Report for Ofcom

International interference analysis for future use of 1452-1492MHz Range

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0. Executive Summary

International coordination of incoming and outgoing interference within the 1452-1492MHz Range is detailed within the FINAL ACTS of the CEPT T-DAB Planning Meeting (4) Maastricht, 2002.

The lower 27.5 MHz (1452-1479.5 MHz) was initially allocated and planned for T-DAB. This plan was revised at Constanta in July 2007 (hereafter the 'Maastricht 2002 Plan') to provide for the implementation of mobile multimedia services within the envelope of a T-DAB Plan entry. This included the facility to aggregate T-DAB frequency blocks for those mobile multimedia services that require bandwidths greater than that for T-DAB.

The UK is a contracting administration to the Maastricht 2002 Plan, and must respect the agreement in terms of Continental coordination requirements. Any use of this spectrum must not cause higher levels of interference to the UK's neighbours beyond the rights of implementation the UK has to its T-DAB allotment plan. Similarly, UK users will not be granted additional protection from incoming interference beyond the rights of implementation neighbouring administrations have to their T-DAB allotment Plan entries.

This report details Mason Communications Ltd ('Mason') investigation into the levels of permissible interference, both entering and leaving the UK, as detailed in the Maastricht 2002 Plan. We have illustrated what constraints these limits impose on networks built in the UK by modelling transmitting networks that create the maximum level of permissible interference. We have also modelled such networks in France, Ireland, Belgium and the Netherlands, in order to determine levels of permissible incoming interference across the UK.

These models are built using the ITU propagation curves and parameters specified within the Maastricht 2002 Plan. Our results are shown in Sections Four and Five and Annexes A and B.

1. Introduction

In 2006, Mason Communications Ltd ('Mason') conducted technical analysis of incoming and outgoing interference in L-Band, as part of a wider project conducted by Mason with Analysys Consulting Ltd ('Analysys') on the future use of L-Band (1452–1492MHz) frequencies. The work was conducted as input to Ofcom's policy consideration with respect to the upcoming auction of L-Band frequencies.

Since Mason's analysis was conducted, the Maastricht Agreement governing T-DAB service planning has been reviewed within the CEPT, which has updated certain aspects of the co-ordination process, such as confirming calculated test points for the analysis of cross border coordination requirements.

Ofcom's review of Mason's earlier report identified three areas where it is agreed that earlier assumptions should be reviewed and the report revised. This report incorporates the revisions detailed below:

- Outgoing co-channel interference from UK systems to continental T-DAB, which Ofcom requested should be calculated assuming a field strength of 41 dBμV/m for 1% time[1] (rather than 59 dBμV/m, as assumed in the earlier Mason report), and should also be re-calculated using the agreed test points that are now available (compared to the reference points that Mason assumed in the earlier analysis).
- Outgoing co-channel and adjacent channel interference from UK systems in block LP to continental S-DAB systems in the upper 12.5 MHz block, which for this study was calculated on the basis that the maximum field strength that UK services must not exceed for adjacent channel operation is 42.1 dBμV/m. This confirmed that adjacent channel interference would not restrict use of block LP in the UK, and that co-channel constraints are similar constraints applying to other blocks.
- Incoming co-channel interference to UK systems from continental T-DAB services was re-calculated by creating a reference network of transmitters across France, Belgium, Ireland and the Netherlands, with interference predicted to test points within the UK.

Ofcom has therefore asked Mason to update these three aspects of the earlier work, and to provide associated revision to the final report of the L-Band analysis.

In addition, whilst producing this revised report Mason identified an issue with the ATDI ICS Telecom implementation of ITU.R-P370-7 CEPT derived model for 1.4GHz T-DAB. ATDI has since resolved this, and a revised software module has been used for all calculations within this report.

[1] The field strength of 41dBμV/m includes the 18dB propagation correction detailed in Maastricht to ensure interference levels are lower than the required threshold, 59dBμV/m at 99% of locations.

1.1 Background and objectives

In December 2005, Analysys, Mason and DotEcon completed a study to investigate Ofcom's options for allocating spectrum within the 1452–1492MHz spectrum band. This included recommendations about the award design (spectrum packaging, auction format, etc.). During the study, a number of services or technologies that could potentially be deployed in the spectrum were identified. These included: digital radio (T-DAB), mobile multimedia (e.g. DVB-H, DMB), broadband wireless access (e.g. WiMAX, UMTS TDD) and satellite digital radio (S-DAB). The study also included some initial analysis to understand the band's usage constraints due to the need to avoid interference with T-DAB and S-DAB users in Belgium, France, Ireland, and the Netherlands. The international interference constraints on this band are twofold:

Interference with European T-DAB services in the bottom 27.5MHz

The lower 27.5 MHz (1452-1479.5 MHz) was allocated and planned for T-DAB in accordance with the CEPT Maastricht 2002 Special Arrangement. This plan was revised at Constanta in July 2007 (hereafter the 'Maastricht 2002 Plan') to provide for the implementation of mobile multimedia services within the envelope of a T-DAB Plan entry. This included the facility to aggregate T-DAB frequency blocks for those mobile multimedia services that require bandwidths greater than that for T-DAB.

The UK is a contracting administration to the Special Arrangement and must respect the agreement in terms of Continental coordination requirements. Any use of this spectrum must not cause higher levels of interference to the UK's neighbours beyond the rights of implementation the UK has to its T-DAB allotment plan. Similarly, UK users will not be granted additional protection from incoming interference beyond the rights of implementation neighbouring administrations have to their T-DAB allotment Plan entries.

Interference with European S-DAB services in the top 12.5MHz

The upper 12.5MHz (1479.5-1492MHz) has been designated at a European level for possible use for satellite digital audio broadcasting services (see ECC Decision ECC/DEC/(03)02). However, the UK has not signed this decision and, as a result, there is no commitment on Ofcom's part to 'reserve' the band for S-DAB use. Again, alternative uses of this spectrum can be deployed in the UK, but, based on the coordination agreement, users would be required not to cause interference with European satellite services, and similarly would not receive protection from them.

The objective of this study was to build upon the results of the first study to develop a more detailed and rigorous international interference analysis. As part of this, we have identified the areas of the UK that will be affected by the above interference constraints, and calculated the corresponding populations affected. We have also estimated the additional cost of deploying these services or technologies that would be incurred in order to comply with these interference constraints.

1.2 Structure of this document

The remainder of this report is structured as follows:

- Section 2 describes our approach to the study
- Section 3 presents the interference thresholds for the different technologies being considered
- Section 4 describes the methodology we have used to analyse co-channel interference to and from Continental T-DAB systems, and summarises our results
- Section 5 describes our methodology and results for adjacent channel interference between lower L-Band systems and Continental S-DAB systems.

In addition, this report has a number of supporting annexes:

- Annex A presents the outgoing interference for each frequency block
- Annex B presents the incoming interference for each frequency block.

2. Approach

In summary, the approach used to understand co-channel international interference in the lower 16 Blocks of L-Band was to model networks that produce the maximum permissible level of interference as described in the Maastricht Plan 2002. We then analysed these networks in terms of permissible UK transmitter powers and levels of interference experienced across the whole of the UK.

The L-Band frequency blocks under consideration

The tables below describe the Block definitions used within the Maastricht 2002 Plan.

T-DAB block number	*Centre frequency (MHz)*	*Frequency range (MHz)*
LA	1452.960	1452.192 - 1453.728
LB	1454.672	1453.904 - 1455.440
LC	1456.384	1455.616 - 1457.152
LD	1458.096	1457.328 - 1458.864
LE	1459.808	1459.040 - 1460.576
LF	1461.520	1460.752 - 1462.288
LG	1463.232	1462.464 - 1464.000
LH	1464.944	1464.176 - 1465.712
LI	1466.656	1465.888 - 1467.424
LJ	1468.368	1467.600 - 1469.136
LK	1470.080	1469.312 - 1470.848
LL	1471.792	1471.024 - 1472.560
LM	1473.504	1472.736 - 1474.272
LN	1475.216	1474.448 - 1475.984
LO	1476.928	1476.160 - 1477.696
LP	1478.640	1477.872 - 1479.408

Table 2.1: Frequency blocks in the lower L-Band [Maastricht 2002 Plan]

The upper 12.5MHz of the L-Band (1479–1490 MHz) is divided into the following blocks:

S-DAB	**Frequency Range (MHz)**
Upper 12.5 MHz	1479.584 - 1491.392

Table 2.2: Frequency blocks in the upper L-Band [Maastricht 2002 Plan]

The ICS Telecom tool

Our approach was to model interference using the ATDI ICS Telecom tool[2], programmed with the relevant ITU-R propagation model for interference prediction, as referenced within the Maastricht 2002 Plan. Figure 2.1 below shows the ICS Telecom ITU.R-P370-7 propagation model dialogue box with the options selected for the report.

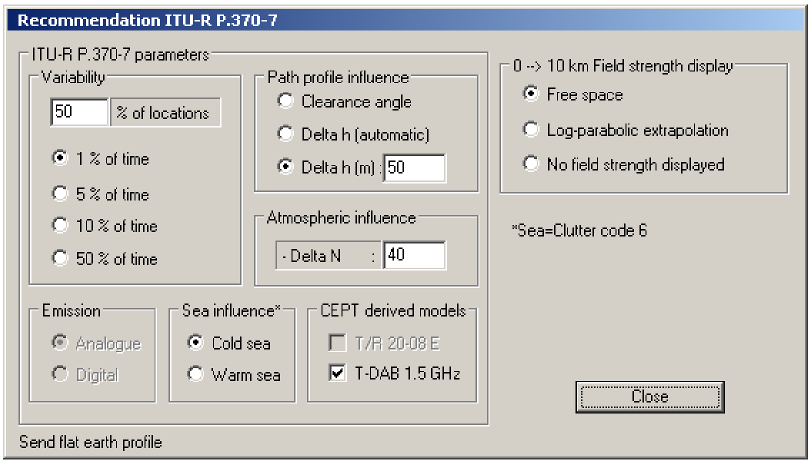

Figure 2.1: Settings of the ICS Telecom propagation model [Source: Mason]

The CEPT-derived model that was chosen to be used within the tool was developed specifically for 1.5GHz T-DAB and is described in detail within the Maastricht 2002 Plan. Example curves are shown in Figure 2.2 below.

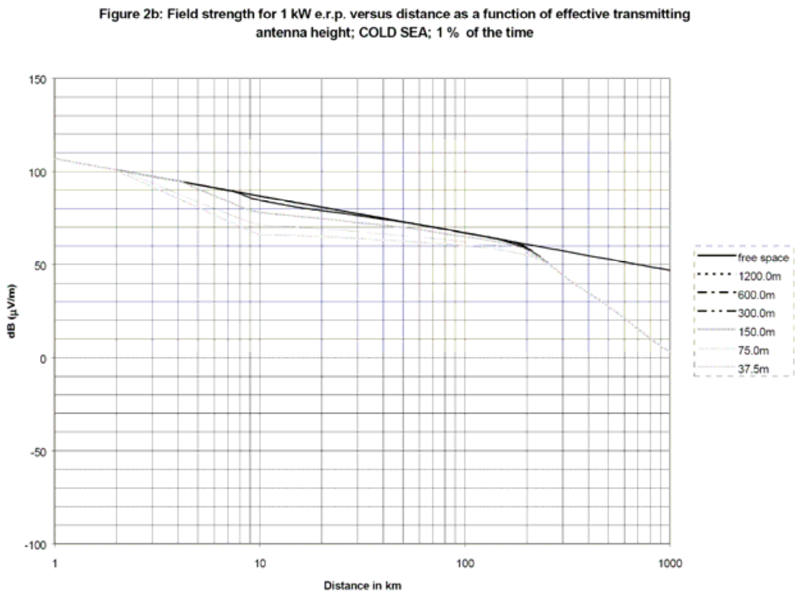

Figure 2.2: CEPT model derived from ITU-R P.370-7 for T-DAB 1.5GHz. Example curves for 1% of time, cold sea [source: Maastricht Plan 2002].

[2] ATDI ICS Telecom 8.8.7 with revised Mod370_7.dll

ICS Telecom was used to perform radio interference modelling for each of the scenarios under study. The results were then transferred into MapInfo to consider the area and population associated with each test point, and to produce thematic maps.

Overview of our methodology

Our analysis proceeded as follows:

- Step 1: Calculate the interference thresholds of the technologies being considered.
- Step 2: Model co-channel interference to, and from, T-DAB systems in Belgium, France, the Republic of Ireland and the Netherlands.[3]
- Step 3: Model adjacent channel interference between UK T-DAB networks and Continental S-DAB networks.
- Step 4: Model co-channel interference with Continental S-DAB services.

The following sections consider each of these in turn.

3 Hereafter in this report we refer to these countries using the term ‘International’, for example ‘International T-DAB systems’.

3. Interference thresholds for different technologies

Thresholds were calculated to determine the interference limit for an acceptable quality of service for the following technologies/services:

- T-DAB
- DMB
- WiMAX
- UMTS TDD
- S-DAB
- DVB-H

Note that several of these technologies would require one or more contiguous blocks and therefore would need to tolerate two or more blocks of interference and comply with international restrictions relevant to each block. In each case, the most significant variable affecting the interference threshold is the basic type of device that the network is designed to cater for, rather than the underlying communications standard. This is because of the different coverage objectives of different devices and services (e.g. whether the device is intended for indoor or outdoor reception), and the characteristics of the receiving antenna.

We have not considered systems requiring a duplexer gap (FDD) as the spectrum available (27MHz) cannot efficiently support a duplexer gap; the levels of permissible interference are quite high compared to traditional FDD spectrum; and the availability in the near future of other bands better suited to FDD. Together these three factors result in a low demand for FDD services in L-Band.

We considered five types of equipment:

- Fixed outdoor receiving equipment
- Hand-held outdoor equipment
- Hand-held indoor equipment
- S-DAB equipment

3.1 Fixed outdoor receiving equipment

Examples of fixed outdoor receiving equipment are:

- WiMAX base stations (uplink)
- UMTS TDD base stations (uplink).

Base stations are designed to be particularly sensitive as they need to receive low field strength signals transmitted by hand-held battery powered devices. Hand-held devices have low gain omni-directional antennas, and are usually in built-up urban areas or even in buildings, which adds further losses to the received signal. Base stations typically are installed at height, with high-gain sectored antennas assisted by mast head amplifiers. Taking the receiver gains and losses into account, a typical base station has an effective receiver sensitivity of –110dBm.

3.2 Hand-held outdoor equipment

Examples of hand-held outdoor equipment are:

- DVB-H and DMB hand-held multimedia devices
- T-DAB hand-held radio
- WiMAX and UMTS TDD hand-held devices.

Hand-held devices are not as sensitive as fixed equipment. For this reason, networks designed to support them need to operate at a higher field strength. Taking the receiver gains and losses into account, a typical hand-held device has an effective receiver sensitivity of –98dBm.

3.3 Hand-held indoor equipment

Examples are the same as the hand-held outdoor devices listed above. For indoor operation, however, additional signal strength is required to penetrate the fabric of buildings. Typically, an uplift of 15dB is allowed for wall losses. This gives an effective receiver sensitivity of –83dBm.

3.4 S-DAB equipment

Satellites deliver a very consistent field strength within their target area, due to an almost constant distance from all locations to the transmitter, and a free space transmission path with no diffraction or multi-path losses. However, as satellites operate at a huge distance from the earth (36 000km for geo-stationary types) there are limits on the field strength that can be generated. The co-channel interference limit for satellite sound broadcasting stated within the Maastricht 2002 plan is shown in Table 3.1 below. From this we observe that a satellite receiver has an effective receive sensitivity of –111.6dBm[4]. Note that satellite systems may utilise space diversity, frequency diversity and time diversity to increase signal quality without increasing field strength.

	Satellite sound broadcasting Digital (1.5 GHz)	*Units*
Field strength to be protected	29	dBμV/m
C/I Ratio	13	dB
Interference Limit	16	dBμV/m

Table 3.1: Interference limit for S-DAB receivers [Source: Maastricht 2002; Annex 2, p.84]

[4] From ITU-R P.525-2: $Pr_{dBw} = E_{dBuV/m} - 20\log_{10}(f_{GHz}) - 167.2$ thus $29 - 20\log_{10}(1.475) - 167.2 = -141.6$dBW = –111.6dBm

3.5 Summary

Table 3.2 below shows the interference limits for devices of the types discussed above. A correction factor is added to the Effective Rx Sensitivity (except in the case of S-DAB) to allow for variations in field strength. This factor ensures that the field strength is greater than the minimum required at 99% of locations.

Item	*S-DAB (outdoor)*	*T-DAB (outdoor)*	*Generic Fixed Base Station (outdoor)*	*Generic Hand Held Device (outdoor)*	*Generic Hand Held Device (indoor)*	*Units*
Rx Sensitivity	**-111.6**	**-94.6**	**-110.0**	**-98.0**	**-98.0**	**dBm**
Rx antenna gain	0.0	0.0	15.0	0.0	0.0	dBi
Wall Losses	0.0	0.0	0.0	0.0	15.0	dB
Minimum equivalent field strength (outdoor)	29.0	46.0	15.6	42.6	57.6	dBμV/m
Receiving antenna height gain correction (1.5 to 10m)	0.0	10.0	0.0	10.0	10.0	dB
Location percentage correction factor (50% to 99%)	0.0	13.0	13.0	13.0	13.0	dB
Minimum median field strength for planning	**29.0**	**69.0**	**28.6**	**65.6**	**80.6**	**dBμV/m**
Co-block protection ratio:	13.0	10.0	10.0	10.0	10.0	dB
Propagation correction:	0.0	18.0	18.0	18.0	18.0	dB
Maximum permissible interfering field strength at 10m AGL	**16.0**	**41.0**	**0.6**	**37.6**	**52.6**	**dBμV/m**

Table 3.2: Calculation of interference limits for different types of equipment [Source: Mason]

4. Modelling co-channel interference for blocks LA to LP

The Maastricht 2002 plan details a series of allotments for each of the blocks LA to LP. Associated with each allotment are a series of test points which form a contour around the allotment. The interference measured at 10m above ground level at each of these test points should be below 41dBμV/m. This value is derived in Maastricht 2002 as follows:

- Minimum median equivalent field strength: 69 dBμV/m
- less a co-channel protection ratio of 10 dB
- less propagation correction of 18 dB (normal-inverse of 99% $\times$ 5.5dB $\times$ $\sqrt{2}$)

The propagation correction takes into account the standard deviation of signal strength at 10m above ground (5.5dB) from both the wanted and interfering (2) transmitters at 99% of locations, hence the formula above.

Test points that lie within the boundary of the country to which the allotment is granted do not affect international interference. In such cases, the international requirement is merely for interference to fall below 41dBμV/m at the coastline or boundary of neighbouring countries. However, in some cases, test points do lie within the borders of neighbouring countries, and in this case interference may exceed 41dBμV/m at the border or coastline, and only fall to 41dBμV/m at the contour connecting the test points.

In Figure 4.1 below the red line shows where UK outgoing international interference should fall below 41dBμV/m for Block LC. For example, note the allocation on the Isles of Scilly, and its impact on north-west France and southern Ireland.

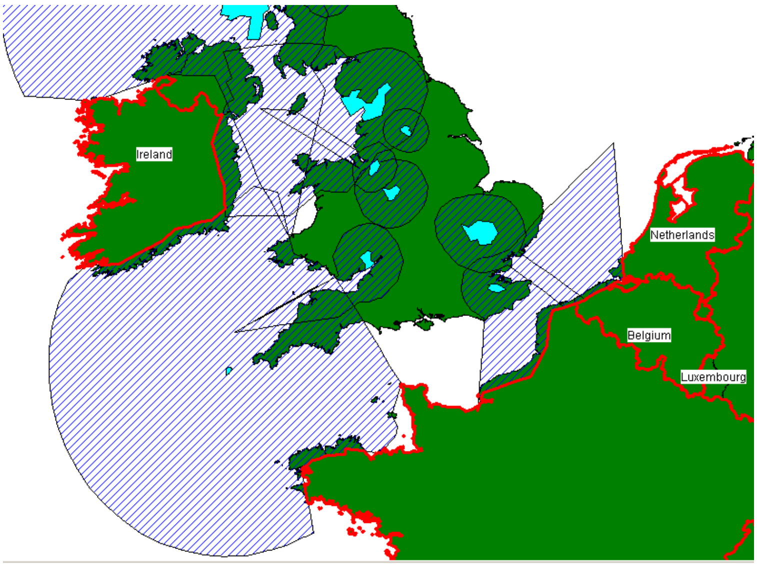

Figure 4.1:
UK Block LC Allotments and test point contours

Any deployment of transmitters across the UK is acceptable as long as the total interference does not exceed 41dBμV/m at this red line. Thus, UK licence holders would not be constrained by the allotment boundaries. The same is true for neighbouring countries.

The same is true for allocations in the UK's neighbouring countries: they have test points within the UK in a similar manner.

To demonstrate what sort of network could produce interference at 41dBμV/m along the red lines, Mason has constructed a reference network for each block, and for each country, consisting of 1kW ERP transmitters, 150m above ground level, spaced at 15km on a hexagonal grid.

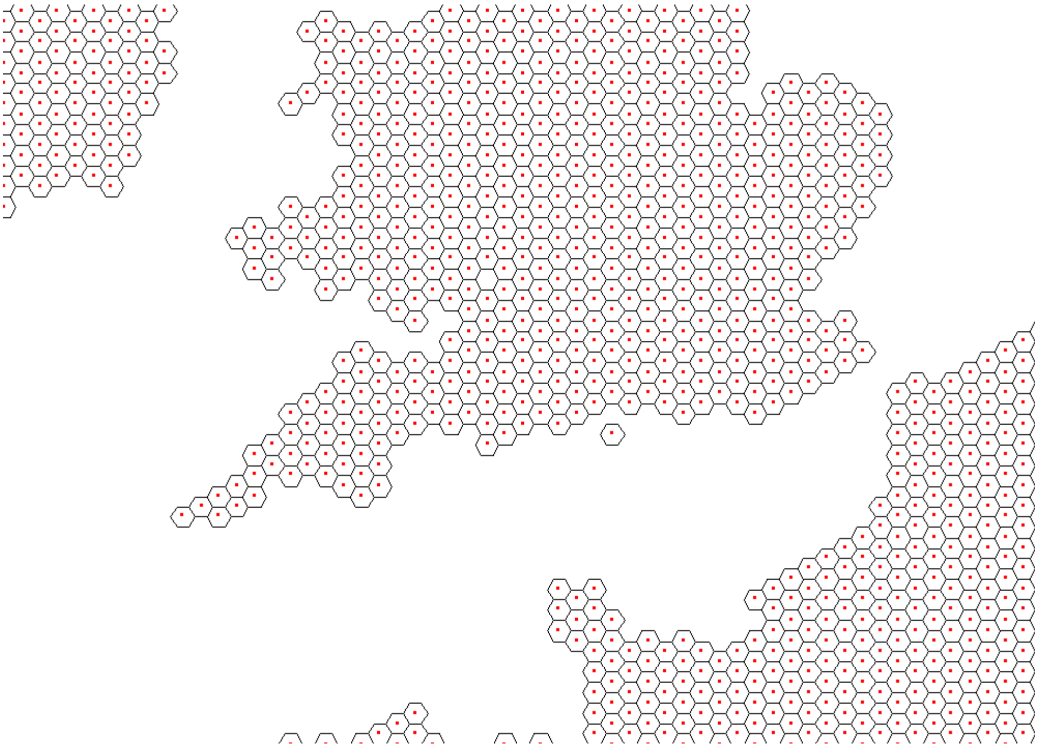

Figure 4.2: Reference network [Source: Mason]

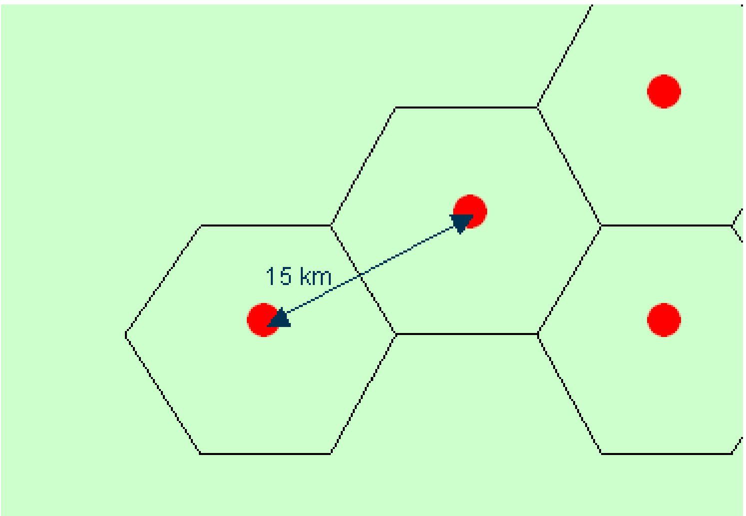

Figure 4.3:
Reference network detail
[Source: Mason]

The field strength is then considered along the red line as shown in Figure 4.1 and its equivalent for other blocks. The field strength was calculated from every transmitter to every test point using ICS Telecom. The transmitter powers were reduced where necessary to ensure that the power sum[5] of all field strengths did not exceed 41dBμV/m. Power reductions were applied to transmitters that contributed the most to the sum of interference at each measurement point. The reductions applied are detailed in Table 4.1 below. After a power reduction was made, the power sum was repeated to identify the next most significant interferer until the sum was less than 41dBμV/m. The whole process was automated and repeated for each measurement point along the red line, and for each of the sixteen blocks LA to LP.

Power Class Correction	*Transmitter Power*	*Bonn Interference*
30dBW	1kW	DAB / DVB-H Omni
26dBW	400W	DAB / DVB-H Offset antenna (4dB reduction in direction of neighbouring country)
21dBW	125W	DAB / DVB-H / WiMax Sectorised antenna (9dB reduction in direction of neighbouring country)
10dBW	10W (Low Power Applications)	Outdoor short range
0dBW	No Power	

Table 4.1: Power Class [Source: Mason]

[5] For interfering field strength calculations the power sum method is used as described in the Maastricht Plan, annex 4 section 2.1

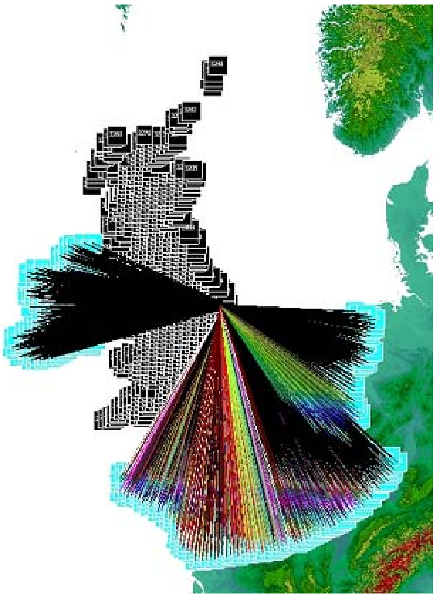

Figure 4.4: ICS Telecom calculating FSR dBμV/m at measurement points around the UK coastline and border with Ireland.

Both outgoing and incoming power adjusted networks were produced by this method for each block.

4.1 Results - outgoing interference

Annex A shows the permissible transmit powers for the tested network of 150m towers spaced at 15km. Note that these power reductions need only be achieved in the direction of neighbouring countries, and this can be achieved by the use of antenna patterns and directional antennas.

The results are summarised in the table and two charts below in terms of Area and Population. These charts show the area and population of the UK that can be served with a network transmitters of a given ERP in the direction of the nearest neighbouring country. Powers are stated as ERP in the direction of relevant test point(s) within or along the coast or boarder of neighbouring countries. Transmitters are 150m above ground level, spaced at 15km on a hexagonal grid.

	Permissible Outgoing Interference allows Network Types 1 - 5		*Permissible Outgoing Interference allows Network Types 1 - 4*		*Permissible Outgoing Interference allows Network Types 1 - 3*		*Permissible Outgoing Interference allows Network Types 1 and 2*		*Permissible Outgoing Interference allows Network Type 1*	
Max ERP in direction of neighbouring country (W) 10m AGL	1000		400		125		10		<10	
Block	*Population*	*Area*	*Population*	*Area*	*Population*	*Area*	*Population*	*Area*	*Population*	*Area*
LA	45%	48%	61%	57%	77%	67%	88%	85%	100%	100%
LB	63%	67%	76%	75%	83%	83%	92%	94%	100%	100%
LC	58%	63%	69%	71%	78%	79%	91%	90%	100%	100%
LD	60%	63%	68%	71%	81%	81%	92%	92%	100%	100%
LE	54%	60%	67%	69%	74%	77%	93%	92%	100%	100%
LF	62%	64%	72%	71%	84%	78%	91%	90%	100%	100%
LG	45%	48%	61%	57%	77%	67%	88%	85%	100%	100%
LH	53%	52%	65%	60%	81%	71%	90%	87%	100%	100%
LI	74%	68%	84%	76%	90%	85%	96%	95%	100%	100%
LJ	74%	68%	84%	76%	90%	85%	96%	95%	100%	100%
LK	74%	66%	85%	74%	94%	84%	100%	95%	100%	100%
LL	87%	80%	94%	89%	99%	95%	100%	97%	100%	100%
LM	64%	64%	73%	71%	84%	80%	93%	92%	100%	100%
LN	76%	64%	86%	74%	92%	84%	99%	94%	100%	100%
LO	77%	66%	86%	76%	93%	85%	99%	94%	100%	100%
LP	63%	67%	72%	76%	83%	84%	92%	93%	100%	100%

Network Type:
Type 1 Indoor Short Range
Type 2 Outdoor Short Range
Type 3 T-DAB / DVB-H / WiMAX Sectorised
Type 4 T-DAB / DVB-H Directional
Type 5 T-DAB / DVB-H Omni

Table 4.2: Summary of UK Population and Area in which various networks can be deployed.

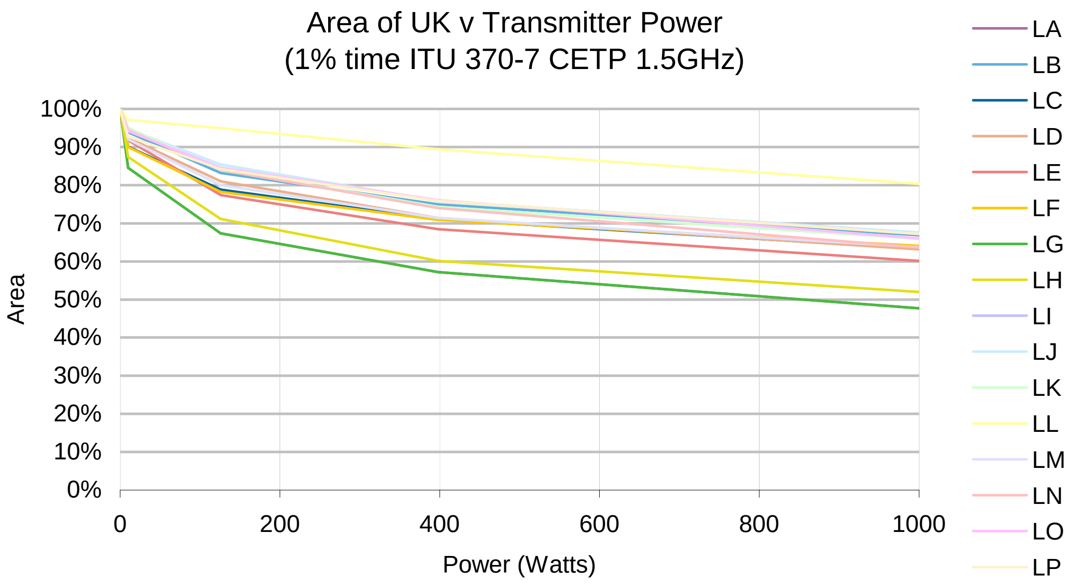

Figure 4.5: Percentage of UK Area that can be served by transmitters of a given ERP [Source: Mason]

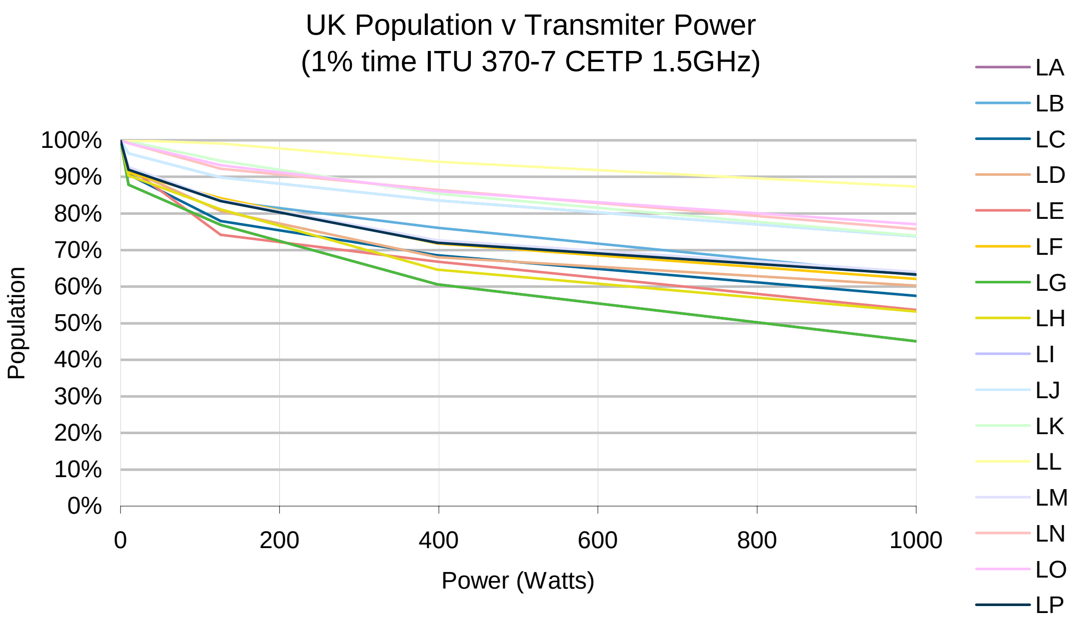

Figure 4.6: Percentage of UK Population that can be served by transmitters of a given ERP [Source: Mason]

4.2 Results - incoming interference

In the same way, Annex B shows the permissible transmit powers for the tested network of 150m towers spaced at 15km across neighbouring countries. In order to establish the incoming interference, the test network was used to calculate field strength at test points across the whole of the UK. These interference field strength predictions are shown on the same maps.

The results are summarised in the table and two charts below in terms of Area and Population. These charts show the area and population of the UK that experience less than the given level of interference. Note that this interference is measured at 10m above ground, and is only received for 1% of time.

	Interference below maximum permissible field strength for Network Types 1 - 5		*Interference below maximum permissible field strength for Network Types 1 - 4*		*Interference below maximum permissible field strength for Network Types 1 - 3*		*Interference below maximum permissible field strength for Network Types 1 - 2*		*Interference below maximum permissible field strength for Network Types 1*	
Interference Threshold at 10m AGL (dBuV/m)	0.6		16		37.6		41		52.6	
Block	*Population*	*Area*	*Population*	*Area*	*Population*	*Area*	*Population*	*Area*	*Population*	*Area*
LA	0%	0%	12%	17%	76%	81%	85%	85%	94%	94%
LB	0%	0%	13%	21%	72%	82%	81%	86%	93%	94%
LC	0%	0%	15%	22%	78%	83%	86%	88%	96%	97%
LD	0%	0%	10%	17%	78%	79%	84%	84%	95%	96%
LE	0%	0%	9%	18%	80%	85%	88%	90%	97%	98%
LF	0%	0%	14%	20%	76%	81%	81%	85%	93%	94%
LG	0%	0%	6%	16%	67%	75%	78%	82%	95%	96%
LH	0%	0%	4%	15%	70%	72%	78%	77%	93%	94%
LI	0%	0%	22%	25%	90%	90%	93%	94%	99%	99%
LJ	0%	0%	17%	22%	83%	87%	88%	91%	98%	98%
LK	0%	0%	17%	24%	95%	93%	99%	96%	100%	99%
LL	0%	0%	25%	27%	96%	97%	100%	100%	100%	100%
LM	0%	0%	18%	22%	74%	84%	82%	87%	95%	96%
LN	0%	0%	15%	21%	94%	91%	98%	95%	100%	100%
LO	0%	0%	12%	15%	91%	86%	97%	92%	100%	99%
LP	0%	0%	14%	15%	92%	86%	97%	92%	100%	99%

Network Types:
Type 1 Generic Handheld Device (Indoor)
Type 2 T-DAB (Outdoor)
Type 3 Generic Handheld Device (Outdoor)
Type 4 S-DAB (Outdoor)
Type 5 Generic Fixed Base Station (outdoor)

Table 4.3: Summary of UK Population and Area in which various networks can be deployed.

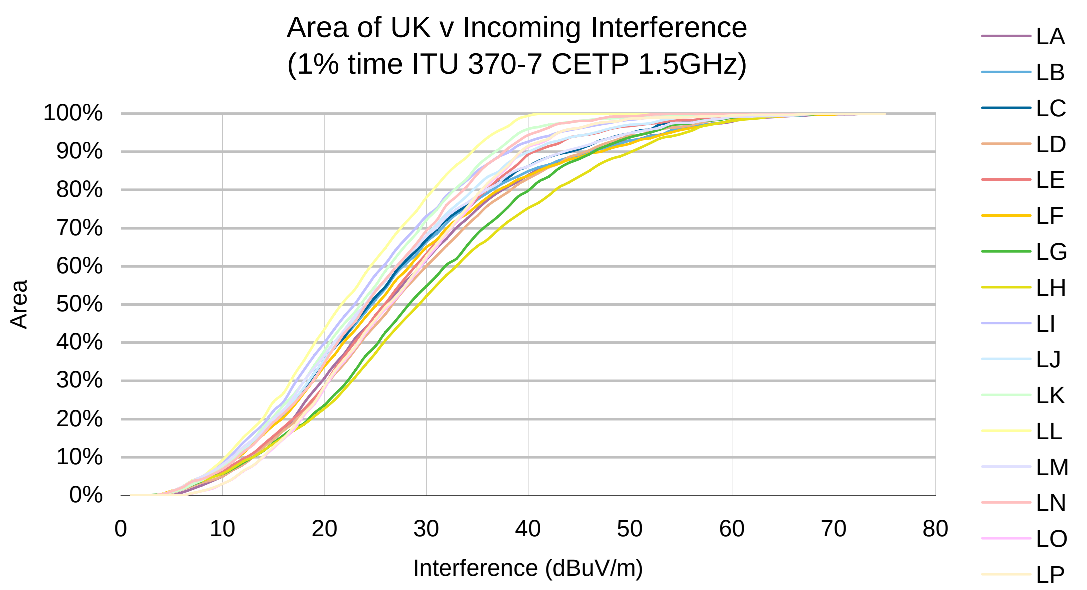

Figure 4.7: *Percentage of UK Area that receives less than a given level of interference [Source: Mason]*

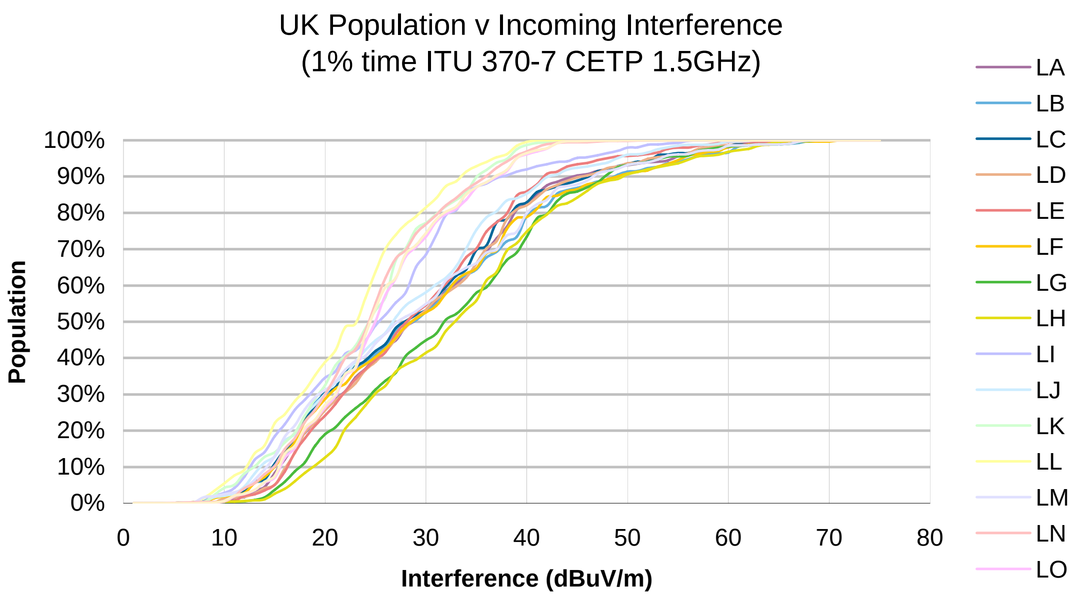

Figure 4.8: *Percentage of UK Population that receives less than a given level of interference [Source: Mason]*

5. Adjacent channel interference between lower L-Band and Continental S-DAB systems

In order to protect adjacent S-DAB, interference field strength along the coast/border of adjoining countries should be no more than 42.1dBµV/m at 10m above ground.

In the case of France and Belgium there are no UK allotments that would permit interference to exceed the lower co-channel threshold of 41dBµV/m beyond the coastline of these two countries. Thus, S-DAB is protected simply by the co-channel constraints on Block LP, as long as the technologies deployed in Block LP have a similar band edge mask and, thus, similar adjacent channel leakage to T-DAB.

See Figure 5.1 below for an illustration of UK allotments in Block LP and the areas where interference (1% of time) may exceed 41dBµV/m (hashed in blue).

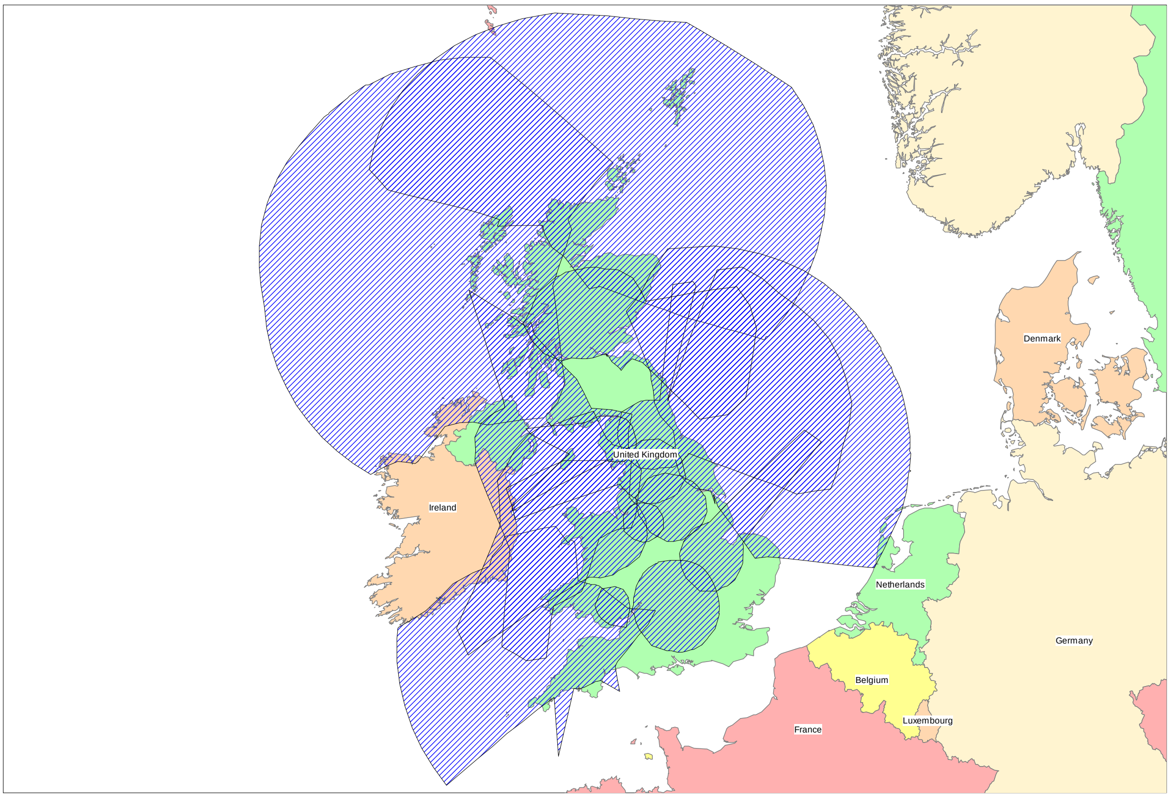

Figure 5.1: Block LP 41dBµV/m contour [Source: Maastricht Plan 2002]

From the figure one can see a small area of coastal north west Netherlands where interference may exceed 41dBµV/m. There is also a sizeable area along the east coast of Ireland. The UK has been explicitly granted these implementation rights within the Maastricht 2002 Plan, and so within these blue areas the UK's rights of implementation to LP supersede the S-DAB protection requirement.