

Arqiva Submission: Ofcom Consultation ‘Changes to the digital television and digital radio technical codes’

Arqiva welcomes the opportunity to respond to the Ofcom consultation on Changes to the digital television and digital radio technical codes.

Arqiva is a communications, infrastructure and media services company at the heart of the broadcast and utilities sectors in the UK. We deliver broadcast television and radio services nationally and provide satellite data and gateway services. We also provide machine-to-machine connectivity for smart metering within the energy and water sectors.

Set out below is our response to the consultation questions.



Response to consultation questions

Question 1

Do you agree with our proposals for adding requirements to the Television Technical Code and Digital Radio Technical Code relating to resilience of broadcast networks and access services?

Arqiva supports Ofcom’s efforts to address the issue of network resilience through use of the technical codes and its proposals to amend the technical codes to include additional reporting requirements such that in future broadcast licence holders and DTT multiplex operators (together, “**Broadcast Stakeholders**”) would be obliged to provide regular updates on their progress towards meeting the recommendations set out in the Ofcom review of the Fire (the “**Ofcom Review**”).

Specific comments in relation to Arqiva’s position as a DTT multiplex licence holder

Arqiva has a number of specific comments in its capacity as a DTT multiplex licence holder (“**Arqiva Muxco**”). Arqiva Muxco agrees that the proposed change to section 4.4 of the Technical Performance code to include disaster recovery reporting is sensible, on the basis that such a reporting requirement is proportionate to the ability of Multiplex Operators to respond to disaster recovery situations such as when constrained by the availability of access to RF spectrum.

Note however that the consultation refers to a description of ‘any’ disaster recovery tests that have been carried out whereas the wording in the draft Television Technical Performance Code document has omitted the word ‘any’. The implication of the omission is that exercises will be carried out to test the plans. The draft Television Technical Performance Code should be amended so that it exactly corresponds with the consultation and therefore makes clear that all details of ‘any’ exercises undertaken to test the plans, are covered. .

We are interpreting the wording around reporting on any disaster recovery tests to mean that that this is only needed if a test/exercise is actually carried out. In other words, this is not making it a

condition that a disaster recovery test/exercise has to be undertaken each year. If one is done then it will be reported in the annual report.

In response to items 3.12 and 3.13, these are sensible and pragmatic additions, but they only relate to the commercial PSB service services ITV1, Channel4 and Channel5. As such, we agree that these items do not create any requirement for other services from these operators carried on the Commercial DTT multiplexes.

Specific comments in relation to Arqiva's position as a digital radio multiplex licence holder

Arqiva recognises the position taken by Ofcom with respect to adding requirements to the Digital Radio Technical Code relating to resilience of broadcast networks.

Arqiva continues to include resilience in the designs of the current and future DAB broadcast systems and to implement them for services for customers and where Arqiva is the multiplex licence holder.

Question 2

Do you have any comments on our proposed changes to the DAB Technical Policy Guidance relating to the process of transmitter approvals? In particular, do you have any comments on our proposed sensitivity analysis, or on whether we should require or permit applicants to provide both horizontal and vertical antenna pattern information?

Arqiva welcomes Ofcom's engagement with licence holders with regard to identifying a workable approach to analysis of ACI hole punching, and agrees with Ofcom that the interim procedures have worked well for the introduction of small-scale DAB. We welcome the formalisation of these procedures, and believe that it maintains a pragmatic balance between the burden placed upon existing licensed multiplex operators and the technical resources required by small-scale DAB licence awardees. We fully support Ofcom continuing to undertake ACI hole blocking predictions and making them available to both existing and new licensed operators.

We understand the desire of Ofcom to further streamline the process and to introduce a sensitivity analysis for 'real world' impacts of new sites. Arqiva welcomes the aim to reduce the administrative burden on all parties, as long as the outcomes remain the same. Some of the proposed improvements to the process are supported by Arqiva, although we do have some concerns regarding the thresholds proposed for the sensitivity analysis. Below we comment upon each proposed change:

Guidance significance thresholds for predicted impacts

Arqiva welcomes the use of guideline predicted impacts as a benefit to all parties with regards to defining acceptable impacts. We also believe that the proposed impacts of 25 households; or 150m of major roads in towns; or 400m of major roads in areas where traffic is usually likely to be flowing at the national speed limit are pragmatic and set the right balance between protecting existing services and allowing new licenses. As discussed further below with regards to sensitivity analysis, we believe these limits will mean that most households impacted would likely find another location which works within their premises if reception is lost, or for roads short glitches

in outdoor reception would result which would be limited in time so that a listener in a vehicle is unlikely to start tuning away before reception recovers.

Vertical radiation pattern information

Arqiva supports the intention of using vertical radiation pattern information in order to improve the accuracy of predictions. For antenna systems that Arqiva provides, 3D patterns are produced as a matter of course for new antenna developments, although for older antenna systems, the data available may be more limited to the Horizontal Radiation Pattern (HRP) and the Vertical Radiation Pattern (VRP) in the main beam. Arqiva believes that it is desirable and practical to request both Horizontal and Vertical Radiation patterns, with the ability to provide 3D antenna pattern files where available.

It should be noted for 3D antenna patterns that Arqiva is aware that there are different file formats available within the market, (for example formats from different antenna providers or from different antenna modelling tools). As a result, we would propose that either a standard or acceptable file format, (or formats), will need to be specified by Ofcom. Alternatively, a description of the file format will need to be provided alongside any 3D antenna pattern file provided. An example would be to specify any file header information; to specify the azimuth and declination angles of the start point of the data; and to specify whether antenna gain unit is dBd or dBi, such that the data can be read correctly by prediction software.

Sensitivity Analysis

Arqiva understands the desire to consider a 'real world' impact compared to a predicted impact. Ofcom are fully aware that planning models for UK broadcasting have been defined in order to provide a high degree of confidence that in declared areas of coverage for robust and interference protected reception is highly likely. For digital radio, this has been defined such that virtually all outdoor locations are served, and it is easy to find a location within a household where good reception can be provided for all coverage prediction pixels declared as served, as shown for Case 1 in the table in paragraph 4.35 of the consultation.

Arqiva also accepts that the areas where ACI blocking will occur is limited to small areas around a new transmitter site, but measurements do show that ACI blocking can be demonstrated in real world conditions, and there are numerous examples of such areas. It is with this in mind that any move to include a sensitivity analysis should be cautious, and we would like to understand further how Ofcom believe that this technique could be introduced and monitored.

Arqiva believes that it is pragmatic to allow for Case 2 as a real-world relaxation, such that if this takes ACI blocking predictions below the thresholds defined above, then the impact can be deemed as negligible. We believe that this would equate to an increased possibility of a short drop-in service for outdoor reception, or a possibility of a listener having to move their receiver for an indoor location, but they could still be very likely to find a position with suitable coverage within their home. However, we do not believe that the same can be said for Cases 3 and 4.

We agree with Ofcom that impacts at Case 4 above the thresholds should be treated as requiring mitigation, but we believe that Case 3 should require a site being brought into service on a trial basis only, with drive testing as a minimum requirement in order to identify any further requirement for mitigation measures.

We also wish to ensure that any relaxation in planning standards is limited purely to the specific case of ACI blocking, where the potential for interference is limited to a specific and known area immediately surrounding a new transmitter location. Robust reception is a key fundamental of UK broadcasting networks, and Arqiva wish to place on record that it cannot be assumed that a similar variation of protection ratios could be considered for co-channel interference cases, where that interference may result over a much wider area of another service and impact a much larger number of listeners.

Question 3

Do you have any comments on our proposals for investigating and potentially permitting use of the non-critical mask?

Arqiva refers Ofcom to its previous consultation response on revisions to the DAB Technical Code in 2019¹ and, in particular, our response to Question 2 of that consultation plus the Technical Annex that was provided. (We provide the text from that response for reference in this response in an annex – see Annex 1 below.) Arqiva’s position remains that we believe measurements need to be provided on the performance of typical receivers and the impact of a change between critical and non-critical masks on the relative performance of transmitter adjacent channel leakage ratio (ACLR) and receiver adjacent channel selectivity (ACS) before any changes are adopted. These measurements would show how important the critical mask filters is to reliable DAB reception, and in which areas or circumstances the use of critical mask filters is required.

Arqiva welcomes Ofcom’s commitment to engage with industry stakeholders and to share the work that is carried out on this matter, but we currently remain with the view that the use of non-critical mask filters is likely to significantly increase the interference to 1st adjacent transmissions in particular, and likely to impair the 2nd adjacent frequency usage too. As a result, we believe that it is very unlikely that non-critical mask filters can be used in areas where 1st and 2nd adjacent frequencies are in use, and that allowing use of non-critical mask filters, even for only low power level transmissions, may constrain flexibility for future frequency allocations in these areas.

Question 4

Do you have any observations on Ofcom’s processes and information we are providing and proposing to provide in relation to acceptance tests and compliance checks? Is there anything missing that would help make the process smoother or easier from your perspective?

Arqiva has been involved in the transmitter acceptance tests over time, both for Arqiva provided services and more recently for a number of Small-Scale DAB services that have chosen to use Arqiva sites for their services.

Arqiva recognises the risk of intermodulation products on sites with existing DAB services and agrees with Ofcom’s view that any change of services on these sites will need to be attended.

¹ https://www.ofcom.org.uk/data/assets/pdf_file/0016/152080/arqiva.pdf

At this stage Arqiva has no more to include in the proposed process.

Question 5

Do you have any comments on the EMF, HbbTV, or document format modifications proposed in this section?

HbbTV has been in common use for some time and, as such, Arqiva regards this change to the technical code to add a reference to HbbTV as sensible to reflect the real world. However, as it is also common to have both a MHEG and HbbTV application running on a service so that you can access the full range of devices then a change is suggested to the proposed wording to add 'and/' so that is allowable to broadcast either or both of the components.

Paragraph 2.38: "Data Services which are broadcast either wholly or as part of a Qualifying service shall be coded using an open standard. It is currently recommended that either the MHEG-5 Broadcast Profile and/or the Hybrid Broadcast Broadband TV (HbbTV) standard be used."

For the addition of the reference to compliance with EMF limits under the Wireless Telegraphy Act, we agree that this is for information only.



About Arqiva

Arqiva is at the heart of the broadcast and utilities sectors in the UK and beyond, providing critical communications infrastructure and media services. Arqiva is the only national provider of terrestrial television and radio broadcasting and provides a machine-to-machine connectivity network for smart metering within the utilities sector.

Arqiva's history can be traced back to 1922 when it broadcast the world's first national radio service. In 1936 it carried the BBC's first television broadcast. In 1978 it enabled Europe's first satellite TV test. By the 1990s Arqiva was working with the UK's mobile operators to bring mobile telecommunications to UK businesses and consumers. In this decade we also launched the UK's national DAB radio and Digital Terrestrial Television networks. Most recently, Arqiva has played a pioneering role in the roll-out of the national smart energy and water metering networks.

Arqiva was a founder member of Digital UK (DUK), Freeview, YouView and Digital Radio UK (DRUK). Freeview is the largest TV platform in the UK delivering over 100 TV and Radio channels to the UK public. Arqiva owns and operates the networks for all of the Freeview multiplex licence holders and is the licence holder for two of the national DTT multiplexes. DRUK works to promote digital radio via liaison with the UK supply chain, business-to-business and consumer marketing. We are also a member of WorldDAB.

We are a shareholder and operator for both commercial national DAB radio multiplexes and transmission provider for the BBC national DAB radio multiplex. We also provide end-to-end transmission services for analogue and digital radio networks for customers including the BBC, Global Radio, Bauer Media and Wireless as well as other independent radio groups.

Through our wholly owned subsidiaries, Now Digital Ltd and Now Digital (Southern) Ltd, and our joint ventures Now Digital (East Midlands) and South West Digital Radio, Arqiva operates 25 local DAB digital radio multiplexes. These multiplexes cover a number of regions of the UK, predominantly in the Midlands, South West and the south of England.

Our major customers include the BBC, Bauer Media, Global Radio, Wireless, ITV, Channel 4, Five, Sky, UKTV, AMC, QVC, and Al Jazeera Networks.

Arqiva is owned by a consortium of infrastructure investors and has its headquarters in Hampshire, with major UK offices in London, Buckinghamshire and Yorkshire and operational centres in the West Midlands and Scotland.

Annex 1 – Response on the proposals for investigating and potentially permitting use of the non-critical mask

Question from the 2019 Digital Radio Technical Code Consultation

Question 2: Do you have any comments on the adoption of the new ETSI mask characteristic and on the potential use of the non-critical spectrum mask?

We recommend that the ETSI Critical Mask continues to be adopted in the UK until there is further information on the performance of receivers.

At present there is a single protection ratio and it is unclear to Arqiva as to which is the dominant effect between ACI or blocking. To that end, we would be keen on exploring with Ofcom the option of working together in the coming weeks and months to take measurements of a range of portable and car receivers to see what the dominant effect is. As the split of the impact between blocking and ACI in the generation of the protection ratios is dependent on the receiver design, so a single protection ratio for all receivers is inappropriate.

It is very difficult to fully predict the impact of using the non-Critical Mask as the numbers and performance of all receivers in the market is unknown. Therefore, we suggest Ofcom continues to use the Critical Mask until Ofcom has a data set of receiver tests which shows the true performance of the Critical and Non-Critical Mask on 1st and 2nd adjacent services. Only at that point and with that knowledge could a truly informed decision be made.

For the avoidance of doubt, the new ETSI Radio Equipment Directive (RED) standards for DAB transmission systems are not yet published but is going through its final drafting. We do not, however, expect the technical element to change. The existing spectrum mask adopted in the UK in 1999 meets the new ETSI RED even with its new definitions on power classes. All existing transmitters deployed by Arqiva meet the RED. We have provided a Technical Annex to this submission which looks at the issues raised in Question 2. This sets out our observations in more detail.

Technical Annex from the 2019 Digital Radio Technical Code Consultation Response

Q2 proposed adoption of the non-Critical Mask

The proportion of the protection ratio consumed by ACS or ACLR is very dependent on the specific frontend design of the DAB receiver under test. (Definitions are provided in the Glossary at the end of this annex.) For example, a receiver with no frontend filtering which has some switchable attenuation followed by a low noise amplifier (LNA) will be very prone to ACS. The LNA will overload when near to an adjacent channel transmitter which is not co-sited with the wanted transmitter and the automatic gain control of the frontend may well start to turn down the gain of the LNA which drives the wanted signal into the noise floor of the receiver plus distortion of the LNA by being over driven by the adjacent channel signal.

It is assumed that these protection ratios come from ETSI TS 103 461.

- Products shall provide adequate audio reception in the presence of interfering DAB signals at specified levels on other frequencies.
- The wanted signal shall be a DAB signal at a level of -70 dBm. The interfering signal shall be a DAB signal with a frequency offset and amplitude as described in table 1.
- Products shall achieve the required selectivity for an interfering signal in all adjacent channels.
- Typically, these protection ratios give a loss of 1 dB C/N in a Gaussian channel for a half rate protected Mpeg1 layer II audio service with unequal error protection.

The key point is that changing the transmitter mask affects only the ACLR.

Three cases need to be considered on the impact of critical vs non-Critical Mask on 1st adjacent services.

- Case 1: when transmitter systems are co-sited sharing the same antenna and where the services ERPs are within a few dBs of each other.
- Case 2: when transmitter systems are co-sited not sharing the same antenna and where the services could be significantly different in ERP on certain bearings.
- Case 3: when the transmitter systems are not co-sited and the second site is within the coverage area of the first

Case 1

In Case 1 the filter systems form part of the combiner. To get maximum isolation between the transmitter systems is critical especially if they are adjacent channel. In this case Arqiva recommends that the Critical Mask is used to help isolate the transmitters from each other.

In this case as the two signals are correlated at the front end of the receiver as they fade up and down as the receiver moves, the ratio of the wanted to unwanted signals stays the same and as they are very close in power ACS has very little effect. In this case the major cause of degradation is ACLR into the first adjacent so using Critical Mask has two benefits in isolating the transmitters in the combiner and protecting the first and second adjacent service from ACLR.

Case 2

In Case 2 the signals of the wanted and unwanted will be correlated as they fade up and down as the receiver moves on a specific bearing away from the site but the ratio of the wanted to unwanted on any specific bearing will vary with the patterns of the antennas and the systems relative powers. Arqiva sets the in band IPs of a typical system to around -27 dBc in a given bandwidth, typically 10 kHz.

This is to maximise electrical efficiency of the systems and to meet the critical spectral mask. The value of -27 dBc comes from the C/N of a Raleigh Channel for a half rate Mpeg 1 Layer II service being in the order of 14 dB to ensure that at the edge of service the self-interference of the transmitter had not created a reduction in coverage, a further 10 dB was added to the 14 dB C/N and a 3 dB margin for other impairments giving -27 dB C/I in the transmitter.

(This estimate is also borne out by practical measurement and increasing the in-band IPs further reduces the service area). If the non-Critical Mask is used the carriers adjacent to the unwanted

signal in the wanted signal will have a further 30 dB + (relative effective radiated powers of the signals on that bearing) of interference added.

This will shrink the coverage of the existing service particularly on bearings where the relative ERPs are substantially greater with respect to the interfering signal. This may not be seen local to the transmitter but will be seen on the fringe of service as the signal degrades into the noise floor.

Case 3

This is more difficult as the unwanted transmission may well be a low power transmitter and may be very local in nature, targeting a very specific community so no combiner is present just a single output filter. In this case Ofcom needs to know the split between ACS and ACLR which makes up the protection ratio of a receiver. If Ofcom is convinced that for 95% plus of all receivers sold in the UK that ACS dominates in this case and ACLR has very little impact then allowing non-Critical Mask is OK.

If Ofcom has any doubt and believe that there are any receivers which are degraded by ACLR in the first or second adjacent case because they have been designed to operate well in the ACS case then Ofcom cannot relax from the Critical Mask.

Glossary

- ACS: Adjacent Channel Selectivity is the amount of power that is received from the adjacent interfering channel, depends on the victim receiver frontend filter, selecting the wanted service.
- ACLR: Adjacent Channel Leakage Ratio is the amount of the interference power that leaks into the neighbouring wanted channel. This depends on the transmitter filter of the polluter.
- Ofcom protection ratios: these include a correction for percentage locations but are based on a single protection ratio that includes ACS and ACLR.

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