

Is 5G a viable solution for radio?

As the development of 5G continues to progress, its potential to successfully support and maintain radio broadcast is increasingly being researched.

Drawing on expert opinion, this factsheet aims to inform readers on the potential implications of 5G for radio, and whether it presents a viable solution for radio broadcasting.

The document introduces and defines key terminology around 5G, as well as a number of functionality concepts regarding the use of 5G for radio including access, service reliability, transmitter power, frequencies and signal distance.

Terminology

5G is a term we are all familiar with hearing and seeing in daily news and information articles. However, 5G means different things to different people. It is used to market the next generation of mobile phone networks, already being rolled out in various European countries. In this context, it often refers to networks built using LTE-advanced technology, the evolution of so-called 4G technology.

The term 5G is defined by the International Telecommunications Union (ITU), where it refers to a new generation of technologies to deliver a broad range of wireless communication and control functions in a collection of so-called 'verticals' – in this context mobile telephony and mobile internet are just one part of the whole project, which includes industrial automation, medical implants, Wi-Fi, etc.

For 3GPP, the industry group that defines most internationally used mobile telephony standards, 5G originally referred only to "New Radio", a more advanced technology than LTE, when used at higher frequencies with wider bandwidths and so able to deliver higher data rates; it is now used more broadly and so includes lower frequency bands where it delivers similar data rates to LTE-advanced. Lastly, in the Institute of Electrical and Electronics Engineers (IEEE), another standards making body for communications standards, 5G refers to a new generation of Wi-Fi standards and Internet of Things (IoT) protocols.

The common element in all these terms is that 5G is used to refer to something better than what has gone before.



3GPP's logo for 5G

Functionality

Access & service reliability

To deliver radio services using IP networks, a combination of different ITU 5G technologies could be used – Wi-Fi when available, and mobile networks at other locations. It's important to consider how devices would access those communication networks and how the listening experience would be maintained when moving from place to place – something quite usual for radio listening.

Public Wi-Fi hotspots have varying access mechanisms – with some, a device can automatically register and stream, while others require an authentication and/or password to be manually entered. Similarly with cellular networks, the user will automatically have access on his home operator's network, but may be denied access to a competitor's network. The cost of access may also be a factor. In terms of coverage, IP access frees the listener from traditional geographic limitations – as long as he has access to the IP network, the location of the radio studios no longer matters, so "local radio" can be consumed anywhere – anywhere there is IP access.

In considering delivery by IP, there is the question of service reliability. Because IP is usually a unicast (one-to-one) protocol, the more listeners in a given location, the more sharing of the same Wi-Fi hotspot or mobile network cell is required, and the backhaul network to the radio station's servers also will become more heavily loaded. This aggregation of traffic means that alternative architectures, more akin to broadcasting, become technically attractive in the network – solutions like multicasting and broadcasting have been included in the 5G standards. However, LTE (4G) also has a broadcast mode, called eMBMS, but despite more than 10 years of building LTE networks, the broadcast mode is only very rarely deployed and handsets that can make use of eMBMS are equally rare. It is likely, therefore, that unicast networks will predominate in 5G networks too – the technical advantages of broadcast being outweighed by the business advantages of unicast.

Transmitter power, frequencies & signal distance

Regarding coverage from a single broadcast transmitter or Wi-Fi hotspot or mobile network cell, the frequency and the power of the transmission are the determining factors, much more so than any elements of the technology being used. Lower frequency transmissions travel further than higher frequency transmissions.

DAB uses transmitters operating at about 200 MHz; the distance between transmitters can be up to around 70 km (depending on terrain).

Traditional mobile phone systems operate at around 900 MHz, and while this means that the signals could travel about 20 km, in practice lower powers are used to restrict coverage to much smaller areas, particularly in more populated areas. There are two reasons for this: firstly, each transmitter is also a receiver – telephony requires two-way communication – and so the base station needs to be within range of the hand held devices used by customers;

secondly, each cell has only a certain amount of data capacity and therefore can only support a limited number of simultaneous users.

LTE networks operate at “low-band” frequencies (below 2 GHz) and “mid-band” frequencies (between 2 GHz and c.4 GHz). Wi-Fi networks operate at 2.4 GHz (common) and 5 GHz (less common).

5G networks, in addition to the frequency ranges of 4G, can operate in the “millimetre bands” between 20 and 75 GHz: these are the bands that can offer 1 Gbps+ data rates, but at these frequencies, signals only travel a few hundred metres, and are easily blocked by buildings.

Articles & studies

The question “Is 5G a viable solution for radio?” has many aspects: cost, coverage, reliability. The following articles and studies provide some answers.

DAB v FM v IP – cost implications

In 2019, Arqiva published a research looking at the operating costs of three technologies – DAB, FM and IP – for delivering of a live radio service to a multi-million listener audience. According to the research, FM is the most expensive distribution channel, standing at £0.00105 per hour, compared to £0.00047 for distribution via IP. On the other hand, DAB+ was found to provide the most affordable means of radio distribution, with a price of £0.00033 per hour.

The full study is available [here](#).

5G – not reliable enough to support the entire radio ecosystem

In an article published by Radio World, the head of technical and infrastructure department at the German national public broadcaster Deutschlandradio, Chris Weck, assessed 5G and whether or not the technology is a suitable platform for radio broadcasting.

In the article, Weck argues that 5G broadcast to smartphones requires a significantly denser transmitter network than that for DAB+ broadcast – approximately 10dB more transmitting power.

What’s more, taking into account the basic and average transmitter distance for DAB+ and 5G broadcasting to smartphones – 60km and 20km respectively – Weck argues that in order to achieve the same coverage as a conventionally planned DAB+ network, 5G broadcasting requires nine times more transmitters in the same area.

The full article is available [here](#).

5G as complementary to DAB+

Despite the numerous doubts raised over the 5G's ability to successfully support broadcast radio, 5G could potentially work as a complementary technology within a hybrid broadcasting model, at the heart of which is DAB+.

This view has been supported by a number of industry experts, including Gernot Fischer, CEO of Radio Technikum, who stated that 5G will not be a competitive technology to DAB+ in linear radio programs, but rather step-in as a supplementary delivery method for time-delayed listening.

The full article is available [here](#).

5G not tailored for broadcast radio

Commenting on the implications of 5G for the development of DAB+ in Europe and beyond, Deutschlandradio's Stefan Raue also declared that 5G lacks the required specifications, standards and a suitable business model tailored to support radio broadcasts.

According to Raue, the nationwide expansion of 5G will take decades – if not more – to be rolled out, while on the other hand, DAB+ digital radio has already reached maturity within the radio landscape.

The full article is available [here](#).

5G broadcast does not meet specific demands required for radio broadcasting

Jochen Mezger, General Manager of Network Technologies and Member of the Executive Board at the Broadcast Technology Institute (IRT), stated that the specific demands of radio broadcasting on the distribution of its linear content, such as coverage and regionalisation, are not automatically met by the introduction of 5G broadcast.

According to Mezger, the broadcasting of radio programs via a 5G broadcast system does not have enough economic potential, and will not be able to be introduced as a stand-alone system.

The full article is available [here](#).

Deutsche Telekom and Vodafone Germany criticise high prices of Germany's 5G auction

In June 2019, Germany's Federal Network Agency announced that the 5G auction, which started in March, ended with 6.55 billion EUR offered in total by the four bidders, including Deutsche Telekom and Vodafone Germany, who criticised the high prices of the country's auction.

The coverage obligations for the licence winners include a requirement to supply speeds of a minimum of 100Mbps to at least 98% of households in each state by the end of 2022, as well as all federal highways, and the major roads and railways. Furthermore, each operator

will have to set up 1,000 5G base stations by the end of 2022, in addition to 500 base stations in “white spot” unserved rural areas. For newcomers, less stringent coverage requirements apply.

The full article is available [here](#).