

Plans for digital radio switchover are against the interest of consumers

by **Steven Green**

Summary

The public does not support FM stations being switched off. Ofcom's research has shown that 91% of people are "satisfied" with the amount of choice available on the radio today, and only 3% of people are "dissatisfied". DAB's proponents claim that its main benefit is the additional choice it offers; therefore Ofcom's research shows that there is very little demand for DAB. This has been borne out in practice by DAB's very low sales figures, which led to Tim Davie, the BBC's Director of Radio, saying that the current trend in sales "would not lead to radio switchover in our lifetime". The public outcry that resulted when the 2015 switchover date was first announced was further evidence of the public's opposition to the plans to switch off FM stations. And the broadcasters have yet to provide a single piece of evidence to even suggest that the public is in favour of this happening. As it is the public that will have to spend approximately £7.7 billion on replacing existing audio equipment, the BBC Trust should hold a public consultation on this matter prior to any legislation being put in place.

DAB delivers lower sound quality than FM. Digital radio switchover should not lead to listeners receiving their favourite stations at lower audio quality, therefore stations must switch to using DAB+ prior to any FM station being switched off.

The commercial radio broadcasters would only save an estimated £16.2 million per annum by switching off FM stations, not the £30 million that the radio industry has claimed, and some of the other claims made by the radio industry about dual transmission costs are contradictory in nature.

The DAB system has a long list of drawbacks associated with it due to the fact that the system was designed 20 years ago and it uses technologies that are outdated and inefficient. Numerous countries that had previously supported DAB rejected using it because it is so outdated. DAB+ is an upgrade of the DAB system, which solves or vastly improves upon each of DAB's drawbacks. The main advantage of DAB+ is that it is three times as efficient as DAB, which mean that DAB+ can carry far more stations, and all stations can be delivered at far higher audio quality than on DAB. Other benefits include transmission costs being far lower; less spectrum being required; reception quality is far more robust; and DAB+ is a much greener technology because the overall transmission power required is far lower.

Despite Internet radio offering consumers many advantages in comparison to DAB/DAB+, the Digital Radio Working Group (DRWG) chose to exclude Internet radio from the recommendations it made to Government about how to proceed towards digital radio switchover. The DRWG did this because the broadcasters want as few people to listen via the Internet as possible, because their stations face more competition on the Internet than they do on DAB. The BBC has consistently acted in a biased manner towards DAB and against Internet radio, for example by showing

twenty-three TV advertising campaigns for DAB without ever promoting Internet radio on TV. The public has a right to be informed by the BBC of the advantages and disadvantages that the different digital radio platforms have to offer so that they can choose for themselves which platform to listen by rather than the BBC choosing for them.

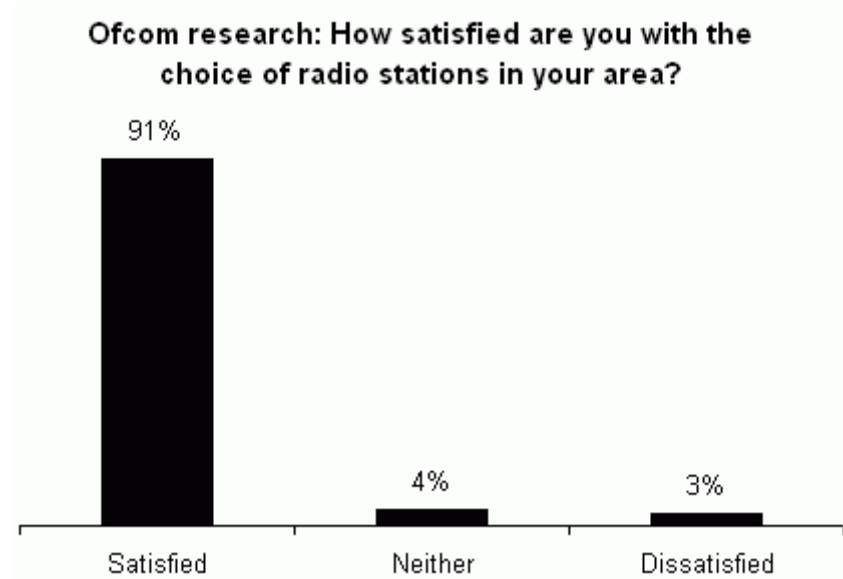
DAB was re-launched in 2002 despite it having some fundamental drawbacks, yet it would have been possible to avoid all of those drawbacks if DAB had been upgraded in the late 1990s. The reason why this didn't happen was because the BBC executives in charge didn't understand the technologies they were making decisions about. Precisely the same mistakes appear to have been made with the current digital radio plans, as important technologies have been completely overlooked. The result of this oversight will be that the UK will very likely end up using digital radio technologies that are a generation behind the rest of the world, and cars purchased in the UK wouldn't be able to receive digital radio in some European countries in future.

Appendices included provide evidence regarding DAB's audio quality problems; the efficiency of DAB+ compared to DAB; calculations showing that the commercial radio industry is estimated to save £16.2 million per annum by switching off FM stations, whereas the BBC would spend £4.3 million more than today; and calculations showing the estimate that digital radio switchover will cost the public £7.7 billion to replace existing audio equipment.

1. The public is opposed to FM stations being switched off

I've followed the digital radio switchover planning process from the outset when the Digital Radio Working Group (DRWG) was set up in late 2007, and I have still yet to see a single piece of evidence that suggests that the public is in favour of this happening, which I would suggest is because the public is opposed to this happening.

For example, the following figure shows the results from an Ofcom market research survey in Q1 2009, which asked consumers about their level of satisfaction with the amount of choice available at the present time.



The supporters of digital radio switchover say that the main benefit for consumers is the additional choice that's available on DAB, yet Ofcom's market research clearly shows that there is no demand for this additional choice that DAB offers. This is where digital TV and digital radio are completely different, because digital TV was very popular because of the additional choice, but that demand isn't present with digital radio, and that explains why DAB sales have been so poor.

Further evidence that indicates that the public is opposed to FM stations being switched off occurred in the week following the Digital Britain report announcing the 2015 FM switch-off date. This issue was discussed on a number of Radio 4 programmes, and in each case the presenter of the programme said that they had received a huge number of emails from listeners, virtually all of which were completely opposed to the plans for FM stations being switched off.

2. DAB delivers lower quality than FM

98% of stereo stations on DAB in the UK are broadcast at lower audio quality than on FM. As the BBC's stations account for such a large proportion of all radio listening, the following table is provided to show the problems with the audio quality of the BBC's stations.

Station	Audio Quality Problems on DAB
Radio 1	Much lower audio quality than on FM
Radio 2	Much lower audio quality than on FM
Radio 3	Significantly lower audio quality than on FM, and the quality is further reduced whenever the part-time station Radio 5 Sports Extra goes on-air during the day
Radio 4	Slightly lower quality than on FM, but frequently reduces to broadcasting in mono whenever the part-time station Radio 5 Sports Extra goes on-air in the evening
6 Music	Much lower than FM-quality
1Xtra	Much lower than FM-quality
Radio 7	Broadcasts in mono despite much of its content being produced in stereo
Asian Network	Permanently broadcasts in mono despite approximately a third of shows playing stereo music

The BBC's national DAB multiplex is completely full, so the BBC is unable to improve the audio quality of its stations, and the only way for the BBC to provide its stations at similar quality to than on FM is if the stations switch to using DAB+.

It is clearly unacceptable for the BBC to switch off its FM stations and replace them with poorer quality DAB versions, so the BBC's stations should switch to using DAB+ prior to the FM stations being switched off.

3. The public should to be consulted on the plans for switchover

It is obviously the public that will be forced to replace its audio equipment at great expense if digital radio switchover goes ahead, so the public deserves to be asked its views on the matter.

The Government might say that there was a consultation process following the publication of the Digital Britain interim report. In actual fact, though, the interim report had this to say on the subject of digital radio switchover:

“The rationale for “switchover” from analogue to digital cannot simply be transferred from television to radio. Analogue and digital radio transmissions can co-exist without the mutual interference which limited digital terrestrial television roll-out prior to switchover. The replacement cycle for cars, and the costs and difficulties associated with retro-fitting existing vehicles with digital radio equipment also points to a more gradual transition process for digital radio.”

Then, out of nowhere, the Digital Britain final report announced that FM stations should be switched off in 2015! The Government therefore has not consulted with the public on the current plans to accelerate the move towards digital radio switchover. This House of Lords Select Committee inquiry is actually the first time that the public has been allowed to have a say on this matter, but unfortunately I doubt very many people are aware of its existence.

The BBC Trust would be an appropriate organisation to hold such a consultation, because it says that it will consult with the public “when there has been a proposal for a ... significant change to an existing service” – and you don’t get much more significant a change to BBC Radios 1 – 4 than proposing to switch them off! But when people asked the BBC Trust to hold a consultation, it said that it wouldn’t do so, and that people should direct their complaints to the Government instead.

FM stations should not be switched off without there being a large-scale public consultation process first.

4. DAB car adaptors are highly inconvenient

Approximately 1% of cars currently have DAB installed; there are 30 million cars on the road; and 2.3 million new cars are sold each year on average. Assuming that all new cars are fitted with DAB as standard from 2014 onwards, I estimate that it would take until 2026 to replace all of the cars currently on the road with new ones that were sold with DAB inside.

Modern cars typically have the car stereo integrated into the dashboard as a theft-prevention measure, which makes installing a new DAB car stereo very expensive, so few people are expected to do this. The remainder of car owners will therefore have to

purchase a DAB car adaptor. Such devices consists of the following pieces of equipment:

- Adaptor unit itself, which has to be stuck on the windscreen
- Wire aerial, which has to be stuck on the inside of one of the windows
- Lead running from the car's cigarette lighter to provide power to the adaptor unit

DAB car adaptors therefore have the following drawbacks:

- They involve trailing wires around the inside of a car;
- They would need to be removed at the end of a journey to avoid them being stolen – people already have to remove car fascias and sat-nav devices

Considering that the public doesn't want FM stations to be switched off, I fail to see why the public should have to pay for the privilege of trailing additional wires around their car then having to remove the adaptor unit at the end of each journey.

5. Justifications given for digital radio switchover are flawed

The broadcasters have given two main justifications for wanting to accelerate the move to digital radio switchover.

Justification 1: The cost of dual analogue and digital transmission is crippling the radio industry financially

Andrew Harrison, chief executive of the RadioCentre, told the inquiry that the radio industry would save £30 million per year in transmission costs if FM stations were switched off. By my calculations, however (see Appendices), commercial radio would only save £16.2 million per annum by switching off analogue radio.

Set against these cost savings is of course the £7.7 billion that the public will be asked to spend on replacing its existing audio equipment, and the inconvenience that the public would have to put up with if digital radio switchover were forced through.

The radio industry has also contradicted itself on the subject of transmission costs, because on the one hand it is saying that DAB is adequate so we won't need to switch to DAB+ for the foreseeable future, whereas on the other hand DAB+ would allow them to vastly reduce their transmission costs. It is clearly contradictory to claim that they desperately want to save money on transmission costs whilst simultaneously being uninterested in saving many millions of pounds per year.

Furthermore, if dual transmission costs really were such an onerous burden, why don't the big commercial radio groups simply withdraw some stations from DAB to save money? It is hardly convincing that the dual transmission costs are having such a negative effect on their finances whilst they do absolutely nothing to reduce the financial burden.

Justification 2: “radio needs to go digital to avoid being left behind other industries, such as TV”

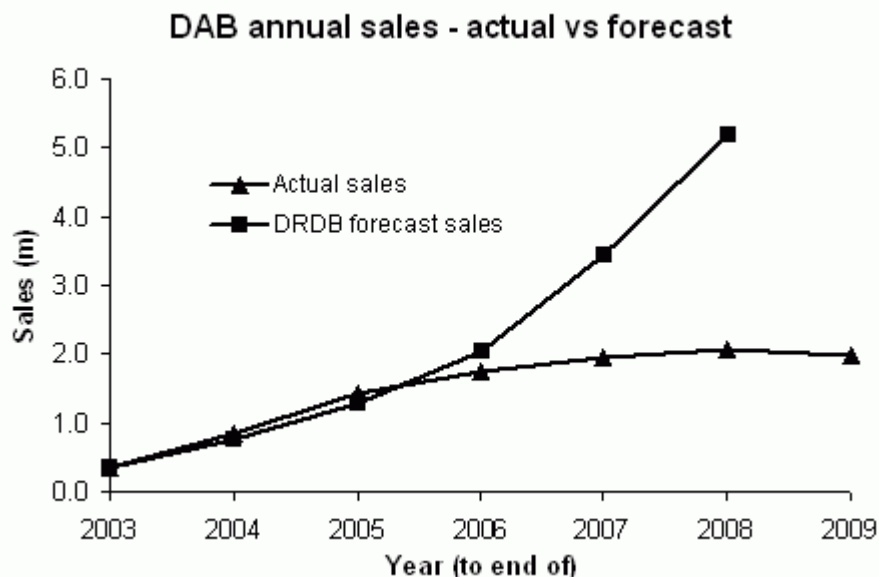
In reality, the UK is about 7 – 8 years ahead of every other large country on earth with regards to the sales and development of digital terrestrial radio. None of the other large Western European countries have even commercially launched digital radio yet, and the large commercial radio groups in both France and Germany have recently been arguing against the planned commercial launch of digital radio in those countries. This justification clearly doesn’t stand up to scrutiny.

6. DAB

DAB has been a commercial failure

DAB has been the biggest technology failure in the UK over the last decade. The BBC has lavished 23 TV advertising campaigns upon DAB since it was re-launched in 2002, yet, after a reasonable start, sales have flat-lined at the 2 million per annum level for the last three years, and sales actually fell slightly last year.

To put into context how poor these sales figures are, the DRDB forecast that annual sales growth, which is a barometer on how well a “new” technology is fairing in the market place, would be in the region of 50 – 70% per annum over the last few years. Actual sales growth, however, has been around 0% for the last three years [DRDB Five-year forecast].



Tim Davie, the BBC’s Director of Radio, who was the BBC’s Director of Marketing prior to taking his current role, summed up the situation well when he said last year that current DAB sales levels “would not lead to radio switchover in our lifetime”.

DAB is outdated and inefficient

The DAB system was designed 20 years ago. Due to the age of the technologies it uses, DAB has numerous drawbacks:

- Lower sound quality than FM
- Extremely inefficient system by modern digital broadcasting system standards
- Unable to deliver a wide choice of stations to listeners
- Reception quality is often unreliable
- Transmission costs are far higher than on modern digital broadcasting systems
- FM transmission costs are far lower
- 120 smaller UK local stations won't be able to broadcast on DAB due to insufficient capacity
- Smaller stations can't afford the transmission costs on DAB
- DAB receivers are far less energy-efficient than FM receivers
- DAB transmission powers are far higher than would be required by modern digital broadcasting systems

Due to its drawbacks, the following list of countries that had supported DAB changed their minds and rejected using it around five years ago:

- France
- Germany
- Australia
- Sweden
- Finland
- Canada

The main reasons given by the above countries for rejecting DAB were that it uses outdated technologies, it delivers low sound quality, it is an inefficient system, and it is expensive to transmit. The withdrawal of support for DAB led to the WorldDMB Forum, which is DAB's world body, upgrading the DAB system, which produced DAB+.

Currently, only the UK, Denmark and Norway support DAB as their primary digital radio system, and Denmark (which has the same percentage DAB household penetration as the UK) announced last year that it plans to switch over to using DAB+, with the first stations switching this year, and switchover to DAB+ is expected to be completed within the next 3 – 5 years.

7. DAB+

I watched a video of the inquiry session with Barry Cox and Ford Ennals, and on the subject of the difference between DAB and DAB+, Barry Cox said that the only advantage DAB+ offers is that it offers more “capacity”, so it can carry more stations. Although it is true that DAB+ can carry far more stations, DAB+ actually offers many advantages over DAB, which I will list below.

The key difference between DAB and DAB+ is that DAB+ is three times more “efficient” than DAB (see Appendices). This means that broadcasters can deliver the following via DAB+:

- DAB+ can deliver 3 times as many stations as DAB, or
- DAB+ can deliver the same number of stations at far higher audio quality than DAB is able to, or
- DAB+ can deliver more stations than DAB and all stations can be delivered at higher audio quality than on DAB

The final option, where DAB+ delivers a combination of more stations and at higher audio quality than DAB, is expected to be by far the most common way that DAB+ will be implemented.

DAB+ offers the following advantages over DAB:

- High audio quality can be delivered affordably
- 2 – 3 times as many radio stations can be carried on a multiplex, thus providing greater choice for listeners
- Transmission costs per station are 3 – 5 times lower
- Reception quality is far more robust
- Less spectrum is required
- Stations can deliver surround sound at low additional cost
- Small local radio stations would be able to afford the cost of transmitting digitally when previously they couldn't

DAB+ delivers superior performance due to its adoption of modern technologies to replace DAB's outdated ones:

- The AAC and AAC+ audio codecs – AAC is used to deliver high audio quality at higher bit rate levels (80 kbps and above), whereas AAC+ is the most efficient audio codec available today when used at low bit rate levels
- Reed-Solomon error correction coding – much stronger error correction than DAB's, which leads to far more robust reception quality
- MPEG Surround format – added to allow broadcasters to deliver multi-channel audio efficiently and cheaply

8. Internet radio has been excluded from digital radio planning due to protectionism

Internet radio and audio streaming services are emerging technologies that are growing in popularity. Internet radio in general offers a number of advantages over DAB/DAB+:

- Most Internet radio streams are at far higher audio quality than DAB
- The Internet can deliver on-demand streams, whereas DAB/DAB+ isn't able to because broadcast platforms aren't able to deliver on-demand content at all
- Personalised radio and audio streaming services are available, such as last.fm and Spotify, which cannot be delivered via broadcast platforms
- Unlimited range of stations
- High-definition radio could feasibly be delivered via the Internet in future because Internet bandwidth/speed increases in-line with Moore's Law (doubling every 18 months), whereas it would be impossible to deliver HD radio via DAB/DAB+ due to lack of capacity
- Distribution costs via the Internet fall exponentially over time due to Moore's Law (bandwidth halves in price every 18 months)
- Interactivity is possible, whereas it is impossible on broadcast platforms such as DAB/DAB+
- Audio can easily be combined with video and pictures

Despite the Internet having the above advantages in comparison to DAB/DAB+, the Digital Radio Working Group (DRWG) excluded Internet radio from the recommendations it made to Government about how to proceed towards digital radio switchover. The reason why the DRWG chose to exclude Internet radio was quite simply down to protectionism: the broadcasters' stations would face more competition on the Internet than they would on the "walled garden of content" on DAB, so they would prefer to push as many people onto DAB as they possibly can.

Furthermore, in its promotion of digital radio, the BBC has up to now shown twenty-three high-impact TV advertising campaigns for DAB, whereas it has yet to show a single advertising campaign to promote live Internet radio listening. The reason behind this was laid bare in a candid admission by the ex-BBC Controller in charge of digital radio in an appearance on Radio 4 Feedback, when he admitted that: "Of course the BBC would prefer it if everybody listened to digital radio via DAB". The BBC is meant to be platform neutral, but in reality the BBC has always been biased towards DAB, because the BBC considers that DAB suits its agenda better than the other platforms do.

On a matter as important as digital radio switchover, each of the digital platforms that deliver radio should be promoted more or less equally, and consumers should be told of the advantages and disadvantages that each offer, so they can decide for themselves which platform to use rather than the BBC choosing for them.

9. Incompetent planning

DAB's problems were entirely avoidable

DAB's long list of drawbacks mentioned previously – which included such fundamental issues as DAB being unable to match FM in terms of sound quality, and a third of all UK commercial radio stations being unable to broadcast on DAB – were in fact entirely avoidable if DAB had adopted the AAC audio codec prior to being re-launched in 2002 (the AAC audio codec had been standardised in 1997, so there was a five-year period in which AAC could have been adopted for DAB, but it wasn't).

The reason why such a fundamental mistake was made was because the BBC executives making the decisions about digital radio didn't understand the technologies they were making decisions about, and they ignored the advice they received about AAC from the engineers in the BBC Research & Development department.

This decision led to numerous countries choosing not to follow the UK's lead in using DAB, which stopped car and mobile phone manufacturers from including DAB in their products, because such manufacturers produce goods for the European market rather than for single countries.

Same planning mistakes are being made today

Although it is impossible to say anything with certainty about the future, I think that the same mistake of ignoring important technologies has been made with the recent digital radio planning as well, and once again it appears to have been caused by BBC executives failing to understand the technologies surrounding them.

One technology that was ignored completely by the DRWG, but which I would say is likely to become widely used to deliver digital radio over the next decade, is the DVB-T2 system, or its cousin the forthcoming DVB-NGH (Next-Generation Handheld) system.

Despite DAB+ markedly bringing down the transmission costs relative to DAB, the prospect of dual transmission for a decade or two is still deterring European broadcasters and Governments from wanting to re-launch digital radio. However, DVB-T2 is approximately 3.5 times as efficient as DAB+ (DVB-T2 is 10.5 times as efficient as DAB). This means that DVB-T2 should reduce the transmission costs per station by a factor of 3.5 relative to DAB+, so DVB-T2 would clearly be attractive to broadcasters.

Importantly, DVB-T2 has also been specified to work in the same spectrum and with the same bandwidth channels as DAB/DAB+ uses, which means that broadcasters would be able to convert their existing DAB transmission networks over to DVB-T2 at low cost. The Swedish Government has already committed to delivering digital radio via DVB-T2 instead of via DAB+, and the German public service broadcaster ARD has also said that it is considering doing so too. Considering the large reduction in transmission costs it allows relative to DAB+, it would be very surprising if DVB-

T2 (or its cousin the DVB-NGH system) didn't end up being the main system for delivering digital radio.

Another technology that was totally ignored by the DRWG is DRM+, which was standardised in September 2007, but which the DRWG presumably ignored in case it slowed down the UK's move to digital radio switchover. DRM+ is primarily intended to be used to broadcast single (as opposed to multiplexed) stations, particularly smaller stations. This makes DRM+ the ideal system to allow the 120 smaller stations to broadcast digitally that can't broadcast on DAB, and because other European countries are many years behind the UK in terms of digital radio development, other countries will very likely make use of DRM+ whereas it appears that the UK won't.

I would say that the current plans for digital radio switchover will very likely result in the following:

- The UK will end up using digital radio technologies that are a technology generation behind the vast majority of the rest of the world (e.g. the UK will end up using DAB+ whereas the vast majority of countries will end up using a next-generation system such as DVB-T2 or DVB-NGH);
- There won't be a common digital radio standard across Europe, so car stereos in the UK won't work in other European countries

Appendices

DAB's audio quality problems

DAB uses the MP2 audio codec (official name MPEG Audio Layer 2). MP2 is a very inefficient audio codec by modern standards, which means that it needs to be used at high bit rate levels to provide good audio quality. The following expert testing and analysis shows this to be the case:

- Independent research carried in 2007 concluded that 128 kbps MP2 delivers “lower sound quality than FM”, Professor Holm, Norway
- “For high quality stereo signals, a bit-rate between 192 and 256 kbps is needed.” BBC Research & Development Department White Paper, “The COFDM modulation system: The heart of Digital Audio Broadcasting”
- In a blind listening test, 128 kbps MP2 was classified as delivering “Annoying” audio quality, and 192 kbps MP2 was classified as delivering “Slightly annoying” quality

In practice, broadcasters typically do use MP2 at the high bit rate levels required to deliver high audio quality, as the following examples show:

- The BBC uses 256 kbps MP2 for the audio on the BBC 1 – 4 TV channels, and it uses 192 kbps MP2 for the BBC News channel
- The BBC uses 192 kbps MP2 for Radios 1 – 4 on the digital TV platforms
- German public service broadcaster ARD uses 320 kbps MP2 for the fifty-five radio stations it operates that broadcast on digital satellite

On DAB in the UK, however, the broadcasters chose to trade off the audio quality, as this allowed them to squeeze more stations into the limited available capacity, and for the last few years 98% of all stereo stations on DAB in the UK have been using a bit rate level of just 128 kbps, and a large number now even use 112 kbps. The audio quality of these stations is much worse than on FM as a result. In areas where capacity is at a premium, such as on the local DAB multiplexes in London, many music radio stations are now being broadcast in mono.

DAB delivers lower quality than FM

The text below is the English summary of a research paper published by Professor Sverre Holm from the University of Oslo, which shows that MP2 at 128 kbps, which is the bit rate used by 98% of stereo stations in the UK, provides lower sound quality than FM.



Summary in English

This analysis of the audio quality of DAB has been made independently of the broadcasting companies and aims at balancing their information.

Through measurement of the audio signal and through informal listening, we have found that DAB suffers from several problems:

- The stereo image is smeared due to heavy use of joint stereo coding. Often the stereo image lacks focus and gives incorrect localization of instruments, in certain cases there is also incorrect balance between a vocalist and the background music.
- The treble cut-off frequency is usually as low as 14 kHz and the result is a lack of brightness and a veiled sound stage. In particular young people will notice this degradation. As young people are the target group for some of these stations, such as P3, this must be considered to be very undesirable.

The reason is that the bit rates for all the channels in the Norwegian DAB network today are much lower than what scientific evaluation of audio quality has recommended, i.e. lower than 192 - 256 kbps which was projected when DAB was debated in Stortinget (Norwegian Parliament) in 1998.

When the capacity is fully utilized, stations with music in the Oslo area use these bit rates:

- Three stations use 160 kbps with an audio quality similar to FM: P2, Alltid Klassisk¹ and P4
- Twelve stations use 128 kbps with lower quality than FM, incl. P1 and P3.
- Two stations transmit in mono at rates of 80 and 96 kbps (Radio 2 Digital Mox and NRK Bam²)

It would have been desirable to stop using 128 kbps as the standard bit rate for music, and use 160 kbps instead. More demanding material should have the same quality as mp3 at 128 kbps, i.e. 192 kbps in DAB. As of today, there is not capacity to increase bit rates to these levels, so the DAB network has too low capacity with respect to requirements for decent audio quality.

The broadcast companies want us to make a choice between FM, with the best audio quality in stationary receivers, and DAB which is best in a car. Today this is an unnecessary choice as there are no technological problems in making a digital radio which is better than FM on all accounts:

- Reception without garbling in cars
- Capacity for all the stations one wants
- Audio with near-CD quality

¹ 24 hours classical music

² Program targeted at children

DAB vs DAB+ efficiency

The following quote from the WorldDMB document titled “DAB+ Brochure” shows that DAB+ is over three times as efficient as DAB:

“A 40 kbps subchannel with HE-AAC v2 provides a similar audio quality (even slightly better in most cases) as MPEG Audio Layer II at 128 kbps.”

Transmission costs

Commercial radio transmission costs

Andrew Harrison has previously claimed that commercial radio is unable to find any additional money to extend its DAB coverage. Therefore, the money saved due to switchover would equal the current cost of transmitting FM.

The table below shows a breakdown of the number of analogue radio station licences in the UK:

Type	FM	AM	Total
Local	241	56	297
National	1	2	3

Using information that the radio industry itself provided me with, the typical transmission costs for the different station categories are shown in the table below:

Type	FM average transmission cost per station per annum	AM average transmission cost per station per annum
Local	£70,000	£50,000
National	£2,000,000	£1,200,000

Of the 297 local commercial radio stations, 120 smaller stations are expected to continue broadcasting on FM post-switchover. Therefore, assuming those 120 smaller stations have the same 80 / 20% split between FM / AM, the overall estimated savings that would result from switching off FM stations will be as follows:

Type	Number of stations	Average transmission cost per station	Total saving due to switchover
Local FM	144	£70,000	£10.1m
Local AM	34	£50,000	£1.7m
National FM	1	£2,000,000	£2m
National AM	2	£1,200,000	£2.4m
Total			£16.2m

Combining commercial radio's saving in transmission costs of £16.2 million with the BBC's increased cost of £4.3 million makes an overall cost saving for the radio industry of £11.9 million.

I would therefore strongly suggest that the £30 million that Andrew Harrison claims that the commercial radio industry would save each year from digital radio switchover is an inflated figure that has been used to make the dual transmission costs issue

appear to be more important than it really is, so that Parliament would look upon the plans for digital radio switchover more favourably than they would if accurate figures were provided.

BBC transmission costs

The following figure from a report BBC Trust titled “The BBC’s Efficient and Effective use of Spectrum” [BBC Efficiency spectrum report], shows the BBC’s transmission costs on the AM, FM and DAB platforms. The

Figure 24 AM, FM and DAB reach, usage and cost			
	AM	FM	DAB
Reach and Usage			
Coverage	95% - 98% (*)	~99%	86%
Cost to BBC (£m) - 07/08 budget			
Direct cost	£9.2	£12.3	£6 ⁴⁵
Shared cost (nations and local radio stations)	£8.2		
Source: BBC (*) Population coverage varies by service. This coverage relates to Radio 4 and Radio 5 Live in AM			

Subscript 45 referenced in the figure above says: “The BBC incurs an additional £3.6m in local DAB.”

On the subject of extending the BBC’s national DAB multiplex, the report says: “Increasing coverage further to levels similar to those of FM radio may cost the BBC up to £40m per annum, as the number of transmitters would need to be increased to approximately 1,000.” In response to a Freedom of Information Act request, the BBC also confirmed to me that they estimate that providing FM-like coverage will cost in the region of £40m per annum.

The BBC’s current and post-switchover annual transmission costs, based on current estimates, are shown in the table below. The BBC is currently expected to spend £4.3m more on transmitting radio than it does today.

	AM/FM	DAB	Total
Current	£29.7m	£9.6m	£39.3m
Post-switchover	0	£43.6m	£43.6m

Cost of digital radio switchover to consumers

Information in this section originated from the Digital Radio Development Bureau (DRDB), and they came from two sources:

- September 2006 edition of Television magazine, which for some unknown reason contained a detailed information about the sales by volume and by value of the radio market, including a breakdown by segment
- DAB Digital Radio Forecast: Set sales & household penetration 2007 – 2011

The following Table shows the DRDB's forecast figures for 2008 (the DRDB ceased publishing its 5-year forecast in 2007, presumably to avoid further embarrassment as actual sales figures were far lower than the DRDB's previous forecasts hoped for):

Segment	Sales '000s	Value £ millions	Average DAB unit price	Proportion of radio market (excl. car stereos)
Audio systems	511	67.5	£132	21%
Hi-fi tuners	35	4.4	£126	2%
Portable radios	1,287	79.2	£62	65%
Boomboxes	58	4.4	£76	9%
Clock radios	400	27	£68	64%
Personal radios	80	5.9	£74	36%
MP3 players with radios	69	7.4	£107	3%
Car retail	15	3	£200	
Car line fit	60	-	-	

Figures for the overall radio market for the year ending April 2006 are shown in the table below.

	Sales million	Value £ million	Average unit price (exc. car stereos)
Analogue & DAB radio	11.6	742	£63.97
Analogue	10.06	596	£59.24
DAB	1.54	146	£94.80

The average cost of DAB devices will slowly fall over time as sales volume levels rise, and a reasonable estimate of the average cost of DAB equipment by the time digital radio switchover could take place would be the average cost of analogue equipment today. A more reasonable date when FM stations could be switched off would be in the year 2020, and it will be assumed that 125 million FM devices need to be replaced, as this is the mid-point between the 100 and 150 million estimates. The

annual rate of change for the price per unit and the sales can be calculated using the following formula: $\text{rate} = \exp(\ln(x_{\text{final}} / x_{\text{initial}}) / N) - 1$, where x_{final} and x_{initial} are the final and initial values of the sales and prices parameters respectively; and N is the number of years until switchover. The rates calculated are -2.771% per annum for the rate of change in price (calculation start date was 2006), and $+22.1681\%$ per annum for the rate of change in annual sales.

The following table shows the results of this analysis:

Year (to end of)	Average DAB unit price £	Annual DAB sales m	Cumulative DAB sales m	Sales value
2009	87.14	2.00	10.50	
2010	84.72	2.33	12.83	197
2011	82.38	2.84	15.67	234
2012	80.09	3.47	19.15	278
2013	77.87	4.24	23.39	331
2014	75.72	5.18	28.57	393
2015	73.62	6.33	34.91	466
2016	71.58	7.74	42.65	554
2017	69.60	9.45	52.10	658
2018	67.67	11.55	63.65	782
2019	65.79	14.11	77.76	928
2020	63.97	17.24	95.00	1103
Total				5924

The above figures are excluding the cost of in-car DAB. DAB is available as an optional extra for many new cars, typically at a cost of over £150. Once DAB is fitted as standard in all new cars, the manufacturers will still pass the cost of installing DAB onto consumers indirectly by simply increasing the average sale price of new cars. I'm also highly sceptical that low-cost DAB car adaptors will prove to be popular, due to the inconvenience of using them. As an estimate I will use a figure of £60 per car for having DAB installed, or a total overall cost of £1.8 billion.

The overall cost to consumers would therefore be:

Non-car DAB devices:	£5,924 million
In-car DAB devices:	£1,800 million
Total:	£7,724 million

There are 25.4 million households in the UK, so the average estimated cost per household would be £304.

I would say that's rather a lot of money for people to spend on something they don't want. And the public is only being asked to spend this money because the commercial radio groups didn't even bother to research whether there was a demand for digital radio in the first place. And by far the largest beneficiaries of this public bailout are privately held companies with foreign owners:

References

1. <http://www.guardian.co.uk/media/2010/jan/27/commercial-radio-revenue-down-lords>
2. “DABs [sic] the way I like it”, Television magazine, September 2006

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I took an MSc in Communications & Signal Processing at Imperial College, University of London, which led to my interest in digital radio, as the MSc covered the technologies that are used in digital radio systems. In 2002 I set up the www.digitalradiotech.co.uk website, which has been reporting on digital radio technologies ever since, and I have been writing about digital radio for Hi-Fi World magazine since 2005, along with writing articles for numerous other publications.