An Introduction to Long Distance Medium Wave Listening

by Steve Whitt (UK) & Paul Ormandy (New Zealand).

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An Introduction to Long Distance Medium Wave Listening

by Steve Whitt

This is a guide to long distance listening (DXing) on the Medium Wave (MW) band. If you've never tried listening to anything other than your local radio station on Medium Wave then these pages are intended to give you an insight into the stations you could hear, and how to identify them. Also covered are the types of receivers and aerials you should use and an introduction to signal propagation. With the imminent arrival of digital broadcasting on Medium Wave, we look at how this will affect the hobby. We also take a detailed look at DXpeditions, where keen listeners go to remote and electrically quiet locations to hear the most difficult catches.

Of course once you've caught an interesting station you will probably want a QSL card, so we also include information that should make this task easier. Naturally a guide like this can only scratch the surface of MW DXing so it needs to act as a pointer towards more information and indeed you'll find up to date listings of suitable books, clubs and sources of specialist equipment.

MW DXing opens up another dimension not covered by most of the shortwave (SW) bands. Although a few MW broadcasts are also available on SW the vast majority are unlikely to be heard on SW frequencies. Indeed many countries (mostly island nations) have no SW operations and only broadcast on MW which means that MW DXing is the only way of logging these elusive parts of the world. Furthermore most MW stations are local in nature and thus can give an interesting insight into what is going on locally; one can hear farm news from the US mid-west, obituaries on Jamaican radio; war reports from the former Yugoslavia, religious salvation from many stations and adventures from ship bourne broadcasters on the high seas. The choice is yours!

Good listening.

Next Section: Who goes There?

An Introduction to Long Distance Medium Wave Listening

by Steve Whitt

Medium Wave Stations

The Medium Wave (MW) band is an internationally agreed band of frequencies primarily set aside for the purpose of broadcasting. It is also known as the AM or MF band or the Broadcast Band (BCB) in various parts of the world. Indeed there are stations using this band in every continent (except Antarctica) and to appreciate the sheer numbers of broadcasters just consider that in the USA alone there are about 5300 stations on 106 channels in the AM band. For many years the MW band has stopped at approximately 1610kHz but it has been extended to 1705kHz in North America. What sorts of signals can you hear on the MW band?

International Broadcasters

Mostly found in Europe and South East Asia, these stations are designed to target audiences in countries distant from the transmitter and studios. Good examples are high power (500kW and upwards) transmitters operated by the Voice of America, BBC and Voice of Russia. Over the years these stations have been joined by a selection of religious broadcasters such as Vatican Radio, PJB in Bonaire, TWR in Monaco and HLAZ in Korea.

Regional Broadcasters

These used to be best exemplified by the Clear Channel stations in North America. These 50000 Watt stations had the exceptional privilege of having a MW channel virtually to themselves. This was a deliberate move to ensure that the vast rural interior could get good radio reception at night when coverage of half the continental USA is typical. Although some stations still operate as de facto clear channel stations, they no longer have an automatic right to use their frequency exclusively.

Synchronised Networks

These are networks of several stations all on one frequency carrying the same programme set up specifically to provide national coverage. Such networks need care in their design and operation to avoid problems with carrier frequency synchronisation and variable delay in the distribution of audio to each transmitter. The most notable examples of synchronised networks are run by the BBC in the UK for distribution of Radio 5 Live, the news and sports network. The network operated by Virgin 1215, also in the UK, is less successful.

Local Broadcasters

By far the majority of stations on the MW band fall into this category, characterised by the co-location of the station, its studios and transmitter and its audience. Transmitter powers can range from as little as 1W to 100kW or more, depending on the coverage area and the degree of co-channel interference. Many local broadcasters in North America operate only during daylight hours in order to avoid problems with co-channel interference brought in by the night-time sky-wave.

Navigational Beacons

Radio signals are an essential means of navigating for most ships and aeroplanes and the frequencies between the Long Wave band and the MW band have been allocated for this purpose. More surprisingly, a sizeable number of aeronautical beacons operate in the MW band interspersed amongst the broadcasters. Over 100 beacons are known, of which the majority are in the former Soviet Union. Beacons are usually low power and intended to give accurate navigational information over 50-100 nautical miles range, however long distance listeners (DXers) will be able to detect the repetitive Morse code identification messages from beacons over much greater distances.

Clandestines, Pirates and Jammers

Most signals described so far are more or less permanent features in the MW landscape. However, there are several more transient types of signals which can be heard, the most prominent of which are pirates and clandestine operations. Pirates are stations operating openly with out official licences from any country. They range from one time hobby pirates operating from someone's bedroom to fully financed operations broadcasting from ships at sea. The heyday of the seaborne pirate seems to be gone since the likes of Radio Caroline, Voice of Peace and Radio New York International have passed into the history books. Just one radio ship is currently operational, in the Mediterranean.

Clandestine stations are usually politically motivated broadcasters often supported by a covert government operation. Operations are complex since stations can pretend to be what they are not and there is always the possibility of the double bluff! These stations come and go, reflecting political changes in their 'host' country. Currently the bulk of known clandestines are operating in the Middle East. Long serving examples include National Radio of the Saharan Democratic Republic (since 1975) and the Voice of Iraqi Kurdistan (since 1965).

Clandestine stations, as well as official broadcasters, are often the target of jamming if the government in the area targeted by the broadcaster feels threatened by the message being carried. Jamming usually takes the form of a powerful transmitter broadcasting irritating noise and interference on the same frequency as the station beaming into the country. Jamming on MW has fallen dramatically since the late 1980s and now is confined mainly to the Middle East and the Korean peninsula.

Long Wave Stations

Though the Long Wave (LW) band (148.5 - 283.5kHz) is not strictly part of the MW Band, many listeners have common interest in the two bands. Long Wave is only used by broadcasters in Europe, North Africa, Mongolia and the Asian part of the former Soviet Union. Elsewhere in the world these frequencies are used mainly by navigational beacons similar to those found between 283.5 and 525kHz. One exception is in the USA where 160-190kHz is also used by experimenters who are allowed just 1W of power to tiny antenna! For more information about Long Wave, check out our page of Longwave Links.

Next Section: Getting Started

GETTING STARTED

by Steve Whitt

Let's take a brief look at what's needed to become a MW DXer and how you get started. Firstly, it is important to realise that the MW DXer can start listening with very cheap and simple equipment; any domestic radio will tune the MW band and it's quite easy to hear 50 - 100 different stations at night using just an internal antenna. However, it is probably preferable to use a better quality domestic radio, or a good car radio to get started. With this type of equipment, stations from up to 1500km away will be regularly heard at night. If radio conditions are favourable and you listen at the right time, reception of some stations over 3000km away should be possible. In this way you can have a go at DXing the MW band before committing yourself to any more sophisticated (or expensive) equipment.

On the other hand, if you are already an active shortwave listener, all that is needed to get going on MW is a change of waveband. Indeed many SW listeners tend to overlook the fact that their radios can usually tune the MW band and that their outdoor antennas are often effective in picking up distant MW signals. For the SW listener who has grown tired of the megawatt international stations, a fresh challenge can be found on the MW band.

Round The Clock

It is possible to DX on the MW band 24hrs a day (provided you don't need to sleep!) but the band has two distinctly different 'personalities' according to the time of day. During daylight hours MW radio signals are absorbed in the lower layers of the ionosphere and only 'ground-wave' signals propagate; these signals radiate away from the transmitter rather like ripples in a pond and allow reception at distances up to about 500 km. Daytime is a good time to listen for low power local radio stations since very few distant signals are audible and therefore interference is at a minimum.

At night the ionosphere tends to reflect, rather than absorb, MW signals and thus energy radiated upwards from a transmitter is refracted back down to earth at some point far away from the transmitter. These are known as skywave signals. It is quite possible for night time signals to under go multiple hops with alternate reflections occurring in the ionosphere and off the earth's surface. This mechanism allows reception to take place many thousands of km away from a transmitter. For example Radio Globo in Rio de Janeiro, Brazil is regularly heard in Europe, its signal having to cross 9500km of ocean on the way. You will of course notice that night time sky-wave propagation fills your radio dial up with hundreds of powerful signals, so how is it possible to hear the weak DX signals?

Over the years international broadcasting organisations have agreed a band plan arrangement on the MW band which requires all stations in an area to operate on fixed frequency channels. This has been arranged to maximise the number of broadcasters who can operate and to minimise the degree of interference affecting the listener. Fortunately for the DXer, international agreement is not perfect and as a result different MW band plans are operated in different continents; most European, African and Asian stations use channels that are exact multiples of 9kHz, whereas in the Americas channels are assigned as multiples of 10kHz. This means that, in Europe for instance, by tuning between the 9kHz channels reception of trans-Atlantic stations becomes possible. For example;

- 1008kHz (112 x 9kHz) Radio 10 Gold, Flevo, Holland
- 1010kHz (101 x 10kHz) WINS New York, USA
- 1017kHz (113 x 9kHz) SWF Baden Baden, Germany

This particular example also illustrates the value of knowing a station's timetable. Although reception of WINS is technically possible as soon as a path of darkness exists between New York and Europe, NOS is a pretty powerful signal and will cause interference. However NOS signs off for the night at the unusually early time of 2230 UTC, and knowing this it is possible to tune a virtually interference free signal from WINS before midnight.

Stations on split frequencies are usually the easiest to hear over long distances since they suffer less co-channel interference. Obviously in any part of the world reception conditions vary and different stations are heard. In order to gauge what you are likely to hear or what you are going to have real difficulty catching it is worth joining a local club that includes MW in its remit; even better would be joining a specialist MW club. You will have access to lots of information on MW listening and in particular you'll be able to see what other enthusiasts are hearing.

DXing in Your Sleep!

The easiest way to identify MW DXers is if they fall asleep during the day. Since the fundamental characteristics of the ionosphere favour long distance MW radio reception at night this hobby will be the province of the shift worker, the insomniac or the outright fanatic. There is one solution and that is to DX in your sleep!

All you need apart from the standard antenna and receiver is a tape recorder and a timer and a fairly methodical approach to listening. Neither the tape recorder nor timer should be expensive and indeed I don't know any serious DXer (SW or MW) who doesn't already use a recorder. Depending on your selection of equipment there are two ways of DXing in your sleep.

If you have an ordinary radio and a separate cassette recorder you'll need to buy a mains timer unit (get one with a digital display since these can be set precisely to the minute) which will cost about £15 - £20 (US$20-40). With such a timer connected in series with the mains lead of the recorder you are able to make a recording at any time of the day or night when you're not around. Just make sure that your radio is tuned to the frequency of the station you want to hear. Unfortunately such remote control is trickier for really tough DXing, since in these circumstance you will want to be making continuous adjustments to your receiver or antennas to improve reception. However, for less marginal conditions this technique is very valuable particularly for night after night monitoring of one frequency. In this case it would be impossible for me to be awake every night and I soon would get put off by the DX-less nights. Indeed taping for an hour each night allows me to quickly find the nights that are particularly good for DX (just 5-10% say) and to then examine the tape more closely for DX signals. In this way I've heard several North American and a couple of Latin American stations that I would not have otherwise heard.

If you have a receiver with a built in programmable timer (e.g. SONY 2001D) you do not necessarily need a separate mains timer. It might be possible to activate the cassette recorder from the radio or if this is not directly practical an external unit called a VOX or voice activated switch might be the answer. This piece of equipment connects in the audio lead from radio to cassette and detects when audio starts i.e. when the internal timer has turned on the radio. It then switches on the recorder for as long as sound is present. So if you have the equipment but have not tried this before why not give it a go.

Next Section: The Identification Question

MW DXing: The Identification Question

by Steve Whitt

If you tune in to your local radio station it soon reveals it identity through a number of clues; its strength, frequency, programme style and most importantly its on air ID (callsign, jingle etc.) which is easily heard since there is no interference. We now need to ask what happens when you are trying to decipher a weak, fading signal from a distant station that may well be using an unfamiliar language. The fundamental question is, at what point is a station identified and how should a station that is not fully identified be described.

The process of identifying stations should be viewed as a broad spectrum of probability. At one end is the completely unidentified station, an example of which is the open or blank carrier with no modulation - although you may have quite a good idea about its identity such a signal really is unidentified. At the other end of the spectrum is the positively (100% probability) identified (e.g. '...the powerful missionary outreach station, the Atlantic Beacon 50000 Watts at 15-70, broadcasting from the beautiful Turks and Caicos Islands in the West Indies...' leaves little doubt about this station's identity!).

Many DX stations fall somewhere between these two extremes; for example you may hear only part of a callsign perhaps in a poorly understood language, or maybe in the midst of heavy interference or jamming. Or perhaps no identification is heard but certain characteristics of the signal or programme content point in the direction of one particular station. Generally speaking, the longer you listen to a station, on one date or over many days, the more clues there are to help achieve successful identification. If you can't ID a station keep listening!

The factors which contribute to the identification of a station are almost without limit. Among them are time of reception, frequency, quality of signal, and programming style. The latter is usually one of the most important clues since valuable information can be gleaned from the languages used and music played, as well as from advertising, weather reports, time checks and so on. It should be appreciated that one's ability to identify a station depends mostly on the ability to interpret what is being heard. And, rather like a detective investigating a crime, it takes experience as a DXer to reach a correct conclusion based upon the limited clues available. Even the most experienced DXer will not be able to identify everything heard, so there needs to be some way of indicating how certain (or uncertain) a particular identification is. Hence the following shorthand expressions have developed as a solution to this problem.

Identified

Implies that the listener is 100% certain of a station's identity since a full announcement by the station was clearly heard.

Presumed

When a station is listed as presumed it means that the listener has had sufficient clues to the station's identity to be almost (90-99% probability) certain of its true identity. About all that is missing is a formal ID announcement.

Tentative

This term usually describes a situation where the listener is fairly certain that a particular station is being heard - indeed that the probability is substantially greater than 50%, typically from 75%-90%. It is important, however, to note that a tentative logging is not just a pure guess since there still have to be a number of clues pointing in the right direction.

Unidentified

Anything short of tentative is called 'unidentified' and the DXer should resist the temptation to classify loggings as tentative if there is insufficient evidence. When there is any doubt about a logging, it is wise to err on the side of caution and list it as unidentified; however it may be worth indicating which station you think it might have been if you have an idea.

At this point a word of caution is probably in order with regards to station listings. All DXers use lists of one sort or another to help them in their hobby (e.g. WRTH, club bulletins etc.) but it is dangerous to rely on a list (even the most up to date) as the sole means of identifying a station. That is not to say that lists should not be part of a DXers 'tools of the trade', but just that caution should be exercised in their use.

Lists are invaluable to help narrow down the range of possibilities when it comes to indentifying a mystery station; they can also guide a listener to the right place on the dial to possibly hear a particular station, but they cannot actually identify a station - only the station itself can do that.

Over reliance on lists and a bit of related 'wishful thinking' results in the practice known as 'list logging' which can be sometimes observed as anomalous loggings reported in the DX logs of some magazines and club bulletins.

Next Section: DXpeditions

Medium Wave DXpeditions

by Paul Ormandy

DXpeditions are the solution for urban DXers trapped in a noisy environment, lacking the real estate for erecting long aerials and yearning after a DX-fix. The solution is to find an electrically quiet environment (preferably near the sea) where aerials can be installed without threatening life (human or fauna). And some DXers go to extreme lengths to obtain these requirements, for example the Scandinavians who frequent Lemmenjoki in the Finnish Arctic Circle and suffer the extremes of weather conditions.

Because DXpeditions are often in remote, electrically quiet conditions, a mains power supply may not be available, with the nearest power pole some distance away (hence the need for battery-operated receivers and tape recorders). Other non-existent luxuries like hot water, telephone (& Internet) connections and nearby shops make planning important. In such circumstances the Dxer's ingenuity is challenged as everything from cooking meals to charging batteries to staying clean and staying in touch becomes a consideration.

Sleep deprivation, bad weather, lengthy journeys and all the other 'negatives' are usually more than offset by the quality of the reception, the chance to experiment with aerials, receivers, splitters etc and above all by the comradeships formed. Days are spent collecting firewood, the odd aerial maintenance chore, recounting the previous night's experiences, tales of 'the one that got away' or sleep (MW DX is best at night so the candle often gets burned at both ends and in the middle too!).

And a successful DXpedition usually doesn't end when you've arrived home . There will be numerous reception reports to write and magazine articles to prepare (having a lap-top on the DXpedition is a great idea!).

Some famous DX-sites and links to articles follow:

- Lemmenjoki, Finland
- Grayland, Washington, USA
- Cappahayden, Newfoundland, Canada
- Sheigra, Scotland
- Coorong, Australia
- Waianakarua, New Zealand

Choosing A Site

There are numerous factors to consider when looking for a site. Ideally, it should be in a remote area, away from nearby power lines, miles from the nearest MW/LW transmitter, close to the sea, having a comfortable place to stay and large enough for long aerials.

Remote areas usually mean farmland. Ideally flat ground with the odd tree to assist erecting aerials. The presence of fences can be handy though a note should be taken that even with all-wooden posts, the chemical treatments to prevent the posts rotting away (eg. tanalising) leaves them conductive (albeit with a relatively high resistance but a concern nonetheless). If you're going to use a fence, either insulate the wire wherever it touches the posts, or run a separate wire along the top.

In New Zealand, the preponderance of electric fence units can ruin an otherwise promising site. A quick check with an AM radio listening for tell-tale clicking is a good test. Electric fences are usually their noisiest during a dry period and a good rain fall lowers the level of noise by improving their ground conductivity and washing insulators tracking high voltage across dusty paths. Electric fences are generally only found on stock farms so other rural land uses like extensive horticulture may offer a lower noise level than in a dairying area, Overhead power lines, particularly high voltage varieties should also be avoided. If the choice is between a quiet, battery-powered DXpedition and an 'all the comforts of home' mains-run version, I'd take the former any day! Noisy power lines also benefit from a good rain to clean insulators etc. Underground power supplies are a good deal quieter as there is no exposure to the elements to cause noise (and they're fairly deep as those poles are quite long!).

And the further away from MW & LW transmitters the better as well. Even with directional aerials, locals will be a pest though you're invariably going to be better off than DXing from home. Other possible sources of RF interference like non-directional beacons (marine and aeronautical NDBs), GPS stations and the like should be checked too.

A site close to the sea is also a benefit. Absorption of signals by ground attenuation is more pronounced the further inland you go. So saying, my Beverage site at Waianakarua is 7km from the coast and reception there is very good. I'd tend to exclude anything more than 10 - 15km from the sea.

When To Go

My favourite months for DXpeditions are around the Autumnal and Vernal equinox, which are late March and late September respectively in the Southern Hemisphere, the opposite in the Northern Hemisphere). Reception from near-polar paths is best around these times though good signals on mid-latitude paths also occur in January/February and October/November.

If you're into long-term planning, the lowest point of the solar cycle is also the time to chase signals. That means 2006 through 2008 will be prime DXpedition years and I'll certainly be looking forward to then!

Next Section: Equipment

Medium Wave DXpeditions: Equipment

by Paul Ormandy

RECEIVERS

O.K, so it's a pretty essential piece of equipment, but what do you need to make all the effort you've put into antennas, finding a location, extra equipment, time off work and away from loved ones worth the while? A receiver that will maximise your chances of hearing those weak, distant signals.

There are numerous figures and specifications provided by manufacturers and test panels which will point you in the right direction towards a DX dream-machine. If were to purchase a receiver for the prime intention of MW DX, the factors I'd be most interested in are:

Selectivity
In the crowded MW band where stations are separated by as little as 1kHz, the ability of the receiver to discriminate between adjacent stations and to provide loggable audio is essential. What's more the width of the filter's skirt is as important as its quoted width and is often determined by the type of material the filter is manufactured from. For example, ceramic filters have very wide skirts allowing interference to ingress whereas mechanical or crystal filters provide very sharp skirts. Look for a receiver with a filter of around 2.5kHz at -6dB and a skirt width of less than 5kHz at -60dB (the narrower the -60dB figure in relation to the -6db the better - don't worry too much what that means, just use it as a point of comparison between receivers).
If you're tossing up options at purchase time, between a VHF converter, external speaker or a sharper filter, take the latter!

Sensitivity
Some receivers aren't designed to apply all of their features to MW and sensitivity is often affected by internal attenuation to prevent strong local signals over-loading the receiver. In many receivers the attenuation can be readily set to zero by a front-panel control, or a simple software fix. In others, (e.g. Kenwood R-5000) it's a soldering iron job which, given the complexity of modern receivers, not all will be keen to tackle.

Preamps
Generally useful devices that may be handy for giving a weak signal that extra nudge. Pre-amps that do not degrade the signal-to-noise ratio are extremely useful, though often they have been disabled on MW or require a user software fix to be enabled. Check to see if they will work on the MW band or can be adapted to do so.

Memories
Some may consider having a receiver with 400 memories as more than sufficient, though for the MW DXer, the ability to program in every MW DX channel in the best mode, with the optimum filter setting etc. is a real bonus. This allows swift tuning between channels which in a strong opening is very handy for analysing the best frequency(s) to monitor.

Noise Floor
And there's little point in erecting long antennas, spending heaps on coax, preamplifiers, tuners, baluns etc, if the weak signals you're chasing can't be heard under the receivers internal noise! A simple test to see how noisy a receiver is, remove the antenna and turn the volume right up - should be very quiet, a low-level background noise, ideally the noise level would be near zero and you would hardly notice the volume had been increased. I'm fortunate to have an ultra-quiet 25 year old Drake SPR-4 that has allowed reception of weak signals at loggable levels, which have been buried on colleagues' receivers.

Hash
Modern receivers with all their synthesisers, microprocessors and fluorescent displays can produce a fair amount of internal noise. This can effect the use of indoor loop antennas near the receiver, as they'll pick up the noise radiated from the electronics. Another simple test is to hold a transistor radio about 50 cm from the set and see how much hash it picks up.

Operating Voltage / Current Consumption

If battery operation is required (for example when running mobile or on DXpeditions) the amount of power drawn by a receiver will dictate how long a battery will last (and if you can start the car after a nights DX!). The Drake R-8A uses 2 amps when running (i.e. 30 hours operation on a fully charged car battery) though the drop in voltage will see the set turning itself off well before the 30 hours are up and 1 amp switched off on the front panel. The consequences of high battery drain mean that you'll need to be prepared for long stints at the dials by bringing extra batteries or charging between uses.
Most receivers are designed to work off 12 or 13.8 volts DC though the AOR 7030+ prefers 15 volts for optimum performance, although it functions very well at 12 volts.

Antenna Switches

Most receivers come equipped with the facility for 1 x 50 ohm input and 1 x 600 ohm input antenna with front-panel switching. I'd prefer to see at least 3 x 50 ohm inputs to allow ready access to a range of antennas. Strangely, the AOR7030+ doesn't have an antenna switch so an external device is necessary.

Best Receivers

If you're looking for a new receiver, there are a number of models currently available that are hailed by DXers as good MW DX machines. Sadly I'm not in the position of having personally used all of these sets, with the exception of the Drake SPR-4 (which I've owned for 15 years), R-8, R-8A and AOR-7030+, though general consensus would be to seriously consider the following:

- Drake R8-B
- Japan Radio NRD-545
- AOR 7030+

For 'pre-loved' units, look for:

- Drake SPR-4, R4B, or R4C
- Icom ICR-71
- Drake R8
- Drake R8A
- Japan Radio NRD-535
- Watkins Johnson HF-1000 (if price is no object!)

And if mains operation is possible

- Collins R390A
- Racal RA-17 or RA-117

Another option worth exploring with many radios to make them really top performing sets is to purchase one modified by Sherwood Engineering. For not a lot more than the purchase price, Sherwood can 'hot-rod' several of the above.

Headphones

There are several types of headphone worth considering. Headphones manufactured with the hi-fi market in mind reproduce high levels of bass and treble. They give excellent frequency response and provide pleasant listening to high-quality music. Great for music and often suitable for DXing, though there is another option.

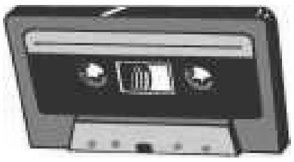
A MW DXer generally isn't too interested in high-fidelity, the frequencies covered by the spoken world are more crucial and there are several headphones that emphasise that frequency range. These are manufactured for the amateur radio and DX fraternity by the likes of Kenwood and Icom. They reduce the amount of bass and therefore rumble and reduce the amount of treble, which will soften heterodyne whistles and reduce hiss.

If you are DXing with others, and particularly on a DXpedition, you'll need a pair of enclosed muff phones to prevent what you're listening to annoying others. There are noise-cancelling headphones which form an electronic noise-barrier to prevent external noise affecting your listening. Sony is one manufacturer of these surprisingly effective devices.

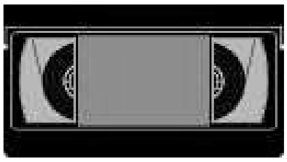
Audio Recorders

It's also important that you have a good tape recorder to capture as many of those often fleeting moments of reception as possible. Some DXers leave the recorder running non-stop, others hit the record button as soon as something interesting pops up.

And recording media now comes in many forms and prices.



- **Audio Cassette Recorder** No doubt the cheapest option, though a recorder with external line-in (or microphone socket), tape counter and external DC power connection are handy. These range from el-cheapo to the broadcast quality versions used by media journalists.



- **Hi-Fi Video** Definitely a mains voltage option and ideal for leaving running especially with long-play modes which in some models will let you record audio for up to 12 hours. And it’s also high quality audio.

- **DAT** Digital Audio Tape offers one of the highest quality portable tape-based recorders. The tapes and recorders are considerably dearer than audio cassettes but this is offset by the wide frequency response and dynamic range

Mini-Disc Another portable solution using a small CD and also expensive. What's more, some mini-disc models radiate a fair amount of hash and aren't suitable in all situations.

MP3 The new kid on the block. No tape or disk is required as the audio is recorded onto a computer chip. These are still in their infancy and the amount of time available for recording is relatively short though I'd expect these units to become one of the tools of the DX-trade before too long.

Personal Computer

In the last few years increasingly sophisticated software has appeared that can turn your PC into a powerful audio recorder and processor. Astonishingly powerful software is available for under $50US that can record and playback, that can speed up and slow down the audio, and that incorporates graphic equalisers and spectrum monitors. Many listeners now use computers because you can easily programme recording times (10 hours over night is easy!), and you can easily check the audio at any time with just a few mouse clicks - no need to wait for a tape to rewind to an imprecise location.

It is also extremely easy to copy, cut and paste sounds just like text in a word processor. So it is very easy to make a short audio clip to e-mail to other DXers for a second opinion or for translation, or even to include with an e-mailed reception report.

Two software packages are well established and widely used by DXers:
Total Recorder by High Criteria www.highcriteria.com
RecAll Pro by Sagebrush www.sagebrush.com

The only drawback with this technology is the fact that many PC's cause radio interference to reception and that mains power is usually essential. It is possible to reduce interference but it takes careful choice of equipment and wiring and some effort. It is also possible to use a battery powered laptop computer to reduce interference and the need for mains power.

A little trick when using stereo recorders. Feed the audio from your main receiver into one channel and audio from a second receiver tuned to WWV into the other. That way you'll be able to have a time-base accessible by playing the tape back through an amplifier with a balance control. (Thanks to Andy Gardner!)

ACCESSORIES

There are other items that the MW DXer may find handy in the pursuit of weak signals, particularly on DXpedition when accompanied by colleagues.

When using modern sets with low-impedance inputs connected to high impedance antennas (e.g. Beverages) a balun is required to maximise signal transfer between the two. Baluns are best installed some distance from the receivers and fed with coax to prevent interaction. It is also a good idea to keep antennas separate as they approach the listening site (e,g, not anchored on the same pole) for the same reason.

When you're fortunate enough to have a number of antennas to choose from, an antenna switch will be required. Ideally they should be metal -encased and offer high isolation between antennas to prevent interaction.

On DXpeditions when DXers are sharing an antenna, a splitter is required to provide equal signal levels to all sets. Standard splitters will cause a small signal loss so amplified versions are another option.

And when you've finally found that ultra-quiet environment, a preamplifier may help you drag a signal out of the mud. It is important that the amplifier has a very low level of internal noise otherwise it will also bury the signal.

Make sure the preamplifier has excellent signal-to-noise figures. An good unit would have a gain of 10 - 20dB and a noise figure of around 2dB. Also make sure they work down to 0.5mHz (500kHz) as a lot of preamps are designed for above 1.8mHz.

You'll find most of these available from places like Universal Radio, Advanced Receiver, Stridsberg Engineering or Kiwa all in the USA, Wellbrook in the United Kingdom or Paul Ormandy's Equinox balun. Home - brewers may wish to check Mark Connelly's WA1ION DX Labs page

BATTERIES

If a mains-free DXpedition is planned, consideration to the type of battery is important. For short duration trips, a standard 60 amp-hour car battery may suffice, though for longer stays or with multiple receivers sharing the same power source, a deep-cycle battery is highly recommended.

These units are often used for back-up power supplies or where reliability is crucial because of their ability to provide a constant voltage under heavy current drain for a considerable period of time.

Whilst more expensive, they are undoubtedly good value given their suitability for running 3+ sets at once. Ratings of at least 85 amp-hour would be the minimum and 120 amp-hour suggested
.

LIGHTING

If you're operating on 12 volts, a lighting system that provides maximum light output and minimum battery drain is essential. I've used standard incandescent (high drain, poor light), fluorescents (low drain, good light but dreadful RF interference) and gas light (no battery drain, excellent light but very noisy). The answers to my dilemma take the form of 12 volt halogen lights. A 20-watt unit over head gives excellent light and less than 2-amp-hour drain though if you're going to have a light mounted a short distance over-head, go for a 10 watt unit as the light output is quite brilliant.

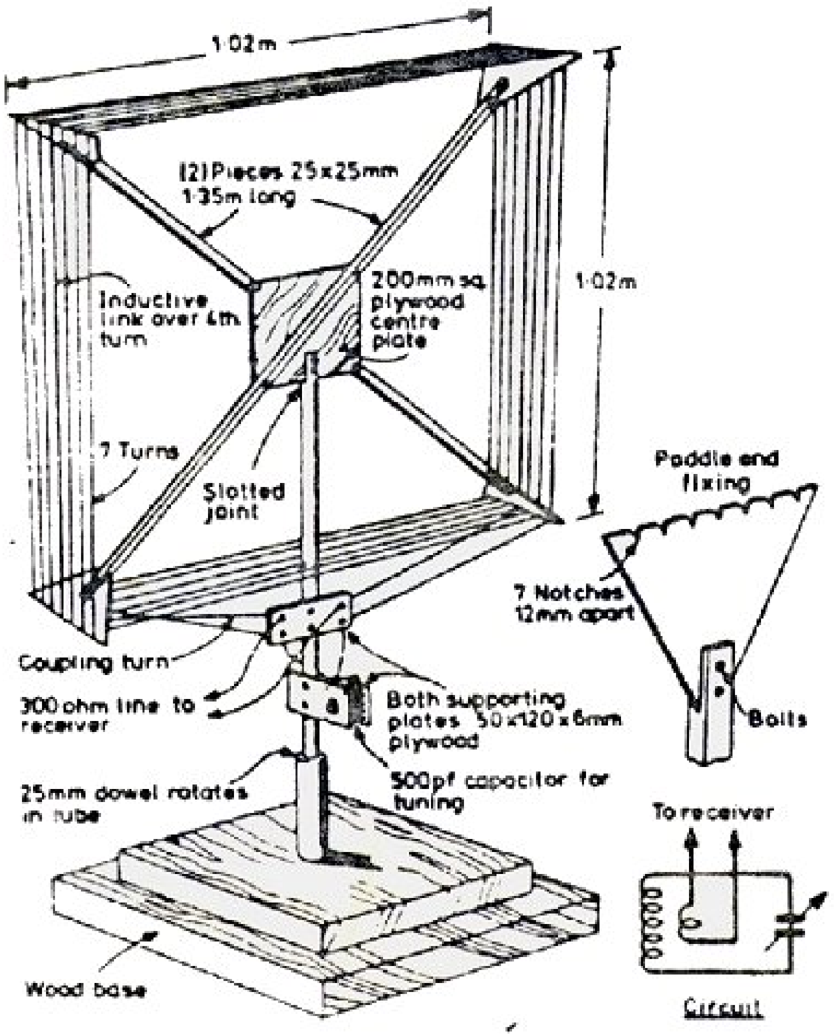
Next Section: Antennas

An Introduction to Long Distance Medium Wave Listening: Antennas

by Steve Whitt

DIY MW Loop Antenna

This is the commonest 'specialist' antenna used by listeners to MW frequencies because it is usable indoors, readily home-built and low cost. The loop possesses a very predictable directional receiving pattern which allows signals from different transmitter locations to be selected by carefully rotating the antenna about its vertical axis. In addition most loops are designed to be resonant on MW frequencies and therefore are tuneable. This is often a very valuable introduction of selectivity before signals even reach the receiver. A good loop tuned to 1MHz will easily reject most signals more than + or - 50kHz away from the desired frequency, thus virtually eliminating any images or 2nd order intermodulation products generated within the receiver.



There are numerous designs for loops. Some are tuned, others are broadband; some are compact indoor models, others are massive outdoor devices, but the commonest design is based on a 1m square wooden frame on which 7 turns of wire have been wound. This inductance is then parallel tuned by a variable capacitor with a maximum value of about 400-500pF. The loop is mounted on a base supported by a wooden broom handle which acts as its axis of rotation. For full constructional details of loops it is best to seek out some of the specialist publications listed in Section 5 since there is not enough room here to cover the construction in detail.

Figure 1 illustrates the all important directional pattern of the loop, which clearly exhibits two symmetrical nulls and peaks which can be directed to undesired or desired stations by physical rotation. In this way the loop is very capable of separating two or more co-frequency stations provided the signals are not arriving from the same (or directly opposite) directions. If the direction of arrival of two signals is separated by 60¡- 120¡ then the loop really excels.

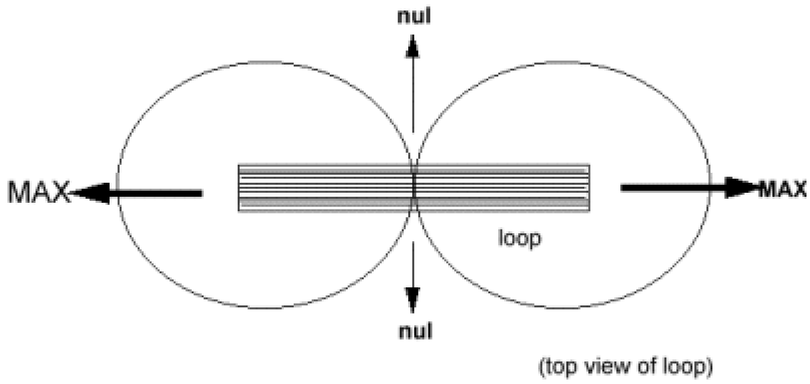


Figure 1: *Directional properties of a Loop Antenna*

DIY Beverage Antennas

The second key antenna, and probably the best, for MW listeners is the Beverage. This antenna is one of the simplest and oldest designs around, having been developed by Harold Beverage in the 1920s. In fact an antenna of this type, 12km long, was used by Beverage in 1922 for the reception in the USA of some of the first low frequency (approx 1.2 MHz) transmissions from Europe.

For a Beverage to be reasonably effective it needs to be between 1 and 10 wavelengths long, which on the MW band implies lengths between 200 and 5000 metres. The longer it is relative to the wavelength of interest, the more directional the antenna becomes. Remember that a Beverage has its maximum signal pick-up along its length and that the antenna should point along the great circle path towards the desired reception area (Figure 2). The Beverage is even cheaper than the loop to build. It is a broadband antenna (i.e untuned) and so effective over the whole MW band, but by virtue of its size it always points in one direction. This means that its reception nulls cannot be easily targeted on unwanted signals. Professional receiving installations (with bigger budgets than DXers) often construct whole arrays of Beverage antennas radiating out like spokes on a wheel from the listening site. The radio monitor of course is able to chose the antenna which gives best quality recap

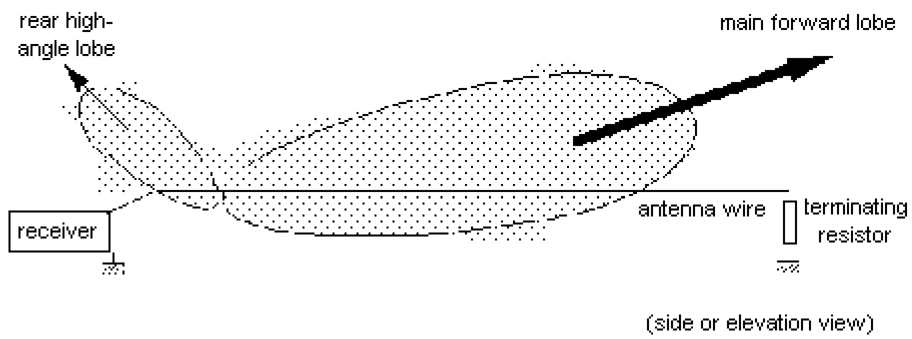


Figure 2: *Directional properties of a Beverage Antenna*

Over the last half century considerable research into the Beverage has been conducted and detailed design rules exist but for the radio enthusiast this is one antenna design that is very tolerant of design imperfections. Here's what you need to do to put your own Beverage antenna together and to have a go:

Location

Unfortunately the Beverage is a large antenna but it doesn't really need much space and it can often be a 'secret' antenna erected unobtrusively. Ideally you need to have a large field or woodland at the back of your house but a long straight fence can be used to support the wire. If you have lots of space you have the freedom to chose the beam direction but if you are just taking advantage of local geography then you may have to accept the limitations imposed on you. If you lack any significant space at home a good alternative is to find some open land nearby.

Wire

Hard-drawn copper wire is best for a permanent antenna since it won't break, but it is not cheap and is quite heavy. I tend to use 7/0.2mm multi-stranded insulated wire for temporary DX-pedition type antennas. A continuous barbed wire fence (galvanised steel) is OK also as long as it's not too rusty to make good electrical connections. If you want to put up a cheap and disguised antenna use thin transformer wire (eg 40 guage); you can lay this along a hedge row. Whatever wire you chose you'll need to be prepared for breaks and repairs; 'chocolate block' connectors are very useful accessories when working with Beverages.

Supports

Gardeners-style bamboo canes (4-6 feet tall) are cheap and good for the job. Just cut a slit at one end with a penknife or junior hacksaw to hold the wire. Lightweight wire (eg 7/0.2mm) needs a support every 15metres or so. If a straight hedge-row or fence runs in the desired direction you can dispense with the bamboo canes; likewise it is possible to support wire in trees or bushes as long as a reasonably constant height (between 4 and 10 feet) above ground can be maintained.

Earth stake and terminating resistor

If a Beverage is operated just as a long wire it will be directional but will pick up signals from both ends of the wire but if the end of the wire furthest from the receiver and nearest the target reception area is terminated with a non-inductive (e.g. carbon) resistor equal in value to the antenna's characteristic impedance (usually about 500 - 600 ohms) the antenna becomes unidirectional. For best results it's good idea to experiment with the resistor value but even a fixed resistor of, say 560 ohms, connected between the antenna and the ground stake will do the job. One good way to produce the terminating resistor is to solder in series a dozen 1watt 47ohm resistors which are then encased in either heat -shrink plastic tubing or self-amalgamating tape. The use of many low value resistors makes the whole combination less prone to moisture affecting the total resistance value. Do not forget that for best results a good earth stake is needed at both ends of the antenna, one for the terminating resistor and the other for the receiver.

Receiver

If you aren't operating from a permanent home installation, or planning a full scale DX-pedition from, for example, a farmhouse, you'll need portable equipment. One good portable receiver that performs very well on the MW band is the Sony ICF2001D. This radio can run off its internal batteries but alternatively a communications receiver that runs off 12V could be used. To make the most of the 2001D (and many other receivers) it is usually essential to place an antenna tuning unit between the Beverage and the radio to avoid overload problems caused by strong local signals. Just imagine the simplicity of driving up to your antenna, parking in a lay-by off the road, and then all that you need to do is pass the antenna wire through the car window, connect it to the receiver and you are ready to go! With a bit of ingenuity you could be DXing with your very own Beverage antenna; you certainly don't need to own several acres of land.

In fact recently I erected a Beverage on a piece of waste land not far from my home. To find the location I did a little browsing of local maps and then surveyed the sites by driving around the neighbourhood. I guess I was lucky but I only had to visit four locations before I found an almost ideal site. Furthermore the site was derelict and deserted so I put up a 330metre run of wire through the bushes. The receiver end terminates on a fence post with some large nails to which I simply connect the receiver with crocodile clips. whilst at the other end I installed the terminating resistor between the antenna wire and a copper earth stake driven deep into soft earth in a ditch. In my case a good ATU is essential since I have a local MW transmitter on 1170kHz.

See also Paul Ormandy's article **Easy-Up Beverages.**

Phasers

Phasing units, which allow the combination of signals from two antennas to reduce/remove interference or noise and to increase gain by adding signals together, have always piqued my interest. Any device able that will improve the chances of hearing something new or rare is worth consideration and a couple of home-brew phasers (inspired by Mark Connelly's work) have graced my shack over the years. Their performance was OK though they were generally tricky to tune and almost always unstable. Enter the electronic version!

A couple of manufacturers are supplying units, which have caught the attention of the DX-fraternity, namely MFJ Enterprises MFJ-1025 and MFJ-1026 and Timewave's ANC-4, are producing moderately priced units. They even give you an advantage with shorter antennas (from home I get good results from two 30 metre slopers running 180 degrees out of phase). Both are available from the suppliers or Universal Radio.

With these units deep, stable nulls on a variety of signals make it possible to totally remove interfering stations and open up a whole new world of possibilities. I use mine as much for increasing signal gain by phasing two antennas together as I do dealing with QRM.

These commercially available units were intended primarily to cancel noise, yet have shown their real value in reducing interference and enhancing signals using signal inversion and phasing. For user reviews, check these articles:

- MFJ-1025
- MFJ-1026

Next Section: Propagation

Long Distance MW Listening: Propagation

by Steve Whitt

To make the most of MW listening you'll need to have a basic understanding of how a radio signal arrives at the receiver from a distant transmitter. A great deal of scientific work has been under-taken investigating the propagation of radio waves, but fortunately for the MW DXer things can be greatly simplified by considering just two dominant propagation modes. MW propagation takes place by means of two different and distinct mechanisms, namely groundwaves and skywaves.

Groundwaves

The groundwave, as its name implies, travels along a path close to the earth's surface. How far such a signal goes is dependent on a number of factors, principally transmitter power, operating frequency and earth conductivity. Groundwave propagation is heavily dependent on the frequency, with low frequency signals travelling greater distances. In fact, every thing else being equal, groundwave signals from a station on 550kHz will travel twice as far over land as those radiated by a station on 1500kHz. The earth conductivity is also a very significant factor and it is found that the better the conductivity the further the signal travels. Sandy or rocky soil is the worst terrain whilst sea water is best and in regions such as the Caribbean, where the sea is particularly saline (and therefore more conductive), groundwave reception of stations up to 1000 miles distant is possible. In contrast, a similar signal travelling over rocky terrain would carry only about one quarter of this distance. Groundwave propagation is very stable resulting in consistent reception conditions. It is, however, usually only associated with daytime (although equally present at night) since at night long distant reception is predominantly via the sky wave. Because of its stable daytime behaviour, radio stations usually optimise their aerials to radiate as much of their signal as possible via the groundwave in order to improve coverage.

Skywaves

There exists a rarefied region of the earth's upper atmosphere that absorbs the intense solar ultra-violet radiation thereby protecting life on the earth's surface. This radiation results in a region of ionised gases known as the ionosphere, which, depending on diurnal and seasonal variations, consists of several fairly distinct layers of high ionisation (Fig. 1). These layers have a profound effect upon radio waves approaching them from transmitters on the ground below. Under certain conditions refraction of waves occurs, resulting in the 'reflection' of signals back down to the earth, whilst at other times signals can be totally absorbed by the ionised gases. During daylight hours solar radiation penetrates the atmosphere far enough to form the lowest layer of ionisation, the 'D' layer roughly 60km above ground. The 'D' layer so completely absorbs signals on MW frequencies that any radio signals radiated by a station other than those parallel to the earth's surface are completely lost.

With the approach of sunset, however, the 'D' layer absorption decreases rapidly and within a few hours MW signals are being reflected back to the ground from higher regions of the ionosphere; depending on circumstances reflection occurs in the E region (about 100-120km up) or in the 'F' layer (225-300km).

Figure 3 & 4 illustrate this process and shows the skip distance which for MW frequencies turns out to be about 100 to 500 miles. Longer distance reception is possible when multiple reflections occur between the ionosphere and the earth's surface. This occurs with least signal loss over ocean paths hence the possibility of good reception of Brazilian stations here in Europe.

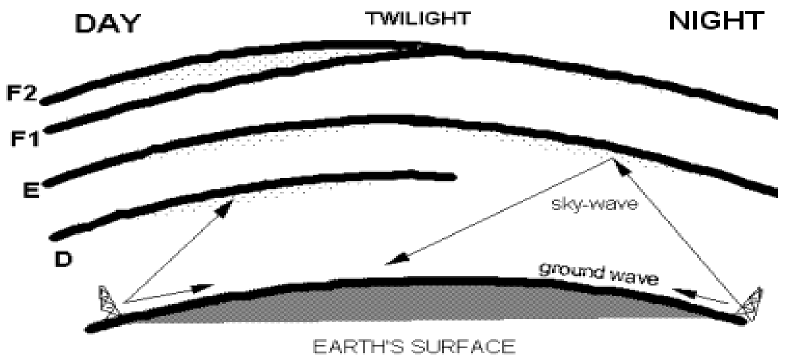


Figure 3: *The Ionosphere and MW Propagation*

Whilst the skywave enables good MW DX at night, it also leads to a deterioration in reception quality for the normal broadcast listener. Firstly there is a region about 50-100 miles from a transmitter (Figure 4) where the groundwave and the skywave signals are received with roughly equal (but varying) strength, leading to severe distortion. Additionally all skywave signals are affected by fading as a result of the continually changing characteristics of the ionosphere.

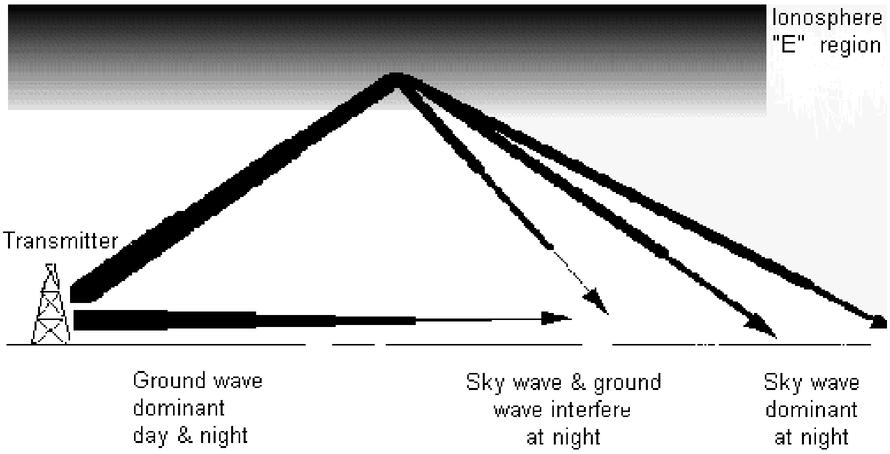


Figure 4: *Skywave / Groundwave Interference*

Anomalous Propagation

A previous section examined some of the basic factors governing MW (and LW) reception, in particular the effect of the ionosphere and the influence of solar radiation and ground effects. We deliberately restricted the subject to effects of a regular or predictable nature; the sort of parameters that a planner takes into account when planning the reception area for a new station.

There are however many other occurrences that have a bearing on radio propagation at these frequencies; each with a greater or lesser degree of unpredictability. Although it is nice to be able to predict when good DX will be heard on the MW band, it is the possibility of the unusual occurring that adds a touch of excitement to the DXing hobby. One of the overriding features of MW propagation is the effect of solar radiation on the upper regions of the earth's atmosphere. Predictable effects of solar radiation can be seen as diurnal and seasonal variations in MW propagation as well as in the influence of the 11 year sunspot cycle.

Less predictable events include ionosperic storms, shortwave fadeouts and polar disturbances. These somewhat esoteric events result from disturbances occurring in the sun, which is, under such circumstances, referred to as 'active'. The mechanisms behind such events are both complex and in some instances not yet fully understood but fortunately the average DXer is likely to be more interested in knowing the effect rather than the cause. In addition it could be very helpful to know when such an event was in progress and to be able to gauge its possible effect on DXing. A number of institutes around the world keep a watch on the sun and the ionosphere but the DXer is faced with the problem of obtaining (and interpreting) this extensive scientific information.

Fortunately the American National Bureau of Standards provides this information via the standard time and frequency broadcasts of station WWV. This station, which is most likely to be heard on 5.0, 10.0 or 15.0 MHz, transmits regularly up-dated radio propagation data during the 18th minute past every hour. It is also possible to obtain the same message by phoning a pre-recorded announcement: the US phone number is +1-303-497-3235.

One piece of information transmitted via WWV that is particularly interesting, is the Fredericksburg 'A' Index (more properly called the Fredericksburg Index of Geomagnetic Activity in the Earth's Magnetic Field) which can be used as a simple guide to propagation on the MW band. It is a simple matter to construct a daily graph of the A indices from which basic propagation predictions can be made. High values (above 20) indicate that MW signals in high latitude paths are likely to be absorbed, leaving signals propagating via paths closer to the equator to dominate. Low values over a period of time indicate a likelyhood of improved reception via higher latitude paths. Long periods of very low (6 or less) values are needed to raise the possibility of good high latitude reception throughout the entire MW band.

Next Section: Interference

Medium Wave Interference

by Steve Whitt

Interference is a topic that affects not just the MW DXer but just about every radio listener. In fact it is usually the level of interference rather than any other factor that limits the reception of weak and distant stations on the MW band.

Interference is usually taken to mean any unwanted signal (or noise) that, by adding to the desired signal, degrades reception of the wanted information. It is usually the case that the interference most often encountered on MW is man-made in origin. Whereas there is very little one can do about naturally occurring interference, it is possible, theoretically at least, to eliminate man-made sources of interference. The first step to suppressing interference is in fact recognising it and identifying its origin. Having identified a source of interference it is an unfortunate fact of life that it may prove impossible to do anything about it. The following are the most common forms of man-made interference to affect MW reception:

Co-channel interference:

Since the MW band is operated in a channelised manner and because there is only 1080kHz of available MW spectrum, there are inevitably several stations transmitting simultaneously on each channel. Normally the powers and locations of stations allocated to a particular frequency are chosen to ensure that a low level of co-channel interference occurs within the target area of each transmitter.

However, listeners outside the target area will experience this form of interference which generally gets worse at night as interfering signals propagate further via the 'sky wave'. In fact it is the acceptable limit of co-channel interference (also known as the protection ratio) that defines the target area boundary for a particular transmitter.

Modulation Splatter:

Splatter or adjacent channel interference can be recognised as unintelligible modulation or programmes heard mixed with the desired programme with the interfering signal originating from a station transmitting on a channel adjacent to that of the desired station. Given that stations are adhering to their local channel bandplan, there are two main causes of modulation splash. Firstly, splash can be the result of a station not limiting the bandwidth of its transmitted audio which results in components of the transmitted sidebands interfering with signals on adjacent channels; this form of splash can also result from a poorly maintained or over-modulated transmitter. Secondly a form of adjacent channel interference can be generated within a receiver with insufficient selectivity when receiving very strong signals. To test if adjacent channel interference is in fact receiver generated an aerial attenuator should be used to reduce the strength of the incoming signal; if the relative degree of interference reduces, a receiver effect should be suspected but if no change is observed then it is possible that the interference is actually being transmitted.

Heterodyne Interference:

A heterodyne is an audible beat note or whistle that is generated in a receiver when two signals on slightly different frequencies are received simultaneously. In a perfect world where all MW stations operated exactly on their allocated channels, heterodyne interference would not be a problem. However since different channel plans are used in different parts of the world it is possible to hear heterodynes on the MW band. Occasionally, within one radio planning region it is possible to find off channel stations either because the station has failed to conform with planning guidelines or a technical problem has arisen in the transmitter. In 1978 the frequencies of the European Asian and African channels were aligned to all be exact multiples of 9kHz, and every station was expected to retune their transmitter to the new channels. However quite a few African stations did not make the move and even today a number of off channel stations are audible. Their presence can cause heterodyne interference to other stations but the keen DXer can use the presence of a heterodyne tone as a good guide to a weak distant station. For example 1395kHz is an official channel used in Europe and Africa but Radio Lome; in Togo never moved from the old frequency of 1394kHz. So if the listener is hunting Lome the presence of a strong heterodyne interfering with stations on 1395kHz indicates that the path to West Africa is open.

Unwanted heterodynes are annoying but fortunately they are easily removed with an audio notch filter. DXers often purchase such an accessory [see Section 6.2] since it improves reception and reduces listener fatigue.

Electrical Interference:

This title covers a multitude of interference sources which will tend to affect listeners living in built up areas, particularly near industrial zones. Man-made electrical interference comes in all shapes and sizes but can be classified as intermittent or long term. It can be difficult to track down intermittent sources of interference but fortunately their nuisance value is not long lasting.

Common examples are engine interference from the poorly suppressed spark plugs of passing cars, and arcing of electrical contacts in thermostats and switches. If the source is identified it is generally not too difficult to suppress this sort of interference. Other examples are caused by faulty street lights and faulty insulators on overhead power lines and in both these cases the solution is to inform the relevant authority. The longer lasting variety is commonly due to harmonic radiation from television (TV) and visual display unit (VDU) timebases. TV interference is audible as a rough buzzing located at precise intervals across the MW band of 15.625kHz (in Europe) or 15.750kHz (in N. America). VDU interference can appear with a frequency separation in the range of 14-18kHz. Unfortunately this form of interference often restricts any serious DXing to outside TV hours. Generally as more and more electrical equipment enters the home and office the greater the level of interference and the less chance there is of suppressing it. Among the more recent sources of (very potent) interference are computers and electronic telephones and office exchanges. Regrettably there is usually little a DXer can do cure this affliction unless they own the offending piece of equipment.

Jamming:

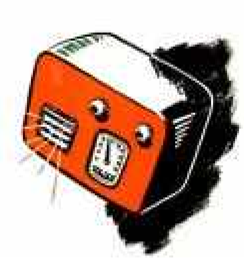
This is a deliberate attempt to interfere with reception and is usually a transmission of man-made noise intended to blanket another programme to make it unintelligible. The amount of jamming present tends to reflect the degree of political unrest in the world and today there is relatively little to bother the MW listener. The extensive jamming associated with Eastern Europe and the former USSR is now consigned to history, but jammers are still active in the Middle East and Korea.

Powerline Communications

A new threat has emerged that could affect all radio reception between 9kHz and 30MHz. Tests began in Germany in early 2001 of a system called Powerline Communications. The system uses data communications to control various devices commonly used in the home, with the signals being conducted through existing power cables. But the use of radio frequencies with a proposed range of up to 300 metres, means that milllions of people in urban areas are theatened by radio pollution from these devices. Imagine trying to DX in an apartment block where dozens of different devices are operating simultaneously. There's still hope that the intereference levels, even to reception of strong domestic signals, will be so high that the whole concept will have to be rethought. Otherwise for many urban dwellers of the future, a trip to a remote spot may be the only chance to enjoy the sort of reception that has made mediumwave DXing such a fascinating hobby for so long.

Other Sources of Noise

Even if one lived in a world without any man-made interference, one would still notice a whole range of noises that limit reception of very weak signals. Of these the least significant (for the MW listener) is the thermal noise and other electrical noise components actually generated within the components of the receiver. This is because



the level of other naturally occurring noise sources picked up by the receiver's aerial is many times greater. Common examples of these types of interference are atmospheric static, which manifests itself as a continuous crackling noise and lightning discharges which are heard as a loud crashing noise. The distinguishing feature of these signals is their broadband nature; namely the noise will be heard at all frequencies in the MW band although the intensity will decrease at higher frequencies. It is interesting to note that the radio wave emitted by a lightning flash behaves as any other radio wave and therefore can propagate over considerable distance; in fact one of the great sources of interference worldwide is the noise generated by the large numbers of daytime tropical thunderstorms. It is for this reason that many broadcasters in the tropics choose frequencies between 3 and 6 MHz for local broadcasting where the effect of thunderstorms is much reduced.

Next Section: Reception Reports

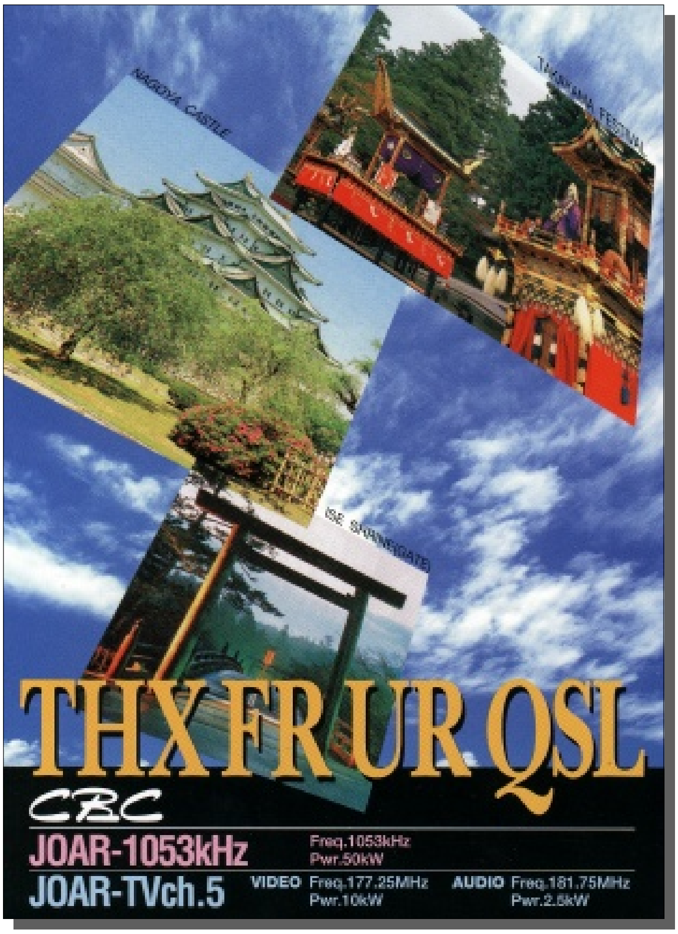
Reception Reports to Medium Wave Stations

by Steve Whitt

These three letters, QSL, are probably a bit of a mystery to the newcomer, so what do they mean? Let us suppose you've just heard Radio Fiji on your pocket transistor radio how are you going to convince everyone that you weren't just dreaming? Wouldn't it be good to have something from the radio station confirming that you really did hear them? Well this is where QSL cards come into the picture; a QSL card is usually a picture postcard (although it can also take the form of a letter, a certificate, or a folder) sent to a radio listener by a radio station confirming that reception actually took place.

In order to get a QSL card from a station there are several things you need to do, but firstly remember that you have to hear the station and then convince station staff that you did hear their signal. Normally one is obtained by sending a station a reception report giving details of how well their signal was received and of the programme material heard, as proof of reception. Naturally you need to say when you were listening (date and times should be in the station's own local time).

Historically, the QSL originated in the days when stations relied entirely on reports from listeners to determine their coverage area. In fact the letters 'Q-S-L' are based upon a radio operators shorthand code (Q code) system that evolved during the early days of radio. Nowadays, however, many stations use reports from professional monitoring stations and have more accurate coverage predictions available, and consequently the QSL survives largely as a service, from the station's point of view. Additionally there is a significant difference in QSL policy between the international shortwave broadcaster, which issues QSL cards to maintain contact with and to gauge the size of its audience, and the local medium wave station being heard outside its usual coverage area. At best, the latter will treat a far off reception report with curiosity and will send out a QSL as a public relations exercise. At worst, to a station with few staff and a limited budget, reception reports from DXers can be a downright waste of time. It is therefore vital that MW DXers follow these top five tips when sending out reception reports to stations.



Make Your Reports Really Work

If you are one of the many MW DXers who not only likes to hear a station but wants to collect a verification or QSL to 'prove' that reception actually took place, then you'll appreciate that hearing the station in the first place is only half the problem. I'm sure that you've wondered why not every station replies to your letters or reception reports. Perhaps only around 50% of MW stations reply; what can be done to increase this ratio ? Many MW broadcasters (in contrast to their SW counterparts) are not interested in audiences in far flung places since their double glazing advertiser is unlikely to extend his sales overseas!

Firstly imagine yourself in the position of the station engineer and then imagine you received a letter from a faraway listener asking for a QSL card. Could you be bothered to reply if you've already received a hundred similar items in your in-tray that week? I know of station engineers that have commented '... some of the reports we get are terrible..', '... we only now reply to reports containing IRCs as the postage was getting rather expensive..', and '... I always reply to DX reports but never know if my letters are received..'

What a listener needs to do is to convince the station that reception really took place and that the report is not just being made up. In addition you need to make the station's task in replying as simple as possible and it always helps to make your reception report stand out from the crowd so that perhaps it won't end up in the 'round file'. Try these steps to good reception reports:

Convince the station

Include full details of commercials and public service announcements that you heard since virtually all stations record these details in their logs. Station slogans won't on their own convince anyone since they are often well-known and widely reported and also lists of records heard are not always very useful since details aren't always kept in station logs. Worst of all is something like 'man talking..' or 'music' which won't help convince anyone! The golden rule is the more detail the better.

Make their job easier

Use the station's local time in reception reports so that they don't have any tricky time zone conversions to do. The only exception is if the station is an international broadcaster that has been announcing a different time zone (e.g GMT or UTC) on air. It is often wise to note down the actual time announced in time checks rather than what your watch says since many stations have somewhat inaccurate studio clocks! Send return postage with your letter. Best of all include mint stamps from the station's country but since this is easier said than done you could send International Reply Coupons which are obtainable from the Post Office. Unfortunately some countries do not accept IRCs for exchange into local postage stamps. For the USA and many other countries you can instead send a US$1 bill since hard currency is often appreciated. Enclose a prepared sticky label with your return address already on it. Write in the station's natural language unless it is a big international broadcaster with various language departments. The natural language may not be the main language of the country they are in (e.g. Spanish speaking stations located in the USA).

Help the station

Local MW stations don't need listeners thousands of miles away; certainly they don't attract more advertising because of this. So if you can help the station with constructive comment on programmes (what you liked and disliked) and on technical quality (eg modulation, audio quality or frequency stability) or by identifying interference, so much the better.

Make your letter stand out

BE POLITE and request a QSL card - never demand one. Introduce yourself and your location; maybe include a local picture postcard or some stickers from your local radio stations. use commemorative or unusual stamps on the envelope; there maybe a philatelist at the station. Unfortunately in some parts of the world this might also make your letter attractive to thieving hands in the postal system. Give a realistic and detailed decription of reception conditions in words that are not too technical (remember it's not always the engineer reading your letter). Never use SINPO style codes on their own.

If you follow some or all of these tips you should not only increase your chances of getting a reply from a station but you will help contribute to good relations between DXers and broadcasters. Finally, if you receive a reply from a station it is an often over-looked basic courtesy to thank them. It is simple and quick (and not too expensive) to send a postcard direct to whoever wrote from the station letting them know that their letter arrived safely and thanking them for their trouble. Research during a Radio Netherlands Media Network edition revealed that very few bother to say 'thanks', and yet it makes all the difference.

Next Section: The Digital Dimension

The Digital Dimension
The Future of Medium Wave DXing in a Digital World by Paul Ormandy

Digital broadcasting on mediumwave is almost here! Widespread implementation will begin in 2003 and while we can speculate about the 'bells and whistles' that digital will bring and whether DXing as we know it will survive, how will we fair in the short term, DXing analogue signals in the midst of the digital revolution?

For years now the news for New Zealand MW DXers hasn't been good, which is a reflection of the scene globally though with its own 'Kiwi" twist. More and more stations entering the market (which seemed saturated as it was), 24-hour broadcasting by all and sundry and national networks setting up stations in every city. These factors along with the advent of 'Access Radio' stations offering an outlet to minority interest groups has resulted in a plethora of stations inundating the MW band. And that's without taking the high noise levels besieging urban DXers into question!

The opening of the FM band in New Zealand two decades ago, and the hoped for mass exodus of MW stations to VHF with the resultant gaps in the broadcast band never materialised. Existing AMers simply simulcasted or ran alternate programming on each band, (despite the government's intentions that any station wanting to move to FM had to relinquish its AM channel) doing little to improve the lot of the MW DXer.

The only good news for New Zealand MW DXers in recent times was that our government would not allocate channels in the extended band (1602 – 1701kHz) thus leaving it free for DXing foreign stations (and it has been a great source of renewed interest in MW DXing too).

So, what will be the impact of digital broadcasting when endeavouring to DX analogue signals in a dual-mode environment, and will our hobby survive in an all-digital world? It is possible that initially digital broadcasting may allow for better reception of analogue signals. The faintest suggestion that things may improve for the mediumwave DXer will arouse my interest.

The Implications for DXers

Let's look at the factors that make life more difficult for us diehard MW DXers and speculate as to what might happen…

Interference

Digital signals will have a tighter bandwidth, so their signals will not cause as much adjacent channel interference ("splash") as existing AM broadcasts. As an example, if an analogue signal wipes out reception on channels 20kHz either side of its nominal frequency, a digital signal may only wipe out channels 5kHz either side. What's more, the level of splash from an AM signal varies with modulation (and there are some forms of audio which cause more splash than others, notably applause and bagpipes!). Digital signals will not vary in modulation so levels of splash will be constant (not sure whether that's good or bad!).

While a digital receiver will be clever enough to discriminate between co -channel analogue and digital modes (and even co-channel and adjacent channel digital signals thus rendering interference a thing of the past), reception of the two mixed-mode signals on an analogue-only receiver will produce a new form of QRM to deal with. Top-end "dual mode" receivers may allow reception of both at good levels by toggling between the two modes.

Congestion

The narrower band space occupied by digital signals will also increase the number of channels available to broadcasters without extending the existing band. In countries where channels are clogged, like in the USA where there are 4,000 plus stations sharing the available 117 frequencies, restrictions (limited hours and low-power operation) imposed on a non-interference basis could be relaxed which would free up more channels to be occupied.

The current spacing between channels in cities is around 30kHz. So over the band (530 – 1700kHz) there are 39 channels at 30kHz spacing's. If 20kHz is a suitable spacing for digital signals, then 58 channels would become available. So another 19 stations could be accommodated… and the implications increase if 10kHz is a suitable spacing. Not only would this mean more local and semi-local stations, it would also have the effect of narrowing the potential gap for DXing stations, which may not be good news for listeners living in those environments.

Then what if it was possible to transmit several program streams at once over the same transmitter? That could lead to de-congestion as several stations owned by one company servicing the same area could all broadcast over just one sender. Thus saving on transmitter running and replacement costs and capital outlay. We could also have companies in the business of owning transmitters leasing available channel-space to broadcasters, even the streaming audio 'stations' currently proliferating on the Internet!

A Move from FM back to MW?

For the last 2 decades, the attraction of the superior audio quality of FM has often seen stations sacrificing the coverage of AM to obtain the better dynamic range and frequency response that FM offers. Many new stations have gone straight to FM and given MW little consideration. Also, it's generally cheaper to establish an FM station from an aerial point-of-view… no large tract of land is required to place a tower and radials upon as an FM aerial needs to be little bigger than an average VHF TV aerial.

And the programming has been split too, with most music stations on FM and talk stations on MW.

If the audio quality of digital is as good as FM, then stations may opt to use MW to increase coverage while retaining audio quality. This could lead to MW once again becoming a multi-format mode with high-quality music channels alongside the 'talkers'.

At some stage, once receiver penetration into homes reaches a crucial point and digital AM broadcasters begin to figure in listener polls, the increased audio quality and coverage on MW will be used as a tool to entice advertisers to use MW instead of FM. Competitors eager to retain their advertising clientele will create a certain synergy, leading to an explosion of digital MW stations as existing AM stations convert and FM broadcasters switch to the new mode.

All of this could lead to congestion on a scale never imagined, and until we know how "DXable" digital signals will be, we won't know the shape of MW DXing in the future.

Being totally pessimistic, (which is not my nature) the death knell of MW DX may be ringing as this new technology threatens. Being optimistic, there may be increased opportunities before digital gains real momentum, with the narrower bandwidth, less splash and slow conversion by many, particularly Third World nations to the new mode.

Next Section: The wetter the better?

The Wetter The Better?

by Andy Sennitt

On the Jan 28th 1999 edition of the Media Network radio show, Steve Whitt of the Medium Wave Circle discussed the effect of the weather on Medium Wave reception. Steve says that weather conditions at the receiving location could be playing more of a part in reception conditions than we have previously thought. Although the ionosphere is much higher up in the atmosphere than, for example, thunderstorms, local rainfall can affect the ground conductivity.

That item was of particular interest to me, as over the years I have experienced many examples of this phenomenon. To take just one, in the mid 60's when I lived in Eastern England, I used to be able to listen to the offshore station Radio Scotland during the day when there was a lot of wet weather about. The station was about 300 miles away using a 10kW transmitter. On hot sunny days in mid summer, the signal was very weak, sometimes inaudible.

David Thorpe in the UK writes: "I can confirm your suspicions. Wet weather does indeed have an effect on ground conductivity. In the past measurements have been made over a 50km path from a London mf tx site, and the field strength of the received signal, measured at the same location, has been more than 2 db uV greater during wet weather conditions".

If you're interested in studying this phenomenon, you need a reliable station list. Some are reviewed elsewhere on this Web site. Continue to the Clubs and Pubs section for details.

Next Section: **Further Information**

Medium Wave Clubs and Publications
Specialist Clubs for MW/LW DXers

North America

National Radio Club
P.O. Box 164, Mannsville, NY 13661-0164, USA
E-mail: gnbc@wcoil.com

International Radio Club of America
P.O Box 1831, Perris, CA 92572-1831, USA

Europe

Medium Wave Circle
59 Moat Lane, Luton LU3 1UU, United Kingdom
E-mail: contact@mwcircle.org

Arctic Radio Club
Box 5050, 350 05 Växjö, Sweden

Umeå Kortvågsklubb
Box 117, SE-901 03 Umeå, Sweden

Oceania

Australian Radio DX Club
15 Olive Crescent, Peakhurst, NSW 2210, Australia
E-mail: dxer@fl.net.au

New Zealand Radio DX League
P.O. Box 3011, Auckland, New Zealand
E-mail: paul@radiodx.com

Other Clubs

Most other radio clubs that concentrate on shortwave radio also include sections on Medium and Longwave listening. However not being specialists their coverage of this topic is generally not as comprehensive.

A good list of clubs can be found in the World Radio TV Handbook. The following are only a small selection of established clubs with regular publications containing good MW/LW columns:

Europe

British DX Club
126 Bargery Rd, Catford, London SE6 2LR, United Kingdom
E-mail: secretary@bdxc.org.uk

World DX Club
17 Motspur Drive, Northampton NN2 6LY, United Kingdom
E-mail: mikewb@dircon.co.uk

Play-DX
c/o Dario Monferini, Via Davanzati 8, I-20158 Milano, Italy
E-mail: playdx@hotmail.com

North America

Ontario DX Association
P.O. Box 161, Station 'A', Willowdale, ON M2N 5S8, Canada

E-mail: odxa@compuserve.com

South America

Grupo Radioescucha Platense
Casilla 465, 1900 La Plata, Argentina
E-mail: jaloy@netverk.com.ar

The Radio News
P.O.Box 65657, Caracas 1066-A Venezuela

Bibliography

Worldwide Frequency Lists

World Radio TV Handbook (WRTH)
WRTH Publications Ltd., PO Box 7373, Milton Keynes MK12 5ZL, United Kingdom. Fax: +44 1908 321030. Web (online ordering): www.wrth.com E-mail: editor@wrth.demon.co.uk
Note: Useful for Medium Wave but limited USA coverage, and not all sections are updated adequately. 600+ pages. Annual

Regional Frequency Lists

AM Radio Log
National Radio Club Publications Center, P.O, Box 164, Dept. M, Mannsville, NY 13661-0164, USA. Web: nrcdxas.org/catalog/amlog/
Most comprehensive list of all US & Canada MW stations

Euro/African Medium Wave Guide
Herman Boel, Roklijf 10, B-9300 Aalst, Flanders (Belgium).
Tel: +32 53 711 244. Web: http://www.emwg.info/ E-mail: contact@emwg.info
PDF version: free download. Updated frequently

Ninety Nine Nights on Medium Wave
Wilhelm Herbst Verlag, Roggendorfstraße 4 D-51061 Köln, Germany. Tel: +49 221 9 66 16 42. Fax: +49 221 66 84 31. E-mail: whv-vertrieb@gmx.de. Web: www.wilhelm-herbst-verlag.de/index.htm

Other Specialist Publications

A DXers Technical Guide
IRCA Bookstore, 9705 Mary NW, Seattle WA 98117-2334, USA
Web: http://www.ircaonline.org
This 156 page book answers questions on receiver and antennas (the theory of their operation, and how to improve their performance), how audio filters and loop antennas can improve DX (and hints on their construction), how to build a beverage and phasing unit, and much more.

Next Section: **Longwave Radio**

Longwave Radio

Northern Star International Broadcasters AS has won the concession to operate a longwave service from Norway on 216 kHz. It plans a Christian-oriented service in English, aimed at adults aged 35-75 years. Its comprehensive Web site includes information for potential investors, coverage predictions, and much more.

The Isle of Man International Broadcasting Company Ltd has been awarded a 10 year licence to operate a longwave station from the Isle of Man on 279kHz. The service, provisionally called MusicMann 279, will be music led, and will target an audience across Britain and Ireland. It is expected to launch around Easter of 2006. IMIB plans to install the transmission antenna on an offshore platform in Manx waters some 9 km northeast of Ramsey, Isle of Man, near the spot Radio Caroline was anchored in the 1960's. The station recently opened a separate corporate website.

The official UK Longwave Atlantic 252 tribute site features many audio and picture memories including anecdotes direct from the DJ's and staff who made the station possible between 1989 and 2001.

"The Distant Listener" is a chapter from the Internet book Four Corners, by Dan K. Phillips, describing the Cape Cod site of Marconi's first wireless station in the U.S. It sketches the station's history, from site selection in 1901, through the first regular transatlantic service in 1903, reception of the Titanic's distress signals in 1912, to its dismantlement in 1920.

The Longwave Club of America is the world's only listening club devoted entirely to signals below 500kHz. It recently opened an impressive new Website containing a wealth of information about listening on this part of the dial.

The Longwave Home Page, has been put together by DXer Robert Kramer. As well as general information, you will find the latest loggings and DX News.

For listeners in New Zealand, there's a good article by DXer Paul Ormandy called How Low Can You Go? on the Website of the New Zealand Radio DX League. You might be surprised at how much they can hear in that part of the world!

The World Below 535kHz contains links to interesting WWW sites related to longwave and VLF radio. However a note on the page warns that "Due to lack of time this page is no longer maintained actively and it may contain obsolete links."

Non-Directional Beacons

As well as broadcasting, the Longwave band is used for **navigational beacons**. Rock's Longwave Beacon Log is a list of stations heard by Ray Rocker in Mississippi. Canadian Nondirectional Radiobeacons was last updated in November 2002. If you're trying to find information about specific airports, AirNav provides an extensive searchable database containing details of non-directional beacons.