



Deviations requests for an ETSO approval for CS-ETSO applicable to GPS Antenna 10-264-35 (ETSO C-144) Consultation Paper

1. Introductory note

The hereby presented deviation requests shall be subject to public consultation, in accordance with EASA Management Board Decision No 7-2004¹ products certification procedure dated 30 March 2004, Article 3 (2.) of which states:

“2. Deviations from the applicable airworthiness codes, environmental protection certification specifications and/or acceptable means of compliance with Part 21, as well as important special conditions and equivalent safety findings, shall be submitted to the panel of experts and be subject to a public consultation of at least 3 weeks, except if they have been previously agreed and published in the Official Publication of the Agency. The final decision shall be published in the Official Publication of the Agency.”

2. ETSO-C144#1 Airborne Global Positioning System Antenna

Deviate from §2.2.2.1 “*Preamplifier Gain and Noise Figure*” of RTCA/DO-228.

Requirement:

RTCA/DO-228 specifies:

2.2.2.1 Preamplifier Gain and Noise Figure

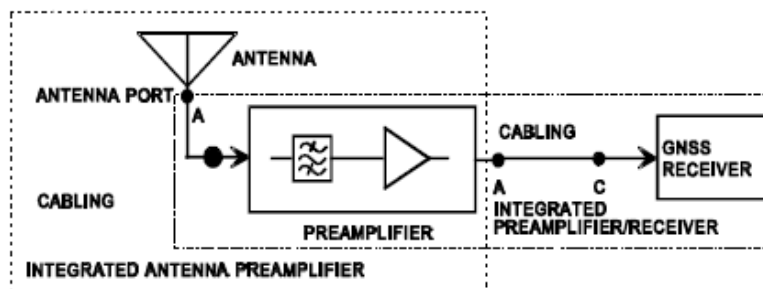
The preamplifier shall provide additional gain of **26.5dB, minimum**, to that specified in Section 2.2.1.4, with a **maximum 4dB noise figure**, including all circuitry in the integrated antenna/preamplifier. This additional gain is applicable to points A and B in figure 2-1, and does not include cabling between the preamplifier and the GNSS receiver at point C.

NOTE: No maximum gain is specified. Thus, the total gain of the preamplifier and GNSS receiver combination may be installation dependent.

¹ Cf. EASA Web: http://www.easa.europa.eu/doc/About_EASA/Manag_Board/2004/mb_decision_0704.pdf

The GNSS antenna, as defined in Section 2.2.1 above, integrated with a preamplifier, as illustrated in Figure 2-1, includes the antenna, cabling between the antenna and preamplifier, burnout protection, selective filtering, and a low-noise-amplifier (LNA).

NOTE: These preamplifier requirements are defined for GPS only. The



requirements for GLONASS are under study.

Figure 2-1 Antenna Configurations

Figure 1: Excerpts from DO-228 requirements for Preamplifier Gain and Noise Figure Industry:

Some receivers specify to use a maximum antenna gain of less than 26.5 dB. To allow the development of a GPS antenna to be usable for such receivers a deviation is requested to allow a 16 dB +/- 1dB antenna gain instead of the requested 26.5 dB. The use of the required gain of 26.5 dB would lead to problems by combining the antenna with GPS receivers having a lower maximum gain specification.

An equivalent level of safety is provided by limiting the use of the antenna having such deviation to installations together with GPS receivers being compatible to such gain.

EASA:

CS-ETSO C-129a (ED-72A paragraph 3.1.1) assumes 29.5 ± 3 dB for the preamplifier gain. Therefore, 26.5 dB minimum is a compatible value with ETSO C-144 (DO-228). For the cable loss ED-72A assumes a value between -3.0 dB to -13 dB.

EASA has no indication from its baseline of GPS receivers and GPS antenna CS-ETSO'd qualified equipment that there is a general interoperability issue between CS-ETSO C-129a and ETSO C-144. Moreover, ETSO C-144 envisages flexibility for the maximum preamplifier gain and the complete gain (preamplifier and antenna).

Nevertheless there may exist dedicated installation combinations where a lower antenna gain can be sufficient. This may lead to circumstances where a lower preamplifier gain can be accepted for a dedicated installation.

An active antenna will amplify noise as well as the signal. Therefore, the potential solution to use an attenuation device or additional cable loss to lower the signal to a level acceptable for the receiver after having it amplified is not a good technical solution either. Consequently we accept such a large pre-amplifier gain deviation for such combination with GPS-receivers being compatible for such signal. The limitation in using the antenna has to be clearly stated in the installation manual and the DDP. Further the installation manual shall contain a clear advice that the installed system performance has to be assessed in respect to signal reception.