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MW Carrier Monitoring

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I had thought, perhaps naïvely, that most MW stations were spot-on their assigned channel. How wrong could I be?

I'd noticed that 1350 kHz produced a definite "growling" effect with Hemel Hospital Radio (the dominant LPAM (*Low Power AM)* station here) zero-beating on 1350.1 kHz. So I decided to investigate further and see if there were other LPAM stations similarly offset from their nominal channels. The idea being that LPAM stations might be more likely to be off-channel than the regional or national broadcasters.

Using the Spectrum Lab audio analysis software written by Wolfgang Buescher and freely available via his website - http://www.qsl.net/dl4yhf - I started monitoring accessible channels to see what I could find.

To generate traces, I tune my AOR 7030+ receiver 1 kHz below a channel in USB mode using the remote control ... for instance to 1469.000 kHz ... and use Spectrum Lab to analyze the resulting audio spectrum. I'm most interested in the audio around 1000 Hz, so I offset the FFT analysis to 1000 Hz and view the audio spectrum from say 975 Hz to 1025 Hz or suchlike, depending on the spread of carriers on that particular channel.

In the USA, stations are allowed to be +/- 20 Hz of their assigned channel. I've yet to find a frequency tolerance for European stations, though it's likely to be similar. Enforcement though might be a different issue, with the sheer number of stations on the air.

I let the software run for 24 hours on a channel, and then look at the resulting audio trace. It's easily seen when European and trans-Atlantic stations fade in/out compared to the local (groundwave) stations. Furthermore, when the fade-in times are compared to the grayline, as computed by say GeoClock, it begins to get very interesting indeed.

Traces

I've uploaded all the traces I've generated so far to my website - http://www.dxradio.co.uk
The scale across the top is the audio frequency in Hz, and the time in UTC is shown down the left hand side. I started off doing traces from midnight to midnight, but it soon became apparent that midday to midday was more appropriate. Most early traces are around 1 MB in size even after jpeg-ing them down as small as they'll go, later ones are smaller as I reduced the speed of the waterfall (ie compressed the time axis).

Something else that surprised me was the effect of aurora on the carriers. Most stations have nice "clean" i.e. narrow stable carriers. But on nights when there has been auroral activity, all the carriers are much fuzzier - for instance the night of the 19-20 July (Figure 2), while I was monitoring 1470 kHz. The fade out times are earlier also.

Accuracy

The AOR 7030+ tunes in 2.655 Hz steps, and the frequency settability from the keypad is +/- 1.4Hz

(why don't they quote this as 1.3285 Hz - half the 2.655 Hz stepping?). The stability with regard to temperature is very good, typically +/- 1 part per million from 10° to 40°C., and I'm running the radio 24 hours a day. Without an accurate audio reference or an exactly known station carrier frequency, it's therefore not possible to accurately say what the exact frequency of a particular station is, but the relative offset of one station vs another is accurate (and precise).
Some channels I have monitored during July and August have been:

171 kHz
Very evident is the newly reactivated Radio Rossii transmitter at Bolshakovo

225 kHz
Poland and Turkey are here, with Turkey having an overnight silent period.

531 kHz
Susy Radio is the strongest all-day station here at the moment. Clearly visible are Beromunster with a 2215-0245 silent period overnight and the Faroes with silent periods 2115-0600 Mon-Sat and 2115-0900 on Sun. Algeria and Spain (4 transmitters) I think account for the rest of the traces.

1170 kHz
Not so much to be seen. My semi-local station is Eleven Seventy in High Wycombe.

1350 kHz
The dominant station is Hemel Hospital Radio. This appears to be on 1350.0105 kHz and has a large number of carriers symmetrically above and below the main carrier. Two other groundwave stations are apparent, one varies 980-985 Hz offset, the other varies around 993 Hz offset. This latter one went off air 2020-2050 on 9th July. There are 2 apparent European stations that fade in around dusk - one around 985 Hz, the other at 1015 Hz. And there are two trans-Atlantic stations fading in much later - one at 992 Hz, the other at 1031 Hz.

1440 kHz
It is easily seen when R Luxembourg switches to its highest power. The receiver's AGC kicks in and the trace almost loses all other carriers. Problem is that this currently occurs at the times when other Europeans would be fading in, as well as the dawn fade-out. But it does look like the two Russians sign-off at 2200 UTC, and there may be a trans-Atlantic carrier too.

1467 kHz
TWR Roumoules dominates this channel.

1470 kHz
Good DX channel this ... Many TA carriers ... as many as 27 noted one night. Here are some "results" from two night's worth of traces. Some "sign-off's" may in fact be significant power-down's, i.e. stations switching to a lower power for nighttime operation. Also I'm monitoring carriers here, not audio, so some stations may end their programming sometime before the carrier is switched off. The early fade-in stations are almost certainly Brazil - nothing else is near sunset, apart from Argentina maybe.

intervals. An audio frequency of 1000 Hz would correspond ideally with an exact zero-beat on 1470 kHz, but it's possible that the whole trace is ±2 Hz. Figure 2 is from 19-20 July, and is similar to Figure 1 except that the horizontal scale runs from 975-1025 Hz.

23-24 July

2220-255 948 Hz sign-off was on 952 Hz until 0100, then drifted down reaching 948 at 0210 0140-0325 970 Hz sign-off 0200-0400 976 Hz sign-off 2110-2308 982 Hz sign-off 0005-0430 984 Hz fade out 2240-2327 987 Hz sign-off 2110-0108 992 Hz sign-off 2320-0430 994 Hz fade out 2200-0230 996 Hz sign-off 2220-0400 998 Hz sign-off 0010-0450 1001 Hz fade out 2110-2300 1002 Hz sign-off 2330-0012 1002 Hz sign-off	0050-0415 1002 Hz sign-off 2210-2300 1006 Hz sign-off 0010-0430 1007 Hz fade out wobbly carrier 0000-0440 1009 Hz fade out 2245-0420 1015 Hz fade out also peaked 2320-2350 2050-0100 1020 Hz sign-off 2340-0450 1023 Hz fade out 2250-0305 1026 Hz fade out 2245-0040 1027 Hz fade out 2250-2350 1063 Hz fade out 0120-0201 1064 Hz sign-off 0050-0430 1064 Hz fade out 2250-0450 1066 Hz fade out variable 0220-0420 1033 Hz fade out

24-25 July (Figure 1)

2350-0300 962 Hz sign-off 0000-0325 970 Hz sign-off 0130-0400 976 Hz sign-off 0210-0415 980 Hz fade out 0110-0425 984 Hz fade out 2340-0105 992 Hz sign-off 0220-0400 992 Hz fade out 2330-0440 994 Hz fade-out 0000-0200 996 Hz sign-off 2300-0100 996 Hz sign-off 0150-0405 997 Hz fade out 2330-0400 998 Hz sign-off 0020-0440 1000 Hz fade out	0050-0415 1003 Hz sign-off 0030-0130 1005 Hz sign-off 0202-0420 1007 Hz fade out wobbly carrier 0140-0410 1007 Hz fade out 0000-0500 1009 Hz fade out 2250-0440 1010 Hz fade out 0220-0420 1015 Hz fade out 2140-0102 1020 Hz sign-off 2340-0445 1024 Hz fade out 2310-0357 1026 Hz sign-off peaked 0050-0120 and 0335-0357 0300-0430 1033 Hz fade out 0020-0440 1064 Hz fade out 2300-0500 1068 Hz fade out variable

This is very much a "work-in-progress" and feedback is welcome, as are traces made elsewhere which can be used for comparison.

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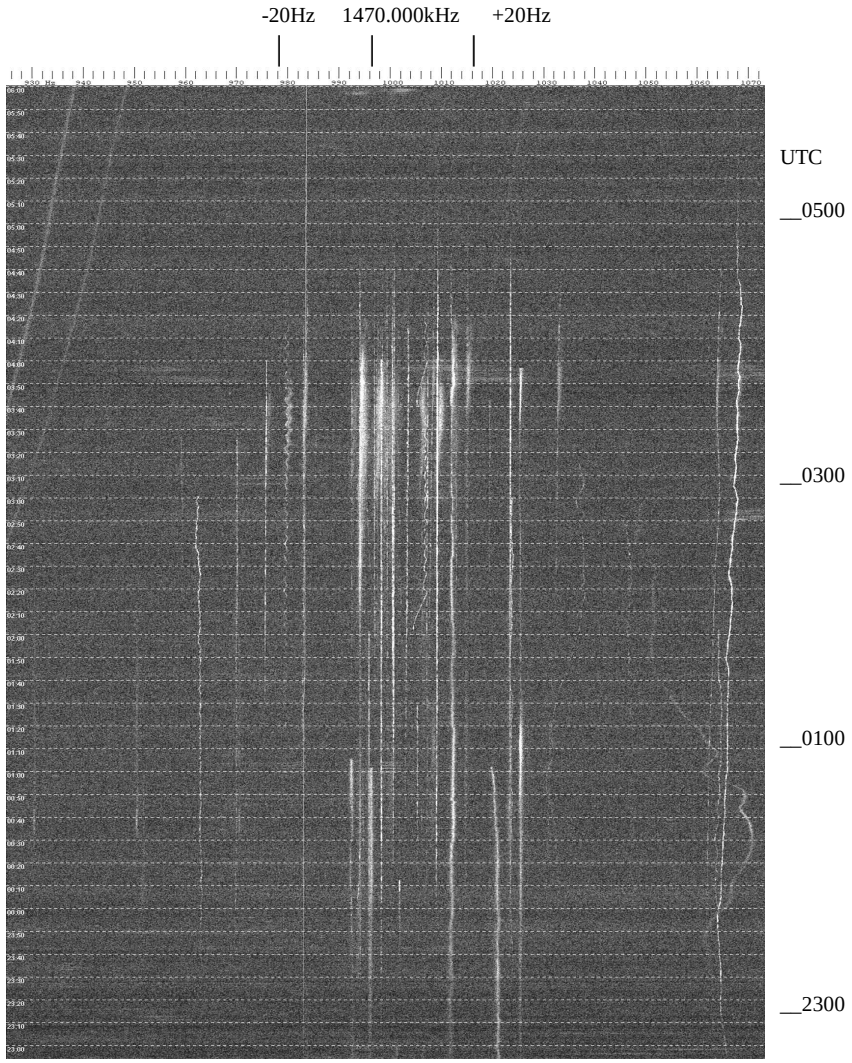

Figure 1: 24-25 July 2002

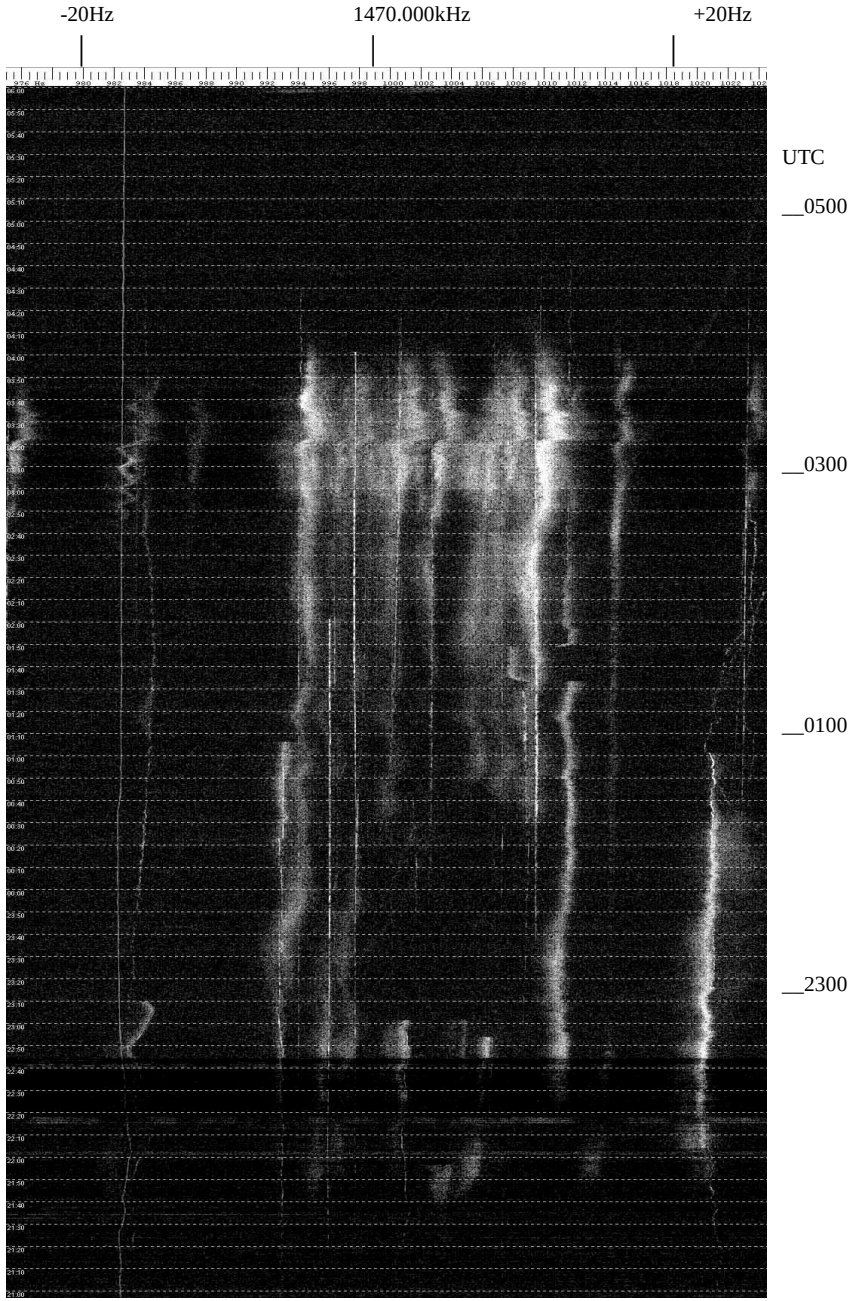

Figure 2: 19-20 July 2002