

Future of Radio

It is a contradiction in terms to hold a consultation on the Future of Radio without even mentioning that DAB has adopted the AAC+ audio codec; so I will address this obviously more urgent topic first and come back to the prospect of FM being switched off at some point later.

DAB's adoption of AAC+

In every radio consultation document I can remember reading, Ofcom has always been keen to remind readers of its statutory duties, and it has repeated its main requirements in this consultation document on page 8:

“Ofcom is also required to secure (amongst other things):

- 2.2.1 the optimal use for wireless telegraphy of the electro-magnetic spectrum;
- 2.2.2 the availability throughout the UK of a wide range of television and radio services which (taken as a whole) are both of high quality and calculated to appeal to a variety of tastes and interests”

So Ofcom presents these as being its first and second (presumably) most-important requirements, and yet the adoption of AAC+ makes DAB four-times as efficient as the old DAB system, which obviously means that DAB+ (the term I will use to refer to the upgraded DAB system) uses the electromagnetic spectrum far more efficiently than the old DAB system does (both in terms of economic and spectral efficiency terms), and that DAB+ will allow a far wider range of radio stations to be broadcast, as well as allowing the audio quality to be improved.

And yet Ofcom has just advertised the licence for the new national DAB multiplex, in which it states that:

“All non-encrypted digital sound programme services (including any provided by the BBC) must be in conformance with the audio coding standards defined in ETS 300 401, namely ISO/IEC 11172-3 (layer II), or 13818-3 (layer II) –LSF format, according to whether sampling rates of 48 or 24 kHz are applied to the source audio.”

Therefore, Ofcom is explicitly breaking its two main statutory requirements, because it is promoting the use of the electromagnetic spectrum more inefficiently, and it is deliberately limiting the range of both radio and mobile TV channels.

I am not suggesting that the whole of the new national DAB multiplex should have been given over to AAC+ services, but it was ridiculously short-sighted not to at least reserve some capacity for AAC+ services to launch at some point in the future – not necessarily as soon as the multiplex launches in 2008.

The main issue is that the receiver base that will be able to receive AAC+ stations will soon outnumber those that can't receive it. The graph below uses figures from the DRDB's (Digital Radio Development Bureau) Five-Year Sales Forecast, and I've

projected sales a further few years into the future. The DRDB forecast that there will be 4.6m DAB receivers sold by the end of this year; 13m by the end of 2008, and 20m by the end of 2009. The only assumption I've used for sales following 2009 are that the rate of acceleration of sales is the same after 2009 as it is before.

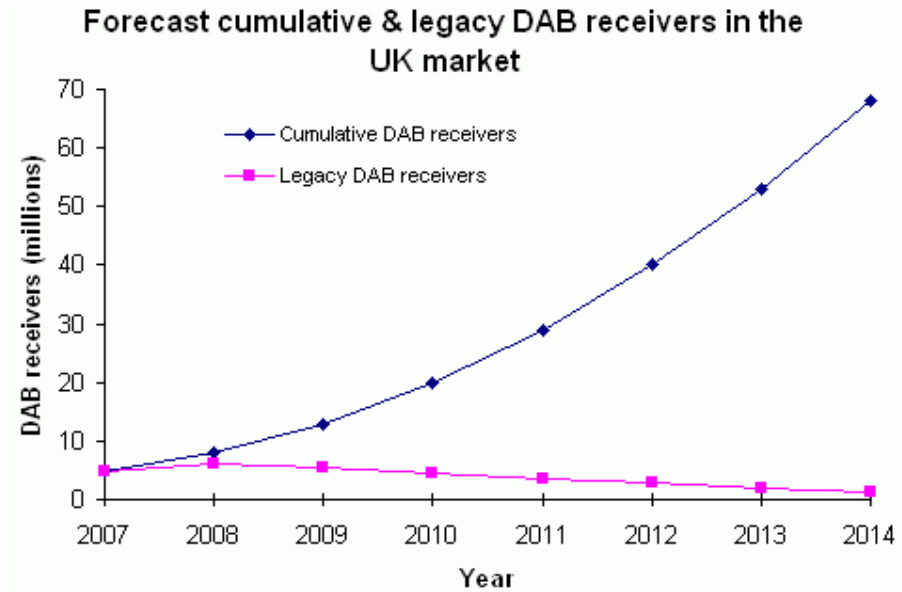


Figure 1. Cumulative DAB receiver sales

With new DAB modules being produced by Frontier-Silicon that will support the new DAB+ standard arriving in the shops by next spring, and which are expected to quickly be adopted by the receiver manufacturers (because they're cheaper than existing DAB modules and they increase the battery-life of DAB portable radios by a factor of three), it is likely that the vast majority of DAB receivers being sold by the end of next year will support AAC+ decoding. So if the sales forecast by the DRDB are anything like accurate, we should be looking at a situation where the large majority of DAB receivers in the market support AAC+ decoding in as little as 3 – 4 years' time. And yet Ofcom forcing the broadcasters to use MP2 on the new national DAB multiplex is going to make it very difficult for them to introduce new stations using AAC+ on this important national multiplex at a later date.

For the reasons I will return to in a moment, it is very likely that the winning bid for the national DAB multiplex will propose to use 112 kbps for the stereo stations, and yet in the same amount of capacity as one 112 kbps stereo station, the following number of AAC+ stations could be carried:

- 3 x 48 kbps AAC+ stations, which provides audio quality equivalent to 160 kbps MP2; or
- 4 x 32 kbps AAC+ stations, which provides audio quality equivalent to 128 kbps MP2.

All it needed was for one “station slot” to be reserved for AAC+ use so that the number of stereo stations could be increased by around 40% – 50% at some point in the future when it is deemed acceptable to launch stations using AAC+.

Simultaneous to the publication of the national DAB multiplex advertisement, Ofcom published a document entitled “Technical Policy Guidelines for DAB Multiplex Licensees”, in which it states that:

“One acceptable approach would be to use some contemporary coding equipment which has been shown to yield results at a lower bit-rate which are at least as good as those at a higher bit-rate yielded by older equipment (e.g. 112 kbit/s compared with 128 kbit/s). In these tests the extent of degradation of the received audio by the process of coding was similar. This degradation did not exceed more than two points on the ITU 5-point grading scale, and was generally less than this.”

Therefore, Ofcom considers that 112 kbps MP2 is acceptable for use, and this makes it very likely that the winning applicant for the new national DAB multiplex will be one that proposes to launch radio stations using 112 kbps MP2, because the applications will be judged using the “beauty parade” methodology, and the winning applicant will be the one that proposes to extend the breadth of choice available by the largest margin. And as using 112 kbps allows one extra stereo station to be launched in comparison to using 128 kbps, it is almost certain that the winning bidder will propose to use 112 kbps for its stereo stations.

Assuming that this will happen, this will make it very difficult to introduce AAC+ on the new national DAB multiplex – indeed, this applies to any multiplex that decides to reduce the bit rates of all of its stereo stations to 112 kbps. The reason why it will be very difficult to introduce AAC+ stations is that the next lowest MP2 stereo bit rate to 112 kbps is 96 kbps, and 96 kbps stereo MP2 provides literally close to MW-quality, so I doubt even Ofcom would allow this bit rate to be used on DAB.

Furthermore, any hopes that the quality of MP2 might improve over time were laid to rest the day that DAB adopted AAC+, because no audio coding company is going to devote resources to flogging the dead MP2 horse just for the UK DAB market – especially as the number of legacy receivers will diminish over time. MP2 is an old and inefficient audio codec whose inefficiency is actually a result of the architecture of the codec itself. The best companies in the audio coding business have tried to improve the quality at low bit rates, and they’ve managed to provide a small improvement, but this is as “good” as MP2 is going to get, and anybody that holds out hope that it is going to get better is, I’m afraid, deluding themselves. And this is ignoring the fact that 128 kbps with the old MP2 encoders – which is the audio quality that the new MP2 encoders achieve at 112 kbps, and which Ofcom seems to think is acceptable – is and always has been pathetically inadequate. This is the 21st century: TV is moving towards HDTV, so why is it acceptable for the audio quality on DAB to be so much worse than on FM?

If 112 kbps is used for the stereo stations on the new national DAB multiplex, there are therefore only the following options to allow AAC+ stations to be launched on it in future:

1. Withdrawal of one or more MP2 services in order to allow a larger number of AAC+ stations to launch in their place; or
2. Reduce one or more radio stations from stereo to mono in order to free up capacity for AAC+ stations to launch.

Withdrawing MP2 stations is obviously undesirable whilst there are a few million MP2-only DAB receivers; and reducing radio stations to mono is also undesirable, although it has the mitigating factor that the vast majority of DAB receivers sold-to-date have been small portable radios, so a change to mono would not be noticed by most listeners. But with both of these options being undesirable, this decision prolongs the use of MP2 on the new national multiplex unnecessarily.

Basically, Ofcom has pulled a double whammy with the simultaneous publishing of the advert for the national multiplex along with effectively forcing applicants to use 112 kbps for stereo stations if they want to have any chance of winning the multiplex licence; and it has thus ensured that the UK listeners and the UK commercial broadcasters will have to wait for the maximum amount of time before we see AAC+ stations on the new national DAB multiplex.

So, not content with the UK using the diabolical DAB system, which country after country has refused to use and which governments and broadcasters alike have criticised vehemently for being completely outdated and inefficient, Ofcom actually *wants* the UK to keep using the diabolical DAB system for as long as possible, and it is even prepared to break its two main statutory requirements to ensure that we use the diabolical DAB system for as long as possible!

Reducing the stereo bit rates to 112 kbps MP2

Because of the difficulty of introducing AAC+ stations once the stereo bit rates have been reduced to 112 kbps, although it might seem to be attractive to reduce the bit rates in the very short term to add one station to existing multiplexes, in the medium term – assuming that removing existing MP2 stations is out of the question – it is much better to keep using 128 kbps so that AAC+ stations can be launched sooner.

For example, the graph on the following page shows the cumulative profit for the following two hypothetical scenarios:

1. Reduce the bit rates of 7 x 128 kbps stations on a multiplex to 112 kbps in order to add one station at 112 kbps now, and add 3 AAC+ stations in 5 years' time;
2. Keep using 128 kbps now, and add 4 AAC+ stations in 3 years' time.

Each curve on the graph is calculated using the following equation:

$$Profit = \sum_{m=1}^{m=M} \sum_{n=1}^{n=N} S_m (1 - e^{-0.2(m-M_n)})$$

where m is the month, M is the total number of months ($= 84$), n is the station number added, N is the total number of stations added, S_m is the cumulative sales to month m in millions (taken from Figure 1), and M_n is the month that station n is introduced.

The main assumption used is that each new radio station has an equal number of listening hours and thus generates an equal amount of profit. The $(1 - e^{-x})$ relationship is used because it takes a while for listeners to notice new stations – in this case it takes 2 years from launch to build up to the steady-state where the station attracts a constant proportion of the overall audience. The actual profit values on the y-axis are meaningless quantities, because they don't take into account the revenue per listener nor the proportion of the total number of listeners that a station attracts – the curves simply show the relative behaviour of cumulative profit for the two different scenarios.

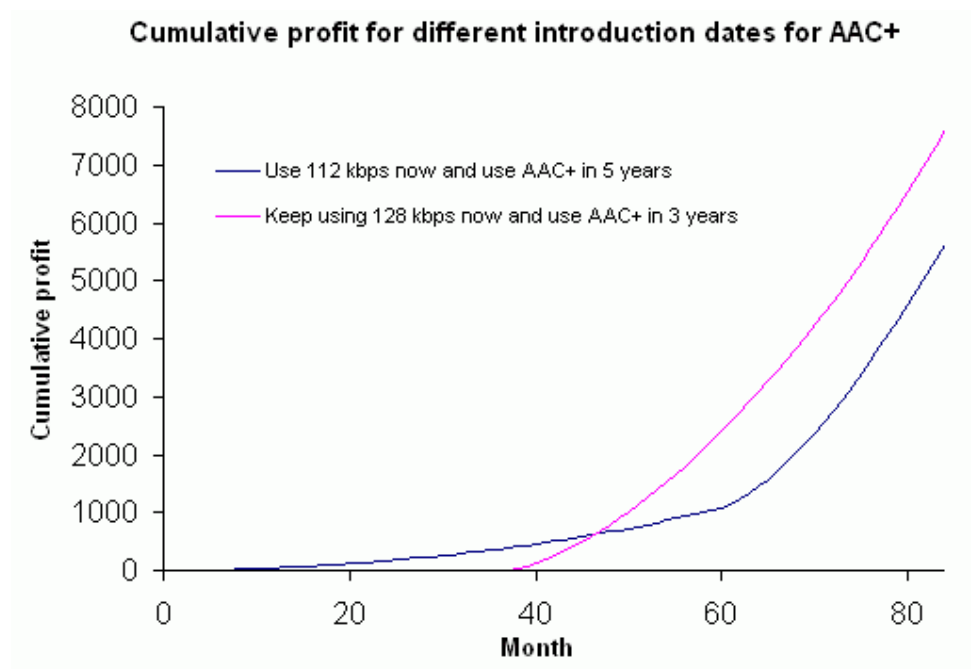


Figure 2. Cumulative profit for different AAC+ introduction dates

Put simply, the figure shows graphically that the best strategy to generate the highest amount of profit is to launch as many AAC+ stations as early as possible, which is hardly rocket science – although it was hardly rocket science to realise that DAB was an inadequate system to use, and yet the UK radio industry only woke up to this fact 3 years *after* the large-scale TV and radio advertising for DAB began, so perhaps it does need to be spelled out...

Commercial radio in financial crisis

Much of the consultation document is devoted to the subject of commercial radio being in financial crisis due to advertising money being diverted from traditional media towards the Internet and younger listeners deserting commercial radio in

droves. So I have to say that I find it incredibly odd that Ofcom is burning the one and only bridge that would help commercial radio: to allow the introduction of a significant to large number of new stations using AAC+; in particular, the launch of a few radio stations aimed at a younger audience, but which don't patronise the audience by endlessly repeating lowest common denominator playlist rubbish – Ofcom's own "iPod Generation" market research highlighted what the problem is, and yet Ofcom is now disallowing the remedial action to be taken.

There is also the threat posed by the Ondas Media subscription-based European satellite digital radio system that is planned to launch in around 2009/10, as well as other proposed satellite systems that may or may not materialise. Although many people are sceptical of paying to listen to radio, it has proved to be successful in the US. Also, being subscription-based it is likely to offer niche content that wouldn't be offered by commercial radio and, of course, it is planned to be advert-free, which will be a major selling point. Again, therefore, it would seem that now is the most inopportune moment to stop commercial radio launching a significant number of new stations in order to provide an attractive proposition to consumers – 7 or 8 new stations on a national DAB multiplex is nowhere near enough to fill the void in decent content available on DAB, and I doubt that listeners lost to the proposition of advert-free radio with niche content will want to return to commercial radio.

If commercial radio is too blind to see what action needs to be taken to ease their plight, then Ofcom should gently nudge them in the right direction (allow AAC+ stations to be launched) rather than giving them enough rope to hang themselves (allowing the use of 112 kbps).

The mythical "crisis in consumer confidence"

Both Ofcom and the broadcasters seem to be suggesting that if new AAC+ stations were launched that would cause a "crisis in consumer confidence", and presumably they think that people that have bought legacy DAB receivers will become disaffected, refuse to buy new DAB receivers ever again, and possibly march in front of Broadcasting House or Ofcom Towers.

Did consumers rise up and refuse to buy Freeview receivers when Ofcom allowed Top-Up TV to launch its pay-TV channels that needed new receivers to be able to watch them? No, they did not; consumers carried on buying Freeview boxes regardless.

And would Ofcom refuse to allow HDTV to be broadcast on Freeview if there were enough space because there is a large Freeview receiver base that cannot receive HDTV transmissions? Of course not.

Furthermore, mobile TV channels are being transmitted on the Digital One multiplex, but has even this caused a "crisis in consumer confidence" over DAB? No.

The mobile TV channels don't appear in the station list of any DAB receivers I own or have used, so if new AAC+ stations were launched and they didn't show up in the station list of legacy DAB receivers – which would obviously be possible to arrange

as the mobile TV channels don't appear in the list – then what exactly does Ofcom expect DAB owners who are blissfully unaware of the existence of new AAC+ stations are going to do when stations that they are unaware about are launched?

It is also true that as DAB ownership isn't high, those that have bought DAB are more likely to either be early adopters or heavy consumers of radio, and these are precisely the kind of people who would welcome new stations along with the future prospect of higher audio quality. Also, the MP2 services are not going to disappear when AAC+ stations are launched, so those listeners that are happy with DAB as it stands will be unaffected.

Reasonable quality DAB receivers can now be purchased for about £50 and, assuming that sales do increase as per the DRDB's forecast, reasonable quality DAB receivers will likely be £35 - £40 in 2 – 3 years' time, and the receivers available will offer far better battery-life and better features. So I would suggest that this supposed risk of a crisis in consumer confidence is hugely exaggerated.

FM switch-off

Audio quality

The obvious issue that Ofcom failed to consider in its consultation document is that of the audio quality on FM, and how audio quality will be regulated once FM is switched off.

Ofcom's regulation of the audio quality on DAB has demonstrably failed: this is 2006 and the audio quality on DAB doesn't even come close to matching that provided by the FM system that was designed in the 1960s.

Encouraged by Ofcom, the broadcasters take full advantage of the fact that radio listeners listen to a certain radio show or radio station because of the content on it, so radio listeners have to put up with whatever audio quality the broadcasters deign to provide, and the broadcasters have decided to provide audio quality that is just sufficient to avoid listeners actually switching off in droves. This is unbelievably patronising, and yet Ofcom fully supports this practice.

Indeed, Ofcom doesn't merely support this practice; it makes this practice inevitable by its "beauty parade" method of awarding multiplex licences.

And when an uncomfortable home truth such as Figure 3 is pointed out to Ofcom, Ofcom retorts that listeners aren't aware of the benefits of the extra choice!

And despite the audio quality on DAB being widely criticised, Ofcom carries on as if everything is just going swimmingly well and maintains that a degradation of 2 points on the ITU scale provides audio quality that is good enough, despite this level of audio quality being worse than on FM.

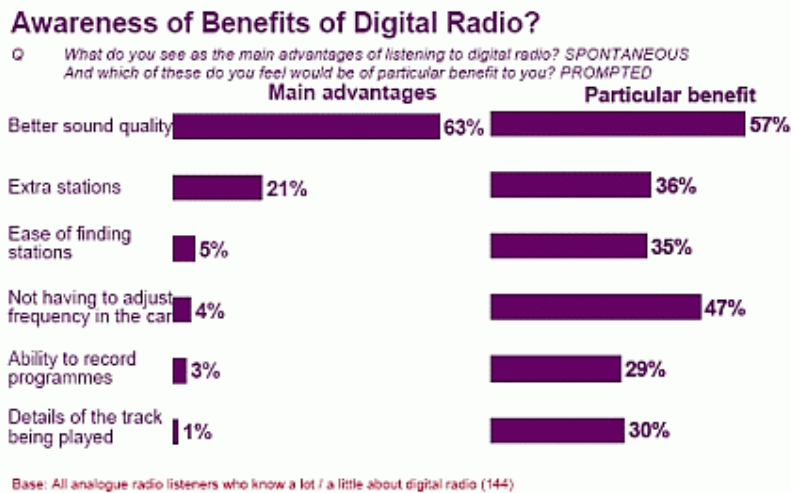


Figure 3. Ofcom-commissioned market research into what analogue radio listeners think the main advantages of listening to digital radio will be

It seems very much the case of those who are in charge of regulating the audio quality on DAB at Ofcom are incapable of admitting that decisions they have taken in the past were wrong. Indeed, I once spoke to the person that currently sets the minimum “acceptable” levels for audio quality at Ofcom on the phone when he worked at the Radio Authority, and when I made the audacious suggestion that any improvements in MP2 encoders should be translated into better audio quality rather than to allow the reduction of the bit rates to 112 kbps, he said that, “not to [allow the bit rates to be dropped] would be admitting that we were wrong originally”.

I’m afraid that the original level was quite obviously wrong, because FM sounds a lot better than DAB, and the level of audio quality should not be regulated to penalise a nation of 60 million people because the professional pride of a single individual might be bruised.

One thing that regulators have oft repeated is that the commercial radio industry has invested a lot of money into DAB, so they should basically be cut some slack. What this means in reality is that DAB costs a lot to transmit, so they should be cut some slack over the audio quality levels they’re supposed to provide. Or in other words, UK radio listeners are paying for the dreadful decisions taken by the Radio Authority, the BBC and the commercial radio industry in adopting the diabolical DAB system in the first place.

However, as the UK will eventually switch to using AAC+ on DAB, this vastly reduces the transmission costs per radio station, so Ofcom should reinstate minimum bit rate levels, and it is time that Ofcom ensures that the audio quality provided on DAB/DAB+ is fit-for-purpose in the 21st century, not fit-for-purpose in the 1950s.

In addition to the reinstatement of minimum bit rate levels and the audacious suggestion that the audio quality on DAB should actually match that provided on FM, in an attached document I propose that a new mobile digital broadcasting system be

designed specifically for the purpose of being used in the FM band once FM is switched off. By using existing technologies, a newly designed system could be designed that increases the spectral and power efficiency relative to existing systems, and which would hugely reduce the transmission costs per radio station or mobile TV channel.

If Ofcom is going to continue to be stubborn over the issue of audio quality and literally deny millions of people what should be their right – to provide audio quality at least as good as that provided on FM – then the only other alternative is to make sure that the transmission costs per station are so low and the number of channels that can be carried is so high that broadcasters would have absolutely no excuse to provide insufficient audio quality levels.

I am happy for this submission to be made publicly available.