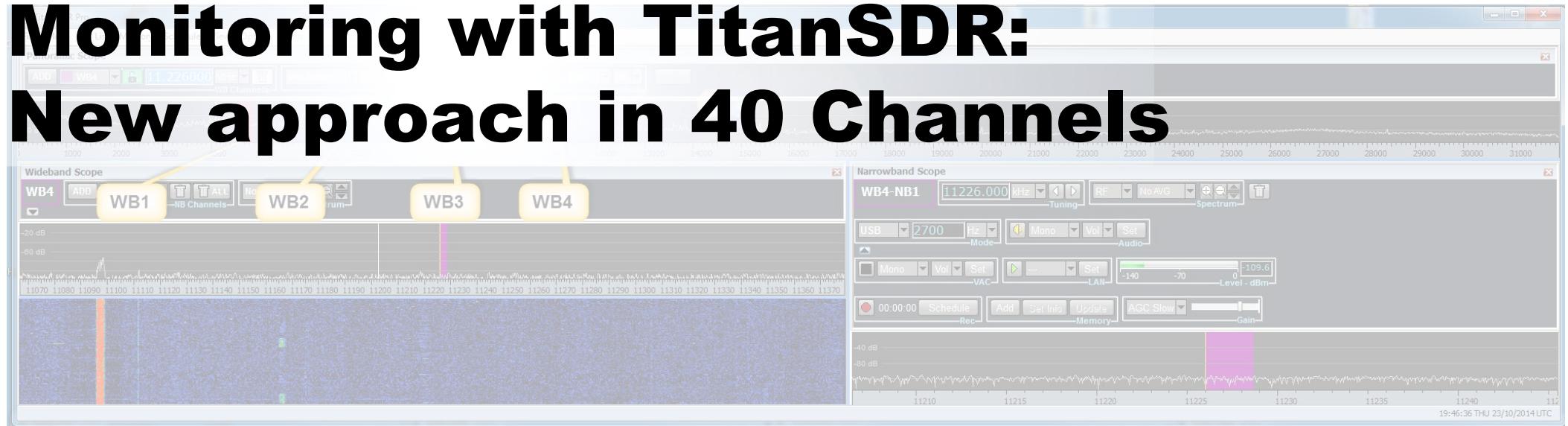


Monitoring with TitanSDR: New approach in 40 Channels



©2014: Nils Schiffhauer, DK8OK

TitanSDR by ENABLIA

This software-defined receiver (SDR) covers 9 kHz to 32 MHz with 16 bit resolution. To further enhance performance, it has 16 preselectors, switched by relays. It's software combines the concept of wide-band (WB) ranges with that of narrow-band (NB) channels. So far, this PRO-approach is unique in this price class of under 2.000 Euro (+ VAT), or under 1.500 Euro featuring 4 WB and 8 NB channels in its basic version. The PRO version also features plug-ins for HOKA- and Krypto500 decoders plus LAN control.

This paper explains at some real-world examples what can be done with these specific approach. It's a complement to the excellent documentation on *Enablia's web page*. You should be familiar with the concept of this receiver and its software. Especially the video on Enablia's web page provides a fast and fascinating introduction.

Here I assume that you have at least viewed that video to directly dive into some example on how to make practical use of TitanSDR. I will concentrate on how to use the WB/NB concept for monitoring.

All given examples do reflect just my interest. But you will easily adapt these for your tasks. They had been made live „on the air“ in October 2014 in Northern Germany. Antenna has been an *active quad-loop* of 20 m circumference. General software used was *SnagIt* (screen-shots), *Adobe Audition CS6* and *Audacity* (audio) and *Adobe InDesign CS6* (layout & PDF). Other software is mentioned elsewhere. Have fun!

Nils Schiffhauer, DK8OK

Concept of WB/NB

The whole range from 9 kHz to 32 MHz can be divided into up to four completely different widebands (WB) according to the following scheme:

- 1 x 2.187 kHz
- 1 x 1.87 kHz
- 1 x 1.56 kHz + 1 x 312 kHz
- 1 x 1.250 kHz + 1 x 625 kHz or
1 x 1.250 kHz + 1 x 312 kHz
- 2 x 937 kHz or
1 x 937 kHz + 1 x 625 kHz or
1 x 937 kHz + 1 x 625 kHz + 1 x 312 kHz
- 2 x 625 kHz + 1 x 312 kHz or
1 x 625 kHz + 1 x 1.250 kHz or
1 x 625 kHz + 1 x 937 kHz or
1 x 625 kHz + 2 x 312 kHz
- 4 x 312 kHz or
any combination above with 312 kHz

The maximum total bandwidth is always 2.187.5 kHz.

Additionally, up to 40 narrow-band channels (NB) can be defined. Each of this channel can be recorded as WAVE-file. This recording can be controlled by a very flexible scheduler, individually for each NB channel.

Furthermore, the output of each of the NB channels can be set to a virtual audio/sound card to drive e.g. decoders. For this you need a 3rd-party software like *Virtual Audio Cable*.

In the first moment, all these features sound a bit puzzling. But on the following pages, you will embrace the power of this software and the new dimensions they open for monitoring!

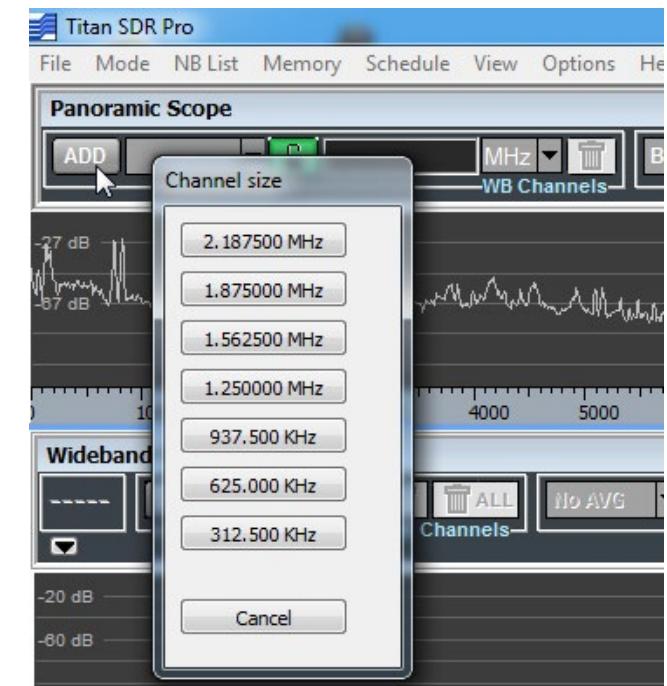


Figure 1: Choose your combination of wideband ranges from this menu. Once you have defined it or them, this menu will present you just with these which can be added according to the scheme on the left – see also below.

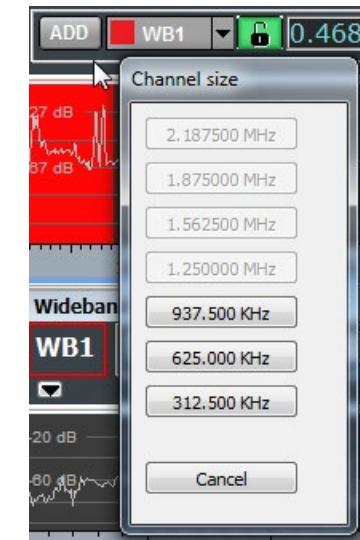


Figure 2: Here one WB range of 937 kHz already had been set. This reduces the choice for additional WB range(s) to the bold ones in the menu.

Example WB/NB: Four Aero bands (WB) plus six NB channels

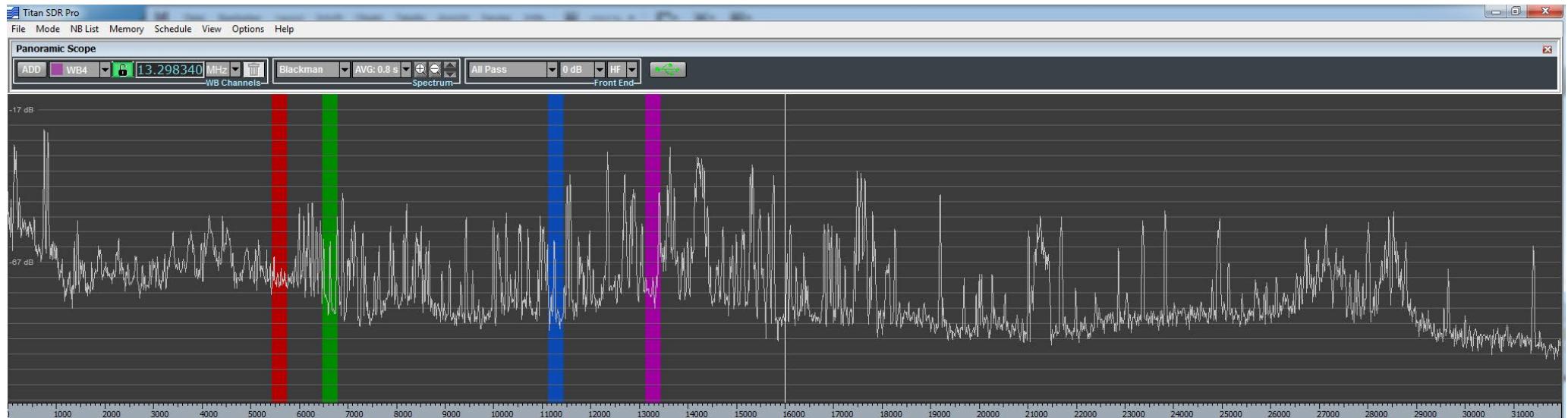


Figure 3: In this example, four WB ranges of 312 kHz each had been set to cover the aero bands at 5 MHz, 6 MHz, 11 MHz and 13 MHz. You can save all combinations as a „session“ under the file name of e.g. „Aero_5_6_11_13“ to access them in future.

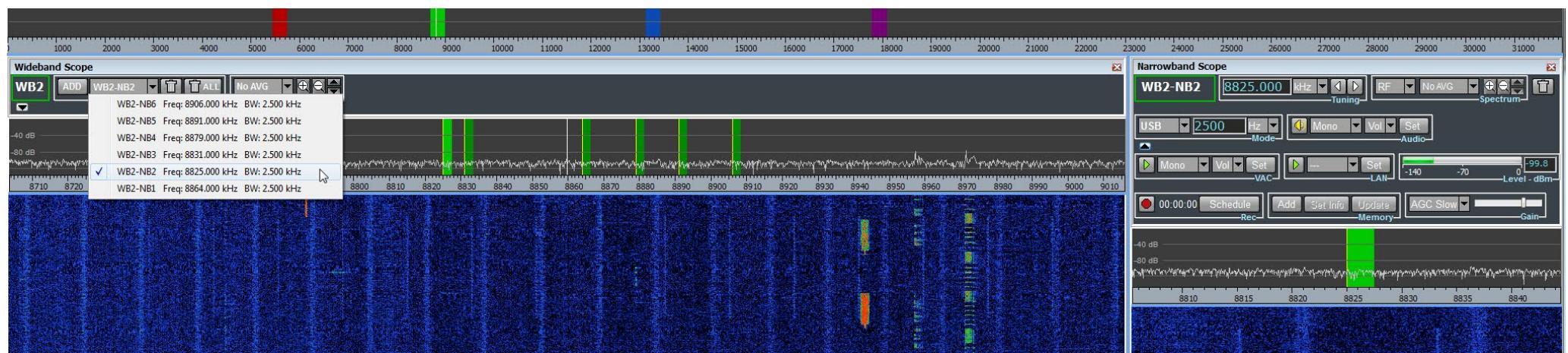


Figure 4: In the next step, the 8 MHz range has been chosen. Then all six channels of the „North Atlantic [Frequency] Family“ had been defined as narrowband channel (NB). See the list of these channels in the drop-down window on the left. All of these channels are demodulated in parallel. Their demodulated audio can be recorded (start/stop manually or scheduled) or/and be let to the input of decoders. Here one channel has been clicked to be listened via the loudspeaker. You can define up to 40 NB channels which can be spread over the four WB band as you need.

Record & Play: Narrow-band

Up to 40 demodulated channels can be recorded as WAVE file – either manually or via an excellent scheduler which also automatically marking the file names with data like HF frequency, date and time of recording.

These WAVE files don't contain any time information as meta data, in opposite to the WMA format which can be used with e.g. *Simon Brown's* software. Because of demodulation and missing recording date/time, you have to observe a few points:

- the recorded signal cannot be „tuned“
- the recorded signal cannot be changed in AGC characteristic
- it can be changed (e.g. in changing bandwidth or adding a notch filter) only with the features of the player software
- you have to note the recording time

What sounds like a restriction, is just a caveat which has to be kept in mind. But it's all efficient an easy if you follow a specific work-flow.

The following examples will show the power of this concept in praxis. I start with a very easy task to get used to some practice like scheduling a recording, analyze this recording for times of activity and eventually save these as MP3 file.

The examples following then, will show how to cope with some more challenging tasks. And they are just examples, reflecting my interest. With the background of your interest and challenges (yes, TitanSDR is a tool mainly for the professionals!) you will quickly see your tasks.

Example: VOLMET Broadcasts, one frequency

Task: I wanted to have an overlook on the activities on VOLMET channel 6.676 kHz from 17:00 UTC to 06:00 UTC to file the strongest signals of each of the active stations.

Therefore, I first defined 6.676 kHz as an NB channel, USB. Then I programmed and activated schedules recording with automatically labeling the file – see figure on the right. All went smoothly, and the next day I had a 1,9 GB WAVE file at 11.025 Hz sampling rate named: „2014-10-24_17'00'00_06_00_01_6676000_USB.wav“.

The following figures will illustrate preparation and results.

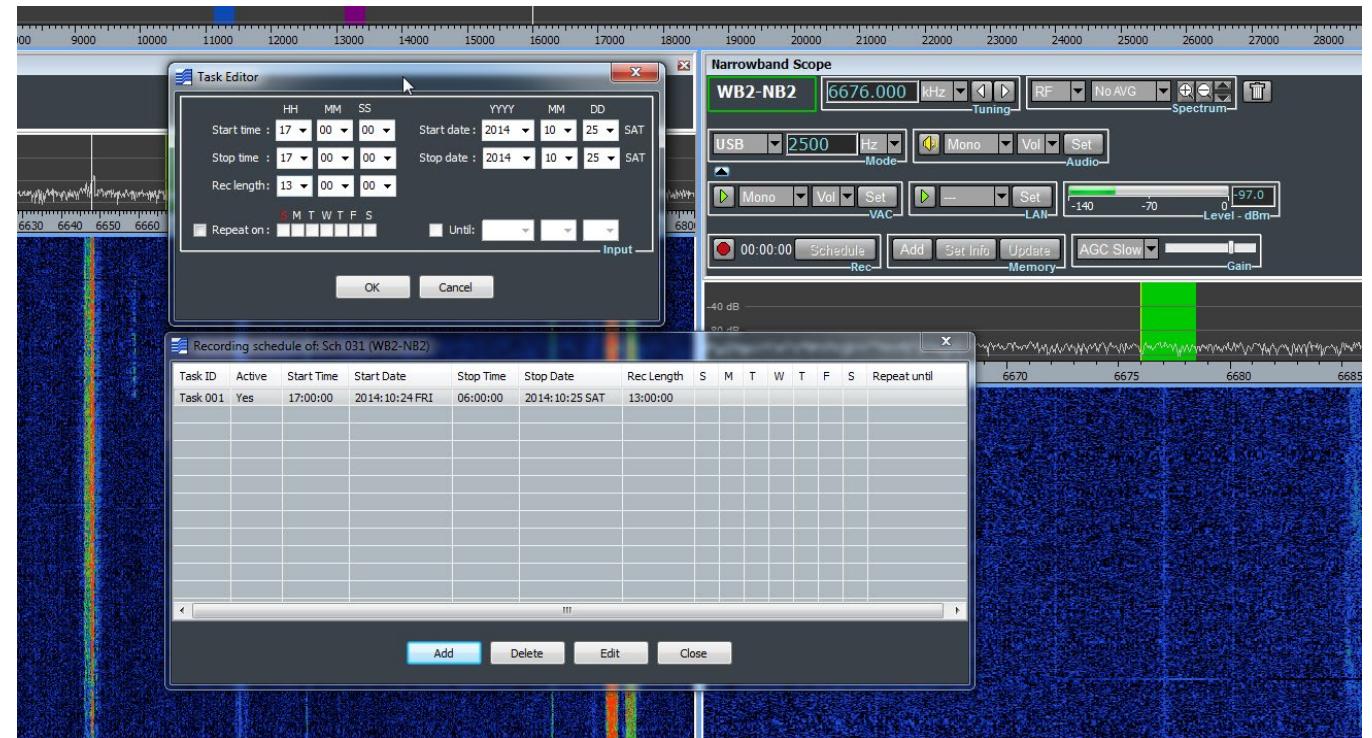


Figure 6: Programming the scheduler is easy. The list provides an overlook over each programmed recording for this NB channel.

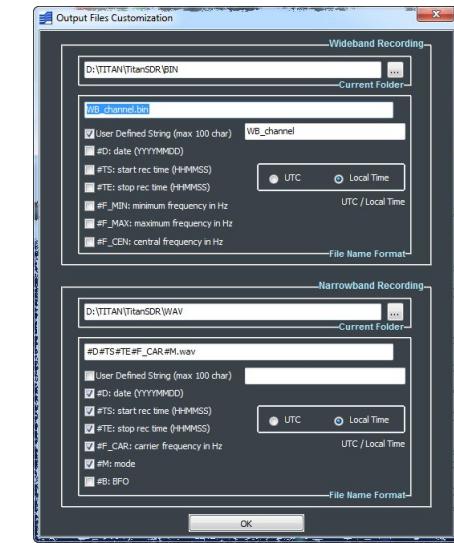


Figure 5: In this menu you can tailor the automatically given file name of NB recordings.

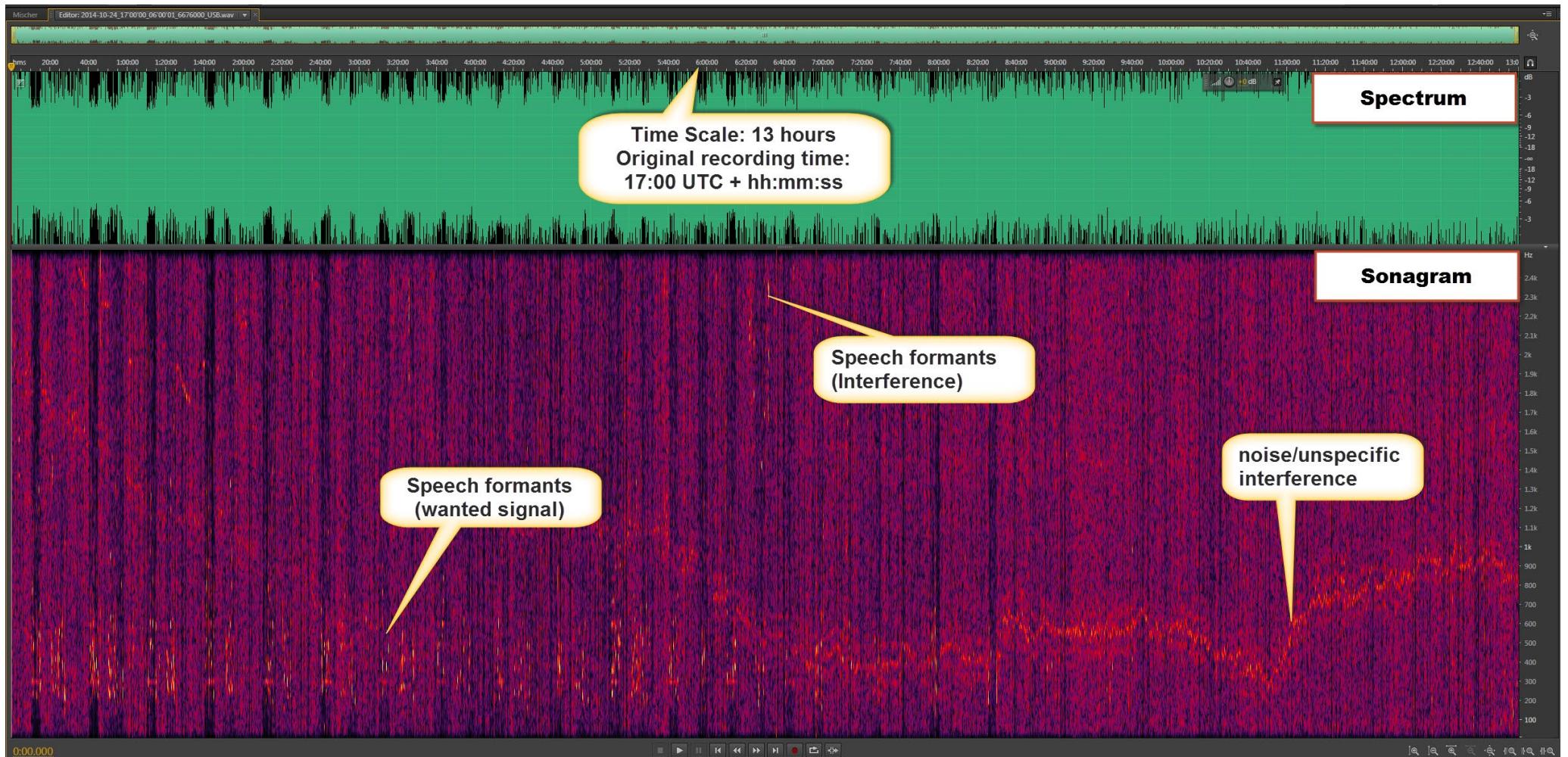


Figure 7: Next step is to open the recording in an audio software. For a couple of reasons, I choose Adobe's „Audition“ as tool. Here you see the complete recording as spectrum (above) and sonagram (below). The representation of this recording had been trimmed a bit in dynamic range (down to 70 dB) and bandwidth (down to 2,5 kHz). Together with a frequency resolution of „512“, even this file containing 13 hours is easy to manage, provides a fast response and, most important, even faint signals are visible.

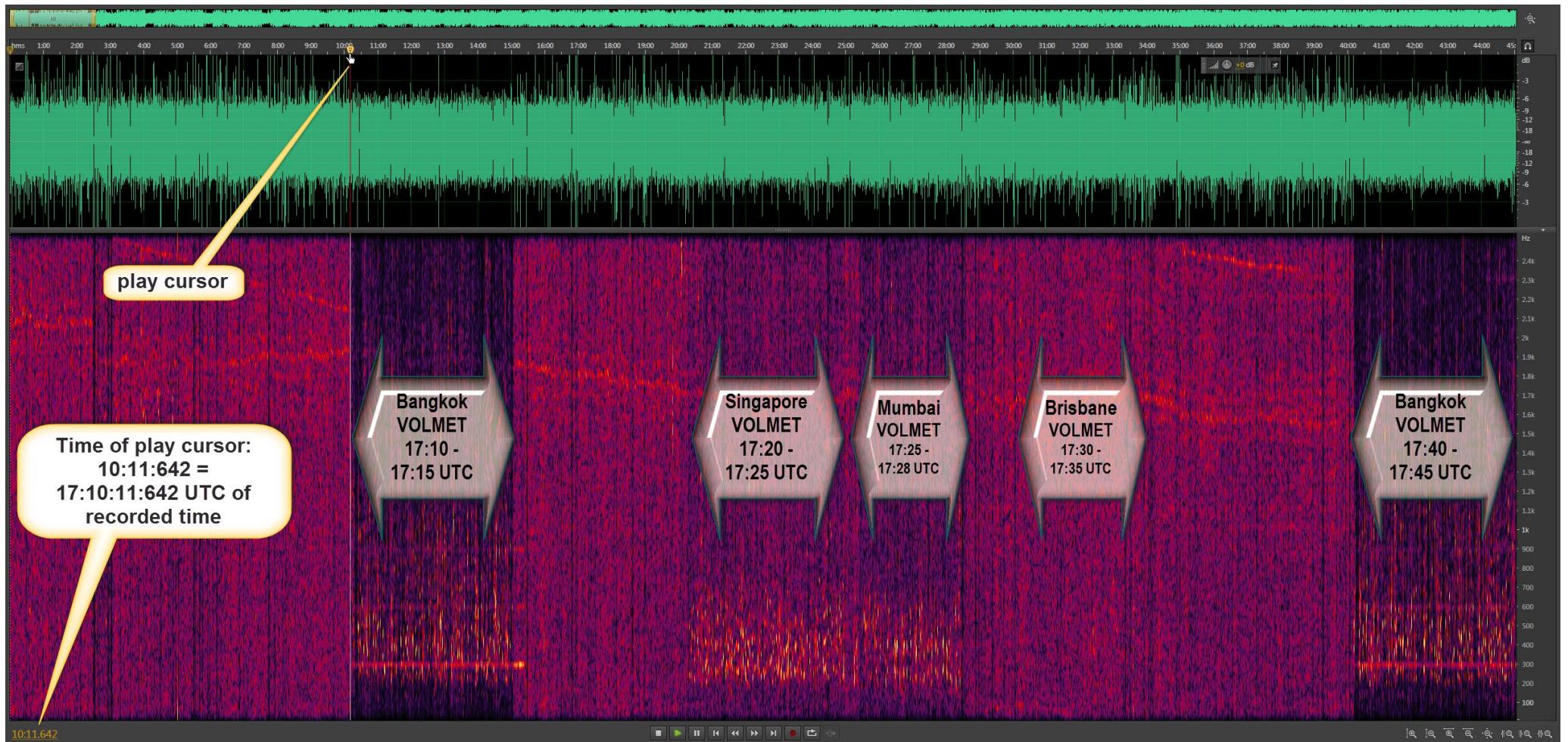


Figure 8: As VOLMET broadcast mostly follows a schedule: „hh:xx:00“ and „hh:xx:00 + 30 minutes“, you easily get an overview by zooming the sonagram to e.g. 60 minutes.

You see Bangkok as strongest station, Singapore and Mumbai also strong, but Brisbane at that time just barely visible & readable.

Overleaf, you will find some zoomed sonograms and audios, taken as MP3 slice from the complete WAV recording.

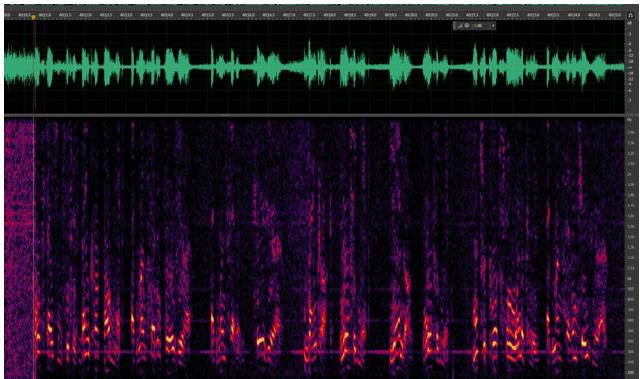


Figure 9: Bangkok VOLMET, strongest at 17:40 UTC. Zoomed from the 13 hours WAV into the start of that transmission. Click louspeaker icon (below) for listening to that part of the transmission.
There is a hum of 300 Hz plus it's weaker harmonics. This maybe the 6th harmonic from the AC frequency of 50 Hz.

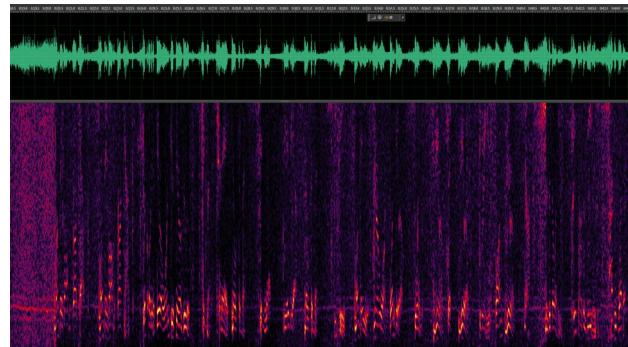


Figure 10: Mumbai VOLMET, strongest at 01:25 UTC. Here a part of the whole recording has been cut out and saved in a separate file. Click louspeaker icon (below) for listening to that part of the transmission.
There is an interference which can be clearly seen/heard just before the broadcast starts.

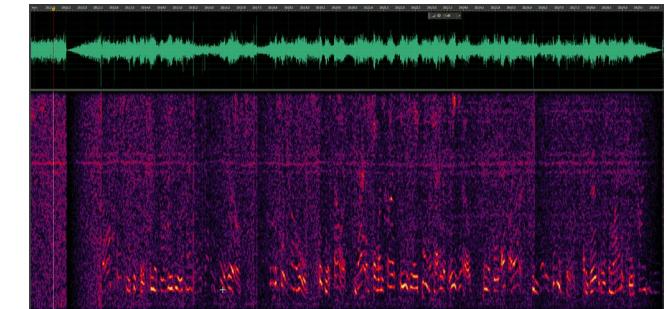


Figure 11: Singapore VOLMET, strongest at 17:20 UTC. You see from the sonagram that this is the weakest station of all three examples. Click louspeaker icon (below) for listening to that part of the transmission.



Just an introduction ...

Surely, you will have noticed that this has been a very easy example which could have been done the same way even with a conventional analog receiver tuned to just one frequency. But I had choose this as an introduction to bridge between the old and the new world. There is more complex to come ...

Example:

VOLMET Broadcasts, many frequencies

Task: Give an overlook of the latest North American weather from Gander VOLMET, Canada.

Challenge: Always to receive and record the best frequency.

As propagation varies during the day, most VOLMET broadcasters do transmit on different frequencies, some of them used only at day time or only during night.

First, get an overlook of the frequencies, e.g. [here \(page 32\)](#). They are used together with New York VOLMET:

3.485 kHz, 6.605 kHz, 10.051 kHz

and 13.270 kHz

In the second step, let's calculate the best channels between the transmitter (Gander) and the receiver (Hanover, in this case). Here, it is done with *PropMan2000* by Rockwell-Collins, a software which relies on refined VoACAP algorithms. Somewhat rapid changes of the best frequency occur from (my) night to the morning. So I programmed a scheduled recording of all four channels (4 x WB, 4 x NB) from 02:00 UTC to 09:00 UTC to get always the best reception quality of the weather reports.

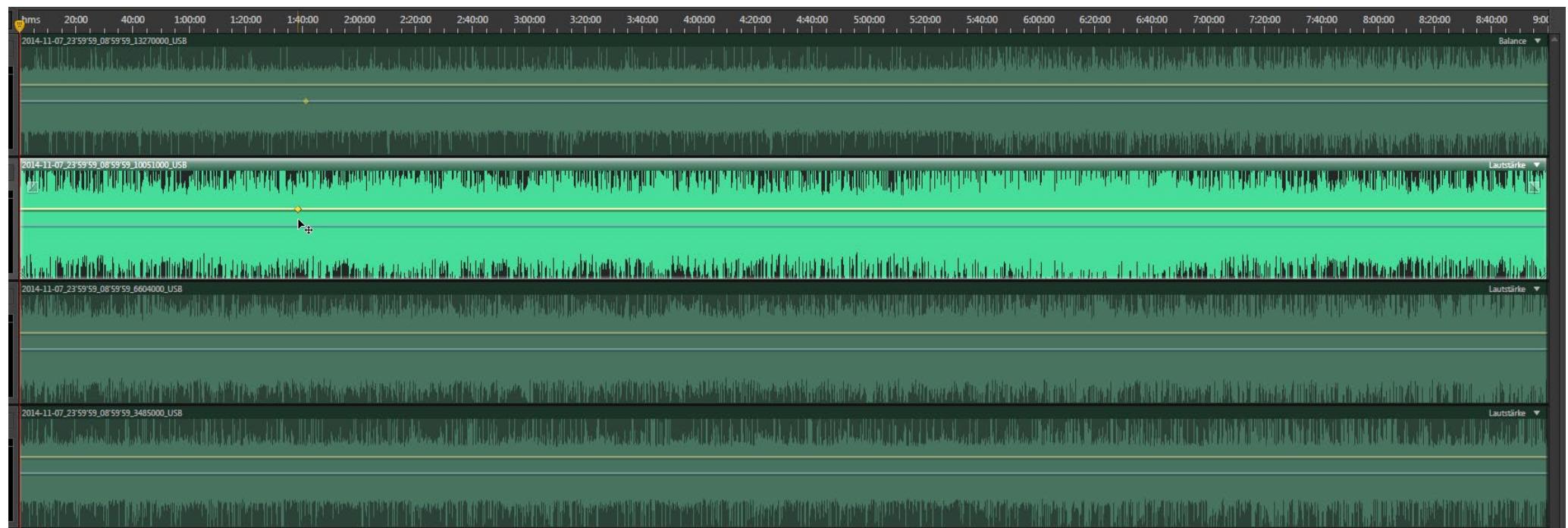


Figure 12: Nine hours audio files from all four frequencies in a multitrack session of Adobe's Audition CS 6. See overleaf for propagation prediction and some audio clips.

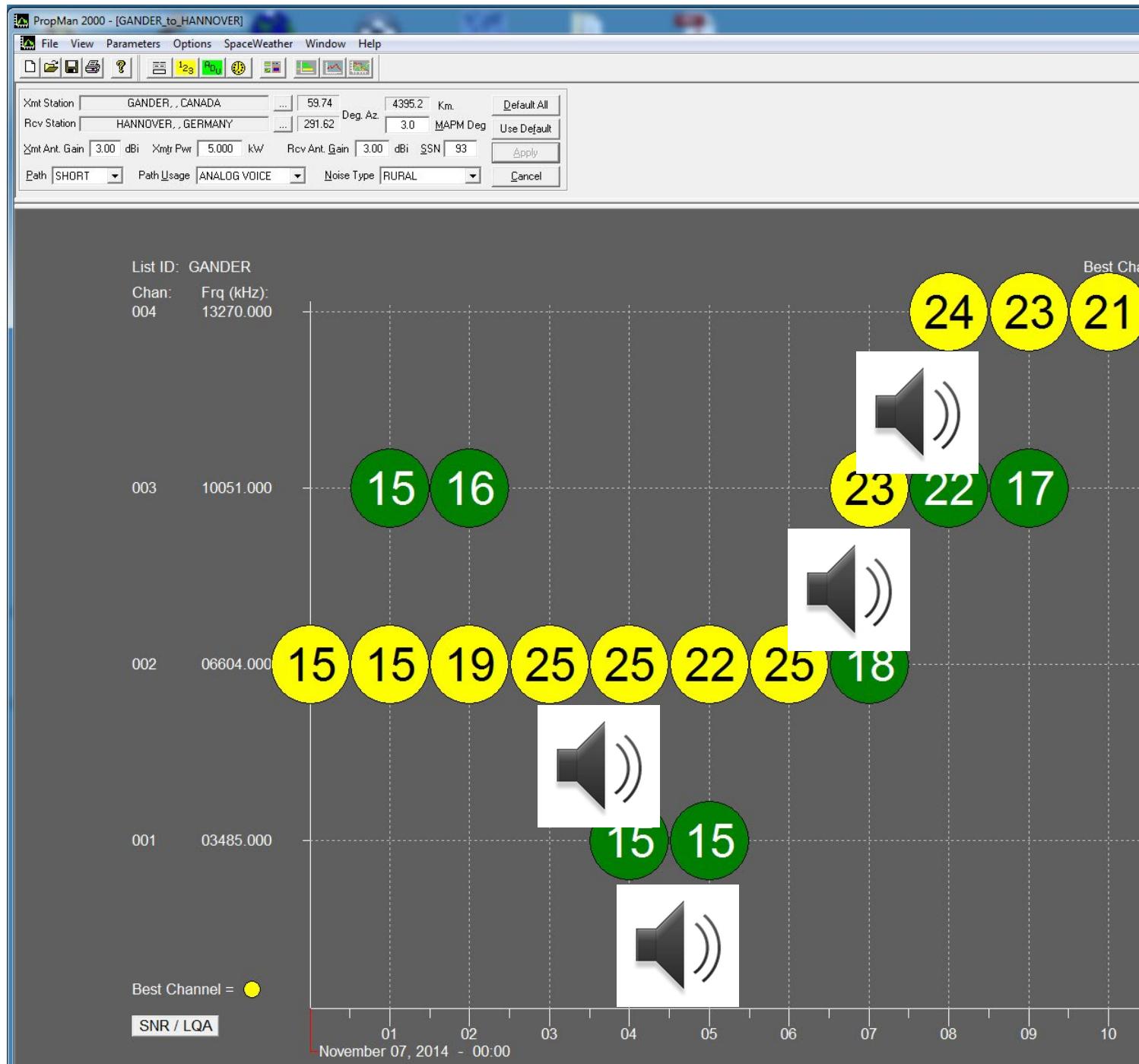


Figure 13: Sunrise and sunset always provide the biggest regular challenge in choosing the best frequency. Here the time from midnight to 09:00 UTC had been chosen. Sunrise at the receiver's site had been 06:29 UTC, sunset at the transmitter's site is at 10:41 UTC.

Propagation has been calculated for this specific day. The numbers inside the circles are SNR in dB in a 3 kHz channel – exactly, what you expect to hear.

„Best“ SNR ranges from 15 dB to 25 dB. Four audio clips are placed just under their SNR entry. Three quarter of the forecast turned out to be just fine, but 13.270 kHz performed very bad. Reason had been geomagnetic activity which cannot be forecasted in a statistical-based propagation software like PropMan 2000.

All in all, this example shows the need to monitor several channels in parallel (if there are some) to ensure the best quality in real life.

Example: FAX Broadcast, two frequencies

Task: Reliable documentation of North Atlantic weather via a FAX transmitter of Royal Navy, Bracknell.

Solution: Receive it in parallel on at least two propagating frequencies out of:

- 2.618,5 kHz
- 4.610 kHz
- 8.040 kHz
- 11.086,5 kHz

At daytime, the last two frequencies provide a good signal. They were received by two narrowband channels, and their VAC audio sent to two instances of a FAX decoder – see right.

8.040 kHz had been received in FSK mode, whereas 11.086,5 kHz had been received in USB mode, hence the different center frequencies.

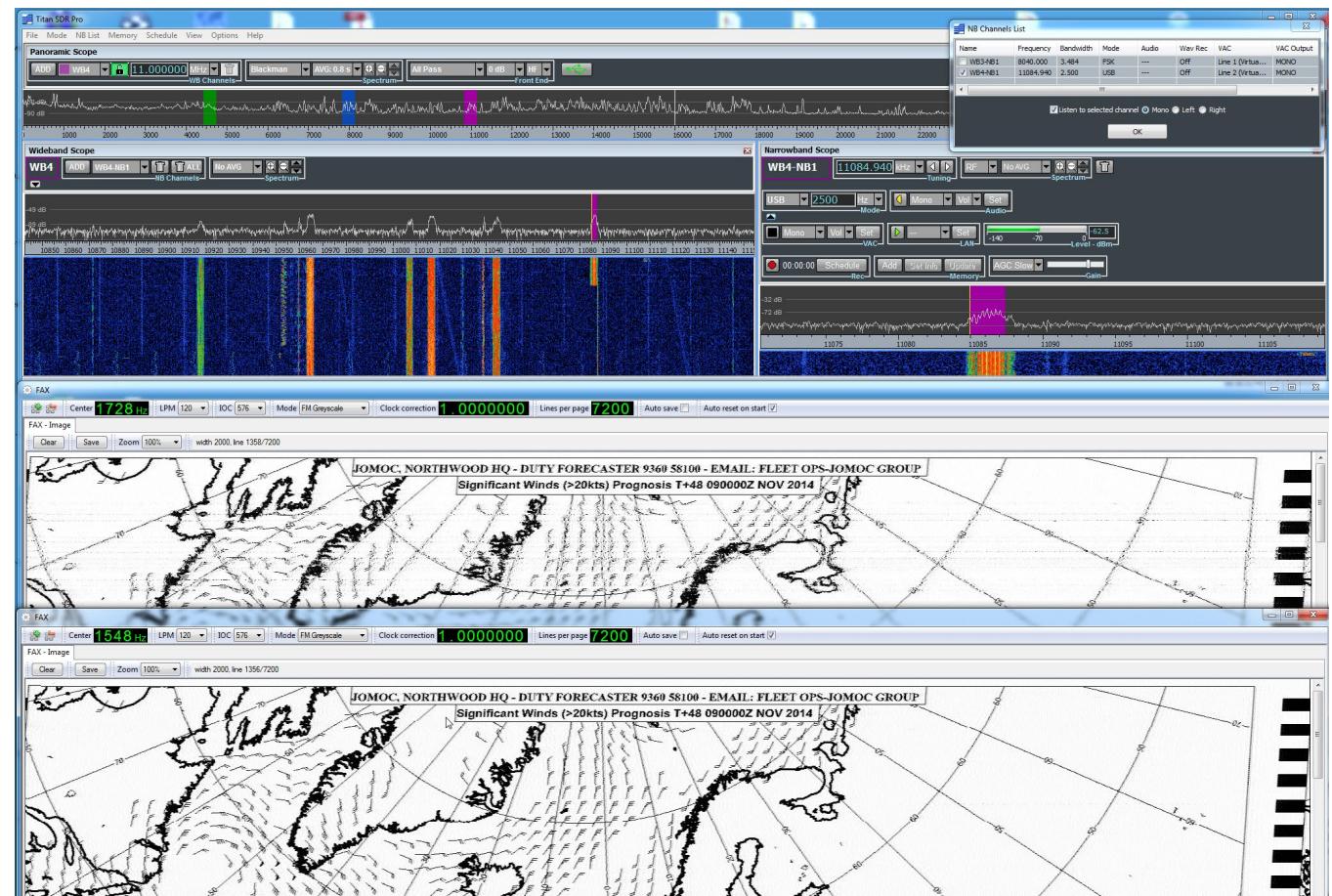


Figure 14: Bracknell Meteo received on two frequencies in parallel: 8.040 kHz (FSK) above and 11.086,5 kHz (USB) below. So you can choose the better picture which will be that with the lowest multipath. See list of the two NB channels in the top right corner.

Example: Multiple Data Reception, ALE

Data reception and decoding doesn't necessarily need a recording. You can simply assign each of the up to 40 NB channels to a different VAC. Their output should be connected to the input of the decoder. For this example, I took four channels of three different flavors of the „US Air Force High Frequency Global Communications System USAF HFGCS“ – see map on the right. They are transmitting „sounding“ calls in *MIL-STD-188-141A (ALE – automatic link establishment)*.

In the first step, build up the WB and NB channels and assign to each of the NB channels a different VAC audio output.

In the second step, prepare a different (instance of a) decoder for each NB channel:

- double-click e.g. decoder software *PC-ALE*, and assign VAC1 (output of NB1) as input for this instance.
- adjust for the correct level of VAC output power, so that the input of the software isn't overdriven.
- add possibly some other data (e.g. channel)

A useful paper with frequencies and other information about this worldwide HF system from UDXF can be found [here](#), and another paper [here](#).

The system consists of at least 14 base stations with powers of around 4 to 10 kW. On a couple of frequencies, each station quite regularly transmits an ALE sounding serially on many channels to check propagation. See the next pages for programming receiver and decoder, plus results.

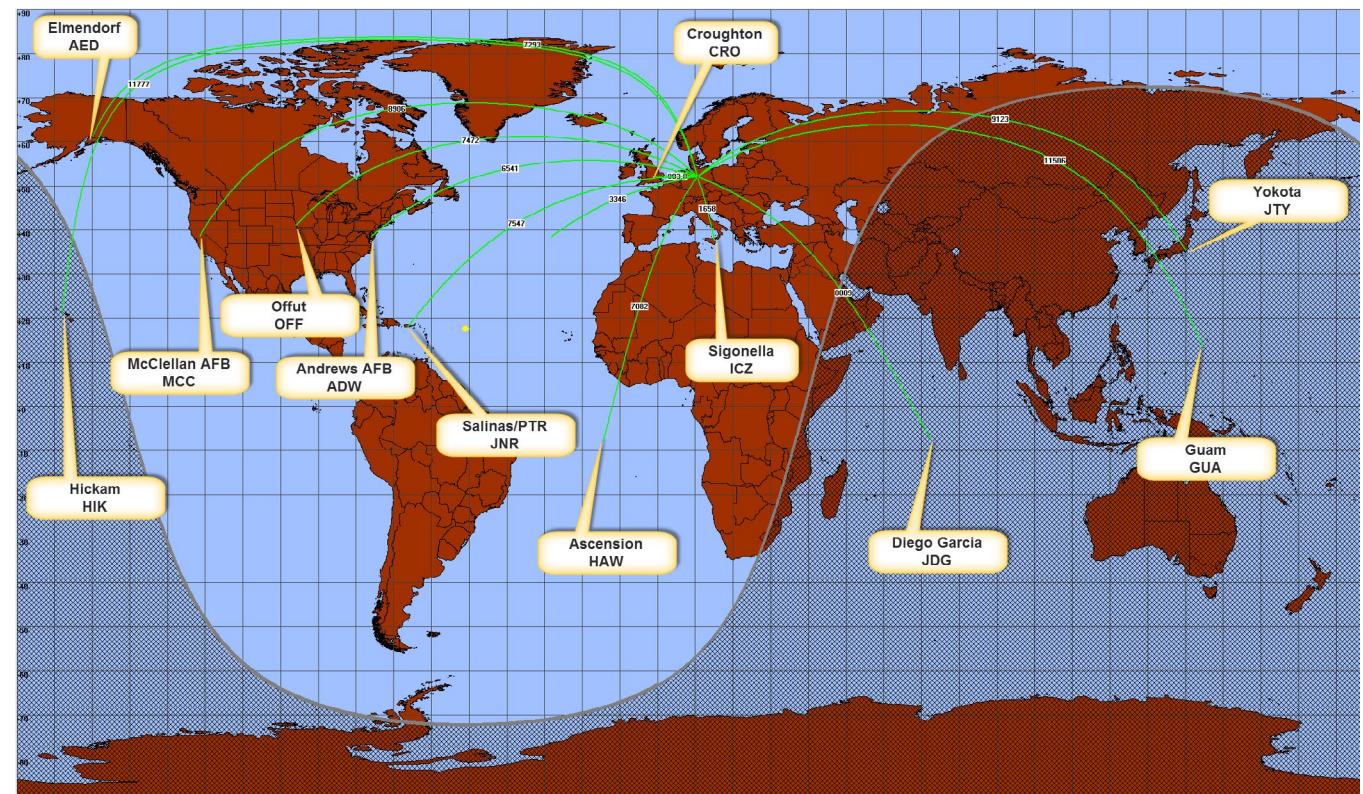


Figure 15: Map of the identified base locations of the USAF HFGCS net, as seen from the author's location in Germany. Each station transmits under different call signs on mostly different frequencies:

The basic call signal (e.g. HIK for Hickam Airbase in Hawaii) stands for the basic USAF HFGCS system.

The Non-classified Internet Protocol Router Network (NIPRNet) adds „NPR“ to the basic call sign, HIK becomes HIKNPR.

The Secret Internet Protocol Router Network (SIPRNet) adds „SPR“ to the basic call sign, HIK becomes HIKSPR.

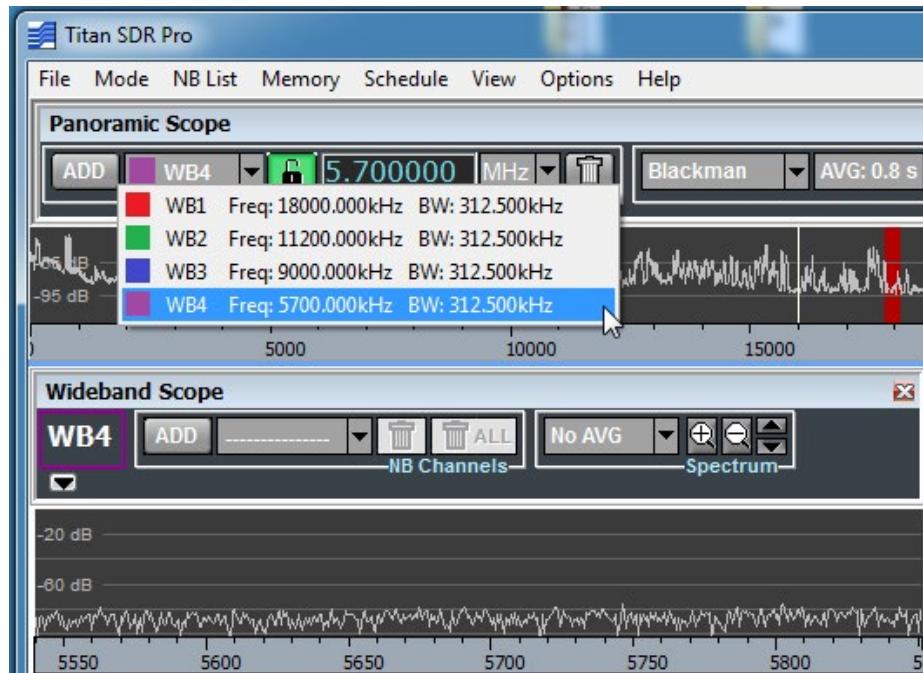


Figure 16: This is the result of programming the receiver – with the four wideband channels ...

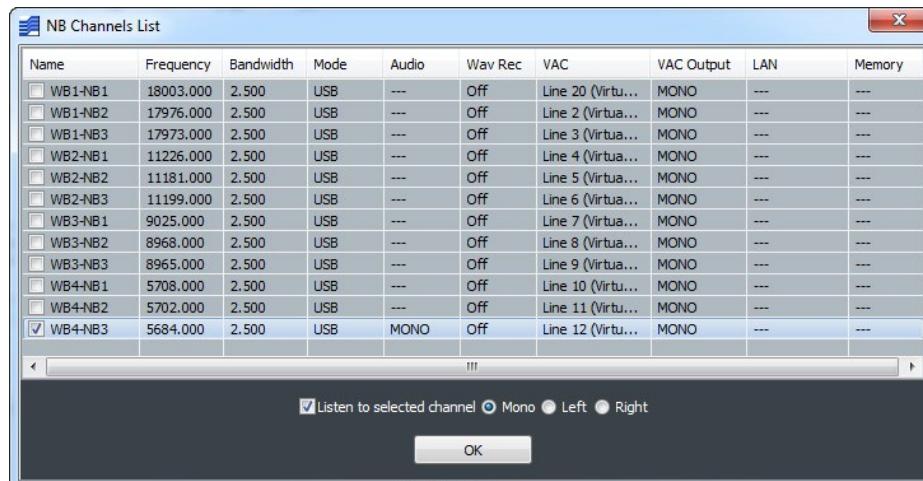


Figure 17: ... and with the 12 narrowband channels with a different VAC output each.

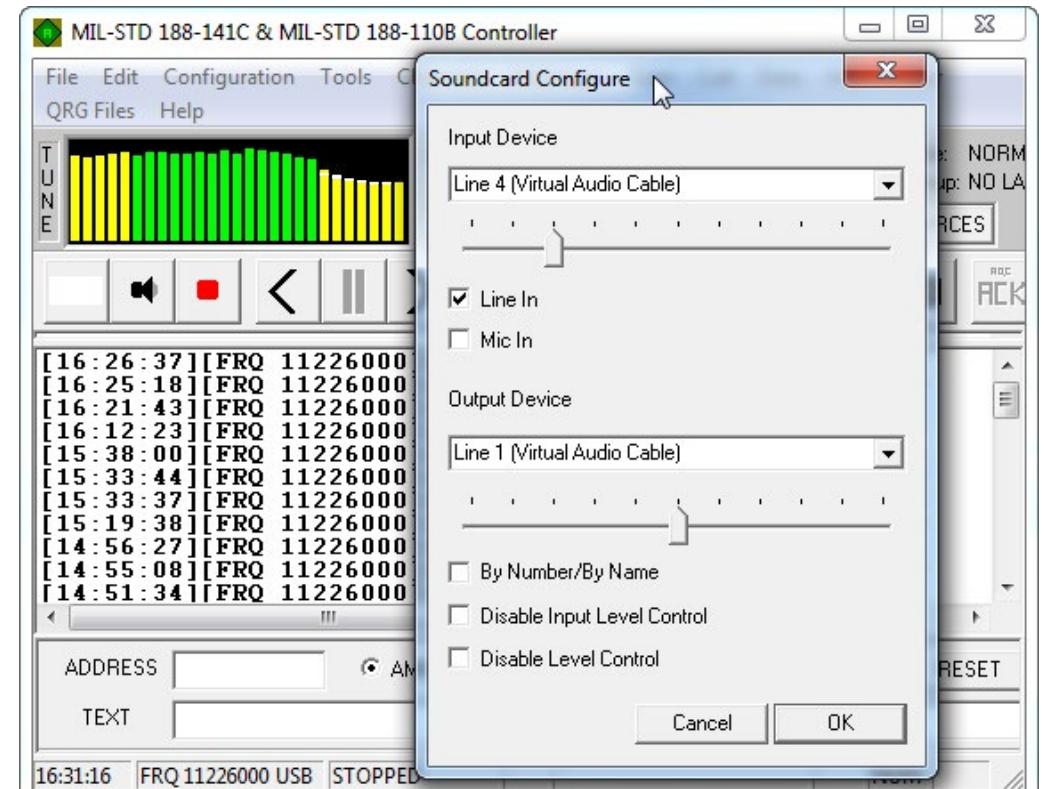


Figure 18: Each instance of decoder PC-ALE has been assigned to the appropriate VAC input (e.g. 11.226 kHz to VAC4, the same as VAC4 output in „NB Channels List“ left) plus ...

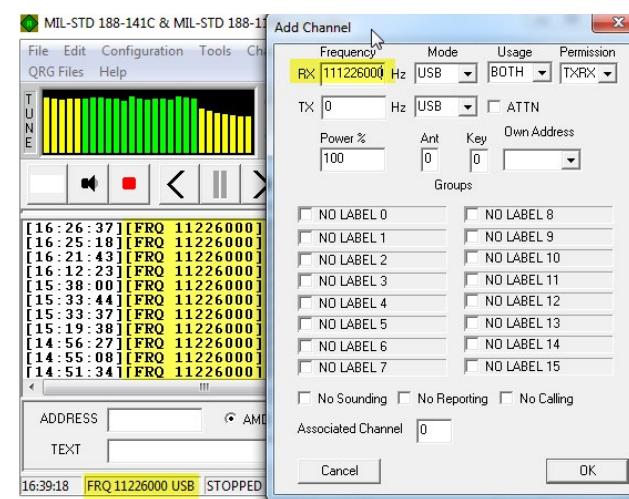


Figure 19: ... the HF frequency of this channel in Hz for overview and documentation. This frequency is automatically inserted into each line of a decoded signal plus at the bottom of the decoder. All are marked in yellow.

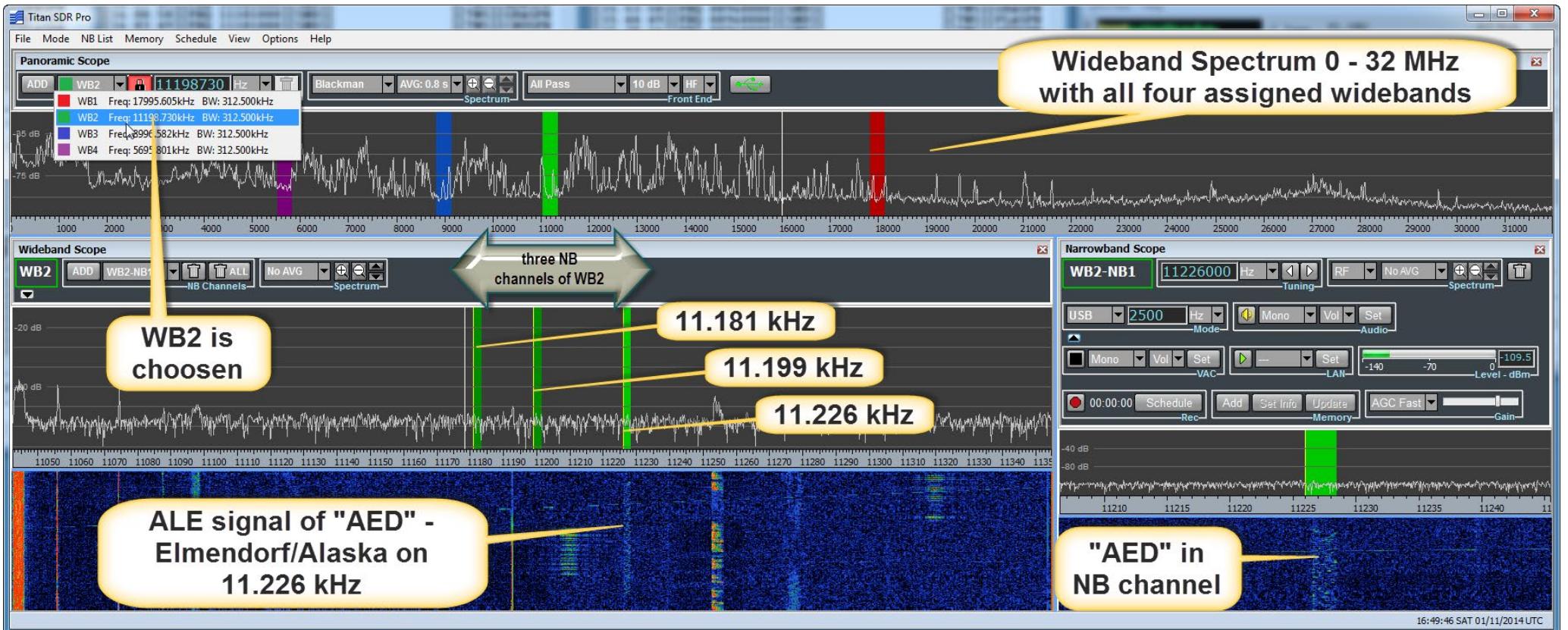


Figure 20: The receiver in action. As all programmed channels are received in parallel, you can listen to one or two NB channels, and may switch to any others. You also can change WB ranges. The receiver is continuously listening on all channels and streaming the audio of each of them to each decoder, see overleaf.

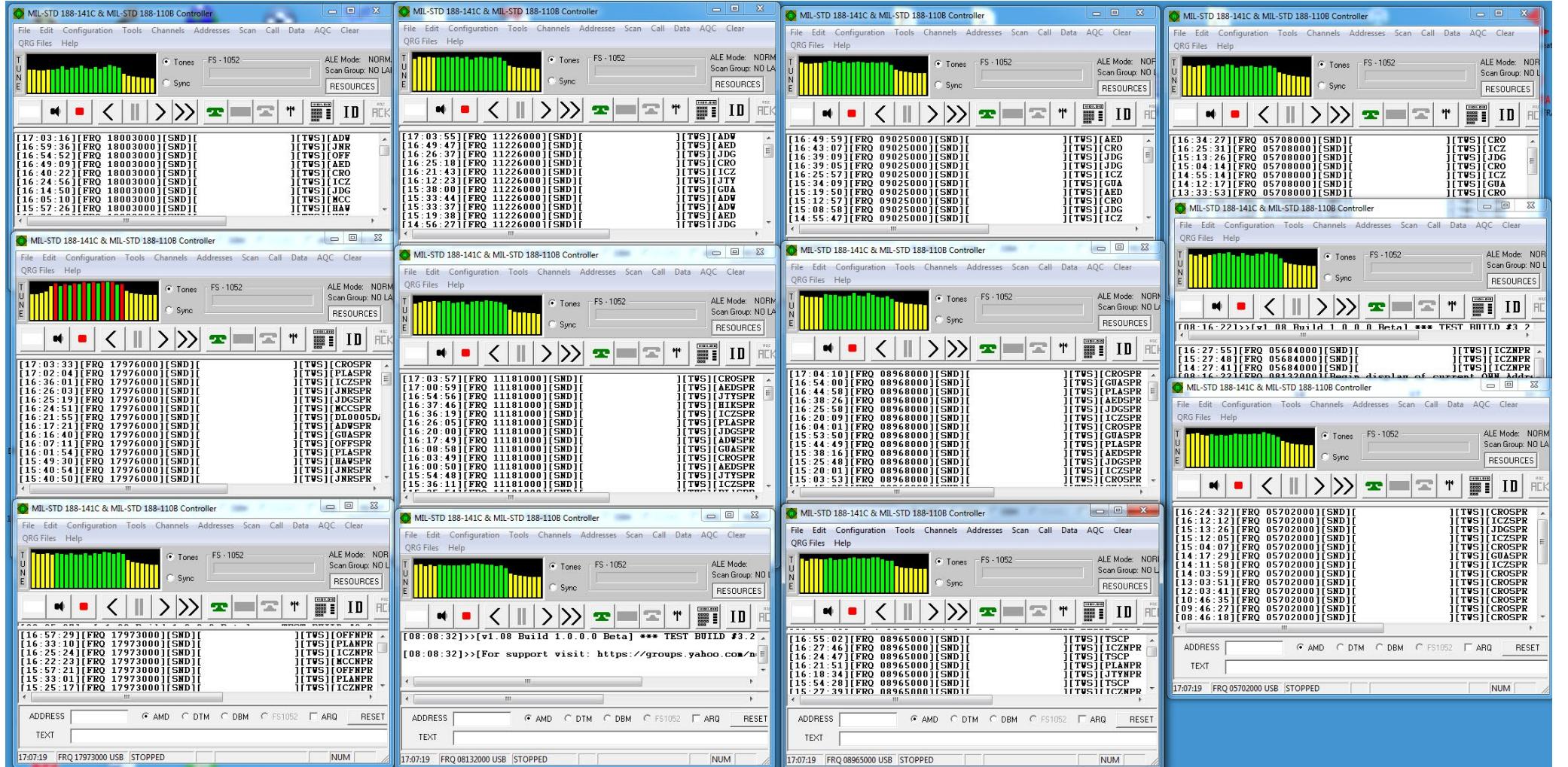


Figure 21: This is the „dashboard“ of all twelve instances of PC-ALE, fed for some eight hours with the output of twelve NB channels from the USAF-HFGCS.

They are organized as follows: Each row presents one WB, each column three NB channels, from left to right: USAF-HFGCS (basic), followed by SIPR and NIPR.

In the display of the first column, second row, you see an ALE signal is just being received on this channel. It turns out to be „OFFSPR“ (xxxSPR as belonging to the second row) on 17.976 kHz. You see the content only after transmission had ceased. Please see the next pages for some inspection of the results.

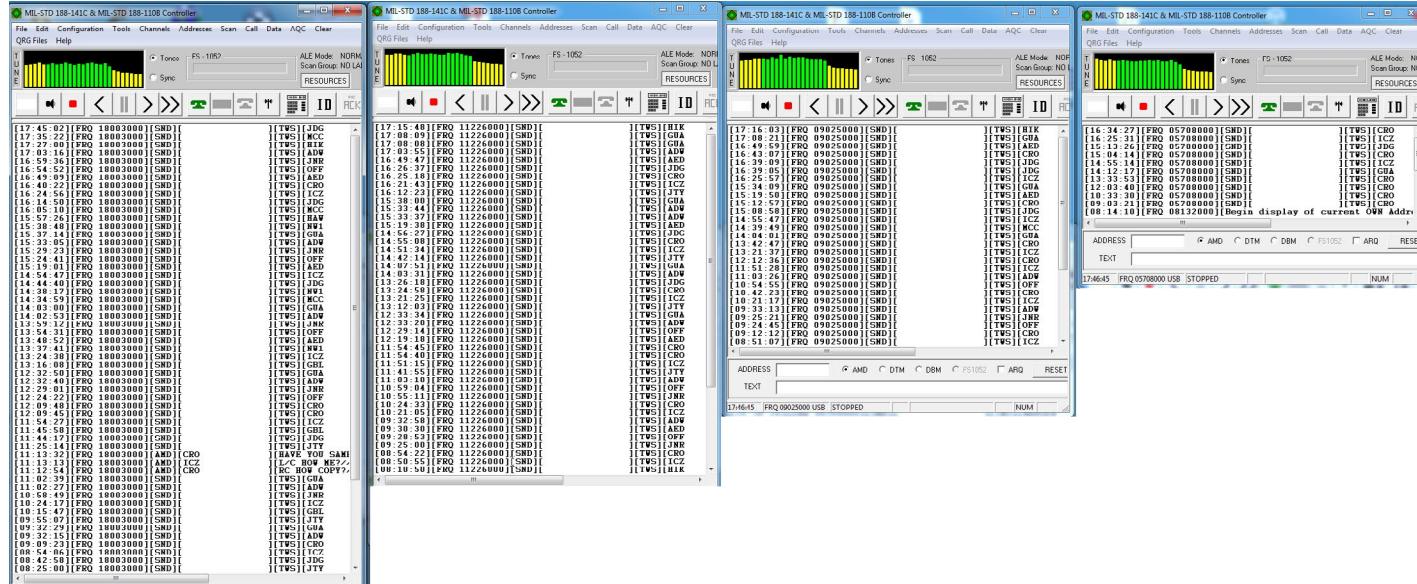


Figure 22: On the left, you see a row with all decoded signals of the basic net on 18.003 kHz, 11.226 kHz, 9.025 kHz and 5.708 kHz. The first entry is at 08:10 UTC, the last at 17:45 UTC. Because this time there was mostly daylight, we received the most stations on the highest frequency.

Conditions had been quite good with receptions of HIK/Hawaii, JTY/Japan and MCC/California. With GUA/Guam at 14:12 UTC, the first DX faded in on 5.708 kHz, followed by JDG/Diego Garcia at 15:13 UTC. We can make out some patterns, e.g. roughly hh:02 and hh:32 from ADW/Andrews on 18.003 kHz. Following this station on the other channels, we see the sequence of 18.003 kHz --> 11.226 kHz --> 9.025 kHz.

Caveat: There are some channels between these channels (i.e. 15.043 kHz, 13.215 kHz and 6.721 kHz) which had been omitted here, because they aren't used by NIPR/SIPR. And you have to observe propagation!

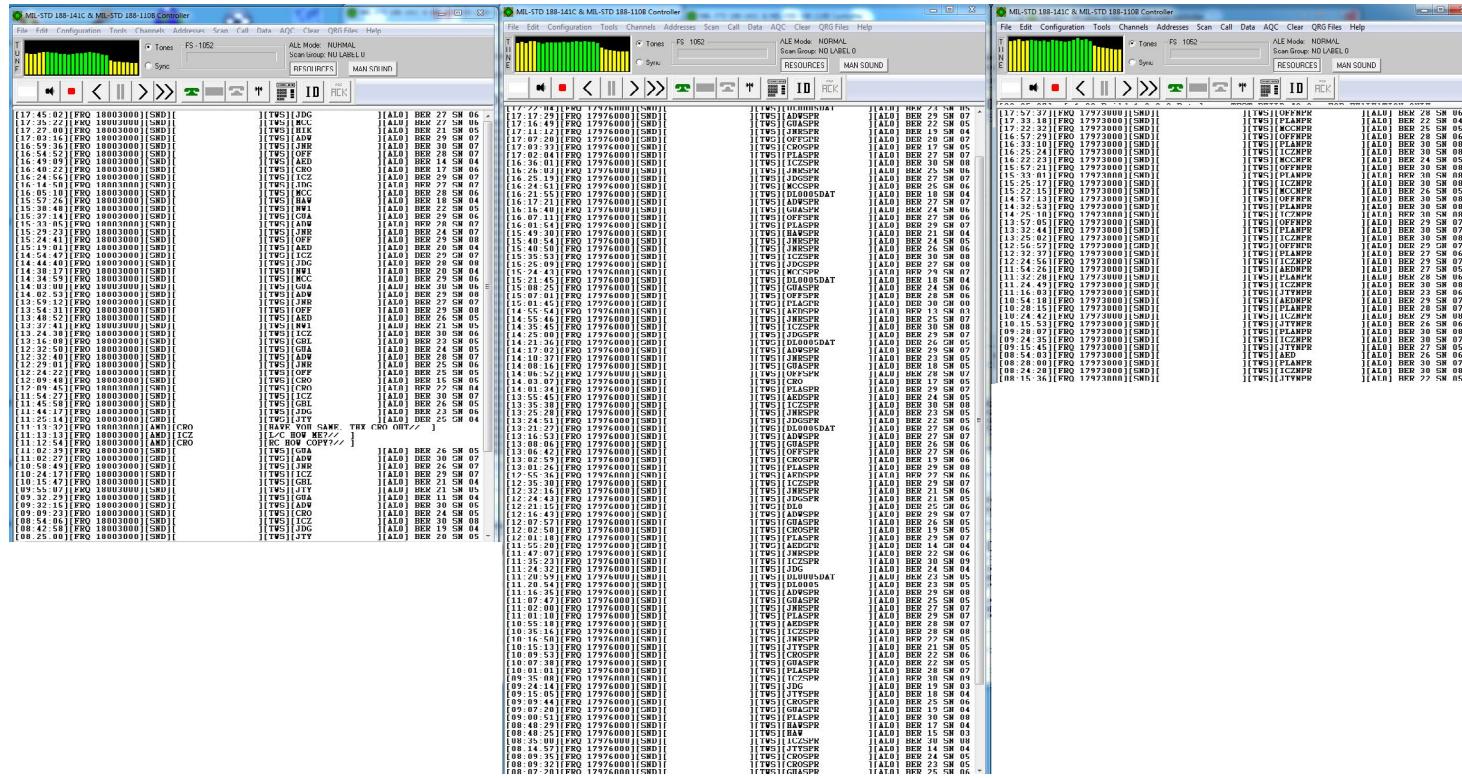


Figure 23: Here you see a column of three channel around 18 MHz with basic, SPR and NPR call signs. They seem to transmit in a pattern of two times an hour with 30 minutes or one hour difference. See e.g. PLASPR/Puerto Rico on 17.976 kHz at 09:00 UTC, 10:00 UTC, 11:01 UTC, 12:01 UTC, 13:01 UTC ... 17:02 UTC. On 17.973 kHz, the same location as PLANPR seems to follow patterns of hh:28 and hh:33. This behavior surely needs some more work.

You see also some radio check-like communications, on 18.003 kHz around 11:13 UTC between CRO/Croughton and ICZ/Signonella.

And you see some other data like BER and SN. BER is the Bit Error Rate, 30 is excellent, lower than 20 means poor quality. SN stands for the signal-to-noise ratio, with greater than 8 clear and lower than 3 noisy.

Propagation: Calculation vs. Measurements

On the following pages you'll find some analysis of the HFGCS data for several paths. In the first figure, the measured signal-to-noise ratio has

been converted into black (excellent) to white (no reception) in steps of 10 percent. The figure below shows a calculation of this path, made with PropMan2000.

Figure 24: Signal-to-noise ratio of Sigonella as measured by PC-ALE.

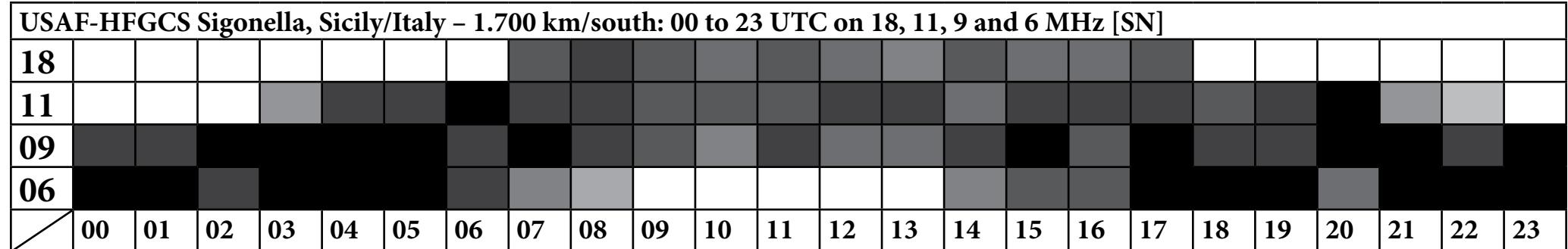


Figure 25: Signal-to-noise ratio between Sigonella and Northern Germany, as calculated by PropMan2000.

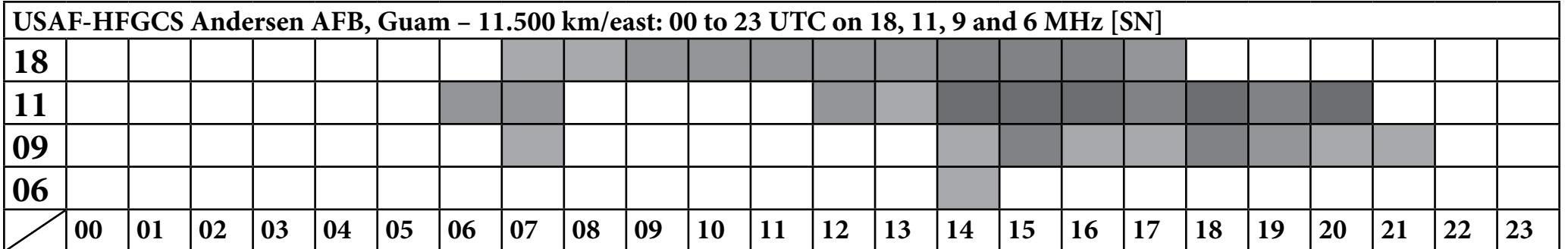


Figure 26: Signal-to-noise ratio of Andersen AFB as measured by PC-ALE.

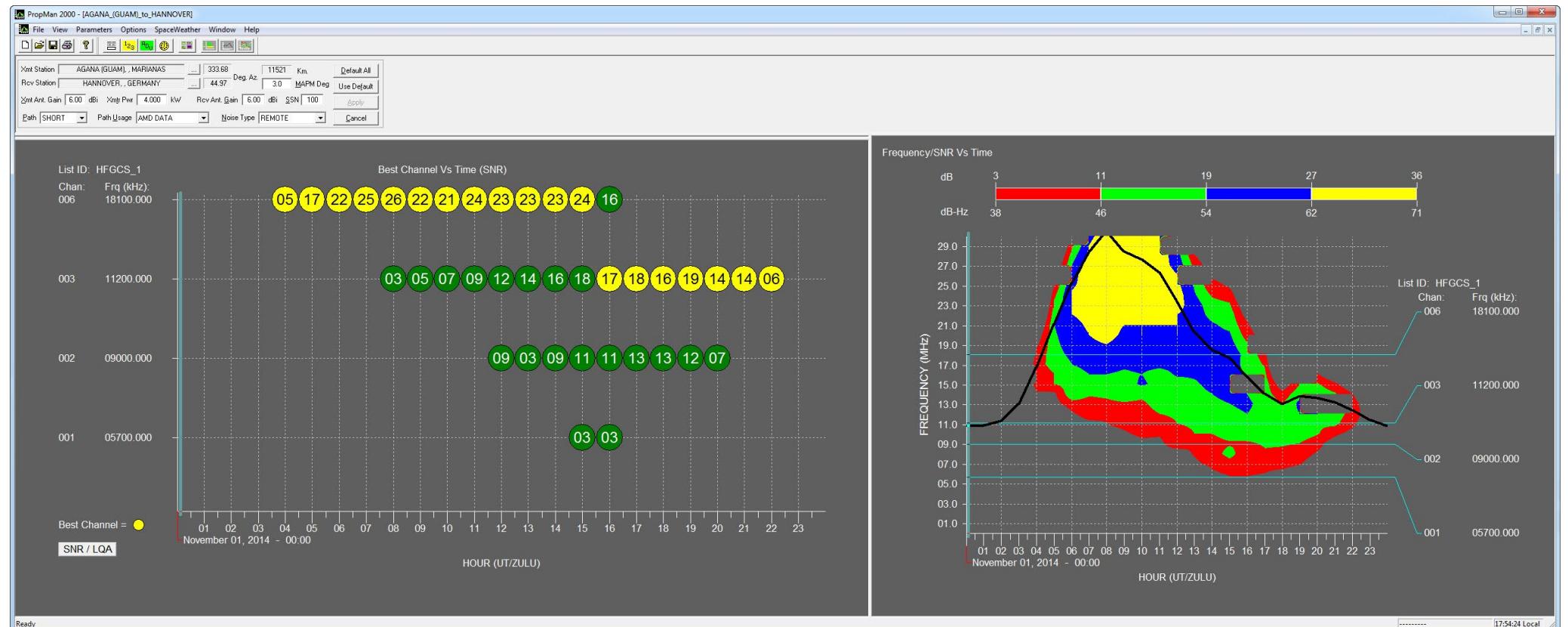


Figure 27: Signal-to-noise ratio between Guam and Northern Germany, as calculated by PropMan2000.

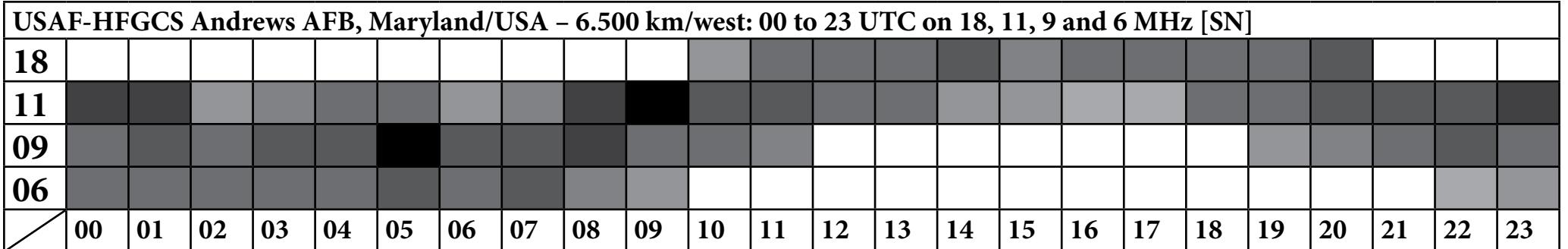


Figure 28: Signal-to-noise ratio of Andrews AFB as measured by PC-ALE.

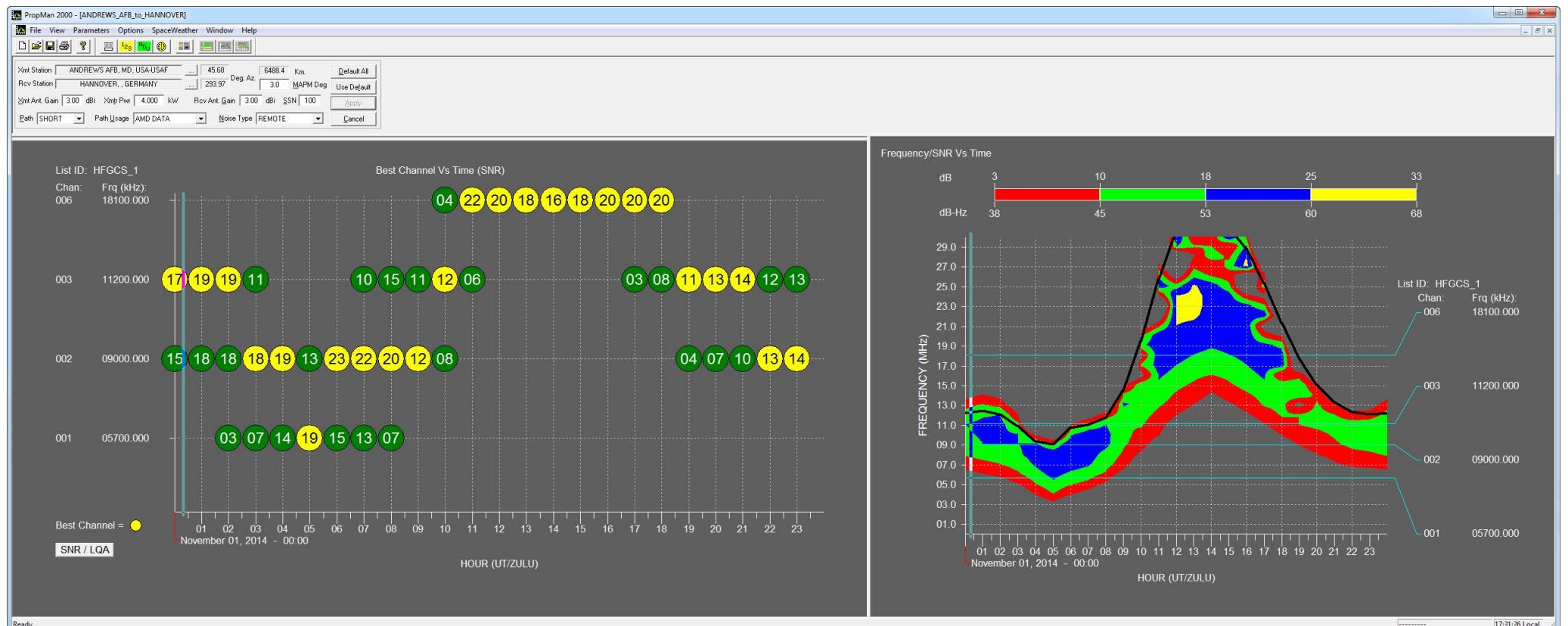


Figure 29: Signal-to-noise ratio between Maryland and Northern Germany, as calculated by PropMan2000.

Example: Multiple Data Reception, DSC

DSC or Digital Selective Calling is a 2-FSK system for standardized communications between coastal stations and ships – according to an *ITU Recommendation*. On HF, all action takes place on the following exclusive channels:

- 2.187,5 kHz
- 4.207,5 kHz
- 6.312,0 kHz
- 12.577,0 kHz
- 16.804,5 kHz

This means that you can receive up to four channels in parallel with TitanSDR. Software decoder in this case is *YaDD*, providing very good results plus a reliable bridge to *DX-Atlas* to visualize at least the received coast stations and their MHz band.

For this purpose, you have to make at least four copies of *YaDD* in different folders, otherwise the software would mix up some results. Moreover, I started around 10:00 UTC with the highest four frequencies. At around 19:00 UTC, I switched the two highest frequencies down to the two lowest frequencies.

Mode has been FSK, bandwidth 500 Hz. This is double as high as needed to compensate for some unstability of transmitters. The software has an automatic frequency control to cope with these effects within a given bandwidth. 500 Hz bandwidth vs. the 3.000 Hz bandwidth of a common communications channel gives you an advantage of nearly 8 dB which is highly welcomed for weak signals. The examples concentrate on coastal stations only. „ECC“ has been clicked to analyze only correct transmission.



Figure 30: Here the receiver has been programmed to receive four DSC frequencies. YaDD has been opened four times from four different folders (see text and figure below).

Name	Änderungsdatum	Typ
LOG	27.11.2013 06:58	Dateiordner
YaDD_1	02.11.2014 10:23	Dateiordner
YaDD_2	02.11.2014 10:23	Dateiordner
YaDD_3	02.11.2014 10:23	Dateiordner
YaDD_4	02.11.2014 10:23	Dateiordner
YaDD_6	02.11.2014 10:23	Dateiordner
YaDD_7	02.11.2014 10:23	Dateiordner
colsettings	02.11.2014 10:20	Datei
DBManager.exe	13.10.2007 13:04	Anwendung
distress.wav	28.11.2013 20:39	Wavesound
DSCLOG.ABS	02.11.2014 10:20	ABS-Datei
unins000.dat	01.11.2014 21:12	DAT-Datei
unins000.exe	01.11.2014 21:12	Anwendung
YaDD.exe	25.03.2014 22:21	Anwendung
YaDD.ini	02.11.2014 10:20	Konfigurations
YADD_CALIBRATION SIGNAL.wav	20.12.2008 15:46	Wavesound
YADD_MMSL_COAST.TXT	19.11.2013 20:51	Textdokument
YADD_SESSIONLOG.txt	02.11.2014 10:20	Textdokument
YADD_SYSLOG.txt	02.11.2014 10:20	Textdokument
YMLog.exe	18.03.2014 20:18	Anwendung

Figure 31: For decoding multiple frequencies in parallel, software YaDD needs copies („instances“) in different folders. I organized the different copies/instances of YaDD in a folder YaDD where I stored also sub-folders. They are named in this case YaDD_1 ... YaDD_7. It's a good idea that their number also represents the specific VAC output, i.e. VAC output VAC1 leading to the YaDD copy in folder YaDD_1, and VAC output VAC2 leading to folder YaDD_2 ...

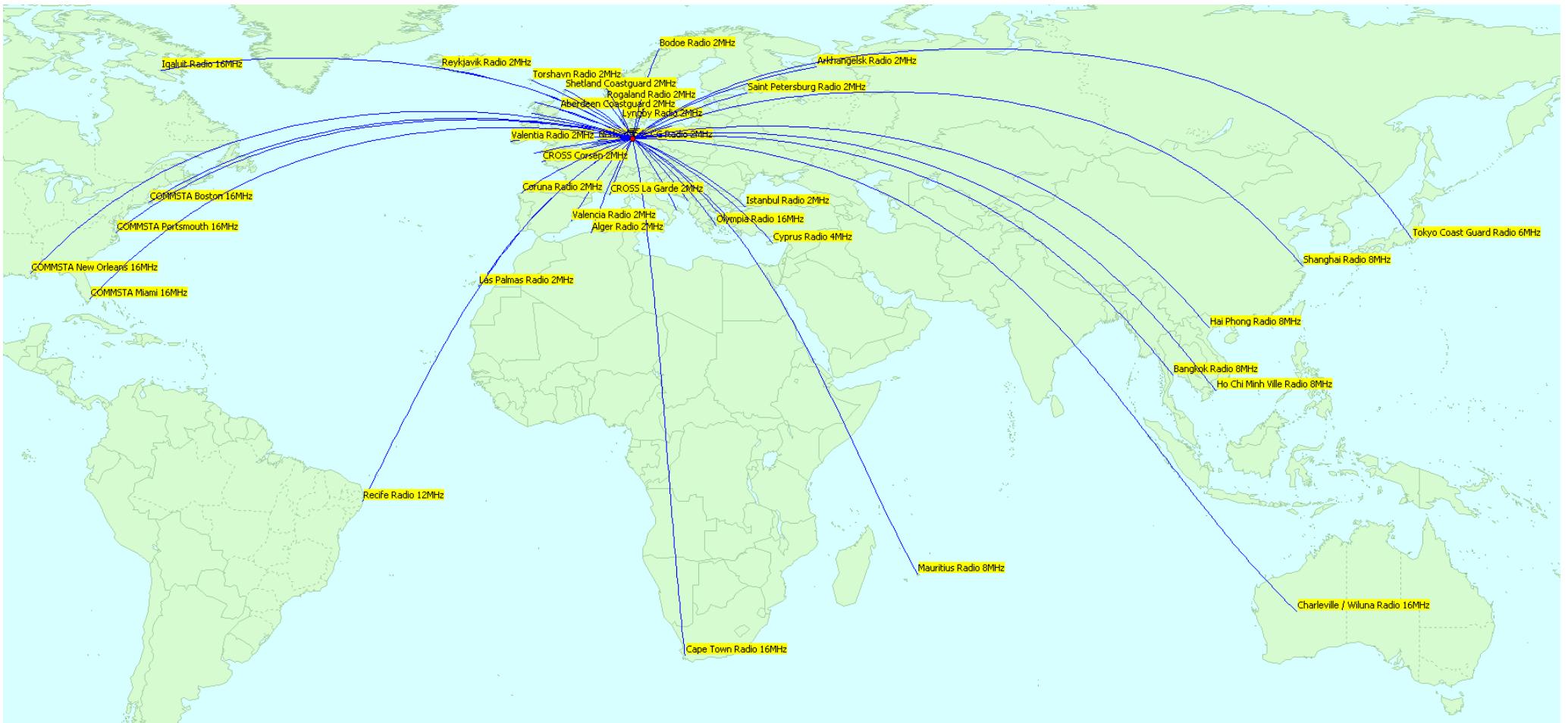


Figure 32: World Map as drawn by the data of YaDD onto DX-Atlas. See overleaf for a map zoomed into Europe.

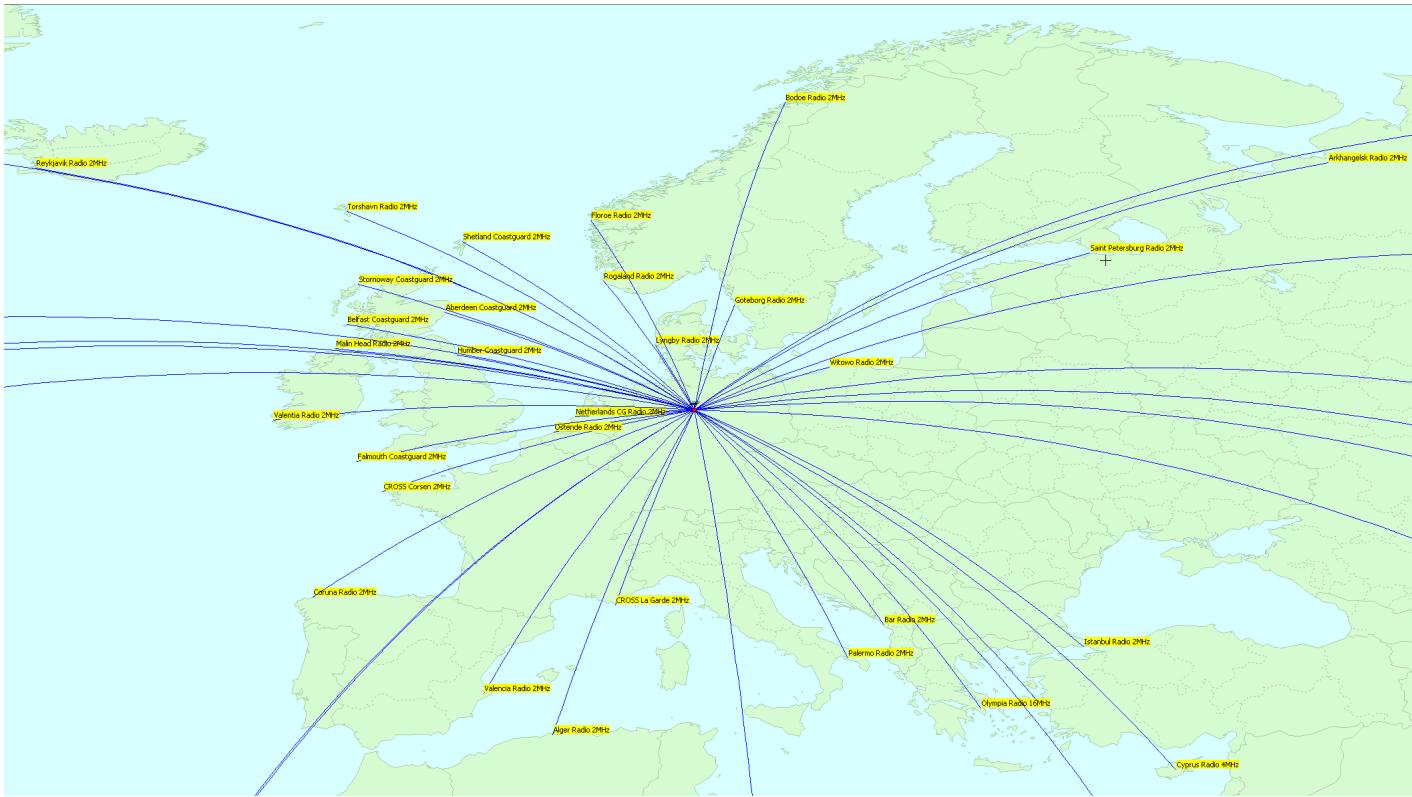


Figure 33: Zoomed into Europe, this map shows the entries on 2.187,5 kHz and 4.207,5 kHz in greater detail.

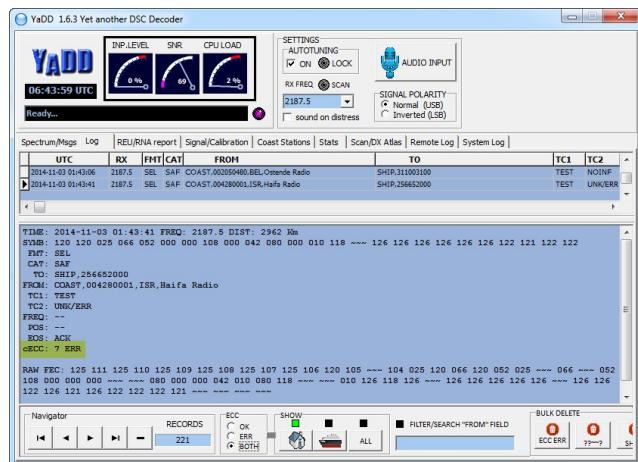


Figure 34: Haifa Radio is not listed because its signal didn't pass the Error Check for the whole message.

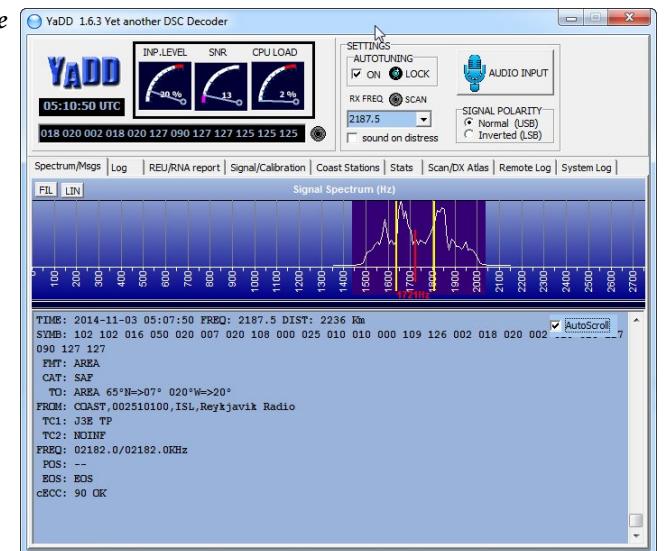


Figure 35: Reykjavik Radio (and all other placed on the map) did pass the Error Check for the whole message.

Example: Multiple Data Reception, STANAG4285

With 8-PSK and a bit rate of 2.400 bps, STANAG4285 is sometimes considered to be the „Holy Grail“ among Utility-DXers. This regards to receivers as well as decoders. TitanSDR performs excellent also in this respect. I programmed six channels of a network of the French Forces (map on the right, where they send a an open test slip):

- FUE Brest/France, 4.295 kHz
- FUG8 Saissac/France, 8.453 kHz
- FUV Jibuti, 8.568 kHz
- FUX St. Denis/Reunion, 12.691 kHz
- 6WW Dakar/Senegal, 16.951,5 kHz
- FUF Ft.-de-France/Martinique, 16.961,5 kHz

Each channel had been assigned to different VACs, namels VAC1 ... VAC6. Then I opened six instances of the decoder and let it work. The results were stunning: all channels performed nearly perfect in parallel, see figure overleaf.

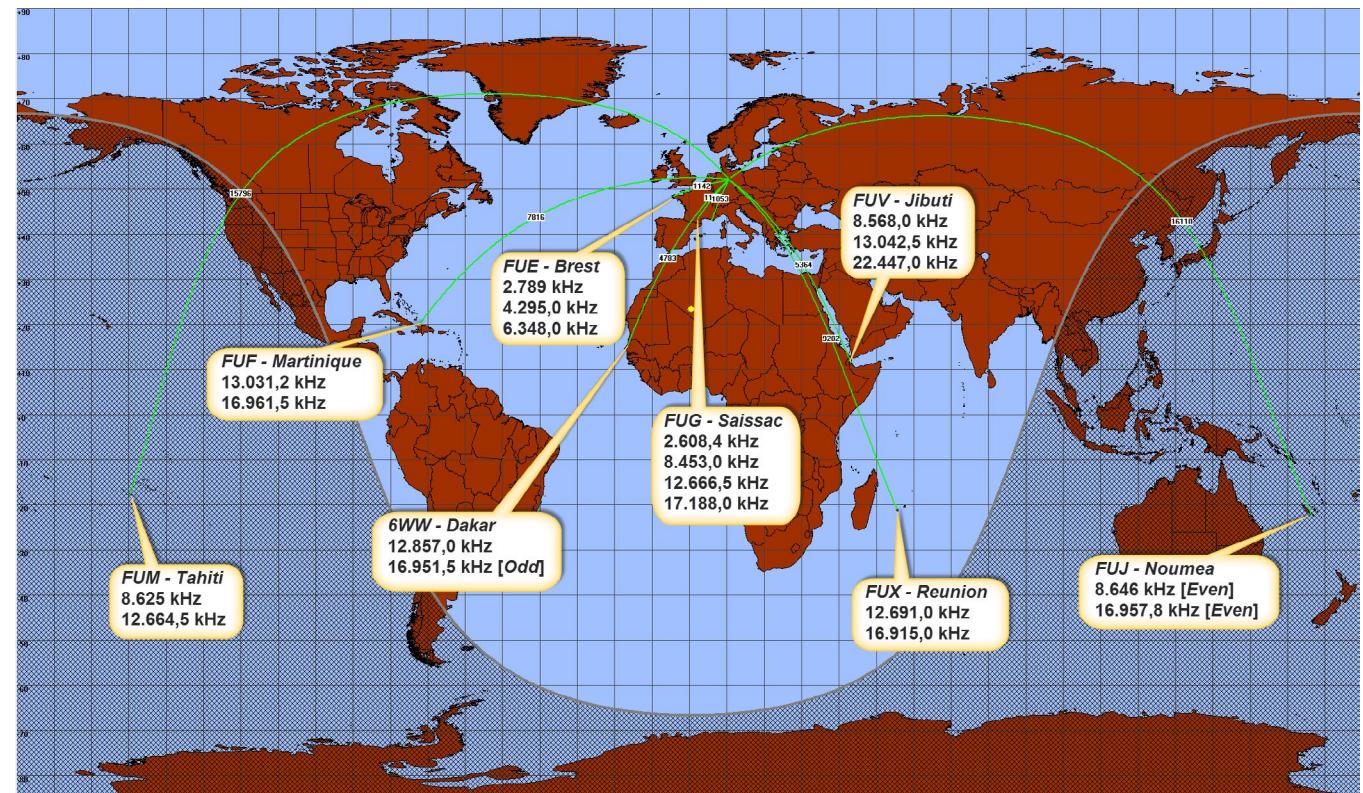


Figure 36: A map of all French station which regularly transmit open STANAG4285 messages and had been received by the author. Due to propagation, they rarely can be received all in parallel. But I managed to receive six of them on November 4th, 2014 at around 18:00 UTC.

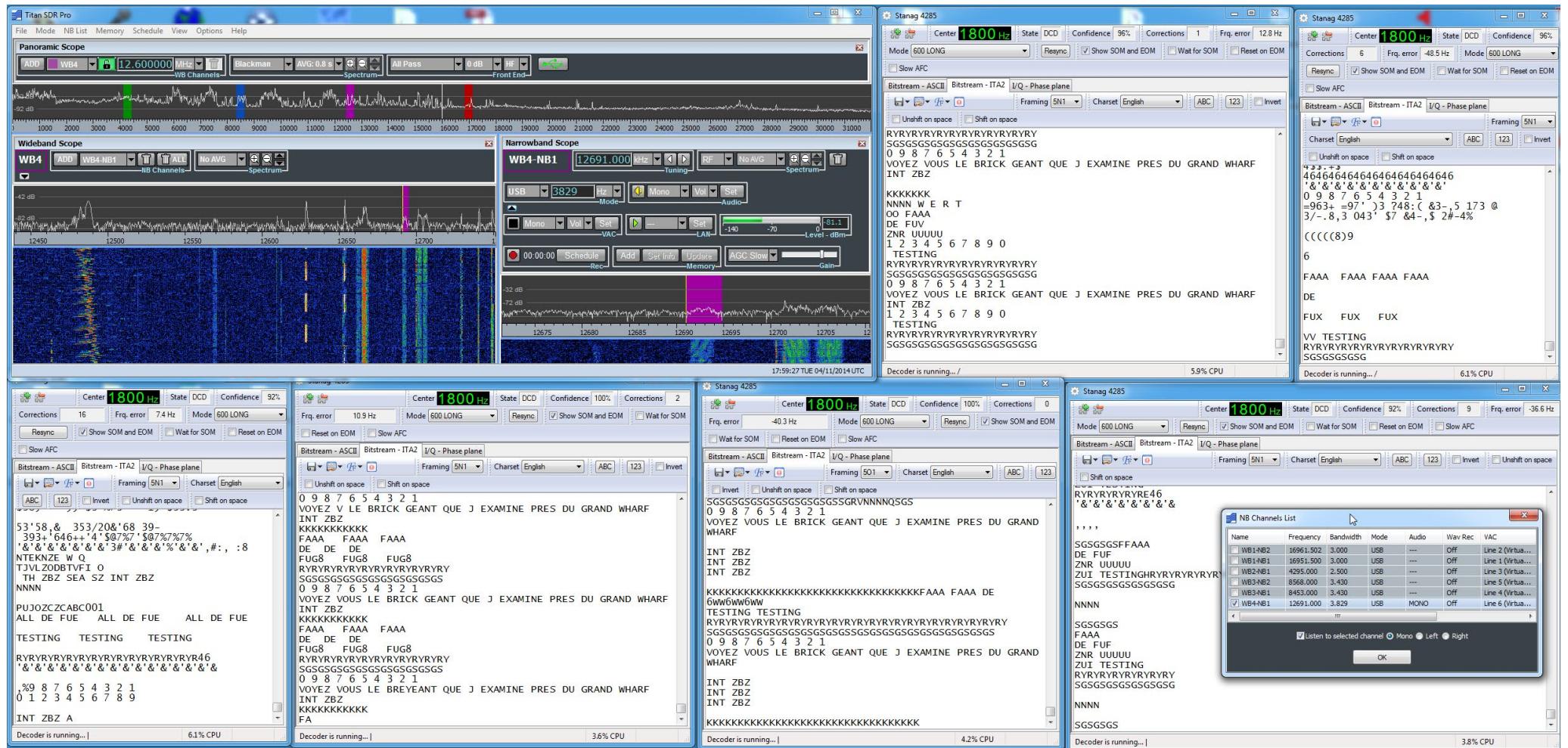


Figure 37: Stunning results: all six NB channels (see left window) in three WB ranges decode STANAG4285 nearly perfect and in parallel. Please note also the different framing chosen for 6WW (5O1, instead of 5N1). These were all channels of this net, I was able to receive in parallel this date & time. Propagation was „fair“ at the time of reception. Nevertheless, „Confidence Levels“ are well above 92% and often reach 100%.

Example: Amateur Radio (PSK31)

Amateur radio on HF doesn't think in „channels“ but mostly uses odd frequencies. So you have to park the receiver e.g. in USB with a, say, 5.000 Hz bandwidth and connect this NB channel via VAC to a decoder which automatically finds stations in this bandwidth.

This first example had been done with PSK31 (mode) and three instances of decoder software FLDIGI. The receiver was tuned via WB to three different NB channels, namely:

- 3.580 kHz (80 m)
- 7.039 kHz (40 m)
- 14.070 kHz (20 m)

These frequencies had also been manually put into the window of each instance of *FLDigi*. To see as many activity as possible, FLDIGI's „Signal Browser“ has been activated to decode numerous signals in a given audio bandwidth in parallel. Of course, you can mix and add also (with) other modes, e.g. assign other NB channels on e.g. MFSK16-frequencies and open another instance on FLDIGI in this mode.

On the right, I made up an example with three PSK31 channels in three different ham band only.

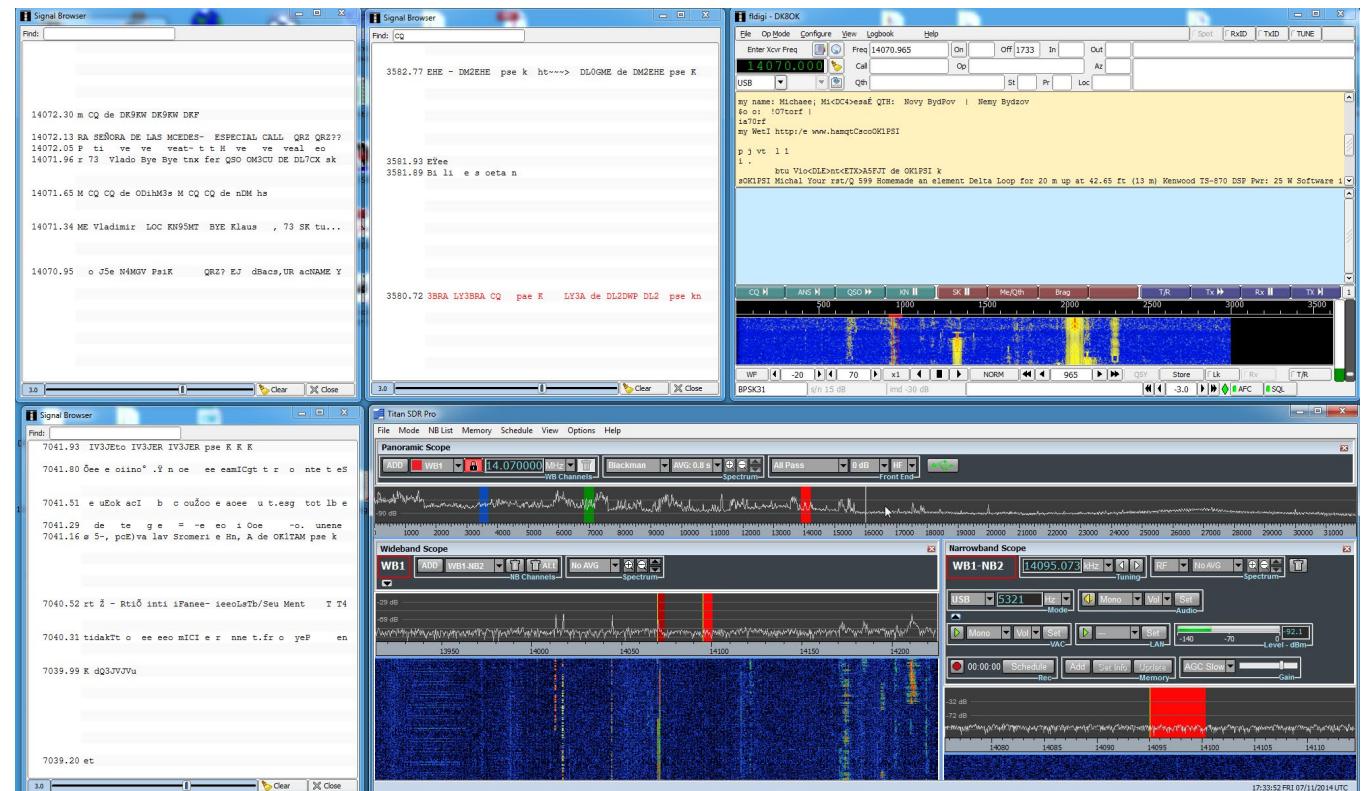


Figure 38: The receiver was parked on three PSK31 subbands of 20 m, 40 m and 80 m. Then „Signal Browser“ had been opened to show the acitivity of this mode on each band. In the right corner at the top, one instance of decoder software FLDIGI has been shown (20 m). The other had been sent to taskbar.

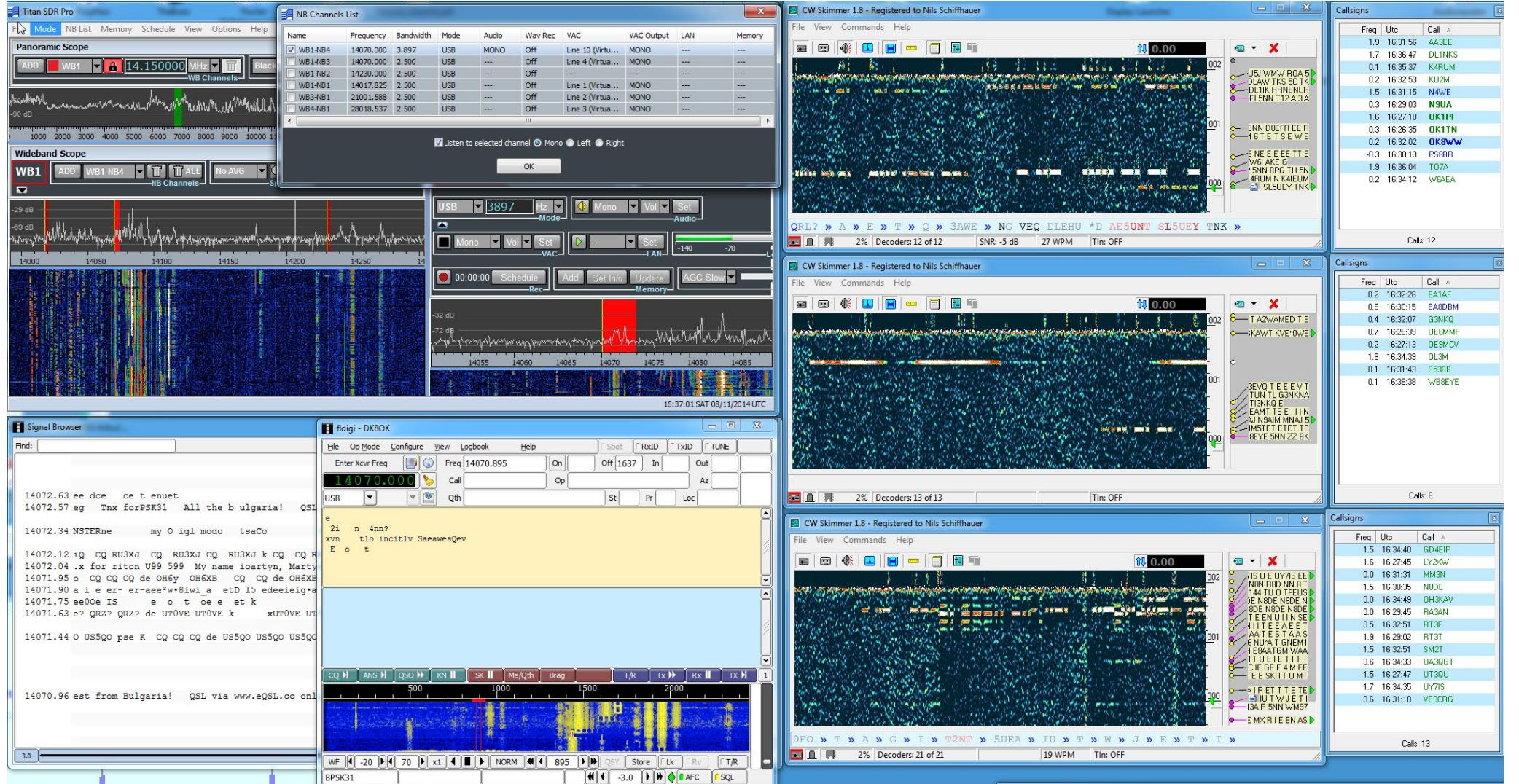


Figure 39: Three ham bands, 20 m, 15 m and 10 m. In all of these three bands I placed an SSB demodulator in their CW-sub bands. Their outputs VAC1, VAC2 and VAC3 were sent to one of three instances of CW Skimmer, a software which demodulates all signals within e.g. a 3 kHz bandwidth in parallel and lists the detected call signs. All CW Skimmer windows are on the right. Additional, I placed another NB at 14.070 kHz and sent its output via VAC4 to the input of FLDIGI. As a result, you see many decoded PSK31 stations in parallel on the bottom right.

Narrow Bands in parallel

You can listen to two NBs in parallel. This is done in stereo, where you put one channel on the left and the other on the right output. This is an efficient tool to e.g. check alternative channels in parallel, listen to both stations working any sort of duplex mode on different frequencies and find parallel broadcasts.

However, this technique has some limits which are inherent to the system of VACs and timing within the Windows OS. While both channels actually are in parallel on a large scale (which fits for e.g. speech), they cannot be used for precise measurements at a scale of milliseconds. Moreover, the difference is not fixed but unpredictable and can even change during a session. The examples show how to use this technique, as well as its limits.

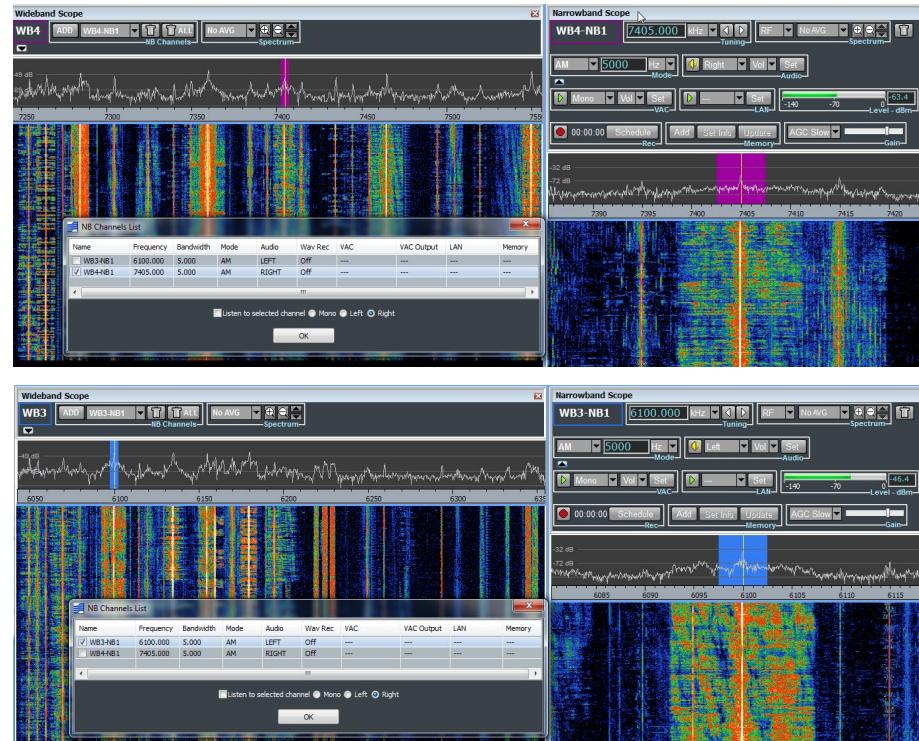


Figure 40: The task was, to compare an English broadcast of Radio China International on 7.405 kHz to that transmission in parallel from the same transmitter on 6.100 kHz. Hence, 7.405 kHz was assigned to WB4-NB1 on the right stereo channel ...

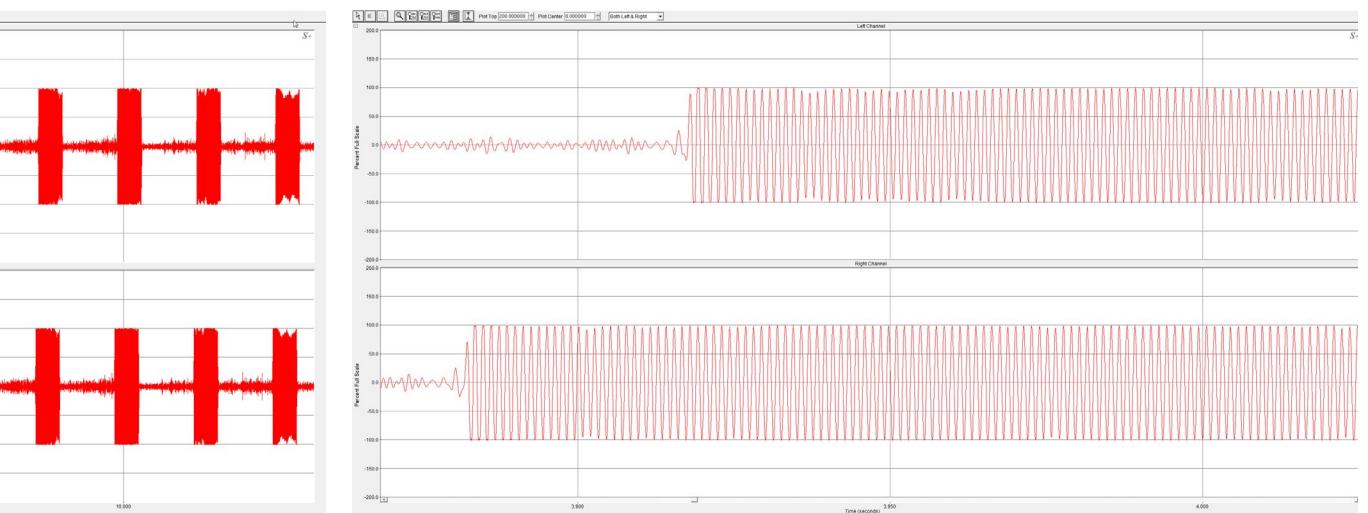


Figure 41: ... whereas the output of 6.100 kHz (WB3-NB1) was put on the left channel. Listen to the result by clicking to the loudspeaker icon below. Thanks to a slightly different propagation of both HF frequencies, you will note a changing impression of both left and right channel.

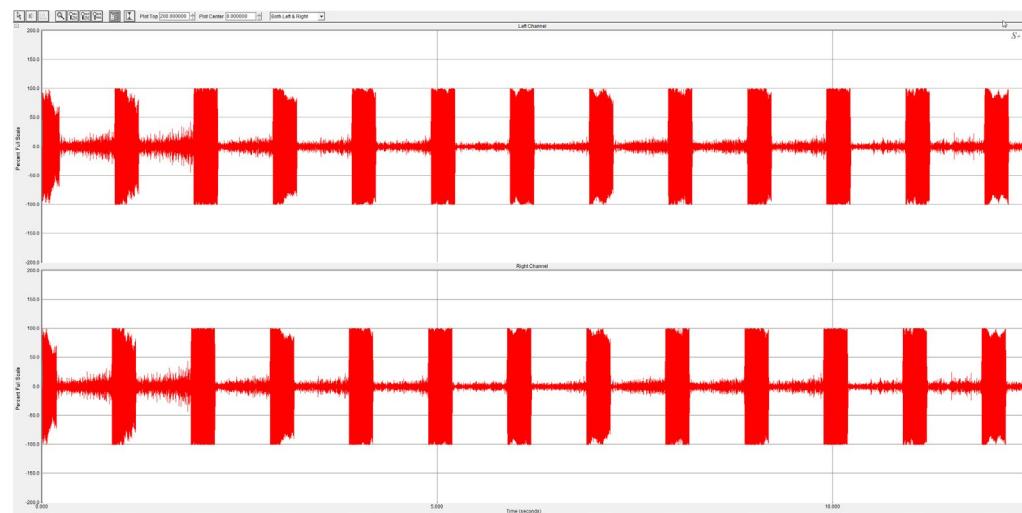


Figure 42: Here the time beeps of CHU 7.850 kHz were received in parallel to test a possible difference. For this purpose, the right stereo channel had been assigned to WB1-NB1, with the left to WB2-NB1 – both on 7.851 kHz in CW to produce an 800 Hz pitch of the beeps. The stereo output was recorded and analyzed with „SpectraPLUS-SC Professional“ software.



Figure 43: Where the output on both channels looks very similar on the large scale of Figure 42 (left), zooming reveals a difference of (at this time) about 0,03 seconds or 33 milliseconds. As this difference is unpredictable and can change even during a session, TOA (time-of-arrival-) direction finding techniques are not applicable.

Record & Play: Wideband Ranges

Wideband ranges up to 2.187 kHz width can be recorded and played „like live“. The receiver works as a dongle. If it is not connect, a real USB dongle which comes with the receiver, has to be used. This is in contrast to the narrowband WAV files which can be played with each and every software.

Wideband ranges can be recorded via schedule or manually. They don't contain a time stamp, you have to add the elapsed time to that time where you started the recording. Furthermore, the proprietary format of the bin-files prohibits use of the *Living Sonogram* technology. You can record one wideband range only, even if you have assigned 4 x 312 kHz.

This all is valid up to software version 2.4.2.8 as of October 28th, 2014. As most (all?!) of these limitations are software-driven, future updates may further enrich the features of this receiver.

I used the wideband recording to tailor some features like bandwidth, mode and AGC to a given situation. With narrowband recordings you loose some flexibility in this respect. The example on the right was recorded in the 24 m broadcast band „on the hour“ around 18:00 UTC. I picked out some identifications of broadcast stations to show the stunning quality of this receiver also in this field. The DRM mode delivers a 12 kHz wide band to a VAC for input to a DRM decoder like *DREAM* oder *SoDiRa*. In the first approach, I had bad luck under W7/64Ultimate. Hadn't too much time & interest to sort this out.

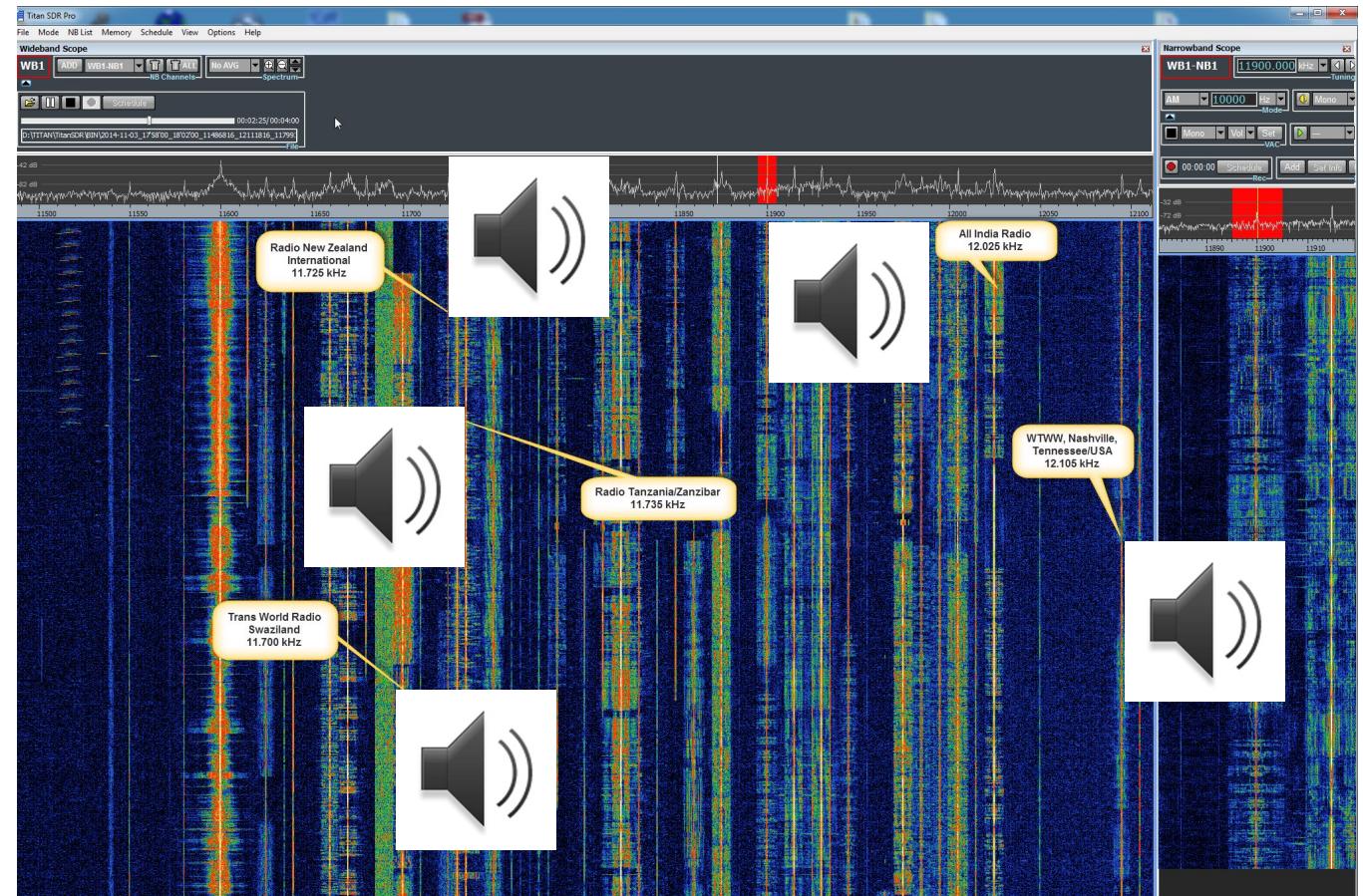


Figure 44: Some five broadcasters from four continents with their identifications at 18:00 UTC from a wideband recording. In each case, AM has been used, as eSSB (USB oder LSB) has no AFC to automatically follow the carrier. Most carriers are off-tuned some 10s or even 100s of Hertz, hence they have to be tuned manually to avoid selective fading causing distortion – plus interference from the opposite sideband.

Now it's your turn!

That's the end of a short introduction in this rather innovative strategy of monitoring narrow-band channels of different HF ranges in parallel. As time has been limited, I could not give more than a few examples to show some general ideas. Now it's your turn – have fun!

73 Nils, DK8OK