Five Mongolians on Long Wave

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Cover: Ölgii, 209 kHz
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Analyzing 209 kHz
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Long Wave: All five Mongolians

As many European broadcasters already have left long wave, they make place to receive some other stations which had been formerly blocked by them. An alert from Christoph, OE2CRM, triggered some monitoring and discussion also in Germany. The question is: What do we can expect?

Mongolia still maintains a nationwide and active net of long wave stations, strategically placed at five locations across this vast country, see *Figures 1* and *2*.

All five locations had been received at my location in Northern Germany. The distances range from 5.455 km to 6.761 km. *Figure 3* (next page) does show them together with the night zone on February, 17th, at 22:00 UTC at their sign-on.

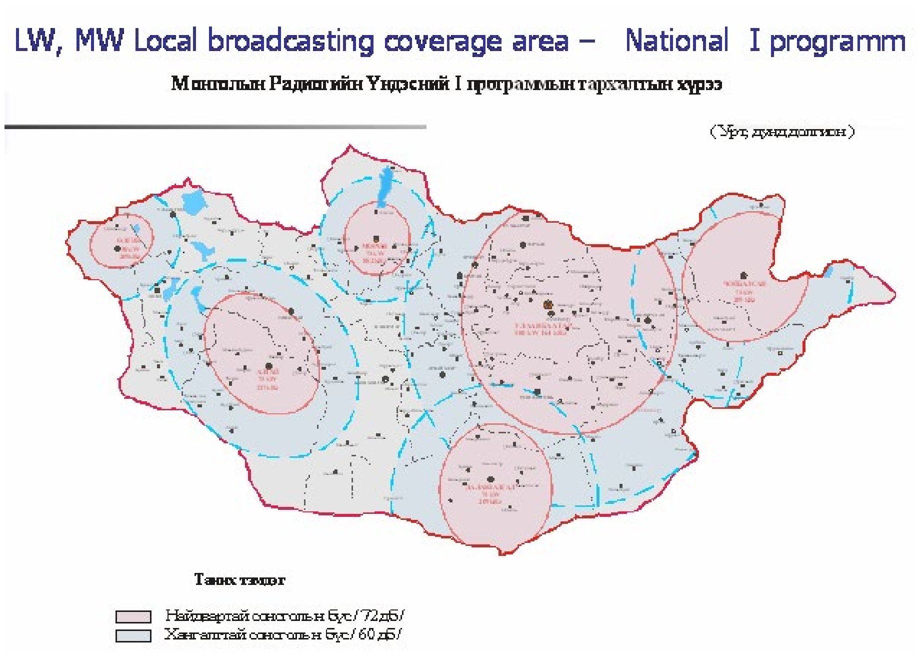


Figure 1: Service Areas of Mongolian transmitters on long and medium wave, footprints of 72 dBµV/m and 60 dBµV/m. Source: click here.

Figure 2: Location and frequencies of Mongolia's long wave transmitters. Map: Google.

If you model the path, you run into some challenges. There doesn't seem any propagation software around which reliably forecasts DX propagation on long wave. And with IPS' GWPS 4.0 there seems only one publicly available software to calculate the footprint (reliable service area, not occasional DX) of a long or medium wave transmitter.

On solution is to let calculate the plasma frequencies over the path at different times – see *Figure 4* for an example Ulaanbaatar-DK8OK at 22:00 UTC. Proplab is the only software providing also a 3D ray-tracing which even works on long wave - see *Figure 5*.

On the other hand, there is an easy rule of thumb to calculate DX propagation: receiver and transmitter should be in darkness. Additionally, there occurs a signal enhancement at the time of sunrise and sunset. In this case, there is only important the time of sunrise at the transmitters' stations, see *Figure 6*, for February 17th, 2015.

All five transmitters had been received recently by various listener in Germany and Austria. "Reception" doesn't always mean listening to the program, but to receive, analyze and identify each of their carrier.

On the next pages we dive into this practise.

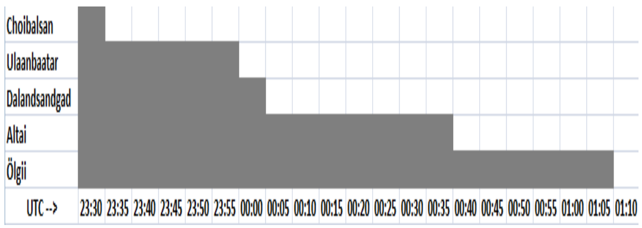


***Figure 6:** Times of sunrise at each of the five transmitters' locations, from east to west.*

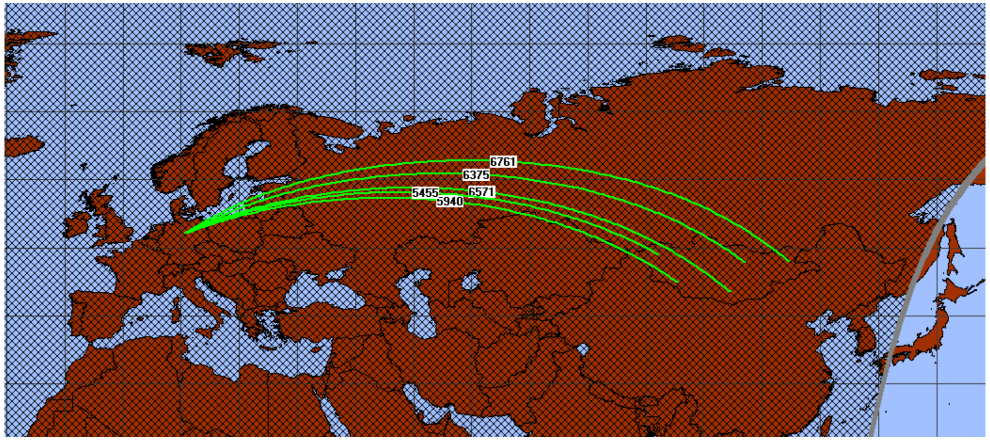


***Figure 3:** Distances from all Mongolian long wave transmitters to DK8OK. Map: PropLab 3.0*

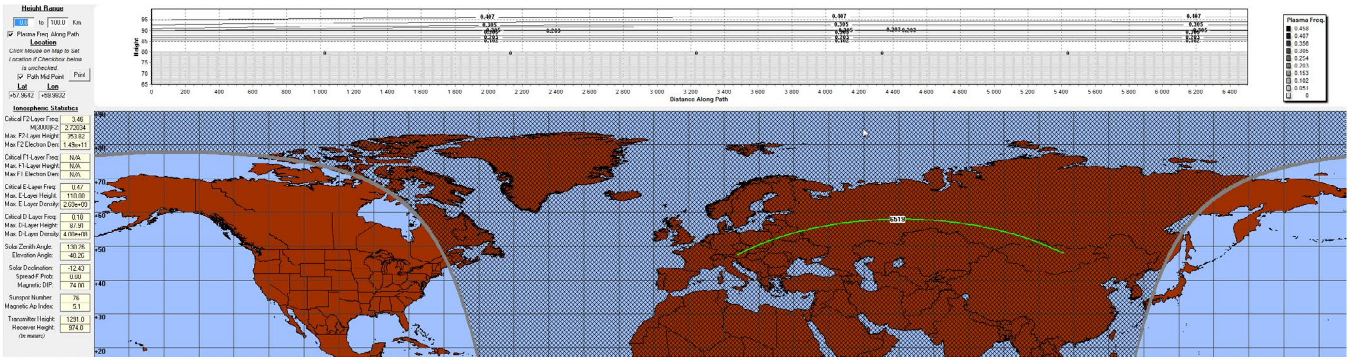


***Figure 4:** Plasma frequencies (top) between Ulaanbaatar and DK8OK at 22:00 UTC. Map: PropLab 3.0*

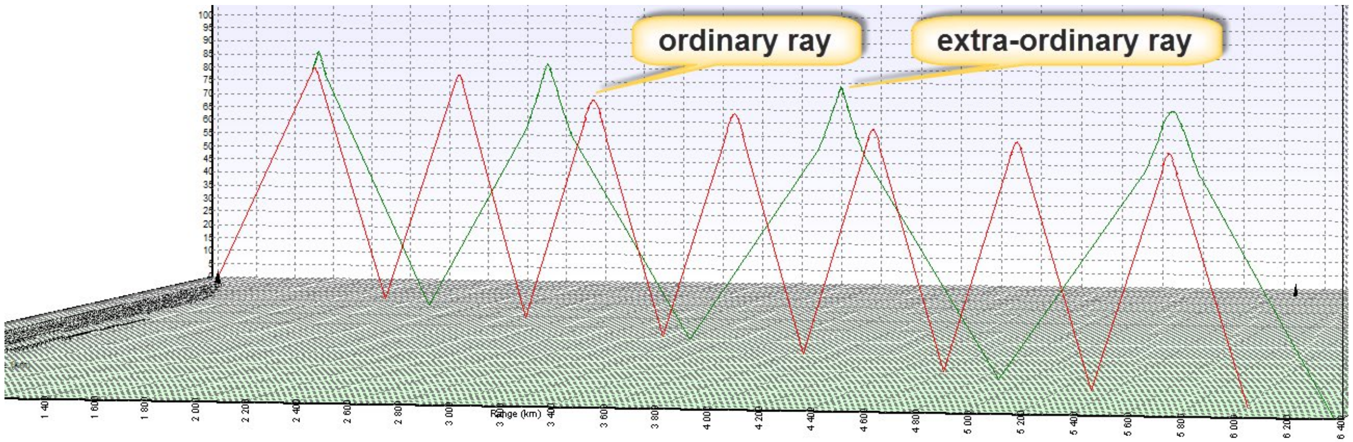


***Figure 5:** The path between Dalandsandgad and DK8OK on 209 kHz at 22:00 UTC. Only 3D-modeling shows the propagating extra-ordinary path with four hops. The ordinary path with its seven hops doesn't seem to contribute to propagation.*

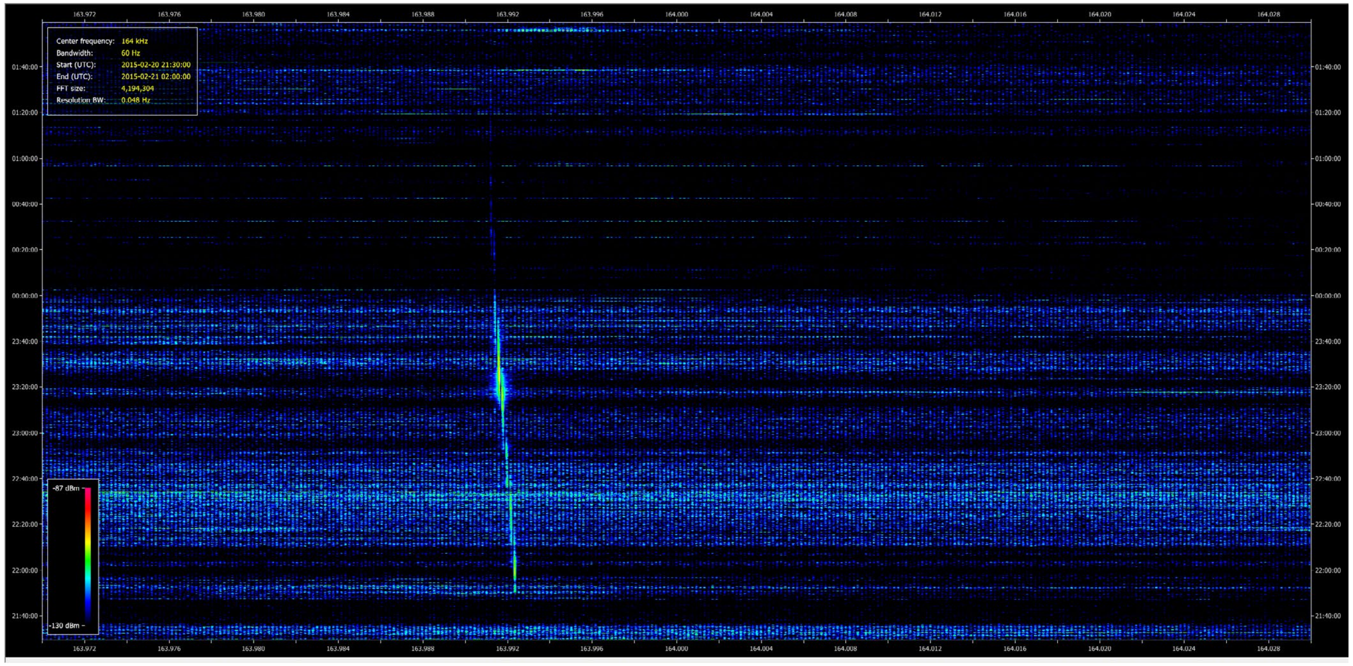


Figure 7: Ulaanbaatar *on 164 kHz. DK8OK, 2015-02-20.*

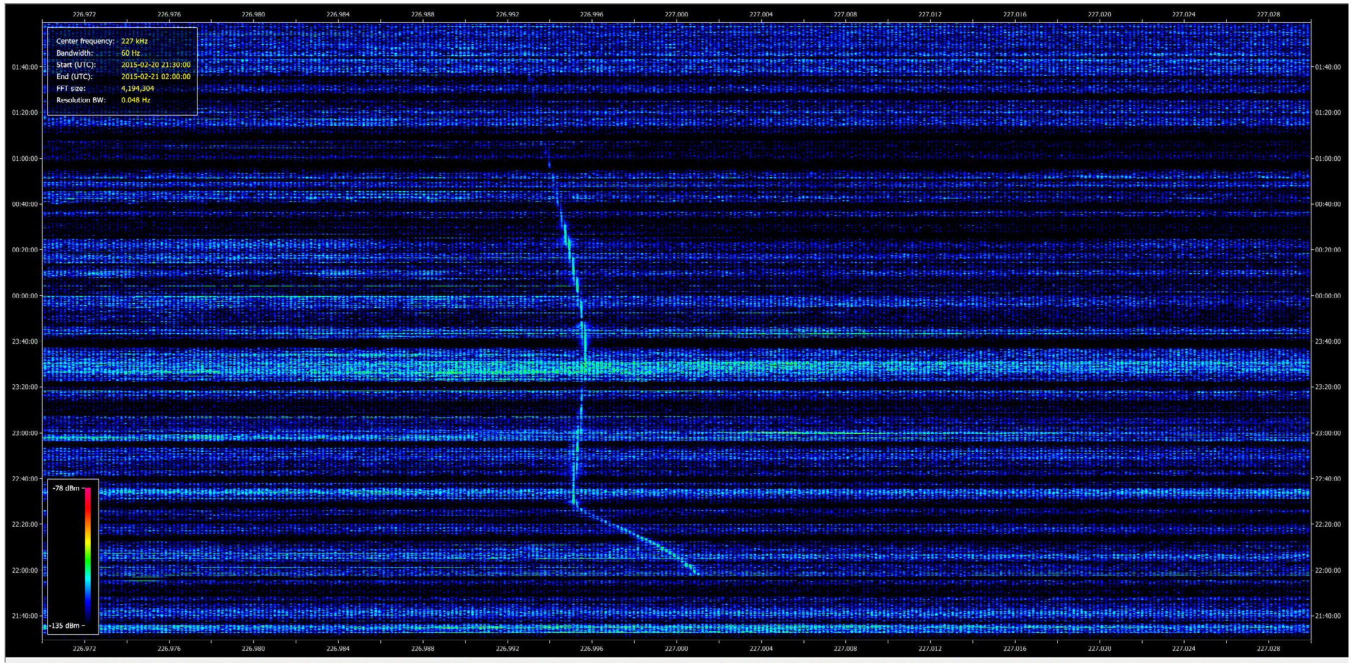


Figure 8: Altai *on 227 kHz. DK8OK, 2015-02-20.*

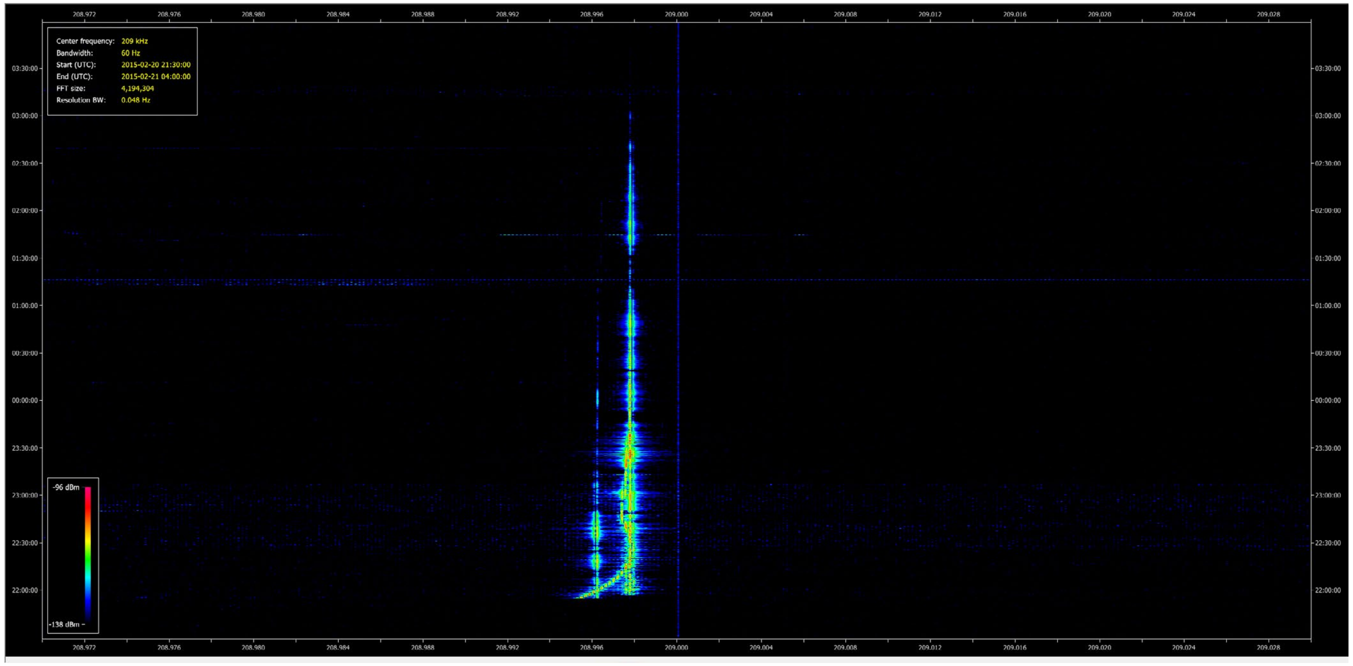


Figure 9: Choibalsan, Ölgii *and* **Dalandsadgad** *on 209 kHz. DK8OK, 2015-02-20.*

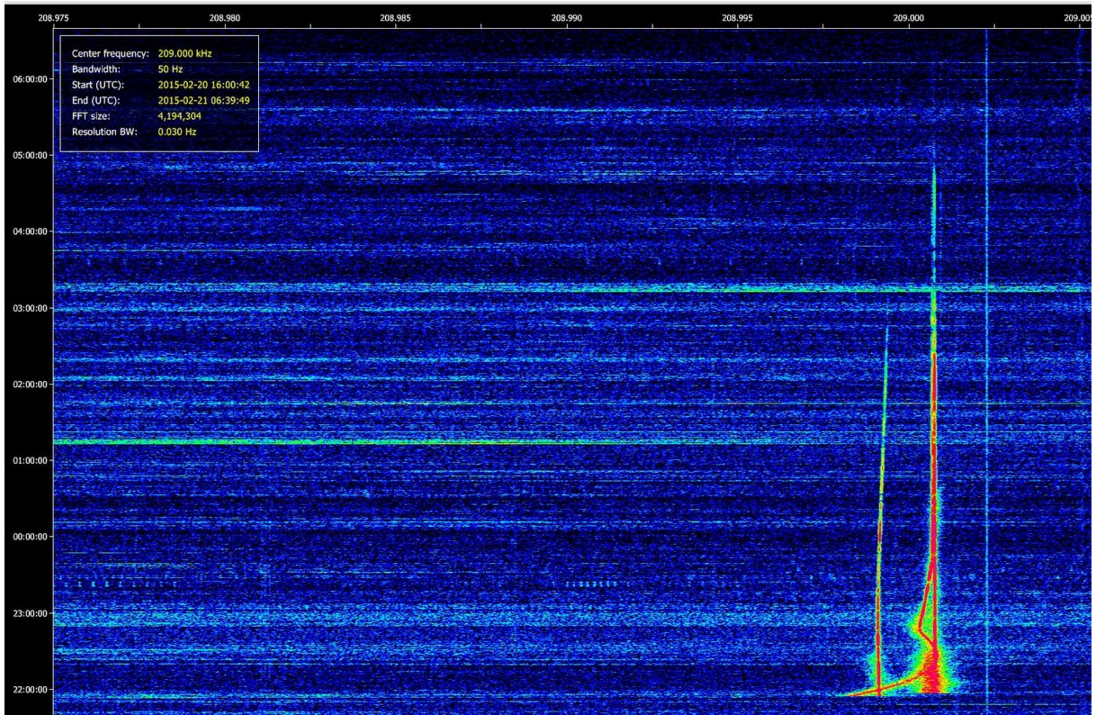


Figure 10: Choibalsan, Ölgii *and* **Dalandsadgad** *on 209 kHz. Hartmut Wolff, 2015-02-20*

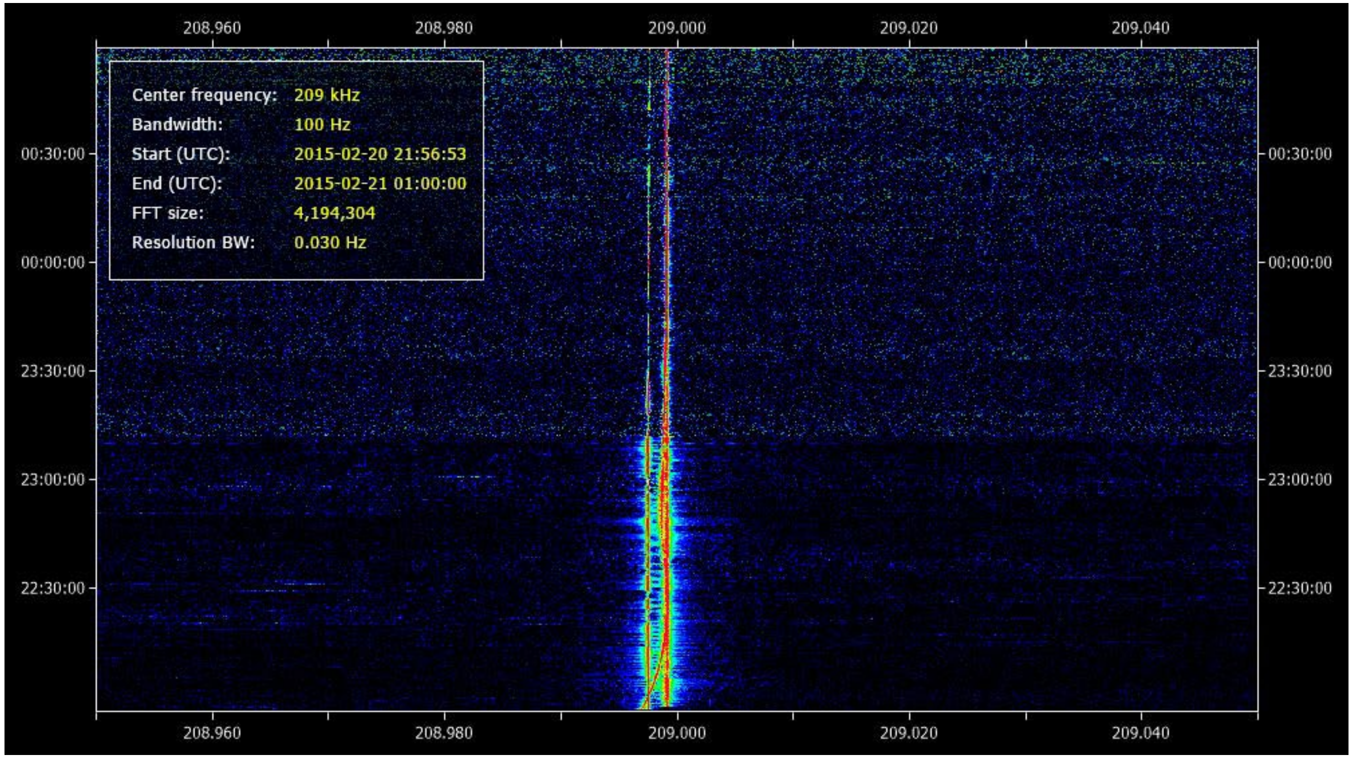


Figure 11: Choibalsan, Ölgii ***and*** **Dalandsadgad** ***on 209 kHz. OE2CRM, 2015-02-20 changed at 23:00 UTC from Beverage to Windom.***

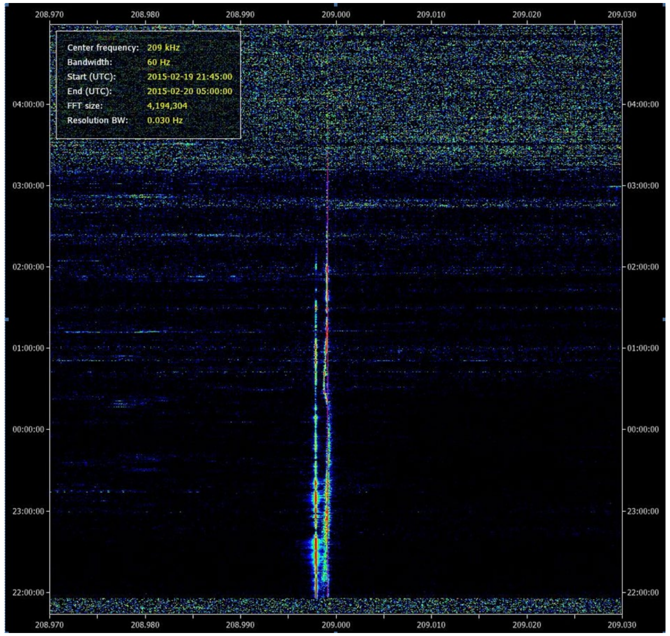
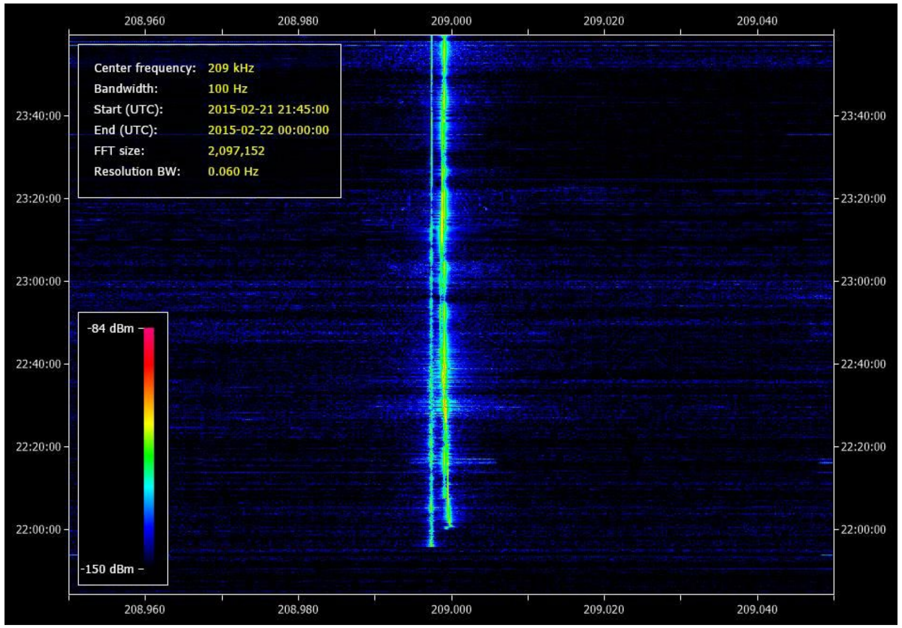


Figure 12: Choibalsan, Ölgii ***and*** **Dalandsadgad** ***on 209 kHz. OE2CRM, 2015-02-19***

Figure 13: Choibalsan, Ölgii ***and*** **Dalandsadgad** ***on 209 kHz. OE2CRM, 2015-02-21***



When it come to the “cluster” of three transmitters on 209 kHz (*Figures 9* to *13*), you see the transmitter lowest in frequency and weakest in signal f/out around 23:30 UTC (*Figure 13*). Hence, this must be Choilbasan in the Far East. The sunrise there almost coincides with f/out. It has been a bit difficult to disentangle the other two station because they are very close together. This has been tried to do with the 10 Hz/2,5 Hz windows of SBSpectrum, a software from Peter Martinez, G3PLX.

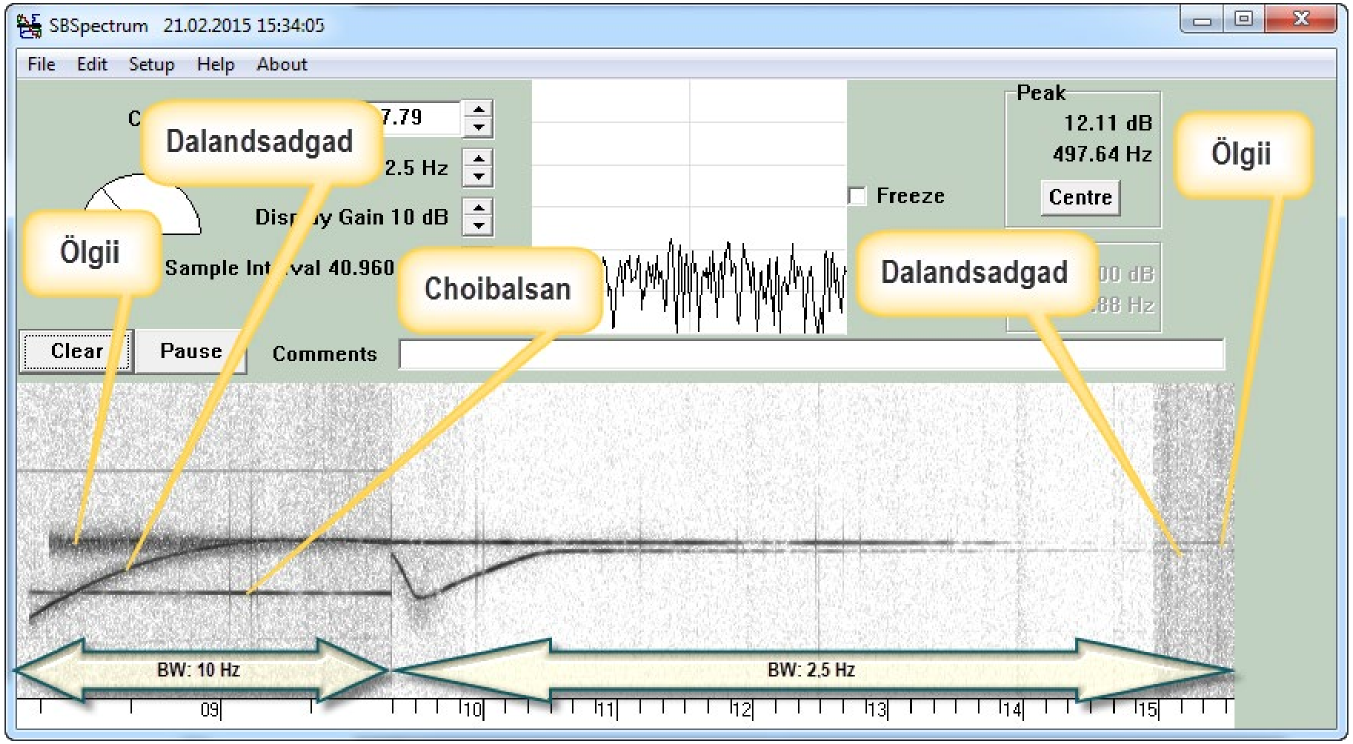


Figure 14: (top right) Here you see a sonagram from a recording of 209 kHz, concentrated on the two stations in close vicinity. The sonagram starts at a bandwidth of 10 Hz, showing also Choibalsan. After switching to a window of only 2,5 width, this transmitter falls out of it, because this station is 1,8 Hz down from this center frequency. You see two signals starting roughly at the same time (actually around 21:58 UTC). One has nearly no frequency drift over many hours, the other shows some drift at the start. This station also is slightly lower (-0,05 Hz) than the first station. This “lower” station fades out earlier. Hence, the station starting at a lower frequency should be Dalandsadgad with earlier local sunrise, the “higher” one Ölgii with later local sunrise and their new (May, 2012) transmitter TRAM150L of Transradio, Berlin.

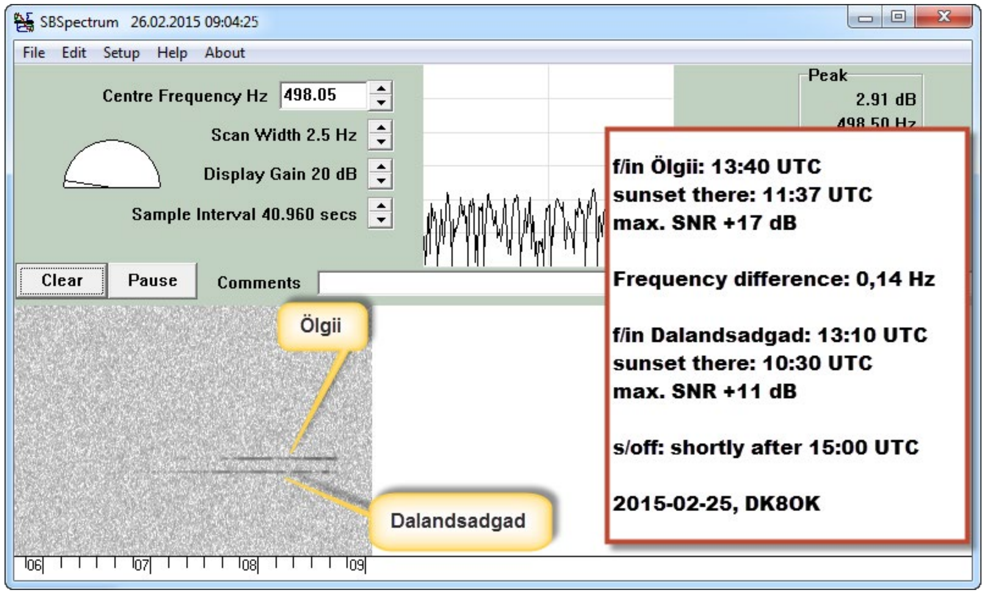


Figure 15: Fade-in an s/off in SBSpectrum‘s 2,5 Hz window in the afternoon at DK8OK.

Analysis DK8OK, 2015-02-20

All transmitter so sign on some minutes before 22:00 UTC. Only two of them (both at nominal 209 kHz) do not show some drift during warm-up time and/or during transmission.

The frequency scale has to be corrected by +1,57 Hz. The GPS synchronization of the receiver must had been switched off because it's introducing a sawtooth-like trace of 0,5 Hz.

- **164 kHz, Ulaanbaatar**
  Surprisingly weak for 500 kW. Max. long-time drift of under 3 Hz. Strongest signal at 23:20 UTC, 25 minutes after local sunrise. At this time also some doppler, as seen from the widening of the trace. Faded out at around 01:30 UTC or 90 minutes after local sunrise.
- **209 kHz, Choibalsan**
  No drift, ≈208,9975 kHz. Faded out at around 01:30 UTC or 90 minutes after local sunrise.
  Max. SNR of carrier ≈+28 dB at a bandwidth of 0,048 Hz, or -47 dB at 3 kHz bandwidth.
- **209 kHz, Dalandsadgad**
  Drifting at warm-up max +3 Hz in 40 minutes, slowly settling on slightly below nominal channel (≈208,99942 kHz). Fade out about 100 minutes after sign-on.
  Max. SNR of carrier ≈+36 dB at a bandwidth of 0,048 Hz, or -39 dB at 3 kHz bandwidth.
- **209 kHz, Ölgii**
  No drift, ≈208,9995 kHz.
  Max. SNR of carrier ≈+30 dB at a bandwidth of 0,048 Hz, or -45 dB at 3 kHz bandwidth.
- **227 kHz, Altai**
  Strongest drift of nearly 10 Hz, mostly during warm-up within the first 40 minutes. Faded out at 01:40 UTC or nearly 60 minutes after local sunrise.

Analysis Hartmut, 2015-02-20

Hartmut provided an impressive screenshot of 209 kHz with strong signals over an exciting length of time.

- **209 kHz, Choibalsan**
  Very slight drift, clearly visible here thanks to the long time of reception. Faded out at around 03:00 UTC or three hours after local sunrise.
- **209 kHz, Dalandsadgad and Ölgii**
  Drift not different to was said under DK8OK. Fade out well after 05:00 UTC or at least four hours after their local sunrise.

At Hartmut and Christoph, the audio was strong enough to allow for loudspeaker/headphone listening. Nils had made out only scraps of the interval signal. We decided, not to publish these audio clips, due to possibly „rye-bolding“ – a homonymous art getting QSLs from stations never heard by himself „on the air“ …

Receiving equipment:

- Hartmut Wolf - Perseus, active K9AY
- DK8OK - SDR-IP by RFSpace, quadloop of 20 m circumference
- OE2CRM - Winradio ExcaliburPRO & Persëus, 100 m Beverage
- Software: SDR-Radio.com 2.3, SBSpectrum 0.3, PropLab 3.0, Adobe Audition 6.0, DX Atlas

Locations of the transmitters on Google/bing maps:

- Altai (75 kW): ***Google*** ***bing***
- Choibalsan (75 kW): ***Google*** ***bing***
- Dalandsadgad (75 kW): ***Google*** ***bing***
- Ölgii (35 kW): ***Google*** ***bing***
- Ulanbaataar (500 kW): ***Google*** ***bing***

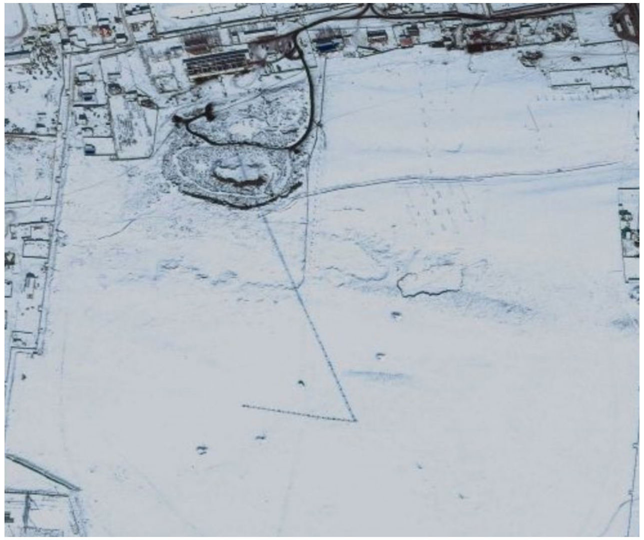


Figure 16: Ölgii transmitter site - caught by Google in winter time …

Figure 17: … whereas bing got the site with even more details (radials!) without snow.

Wolfgang, DF5SX, is an avid collector of all things with a radio touch. He supplied us with many pictures and information from which we present here a small selection on this and the following page.

Figure 20: Transmitter housing, Choibalsan

Figure 21: The team at Choibalsan transmitter

Figure 18: The team at Dalandsadgab transmitter

Figure 19: Open feeder line from transmitter to antenna at Dalandsadgab

Figure 22: Old transmitter housing, Ölgii

Figure 23: Inaugarating the new Transradio transmitter (fit for DRM, see above!) at Ölgii

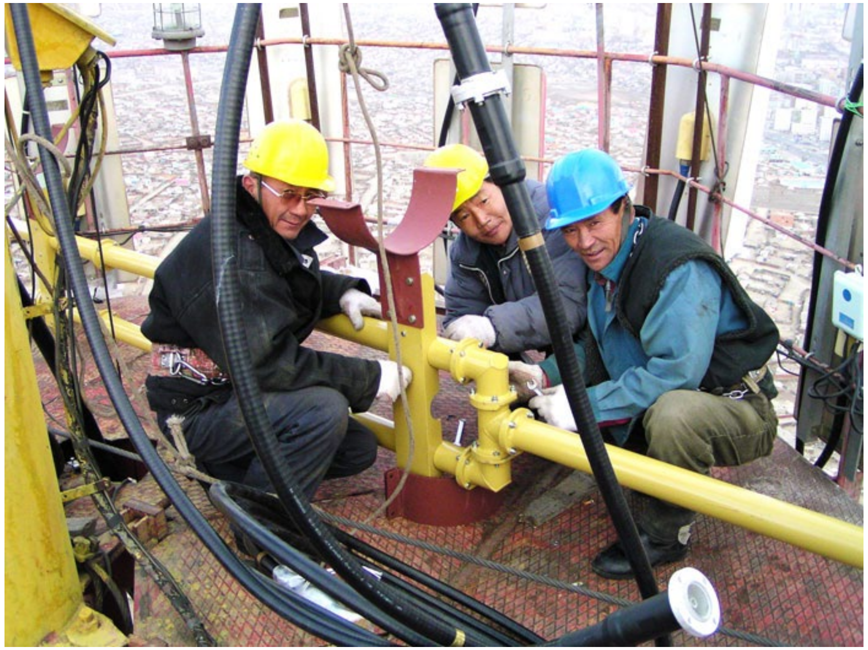


Figure 24: Working high on the transmitter tower, Ölgii