Inmarsat's respond to EETT's public consultation with title: "ΔΗΜΟΣΙΑ ΔΙΑΒΟΥΛΕΥΣΗ ΑΝΑΦΟΡΙΚΑ ΜΕ ΤΗ ΧΟΡΗΓΗΣΗ ΔΙΚΑΙΩΜΑΤΩΝ ΧΡΗΣΗΣ ΡΑΔΙΟΣΥΧΝΟΤΗΤΩΝ ΣΤΙΣ ΖΩΝΕΣ ΤΩΝ 700 MHz, 2 GHz, 3400 - 3800 MHz και 26 GHz"

Inmarsat is pleased to provide comments to EETT in response to the public consultation related to the granting rights for the use of 700 MHz, 2GHz, 3400-3800 MHz and 26 GHz bands.

Inmarsat

Inmarsat has been providing satellite communications since 1979, initially providing safety related communication to ships at sea. Since then our satellites and technology have advanced enormously, and Inmarsat now provides a wide range of services, specialising in particular in communications to mobile users and mobile platforms such as ships, aircraft and land vehicles.

As an industry leader and pioneer of mobile satellite communications, Inmarsat has been enabling global connectivity for more than four decades. We strive to make a difference to our customers by making their businesses more efficient and effective and by helping them to remain safe and more connected.

Our four business units provide first-class global, mobile connectivity to our customers:

(a) Aviation: Inmarsat has been providing connectivity services to the cockpit for many years, including automatic position reporting and secure communications between the pilot and the air traffic control. We provide cabin connectivity for aircraft passengers and we are rapidly deploying broadband in-flight Wi-Fi connectivity based on our GX satellite technology.

(b) Maritime: Inmarsat offers reliable and resilient communications solutions to the maritime industry. From the largest commercial fleets to coastal vessels, our services are based on our long record of accomplishment in managing global networks and, consequently, a unique understanding of the challenges of living and working in a maritime environment.

(c) Government: Inmarsat remains a key partner to many governments around the world. We aim to augment a government's existing communications networks and ensure that, wherever they need to be, our secure, reliable and powerful mobile satellite networks are always available.

(d) Enterprise: Inmarsat provides a wide portfolio of global voice, broadband data, Machine-to-Machine ("M2M") and value-added services. We see significant growth opportunities in the medium-term from emerging new Internet of Things ("IoT") markets in sectors such as mining, smart cities, smart agriculture, logistics and transportation.

S-band

Answer to Question 2*: Do you believe there is a need for additional measures beyond the ones defined the amended ECC/DEC/(06)01, regarding the coexistence between MFCN in the 2GHz band and systems in adjacent bands? If yes, please justify in detail.*

Regarding the EETT proposals related to new 5G system the 2 GHz bands, Inmarsat seeks to ensure that adequate protection measures are provided regarding the use of the adjacent MSS bands by Inmarsat. Inmarsat has deployed an integrated satellite and terrestrial system, the "European Aviation Network" (EAN), which is providing commercial operations for the provision of broadband connectivity to aircraft in Europe. The EAN is composed of a space segment and a terrestrial complementary network ("complementary ground component"). The EAN provides service to aircraft across Europe, including those flying to and from Greece, and it provides European aircraft passengers with high quality broadband Internet connectivity. The satellite part of the system, "Europasat" is operated by Inmarsat and is controlled from the Nemea earth station.

The EAN equipment installed on the aircraft includes terminals which communicate with the ground stations and separate terminals which communicate with the satellite. This EAN equipment, which receives in the band 2170-2200 MHz is susceptible to interference from mobile base stations operating in the adjacent band 2110-2170 MHz, particularly if such base stations are deployed at or near airports. The interference potential is increased if the current 300 kHz guard band that exists between the mobile band and MSS band is removed.

The CEPT ECC Report 298, includes the following in its conclusion:

> "CEPT concluded on an updated band plan for the 1920-1980 MHz and 2110-2170 MHz band and that it is up to each administration to decide, based on its requirements, and considering the impact on existing authorizations in its country within the band and services in adjacent bands, whether and how to migrate from the band plan in previous revisions of ECC Decision (06)01 to the new band plan, and any associated conditions"

Hence, it would be fully consistent with this Report and ECC Decision (06)01 for EETT to retain the frequency arrangements for MFCN in the bands 1920-1980 MHz and 2110-2170 MHz that maintain the 300 kHz guard band with respect to MSS operations in the adjacent bands. Inmarsat recommends this approach of retaining the 300 kHz guard band, so as to provide continued protection to MSS/CGC operations in the adjacent bands.

Inmarsat notes that EETT proposes to include no limitation on the power of MFCN base station emissions for operations in the 2 GHz band. Such a provision will increase the potential for harmful interference to EAN operations, since with no power limitation, very high interference could occur to EAN terminals from MFCN base stations deployed in or near to airports.

The potential interference to Inmarsat's EAN system can be managed, provided that operators seeking to deploy base stations in or near to airports coordinate with Inmarsat before deployment. The following requirement is identified in ECC Report 298 (section A2.4):

> "The MSS allocation directly adjacent to MFCN above 2170 MHz is used for EAN applications. Therefore, the only possible interference from MFCN base stations

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> may occur while the MSS receiver in an aeroplane is on the ground. If an additional protection is still needed, it can be granted by applying coordination procedures for MFCN base stations around airports, instead of a mandatory guard band for CEPT countries."

Inmarsat requests that EETT adopt the findings of the CEPT studies and ensure that new licensees of MFCN systems in the 2 GHz bands coordinate with Inmarsat operations at major commercial airports, to ensure that harmful interference will not be caused to EAN operations. Given that EETT proposes to authorise MFCN services with no guard band and with no base station power limits, the requirement to coordinate is particularly important in Greece.

In addition, the Nemea earth station is currently used for transmitting and receiving to and from the Inmarsat satellite in the S-band frequencies (1980-1995 MHz / 2170-2185 MHz), including for the monitoring of the operation of the satellite. These operations could suffer harmful interference if base stations operating in the adjacent MFCN bands are deployed close to the earth station antenna.

Consequently, Inmarsat requests that the requirement for new MFCN base stations in the 2 GHz bands to be coordinated with Inmarsat EAN operations, including Inmarsat's S-band operation in Nemea, is included by EETT as a part of the licence conditions for new MFCN operators.

C-band

Response to Question 13: ***Do you agree with EETT's proposal regarding the coexistence measures between MFCN networks and Earth Stations in 3400-4200 MHz?***

In response to Question 13 "Do you agree with EETT's proposal regarding the coexistence measures between MFCN networks and Earth Stations in 3400-4200 MHz?", Inmarsat welcomes and supports EETT's proposal to protect Earth Stations in Nemea and Thermopylae operating in the 3600-4200 MHz band against interference and blocking. We consider the interference protection threshold of -131dBm/MHz is sufficient, as a long-term co-channel interference limit. However, we highlight the need for an additional short-term interference protection threshold. Therefore, alongside the existing long-term proposal, we would like to propose the level of -120 dBm/MHz referenced at the output of the earth station antenna for 0.005% of time, as a short-term interference protection threshold in line with Recommendation ITU-R SF.1006[1]. This use of the additional short-term threshold is necessary to ensure that FSS performance requirements are met. The use of both criteria is common in ITU-R studies, such as those contained in Report ITU-R S.2368[2].

Inmarsat would like to highlight that EETT does not propose adequate protection measures for the operation of FSS gateway Earth Stations within Greece in the frequency band 3400-3600 MHz. Inmarsat satellites use the band 3550-3700 MHz for feeder links and it is not feasible for Inmarsat to operate outside these bands, e.g., above 3800 MHz, as Inmarsat's existing satellites in orbit and those being currently constructed only operate C-band feeder links in the 3550-3700MHz band.

Furthermore, in cooperation with OTE, we are planning to establish a new earth station in either Thermopylae or Nemea, and we would seek to ensure that adequate interference protection measures are taken in the 3550-3700 MHz band for those two sites for the operation of gateway earth stations. The use of the band 3550-3700 MHz for feeder downlinks has been coordinated through the ITU for the satellites proposed to be used from Nemea and Thermoplyae. We would also like to highlight the need for protection of the whole 150 MHz (3550-3700 MHz) since the specific parameters of the satellite downlink emissions e.g. exact DL frequency or bandwidth may vary in time depending on the traffic requirements and depending on constraints due to coordination with other satellite networks. Therefore, we would like to propose to EETT to extend the protection range for earth stations in Nemea and Thermopylae to 3550 – 4200 MHz, instead of 3600-4200 MHz. We recommend that EETT adopt the same interference protection thresholds[3] in the 3550-3600 MHz band as those identified in the 3600-4200 MHz for FSS earth stations operating at the Nemea and Thermopylae sites. As highlighted earlier, Inmarsat satellites use the band 3550-3700 MHz for feeder links, and it is not feasible for Inmarsat to operate C-band feeder links outside these bands. Adoption of such protection measures will ensure the continued protection of the

[1] REC. ITU-R SF.1006: Determination of the interference potential between earth stations of the fixed-satellite service and stations in the fixed service. https://www.itu.int/dms_pubrec/itu-r/rec/sf/R-REC-SF.1006-0-199304-I!!PDF-E.pdf

[2] Report ITU-R S.2368: Sharing studies between International Mobile Telecommunication-Advanced systems and geostationary satellite networks in the fixed-satellite service in the 3 400-4 200 MHz and 4 500-4 800 MHz frequency bands in the WRC study cycle leading to WRC-15. https://www.itu.int/pub/R-REP-S.2368.

[3] Long-Term interference protection threshold: -131dBm/MHz
Short-Term interference protection threshold: -120dBm/MHz for 0.005% of the time
Blocking interference threshold: -60dBm

operation of such feeder links, as well as services by other FSS operators, at the Nemea and Thermopylae sites.

In addition, Inmarsat does not support EETT's proposal to require the agreement of MFCN operators to protect new FSS Earth Stations in Nemea and Thermopylae. The sites of Nemea and Thermopylae are currently also used by other satellite operators whose earth stations antennas are pointing to different satellites and we consider that protection of additional new earth stations in the existing sites of Nemea and Thermopylae will not impose any significant additional constraints on MFCN operators. All earth station operations at those sites – existing and new – should be entitled to protection without the need for prior agreement from MFCN operators. The use of the C-band spectrum, including the frequency band 3550-3700 MHz, will be required in the long-term by the satellite community at a small number of specific locations. In the case of Inmarsat, the protection requirement is to ensure continued and future operation of MSS feeder links within Greece which is used to support the Inmarsat L-band mobile satellite services, which are widely used in Greece and globally. Therefore, we would like to propose that the interference protection thresholds should apply also to operation of new Earth Stations in the existing sites of Nemea and Thermopylae, enabling the continuity and the growth of satellite operations in these two sites. Several other European countries, for example Italy and Germany[4], have established protection requirements for FSS earth station operations at specific sites, while enabling 5G or MFCN deployment across the rest of the country.

[4] Regarding the situation in Germany, MFCN operators and FSS operators are required to cooperate to avoid causing interference to certain earth stations operating in the band 3400-3600 MHz. Furthermore, MFCN operators using the band 3600-3800 MHz are required to share with FSS earth stations, with existing earth stations protected. BNetzA has specified 10 specified earth stations using the band 3600-3700 MHz to be protected, and references a number of additional earth stations used for security-related communications. For more details, see paras 193 - 205 of the "President's Chamber decision of 14 May 2018 on the order for and choice of proceedings for the award of spectrum in the 2 GHz and 3.6 GHz bands for mobile/fixed communication networks (MFCN) ", available in English at https://www.bundesnetzagentur.de/SharedDocs/Downloads/EN/Areas/Telecommunications/Companies/TelecomRegulation/FrequencyManagement/ElectronicCommunicationsServices/FrequencyAward2018/20180613_Decision_I_II.pdf?__blob=publicationFile&v=2