Broadcast Digital Radio Technical Codes and Guidance

Updates and amendments

Statement

Publication date: 1 July 2014

About this document

This document summarises the updates and amendments that Ofcom intends to make to the Broadcast Digital Radio Technical Code and Guidance. These changes follow our consultation that was published on 11 April 2014.

In our consultation, Ofcom made a number of proposals for amending the technical documents. We set out the points made by respondents to each of them, together with our response to any alternative proposals or related points.

One of Ofcom's aims is to regulate only where necessary. The Technical Code and associated documents are in place to ensure that licensed services achieve at least a minimum standard of technical quality, do not cause interference to other licensed services and seek to ensure interoperability with other services and receivers. In updating the Code and Guidance, we have taken account of technical developments and industry practices since our last review in 2006 and taken steps to deregulate where it is appropriate to do so.

The revision of the Code and Guidance is particularly appropriate as we are publishing the advertisement for the new national DAB multiplex on the same day as this Statement.

The revised Code and associated documents will provide clarity and certainty for applicants for the new national DAB licence. Some of the licence obligations also comprise assessment criteria against which proposals from applicants for the new national licence will be judged. They will also provide clarity and certainty for other existing operators and any potential future entrants to the market.

Contents

Section 1

Executive summary

1.1 Our published Technical Codes are derived from Ofcom's general duties, as well as those powers that relate specifically to the delivery of the radio multiplex service. The Code and associated documents are in place to ensure that licensed services achieve at least a minimum standard of technical quality, do not cause interference to other licensed services and seek to ensure interoperability with other services and receivers.

1.2 The documents were last revised in 2006 and Ofcom has consulted on proposals for updating and amending the documents to reflect changes in technology, industry and the radio market since that time. Our consultation *Broadcast Digital Radio Technical Codes and Guidance* was published on 11 April 2014 and closed on 23 May 2014. Ofcom received 14 responses from stakeholders to the consultation; our responses to these comments are addressed in this document.

1.3 This Statement concludes that consultation process and sets out the revised Technical Code and associated documents with which new and existing DAB multiplex licensees must comply. The relevant documents comprise:

a) Digital Radio Technical Code;

b) Technical Policy Guidance for DAB Multiplex Licensees; and

c) List of agreed reference sites (to be developed through the JPRG)

1.4 Changes to the Technical Code and associated documents are effective from today.

1.5 Alongside this Statement we are publishing an advertisement for a new licence to build and run a second commercial national DAB multiplex. Potential applicants for the new licence should take into account the requirements of the revised Technical Code and associated documents when compiling their applications.

Section 2

Introduction

Overview

2.1 This document sets out the revised Digital Radio Technical Codes and Guidance for the radio industry. The Code and Guidance set out the high level requirements with which radio multiplex licensees are required to comply as a condition of their multiplex licence.

Background

2.2 Our published Technical Codes are derived from Ofcom's general duties, as well as those powers that relate specifically to the delivery of the radio multiplex service. The Code and associated documents are in place to ensure that licensed services achieve at least a minimum standard of technical quality, do not cause interference to other licensed services and seek to ensure interoperability with other services and receivers.

2.3 The documents were last revised in 2006. In light of the developments in both technology and industry practices that have taken place since that time, we published a consultation, *Broadcast Digital Radio Technical Codes and Guidance*[1] on 11 April 2014 (the 'Consultation Document'). This set out our proposals for updating and amending the documents to reflect changes in both the technology and current operating environment of the radio industry, as well as reflecting one of Ofcom's principles, to regulate only where necessary.

2.4 The consultation closed on 23 May 2014. We received 14 responses of which one was totally confidential, two were partially confidential and 11 were non-confidential. We have published the partially confidential and non-confidential responses on our website.[2]

2.5 This statement sets out our conclusions to that consultation in light of stakeholder responses and any other relevant considerations.

Related work

2.6 On 16th December 2013, the Government announced a package of digital radio investment measures aimed at giving more people access to more digital radio services. One of the measures announced was that Ofcom would seek to advertise a licence to build and run a second commercial national DAB multiplex.

2.7 As a result of that announcement, we are publishing an advertisement for interested parties to apply for a new second commercial national DAB multiplex licence. The revision of the Code and associated documents is therefore particularly appropriate at this time as applicants will need to take account of the requirements of the revised Code when compiling their applications.

[1] See: http://stakeholders.ofcom.org.uk/binaries/consultations/digital-radio-tech-codes/summary/Digital_Radio_Tech_Codes.pdf
[2] See: http://stakeholders.ofcom.org.uk/consultations/digital-radio-tech-codes/?showResponses=true

Structure of this document

2.8 Section 3 summarises the responses to our proposals and related questions, as well as our response to the points raised by stakeholders, along with a summary of the revisions we have made to the Code and associated documents in light of those comments and any other relevant considerations.

2.9 Alongside this statement, we are publishing updated versions of the Digital Radio Technical Code and Technical Policy Guidance for DAB Multiplex Licensees which are effective from today. We will publish a list of reference sites which accompanies the documents once agreed through the JPRG.

Section 3

Revisions to broadcast digital radio technical code and guidance

Overview

3.1 In our Consultation Document we identified several areas within the Code and associated documents for proposed revisions. They are as follows:

- Adding provisions for the inclusion of the **DAB+** standard;
- Revision of **planning standards** to be consistent with our guidance to Government;
- Revision of our policy relating to the **approval of transmitter proposals** before they are brought into service;
- Revision of our approach to the **allocation of capacity**; and
- Revision of our multiplex management policy as it relates to **TA/TP (traffic announcement / traffic programming)** travel flags.

3.2 In the remainder of this section we summarise the comments and feedback we have received to our proposals, together with Ofcom's response and conclusions for each of the above areas as they relate to the Code and associated documents.

Introduction of alternative audio encoding: DAB+

Ofcom proposals

3.3 In our consultation document we proposed the inclusion of DAB+ in our Technical Code and to permit a proportion of services on the second national commercial multiplex to broadcast using DAB+ if the licensee wishes to do so.

3.4 DAB+ provides the potential for audio services to make more efficient use of multiplex capacity as it provides a higher subjective sound quality or requires less bandwidth than audio services using DAB. Inclusion of the DAB+ standard within the Technical Code also signals to industry that as they prepare their products for the future, it is important for receivers to have the capability of receiving DAB+ services.

3.5 With reference to the new national multiplex licence, we said that we would initially limit the proportion of multiplex capacity occupied by DAB+ services to 30% but that this may subsequently be reviewed. Our rationale is that this would ensure that the multiplex provides programme services which are compatible with the majority of UK DAB receivers, while signalling the emergence of DAB+ technology to industry.

Consultation responses

3.6 With one exception, respondents were unanimous in their support for our proposal to include the DAB+ standard into our Code. One individual who was not in favour

commented that DAB+ should not be permitted until a large number of compatible receivers are in use, or that a (receiver) replacement system is in place.

3.7 Several stakeholders such as Digital Radio Group London Ltd and Bauer Media suggested that the ability to adopt the DAB+ standard should be extended to all existing multiplex operators and not just the new national multiplex licensee. Voice of the Listener and Viewer (VLV) said that it welcomed the opportunity for all DAB operators to migrate to DAB+ and Arqiva commented that it wanted to see a level playing field for both national and local multiplexes.

3.8 Stakeholders did not generally agree with our proposals to limit the proportion of the new national multiplex capacity to be occupied by DAB+ to 30%. Bauer Media said that the change to DAB+ would be gradual and therefore the 30% limit was unnecessary. This view was shared by other respondents including one confidential respondent. The BBC, Frontier Silicon and World DMB added that the basis and timing for our proposals to review the 30% limit was unclear. Arqiva sought assurance that any such review would involve the industry and said that it would welcome the publication of a firm timescale for the review. DRUK was also opposed to the 30% limit and argued that commercial reality and the need to reach listeners would ensure that the introduction of DAB+ would happen when listeners are ready.

Ofcom consideration of responses

3.9 We welcome the support from stakeholders' in response to our proposal for the inclusion of the DAB+ standard into the Code.

3.10 We note stakeholders' views that a limit is not needed on the proportion of services in the second national multiplex that can adopt DAB+. It may be that some respondents had not fully taken into account the benefits of the improved spectral efficiency of DAB+. This would enable the number of DAB+ stations to match or, depending on non-radio data usage, potentially even exceed the number of DAB stations on the multiplex, despite the DAB+ cap.

3.11 Although it is perhaps unlikely that the licensee of the new multiplex would seek to completely fill the multiplex with DAB+ services initially, the proposed limit provides a guarantee that the second national commercial multiplex will provide a range of programme services that are compatible with all digital radio receivers and provide listeners with increased choice. Permitting DAB+ provides the opportunity for the licensee to launch DAB+ services and sends a clear signal to manufacturers and industry that equipment needs to be capable of receiving DAB+ in order to be compatible with services that might launch in the future.

New national multiplex

3.12 We note the desire from some respondents for increased clarity over when a review might be carried out. We propose to review whether the limit is necessary no later than 2018 which would allow time for the second national commercial multiplex to launch and for us to assess the continuing necessity of the limit. Should it become evident that there is a risk that the 30% limit might hinder development of the DAB platform before that time, then Ofcom would be prepared to initiate a review at the request of the second national commercial multiplex licensee. We envisage that our review will take into account the views of industry as well as the interests of consumers.

3.13 We will therefore adopt the approach of placing a limit of 30% on the proportion of services that the new national commercial multiplex licensee can broadcast using DAB+.

Existing multiplexes

3.14 Ofcom recognises that there could be value for existing multiplex licensees, providers of sound programme services carried in the multiplexes and for listeners, if existing multiplexes can also adopt DAB+. However, the considerations for adoption of DAB+ on other multiplexes are necessarily different to the new national commercial multiplex. The existing national commercial multiplex (licensed to Digital One) and the local multiplexes are already operational and carry services that listeners value; any transition to DAB+ would need to take into account the impact that adoption of DAB+ would have on listeners that possess sets capable of receiving only DAB services and who would therefore lose access to those services migrating to DAB+.

3.15 Ofcom is therefore prepared to consider proposals for services to switch to DAB+ from operators of existing multiplexes on a case by case basis. In making its decision, Ofcom will need to take account of the impact of the change on listeners and will consider matters such as the uptake of compatible receivers, whether the service is an existing service or is new to the multiplex, the range of services available on the multiplex and any other relevant factors at the time.

3.16 For the reasons outlined above, we will update the Code as proposed.

Planning standards: wanted coverage and interference protection

Ofcom proposals

3.17 In our consultation document we proposed aligning our planning standards with those that form the basis of our advice to Government[3] and to remove the requirement to constrain coverage to specific editorial areas. That advice is based on a revised set of assumptions and thresholds for planning the coverage of DAB services, as most reception of radio services is through in-car receivers or on radios using set-top aerials rather than through fixed rooftop aerials as has been assumed in the past.

3.18 We also proposed that when making DAB coverage predictions, all assessments will be carried out on the basis of UEP-3[4] being used for audio and UEP-3A for data services. Services should generally operate at this level unless otherwise agreed with Ofcom, in order to ensure a consistent user experience and stability for the receiver market through certainty of coverage.

Consultation responses

[3] DAB coverage planning, Ofcom Report to Government, Appendix E, Technical Parameters & Algorithms: http://stakeholders.ofcom.org.uk/binaries/broadcast/radio-ops/coverage/Annex_E.pdf

[4] As well as programme services the multiplex contains certain error correction data that enables receivers to compensate for the effects of errors that are introduced by interference and other distortions between the transmitter and receiver. Unequal Error Protection (UEP) level 1 provides the highest level error protection. UEP level 5 provides the least error protection but the greatest capacity for programme services

3.19 The majority of stakeholders who responded to the consultation agreed with our proposals to revise the planning standards to align with the advice given to Government. VLV commented that the proposals seemed appropriate and World DMB said that the revisions provided a solid basis for coverage planning in the UK. AT Consultancy commented that a proposal to use the UK Planning Model as the basis of coverage assessments potentially raised competition concerns as only the BBC and Arqiva have access to the model.

3.20 In relation to our proposals for coverage assessments to be made on the basis of UEP-3, the responses from stakeholders followed two main themes. While many supported the approach in relation to carrying out initial coverage assessments, several respondents argued that regulation of protection levels was unnecessary. These respondents maintained that such decisions were best taken by the multiplex operator together with broadcasters and that an inflexible approach to regulation of error protection levels could limit listener choice and was inconsistent with our proposal to reduce the degree of regulatory intervention.

3.21 DRUK further commented that listeners do not expect all radio services to have identical coverage and that any change in protection levels that could affect receiver specification should be raised with the Approved Product Group (APG)[5]. UTV commented that any requirement to build new transmitter sites to address any loss of coverage arising out of a change of error protection level would be disproportionate.

Ofcom consideration of stakeholder responses

3.22 We welcome stakeholders' positive response to our proposals in relation to planning standards as advised to Government.

3.23 One of the statutory criteria that Ofcom is required to take into account in deciding whether and to whom to award a multiplex licence is the extent and speed of coverage rollout. As such it is important that operators have clarity and certainty regarding the way in which Ofcom makes such decisions. It is also important that operators adhere to the coverage commitments they make when applying for a licence as coverage is one part of the basis on which their licence has been awarded. The coverage obligation that arises out of the commitment ensures maintenance of listener choice, consistency for the listener experience, and the stability of the platform. Setting all DAB coverage assessments on the basis of UEP-3 provides that certainty.

3.24 We appreciate that there is a need for flexibility in the ongoing operation of a broadcast multiplex to enable operators to respond to changing circumstances. The provision within our consultation document to consider proposals from operators to use UEP-1 or UEP-2 on a case by case basis provides an appropriate level of flexibility, while at the same time ensuring that such steps do not lead to the disenfranchisement of listeners. Ofcom would judge each case on the facts available, including the possible impact upon listeners and alternative approaches for mitigating any loss of coverage that might occur. We have amended the wording in our Code to make this clear.

[5] Approved Product Group (APG) – The group, made up of manufacturers, broadcasters, transmission providers and Ofcom, is responsible for agreeing the technical specification required in order to achieve the Digital Tick standard.

3.25 Separately, we are reviewing our needs (and the likely needs of industry) for tools to plan coverage of both DAB and digital television services, with the aim that any future commonly agreed model is available to a wide range of stakeholders. Until such time as we achieve that aim, we will ensure that any competitive process (for example an invitation to apply for a licence) does not discriminate against parties that do not have access to the UK Planning Model.

3.26 Alongside our consultation document we published a draft revised Digital Radio Technical Code and Guidance Note setting out our proposals for revising our approach to planning coverage for DAB services. In the light of stakeholder comments we are satisfied that this approach is appropriate. Ofcom has a duty to ensure that the interests of listeners are protected and to promote choice. While we note stakeholder comments, we do not consider there is any evidence that amending our proposal would ensure that there was balance between the two. We will therefore amend the Digital Radio Technical Code and Guidance Note as proposed, clarifying that we will consider alternative measures for addressing coverage loss.

Approval of transmitter proposals

Consultation proposals

3.27 In our consultation document we proposed a new approach to approving new transmitter sites for a multiplex before they can be brought into service – this process addresses the issue of managing the impact of Adjacent Channel Interference[6] (ACI).

3.28 We proposed an approach that moved away from the previous arrangement based upon an industry Memorandum of Understanding and the Reserved Assignments List (RAL) that defined parameters within which multiplex licensees could implement a transmitter at listed transmission sites.

Consultation responses

3.29 Stakeholders generally expressed support for our proposals. Arqiva sought some clarification on the basis of seeking Ofcom approval and suggested that the new list of agreed reference sites should comprise all of the current RAL and non-RAL sites. The BBC sought clarification on why Ofcom would need to sanction agreements between multiplex operators on the level of acceptable ACI impact and argued that such decisions should be left to industry. The BBC also suggested that clarification of some of the terms used within the proposed procedure flowcharts would be helpful – particularly what might constitute a significant or unacceptable impact and what 'further consideration' might entail.

3.30 Both the BBC and Arqiva requested that Ofcom should provide further clarity on the matters it might take into account in considering the interests of consumers when making a decision.

[6] ACI - where households and radios in cars travelling on roads close to the transmitter of one broadcaster are unable to receive services from another, because their radio sets are affected by the much stronger signals from the transmitter near them.

Ofcom consideration of stakeholder responses

3.31 We welcome stakeholders' positive response to our proposals which we consider reflect the aspirations of commercial DAB multiplex licensees and the BBC for a more streamlined process than the previous arrangement.

3.32 Our proposals for the process of managing and approving proposals for new transmitters are based on discussions in the JPRG. In this forum multiplex operators supported an approach where they seek to reach agreement amongst themselves for proposed new transmitters. Ofcom's role would be to make a final decision taking into account the impact upon listeners, including in cases where multiplex operators were unable to reach agreement.

3.33 The flowcharts in the Guidance Note set out the basis for how we expect multiplex operators to cooperate in developing their plans for building new transmitters. Our engagement with the radio multiplex operators prior to consultation suggested that inclusion of specific thresholds would not be desirable. This is because there are many variables that contribute to a decision on what might constitute an acceptable impact on the coverage of a 'victim' multiplex when another multiplex licensee's transmitter is brought on air. Examples of the factors that Ofcom would take into account when considering the possible impact upon listeners would include (but not be limited to) the following:

- quality and reliability of both indoor and mobile reception of other multiplexes in the area;
- increase in the coverage of the proposing multiplex compared with the loss suffered by other multiplexes;
- number of multiplexes predicted to be affected;
- duration of any impact; and
- degree to which reception of the victim multiplexes is degraded.

3.34 We do understand that it could be helpful to the multiplex operators to have guidance thresholds that provide an indication as to the likely acceptability of a transmitter proposal. We therefore propose to work with the multiplex licensees to develop guidance thresholds over the next few months through the JPRG. These will take into account experience gained in building transmission sites, and our understanding of whether theoretically calculated coverage losses accurately predict the actual experience in a variety of different reception environments.

3.35 Based on stakeholder responses, we are satisfied that our proposals have adopted the correct approach, balancing the freedom of multiplex operators to co-ordinate their own roll-out plans against the backstop powers of Ofcom to give a final determination if necessary.

Capacity allocation

Consultation proposals

3.36 In our consultation document we said that we would remove the requirements for a minimum capacity requirement (bitrate) in relation to sound quality. This is only one of several contributory factors in determining sound quality and therefore it is only

partially effective in maintaining it. Without this requirement, multiplex operators and sound service providers would be given the flexibility to determine the bitrate appropriate to individual programme services carried within DAB multiplexes.

Consultation responses

3.37 Stakeholders were generally in support of the proposals to remove the minimum bitrate.

3.38 Frontier Silicon commented that it was important that Ofcom ensure a clear qualitative view of an acceptable standard otherwise poor quality in one service could compromise the perception of the whole platform. A similar point was made by a confidential respondent commenting that a listener who is disappointed with the sound quality of a programme service may think that the receiver is at fault or that the platform is not fit for purpose. VLV expressed similar views and did not agree that the market would determine sound quality issues.

3.39 AT Consultancy and the BBC considered that there was some inconsistency in the wording describing our approach that required clarification. AT Consultancy stated that the proposed wording for insertion in the Guidance Note stipulating that 'audio quality should generally be of a standard consistent with the reasonable expectations for the majority of listeners' was not consistent with the licence wording that requires that the service provided by the multiplex licensee achieves generally high standards of technical quality. The BBC felt that some of the wording contained in section 2.2 of the Guidance Note was not consistent with our proposal to remove minimum bitrates.

Ofcom consideration of stakeholder responses

3.40 We welcome stakeholders' support and observations in relation to our proposals for multiplex capacity allocation. We note the concerns some stakeholders have expressed suggesting the potential negative impact on listeners experiencing poor sound quality on DAB services.

3.41 As set out in our consultation, so far there is no evidence to suggest dissatisfaction with the technical quality of platforms that are not subject to explicit technical quality standards requirements. Further, we consider that our proposals make it clear that while multiplex operators and sound service providers will determine for themselves the bitrate allocated to individual services, such decisions are to be made with regard to Ofcom expectations. Within this framework, operators and content providers must consider the expectations of the majority of listeners, taking relevant factors into account, for example the nature of the content of the service.

3.42 We believe that the requirement to meet reasonable expectations for the audio quality of individual services is consistent with the requirement on the multiplex operator to achieve generally high standards of technical quality in the delivery of the multiplex service, of which audio quality (when taken as a whole) is just one aspect. While we note feedback from stakeholders who would like more explicit requirements for sound quality, these two requirements together go further to set regulatory expectations for sound quality on the DAB platform than for any other delivery platform. Given our stated intention to regulate only where necessary, we do not believe it would be proportionate to introduce additional sound quality requirements.

3.43 We acknowledge the VLV's view that there is a risk to quality if bitrate decisions are left to the market. However, we believe that there is a greater risk to station operators

of losing audiences if they broadcast a signal quality which listeners do not find acceptable.

3.44 In light of stakeholder views and considering the above, we are satisfied that the proposals as drafted deliver the correct balance of flexibility while ensuring that the expectations of the majority of listeners are met. We will therefore update our Code in accordance with our proposals.

Multiplex management – supplementary signalling

Consultation proposals

3.45 In our consultation document we proposed to include provisions within the Code that would place certain requirements on DAB multiplexes that choose to provide travel information for their listeners and to make use of traffic announcement/traffic programme (TA/TP) travel flags as part of the service. By including new provisions within the Code, the approach for DAB would mirror our existing policy for FM services.

Consultation responses

3.46 Stakeholders generally expressed support for our proposals.

3.47 Digital Radio Group London Ltd and Global commented that all operators should be obliged to support TA/TP and that the Code should support 'Service Following' in accordance with ETSI[7] standards and minimum receiver specification[8]. They highlighted that multiplex signalling is essential to the future success of local DAB and that consistent functionality would enhance the listener experience. This latter point was also made by Arqiva.

3.48 DRUK said that the minimum receiver specification includes a number of requirements including 'service following' and traffic announcements. DRUK was therefore of the view that it is important for Ofcom's Code and the minimum receiver specification to remain aligned, if listeners are to enjoy a good experience.

3.49 World DMB commented that the consultation did not adequately express the functioning or capabilities of the announcement feature of DAB. It suggested that further work is required prior to implementation of traffic announcements in the UK, particularly in relation to filtering mechanisms and Cluster IDs, in order that the choices of both broadcasters and listeners are respected. This view was also shared by the BBC.

3.50 Arqiva said that Ofcom should monitor the use of the TA/TP facility to ensure that radio retuning only occurs between stations that are linked.

[7] ETSI – European Telecommunications Standards Institute is a recognised European standards body.
[8] *Minimum specifications for DAB and DAB+ in-vehicle digital radio receivers and adaptors* http://www.getdigitalradio.com/industry/technical-documents/

Ofcom consideration of stakeholder responses

3.51 We welcome the support of stakeholders in response to our proposals, as well as their additional views on issues that could potentially affect the implementation of our proposals.

3.52 In view of the responses we have received, we agree that further work is required to fully specify the regulatory requirements relating to the full range of announcement types supported by DAB. We intend to work with industry and standards bodies to this end and to ensure that our Technical Code and industry practice remains aligned. The text proposed in our Technical Code does however provide a starting point for achieving a consistent experience between FM and DAB. We will therefore update our Code as proposed, but keep the requirements under review as our discussions with industry progress.

3.53 We consider that our revised Code creates a positive framework within which the benefits of the TA/TP feature can be exploited. This is further supported by the minimum receiver specification and the steps taken by industry to implement the technical capability that would enable broadcasters to dynamically switch TA/TP flags during the second half of 2014,. The benefit to consumers will be an enhanced and consistent experience. For multiplex operators we consider that the perception of a stable and technically robust platform is likely to manifest itself through greater attractiveness of the DAB platform.

3.54 On that basis, we would encourage multiplex operators to support and work to provide TA/TP services. We do not however consider that it is necessary, or proportionate, to mandate TA/TP through the Code at this time without a fuller analysis of the technical and cost implications of doing so, particularly for smaller scale operators. We will however, keep this under review as our discussions with industry progress.

3.55 Ofcom's approach to monitoring compliance with technical conditions is generally in response to complaints either from listeners or industry stakeholders, although we also carry out ad-hoc monitoring from time to time to satisfy ourselves that licensees are meeting their obligations. We will adopt the same approach for monitoring of the use of TA/TP functions.

Other comments

3.56 We asked stakeholders for any additional comments that they might have in relation to the proposed draft of the Digital Radio Technical Code or Technical Policy Guidance Note, or any other comment on matters raised in our consultation. We address the points made in the paragraphs below.

3.57 We note the comments made in relation to the drafting of the Code, technical references and suggestions for alternative wording. Where appropriate we have reflected these amendments within our Codes. There were some matters raised that are outside of the scope of this consultation and while these comments have been duly noted, they are not addressed within this Statement.

Stakeholder comment	Ofcom response
AT Consultancy suggested that the removal of all mandatory bit-rate requirements makes it inconsistent for Ofcom to object to the use of the Variable X-PAD facility.	We agree the use of variable X-PAD is permissible. Licensees should however bear in mind the potential impact that allocation of bitrate within the audio bandwidth to X-PAD could have on audio quality. They should therefore ensure that their assessments of quality take into account the most demanding situation (i.e. the maximum envisaged bitrate being used by the X-PAD component).
AT Consultancy suggested that Ofcom could assist in the wider adoption of low-cost methods for the expansion of DAB network coverage if it would be permissible for an on-channel repeater that is re-transmitting a service from a transmitter (that is carrying a TII code) to suppress the TII code on the repeater's output rather than having to insert a new unique code.	We agree and have included amended wording in the Technical Code to permit on-channel repeaters to suppress the TII of the transmitter whose signals it is re-transmitting.
DRUK and one confidential respondent noted that any further changes to the Code could impact on minimum receiver standards.	We will continue to keep our Codes under review and work with industry and manufacturers to ensure interoperability between transmitted signals and receivers.
Frontier Silicon and a confidential respondent queried whether there were any plans to address the accuracy of the 'time pips' on DAB radios.	This lies outside the scope of the proposed revisions of the Technical Code and Guidance. In principle the timing of the time signal as broadcast can be advanced to take account of the propagation delay through the transmission network including an allowance for the receiver. In practice this presents practical difficulties, particularly as different receivers exhibit differing delays. There are many ways of obtaining accurate time references nowadays including inexpensive clocks that are readily available and take a reference signal from a time standard transmitter and are accurate.
Arqiva asked whether the phrase 'taken as a whole' in paragraph 3.3 of the draft Technical Code meant that lower quality services could be balanced by services broadcast at higher qualities within the same multiplex.	We expect that the quality of audio services should meet the reasonable expectations of the majority of listeners and that this expectation could vary depending upon the material being broadcast, the target audience and (if applicable) the audio quality that the service achieves on other platforms. This means that there could be differences across the services within a multiplex with some of a lower quality than others. Overall,

	the services within a multiplex should achieve high standards of technical quality.
Arqiva suggested adding a sentence to paragraph 3.1 to clarify that transmitter parameters should be in line with JPRG published documents rather than the original licence application.	The sentence in the Guidance Note is unchanged from the original wording that has been in place for some years and relates to the basis of the licence award, rather than the actual transmitter operating parameters with which a licensee must comply; these are set out in the multiplex licence.
Arqiva suggested that Ofcom should consider that the basis for the list of Reference Sites should be the existing DAB transmitter sites and suggested modifying the wording in paragraph 3.8 of the Guidance Note accordingly.	We are working with the JPRG to refine which sites should appear on the list of Reference Sites. We have discussed and agreed this proposal with JPRG members and have modified the wording of paragraph 3.8 of the Guidance Note.
Arqiva suggested that operators can only make reasonable efforts to ensure that a transmission site can be used by other operators as these are often owned by third parties.	We agree that matters of site sharing are often outside the control of individual multiplex operators and have modified the wording of the Guidance Note to reflect this situation.
Arqiva would like Ofcom to share details of approvals of site proposals where appropriate, together with the criteria used to judge the acceptability of site proposals.	Ofcom will work with the JPRG members so that they understand the decisions made by Ofcom in relation to new transmitter proposals and the criteria used to make those decisions.
Global Radio commented on the regulation associated with hard and soft linking and expressed concern that the current approach would place a disproportionate overhead on the network signalling and therefore prevents implementation of effective linking on one of their networks.	We understand that the signalling requirement for switching of hard and soft linking could place a significant demand upon multiplex capacity. We have therefore clarified the wording contained in paragraph 4.5 of the Code to potentially reduce that demand without altering the aim of the requirement.

Annex 1

List of consultation respondents

A1.1 This annex provides a list of the stakeholders who responded to our Broadcast Digital Radio Technical Codes and Guidance consultation published on 11 April 2014. A total of 14 responses were received to the consultation, of which 11 were non-confidential, two were partially confidential and one was fully confidential.

A1.2 Non-confidential and partially-confidential responses to our consultation have been published on our website and can be viewed here

A1.3 Organisations from whom we received non-confidential responses are listed below:

- Arqiva Ltd
- AT Consultancy
- Bauer Radio
- BBC
- Digital Radio Group London Ltd
- Digital Radio UK (DRUK)
- Frontier Silicon
- UTV Media
- Voice of the Listener and Viewer (VLV)
- World DMB Forum

Annex 2

Glossary of terms

ACI	Adjacent Channel Interference: Where radios in households (and in cars travelling on roads) close to the transmitter of one broadcaster are unable to receive services from another because their radio sets are affected by the much stronger signals from the transmitter near them.
Cluster IDS	Cluster IDs are codes within a multiplex stream that allows grouping of stations for announcements.
DAB	Digital Audio Broadcasting: The technology by which terrestrial Digital Radio multiplex services are broadcast in the UK.
DAB+	A development of DAB that employs a more advanced means of encoding the audio than DAB.
DCMS	Department for Culture Media and Sport, the Government department responsible for policy relating to broadcasting and spectrum.
Dynamically switch	Ability to quickly alter the state of something in response to changing conditions.
EBU	European Broadcasting Union: A body representing principally the Public Service Broadcasters in Europe.
EEP	Equal Error Protection: Error protection procedure which provides an equal degree of resilience to each component of a stream of data.
ETSI	European Telecommunications Standards Institute: A European standardisation body.
FM-RDS	FM Radio Data Service: Data broadcast within a FM radio service that carries supplementary information that can deliver a range of services in addition to the sound to compatible receivers.
JPRG	Joint Planning for Radio Group: A group chaired by Ofcom, comprising representatives of all of the commercial multiplex licensees and the BBC that meets to discuss matters relevant to the expansion of digital radio services in the UK.
Multiplex	A single signal which contains, when decoded, multiple discrete streams of digital information (including audio streams). Individual components of the multiplex are decoded at the receiver in order to present the desired radio service to the listener.

OCR	On Channel Repeater: A device that receives a weak signal, amplifies it and re-transmits it on the same frequency.
RAL	Reserved Assignments List: A list of transmitter sites and associated characteristics within which any licensee may expect to be able to secure Ofcom's agreement to develop, subject to compliance with all other requirements of the licence. Superseded by the Reference sites list.
Service Linking	A means of associating radio services carried on different DAB multiplexes or on DAB and FM to assist mobile receivers to select an appropriate alternative signal when they retune.
TII	Transmitter Identification Information: An optional code within the DAB signal that can be used to identify an individual transmitter.
UEP	Unequal Error Protection: Error protection procedure which allows different degrees of error protection to be provided to different parts of a datastream.
UKPM	UK Planning Model: A proprietary computer model for predicting coverage of DAB and digital TV services.
X-Pad	Extended Programme Associated Data: A data channel within the audio bitstream that can carry data services subsidiary to the main audio service.