



Ofcom

Digital Dividend
Study

International
Interference
Assessment

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1. Introduction

This report forms deliverable D1.1 (b) of ‘Digital Dividend – Study on Compatibility/Technical Usage Conditions’.

1.1 Released Spectrum

The spectrum released from digital switchover is shown below in yellow. This report also covers channel 36 (aeronautical radar), which may be available in advance of the other released spectrum.

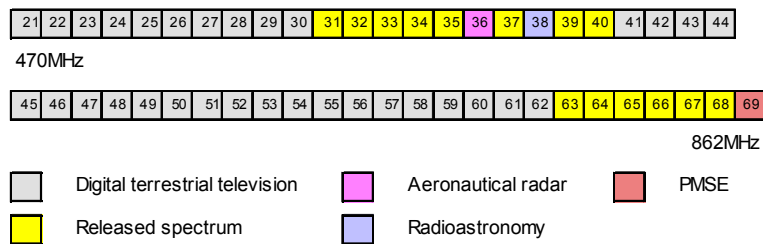


Exhibit 1.1:
 UHF spectrum
 following digital
 switchover
 [Source: Ofcom]

1.2 Scope of D1.1 (b)

The scope of this deliverable is to:

- Complete an **interference analysis** for each channel in the released spectrum, using the GE06¹ plan, in combination with bilateral agreements²
- Provide **maps** of the UK and neighbouring countries’ sites, as recorded in the GE06 plan and as modified by bilateral agreements on a channel-by-channel basis for the UK cleared spectrum, including channel 36
- Provide interpretation of ‘not to be exceeded’ interfering field strength value on the border/coast of the neighbouring countries, and expected GE06 incoming interference field strength values along the UK coast.

Mason has analysed incoming and outgoing international interference to and from the United Kingdom. We have not assessed interference to and from the British Crown

¹ The Final Acts of the Regional Radio Communication Conference for planning of the digital terrestrial broadcasting service in parts of Regions 1 and 3, in the frequency bands 174-230MHz and 470-862MHz (RRC-06). Geneva, 15 May-16 June 2006

² GE06 Band IV/V Bilateral Co-Ordination Agreements

Dependencies (Channel Islands and the Isle of Man) or the British Overseas Territories that are party to the GE06 plan (e.g. Gibraltar).³

In addition to the released spectrum, this issue of this report also includes information on channels 60, 61 and 62.

1.3 The Coordination Process

The GE06 plan includes both channel assignments and channel allotments. Channel *assignments* are specific transmitter locations with a stated transition channel transmit power and antenna height. The assignments are usually entered into the plan as Omni directional antennas (as in the case of the UK). However, in practice many digital-terrestrial television (DTT) main sites will employ carefully tailored antenna patterns to meet the target coverage area. So, the level of international interference may be less than that suggested within the GE06 plan.

Where administrations were not ready to apply for transmitter assignments at the Regional Radiocommunication Conference (RRC06) – perhaps because transmitter locations were not known – they were granted channel *allotments*. An allotment is a ‘place holder’ that reserves a channel for a specific geographical area without necessarily detailing all transmitter locations.

Before a channel allotment can be used for broadcast it needs to be converted to one or more transmitter assignments. These assignments will be entered into the GE06 plan and, if necessary, amendments to the bilateral coordination agreements will be made to mitigate interference prior to the assignment being entered into the frequency plan.

At the time of writing, several channel allocations in France and the Netherlands are still at the allotment stage. Thus the level of interference once these are converted to assignments may be different from the interference shown in the appendices of this report.

³ Ofcom represents the UK in the ITU. Ofcom also represents the British Overseas Territories, the Channel Islands, and the Isle of Man under informal arrangements agreed between the respective governments.

2. Methodology

2.1 Planning Tool Configuration

Radio planning tool ICS Telecom 8.2.3 was used to predict imported and exported interference with the following parameters:

- Digital terrain model (DTM): 500m horizontal, 1m vertical resolution (see Figure 2.1)
- Propagation model: ITU-R P.1546-2
- Transmitter location, height and ERP: as per GE06 assignments or allotments adjusted to comply with international bilateral agreements between the UK and the following neighbouring countries:
 - Belgium
 - France
 - The Netherlands
 - The Republic of Ireland
- Receiver antenna height: 10m above ground level
- Calculation distance limit: 1000km
- Field strength displayed using the ‘Power Sum Coverage Display’.

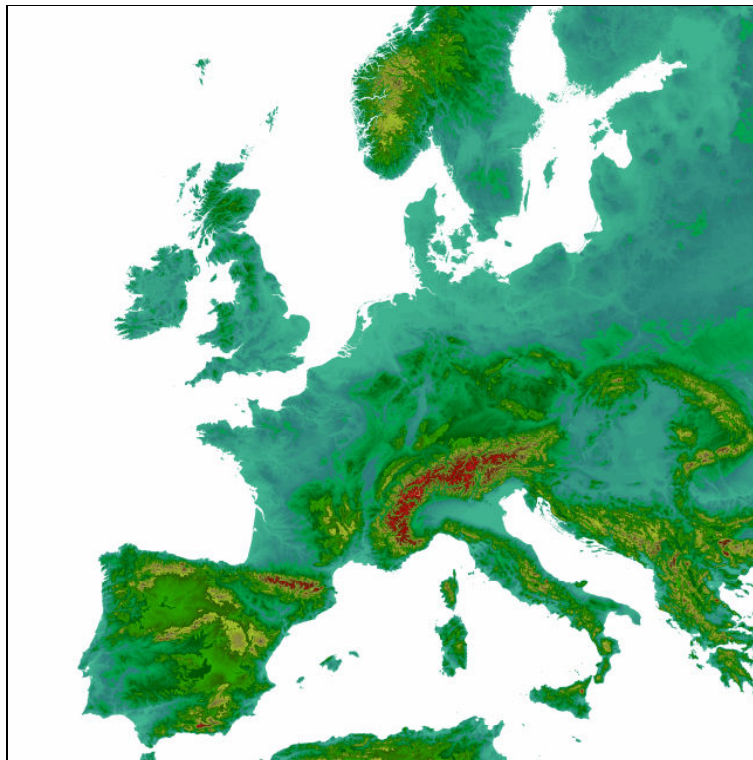


Figure 2.1: Digital Terrain Model used for Interference Analysis

2.2 Detail of Propagation Model Settings

The propagation parameters used for coverage predictions are:

- Variability – 50% of locations, 1% of time
- Sea path – cold
- Terrain clearance angle selected, to make best use of the DTM
- Emission – digital broadcast selected.

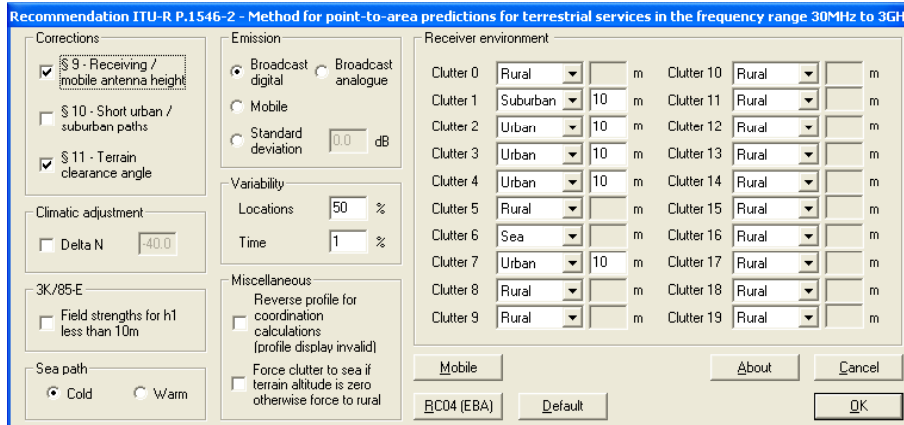


Figure 2.2: Propagation Model ITU-R P.1546-2 Specific Settings

2.3 Process

Initially coverage was predicted using the assignment transmitter parameters detailed in the GE06 agreement.

Where no assignments were included within the GE06 agreement, but instead allotments are recorded, Mason has done the following, in order of preference:

- Where reference assignments have been included in the bilateral agreements for the purpose of coordination, these have been used
- Where actual candidate transmitter sites are known these have been used, as in the case of the Netherlands
- Failing this, Mason has modelled transmitter characteristics within the allotment in accordance with the GE06 reference network stated within the GE06 allotment entry.

Each coordination requirement in each bilateral agreement was then analysed and restrictions were applied to transmitters as per the agreement. The coordination requirements are worded in one of the following ways:

- A revised transmit power between two specific Tx azimuth bearings (e.g. 43dBW, 80-90deg)
- A power reduction between two specific Tx azimuth bearings (e.g. -7dB, 80-90deg)
- A requirement to reduce interference to a specific level at the coastline (e.g. 29dBµV/m on the coast of France)

- A requirement to reduce interference to a specific level at the boundary of an allotment (e.g. 45dB μ V/m at allotment boundary HOL0502-64)
- A requirement to reduce interference to a specific level at the boundary of a UK service area.

In each case the change was achieved by altering the antenna pattern. In order to take measurements at the boundaries of UK service areas and continental allotment areas it was necessary to construct a MapInfo Interchange File (.MIF) for each allotment and each service area. These are shown in Appendix G.

3. Coordination Requirement Modelling Examples

3.1 Interference from UK assignment G–10104/37 to France

This section details an example of how the UK assignment G–10104/37 (Royal Tunbridge Wells channel 37) was adjusted to meet the stated coordination requirement in the bilateral agreement between France and the UK. The same process has been followed throughout the analysis.

The coordination requirement in this case was stated as ‘Agreed subject to 29dB μ V/m co-polar and 45dBuV/M cross-polar on the French coast’. In cases such as this where interference limits are quoted as both cross-polar and co-polar we have modelled the most limiting case, that of co-polar interference. Thus operators who can comply with the polarization stated in the GE06 plan, which does vary from site to site, will be permitted to generate more interference than indicated in this analysis. The location of UK assignment G–10104/37 is shown below in Figure 3.1.

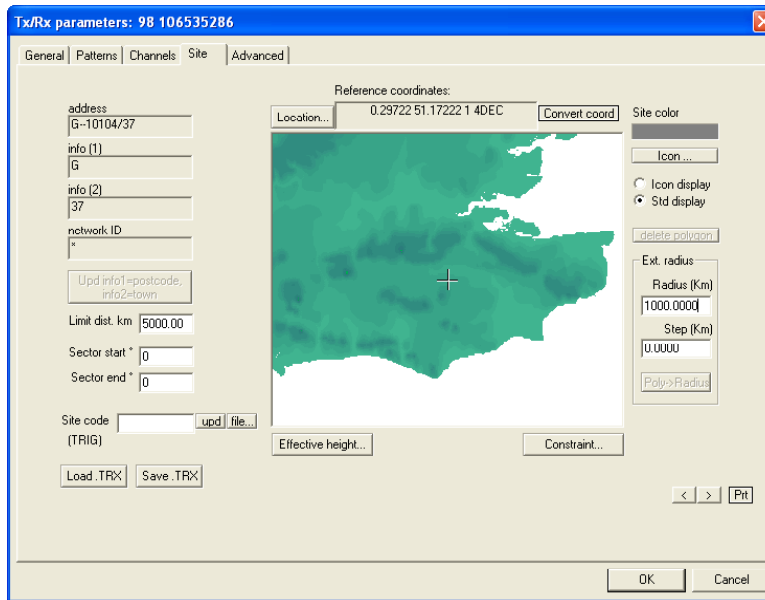


Figure 3.1: UK Assignment G–10104/37

The GE06 plan details for this site state an ERP 36dBW (4kW) and a mast height of 50m. An interference prediction using these parameters is shown below, in Figure 3.2.

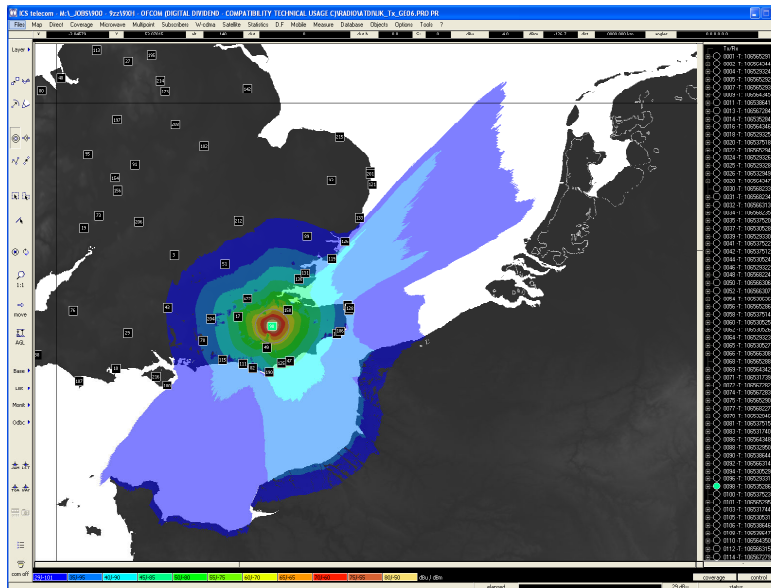


Figure 3.2: UK Assignment G–10104/37 – Interference Plot

From this prediction we note that the 29dBµV/m interfering field strength stated in the bilateral agreement for the French coast has been exceeded over a considerable area. To meet the coordination requirement the UK transmitter power was reduced by 7dB from 90 to 190 degrees and 2dB from 195 to 225 degrees, as shown in Figure 3.3.

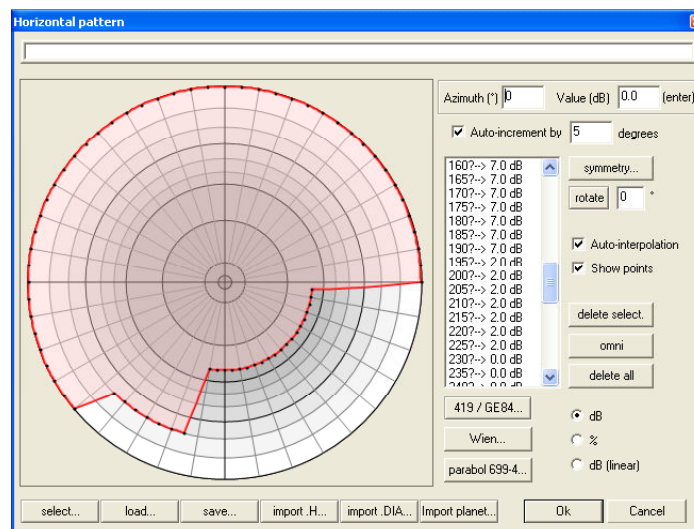


Figure 3.3: UK assignment G–10104/37 – Transmitter Adjustments

The revised interference prediction is shown in Figure 3.4.

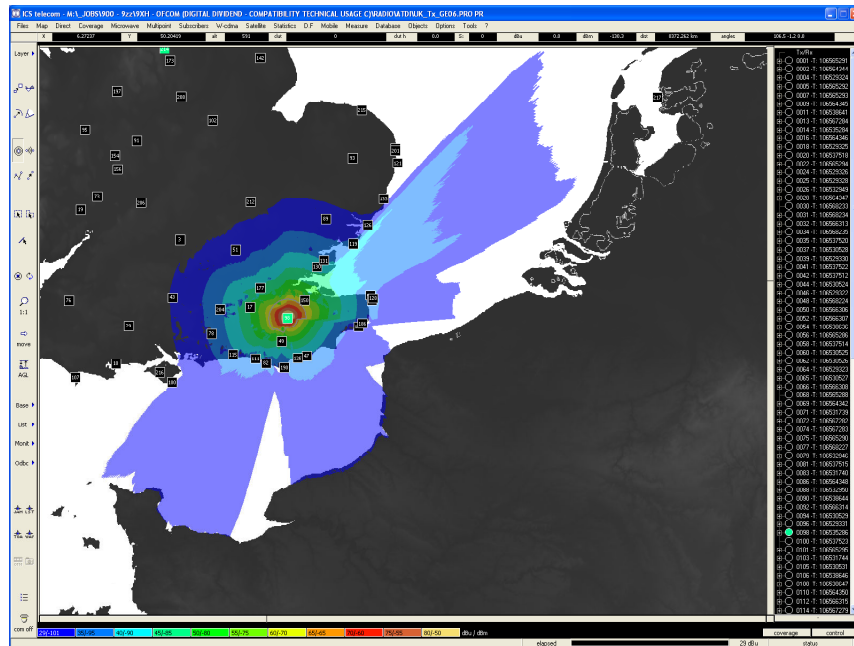


Figure 3.4: UK assignment G–10104/37 – Meeting the Coordination Requirement

3.2 Interference from Holland to UK example

This section details how the Holland HOL0303-35 sites were adjusted to met the stated coordination requirements within the bilateral agreement between Holland and the UK. We have highlighted UK service areas in Figure 3.5 that suffer excessive interference.

The relevant UK service areas and permitted field strengths at their respective boundaries are:

- G—11500/35 Sudbury, 59dB μ V/m
- G—11596/35 Bornham on Crouch, 51dB μ V/m
- G—11597/35 Rouncefall, 51dB μ V/m
- G—13902/35 Hastingsings. 44dB μ V/m

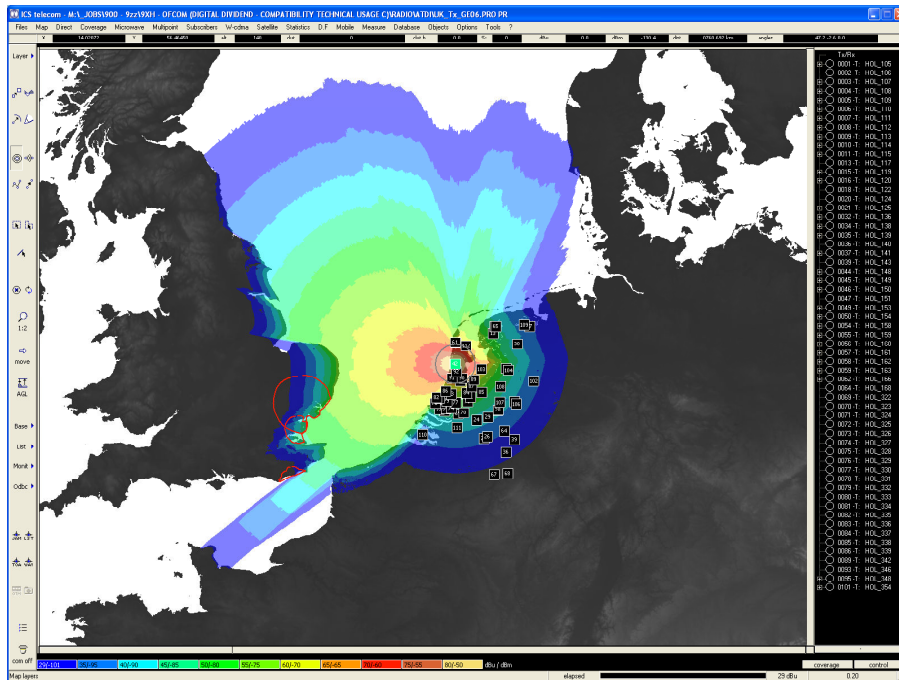


Figure 3.5: Holland HOL0303-35 – Interference Plot

To meet the coordination requirement the transmitter power was reduced by 9dB from 230 to 240 degrees, and by 12dB from 245 to 260 degrees. The revised interference prediction is shown in Figure 3.6.

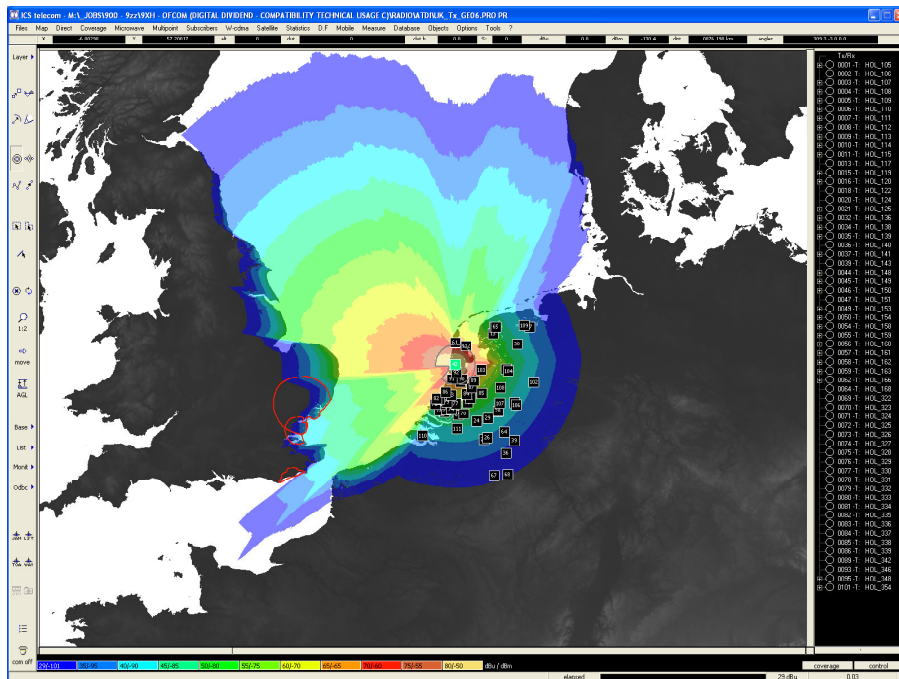


Figure 3.6: Holland HOL0303-35 – Meeting the Coordination Requirement

Appendix A
UK Exported Interference Plots

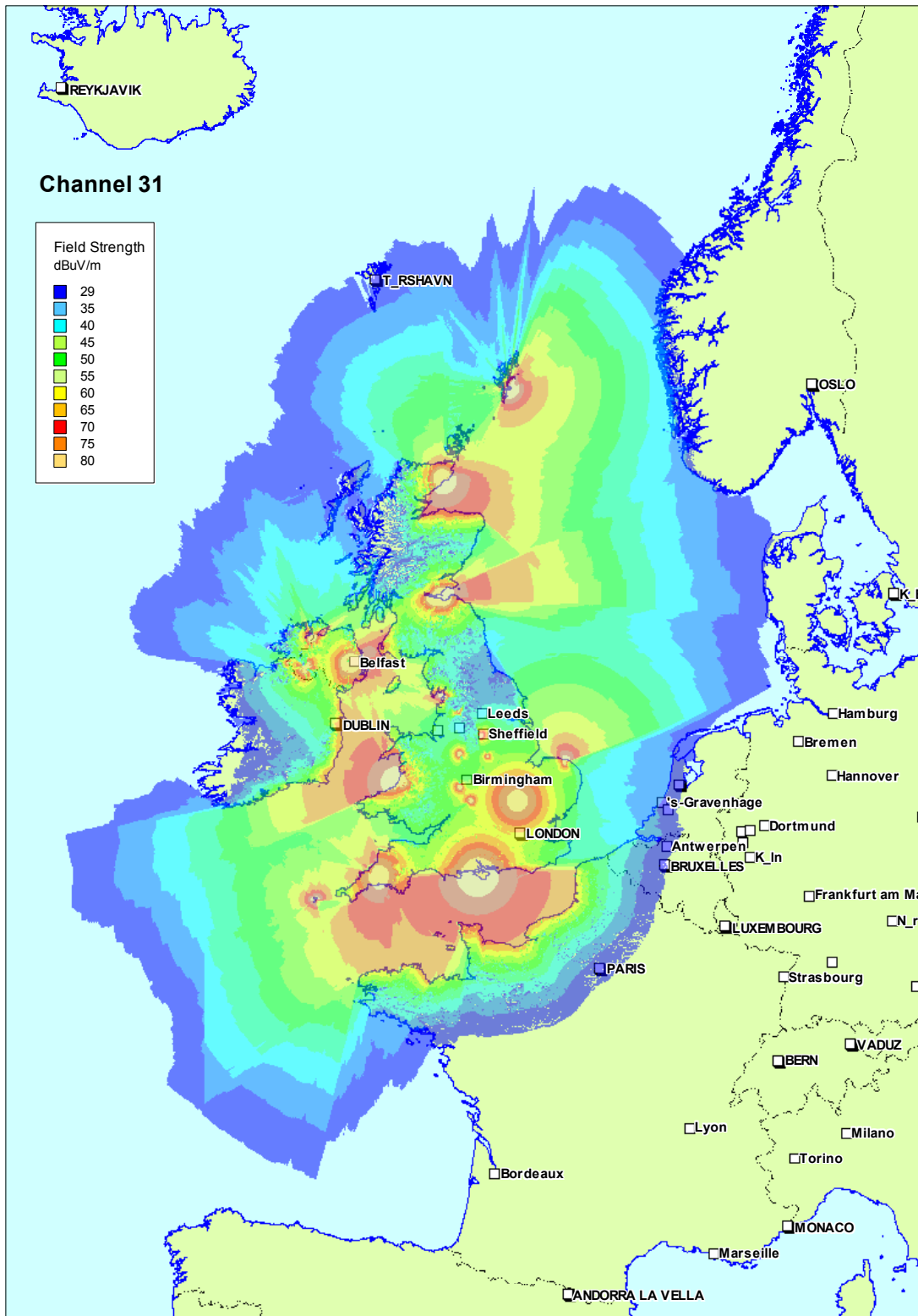


Figure A.1: Channel 31 Coordinated UK Exported Interference