CEPT ECC
Electronic Communications Committee

ECC Decision (15)02

The harmonised use of broadband Direct Air-to-Ground Communications (DA2GC) systems in the frequency band 1900-1920 MHz

Approved 3 July 2015

EXPLANATORY MEMORANDUM

1 INTRODUCTION

This ECC Decision aims at harmonising implementation measures for broadband Direct Air-to-Ground Communications (DA2GC) systems in the frequency band 1900-1920 MHz.

Consumers increasingly expect to be connected everywhere, all the time, e.g. with all kinds of mobile devices. This includes the ability to access broadband services while on-board aircraft and European airlines have expressed an interest in offering internet services to their flight passengers in their continental fleet as soon as possible.

Broadband Direct-Air-to-Ground Communications (DA2GC) systems provide a bi-directional radio link between an Aircraft Station (AS) and a Ground Station (GS). The aircraft station is mounted on-board aircraft and is under the control of a network of ground stations which provide control and telecommunication functionalities for DA2GC.

Broadband DA2GC systems may operate in national airspace or international airspace.

This ECC Decision covers the radio regulatory aspects of operation of such systems, excluding the aviation safety aspects (both technical and human factors related) that are the responsibilities of the relevant aviation authorities.

2 BACKGROUND

Broadband DA2GC systems constitute an application for various types of telecommunications services, such as internet access and mobile multimedia services. Such systems aim to provide access to broadband communication services during continental flights on a Europe-wide basis. The connection with the flight passengers' user terminals within an aircraft is already available using a wired or wireless on-board connectivity network.

The broadband DA2GC systems under consideration in this Decision ("the systems") are intended to provide connectivity between a network of ground stations and appropriately equipped aircraft. The aircraft stations will only transmit during certain phases of the flight and will not be operated while the aircraft is on the ground or during take-off and landing.

The allocation or designation of frequency bands under specified conditions in CEPT member countries is laid down by law, regulation or administrative action. The ECC also recognises that for broadband DA2GC systems on-board aircraft to be introduced successfully throughout Europe, confidence must be given on the one hand to manufacturers to make the necessary investments and on the other hand to users of existing services that their protection will be ensured.

This is particularly needed for broadband DA2GC in order to ensure the provision of an uninterrupted service whilst aircraft cross the borders of various countries and to reduce the regulatory requirements placed on administrations and aircraft operators.

It will frequently be the case that, on any one flight, an aircraft will travel through the airspace of more than one country with the time spent in the airspace of any individual country being typically of short duration. An agreed regulatory approach is required to ensure that the spectrum utilised by the systems can be used in any national airspace that the aircraft is crossing, provided that the systems conform to agreed limits in order to prevent harmful interference.

Airworthiness certification of the systems' aircraft components is the separate responsibility of the relevant aviation authorities for the country of registration of the aircraft.

The wireless link between the aircraft and the worldwide broadband network (e.g. Internet) can be established either by means of broadband DA2GC systems or via satellites. Broadband DA2GC systems

and satellites can be seen as alternative technical solutions which are in competition. On the other hand, both solutions could also be seen as complementary to each other.

MSS systems (1980-2010 MHz / 2170-2200 MHz) are being developed and such systems may include a Complementary Ground Component (CGC). In Europe, MSS CGC systems might also be used to provide communication to aircraft.

ECC conducted in 2010-2011 a review of ECC/DEC/(06)01 taking into account the information on the practical implementation and authorisations in force. During the revision process, ECC has come to the conclusion that the unpaired 2 GHz frequency bands (i.e. 1900-1920 MHz and 2010-2025 MHz) were mostly unused and there was absence of equipment from manufacturers; the frequency band 1900-1920 MHz, although licensed in many countries, remained largely unused. Frequency arrangements for the unpaired 2 GHz frequency bands have been removed from the revision of ECC/DEC/(06)01 and it was concluded that further investigations were needed to develop a suitable ECC framework for those frequency bands. These investigations led to the identification of these frequency bands for broadband DA2GC as an alternative usage.

A broadband DA2GC system in the 1900-1920 MHz band is expected to be able to cover the whole European airspace with less than 500 GS (e.g. approx. number of DA2GC ground stations for Germany is 20, Italy - 25, France - 35 and Spain - 30). Thus the number of GS in each country to be coordinated with MFCN base stations being operated in the band adjacent to 1900-1920 MHz is rather low.

3 REQUIREMENT FOR AN ECC DECISION

Broadband DA2GC systems are planned to be deployed in Europe by 2017.

There is a need for an ECC Decision to allow for the harmonised use of the 1900-1920 MHz frequency band for broadband DA2GC.

A commitment by CEPT member countries to implement an ECC Decision will provide a clear indication that this frequency range will be made available on time and on a Europe-wide basis and that the means to ensure protection of existing services will be applied.

ECC DECISION OF 3 JULY 2015 ON THE HARMONISED USE OF BROADBAND DIRECT AIR TO GROUND COMMUNICATIONS (DA2GC) SYSTEMS IN THE FREQUENCY BAND 1900-1920 MHz (ECC/DEC/(15)02)

"The European Conference of Postal and Telecommunications Administrations,

considering

a) that the introduction of broadband DA2GC systems enables broadband communications services during continental flights over wide territories in the CEPT;

b) that aviation passengers can be offered connectivity on continental and intercontinental flights for aircraft equipped for terrestrial and/or satellite communications systems;

c) that broadband DA2GC systems are likely also to be used for non-safety airline operational communications;

d) that harmonised conditions across CEPT help to establish an effective single market for these applications, with consequent economies of scale and benefits to passengers, and avoid difficulties in enforcing divergent national regulations;

e) that every state has sovereignty over the airspace[1], including the radio spectrum, above its territory;

f) that the use of a broadband DA2GC AS requires authorisation by the relevant national administration of the country of registration of the aircraft;

g) that the installation and use of a specific system or systems within the aircraft will be subject to regulation, including airworthiness certification, by the relevant aviation authority and the system cannot be put into operation until it complies with these requirements;

h) that for ASs different authorisation regimes may be established in each country where the DA2GC is allowed to operate (see ECC Report 214);

i) that DA2GC GS are operated under the control of a network and are licensed individually (see ECC Report 214);

j) that appropriate measures should be taken to ensure that the broadband DA2GC aircraft and ground stations do not cause harmful interference into systems on the ground including MFCN operating in the adjacent band above 1920 MHz;

k) that frequency coordination is required between DA2GC GS transmitting within 1900-1920 MHz and MFCN base stations receiving above 1920 MHz;

l) that ECC adopted ECC Report 214 "Broadband Direct-Air-to-Ground Communications (DA2GC)" and ECC Report 209 "Compatibility/sharing studies related to Broadband Direct-Air-to-Ground Communications (DA2GC) in the frequency bands 1900-1920 MHz / 2010-2025 MHz and services/applications in the adjacent bands". These Reports identify certain technical conditions for DA2GC systems to ensure that they do not cause harmful interference to other services;

m) that the frequency band 1900-1920 MHz is allocated to the mobile service on a primary basis in the European Common Allocation Table (ERC Report 25) and in the ITU Radio Regulations;

n) that within Europe the frequency band 1900-1920 MHz was designated for UMTS (among other systems) but the frequency band has been removed from the amended ECC/DEC/(06)01 in 2012;

[1] This defined as: - the space above a particular national territory, treated as belonging to the government controlling the territory. It does not include outer space, which, under the Outer Space Treaty of 1967, is declared to be free and not subject to national appropriation.

o) that in some countries operators have licences for MFCN under the primary mobile allocation in this frequency band. No co-channel sharing studies between MFCN in this band and DA2GC have been carried out within CEPT;

p) that CEPT has taken into account the broadband DA2GC candidate applications as described in CEPT Report 52 and ECC Report 214 for the frequency bands 1900-1920 MHz and 2010-2025 MHz;

q) that three different system reference documents for broadband DA2GC have been developed and provided by ETSI (see ECC Reports 209 and 214);

r) that CEPT decided no longer to consider the option to designate spectrum in the band 2010-2025 MHz for broadband DA2GC, for reasons explained in CEPT Report 52, thereby restricting the choice to TDD systems operating within 1900-1920 MHz only.

s) that Decision ECC/DEC/(15)03 designates the frequency band 5855-5875 MHz for broadband DA2GC systems on a non-exclusive basis;

t) that CEPT Report 52 describes the possible sharing scenarios between broadband DA2GC, PMSE and short-range devices, including DECT;

u) that in EU/EFTA countries the radio equipment that is under the scope of this Decision shall comply with the R&TTE Directive. Conformity with the essential requirements of the R&TTE Directive may be demonstrated by compliance with the applicable harmonised European standard(s) or by using the other conformity assessment procedures set out in the R&TTE Directive.

DECIDES

1. that the **purpose of this ECC Decision** is to:
   - harmonise the use of the frequency band 1900-1920 MHz for broadband Direct-Air-to-Ground Communications (DA2GC) systems;
   - establish a common framework for facilitating implementation of a broadband DA2GCsystem in the frequency band 1900-1920 MHz;
2. that CEPT **administrations shall**:
   - designate the frequency band 1900-1920 MHz for broadband DA2GC on a non-exclusive basis;
   - apply the technical and operational requirements for the harmonised frequency arrangement for TDD in the band 1900-1920 MHz, according to Annex 1;
   - ensure co-existence between DA2GC GS and MFCN stations, through coordination with MFCN base stations operating in the 1920-1980 MHz band, taking into account the guidelines as provided in Annex 2;
3. that CEPT administrations shall exempt from individual licensing and shall allow free circulation and use of DA2GC AS operating under the control of a network;
4. that CEPT administrations shall notify the coordinates of the DA2GC GS to the Office;
5. that this Decision shall be subject to review by the end of 2017;
6. that this Decision **enters into force** on 3 July 2015;
7. that the preferred **date for implementation** of the Decision shall be 3 January 2016;
8. that CEPT administrations shall communicate the **national measures** implementing this Decision to the ECC Chairman and the Office when the Decision is nationally implemented."

Note:

Please check the Office documentation database http://www.ecodocdb.dk for the up to date position on the implementation of this and other ECC Decisions.

ANNEX 1: TECHNICAL AND OPERATIONAL REQUIREMENTS FOR DA2GC SYSTEMS IN THE BAND 1900-1920 MHz WITH TDD OPERATION MODE

A DA2GC ground station (GS) may use multiple sector antennas with fixed azimuth and elevation patterns. For such a GS, a fixed elevation up-tilt is introduced to maximise reception at normal cruising altitudes of a commercial aircraft.

The aircraft station (AS) antenna may be based on an existing commercial aircraft antenna, which has been enhanced to support operation in the allocated frequency band, and so facilitates retrofit while not creating any additional drag for the aircraft.

A beamforming system can be implemented which uses advanced phased array and signal processing technology on the aircraft and at the ground station, to produce shaped and steerable beams. This enables dynamic beam pointing at both ends of the link such that the ground station and the aircraft mutually track each other. The use of beamforming helps to reduce co-channel interference and improves both the DA2GC link performance and its frequency sharing capabilities.

Power control is used in both directions, to maintain the required received power level at the GS and AS receivers.

ECC Reports 209, 214 and 220 provide detailed technical information.

Table 1: Main parameters for GS

Parameter	Value
Maximum channel bandwidth	20 MHz
Maximum e.i.r.p. spectral density	50 dBm/MHz
Minimum operational elevation angle of antenna main lobe	+5°
NOTE: The e.i.r.p. level in this table represents the maximum operational level at all times for a single beam, in the direction of the aircraft	

Table 2: Main parameters for AS

Parameter	Velue
Maximum channel bandwidth	20 MHz
Maximum e.i.r.p. spectral density	34 dBm/MHz
Minimum ATPC (adaptive transmitter power control) range	10 dB
Minimum operational height above ground	3 000 m

For the protection of DECT systems below 1900 MHz and MFCN above 1920 MHz, the requirements for the out-of-block[2] e.i.r.p. limits for the DA2GC ground stations and aircraft stations in Table 3 shall apply.

[2] under this ECC Decision «block» is the 1900-1920 MHz frequency band

Table 3: Out-of-block e.i.r.p. limits for GS and AS

Frequency range of out-of-block emissions	Maximum out-of-block e.i.r.p. spectral density GS	Maximum out-of-block e.i.r.p. spectral density AS
1880 1900 MHz	-12 dBm/MHz	-3 dBm/MHz
1920 – 1980 MHz	-23 dBm/MHz	-3 dBm/MHz
The limits for the GS are specified for the entire hemisphere below the horizontal plane of any installation.		

Table 4: Coordination requirements

Ground Station
Coordination with MFCN base stations operating in the 1920-1980 MHz band is required (See Annex 2 for guidelines)

ANNEX 2: GUIDELINES FOR CEPT ADMINISTRATIONS TO ENSURE CO-EXISTENCE WITH MFCN BS

BACKGROUND

According to ECC Report 209, for most situations the calculated separation distance between DA2GC GS and MFCN BS in order to avoid interference will be less than 2 km for rural areas and 600 m for urban areas. These separation distances correspond to the limits in Table 3 of Annex 1, and in addition ECC Report 209 also assumes a case when the MFCN BS is at higher altitude than the DA2GC GS (10 m difference in height). Only in the situations where the MFCN BS is at a significantly higher altitude than the DA2GC GS there may be a need for greater separation distances.

Coordination and registration will be needed for the DA2GC GS. Co-location of DA2GC GS and MFCN BS is not possible.

This coordination would also support that a pan-European broadband DA2GC system would not be subject to operational restrictions at border areas in the future.

A broadband DA2GC system in the 1900-1920 MHz band is expected to be able to cover the whole European airspace with less than 500 GS (e.g. approx. number of DA2GC ground stations for Germany is 20, Italy - 25, France - 35 and Spain - 30). Thus the number of GS in each country to be coordinated with MFCN base stations being operated in the band adjacent to 1900-1920 MHz is rather low.

Based on the results of the compatibility studies included in ECC Report 209 relevant mitigation measures and careful radio network planning in combination with site coordination is required. Also Report ECC 209 concludes that a 10 MHz guard band would be sufficient to protect MFCN BS, i.e. that coordination is a priori needed with MFCN BS operating in 1920-1930 MHz.

GUIDELINES

Coordination with MFCN base stations in the adjacent band above 1920 MHz- either within a country or between neighbouring countries - should be carried out.

These guidelines primarily relate to co-ordination within national boundaries. For the situation where stations are within the territories of different administrations, the use of these guidelines within bilateral agreements may help to expedite cross border co-ordination.

In deploying new stations, administrations and operators should be cognisant of the need to minimise constraints on other networks and this should be ensured by the coordination process.

COORDINATION PRINCIPLES

Coordination of DA2GC GS with other stations should be carried out on a case-by-case basis, since no single separation distance, guard band or signal strength limit can be provided. This could be achieved based on similar principles to those which have been used for coordination between land mobile networks.

The following key principles related to the coordination between DA2GC GS and MFCN base stations should be considered at national level or between neighbouring countries in order to ensure co-existence:

1. Coordination is primarily about national implementation, local propagation conditions and national licensed use, which is best dealt with by national administrations;
2. The principle should be that the operator who introduces changes to his network has to trigger a coordination process (e.g. rollout of a new station or network modification);

3. The implementation of these guidelines is at the discretion of the national administrations to the extent this may help them;
4. Coordination processes and associated protection should only apply to registered/licensed spectrum users;
5. The coordination process should be both accurate and fast to enable all operators to efficiently plan spectrum utilisation and network deployments.