

Creating a 112 MHz sub-band within 470-862 MHz band

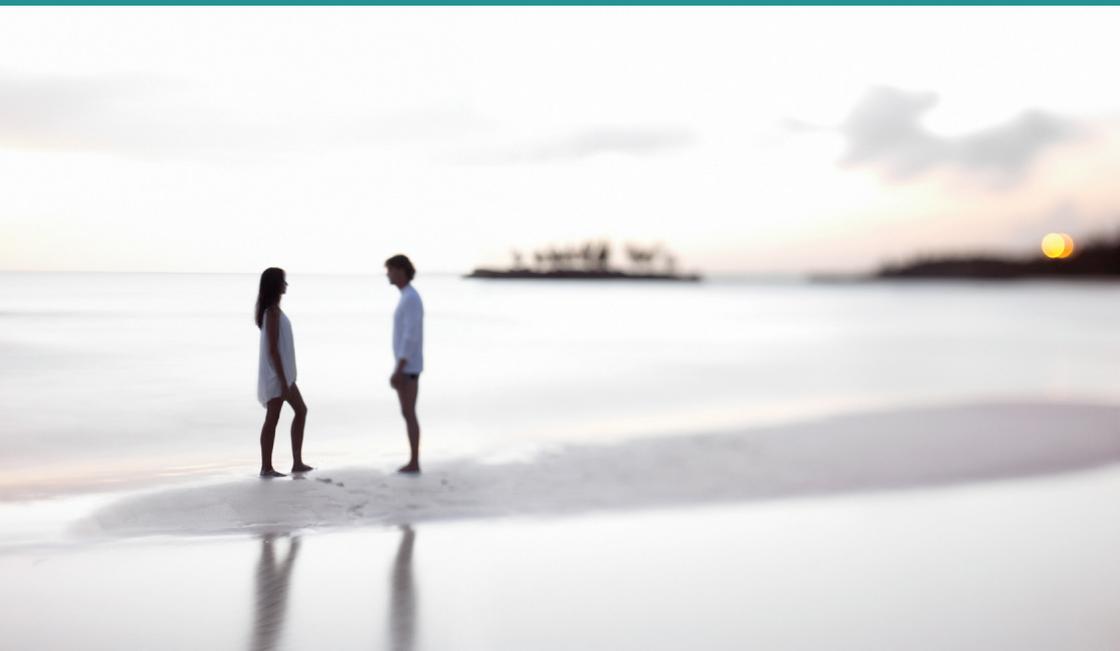
technical possibilities in Europe

Towards globally harmonised Digital Dividend



UMTS
Forum

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The UMTS Forum commissioned a study around the technical feasibility of creating a 112MHz sub-band in several countries in the upper part of the UHF band (between 750 and 862MHz), while ensuring that national digital terrestrial television broadcasting resources are still fulfilled (7 national layers per country), and taking into account the protection of GE-06 plan up to 130 km in the neighbouring countries.

Key messages

GE-06 Plan was done assuming that the whole band 470-862 MHz can be used for broadcasting systems.

Some assumptions of this study are different than those from RRC-06.

The study assumes:

- 7 national layers per country
- The deployment of digital broadcasting networks based on existing sites in real terrain models

Coverages of sites for offering broadcasting services are adapted up to the border of the allotments.

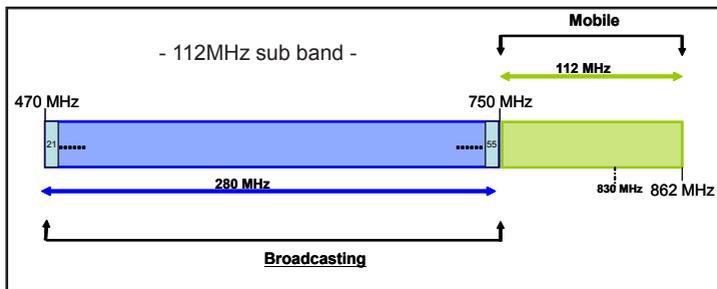
New sites are added for limiting digital broadcasting emissions to only the allotment targeted.

- ▶ **The reuse of frequencies in UHF band could be increased**
- ▶ **A 112MHz sub-band could be released in the upper part of UHF band**

Studying the feasibility of creating a 112 MHz sub-band

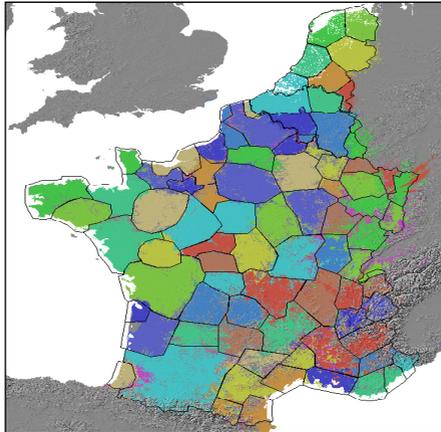
The purpose of this study was to analyse the technical feasibility of creating a sub-band in the upper part of the UHF band (750 – 862 MHz) in Belgium, France, Netherlands and Luxembourg (taken as representative of difficult cases), while other neighbouring countries would keep GE-06¹ Plan.

UMTS Forum intention is to show that several neighbouring European countries may have a possibility to release the same sub-band of 112 MHz when reassigning channels of their 7 layers' allotments under certain conditions. The 112MHz sub-band is created keeping equitable access (7 layers per country) to broadcasting resources in the remaining spectrum and ensuring that neighbouring countries can follow GE-06 agreement without interference.



The Methodology used

1. Allotments obtained at GE-06 and declared in the BR IFIC¹ (7 national layers per country) are used for modelling each country's coverages. Most of allotments are overlapped; therefore allotments' shapes are redefined in order to have adjacent allotments for each layer;
2. It is assumed a Digital Broadcasting network (including a Mobile Broadcasting network) reuses all existing broadcasting sites declared in the BR IFIC;
3. Antenna patterns are redefined in order to limit the power received at the border of all allotments to the threshold level needed for offering a Digital Broadcasting service; the aim of this step is to facilitate the reuse of spectrum while adapting coverage to the border of the allotment, hence limiting potential interferences;



4. A Digital Broadcasting network is modelled in each country optimizing the number of sites, and adding others if necessary, to ensure a service coverage of 95% of population for fixed/portable broadcast reception. For Mobile Broadcasting around 70% of population coverage is achieved in the study;
5. A new frequency channel for all allotments in the 7 layers in each country studied (France, Belgium, Netherlands, Luxembourg) was searched between 470 and 750 MHz (channels 21 to 55, except channel 38 in order to protect radioastronomy services). This step is done for ensuring protection of Digital Broadcasting services among allotments of countries studied, as well as in their neighbouring countries.

¹-BR IFIC: Bureau des Radiocommunications (International Frequency Information Circular)

The Assumptions

Four countries studied and three kinds of broadcasting services offered between 470-750 MHz

7 national layers have been considered in each of the countries studied for realising a 112MHz sub-band in order to maintain the principle of equitable access .

- Belgium and Netherlands: 6 RPC2¹ layers would offer digital broadcasting service for portable reception and 1 RPC2 for mobile broadcasting
- France: 6 RPC1 layers would offer digital broadcasting service for fixed reception and 1 RPC2 for mobile broadcasting
- Luxembourg: 3 RPC1 layers would offer digital broadcasting service for fixed reception, 3 RPC2 layers would offer digital broadcasting service for portable reception and 1 RPC2 for mobile broadcasting.

Neighbouring countries are taken into account

The neighbouring countries modelled in this study are Germany, United Kingdom, Switzerland, Spain, Italy, Monaco and Andorra. All allotments and assignments of neighbouring countries declared in the GE-06 Plan are taken into account up to 130 km from the border.

Digital Broadcasting Parameters

For each offered broadcasting service, different parameters have been assumed and calculated, according to RRC-06 Final Acts as well as other referenced documents from EBU, ETSI standards and ITU Recommendations. It has been assumed:

- Digital broadcasting for fixed reception: DVB-T with a modulation of 64-QAM 2/3
- Digital Broadcasting for portable reception: DVB-T with a modulation of 16-QAM 2/3
- Mobile broadcasting indoor reception: DVB-H with a modulation of QPSK 2/3

Propagation & Terrain model

A deterministic propagation model has been used composed of the following terms: Free space loss as described in the Recommendation ITU-R P.525, a Diffraction term as recommended in Deygout 94 method, and a Coarse Integration for sub-path attenuation factor.

The study is based on a precise 200 m digital map of Belgium, France, Netherlands and Luxembourg, as well as up to 130 km in their neighbouring countries.

¹-RPC: Reference Planning Configuration



Creating a 112MHz band

Following the methodology and the assumptions described above, four countries have been studied:

Step 1: France & Belgium

Firstly, it has been studied the feasibility of releasing 112MHz in two neighbouring countries: France and Belgium. After five iterations, a new channel has been obtained between channels 21 and 55 (470 – 750 MHz) for all allotments in the 7 layers for these two countries. This new frequency arrangement, while limiting coverage to the border of the allotments, could cover around 97% of population on average in their 6 layers as well as having one layer for mobile broadcasting.

Step 2: France, Belgium, Netherlands and Luxembourg

Based on results obtained in Step 1, a new frequency plan over the 7 layers of these four countries has been calculated. After five iterations, all allotments obtain a new channel between channels 21 and 55. In the last two countries Netherlands and Luxembourg, it has been observed that coverage of some layers are quite interfered in the border of these countries. Most of interferences are concentrated at the German border of these four countries and the interference is mainly due to the high sites with high power omnidirectional antenna patterns located at that border.

Results

A new frequency arrangement over the 7 layers of France, Belgium, Netherlands and Luxembourg for all allotments has been obtained using only channels between 470 and 750 MHz taking into account German allotments but without considering German assignments declared in BR IFIC up to 130 km from the border. A new frequency arrangement is obtained over these four countries in their 7 layers with minimum interferences, i.e. at least 97% of population is covered. Results obtained are shown below:

	Average of Population Interfered		Average of Population Covered	
	DVB-T	DVB-H	DVB-T	DVB-H
Belgium	0.22%	0.05%	97%	68%
France	0.74%	1.09%	98%	74%
Holland	0.01%	0.00%	98%	71%
Luxembourg	0.42%	0.00%	97%	67%

Moreover, a comparison with the GE-06 Plan has been done by using the methodology and the assumptions of our study. For this case, only frequencies declared in BR IFIC have been used: 6 French national layers, 7 Belgian national layers, 7 Dutch national layers and 4 national layers from Luxembourg. Results obtained show that covered population is very similar and that interferences appear even when adapting broadcasting coverage to the border of the allotment.

	Average of Population Interfered		Average of Population Covered	
	DVB-T	DVB-H	DVB-T	DVB-H
Belgium	0.46%	0.81%	97%	67%
France	1.85%	no layer	96%	no layer
Holland	0.72%	7.03%	98%	67%
Luxembourg	0.62%	0.00%	97%	67%

Conclusions

The study concluded that a new frequency arrangement could be obtained in several neighbouring countries (France, Belgium, Netherlands and Luxembourg) for releasing the same 112MHz sub-band in the upper part of UHF TV band while maintaining 7 national layers for digital broadcasting. This could be achieved by adapting their antenna emissions for offering digital broadcasting services to the border of their allotments and also by coordinating the effects of neighbouring high power assignments in the border.

This UMTS Forum study has been performed in collaboration with the radio planning company ATDI, in order to benefit from their expertise in broadcasting planning methodology and tools, with active participation of UMTS Forum experts.

For information, the UMTS Forum has edited a brochure with its key messages for WRC-07 Agenda Items 1.4 and 1.9. The UMTS Forum supports a globally harmonised solution for the provision of coverage in large areas of low population density. To fulfil this coverage demand, a globally harmonised sub-band of around 100 MHz should be identified for IMT in the upper part of the band 470-862 MHz at WRC-07.

About the UMTS Forum

Founded in 1996, the UMTS Forum is an international industry association that is committed to the success of Third Generation (3G) UMTS mobile systems. Bringing together players from across the mobile industry on a peer-to-peer basis, the UMTS Forum promotes a common vision of 3G/UMTS and its Long Term Evolution, as well as its worldwide commercial success. Membership of the UMTS Forum is open to everybody with a commercial interest in 3G/UMTS mobile – including fixed and mobile network operators, infrastructure vendors, terminal device manufacturers, regulators, media/content providers and developers of 3G/UMTS services and applications.



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