able to pass more easily through some objects, such as the tree canopy and to reject some multipath in urban environment. In addition this open signal will be provided in 2 frequency bands (E1 and E5), both harmonised with GPS. This is expected to further improve the performances in the automotive sectors (e.g. corrections of ionosphere errors and better resilience to interferences).
- ✓ Galileo will improve the availability of a good position at higher latitudes due to its higher elevation of satellites (versus GPS).
- ✓ In addition, Galileo will provide authentication services, currently not provided by other GNSS systems; which will allow to assess the authenticity of the signal against attempts to spoof it (e.g. in order to create the impression that the person or the vehicle is in another place) and will contribute to the robustness of GNSS for applications in which safety/security are involved.

European Geostationary Navigation Overlay System (EGNOS)

- ✓ EGNOS is a satellite based augmentation system of GPS, operational since 2009, that provides corrections of the errors to the ionosphere and other typical system errors, improving the final accuracy. In addition, it delivers information on the reliability of GPS satellites.
- ✓ EGNOS covers Europe but it is under extensions in other regions and is interoperable with similar regional systems in other parts of the world.
- ✓ EGNOS corrections can be easily used by automotive receivers, in fact most popular models use it, and this does not imply additional cost. The signal is free of charge.

4. Next steps

During the meeting of 28th – 30th April, the above technical argumentation will be better explained and supported by data from experts of the European GNSS Agency, as a contribution to the debate on Navigation Module requirements.

¹ Regulation (EU) no 1285/2013 of the European Parliament and of the Council of 11 December 2013 on the implementation and exploitation of European satellite navigation systems