The requirements described in this document apply to all programmes, podcasts, downloads or any "content" made for the BBC without a video component.

In this document the term

The

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high quality   broadcast quality

BBC Radio delivers a diverse range of programmes to its listeners via terrestrial and satellite transmission, online streaming and downloads. An underlying requirement for all programmes and delivery methods is that the audio quality heard by the listener is consistently high.

Audio quality may be defined by a combination of objective parameters   bandwidth,

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If the audio file is programme material delivered for broadcast, then the audio format for the file will be: Linear PCM, 48 kHz, 16 bit (or greater, by prior agreement)

To reduce file size and so speed up file delivery over the Internet, the BBC will accept such wav files encoded to FLAC format (.flac).

Audio files delivered to the Radio Digital Archive (RDA) should be stored in their native format, normally 16 bit 48kHz. In some cases, audio recorded at a venue will be of higher quality than that delivered to the RDA via the normal route (via the playout and production system). In such cases, a mechanism should be in place to ensure that the higher quality version is also retained by the RDA. Where material requires archiving in a format other than 16 bit 48kHz, bespoke arrangements must be made with the Archive.

48kHz is the standard audio sample rate across both BBC Radio and TV. In common with much of the audio and radio industry BBC Radio at one time used a sample rate of 44.1kHz in production environments. This was helpful when audio CD and CD-R were the principal source and recording media, but was only an interim measure. Where content has been produced at 44.1kHz or other sample rates, high quality sample-rate conversion should be used to provide a 48kHz version at the point of delivery for broadcast.

Stereo programmes must always be supplied as a single wav (or FLAC) file with the two channels recorded as A and B (i.e. left and right) not as M and S (i.e. sum and difference).

Stereo programmes must be recorded so as to be compatible for listeners in mono. In general signals should be in phase between channels. The S (difference) signal should rarely exceed the M (sum) signal (otherwise cancellation can result when the signal is heard in mono). Avoid extremes of stereo imagery or

nt with the

commissioning editor.

True peak level is not to exceed -1dBTP measured using a true peak (4x oversampling or higher) meter, compliant with [ITU-R BS.1770](#)[6].

Programmes must be produced in accordance with

Stereo productions, where music is either absent, or features less prominently within a programme.
Speech programmes such as panel discussions, where stereo is useful in providing positional information for the listener.
Remote inserts in stereo, where it is important that the audio quality from the OB matches that of contributors in the studio.
As above, but in mono, allowing for a further reduction in bit rate.

Category B programmes require high quality audio. Slight bandwidth reduction and mild codec artefacts are acceptable.

Mono inserts to news, magazine programmes, etc., where speech clarity and intelligibility takes priority over audio quality

Category C programmes must retain good overall clarity, but some noticeable bandwidth reduction and codec artefacts are acceptable.
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A further consideration is whether a link is the main TX path or a backup route. It is usually acceptable to risk a slight reduction in audio quality relative to the main TX path if this provides a significant cost saving. However, it is important that any degradation is not too great. Guidance is given in the table in Appendix 1.

Microphone processing (or EQ of a mic feed) is highly personal and will normally be devised by or with individual presenters to give their voice a particular timbre on air. As with other types of adjustment applied in the studio, it needs to be done with care so that it complements rather than
pplied further downstream.

Are processing artefacts such as pumping, distortion or frequency response errors likely to be obvious to many listeners?

the other extreme, a station such as Radio 3 that broadcast wide dynamic range content may have an average loudness at the receiver of less than -23 LUFS. Although to some extent a step-change in loudness is expected when switching between a classical and a pop station, this is no longer desirable or incurable with digital platforms. In particular, the ability to stream internet services and build custom programme sequences makes loudness matching more important than ever.

EBU R 128[5]

Several proprietary techniques are available to embed audio watermarks in station output. As distinct from data carried separately from the audio, these watermark signals have the potential to affect audio quality. Although the manufacturers of such devices strive to minimise possible audibility of the embedded signals, the watermarks must also be sufficiently robust to allow reliable decoding. In other words, there will always be a trade-off between the two factors. Careful listening tests must be conducted   using the exact same configuration as proposed for the final installation   before watermarking is applied to live services.

[1] Digital Production Partnership: Technical Standards for Delivery of Television Programmes to UK Broadcasters

[2] Specification of the Broadcast Wave Format: A format for audio data files in broadcasting

[3] EBU Tech. 3205-E: The EBU Standard Peak Programme Meter for the Control of International Transmissions

[4] BBC R&D White Paper WHP202: Terminology for Loudness and Level, dBTP, LU and all that

[5] EBU Recommendation R 128: Loudness Normalisation and Permitted Maximum Lisa

Platform	Codec	Radio 1	1 Xtra	Radio 2	6 Music	Radio 3	Radio 4 FM	Radio 4 LW	4 Extra	5 live (UK only online)	Sports Extra	Asian Network	CBeebies Radio (UK only)
DAB	MPEG LII	128 js	128 js	128 js	128 js	192 s / 160 js	128 js / 80 m	64 m	80 m	80 m / 64 m	64 m	64 m	N/A
DVB	MPEG LII	192 s	160 s	192 s	160 s	192 s	192 s	96 m	160 s	96 m	96 m	128 js	N/A
Online Profile 1	AAC-LC	320 s	320 s	320 s	320 s	320 s (also on ShoutCast)	320 s	320 s	320 s	320 s	320 s	320 s	320 s
Online Profile 2	AAC												