



Electronic Communications Committee (ECC)
within the European Conference of Postal and Telecommunications Administrations (CEPT)

ECC RECOMMENDATION (10)02

A FRAMEWORK FOR AUTHORISATION REGIME OF GLOBAL NAVIGATION SATELLITE SYSTEM (GNSS) REPEATERS

Recommendation adopted by the Working Group “Frequency Management” (FM)

INTRODUCTION

Global Navigation Satellite System (GNSS) repeaters are devices that industry and commercial organisations wish to use to continue reception of location based information in areas where of signal blockage occurs to ‘SatNav’ receivers (Global Navigation Satellite System receivers). Examples of such places are vehicle garages or laboratories where products using GNSS receivers are tested.

GNSS repeaters receive GNSS signals and re-radiate them inside buildings in order to provide a usable signal for continued operation. However, they like any active radio transmitter device, have the potential to cause interference. The impact on other GNSS receivers in the vicinity outside the intended repeater coverage area has been the subject of ECC Report 129.

GNSS systems currently operate in the bands 1164-1215 MHz, 1215-1300 MHz and 1559-1610 MHz.

It should be noted that the technical compatibility of GNSS repeaters is provided in ECC Report 129 and the regulatory considerations in companion ECC Report 145.

This recommendation provides guidance on a authorisation regime for GNSS repeaters, covering non-governmental and governmental GNSS applications. It includes guidance for safe and reliable methods to limit the potential for harmful interference to GNSS receivers receiving in the same band and in areas adjacent to the repeater 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.

“The European conference of Postal and Telecommunications Administrations,

considering

- a) that GNSS technology applications for 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 repeaters can provide a benefit to manufacturers for testing GNSS devices that only have internal GNSS antenna connections and to users operating in areas where GNSS signals are shadowed;
- c) that GNSS repeaters have the potential to cause degradation of the accuracy of other position location devices;
- d) that aeronautical users are concerned as unknown GNSS repeaters operating close to aircraft could cause errors or stop the aircraft acquiring and tracking GNSS before leaving the airport gate;

- e) that government users are also concerned that uncontrolled use of these devices might negate the trust in the use of GNSS and therefore undermine the regulatory basis of any location-based applications;
- f) that it is essential for GNSS repeater devices and/or their transmitting antennas to be appropriately separated from areas where normal GNSS reception is possible;
- g) that it would be desirable for administrations to have common recommendations at their disposal in order to control the use, the compliance and the marking of this equipment;
- h) that ETSI has finalised the Harmonised European Standard EN 302 645 for GNSS repeaters, but that GNSS repeaters in their simplest form, can be constructed of sub-components purchased separately, each being R&TTE compliant;
- i) that CEPT has completed its spectrum engineering study on GNSS repeaters in ECC Report 129 and its regulatory report on GNSS repeaters in ECC Report 145;
- j) that overall usage is not expected to have a mass-market demand, but reasonable numbers of systems already operate to cover small indoor areas or for equipment testing purposes.

recommends

- 1) that the operation of GNSS repeaters should be limited to the bands 1164-1215 MHz, 1215-1300 MHz and 1559-1610 MHz;
- 2) that the use of radio frequencies by GNSS repeaters should only be authorised on a site specific basis, mobile use should not be authorised;
- 3) that the technical characteristics of a GNSS repeater should follow the parameters as given in Annex 1;
- 4) that the use of radio frequencies by GNSS repeaters should be restricted to professional applications for:
 - Government associated agencies, including law enforcement, fire and rescue organizations and the contractors supporting them,
 - Companies in the military and civilian aviation industry, including aircraft and avionics manufacturers and relevant maintenance facilities,
 - Manufacturers of GNSS chipsets and integrators of such chipsets into other equipment,
 - Manufacturing, production and test facilities where GNSS is an integral part of the finished product, and
 - Operators of indoor facilities where emergency services need to continue tracking GNSS where it is otherwise unavailable;
- 5) that the site specific authorisation should provide specific implementation guidance for installation within the authorisation conditions. Further guidance is provided in Annex 2 of this Recommendation.”

Note:

Please check the Office web site (<http://www.ero.dk>) for the up to date position on the implementation of this and other ECC Recommendations

Annex 1

AUTHORISATION CONDITIONS

Technical Characteristics of GNSS repeaters

- The GNSS repeater maximum system gain should be limited to a value of 45 dB and that the e.i.r.p of any amplified GNSS defined signal should not exceed -77 dBm.
- The maximum output power of the GNSS repeater system, when subject to signals that are not defined as GNSS type signals, should be restricted to a limit of -20 dBm.
 - This limit applies to the out of band emissions of non-GNSS type signals that have been received and amplified within the GNSS repeater bands, as defined in Recommends 1.
 - This limit also applies to any emissions of non-GNSS type signals, that have been partly amplified, and that are adjacent to, but outside of the GNSS repeater bands.
- That chaining two or more GNSS repeaters to increase overall system gain above +45 dB should not be permitted as this increases the risk of harmful inference to unacceptable levels.

The device should incorporate filtering, which can be associated with the receiver and transmit antennas or it can be by separate filters. The filter response should be centred at the carrier frequency of the GNSS signal to be radiated and the -3 dB points should be ± 20 MHz.

- For a repeater operating in the 1164-1215 MHz band the filtering should also provide at least 37 dB of rejection at frequencies below 1151 MHz.
- At 1300 MHz, the repeater combined filtering losses (antenna related and any installed filter) should exceed 45dB.
- In the case of a repeater operating in the band 1559-1610 MHz, and designed to re-radiate signals centred on the 1575.42 MHz:
 - 5dB of filtering should be provided at the 1559 MHz band edge. It could be provided by means of the receiving and transmitting antennas. This constraint would, however, not be practical for repeaters designed for lower frequency signals such as the B1 channel used by the COMPASS system
 - at least 10 dB of filtering should be provided at the 1610 MHz band-edge. However, this would not be practical for repeaters designed for the GLONASS system which would need to radiate signals up to 1605.375 MHz.
- In specific instances, for example where repeaters are used in aircraft hangars, additional filtering may be required. Such situations should be considered on a case by case basis.

Annex 2

GUIDANCE

Site licences and implementation

The GNSS repeater transmit antennas should be located as close as possible to the GNSS application's receiving antenna so that the re-radiator can operate at the minimum EIRP level necessary to perform the intended function. It would be preferable to provide RF attenuation or shielding for directions away from the area required for the re-radiated GNSS signals.

Users should direct any re-radiating antenna away from any large open apertures which would increase signal levels in places accessible by the public or other GNSS operations.

The repeater design and connections should ensure that it is difficult to include additional amplification above 45 dB.

The person or organisation authorised must take all necessary additional measures to ensure that installed GNSS repeater does not affect the accuracy of GNSS receivers located outside the building, in places accessible by the public or by other GNSS operations.

That installation within airport boundaries should require clearance from the local aviation authorities, even though they might not own the airport.

Military or other government authorities might impose particular site limitations.