

The history of 648 kHz in the UK

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With the MF channel of 648 kHz now allocated by Ofcom and on-programme for Radio Caroline, the author, who is part of the engineering team for Radio Caroline, has researched the fascinating and often contradictory history of the frequency.

Before 648

During the 1930s, the BBC established two separate broadcast networks (programme streams) for the majority of listeners in the UK. The 'National' programme was just that, a single programme originated in London, but broadcast from a network of high-powered sites around the country. It provided a single national service. The accompanying 'Regional' programme was mostly broadcast from the same high-powered sites, but carried programme reflecting and appealing to the various regions of the country, such as Midlands, North, London, West, Scottish and Welsh. Programmes for the regional service were produced in many of the country's large provincial cities, though some were shared between regions. Thus, many of the historic broadcasting facilities, such as Brookmans Park, Moorside Edge, Lisnagarvey and Droitwich which continue to this day, came into existence.

Wartime broadcasting

Much changed during the war, first to supplement the high-powered stations with the addition of over 60 low-power 'city' transmitters. These were co-ordinated on a single frequency, 1474 kHz, to prevent 'direction finding' attempts by enemy bomber aircraft. This also meant that a city station could broadcast local programmes from a local studio in the event of local issues or loss of programme feed from London. Secondly, the regional and national programmes were replaced by the 'Home' and 'Forces' programmes, whilst some geographically advantageous transmitter sites were re-allocated to provide overseas transmission facilities into occupied Europe. Whereas the Home programme was to carry serious content to reflect the gravity of the situation, the Forces programme was intended to provide light entertainment, comedy, dance band music and generally morale-boosting programmes to take the mind of servicemen off the grim tasks they were faced with. Needless to say, the Forces Programme was also popular amongst the general public.

Black, Grey and White transmissions

During the war years, the UK Government's Political Warfare Executive had undertaken various projects to broadcast into Europe and over the Atlantic using first their own low-power facilities from Gawcott and Potsgrove and then their newly-established high-power transmission facility at King's Standing near Crowborough in Sussex. This facility was built in 1942 and housed what was then the World's largest broadcast transmitter codenamed 'Aspidistra' and labelled on-site as Aspi 1 or 'A1'.

The Home, Light and Third

At the end of hostilities, the Home service remained very much as it had been during the war, but with more regional content on a variety of frequencies around the country, while the Forces Programme was renamed the Light Programme and continued with light entertainment on a national basis. In 1946, the BBC wished to establish an outlet for serious (classical) music, drama and 'intellectual' cultured programming and so the imaginatively-named Third Programme was created. After initial broadcasts started in 1946 from Droitwich on 583 kHz (514 m) at 150 kW, the Third Programme moved to Daventry from March 1950 on a newly-allocated frequency of 647 kHz (464 m) and using a new Marconi 2 x BD206 150 kW transmitter with a 725-foot high, centre-fed and top-loaded 0.625λ antenna mast that was designed to provide maximum groundwave and anti-fading propagation.

This excellent, central site covered the majority of England so just a small number of low-powered relay sites on 1546 kHz were required for the more distant parts of the UK.

Thus, as far as the BBC was concerned, these three separate services could cater fully for the needs of the nation – the Light Programme, mainly on longwave from Droitwich, but with some mediumwave 'in-fill' sites on 247 m (1215 kHz), the regional Home service on various mediumwave frequencies, and the Third Programme.

After the war, Aspi 1 continued to broadcast at 500 kW, though the programmes were generally of the BBC European service rather than the various shades of black, grey and white propaganda for which it had originally been built.

Although the Government and BBC were quite happy for the Crowborough facility to broadcast into Europe, they were less than enthusiastic that one of the many 'cross-border' pre-war stations, namely Radio Luxembourg, decided to recommence transmissions targeted at UK audiences. The Government tried just about every means within their jurisdiction to prevent it and discourage people from listening. However, with just three radio services available, all of which were run by various BBC committees, it is no wonder that Luxembourg rose to such prominence during the 1950s with its popular commercial programming.

Offshore (1)

Roll on now to 1967. The Marine *etc.* Broadcasting Offences Act attempted to outlaw the offshore

broadcasting stations and the need for an all-day popular music channel was finally recognised at Government level. At the end of September the Light Programme was split into two – the longwave service continued as before but was renamed Radio 2 and the mediumwave in-fills launched the new pop music service Radio 1. Powerful additional transmitters at Droitwich and Washford had to be commissioned to provide Radio 1 in the areas where there was only longwave coverage of the Light Programme and, conversely, new mediumwave transmitters in Scotland provided Radio 2 in areas where 247 m (1215 kHz) was now carrying Radio 1. The Third Programme became Radio 3, still on 647 kHz (646 m) from Daventry, and the regional Home service became Radio 4 – principally a national service, but with regional opt-outs on various regional frequencies.

The coverage of Radio 1 and Radio 2 was somewhat lacking, with parts of the country unable to receive satisfactorily one or other of the programmes, so further changes became necessary... but it took a jaw-dropping 11 years to effect.

The MF/LF re-organisation

November 23rd 1978 saw a major re-organisation of radio channels across all of Europe, including the alignment of all stations to 9 kHz channel spacing. The BBC took advantage of this alignment to implement major changes to their mediumwave and longwave stations.

The growing roll-out of Local Radio during the 1970s meant that the need for regional content on Radio 4 was redundant, so Radio 4 became a national service and moved onto the 1500 m longwave channel, freeing up four high-powered mediumwave channels which were then re-allocated around the country and split into two groups: 330 m and 433 m (the former London and Northern Home transmissions) and 275 m and 285 m (the former Midlands and West Home transmissions). Additional transmitters were introduced on each of these four wavelengths, but alternately staggered around the country, such that any overlap or mush zone between adjacent sites was minimised. 330 m and 433 m (or 909 kHz and 693 kHz on the newly-aligned 9 kHz channels) were assigned for Radio 2, whilst 275 m and 285 m (1089 kHz and 1053 kHz) were allocated to Radio 1. Radio 3, in turn, got the old hand-me-down poor coverage of Radio 1's old 247 m (1215 kHz) – though it had national full-time coverage on VHF/FM, which many of its listeners were most likely to use. Accordingly, the old Radio 3 frequency, which became 648 kHz, was no longer in service for domestic programmes. As this was the lowest mediumwave channel allocated to the BBC, it could offer the best daytime (groundwave) coverage and, combined with the fact that the channel was mostly in the clear across Europe, made it an ideal frequency for the European programmes of the World Service and it was put into use at 500 kW from the Crowborough site in Sussex.

Some may consider it rather strange that the BBC's best mediumwave channel served only an overseas audience whilst Radio 3 listeners got the worst coverage of the mediumwave national networks. But the reader should be aware that all this took place at the height of the Cold War.

With the Aspi 1 500 kW transmitter equipment at Crowborough approaching 40 years old, it was coming to the end of its useful life and a replacement was required.

Although coverage into Europe from Crowborough was good, the site was still some way inland (having been sited to hide it from enemy warships and aircraft) resulting in much signal being 'wasted' before it reached the English Channel.

Offshore (2)

The search was now on for a new site to house a new transmitter and antenna to provide BBC European coverage as the Cold War continued to escalate. It is said that Mr Bernard Bale, an engineer in the BBC World Service Schedule and Frequency Management Department, had suggested a certain technically suitable location to the powers-that-be, as he was aware that the RAF and USAF had vacated an apparently-failed over-the-horizon-radar facility in eastern England.

On the coast of Suffolk, or more precisely, a few hundred yards off the coast of Suffolk, is a spit of land known as Orford Ness, used as a secret military area during both world wars and during the 1960s until the mid-1970s to house an experimental joint UK/US missile tracking radar system. Code-named 'Cobra Mist', the site (**Figure 1**) was no longer required by the Ministry of Defence and now the BBC, in conjunction with the Foreign Office, made plans to redeploy it. The 1296 kHz 500 kW European multi-language service from Crowborough was transferred there first in 1979 using ORF-2A and ORF-2B transmitters at 250 kW each, combined on to a six-tower array producing a bearing of 90°.

BBC World Service for Europe on 648 kHz was first broadcast from Orfordness on a test transmission basis in 1979 using a 1965-vintage 50 kW Continental Electronics 317C Doherty transmitter ('Avocet') during the hours of daylight into a simple two-mast directional array. Compared to Aspi 1, results were so encouraging that the full 24/7 service was established there from September 1982 until March 2011 using ORF-1, an AEG-Telefunken 600 kW transmitter. The antenna system was an array of five in-line towers; this array directed the signal into a south-easterly 110° beam from the UK, giving an effective radiated power to the target area of over 3 MW.

A reserve antenna was provided for the 648 kHz service together with a reserve 180 kW Doherty transmitter (ORF-3) that had been transferred from Crowborough. This antenna was a new design and consisted of a 200-foot top-loaded omnidirectional, half-folded dipole; the top-loading was adjusted in both angle and length at commissioning so that the feed-point impedance was 50 Ω; this approach negated the use of an antenna tuning unit.

Although mostly in English, programmes in German and French were also aired at times, particularly in the early 1990s as East and West were united and the Iron Curtain came down.

BBC QRT

The BBC service on 648 kHz was terminated in March 2011, followed by the 1296 kHz then digital radio mondiale-only service some months later for a number of reasons – financial savings, lack of interest in international radio, listener migrations to online and digital listening and upcoming major capital investment to replace the ageing equipment. At the end of transmissions, the site was operated by Babcock Communications on behalf of the BBC and Foreign and Commonwealth Office.

A temporary RF reprieve

It was during the period that the 648 kHz service was silent and before the operating WT licence was withdrawn, that there was an unfortunate coincidence of fires and system failures at several principal Dutch transmitter sites. They were taken off-air within hours of each other in late July 2011, thus depriving a significant amount of the population of almost all radio broadcasting. It was deemed to be such an important event that arrangements were put in place between the Dutch and UK Governments to broadcast NOS Radio 1 (the Dutch equivalent to BBC Radio 4) from Orfordness using ORF-1 to provide instant total coverage to the country. Radio 1 is deemed by the Dutch Government to be the national emergency communications channel, in much the same way as Radio 4 is in the UK. These transmissions came to an end on 22nd September 2011 when regular services were again restored from within Holland.

And so, on that date, 648 kHz from Orfordness finally fell silent.... the WT licence to use the 648 kHz frequency was withdrawn by Ofcom in 2012. Eventually, Ofcom declared it would be made available for new community radio stations and licence applications were invited by them in late 2016. On 22nd May 2017, Ofcom announced that Radio Caroline had been offered a licence and a few days later allocated 648 kHz.

22nd December 2017 – 648 on: but now at minus 599 kW compared to before!

Although nominally a 'clear channel' across north-western Europe, 648 kHz is by no means quiet. Radio Caroline is

fortunate in that no other station in the UK has (so far) been granted permission to use the channel, so even with a modest output of 1 kW, the signal provides 'anorak' DX-grade reception at some considerable distance from the transmission site during the daytime. There is little chance that any neighbouring countries will also be allocated the channel which is an added benefit. However, there are stations in Spain (which was well outside of the BBC's directional beam), Slovenia and possibly Bulgaria on this frequency. Spain and Slovenia are both active and put a reasonable signal into the UK at night – though with slow and deep fades. The Bulgarian station may well be defunct. As Slovenia and Bulgaria both lie within the main beam of the former BBC transmission, it is quite possible that transmissions were introduced deliberately during the Cold War to provide night-time disruption to the BBC service. Other stations to which 648 kHz is allocated are in Libya (also believed to be inactive) and a 2 MW station in Saudi Arabia. Although the latter is many miles away, it will at times put a signal into Northern Europe. None of these transmissions will cause problems within the primary coverage area of Radio Caroline's transmitter in Suffolk and north Essex but will limit the extent to which the signal can be heard around Europe at night-time.

Radio Caroline is being carried on what was the reserve omnidirectional antenna at Orfordness from their own, newly installed solid-state Canadian Nautel ND2.5 transmitter in the ITS building plant room.

Readers who have a pre-1978 radio with stations marked on the dial, will find 'Third' or 'BBC R3' marked at 464 m. 1950-era dials may have this marked as 'Davertry'. This is where one can find Caroline on 648 kHz.



Figure 1. The former Cobra Mist building at Orford Ness in 2004 (by Harumphy at the English language Wikipedia, CC BY-SA 3.0, <https://commons.wikimedia.org/w/index.php?curid=22947218>)