Programme Making and Special Events

High power PMSE applications in the lower two megahertz of Channel 38 (606-614 MHz)

Consultation

Publication date: 18 December 2012

Closing Date for Responses: 22 January 2013

Contents

Section 1

Executive summary

1.1 This document consults on a proposal to permit the use of two 200 kHz channels in the band 606-608 MHz for high power Programme Making and Special Events (PMSE) applications. We also explain our associated decision to allow these high power users to continue to operate in channel 69 beyond the end of 2012 (which is the deadline for all other PMSE licensed use to cease), up to the date of our award of 800 MHz and 2.6 GHz.

1.2 High power PMSE refers to audio links operating above 50 mW. Typical applications operate between 1 W and 10 W ERP to provide audio links for a number of services including studio to (broadcast) transmitter links (STLs) for short term broadcasts such as Restricted Service Licences (RSL) and high power microphones at sporting and other major events such as the Open Golf Championship.

1.3 As part of the clearance of the 800 MHz band we made channel 38 available as the replacement for channel 69. At the time channel 38 was restricted to low power PMSE applications only ie. wireless microphones and in ear monitors as our analysis showed there was a risk of interference from high power PMSE applications to the Radio Astronomy Service (RAS) operating in channel 38 in neighbouring administrations. This analysis considered the case where high power PMSE was operating within the RAS allocation at 608-614 MHz.

1.4 We have looked again at the spectrum options for high powered users and our recent analysis, detailed in Annex 5, examines the coexistence of high power PMSE in the lower two megahertz of channel 38, 606-608 MHz, with the adjacent RAS allocation.

1.5 The analysis presented in this consultation concludes that high power PMSE can operate in 606-608 MHz without causing harmful interference to the RAS in neighbouring administrations.

1.6 There is a risk that high power PMSE will interfere with low power PMSE. However, based on the low density of high power use and that low power users can tune to another PMSE channel in channel 38 (which they would do if they received interference from another low power user) we think that it is disproportionate to not allow high power use in the band in order to protect low power PMSE.

1.7 Based on our conclusions we propose that high power PMSE can access two channels in the lower two megahertz of channel 38, 606.7 MHz and 607 MHz, at a maximum ERP of 10 W.

1.8 Because of the delay in identifying suitable spectrum, high power PMSE users who are eligible for funding under the Channel 69 Funding Scheme have been unable to progress their claims and take steps to replace or modify their equipment. We have therefore decided to allow this small number of users extended access to channel 69 beyond the deadline of 31 December 2012 up to our 800 MHz award date. We make this exception to the deadline only in this specific case because of the continued uncertainty around alternative spectrum since the funding scheme was set up. We continue to maintain the deadline of the end of the year for all other users to cease operation in channel 69.

1.9 The analysis presented in this document represents an Impact Assessment, as defined in section 7 of the Communications Act 2003 (the Act). Further copies may be obtained from www.ofcom.org.uk or from Ofcom at Riverside House, 2a Southwark Bridge Road, London SE1 9HA. Comments on the proposals outlined in this document are invited by **5pm 22 January 2013**. We expect to release a Statement on this consultation in **January** 2013, having taken into account stakeholder responses to our proposal.

Section 2

Proposal

Background

2.1 In 2009 we decided to clear the 800 MHz band (790-862 MHz, TV channels 61-69) so it matches the spectrum being released in other European countries. This decision benefits citizens and consumers as the spectrum can be made available for new mobile broadband services. Because of this PMSE use of the 800 MHz band will cease on 31 December 2012.

2.2 Channel 69, (854-862 MHz), available for PMSE use until 31 December 2012, provided exclusive UK wide access to spectrum for PMSE. Channel 69 was arranged to provide 14 discrete 200 kHz channels for low power PMSE with high power applications interleaved between the low power channels.

2.3 Low power use is considered to be PMSE applications with a radiated power less than 50 mW, typically wireless microphones and in ear monitors. Low power use was authorised by the UK UHF Shared Licence which permitted access to all 14 (low power) channels within channel 69 anywhere in the UK. Users had to accept the risk that another authorised user in the same location might cause interference and they would need to coordinate between themselves to resolve the problem. UHF Shared licences could be 12 or 24 months duration.

2.4 High power use is considered to be PMSE applications with a radiated power greater than 50 mW, typically used for audio links operating between 1 W and 10 W ERP. These links are employed in various scenarios such as studio to (broadcast) transmitter links (STLs) for short term broadcasts such as Restricted Service Licences (RSL) and high power microphones at sporting and other major events such as the Open Golf Championship. In channel 69 audio links were authorised by a Standard Licence which permitted access to a designated (PMSE) channel within channel 69 at a defined location for a specified period.

2.5 In 2011 there were 218 high power assignments for audio links supporting various events.

2.6 In clearing channel 69, as part of the 800 MHz clearance, we made a commitment to:

- provide replacement spectrum and maintain PMSE access to channel 69 during the changeover period; and
- provide funding to eligible PMSE users who were affected by us clearing channel 69.

2.7 To realise the above commitments we allocated channel 38 (606-614 MHz) as the replacement for channel 69 and set up the Channel 69 Funding Scheme to provide funding for the residual value of equipment (or the cost of modification) so that eligible PMSE users would be left in an equivalent position as if we had not decided to clear channel 69. Both high power and low power PMSE licensees were entitled to funding providing the eligibility criteria were met.

2.8 We were able to allocate channel 38 for PMSE as the requirement to protect UK radio astronomy observations in this band was to end by the beginning of 2012 (the UK RAS vacated channel 38 in September 2011).

2.9 The Radio Astronomy Service continues to make use of channel 38 in neighbouring administrations. Observations in the band 608-614 MHz takes place at the following locations[1]:

- Westerbörk, the Netherlands (330 km from UK coastline).
- Effelsberg, Germany (400 km from UK coastline)
- Humain, Belgium (300 km from UK coastline)
- Nançay, France (400 km from UK coastline)

2.10 The UK has an obligation to protect these sites in accordance with the protection criteria detailed in Recommendation ITU-R RA.769. Analysis against this Recommendation indicated that there was a significant risk that high power PMSE applications would interfere with the RAS, most significantly at Westerbörk due to the Single Dish observation mode employed[2] and its proximity to the UK.

2.11 In our interim statement "Programme-making and special events: Future spectrum management, access and availability" published on 15 April 2010[3] we outlined the arrangements for different types of PMSE user moving from channel 69 to channel 38 or other replacement spectrum.

2.12 The Interim Statement concluded that high powered PMSE applications that could operate in channel 69 would not be allowed to operate in channel 38 in order to satisfy our obligation to protect the RAS in neighbouring administrations, specifically Westerbörk in the Netherlands. This decision was based on the analysis that showed a high risk of interference into the RAS from high powered PMSE.

Analysis of options for high power PMSE

2.13 In the Interim Statement we identified the band 1517-1525 MHz as a possible solution for these high power applications. However, discussions with affected stakeholders has shown that this band is not suitable due to propagation characteristics and, for some applications, no equipment availability.

2.14 Other options have been explored to identify replacement spectrum including options in VHF, within the interleaved band (470-790 MHz) and at 469 MHz. It is clear that while these solutions provide alternative spectrum all have limitations and do not provide the same utility as that enjoyed in channel 69.

2.15 We looked again at access to channel 38 and found the analysis previously carried out considered the impact of high power PMSE operating within the RAS allocation of 608-614 MHz only. It did not assess the impact of high power PMSE outside the RAS allocation but within channel 38 ie in the band 606-608 MHz. The analysis in Annex 5 examines this scenario and demonstrates that there is no risk of harmful

[1] As referenced by the Committee on Radio Astronomy Frequencies (CRAF). CRAF is a committee of the European Science Foundation www.craf.eu
[2] Single Dish observation mode has the lowest threshold interference level of -253 dB(W/m^2 · Hz)
[3] http://stakeholders.ofcom.org.uk/consultations/bandmanager09/statement

interference to the RAS from high power PMSE operating below 608 MHz. Therefore, the preferred option would be to provide access to channel 38 for high power PMSE applications.

Benefits

2.16 The allocation of two 200 kHz channels for high power PMSE use in channel 38 provides replacement spectrum with broadly the same utility and technical characteristics as that enjoyed in channel 69 and meets the requirements of high power users.

Impacts

2.17 The band is used for Radio Astronomy in a number of neighbouring countries and there is an obligation on the UK to protect this service. Nevertheless, our analysis shows that there is no risk of interference to the RAS in neighbouring administrations from high power PMSE in the lower two megahertz of channel 38

2.18 We recognise that there is an increased risk of interference to low power PMSE use in channel 38 if high power use is permitted. It is difficult to determine where this interference would take place as we cannot know the locations where low power PMSE operates as it is under a UK wide shared licence. However, based on the low density of high power use and that low power users can tune to another PMSE channel in channel 38 (which they would do if they received interference from another low power user) we think that the risk of interference to low power users is small.

2.19 Our decision not to allow high power use in channel 38 was based on the requirement to protect the RAS in neighbouring administrations and not to protect low power use in channel 38. As the analysis shows that high power use is compatible with RAS, and for the reasons outlined above, we think that it is disproportionate to not allow high power use in the band in order to protect low power PMSE.

Extending access to channel 69

2.20 Because of the delay in identifying suitable replacement spectrum, high power PMSE users who are eligible for funding under the Channel 69 Funding Scheme have been unable to progress their claims and take steps to replace or modify their equipment. We have therefore decided to allow this small number of users extended access to channel 69 beyond the deadline of 31 December 2012 up to our 800 MHz and 2.6 GHz award.

2.21 This extension means that they can continue to operate during this consultation period and, subject to the consultation outcome, during the process of changing their equipment. We make this exception to the deadline only in this specific case because of the continued uncertainty around alternative spectrum for these users since the funding scheme was set up. We continue to maintain the deadline of the end of the year for all other PMSE users to cease operation in channel 69.

Impact assessment and equality impact assessment

2.22 The analysis presented in this document represents an impact assessment, as defined in section 7 of the Act[4]. For further information about our approach to impact assessments, see the guidelines "Better policy-making: Ofcom's approach to impact assessment"[5]. Following an initial assessment of our proposal we considered that it was reasonable to assume that any impacts on consumers and citizens arising from this proposal would not differ significantly between groups or classes of UK consumers and citizens.

Consultation question

2.23 We propose that two 200 kHz channels in channel 38 at 606.7 MHz and 607 MHz are made available for high power PMSE with a maximum ERP of 10 dBW.

Question 1: Do you agree with our proposal to allow high power PMSE use on 606.7 MHz and 607 MHz at a maximum of 10 W ERP?

Next steps

2.24 We welcome stakeholder feedback to this consultation document. The deadline to submit responses to us is **5pm** on **22 January 2013**. We expect to release a Statement on this consultation in January 2013 having taken into account stakeholder responses to our proposals.

[4] www.opsi.gov.uk/acts/acts2003/pdf/ukpga_20030021_en.pdf .
[5] Which are on our website at http://www.ofcom.org.uk/about/policies-and-guidelines/better-policy-making-ofcoms-approach-to-impact-assessment/

Annex 1

Responding to this consultation

How to respond

A1.1 Ofcom invites written views and comments on the issues raised in this document, to be made **by 5pm on 22 January 2013**.

A1.2 Ofcom strongly prefers to receive responses using the online web form at http://stakeholders.ofcom.org.uk/consultations/pmse-channel-38/howtorespond/form, as this helps us to process the responses quickly and efficiently. We would also be grateful if you could assist us by completing a response cover sheet (see Annex 3), to indicate whether or not there are confidentiality issues. This response coversheet is incorporated into the online web form questionnaire.

A1.3 For larger consultation responses - particularly those with supporting charts, tables or other data - please email vaughan.john@ofcom.org.uk attaching your response in Microsoft Word format, together with a consultation response coversheet.

A1.4 Responses may alternatively be posted or faxed to the address below, marked with the title of the consultation.

Vaughan John
Spectrum policy Group
Ofcom
Riverside House
2A Southwark Bridge Road
London SE1 9HA

A1.5 Note that we do not need a hard copy in addition to an electronic version. Ofcom will acknowledge receipt of responses if they are submitted using the online web form but not otherwise.

A1.6 It would be helpful if your response could include a direct answer to the question asked in this document, which is listed at Annex 4. It would also help if you can explain why you hold your views and how Ofcom's proposals would impact on you.

Further information

A1.7 If you want to discuss the issues and questions raised in this consultation, or need advice on the appropriate form of response, please contact Vaughan John on 020 7981 3093.

Confidentiality

A1.8 We believe it is important for everyone interested in an issue to see the views expressed by consultation respondents. We will therefore usually publish all responses on our website, www.ofcom.org.uk, ideally on receipt. If you think your response should be kept confidential, can you please specify what part or whether

all of your response should be kept confidential, and specify why. Please also place such parts in a separate annex.

A1.9 If someone asks us to keep part or all of a response confidential, we will treat this request seriously and will try to respect this. But sometimes we will need to publish all responses, including those that are marked as confidential, in order to meet legal obligations.

A1.10 Please also note that copyright and all other intellectual property in responses will be assumed to be licensed to Ofcom to use. Ofcom's approach on intellectual property rights is explained further on its website at http://www.ofcom.org.uk/about/accoun/disclaimer/

Next steps

A1.11 Following the end of the consultation period, Ofcom intends to publish a statement in January 2013.

A1.12 Please note that you can register to receive free mail Updates alerting you to the publications of relevant Ofcom documents. For more details please see: http://www.ofcom.org.uk/static/subscribe/select_list.htm

Ofcom's consultation processes

A1.13 Ofcom seeks to ensure that responding to a consultation is easy as possible. For more information please see our consultation principles in Annex 2.

A1.14 If you have any comments or suggestions on how Ofcom conducts its consultations, please call our consultation helpdesk on 020 7981 3003 or e-mail us at consult@ofcom.org.uk . We would particularly welcome thoughts on how Ofcom could more effectively seek the views of those groups or individuals, such as small businesses or particular types of residential consumers, who are less likely to give their opinions through a formal consultation.

A1.15 If you would like to discuss these issues or Ofcom's consultation processes more generally you can alternatively contact Graham Howell, Secretary to the Corporation, who is Ofcom's consultation champion:

Graham Howell
Ofcom
Riverside House
2a Southwark Bridge Road
London SE1 9HA

Tel: 020 7981 3601

Email Graham.Howell@ofcom.org.uk

Annex 2

Ofcom's consultation principles

A2.1 Ofcom has published the following seven principles that it will follow for each public written consultation:

Before the consultation

A2.2 Where possible, we will hold informal talks with people and organisations before announcing a big consultation to find out whether we are thinking in the right direction. If we do not have enough time to do this, we will hold an open meeting to explain our proposals shortly after announcing the consultation.

During the consultation

A2.3 We will be clear about who we are consulting, why, on what questions and for how long.

A2.4 We will make the consultation document as short and simple as possible with a summary of no more than two pages. We will try to make it as easy as possible to give us a written response. If the consultation is complicated, we may provide a shortened Plain English Guide for smaller organisations or individuals who would otherwise not be able to spare the time to share their views.

A2.5 We will consult for up to 10 weeks depending on the potential impact of our proposals.

A2.6 A person within Ofcom will be in charge of making sure we follow our own guidelines and reach out to the largest number of people and organisations interested in the outcome of our decisions. Ofcom's 'Consultation Champion' will also be the main person to contact with views on the way we run our consultations.

A2.7 If we are not able to follow one of these principles, we will explain why.

After the consultation

A2.8 We think it is important for everyone interested in an issue to see the views of others during a consultation. We would usually publish all the responses we have received on our website. In our statement, we will give reasons for our decisions and will give an account of how the views of those concerned helped shape those decisions.

Annex 3

Consultation response cover sheet

A3.1 In the interests of transparency and good regulatory practice, we will publish all consultation responses in full on our website, www.ofcom.org.uk.

A3.2 We have produced a coversheet for responses (see below) and would be very grateful if you could send one with your response (this is incorporated into the online web form if you respond in this way). This will speed up our processing of responses, and help to maintain confidentiality where appropriate.

A3.3 The quality of consultation can be enhanced by publishing responses before the consultation period closes. In particular, this can help those individuals and organisations with limited resources or familiarity with the issues to respond in a more informed way. Therefore Ofcom would encourage respondents to complete their coversheet in a way that allows Ofcom to publish their responses upon receipt, rather than waiting until the consultation period has ended.

A3.4 We strongly prefer to receive responses via the online web form which incorporates the coversheet. If you are responding via email, post or fax you can download an electronic copy of this coversheet in Word or RTF format from the 'Consultations' section of our website at www.ofcom.org.uk/consult/.

A3.5 Please put any parts of your response you consider should be kept confidential in a separate annex to your response and include your reasons why this part of your response should not be published. This can include information such as your personal background and experience. If you want your name, address, other contact details, or job title to remain confidential, please provide them in your cover sheet only, so that we don't have to edit your response.

Cover sheet for response to an Ofcom consultation

BASIC DETAILS

Consultation title:

To (Ofcom contact):

Name of respondent:

Representing (self or organisation/s):

Address (if not received by email):

CONFIDENTIALITY

Please tick below what part of your response you consider is confidential, giving your reasons why

Nothing ☐

Whole response ☐

Part of the response ☐

Name/contact details/job title ☐

Organisation ☐

If there is no separate annex, which parts?

If you want part of your response, your name or your organisation not to be published, can Ofcom still publish a reference to the contents of your response (including, for any confidential parts, a general summary that does not disclose the specific information or enable you to be identified)?

DECLARATION

I confirm that the correspondence supplied with this cover sheet is a formal consultation response that Ofcom can publish. However, in supplying this response, I understand that Ofcom may need to publish all responses, including those which are marked as confidential, in order to meet legal obligations. If I have sent my response by email, Ofcom can disregard any standard e-mail text about not disclosing email contents and attachments.

Ofcom seeks to publish responses on receipt. If your response is non-confidential (in whole or in part), and you would prefer us to publish your response only once the consultation has ended, please tick here. ☐

Name

Signed (if hard copy)

Annex 4

Consultation question

A4.1 The question contained in this consultation is:

Question 1: Do you agree with our proposal to allow high power PMSE use in channel 38 on 606.7 and 607 MHz at a maximum of 10 W ERP?

Annex 5

Interference analysis from high power PMSE into Radio Astronomy

A5.1 Radio astronomy receivers are very sensitive and can detect very weak signals. Accordingly the protection requirements are stringent and are defined in Recommendation ITU-R RA.769*, Protection criteria used for radio astronomical measurements*, with the most exacting being the protection of Single Dish operation.

A5.2 From ITU-R RA.769 we get:

- Threshold interference level = -253 dBW/m^2/Hz, or;
- -185.2 dBW/m^2 over 6 MHz (608-614 MHz), or;
- -39 dBµV/m (in 6 MHz)

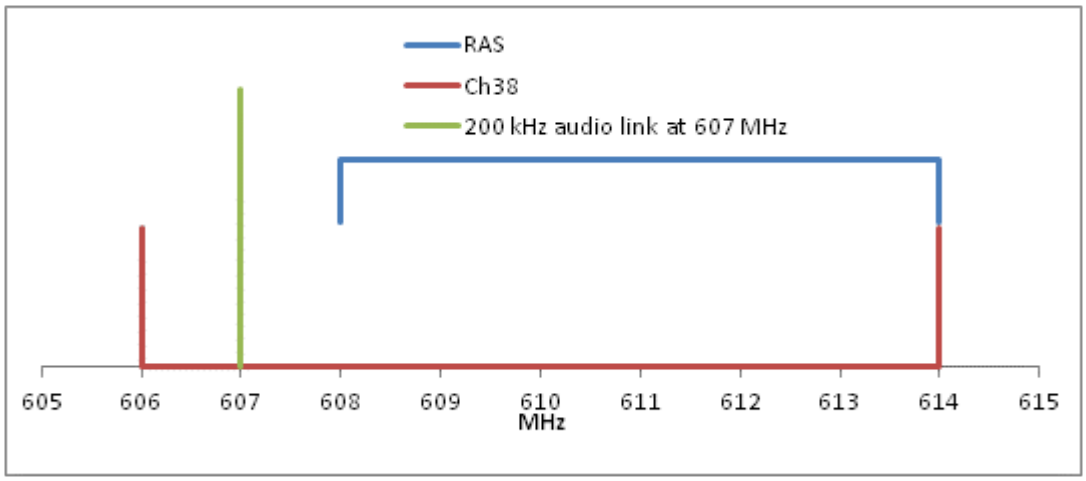
A5.3 Westerbörk, in the Netherlands, operates a single dish antenna and must, therefore, be protected to this level. Westerbörk is approximately 330 km from the UK coastline and is located at:

- 06° 36’ 15” (6.6042°)E, 52° 55’ 01” (52.9169°)N

A5.4 This analysis only considers the interference to Westerbörk due to the Single Dish observation mode employed and its proximity to the UK. Other observatories either use a different observation mode requiring less protection or are further from the UK.

A5.5 Channel 38 covers the band 606-614 MHz with the RAS allocation being a sub-band from 608-614 MHz. When assessing the impact of high power PMSE on the RAS previous analysis only considered the protection requirements from a PMSE transmission within the RAS allocation. The analysis presented here explores the effect of high power PMSE operating at 607 MHz ie adjacent to the RAS allocation. Figure 1 illustrates this.

Figure 1: Channel 38 with the RAS allocation overlaid



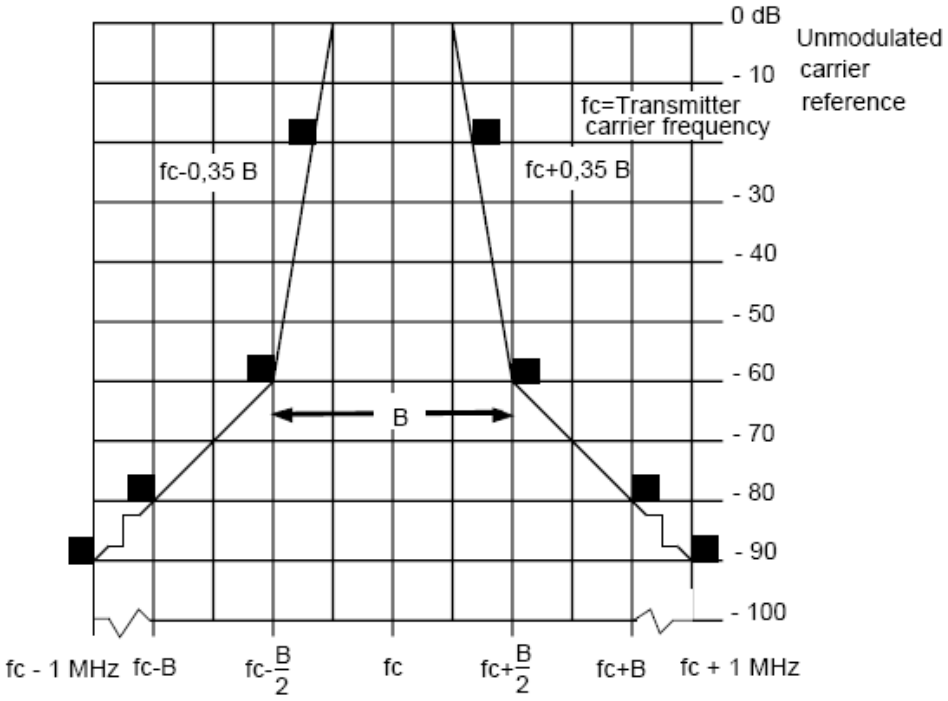
Source: Ofcom technical analysis

Audio link

A5.6 High power PMSE is applications are typically for wide band (200 kHz) audio links. The transmission mask and spurious emission levels used in this analysis are taken from the ETSI harmonised Standard EN 300454: *Electromagnetic compatibility and Radio spectrum Matters (ERM); Wide band audio links*. Figure 2 gives the transmission mask of a wide band audio link defined in EN 300454.

Figure 2: transmission mask of a wide band audio link (ETSI EN 300454)

NOTE: If the spectrum is outside the mask then the transmitter may be declared compliant within the next larger channel bandwidth defined in subclause 5.1, subject to the agreement of the manufacturer. If the spectrum is outside the 200 kHz mask, the equipment shall be deemed not compliant.



A5.7 Beyond ±1 MHz the limits are in the spurious domain. Table 1 and 2 provide the spurious emission limits as defined in EN 300454.

Table 1: Radiated spurious power limits for frequencies greater than ±1 MHz (ETSI EN 300454)

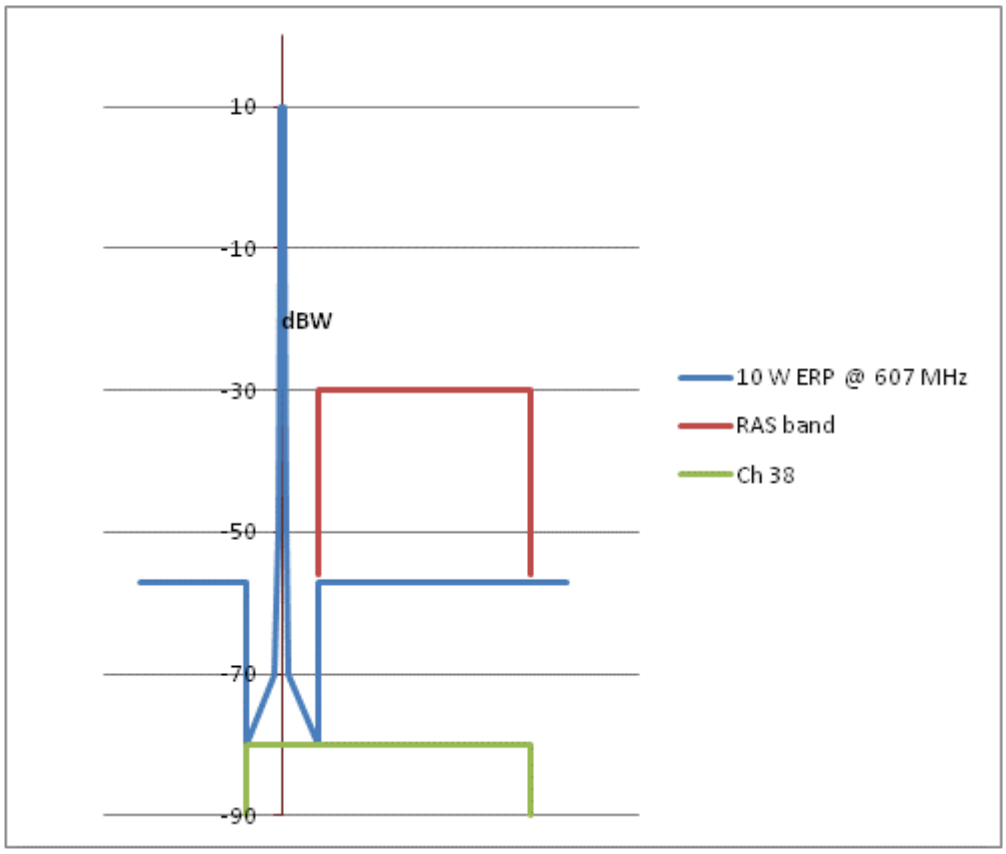
Transmitter power	Radiated spurious power limit	
	Frequencies below 1 000 MHz	Frequencies above 1 000 MHz
Up to 1 W	250 nW	1 µW
Up to 10 W	250 nW	1 µW
Above 10 W	250 nW	1 µW
Standby	2 nW	20 nW

Table 2: Measuring receiver bandwidth (ETSI EN 300454)

Frequency being measured: (f)	Measuring receiver bandwidth
150 kHz < f < 30 MHz	9 kHz to 10 kHz
30 MHz < f < 1 000 MHz	100 kHz to 120 kHz
f >1 000 MHz ≥	1 MHz

A5.8 Applying EN 300454 to a 10 W, 200 kHz audio link transmission at 607 MHz we have the following emission mask as shown in Figure 3.

Figure 3: Emission mask for 200 kHz, 10 W audio link at 607 MHz



Source: Ofcom technical analysis

A5.9 As can be seen in Figure 3 the spectrum emission mask across the RAS band is flat. This is 1 MHz from the PMSE channel and is the spurious emission domain. According to EN 300454 this has an 'absolute' level of 1 µW/100 kHz. For a 200 kHz audio link signal with a centre frequency of 607 MHz ie 1 MHz from lower frequency boundary of RAS channel, power in the RAS channel is:

- 1 µW/100 kHz = -60 dBW/100 kHz; or for power across the whole band;
- -42.2 dBW/6 MHz (for analysis this can be considered as the equivalent co-channel ERP of the interferer).
- For an audio link transmitting at 10 W ERP the out of band power is the same as the spurious emissions at a frequency separation of 140 kHz from the RAS boundary, 608 MHz. At Δf greater than 140 kHz OOB power is less than spurious.

Analysis

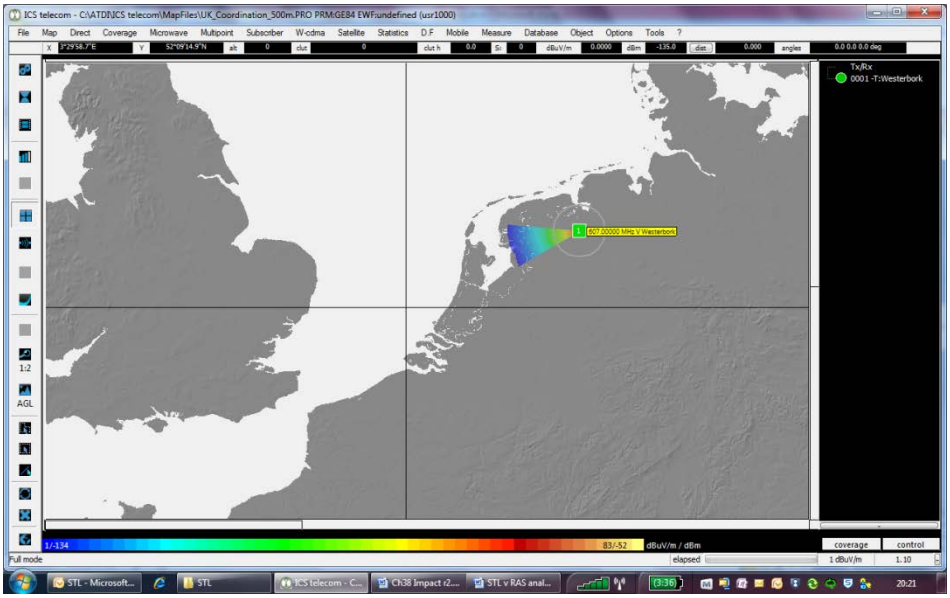
A5.10 Based on the above spurious emission limits from EN 300454 and:

- Equivalent co-channel ERP -42.2 dBW/6 MHz or 60.3 µW
- Transmitting (audio link) antenna height = 20 m
- Receiving (RAS) antenna height = 50 m

- Time interference threshold is exceeded = 10%

A5.11 Figure 4 shows the separation distance calculated for the above criteria based on the propagation model Recommendation ITU-R P.452, *Prediction procedure for the evaluation of microwave interference between stations on the surface of the Earth at frequencies above about 0.7 GHz.* As can be seen the separation distance is approximately 100 km and shows that audio links can be deployed in the lower two megahertz of channel 38 without interfering with the RAS in the Netherlands.

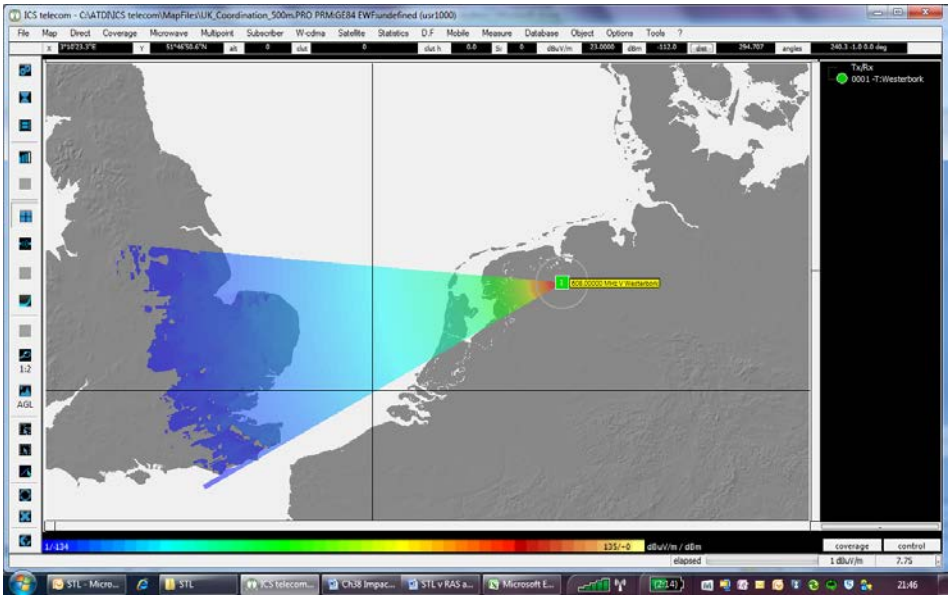
Figure 4: Separation distance from Westerbörk for a 200 kHz audio link. (From ITU-R P.452, 607 MHz, 10% time)



Source: Ofcom technical analysis

A5.12 By comparison a 10 W audio link within the RAS allocation has the separation distance illustrated in Figure 5. This is consistent with the results from the previous analysis.

Figure 5: Separation distance from Westerbörk for a 200 kHz audio link. (From ITU-R P.452 607 MHz, 10% time)



Source: Ofcom technical analysis

Conclusion

A5.13 High power audio links can be deployed in channel 38 and still protect the RAS in the Netherlands providing the assigned channels are below 608 MHz. If ERP is limited to 10 dBW then audio links can be deployed up to 607.86 MHz before the interfering power starts to increase beyond that derived from the spurious emission limit.

A5.14 There is some risk of high power users interfering with low power microphones. However, based on the low density of high power use, 218 assignments in 2011, and that low power users can tune to another PMSE channel in channel 38 we think that the risk of interference is acceptably low.