

**3GPP TSG RAN Meeting #26**  
**Vouliagmeni Athens, Greece, 8 - 10 December, 2004**

**RP-040464**

**3GPP TSG GERAN**  
**Meeting no 22**  
**Cape Town; South Africa**  
**8 – 12 November 2004**

**TDoc GP-042906**

**Title:** Reply LS on considerations to avoid interference for terrestrial networks for onboard GSM networks

**Response to:** LS on considerations to avoid interference for terrestrial networks for onboard GSM networks (GP-042605, ETSI MSG #8 M-04-021)

**Source:** 3GPP TSG GERAN  
**To:** ETSI MSG  
**Cc:** 3GPP TSG RAN

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**1. Overall Description:**

GERAN welcomes the information regarding onboard GSM networks, and is pleased to have the opportunity to contribute in this area.

GERAN has started studies on the requested levels for harmful interference and is intending to complete these at its next meeting taking place at the end of January 2005.

GERAN would like to offer some initial observations.

It is assumed that interference from the onboard BTS will not affect terrestrial networks if properly installed.

It is assumed that for terminals sending access burst to the onboard system, when transmitting on the same resources allocated to a random access channel on a terrestrial network, terrestrial networks may receive these, and this consequentially may lead to the terrestrial network unnecessarily allocating resources for some time. This will be further studied.

The main effect is likely to be from the electromagnetic screening. This is expected to be a broadband interfering signal covering all bands used for cellular systems in use in the area below the aircraft, excluding only the channels used for the onboard system. Please note that GSM is not only specified in the well known 900, 1800 and 1900 MHz bands, but also in the 380, 410, 450, 480, 750, and 850 MHz bands, and that these include also frequencies allocated for TETRA (T-GSM) and railway applications (R-GSM). These last two will not be considered in the GERAN studies.

The main parameter required to determine a harmful interference level are BTS sensitivity level, BTS antenna gain towards the aircraft, and acceptable carrier to interference levels. Furthermore the type of interference and number of simultaneous interferers (e.g. aircraft holding loops before decent) may need to be taken into account.

GERAN has specified a minimum reference sensitivity level for BTS, but this can not be used. Installed BTS are significantly better than this, as especially in rural areas this improves coverage. Tower mast amplifiers and

diversity further improve this. GERAN intends to determine real sensitivity levels. Figures around -117 dBm have been mentioned, but require confirmation.

Studies presented to a GERAN predecessor from 1988 suggest that for a Boeing 747 fuselage attenuation is at around 2 dB. No information is currently available on other types of aircraft. They also suggested that aircraft can be seen at low elevation by terrestrial base stations and thus be in the main antenna lobe with typical gains up to 12 dB.

The acceptable carrier to interference (C/I) ratio for speech telephony is specified at 9 dB. Other services require higher C/I ratios.

Based on these initial numbers, for a single aircraft interfering and not yet adding a margin the acceptable interference level to terrestrial GERAN networks is likely to be below  $-117 - 12 - 9 = -138$  dBm.

As stated previously, GERAN intends to further address these aspects aiming to conclude a final figure at their next meeting.

GERAN would like to inform MSG that GSM (and UMTS) network selection mechanisms require terminals to search for available networks on all supported bands and radio access technologies

- at switch on,
- in manual mode when triggered by the user,
- in a periodic background scan mode, and
- after loss of the serving network.

Switch on and periodic background scan will be normal when GSM terminals would be used onboard aircraft. The periodic scan is controlled by a timer on the SIM and has a minimum time of 6 minutes. 3GPP has modified the background scan procedure from Release 99, which will lead to a far more frequent use of this procedure than in currently available terminals.

The GSM and UMTS specifications define a priority order of networks the terminal should try to attach to. In most cases where a terrestrial network can be seen (e.g. the last registered after take off) this is likely to have a higher priority than the onboard network. The terminal transmit power to use for the attach is decided by the network the terminal tries to attach to. This is typically set to 2 Watts for GSM for terrestrial networks. If further transmission takes place to the terrestrial network this will also be with a terminal output power ordered by the terrestrial network.

Therefore, unless shielding is perfect, transmission to terrestrial networks cannot be prevented.

GERAN is currently working on improving terminal sensitivity using single antenna interference cancellation, which depending on the interference signal used for the electromagnetic shielding, may reduce its effectiveness. In future releases of the specification further receiver enhancements are foreseen.

GERAN would welcome more detailed information on the electromagnetic shielding to further assist in this area.

## **2. Actions:**

### **To MSG**

#### **ACTION:**

GERAN kindly asks MSG to note these initial observations, and await the final conclusions which are expected end of January 2005.

GERAN furthermore informs MSG that it would be beneficial for GERAN to have more information especially on the electromagnetic screening.

## **3. Date of Next TSG-GERAN Meetings:**

TSG-GERAN # 23	24 <sup>th</sup> – 28 <sup>th</sup> January 2004	Tampa, US
TSG-GERAN # 24	4 <sup>th</sup> – 8 <sup>th</sup> April 2004	Dublin, Ireland