



# ECC Recommendation

## (11)08

Framework for authorisation regime of indoor global navigation satellite system (GNSS) pseudolites in the band 1559-1610 MHz

**Approved 21 October 2011**

## INTRODUCTION

Pseudolites (Pseudo satellites, PL) are defined as a sub-group of equipment that can support operation of GNSS (Global Navigation Satellite Service) receivers. They transmit GNSS equivalent signals on the same frequency bands allocated to the Radio Navigation Satellite Service (RNSS) so as to ensure the availability of location based information in areas where signal blockage occurs to 'GNSS' receivers .

The technologies providing PL signals can help to address indoor coverage and accuracy shortcomings, by providing additional ranging signals and by improving geometry. However, PL are ground based radio transmitters that transmit a GNSS-like navigation signal. It requires users to have modified GNSS-receivers to receive these signals. It is expected that these GNSS receivers have minor changes compared to today's receivers. PL can be used as augmentation to GNSS or stand-alone in an environment where GNSS signals are not available due to propagation constraints. It is thus possible to extend the service coverage of satellite navigation to difficult propagation environments maintaining high accuracy under attractive cost conditions.

For many years, PL have been investigated for a wide variety of applications. In the beginning, they were used to test GPS when no satellites were available. Then their usage evolved to local augmentation of GPS positioning and finally extended during the last years to pseudolite-only and indoor navigation systems.

In the course of development of the Galileo satellite navigation systems PL were defined as part of the Galileo architecture.

ECC Report 168 describes guidelines for a regulatory framework under which indoor GNSS PL could be operated in CEPT and ECC Report 128 provides detail of the Spectrum Engineering compatibility assessment of PL.

The radionavigation-satellite service (RNSS) operates on a primary basis in the bands 1164-1215 MHz, 1215-1300 MHz and 1559-1610 MHz in which it provides radionavigation signals that can be used for safety and regularity of flight.

This ECC Recommendation provides guidance on an authorisation regime for indoor GNSS PL. It includes guidance for safe and reliable methods to limit the potential for harmful interference to non-participating GNSS receivers receiving in the same band and in areas adjacent to the PL coverage area. It provides administrations with practical information for the development of a national regulatory policy.

The choice of the appropriate authorisation regime remains a decision for national administrations.

## ECC RECOMMENDATION OF 21 OCTOBER 2011 ON FRAMEWORK FOR AUTHORISATION REGIME OF INDOOR GLOBAL NAVIGATION SATELLITE SYSTEM (GNSS) PSEUDOLITES IN THE BAND 1559-1610 MHz

“The European Conference of Postal and Telecommunications Administrations,

*considering*

- a) that GNSS technology applications providing location based information and timing information are used within the CEPT, this includes many mobile communications terminals that include GNSS receivers;
- b) that GNSS applications are also used for safety purposes;
- c) that indoor GNSS pseudolites can be beneficial to various usages, mass market location based applications, navigation in tunnels and parking, worker security and high accuracy positioning of machinery, as described in ECC Report 168;
- d) that indoor GNSS pseudolites may have the potential to cause partial or total degradation of the accuracy of other position location devices, in particular of non-participative GNSS receivers;
- e) that indoor GNSS pseudolites may have the potential to cause interference to GNSS receivers in airport areas, or in the vicinity of them;
- f) that indoor GNSS pseudolites may have the potential to cause interference to stations of the RAS;
- g) that these potential degradation and interference as mentioned in *considering d)* and *e)* may be significantly increased if indoor PL do not use dedicated codes for PLs as reserved in the Interface Control Documents (ICD) published by the GNSS system operators;
- h) that CEPT spectrum engineering studies on the use of indoor GNSS pseudolites in the 1164-1215 MHz, 1215-1300 MHz and 1559-1610 MHz bands are available in ECC Report 128 and guidelines for a regulatory framework under which indoor GNSS PL could be operated in CEPT are in ECC Report 168;
- i) that further technical studies would be needed with regard to the compatibility between the pseudolites and, on the one hand, the Aeronautical Radio Navigation Service in the 1164-1215 MHz band and, on the other hand, the Radiodetermination service in the 1215-1300 MHz band.

*recommends*

1. that the operation of indoor GNSS pseudolites should be limited to the band 1559-1610 MHz;
2. that indoor GNSS pseudolites should use dedicated codes only as reserved by the corresponding GNSS system operators as described in *considering g)*;
3. that the use of radio frequencies by indoor GNSS pseudolites should be subject to the grant of individual rights of use;
4. that indoor GNSS pseudolites should be installed in airport areas, or in the vicinity of them, only after case by case studies with the objective to avoid any potential interference to GNSS receivers in these areas;
5. that indoor GNSS pseudolites using pulsed technology should be installed in the vicinity of stations of the RAS making observations in the band 1610-1613 MHz only after case by case studies, to avoid potential interference to these RAS stations;
6. that the technical characteristics of indoor GNSS pseudolites operating within the band specified in Recommends 1 should follow the parameters as given in the Annex.”

## ANNEX

### Technical Characteristics of indoor GNSS pseudolites operating within the band 1559-1610 MHz

- GNSS CW and pulsed-PL should be authorised;
- GNSS PL e.i.r.p. should be limited to – 50 dBm in the general cases;
- GNSS PL e.i.r.p. should be limited to – 59 dBm in airport areas.
- Mitigation techniques such as the following should be implemented:
  - Using PL antennas tilted toward the ground and pointing inside the building The e.i.r.p above elevation angles higher than 0 degree should be reduced by at least 6dB compared the maximum e.i.r.p.;
  - Avoiding PL deployment close to large aperture or implementing additional attenuation with shielding material;
  - Reducing the PL maximum e.i.r.p.

#### In addition, the following elements should be taken into account:

- Transmit antenna patterns have to be adapted according to the site requirements and coverage areas. Antenna patterns should be designed to minimise impact on non-participating receivers and focus only on the operations area;
- Site installations should be conducted and maintained by professional installers only. This should include e.g. appropriate measures to avoid unauthorised insertion of additional RF power amplifiers between signal generator and antenna and others;
- As knowledge of the location of indoor GNSS pseudolite installations through licensing is recommended, the installation of indoor GNSS pseudolite in mobile vehicles should not be allowed;
- Other government entities, such as defence or meteorological services, may require specific site restrictions similar to those applicable to airport areas.