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Revisions to Digital Radio Technical Codes

Statement following consultation

STATEMENT:

Publication Date: 11 June 2019

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Section

1. Overview

Ofcom published a consultation on 4 February 2019 which proposed making changes to the existing technical rules that the UK's DAB digital radio broadcasters are required to comply with as a condition of their licences. We proposed these changes with the aim of ensuring that our rules remained appropriate and proportionate.

The consultation closed on 28 March 2019, and we received 28 responses to our proposals from industry stakeholders and members of the public. We have considered all of the points raised by respondents, and we have made certain revisions to our proposed changes in light of the comments that we received.

This Statement concludes the consultation process, sets out our analysis of the points raised by respondents, and includes our final decision on the proposed changes to the technical codes. The new Technical Code documents[1] will come into force today (11 June 2019).

[1] https://www.ofcom.org.uk/tv-radio-and-on-demand/information-for-industry/guidance/DAB-Technical-Policy-Documents

What we have decided – in brief

The main changes that we have decided to make are in the following areas:

ACI/blocking procedures

We are proceeding with the changes that we proposed in relation to the management of 'Adjacent Channel Interference' (ACI) and 'blocking', which are technical effects that can disrupt reception of existing DAB stations when new DAB transmitters are built. These changes revise the process that licensees should follow when seeking to bring new transmitter sites on air. In response to feedback from our consultation, we have decided to extend slightly the maximum turnaround times for existing multiplex operators to respond to ACI/blocking liaison requests. We will also introduce a target turnaround time for determinations by Ofcom in cases where broadcasters cannot reach agreement on specific liaison requests. We will continue to work with industry to provide further clarity for parties wishing to build new transmitters ahead of licensing new small scale DAB multiplexes.

Spectrum masks for DAB

We have decided not to proceed with including the 'non-critical mask' (a spectrum 'envelope' which is slightly more relaxed than the 'critical mask' which is currently used by all existing DAB multiplexes) in our Technical Code at this time. This is due to the possibility of interference occurring to other services and the likely small benefit of introducing the non-critical mask at this time. We will however keep this under review, particularly if industry wishes to implement significant numbers of low power transmitters where the cost savings would be relatively greater than for medium and high power transmitters and the interference potential is more limited.

DAB+ audio encoding

We have decided to proceed with removing the current requirement for licensees to obtain specific authorisation from Ofcom before adopting DAB+ audio encoding. This change is intended to remove potential barriers to the adoption of the more efficient DAB+ standard by broadcasters.

Other detailed revisions and updates

Ofcom will continue to allocate certain codes that are transmitted as part of the DAB signal which identify individual transmitters and stations, and we will continue to allocate unique codes across the UK. We will carry out further work on the implications of code re-use if the supply of available codes is likely to be exhausted.

We will proceed to formalise requirements around minimum DAB/DAB+ 'protection levels' and will set these at specific levels, although we will allow DAB and DAB+ stations the flexibility to adopt protection levels that are more robust than the minimum levels if they desire.

This overview is a simplified high-level summary only. Our full decisions and reasoning are set out in the main sections of this document.

2. Introduction

2.1 Ofcom's Digital Radio Technical Code (the 'Code') and Technical Policy Guidance for DAB Multiplex Licensees (the 'Guidance') set out the technical rules which commercial DAB radio multiplex operators are required to comply with as a condition of their Broadcasting Act and Wireless Telegraphy Act multiplex licences (the BBC's national DAB multiplex is not licensed under the Broadcasting Act 1996 and the requirements of the Code do not therefore apply to it, though the BBC's multiplex is subject to specific technical requirements set out in its Wireless Telegraphy Act licence).

2.2 The requirements in the Code and Guidance are in place to ensure that licensed services are implemented using common minimum 'baseline' technical characteristics, and do not cause undue interference to other licensed services. They also seek to ensure basic interoperability and coexistence between individual DAB multiplexes and other services which use nearby spectrum (for both broadcast and non-broadcast uses), and with domestic DAB receivers.

2.3 Our consultation[2], published on 4 February 2019, proposed making changes to some aspects of these technical rules with the aim of ensuring that they remain appropriate and proportionate to the needs of both existing and potential new multiplex operators, and that they continue to provide a baseline technical performance standard which benefits the wider industry as well as consumers.

2.4 We received 28 responses to our consultation: two of these responses were confidential, and two were partially confidential. Non-confidential or partially-confidential responses were received from the following organisations and individuals, and their responses are available on our website[2]:

Angel Radio	Community Media Association	RadioDeck and Brighton and Hove Radio
Arqiva	Commtronix	RadioDNS
Audessence	DAB Radio Technology Ltd	Radioplayer
Bauer Digital Radio, CE Digital, Digital Radio Group	DTG	transplanUK
BBC	Future Digital Norfolk	Wetherby Community Radio Ltd
Belfast FM	Graham Hughes	William Turrell

[2] https://www.ofcom.org.uk/consultations-and-statements/category-2/revisions-to-digital-radio-technical-codes

BFBS	Maxxwave Ltd	Wireless Group (including Switchdigital (London) and Switchdigital (Scotland))
Bristol Digital Radio	MuxCo Ltd	WorldDAB Forum
Cambridge Digital Radio and Huntingdon Community Radio	Nation Broadcasting Ltd	

Table 1: Consultation respondents

2.5 We have carefully considered the points raised by respondents to the consultation on our proposed changes. We have decided to implement many of the changes as originally proposed in the consultation. However, we have decided to make some minor modifications to our proposed changes in light of the comments that we received.

This statement concludes the consultation process, and the revised Digital Radio Technical Code and Technical Policy Guidance for DAB Multiplex Licensees documents (available at https://www.ofcom.org.uk/tv-radio-and-on-demand/information-for-industry/guidance/DAB-Technical-Policy-Documents) come into force today, 11 June 2019. Versions of these documents containing markup highlighting the revisions we have made to our initial proposals are available in Annexes 1 and 2 of this statement.

Main modifications to initial consultation proposals

2.6 We have decided to modify the initial proposals in our consultation in the following areas. The rationale for, and our detailed considerations of, these changes are provided in the following sections of this document.

- **ACI/Blocking Procedures:** Our consultation proposed modifying existing procedures which seek to minimise the risk of new DAB transmitters causing reception problems within the coverage areas of existing DAB transmitters (these effects are known as 'ACI' and 'blocking'). While we have decided to proceed with the changes broadly as-proposed, we have decided to extend the maximum turnaround times for existing multiplex operators to respond to ACI/blocking liaison requests. We will also introduce a target turnaround time for determinations by Ofcom in cases where broadcasters cannot reach agreement on specific liaison requests. We have included more explicit guidance on the information that organisations wishing to implement a new transmitter must provide to existing multiplex operators, and will require field measurement data to be provided in an electronic format with a brief accompanying narrative report. We will also more closely define some of terminology used in the ACI/Blocking Guidance. Ahead of the licensing of new small scale DAB multiplexes, we will work with industry stakeholders to provide more explicit guidance on the type and quality of information that needs to be provided to other multiplex licensees and to Ofcom by parties wishing to launch new transmitters.

- **Spectral Masks:** Our consultation asked for views on the implications and desirability of allowing an alternative spectral mask (the 'non-critical' mask) to be used by DAB services in some circumstances, which could lower the capital costs of new DAB transmitter installations. While the majority of respondents agreed with this proposal, some concerns were raised on the possible interference impacts of the new mask. Having considered the points raised, it is apparent that further technical analysis is required before the non-critical mask can be deployed. We have concluded that as the likely savings to be realised by operators by using non-critical mask filters are likely to be small for the powers of transmitters likely to be built over the next few years, we will not be including the possibility of non-critical mask filters being deployed at this time. We will keep this area under review and will consider carrying out further work and, if appropriate, permitting use of the non-critical mask in the future.
- **DAB+:** Our consultation proposed removing the current requirement for licensees to obtain specific authorisation from Ofcom before adopting DAB+ audio encoding. This was intended to remove potential barriers to the adoption of the more efficient DAB+ standard by broadcasters. We have decided to proceed with this change. Our consultation also proposed requiring multiplex operators to liaise with stations moving from DAB to DAB+ to ensure that listeners are provided with information on ways to continue listening to the service (e.g. ensuring that they are using a DAB+-capable radio). We have decided to implement this requirement, but recognise that we may need to introduce more specific listener communications requirements in future if the liaison requirement proves ineffective.
- **Editorial clarifications:** Our consultation proposed clarifying the Code and Guidance where possible to make the documents easier for less technical stakeholders to understand and comply with. Following feedback from respondents, we will add additional clarifications and corrections to the text and to the technical terminology used in the documents.

2.7 We also proposed making other changes to specific areas of the Technical Code to clarify and update certain detailed technical regulations in the following areas:

- Rationalising the requirements for **monitoring facilities and equipment** which broadcasters are currently required to make available at their transmitter sites. We will implement these changes as proposed.
- Clarifying the implications of **minimum repetition rates** for some of the essential technical signalling which forms part of the transmitted DAB signal: We will implement these changes broadly as proposed.
- We noted that there may be a **need to re-use certain technical signalling codes** (known as TII codes and SId codes) if the size and number of DAB networks in the UK increases significantly in the future. In light of the responses we received, we will continue to allocate unique codes for the time being, and will carry out further work on the implications of code re-use if there is a likelihood of code exhaustion.
- We also sought initial views from stakeholders on whether bodies other than Ofcom might be better-placed to **manage the allocation of codes** to individual services and multiplexes in future. The consultation responses revealed a limited appetite for third-

parties to take on this role, with some responses strongly arguing that Ofcom should continue to perform this role. We will therefore continue to allocate codes, but will re-visit the situation should viable alternative allocation models emerge in the future.

2.8 Other significant areas where we received comments from stakeholders included:

- **Protection levels:** The consultation proposed formalising requirements around minimum DAB/DAB+ protection levels which had been adopted following our previous consultation on the DAB technical codes in 2014. Protection levels define the amount of error correction data that is applied to individual radio services, and this influences their reception robustness and therefore the effective coverage of the signal. We have decided to amend the protection level requirements to allow DAB+ stations the flexibility to adopt protection levels that are more robust than the originally-proposed level. This will mirror the flexibility that is already available for DAB services.
- **Alternative polarisations:** DAB services are currently transmitted using vertical polarisation only. Some respondents suggested that we should permit horizontal or mixed polarisation as an alternative. On balance, we do not believe that there is sufficient evidence on the benefits of alternative polarisations to permit such a change at this stage. We will seek further views and evidence on this in our forthcoming consultation on the technical licence conditions that we propose applying to small scale DAB multiplexes.
- **Detailed technical comments:** Stakeholders made various helpful suggestions on specific areas where the terminology used, or drafting of, the Code and Guidance could be improved. We have considered and adopted these suggestions where appropriate to do so.

2.9 The following sections of this document set out the comments we received, and our responses to them, in more detail.

3. Adjacent Channel Interference (ACI) and blocking processes

Overview of proposed changes

3.1 Section 3 ('Approval of transmitter proposals') in the 2014 version of the Technical Policy Guidance for DAB Multiplex Licensees' ('the 2014 Guidance') contains procedures for the management of Adjacent Channel Interference (ACI) and blocking when broadcasters propose building new DAB transmitters.

3.2 Our consultation proposed modifying these procedures so that site proposers self-categorise new sites into 'Red', 'Amber' or 'Green' categories (reflecting the level of ACI/blocking risk) using simple non-mathematical criteria. Proposers would still need to liaise with other potentially affected multiplex operators as per the 2014 Guidance, but these broadcasters should now respond to proposals within specified timeframes. The proposed procedure also contains simple guidance on the techniques and measures which can be used to minimise or mitigate the risk of ACI, as well as guidance on the information that proposers will need to provide to other multiplex licensees when submitting liaison requests.

Responses from stakeholders

3.3 Responses to our proposals from smaller broadcasters were generally positive, with larger broadcasters and transmission providers expressing more reservations, concerns, or suggested modifications.

3.4 Specific points raised included:

- Arqiva and Wireless Group stated that the target turnaround times for multiplex operators should be increased from 10 to 20 working days for 'green' sites, and from 20 to 30 working days for 'amber' sites. Arqiva also stated that extensions beyond these timescales should be permissible in certain circumstances where the multiplex operator can demonstrate a genuine reasonable requirement for an extension.
- Wireless Group stated that information provided by proposers of Green sites must also include a full assessment of why the site has been classified as Green, and must include details of the power levels of other multiplex services and the site details for any adjacent existing site.
- Some respondents noted that a target timescale should be defined for final determinations by Ofcom in situations where proposing and existing multiplex operators cannot reach agreement on a site proposal.
- Several respondents stated that the 'Red' category of ACI/blocking risk is too broad, or that the overall Red/Amber/Green classification is too subjective. Angel Radio noted that an existing transmitter installation which is operating successfully as part of the small scale DAB trials could not have been built under the proposed 'Red' definition.

- Wireless Group stated that, in the absence of a response from a multiplex operator, the approval of the 'victim' multiplex should never be implied. They cited a possible scenario where a liaison request could be overlooked during periods of high activity.
- RadioDeck and Brighton and Hove Radio objected to the proposed changes on the grounds that they would introduce bottlenecks and the potential for abuse by incumbents. Bristol Digital Radio stated that the new process should be robust enough to cope with situations where incumbent broadcasters seek to block or delay the establishment of a new transmitter site.
- Some respondents stated that the results of drive test measurements should be made available electronically to existing multiplex operators, and should be accompanied by a clear narrative report on the findings of the drive tests.
- Arqiva stated that the cost of processing ACI liaison requests should be met by the proposing broadcaster through a rate card system.
- Arqiva also sought clarification of the legal framework under which the ACI procedures operate.
- Wireless Group stated that listener impact tests must not be undertaken during daytime programming or take place during special events, citing the need to avoid such tests causing disruption to existing services.
- Other specific suggestions were received from Arqiva: these included points highlighting ambiguities around the point at which an ACI liaison request is deemed to have been received, the definition of terms such as 'competent engineer' and 'undue interference', and the specific data to be included in (and the format of) site proposal requests.

Our responses to stakeholder comments

ACI liaison process and timescales

3.5 As our consultation noted, Ofcom recognises that processing and responding to ACI liaison requests does impose a burden on existing broadcasters, and our proposed changes sought to minimise this burden by streamlining the existing processes. A robust ACI process does ultimately benefit all broadcasters, and the DAB platform more widely, by ensuring the reception of existing services is not unduly impaired by the launch of new services.

3.6 We are conscious of the desirability of allowing broadcasters a reasonable degree of flexibility in allocating their own specialist engineering resources to ACI activities. Conversely, we recognise that lengthy delays in responding to ACI requests may unnecessarily impede the launch of new services, potentially creating commercial difficulties for new broadcasters and delays in the availability of new DAB services for listeners.

3.7 We have therefore decided that we will extend the maximum response times for 'green' sites to 20 working days, and to 30 working days for 'amber' sites (from the 10 and 20 working days respectively that we proposed in the consultation).

3.8 We recognise there may be some exceptional circumstances in which it may not be possible to meet these timescales (for example staff illness). We will include a specific reference to such exceptional circumstances in the ACI Guidance, and Ofcom will consider any request for delay in such circumstances on a case-by-case basis.

3.9 We also agree with the points raised by some respondents relating to the lack of a maximum timescale for Ofcom to come to a final decision in circumstances where an ACI liaison request is disputed or deadlocked following the broadcaster liaison process. Therefore we will aim to come to a final decision within 30 working days in dispute or deadlock situations. However, by virtue of the fact that that the circumstances of such disputes are likely to be relatively complex, we may need to request additional information or data from the proposer or existing multiplex operator(s) in order to come to a decision. Periods when we are awaiting such additional information will not count towards the 30 day turnaround time.

3.10 One respondent suggested that a formal mediation or dispute resolution process should be put in place for the ACI process. Our current view is that the Ofcom determination period should serve this purpose in most circumstances. We will review how the new ACI process operates once put into practice and we will introduce a more formal dispute resolution process at a later date if it is found to be necessary.

3.11 Arqiva asked for clarification of the point at which a liaison request is deemed to have been made, and the procedure which will be followed if the information supplied by the proposer is found to be incomplete. We believe it would be reasonable for incomplete requests to be flagged by recipients at the acknowledgement stage: Our consultation proposed that amber site requests should be acknowledged within 5 working days, however in light of the slightly extended response timescales we have now decided upon, we will add a requirement for an acknowledgement to be provided within 7 working days for both amber and green site requests, at which point any omissions should be pointed out to the proposer. Re-submitted requests will be treated as new requests for the purposes of response timescales (i.e. the 'clock' will reset).

3.12 We will also modify the guidance to clarify that Ofcom retains sole discretion to approve or reject new transmitter proposals as part of the ACI/blocking liaison process.

Red/Amber/Green categorisation

3.13 Several respondents expressed concerns that the proposed 'red', 'green' and 'amber' site categorisations were either too subjective, or that the definitions for individual categories were too wide. Wireless Group stated that computer-modelled predictions remain valuable for assessing potential ACI impact.

3.14 A key aim of the revised ACI procedures is to make the process more accessible to new entrants who may not have previous experience in DAB transmission, and to streamline the process to cope with a potentially large number of new DAB transmitters coming on-air in future. We therefore sought to re-focus the ACI process so that site proposers can submit proposals using straightforward, objective criteria in a standardised format. This

simplified approach should also ease the process of assessing requests. However, we do understand the concerns raised about the potentially subjective nature of the classifications.

3.15 Similarly, some respondents stated that the categorisations were too restrictive and that, in some circumstances, viable and non-disruptive transmitter sites would be classified as 'red' and could therefore not proceed to be built.

3.16 Recognising these views, we intend working with industry to develop more detailed criteria and guidance over the next few months and to make this guidance available before we commence licensing small scale DAB. Our intention is to build upon processes used during the rollout of national and local multiplexes, as well as more recently with small scale trial sites. Our intention is that this additional guidance can be published when we invite applications to apply for small scale DAB multiplex licences.

3.17 We agree with Wireless Group's suggestion that a site proposer's liaison request should include a full assessment of why a particular site has been classified as 'Green' and have modified the proposed text in the site details checklist (Annex A1 of the Guidance) to include this.

Computer planning tools

3.18 We recognise that computer models have been, and remain, useful when assessing the risk of ACI. We are not seeking to downgrade the use of computer models, and have merely included alternative options (such as drive tests) in the Guidance for the benefit of operators who do not have access to computer modelling tools. We will however modify the site 'Example site details check sheet' at Annex A1 of the Guidance to include provision for computer-modelling data where it is available.

3.19 Nation Broadcasting suggested that a particular computer planning tool, the UK Planning Model (UKPM), could be made available to small scale multiplex operators, or that population counts should be made optional. The UKPM is a proprietary piece of software developed by the BBC and Arqiva. Ofcom is not able to require that it should be made more widely available, although third parties are free to approach those organisations if they wish to enquire about the terms under which they might be given access either to the Planning Model or for planning work to be carried out on their behalf.

3.20 Population counts are only required in cases where an ACI impact prediction is carried out by computer model, and other more widely available planning tools do have the ability to count populations. Computer-predicted population counts are not required in cases where site proposers opt for alternative methods of site impact assessment such as drive tests.

Implied approval

3.21 We note Wireless Group's comments about the undesirability of automatic approval in cases where a multiplex operator does not respond to a liaison request, for example due to an administrative oversight during periods of high ACI liaison demand. While we consider that this risk will be offset by the requirement for all liaison requests to be acknowledged

by the recipient (if an acknowledgement is not sent within the specified timeframe, we would expect the proposer to highlight the issue with the relevant multiplex operator and to Ofcom), we accept that there are some circumstances where the absence of explicit approval may not reflect the receiving multiplex operator's position. We will therefore remove the references to implied approval from the Guidance.

Information and data formats to be provided by site proposers

3.22 Several respondents stated that the results of drive test measurements should be recorded electronically and made available to other multiplex operators. Some respondents also stated that drive test measurements should be accompanied by a clear narrative report explaining the findings. We agree with these suggestions and have modified the Guidance to include these requirements. We do not propose to require specific data formats at this stage but are willing to facilitate cross-industry discussions to establish a commonly-acceptable format or formats.

Definition of terms

3.23 Arqiva suggested that it is important that Ofcom defines more clearly some of the terms proposed to be used in the Guidance, specifically 'competent engineer' and 'undue interference'. Wireless Group also suggested that the Guidance should require that licensees who do not possess the necessary skills must be required to engage the services of competent RF engineering contractors.

3.24 Our general approach is to be as flexible as possible and not to be overly prescriptive unless absolutely necessary. Instead of tightly defining the terms, we can provide the following guidance. We will aim to provide further guidance and clarification as we develop the framework for licensing small scale DAB.

Competent Engineer

3.25 A competent engineer should be able to demonstrate the following characteristics:

a) A good understanding of radiofrequency engineering principles;

b) An engineering qualification in a relevant subject or demonstrable industry experience in planning or assessing coverage or interference;

c) Demonstrable experience in building/commissioning radio transmission sites; and

d) Access to appropriate planning tools or test equipment to carry out predictions of field strength and interference and/or carry out reception surveys where results are electronically logged.

Undue interference

3.26 Ofcom's role when assessing whether to implement a particular radio technology is to assess the risks and benefits, taking into account the available evidence and views of relevant stakeholders. When planning and implementing radio communications services, it

is often not proportionate or possible to completely limit the risk of interference occurring to one service without severely restricting development of another.

3.27 Our general approach in the rollout of DAB radio services has been to minimise the risk that new transmitters present to reception of existing radio services. In practice, this has not meant completely avoiding all interference, but ensuring the any loss of reception is minimised where it is not possible to reasonably avoid it.

3.28 We consider it would be unnecessarily restrictive to put in place numerical limits on any impact on reception as circumstances will vary from location to location. We will however continue to work with all stakeholders in following this approach and, as previously, seek to avoid loss of significant clusters of population or interruptions of reception on main roads.

Listener impact tests

3.29 Our consultation proposed that existing multiplex operators should be informed two weeks in advance of listener impact test transmissions being carried out. Wireless Group stated that listener impact tests should not be carried out during daytime programming or special events.

3.30 We do recognise there are particularly sensitive periods where broadcasters may wish to avoid any risk of temporary disruption to their services due to listener impact tests, and we have modified the text in Section 3.49 of the Guidance to clarify that potentially-affected licensees may require that certain programming periods or special events are avoided. We expect that licensees should work together constructively, with existing licensees making reasonable efforts to accommodate requests for tests and the parties requesting those tests showing flexibility and avoiding key times. We do not, however, believe it would be proportionate for Ofcom or other licensees to require that day-time tests are avoided completely.

Cost recovery

3.31 Arqiva stated that small scale DAB applicants should cover the costs incurred by multiplex operators who undertake technical assessments of ACI liaison requests through an agreed rate card system. This is because the respondent considers ‘that there is an unacceptable risk on incumbent multiplex operators who may face very significant costs associated with multiple applications for small scale DAB multiplexes’.

3.32 As our consultation noted, we do recognise that assessing ACI liaison requests places an administrative burden on both new and existing broadcasters. While the launch of small scale DAB will inevitably lead to an increase in the number of new DAB transmitter site proposals, existing multiplex operators are already responsible for carrying out assessments of ACI liaison requests under the current procedures, for which there is no cost-recovery mechanism.

3.33 Separately, the licensing timetable for small scale DAB services has not yet been established: Ofcom will shortly be consulting separately on the principles and priorities

that we propose to apply in drawing up the timetable for small scale DAB licensing. While the absolute number of new small scale DAB transmitters may be relatively large, the impact of ACI requests on existing broadcasters will depend to some extent on the sequencing and pace of the licensing process.

3.34 More generally, we believe that an effective ACI liaison process ultimately benefits incumbent DAB operators and the DAB platform as a whole by providing a proportionate and effective means of protecting listeners from disruptive blocking and ACI effects: we note that the existing cross-industry approach (which does not include cost recovery) has proven effective to date. We also note that none of the other DAB multiplex operators who responded to the consultation suggested that a cost-recovery mechanism should be introduced.

3.35 We consider that the introduction of cost-recovery is likely to introduce additional barriers to entry for new multiplex operators, which was not present for the existing licensees.

3.36 Therefore on balance, we do not consider that there is a compelling case for site proposers to meet the costs that existing licensees incur in assessing the likely impact of their services on incumbent broadcasters. We will however monitor how the new ACI procedures operate in practice, and if clear evidence of an unreasonable burden being created emerges, we will review the position.

Process shortcomings and potential for abuse by incumbents

3.37 One respondent (RadioDeck Ltd / Brighton & Hove Radio Ltd) did not support the proposed approach to ACI management. They stated:

3.38 *"The ACI process as currently proposed is unlikely to be workable as it introduces bottlenecks and potential abuse by existing 'legacy' multiplex operators - who are effectively invited to stifle their only minor competition. The process used for the trials was much simpler than this and we understand that none of the transmitters caused blocking or interference. It is unclear why the simple, proven and workable process used for the trial needs to be replaced with a complex, untested, slow and bureaucratic one."*

3.39 We do not agree that the proposed process is unlikely to be workable, as it is a variation on the existing approach to ACI management which has been in place for a number of years, albeit with modifications which are intended to streamline the process and make it easier to participate in for new entrants.

3.40 We believe it is desirable that both new entrants and existing broadcasters remain fully engaged in the ACI management process (as they are under the current process for existing commercial DAB transmitters).

3.41 Due to the limited scope and short intended duration of the small scale DAB trials, the ACI liaison process for the trials was primarily led by Ofcom on behalf of the ten triallists: we produced in-house technical predictions of likely ACI impacts, and carried out subsequent drive-testing ourselves. However, it would not be viable for us to carry this approach forward to the permanent licensing framework for small scale DAB due to resource

constraints. Therefore while we do not propose to alter our approach to the ACI process in light of these comments, as noted in section 3.16, we intend to work with industry over the coming months to develop more detailed criteria and guidance and to make this guidance available before we commence licensing small scale DAB.

4. Spectrum masks for DAB

4.1 Our consultation asked for views on two proposed changes to the 'spectrum masks' which DAB transmitters need to comply with. A spectrum mask defines limits to the levels of signals that a practical transmitter system inevitably outputs on frequencies outside the frequency range occupied by its useful (wanted) signal.

New ETSI critical mask

4.2 The 2014 version of the Technical Code requires compliance with a 'critical' mask characteristic (the '2014 critical mask').

4.3 Our first proposed change was to align the mask defined in the Technical Code with a mask contained in an international standard, ETSI EN 302 077 v2.1.1[3] (the 'ETSI critical mask'). This standard was developed following the introduction of European Directive 2014/53/EU (the Radio Equipment Directive, or RED).

4.4 There are some differences between the 2014 critical mask and the new ETSI critical mask. The 2014 critical mask defines one filter characteristic that applies to all power classes of transmitter except very lower power repeaters. The new ETSI critical mask is specified for three power classes: low power (up to 25W), medium power (greater than 25W and up to 1kW) and high power (above 1kW).

4.5 The new ETSI critical mask characteristic is identical to the 2014 critical mask for the medium power class (between 25 and 100 watts conducted power), in that its limits are expressed relative to the transmitter's output power. For lower power and higher power cases, the ETSI mask specifies absolute power values. This means that the ETSI filtering requirements become less stringent for transmitter powers below 25W

4.6 However, the ETSI critical mask is more demanding than the current mask for transmitter powers above 1kW. We therefore proposed to clarify in the Technical Code that existing transmitters put into service before the updated version of the Technical Code comes into force with an output power above 1kW will not need to be made compliant with the new ETSI mask retrospectively and the current mask (corresponding to the ETSI medium power critical mask) will continue to apply. Transmitters put into service after that date will need to comply with the new ETSI mask.

Potential for use of non-critical mask

4.7 Our consultation also contained a 'call for inputs' which asked for stakeholder's views on the potential future adoption of a more relaxed ('non-critical') mask characteristic for DAB services in some situations. The non-critical mask is also defined in the current version of ETSI EN 302 077 v2.1.1. If a non-critical mask were to be adopted, broadcasters could potentially deploy less complex and expensive filters (thereby lowering the capital cost of

[3] https://www.etsi.org/deliver/etsi_en/302000_302099/302077/02.01.01_60/en_302077v020101p.pdf

new transmitter systems). However, it would lead to a slight increase in the level of signals that 'spill over' into adjacent frequencies, including to other DAB and programme making and special events (PMSE) services.

4.8 Our consultation contained an initial overview of the potential issues. We set out a preliminary conclusion indicating that the non-critical mask could be deployed without causing disruption to other services in some situations. However, we also recognised that the technical compatibility analysis on the use of the non-critical mask would need to be developed further, and we said that we would continue this work with a view to setting out our final conclusions alongside a future consultation on how we intend to license small scale DAB multiplexes, which is expected to be published shortly.

Responses from stakeholders and Ofcom decision

New ETSI critical mask

4.9 No respondents objected to the adoption of the new ETSI critical mask. We will therefore modify the critical mask as proposed in the consultation.

'Call for inputs' on the adoption of the non-critical mask

4.10 A majority of respondents who expressed an opinion on the adoption of the non-critical mask were supportive, or outlined their views on the specific situations in which the critical mask might be technically viable.

4.11 However, Arqiva and Wireless Group stated that use of the critical mask should not be permitted until further information on the performance of receivers is available (with Arqiva contributing a detailed technical discussion of the issue as part of their response).

4.12 Arqiva, BBC, DTG, and WorldDAB stated that they would be willing to work with Ofcom to further explore the opportunities and implications of adoption of the non-critical mask.

4.13 Some respondents noted an apparent error in the non-critical mask characteristic table (table 2 in the consultation) where the ±0.97 MHz breakpoint appears twice. However, this is intentional, and is due to the 'brick wall' characteristic of the first two breakpoints and the same characteristic is contained in the ETSI specification.

4.14 One of the justifications for moving to adopting the non-critical mask filter is that non-critical filters could be less expensive and smaller than filters meeting the critical mask specification. We note that non-critical filters are not widely available at present as a standard product. It is therefore not certain what the cost savings over a critical filter are likely to be, although we estimate it would be of the order of a few hundred pounds per filter unit. While welcome at all power levels, the cost and size benefits of deploying non-critical filters are likely to be most significant for transmitters operating at low power levels, perhaps 10-50W and below.

4.15 We do agree with respondents that further technical work is required on adoption of the non-critical mask, and we will engage with stakeholders in the radio sector with the aim of coming to an agreed position on the possible uses of the non-critical mask.

4.16 Our consultation proposed adding the non-critical mask characteristic to the Technical Code, alongside a clear statement noting that the critical mask must be used by broadcasters unless the non-critical mask is explicitly permitted in individual licences. Given there is further technical work to be carried out and the likely benefits of adopting the non-critical mask are modest at the power levels for transmitters likely to be implemented by operators over the next few years, we have concluded that we do not at this point need to include the non-critical mask in our Technical Code. The critical mask will remain the required characteristic for the time being.

5. DAB+ audio encoding

Summary of proposed changes

5.1 Our consultation proposed removing certain restrictions on broadcasters who wish to transmit digital radio services in the DAB+ format.

5.2 To date, most DAB services in the UK have used the original DAB standard, where audio is encoded using MPEG 1 Layer II compression. DAB+ uses the more recent MPEG 4 HE-AAC v2 (ISO/IEC 14496[4]) compression standard, which offers improved technical efficiency. DAB+ also provides an additional layer of Reed-Solomon error protection and virtual interleaving which improves the decoding reliability. DAB+ is already used by a relatively small number of stations on commercial DAB multiplexes, but it is used more widely on the small scale DAB trial multiplexes.

5.3 Specifically, we proposed removing a condition from the 2014 Technical Code which requires broadcasters to obtain prior written permission from Ofcom before adopting DAB+ audio encoding.

5.4 Our consultation also recognised that, because not all existing radio receivers can decode DAB+ services, some listeners with DAB-only radios could lose access to an existing station if it moves from DAB to DAB+. We stated that multiplex operators and radio stations themselves would best-placed to judge when - or if - to move to DAB+: retaining and building audiences is critical to the commercial viability of radio broadcasters, and therefore we stated that broadcasters are only likely to move to DAB+ when a sufficiently large proportion of their audiences are capable of receiving their service in the alternative format.

5.5 However, we proposed introducing a new condition in the Technical Code requiring multiplex operators carrying services wishing to move from DAB to DAB+ to liaise with the affected service provider(s) (i.e. the individual radio station(s)) with the aim of providing appropriate information to listeners on the changes (e.g. on-air announcements).

Responses from stakeholders and Ofcom decisions

Removal of written consent requirement for DAB+

5.6 No respondent objected to the removal of the requirement to obtain written permission to adopt DAB+. We will therefore make this change to the Technical Code as originally proposed.

5.7 Some respondents argued for additional measures to encourage the adoption of DAB+ (e.g. Wetherby Community Radio Ltd stated that DAB+ should be the primary encoding standard for the DAB platform, and WorldDAB encouraged active planning for a transition

[4] https://www.iso.org/standard/76383.html

to DAB+ but recognised the issues facing the UK in terms of installed DAB-only receivers). William Turrell and a confidential respondent argued that the sale of DAB-only receivers should be discouraged or banned. William Turrell also stated that more effort should be made to establish DAB+ receiver sales figures.

5.8 We have considered these points, and while we recognise the desire from some parties for a formally structured transition to DAB+ for the UK broadcast digital radio sector, we currently consider that the pace and scope of any transition is best determined by the natural evolution of the market. Additionally, industry initiatives such as the 'digital tick' can provide reassurance to consumers that digital radio equipment is capable of DAB+ operation.

Listener advice liaison requirement

5.9 This proposed condition would require multiplex operators to liaise with service providers wishing to move from DAB to DAB+ with a view to providing timely and appropriate advice to listeners alerting them to the forthcoming change. Some respondents (Bauer Digital Radio, CE Digital, Digital Radio Group, MuxCo Ltd, and Wireless Group) disagreed with the proposal. These respondents stated that the liaison requirement was not appropriate for the Technical Code, or that it was unworkable, or that the listener communication requirement should fall on the service providers directly.

5.10 We have considered these comments, and we do agree that the listener communication requirement would ideally be placed on the service provider directly, rather than on the multiplex operator. We also note that, while the proposed listener advice condition requires the multiplex operator to liaise with a service provider, it creates no obligation on the service provider to actually provide such advice.

5.11 However, we also consider that, in the normal course of its business, the multiplex operator (as the licensee responsible for implementing technical changes such as that from DAB to DAB+) does have a role to play in liaising with service providers about the implications of any technical changes to the service (e.g. changes in other audio characteristics or capacity occupied). Therefore, while the proposed listener advice liaison requirement does not create a formal obligation on the service provider, it does ensure that the consumer implications of a DAB+ migration are communicated to the service provider.

5.12 More generally, we sought to make this requirement as 'light touch' as possible so as to avoid the need to introduce a new formal regulation on service providers, or the need to vary the licences of all licensed radio broadcasters to effect such a regulation.

5.13 As our consultation noted, we would not expect widespread migration to DAB+ to occur until market conditions (in particular receiver penetration) supports such a change. We also believe that in situations where a broadcaster elects to move to DAB+ while a significant proportion of its audience is using DAB-only sets, it would be commercially and reputationally rational to provide advice for listeners with DAB-only sets.

5.14 On balance, we believe that our proposed liaison requirement provides a proportionate mechanism to highlight the consumer implications of DAB+ migrations to service providers, and will implement the change as proposed in the consultation. We will however monitor any future DAB+ migrations, and if there is evidence of consumer harm we will consider alternative options such as imposing a communication requirement on radio service providers directly.

Other Issues: DAB/DAB+ Error protection levels

5.15 A number of respondents raised issues around the regulation of error protection levels in their responses to the consultation question about DAB+. We deal with these comments separately in Sections 6.28-6.37 below.

Other issues: HE-AAC v2

5.16 A number of respondents raised the point that, as drafted, the Code requires DAB+ services to adopt the HE-AAC v2 codec, and that the other variants of the AAC codec (in particular AAC-LC) should also be permitted.

5.17 This drafting existed in the 2014 revision of the Technical Code reflects the international standards for DAB+ which require the use of HE-AAC v2. However HE-AAC v2 is an extension of the previous HE-AAC v1 and AAC-LC codecs, and broadcasters can choose whether or not to implement the advanced coding features that are present in HE-AAC v2. If these additional features are not used, the audio will effectively become either an HE-AAC v1 or AAC-LC stream, which all DAB+ receivers can decode. We will therefore retain the existing drafting in the Code.

6. Digital Radio Technical Code: other proposed revisions

Summary of proposed changes

6.1 Our consultation proposed making a number of editorial changes to the Digital Radio Technical Code to rationalise its requirements, to ensure consistency with the current versions of the international standards for DAB, and to accommodate the anticipated implications of the launch of small scale DAB services.

6.2 The main changes that we proposed were:

Removal of 'out of scope' requirements

6.3 The 2014 Technical Code contained an informative section which listed some specific legislative and regulatory areas which fall outside the scope of the Code and of Ofcom's responsibilities, but which licensees were advised to be aware of (for example, Health and Safety requirements and electromagnetic field exposure limits). We proposed replacing this section with more general text.

Removal of DAB Mode II

6.4 The 2014 Technical Code referred to DAB transmission Mode II. We proposed removing this reference, as Mode II has now been removed from the international technical specification for the DAB system (and was never used in practice by any UK broadcast services).

Removal of directional coupler requirement

6.5 To increase flexibility in transmitter system design, we proposed removing an existing requirement for broadcasters to provide a 'directional coupler' (which allows technical compliance measurements to be made on a transmitter system without interrupting service) on standalone transmitter systems (directional couplers would still be required where multiple transmitters are combined into a common antenna system). However we noted that in the absence of a directional coupler, Ofcom may require the transmitter to be taken out of service at short notice in order for technical compliance measurements to be made.

Removal of dummy load requirement

6.6 We proposed removing the requirement for a dummy load (RF power resistor) to be made available at transmitter sites, noting that licensee-supplied dummy loads are rarely used in practice during Ofcom compliance measurement testing.

MCI/FIC Repetition Rate and AIC

6.7 A multiplex carrying a large number of DAB+ services may not meet certain nominal signalling rates specified under the international technical specifications for the DAB/DAB+ system. We therefore proposed adding text to the Technical Code highlighting this potential limitation, and amending the requirement on repetition rates in the Code so that it aligns with the limits set out in the international technical standard. We also sought input from stakeholders who might have evidence that the required repetition rates could be maintained when a large number of services are carried in a multiplex, or that receiver behaviour is not impaired when the minimum repetition rates are not met.

6.8 We also proposed removing a reference to the 'Auxiliary Information Channel (AIC)' from this part of the Technical Code, as it has been removed from the international standard for the DAB system.

Error Protection

6.9 We proposed to insert a requirement for minimum error protection level for DAB services and a fixed error protection level for DAB+ services into the Technical Code. These requirements are already contained in the associated Guidance and were subject to consultation during 2014.

SId & TII Codes

6.10 Our consultation noted that, should a large number of DAB service launch in future, it may not be possible for Ofcom to continue to allocate unique Sid and TII codes (technical signalling codes in the DAB multiplex which identify individual DAB stations and transmitters respectively). We asked for input on the implications of this possible change.

6.11 We also asked stakeholders for views on whether bodies other than Ofcom might be better-placed to manage the allocation of identification codes to individual services, multiplexes, and transmitters in future.

Detailed technical drafting points

6.12 Some stakeholders made comments on the detailed technical drafting of some of parts of the Technical Code changes that we were consulting on, and on the Code more generally.

Responses from stakeholders and Ofcom decisions

Removal of 'out of scope' requirements

6.13 We received no comment on this proposal.

6.14 We will therefore make the changes proposed in the consultation.

Removal of DAB Mode II

6.15 We received no objections to this proposal, and one respondent (DAB Radio Technology Ltd) specifically supported it.

6.16 We will therefore remove the reference to DAB Mode II as proposed in the consultation.

Removal of directional coupler requirement

6.17 DAB Radio Technology Ltd and Commtronix objected to the removal of the directional coupler requirement for standalone systems. DAB Radio Technology Ltd cited problems around proving system compliance in the absence of a directional coupler, associated difficulties in checking filter tuning, and an increase in the amount of equipment that would be required to commission the transmitter system. Commtronix stated that a directional coupler makes Ofcom inspection less intrusive, and allows for easier routine checks. Commtronix also noted that a planned break in service can require considerable negotiation with the services carried on the multiplex.

6.18 We note these views, and agree that it is good engineering practice to incorporate a directional coupler. However, we remain of the view that the installation of a directional coupler should ultimately be a matter for the individual multiplex operator rather than the regulator, and that the risks associated with not providing a directional coupler (e.g. unplanned service outages, and negotiating with service providers to agree planned service outages, as well as the need to take the transmitter out of service at short notice should Ofcom need to make technical compliance measurements) should rest with the multiplex licensee. We will therefore remove the directional coupler requirement for standalone transmitter systems as proposed in the consultation.

6.19 Where directional couplers are still required (for antenna systems sharing a common antenna), Arqiva suggested that coupler calibration data should be made available for Ofcom to review, and made suggestions about the technical characteristics that the coupler should meet. We note these suggestions, but will not modify the text at this stage.

Removal of dummy load requirement

6.20 DAB Radio Technology Ltd supported the removal of the dummy load requirement, but only if the directional coupler requirement was retained. No other respondents commented on this proposal.

6.21 Although we are not retaining the directional coupler requirement, we will proceed to remove the dummy load requirement as proposed.

MCI/FIC Repetition Rate and AIC

6.22 Arqiva recommended that the passages in the Technical Code relating to repetition rates should be replaced by text which is published in the international standard (ETSI TS 103 176) so that there is no risk of ambiguity between the Code and TS 103 176.

6.23 The Community Media Association stated that Ofcom should be open to evidence that minimum repetition rates can be maintained for multiplexes carrying more than 20 services or that reception is not impaired with slower repetition rates.

6.24 Bristol Digital Radio and Future Digital Norfolk stated that repetition rates should not be more restrictive than the prevailing international standard.

6.25 In response to Arqiva's comment, while we agree that replacing the repetition rates passages in the Technical Code with text from the international standard would reduce the potential for ambiguity, our Technical Code is not intended to reproduce wording contained in other documents. We have though amended the wording in the Code to remove the stipulated repetition rate for MCI information and strengthened the references to the parameters contained in TS 103 176. We believe this has removed any ambiguity that might have existed.

6.26 Closer alignment with the TS 103 176 standard will also have the effect of addressing the Community Media Association's comments, as that specification does allow for more than 20 services to be accommodated in a multiplex and for repetition rates to be reduced accordingly.

6.27 Therefore, subject to the amendments detailed in 6.25, we will make the changes proposed in the consultation.

Error Protection

6.28 A number of respondents commented on this proposal: some comments on this topic were provided under consultation question 5, which asked about our proposed changes to the DAB Technical Policy Guidance (and which also contains requirements on error protection levels). We will consider all responses on error protection in this section.

6.29 Some respondents (Bauer Digital Radio, CE Digital, Digital Radio Group, MuxCo Ltd & Wireless Group) stated that any regulation of error protection levels was inappropriate, and that broadcasters should be free to select any technically valid protection level for individual services. DAB Radio Technology Ltd pointed out that some radio services are currently operating with less robust protection levels than proposed.

6.30 Other respondents (Bristol Digital Radio, Future Digital Norfolk), noted that while the proposals give some degree of flexibility to the error protection applied to DAB services, equivalent flexibility should be available for DAB+ services (rather than a fixed EEP level).

6.31 One respondent (Angel Radio) felt that DAB services should have the ability to move to more robust protection levels while retaining the flexibility to move back to a minimum UEP level. Maxxwave stated that preventing the use of UEP-1/UEP-2 would remove flexibility for low-demand multiplexes in rural areas.

6.32 The statement following our 2014 consultation[5] outlined our rationale for setting minimum error protection levels on DAB and DAB+: these primarily relate to ensuring that operators

[5] https://www.ofcom.org.uk/consultations-and-statements/category-2/digital-radio-tech-codes

adhere to the coverage commitments they made when applying for a licence. The coverage obligation that arises out of these commitments ensures maintenance of listener choice, consistency for the listener experience, and the stability of the platform. We do not accept that circumstances have changed materially since then, and we believe that it remains appropriate for error protection levels to be regulated.

6.33 However, we do accept that it would be appropriate for DAB+ services to have the flexibility to adopt more robust error protection levels in a similar manner to DAB services. We will modify the drafting of the Technical Code to reflect this.

6.34 We will retain the requirement for services who wish to adopt a more robust protection than UEP-3 or EEP-3A level to seek Ofcom's consent to do so.

6.35 There are only two UK DAB services currently operating at UEP-4, those services having adopted that protection level before the formal adoption of the minimum UEP level policy. These specific services may continue to operate at the lower protection levels.

6.36 Arqiva made a separate technical drafting point relating to the error protection used for half-rate (24 kHz sample rate) services, and also to the level of protection offered by alternative EEP levels that offer equivalent or better levels of error protection than EEP-3A.

6.37 As set out above, while UEP-3 and EEP-3A remain the baseline protection level to be adopted by multiplex licensees, Ofcom will consider proposals to adopt alternative variants if licensees can provide evidence that doing so would not adversely affect coverage or listener experience. We have incorporated this clarification in the Technical Code wording.

SId & TII Codes

6.38 On the potential need to allocate non-unique SIds to service in the future, some respondents (BBC, Bristol Digital Radio, RadioDNS, RadioPlayer, WorldDAB and one confidential respondent) expressed significant concerns. These concerns included that unique SIds are a fundamental feature of the DAB system and the international standards on which it is based, and that if non-unique codes were allocated then the integrity of the DAB broadcast system (particularly in-vehicle reception) could be compromised.

6.39 Some respondents questioned whether code exhaustion was a real prospect, or stated that the total code space available to the UK could prove sufficient for future needs (DAB Technology Ltd and WorldDAB), or stated that centralised and more detailed management could make the best use of the existing code space (RadioDNS)

6.40 Some other respondents stated that code re-use could be used in principle or as a matter of course (Commtronix, Maxxwave, and Wetherby Community Radio).

6.41 We initially raised the possibility of future code exhaustion because the SId code space for DAB services is finite. If the eventual number of small scale DAB multiplexes is large, and a large number of unique services are carried on these multiplexes, code scarcity or exhaustion could become an issue. However, we acknowledge the practical and international standards compliance implications of SId code re-use that respondents to the

consultation raised, and agree that the existing code space resource should be sufficient for at least the short to medium term.

6.42 We will therefore continue to allocate unique SId codes but will monitor any changes in demand patterns. Should code scarcity or exhaustion seem a realistic prospect on in the future we will consider possible alternative approaches in more detail in advance of that point.

6.43 We also asked whether respondents had any views on alternative models for dealing with the administration of SId and TII codes in the future.

6.44 Cambridge Digital Radio and Huntingdon Community radio, the CMA, Commtronix, DAB Radio Technology Ltd, Future Digital Norfolk, RadioDeck & Brighton and Hove Radio, Wireless Group and WorldDAB argued that Ofcom should continue to allocate SId TII codes.

6.45 Other respondents stressed the importance of correct code allocation and asked for Ofcom's policy on code allocation to be made clearer (Angel Radio and Nation Radio).

6.46 The DTG stated that code allocation could be dealt with by industry, as is the case with television. Radioplayer stated that if a third-party organisation does take on responsibility for issuing codes, it should be a non-profit body which has the backing of broadcasters and which is not allied with a major transmission provider.

6.47 A majority of stakeholders who commented on the desirability of code allocation being performed by a third party expressed a preference for Ofcom to continue to allocate codes, and the responses revealed no compelling, low-cost third-party alternative to the current process. We have therefore decided that Ofcom will continue to allocate codes as we presently do, but we will remain open to evidence of viable alternative approaches.

Detailed technical drafting points

6.48 We have considered the editorial drafting points raised by stakeholders on our proposed changes, and on the Technical Code more widely, and have incorporated these changes where appropriate.

6.49 We have amended the wording in paragraph 3.8 of the Code relating to Supplementary Switching to better align it with the terminology used in the applicable standards.

7. Technical Policy Guidance for DAB Multiplex Licensees: other proposed revisions

Summary of proposed changes

7.1 Sections 2.1 to 2.4 of the 2014 Technical Policy Guidance deal with Ofcom's position on the allocation of, and changes to, the audio characteristics of services carried on DAB multiplexes.

7.2 However, our policy regarding the audio characteristics of future small scale DAB services has not yet been set: this issue will form part of our separate consultation on the licensing of small scale DAB which will be published shortly.

7.3 Therefore, our consultation proposed a modification to the Guidance to clarify that sections 2.1 to 2.4 apply only to national and local DAB multiplex licences. Our consultation stated that when the policy for small scale DAB has been determined, we will revise and re-issue the Guidance in line with this policy.

Responses from stakeholders and Ofcom decision

7.4 Some respondents (Bauer Digital Radio, CE Digital, Digital Radio Group, MuxCo Ltd, disagreed with this proposal, primarily on the grounds that there should not be contrasting requirements on small scale DAB compared to local and national DAB services.

7.5 The BBC stated that it would be sensible to make changes to the Guidance once policy for small scale DAB has been defined. Wetherby Community Radio made a similar point.

7.6 Nine other respondents (primarily smaller broadcasters) agreed with the proposal.

7.7 We have considered these responses. We understand the concerns raised by existing larger broadcasters who stated that that there should not be a divergence in regulatory approach between national & local DAB services and future small scale DAB services.

7.8 As the legislation for small scale DAB multiplexes has not yet been laid in Parliament and no such licensed services exist[6] , it would be premature to restrict the scope of this Guidance. We will therefore not make the proposed wording change and will consult further in the future if necessary when the regulatory framework for small scale DAB services has been established

[6] Except a small number of temporary trials to which separate technical requirements apply

8. Other issues raised by respondents

8.1 Some respondents raised issues which were not directly related to the consultation questions or the changes that we were proposing, but rather to the Code or Guidance more generally.

Horizontal / Mixed polarisation

8.2 DAB transmissions in the UK have always operated using vertical polarisation only, and the Technical Code does not permit alternative polarisations to be used. A number of respondents (Angel Radio, Cambridge Digital Radio and Huntingdon Community Radio, the CMA, Future Digital Norfolk, Nation Broadcasting and transplan, requested that alternative polarisations (horizontal, mixed, or slant) should be permitted for DAB services.

8.3 RadioDeck and Brighton and Hove Radio felt that mixed polarisation would create rather than solve problems.

8.4 There are no studies that we are aware of that have been carried out comparing the benefits of mixed polarisation vs linear polarisation for DAB in Band III. We have, though, reviewed the results of a limited number of studies that have been carried out comparing vertical, horizontal and mixed polarisation for broadcast radio by the BBC[7] and Radiotelevizija Slovenija/Institut für Runfunktechnik (RTVS/IRT)[8] These studies were carried out for FM radio in Band II (88 - 108 MHz) which, although also using VHF spectrum in Band II, differs from DAB in Band III in some important respects. The main conclusions from these studies are that

a) vertical polarisation is the preferred approach for new technologies (which would include DAB), although mixed polarisation is recommended for FM broadcasting in order to maintain compatibility with households that have horizontally polarised rooftop aerials (BBC).

b) horizontal polarisation is preferred in hilly or mountainous terrain to reduce the effects of multipath interference (RTVS/IRT)

8.5 Having reviewed the available evidence and, bearing in mind the differences between DAB and FM signals, our preliminary conclusion is that the case for including horizontally polarised signals in addition to vertically polarised signals is weak. For DAB there is no legacy of horizontally polarised rooftop aerials to provide signals for and the digital transmission system used by DAB is not affected by multipath interference in the way that FM radio signals are.

[7] VHF-FM Radio broadcasting: tests to compare horizontal, vertical and mixed polarisations G.H.Taylor and D.S.Cox, BBC 1986: http://downloads.bbc.co.uk/rd/pubs/reports/1986-13.pdf
[8] Comparison between mixed and horizontal polarization for VHF/FM sound broadcasting, L.Gregorac & R.Schramm, EBU 1992: https://tech.ebu.ch/docs/techreview/trev_254-gregorac.pdf

8.6 Transmitting both horizontal and vertical signal components increases costs for broadcasters. Antenna arrangements are more complicated than for a single plane polarisation and radiated powers (or antenna gain) need to be doubled to put an equivalent signal out in each plane – thus increasing the cost to purchase the transmitter/antenna or the ongoing running cost.

8.7 We will shortly make proposals for the technical conditions relating to small scale DAB multiplexes when we consult on the framework for licensing small scale DAB services. This will include the choice of polarisation, and we will consider any additional evidence we receive showing that mixed polarisation has advantages over vertical polarisation.

8.8 The Technical Code will retain the current requirement for vertical polarisation only in the meantime.

Very Low Power Repeaters

8.9 Very Low Power Repeaters are small DAB 'relay' transmitter systems. They are primarily used by retailers to demonstrate DAB radio sets inside large stores which would otherwise be unable to receive DAB signals (e.g. due to the RF shielding effects of the building). Currently the Technical Code requires Very Low Power Repeaters to operate on DAB blocks 10B to 12D (the range of frequencies used by existing national and local DAB services).

8.10 Angel Radio and Nation Broadcasting suggested that the permitted frequency range for Very low Repeaters should be extended to include the frequencies proposed for use by small scale DAB services.

8.11 Due to the fact that PMSE frequency allocations are interleaved between small scale DAB blocks, there is the potential for interactions between the two services, and a more detailed technical analysis would be required in order to quantify any risk of interference. If there is demand from industry for Very Low Power Repeaters to cover small scale DAB frequencies in future, we will consider the case for extending the permitted frequency range at that time.