CEPT ECC
Electronic Communications Committee

ERC Recommendation 12-12

Radio frequency channel, arrangement for Fixed Service Systems operating in the band 55.78 to 57.0 GHz

Approved 29 October 1999

Amended 30 January 2015

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INTRODUCTION

The channel arrangements in ERC/REC 12-12 were originally developed in late ’90 years, having in mind a possible emerging FS market for private small business broadband wireless access to core networks for internet and data connections and entertainment purpose.

The relatively short hops achievable, when broadband high G.826 quality links were considered, were not attractive, at that time, for the mobile backhauling market, which needed link length characteristics typically achievable by 23 and 38 GHz bands.

The rapid advent of XDSL broadband connections, as well as of mobile wireless access, made fruitless also the original intent for these bands use; actually, in 2011 ECC Report 173 reported no fixed links present or planned use in CEPT area for this band.

ECC Report 173 also reported that in nearly all case conventional link-by-link planned license conditions apply.

However, with the advent of new generation of mobile networks, the issue of the deployment of “small cells” in highly populated areas (i.e. with expected “micro/pico base stations” density up to about 100/km2). Part of them might benefit of easy fiber backhauling, but a significant number would need wireless backhauling resulting in many tens of links per km2 with typical length less than 1 km spread in a relatively large number of different channels of medium/high bandwidth.

This requirement perfectly match the 55 GHz frequency range, also considering the impact of oxygen absorption attenuation ranging from about 6 dB/km up to about 10 dB/km in higher portion of the band.

This band is also identified in the Radio Regulation 5.547 for “high density fixed service” applications; for being attractive to the mass backhauling market these links needs to be cost effective, quickly deployable and; these requirements call for unlicensed or other very simple planning/licensing procedure, either as link-by-link or in as block assignment.

ECC RECOMMENDATION 12-12 OF 30 JANUARY 2015 ON RADIO FREQUENCY CHANNEL ARRANGEMENT FOR FIXED SERVICE SYSTEMS OPERATING IN THE BAND 55.78 - 57.0 GHz

"The European Conference of Postal and Telecommunications Administrations,

considering

a) that CEPT should develop radio frequency channel arrangements in consultation with organisations developing standards for radio systems, in order to make the most effective use of the spectrum available;

b) that the propagation characteristics of the 55.78 to 57.0 GHz are ideally suited for use of short range digital radio links in high density networks;

c) that Radio Regulations 5.557A states that in the band 55.78-56.26 GHz, in order to protect stations in the EESS (passive), the maximum power density delivered by the transmitter to the antenna of a fixed service station is limited to -26dB(W/MHz);

d) that the attenuation due to oxygen absorption would significantly limit the achievable link length;

e) that the evolution of mobile network technology requires more and more capacity and high density of short links for the backhauling infrastructure;

f) that ETSI EN 302 217-2-2 provides characteristics and limits of Point-to-Point equipment in these bands, to be applied when link-by-link coordination procedure is applied;

g) that very dense short links backhauling network in urban areas requires simple licensing and deployment procedures;

h) that ECC/REC(01)04, developed specifically for the 42 GHz band, gives general technical guidelines for the assignment of frequency blocks to Fixed Service applications;

i) that as an alternative to conventional coordination, a simple form of coordination, similar to that described by ECC Report 80 as "light licensing", could maintain spectrum efficiency and availability for FS avoiding harmful interference among the users;

j) that Radio Regulations allocate the band 55.78 to 57.0 GHz on a primary basis for Fixed, Earth Exploration Satellite (passive), Inter-Satellite, Mobile and Space Research (passive) services;

k) that Radio Regulations 5.547 identifies the band 55.78 to 57.0 GHz for HDFS applications;

l) that in the frequency range a high antenna directivity is achievable even with small size antennas, increasing the density of equipment and further reducing risk of interference with same and other services;

m) that the applications in this frequency band may require differing channel bandwidths for medium and high capacity connections.

recommends

1. that the CEPT administrations should follow the recommended channel arrangements for time division duplex (TDD) systems in the frequency range 55.78 to 57.0 GHz given in ANNEX 1:;

2. that the CEPT administrations should follow the recommended channel arrangements for frequency division duplex (FDD) systems in the frequency range 55.78 to 57.0 GHz given in ANNEX 2:."

3. that administrations wishing to assign frequency in blocks, should consider blocks of N x 28 MHz size, either with channels self-planned among the operators or following the block assignment guidelines given in ECC/REC(01)04;

4. that administrations who wish to implement a self-coordination mechanism similar to "light licensing" may refer to the example provided in ANNEX 3:."

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 Recommendations.

ANNEX 1: RADIO-FREQUENCY CHANNEL ARRANGEMENTS IN THE BAND 55.78 - 57.0 GHz FOR SYSTEMS USING TDD

Let fr be the reference frequency of 55786 MHz,

fn be the centre frequency of a radio-frequency channel in the band 55.78 - 57.0 GHz,

then the centre frequencies of individual channels are expressed by the following relationships:

a) for systems with a channel separation of 112 MHz:

$$fn = fr + 112\ n \quad MHz$$

where:

$$n = 1, 2, 3, ...10$$

b) for systems with a channel separation of 56 MHz:

$$fn = fr + 28 + 56\ n \quad MHz$$

where:

$$n = 1, 2, 3, ...20$$

c) for systems with a channel separation of 28 MHz:

$$fn = fr + 42 + 28\ n \quad MHz$$

where:

$$n = 1, 2, 3, ...40$$

d) for systems with a channel separation of 14 MHz:

$$fn = fr + 49 + 14\ n \quad MHz$$

where:

$$n = 1, 2, 3, ...80$$

Smaller channel size of 7 MHz and 3.5 MHz can be obtained by subdivision of one or more 28 MHz channels.

Table 1: Calculated parameters according to Recommendation ITU-R 746

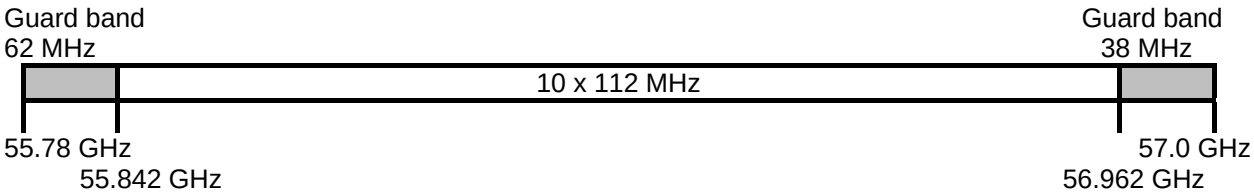
XS MHz	n	f1 MHz	fn MHz	Z1S MHz	Z2S MHz
112	1,...10	55898	56906	118	94
56	1,...20	55870	56934	90	66
28	1,...40	55856	56948	76	52
14	1,...80	55849	56955	69	45

XS Separation between centre frequencies of adjacent channels

Z1S Separation between the lower band edge and the centre frequency of the first channel

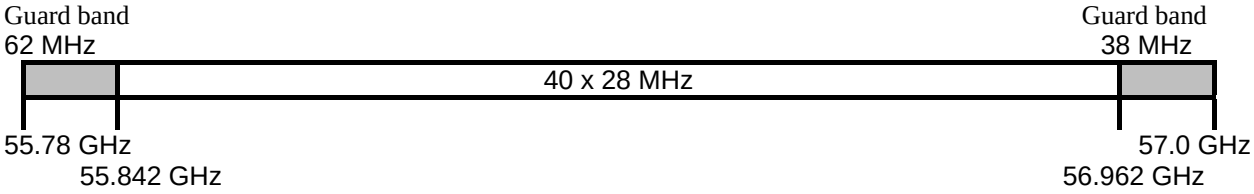
Z2S Separation between centre frequencies of the final channel and the upper band edge

a) 112 MHz channels



b) 56 MHz channels

c) 28 MHz channels



d) 14 MHz channels

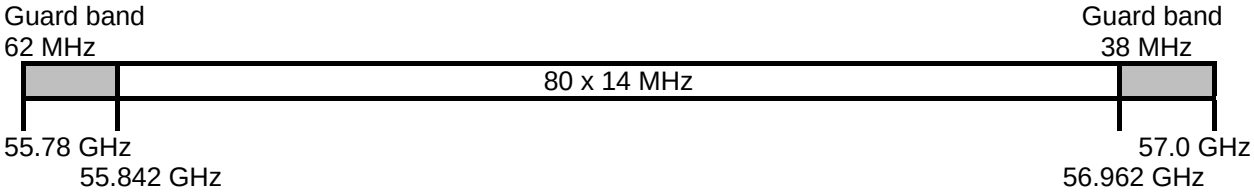


Figure 1: Occupied spectrum: 55.78 to 57 GHz band

ANNEX 2: RADIO-FREQUENCY CHANNEL ARRANGEMENT IN THE BAND 55.78 - 57 GHz FOR SYSTEMS USING FDD

The radio frequency channel arrangement for channel separations of 112 MHz, 56 MHz, 28 MHz and 14 MHz shall be derived as follows:

Let

fr be the reference frequency of 55814 MHz;

fn be the centre frequency (MHz) of the radio-frequency channel in the lower half of the band;

fn' be the centre frequency (MHz) of the radio-frequency channel in the upper half of the band;

TX/RX separation = 616 MHz

Center gap = 112 MHz, for channels size up to 56 MHz;
= 168 MHz for channels size 112 MHz;

then the frequencies (MHz) of individual channels are expressed by the following relationships:

a) for systems with a channel separation of 112 MHz:

lower half of the band: $fn = fr - 28 + 112\ n$
upper half of the band: $fn' = fr + 588 + 112\ n$ where n = 1,2, … 4

b) for systems with a channel separation of 56 MHz:

lower half of the band: $fn = fr + 56\ n$
upper half of the band: $fn' = fr + 616 + 56\ n$ where n = 1,2, … 9

c) for systems with a channel separation of 28 MHz:

lower half of the band: $fn = fr + 14 + 28\ n$
upper half of the band: $fn' = fr + 630 + 28\ n$ where n = 1, 2, 3, … 18

d) for systems with a channel separation of 14 MHz:

lower half of the band: $fn = fr + 21 + 14\ n$
upper half of the band: $fn' = fr + 637 + 14\ n$ where n = 1, 2, 3, … 36

Smaller channel size of 7 MHz and 3.5 MHz can be obtained by subdivision of one or more paired 28 MHz channels.

Table 2: Calculated parameters according to Recommendation ITU-R 746

XS MHz	n	f1 MHz	fn MHz	f'1 MHz	f'n MHz	Z1S MHz	Z2S MHz	YS MHz	DS MHz
112	1, 4	55898	56234	56514	56850	108	150	280	616
56	1,...9	55870	56318	56486	56934	90	66	168	616
28	1,...18	55856	56332	56472	56948	76	52	140	616
14	1,...36	55849	56339	56465	56955	69	45	126	616

XS Separation between centre frequencies of adjacent channels;

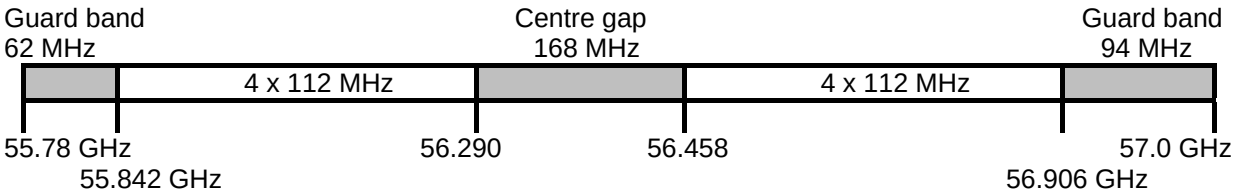
YS Separation between centre frequencies of the closest go and return channels;

Z1S Separation between the lower band edge and the centre frequency of the first channel;

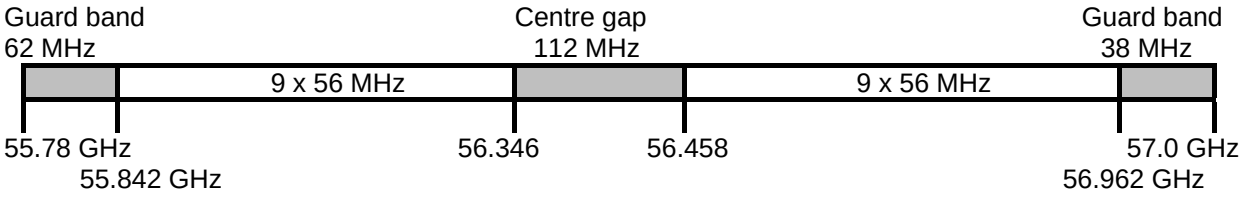
Z2S Separation between centre frequencies of the final channel and the upper band edge;

DS Duplex spacing (f'n - fn).

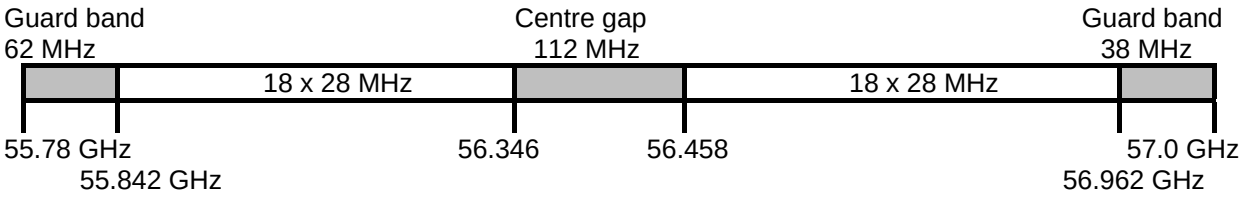
a) 112 MHz channels



b) 56 MHz channels



c) 28 MHz channels



d) 14 MHz channels

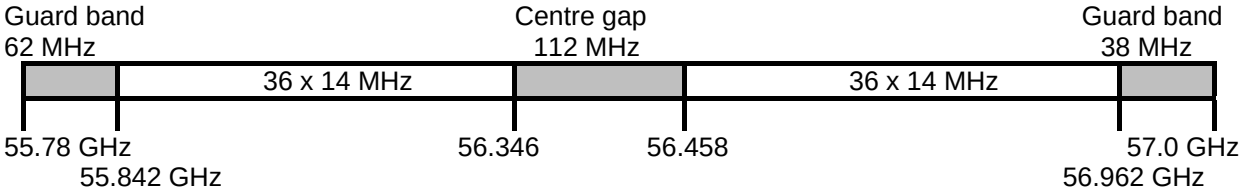


Figure 2: Occupied spectrum: 55.78 to 57 GHz band

ANNEX 3: EXAMPLE OF TECHNICAL BACKGROUND FOR IMPLEMENTING A SELF-COORDINATION APPROACH FOR PP FS

To assist the planning of PP fixed links, self-coordination approach, similar to the “light licensing”, described in ECC Report 80, can be considered. Such regimes do not mean “licence exempt” use, but rather using a simplified set of conventional licensing mechanisms and attributes within the scope decided by administration. This planning is delegated to the licensee.

Administrations intervene for protecting a limited number of sensitive sites while giving greater flexibility elsewhere than it could be allowed without the geographical limitation.

This process requires to record for instance the following set of simple criteria for each authorised link and makes the data available publicly to assist in the identification of operational parameters and to conduct interference analyses:

- Date of application (In order to assign priority);
- Transmit, receive centre frequencies and occupied bandwidth;
- Equipment type, specifying relevant transmitter/receiver parameters;
- Link location (geographic coordinates, height/direction of antenna, etc…);
- The antenna gain and radiation pattern.

Subject to the conditions set by the administration, it is left to the operator to conduct any compatibility studies or coordinate as necessary to ensure that harmful interference is not caused to existing links registered in the database, keeping that analysis available for any dispute resolution. For example, an operator wishing to install a new link could calculate the interference that the new link will create to the existing links in the database. Then it will be possible to determine whether this new link will interfere with existing links. If so, the new link could be re-planned to meet the interference requirements of existing links in the database. Otherwise, the new link may be also co-ordinated with existing operators, who might suffer from the interference.

To assist with the resolution of disputes, licenses are issued with a “date of priority”: interference complaints between licensees may therefore be resolved on the basis of these dates of priority (as with international assignments). Consideration of a maximum time frame between the link registration and its effective operational start is a matter for Administrations at national level.