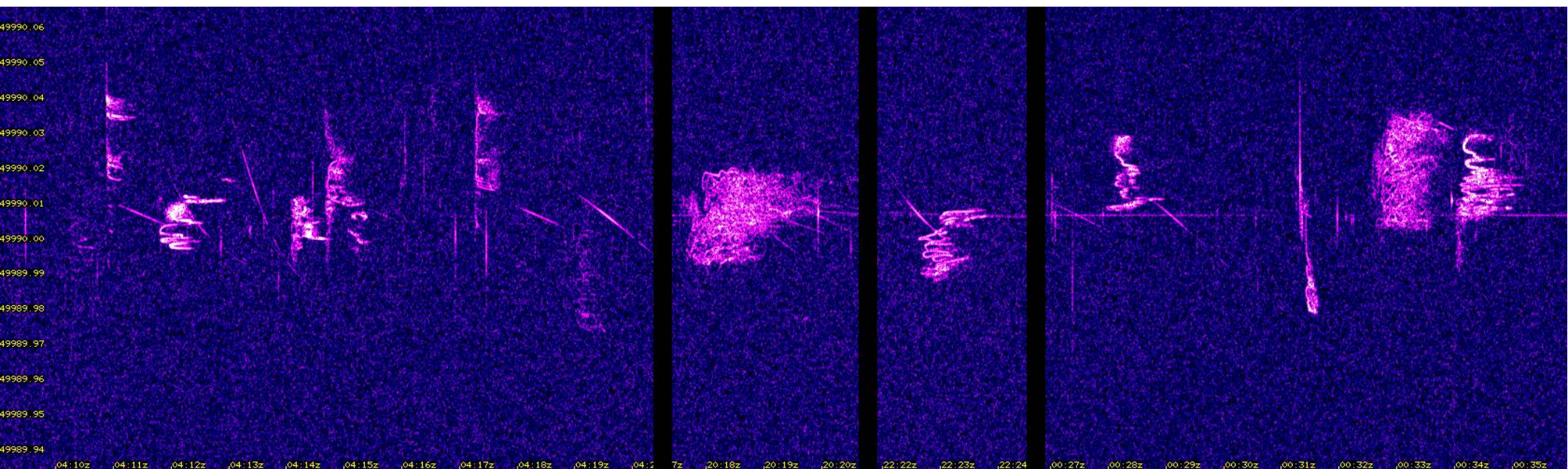




Building the CAMRAS 'Meteor Scatter' webSDR

by Simon Bijlsma PA7SB



How did it all start?



The first demonstration of meteor detection with a FT817 transceiver with only it's 'rubber ducky' antenna (2009).



'Tales at the fence' ('Hekvertellingen')





Demonstration of 'meteor scatter'

- Since then at every public event at the telescope I had put up my portable 'meteor scatter' station for demonstration.
- With a home made 4 element 2m Yagi and a Yaesu FT 817 as receiver. Occasionally with laptop and FFT software for visual representation of the meteor echoes.
- Visitors liked the demonstrations and often were amazed by the results with the very modest equipment used.



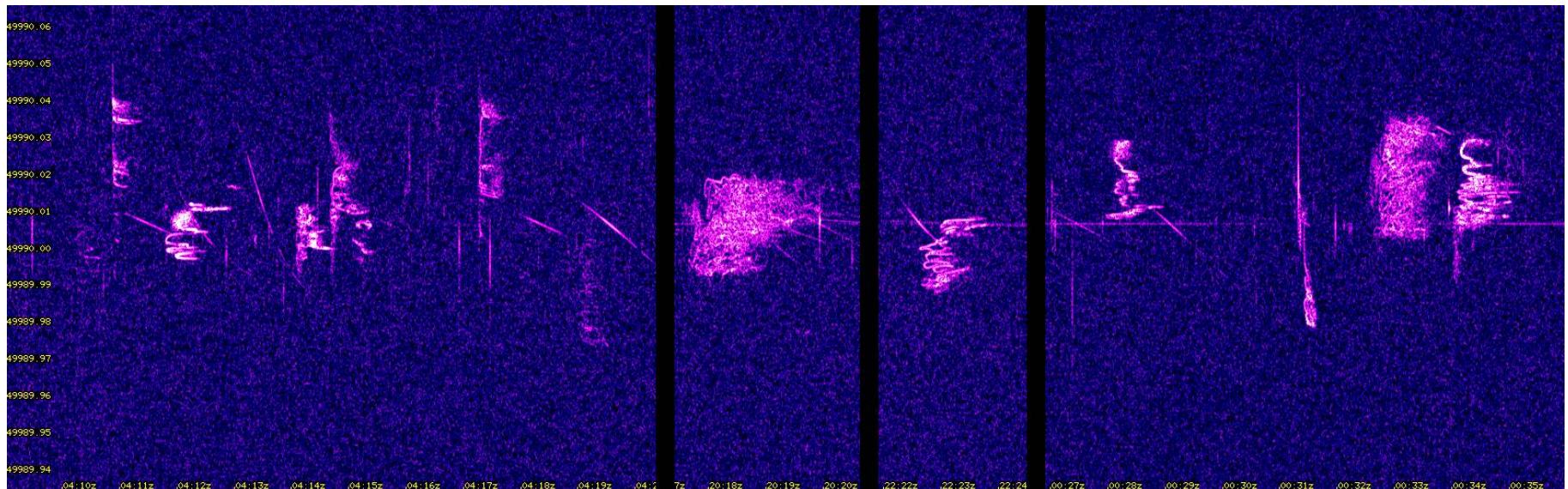
My portable 'meteor scatter' station.





2011 Perseid shower event

- Together with Megan Argo, Pieter Tjerk de Boer and Paul Boven we simultaneously recorded meteor echoes on several 6m frequencies.
- Aim was to detect the meteor trajectory
- Analogue TV transmitters on 49.740 MHz e.a..
And the Ypres meteor beacon on 49.990 MHz (see picture below).





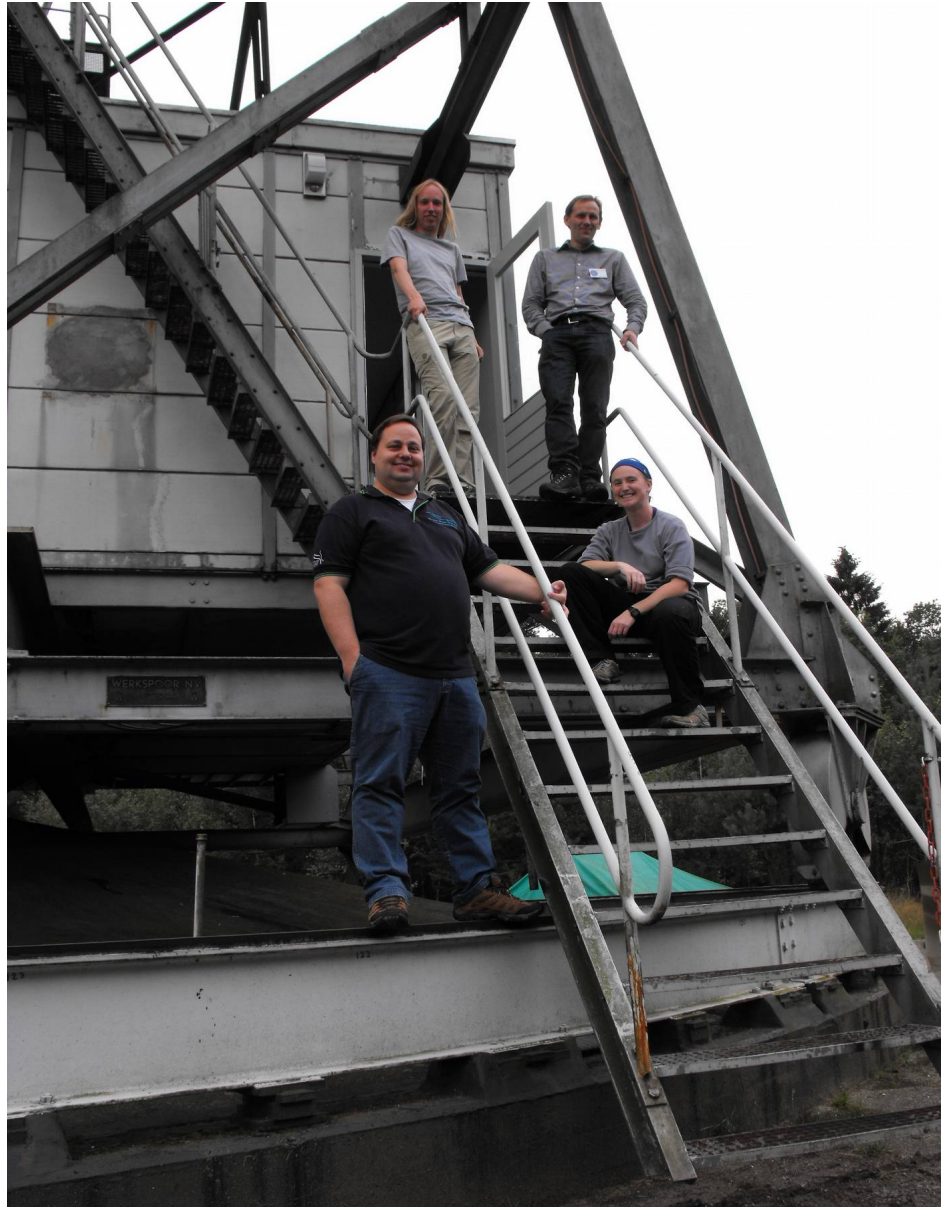
The 2011 'Meteor Scatter Crew'

Pieter-Tjerk

Simon

Paul

Megan





Testing and trouble shooting





For 6m we used a LOFAR LBA antenna



The webSDR stream of 6m was online during the weekend of the Perseid meteor shower maximum.



Also the French GRAVES space radar



We used my 4 element DL6WU Yagi antenna for reception of echoes from the GRAVES space radar.



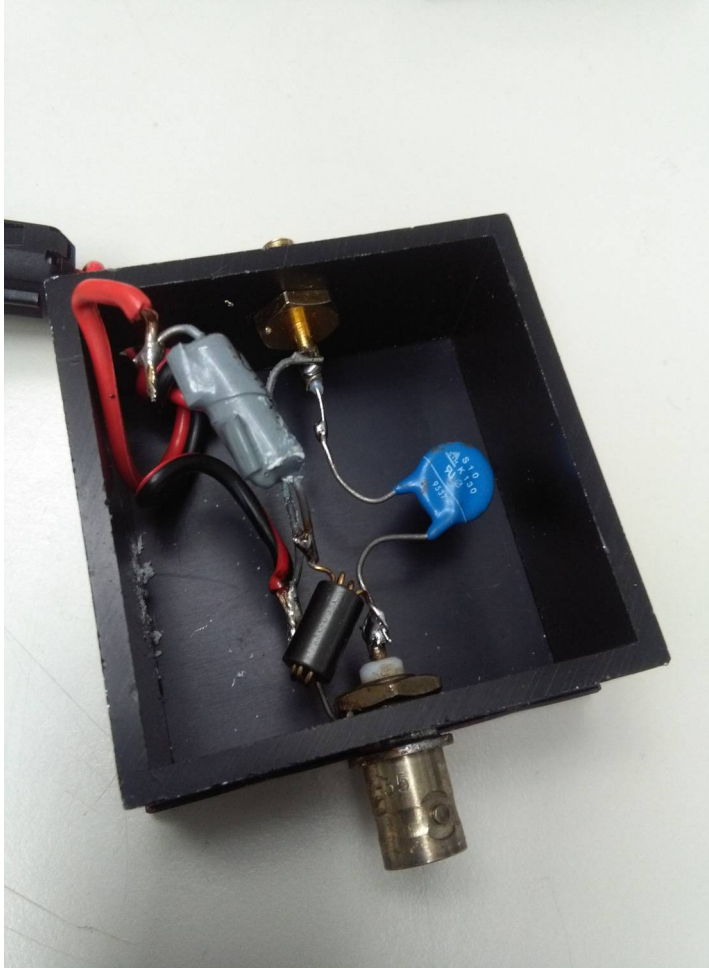
A more permanent online 'meteor scatter' receiver

- During 2012 – 2014 the telescope restoration took place
- In 2016 the first test setup was operational for several months from summer until late October.
- At first only 2m with a common RT820 t1 RTL SDR dongle.
- A short test followed with 6m.
- Unfortunately the test was forced to end by a cut coax cable through a mower.
- Besides the antenna area underwent changes like removing of trees etc.. The receiver went silent.





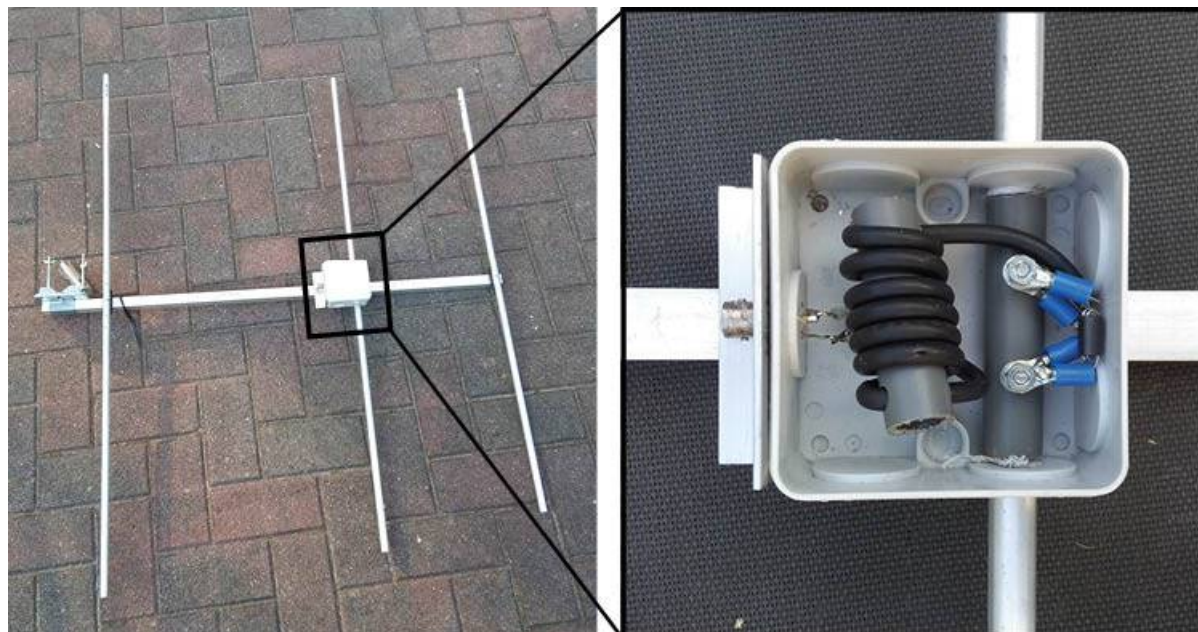
The 2016 hardware



- Bias T and old RTL SDR RT820 t1 dongle in aluminium case



Home made DK7ZB Yagi antennas





The 2016 aerial setup

3 el. 2m Yagi



5 el. 2m Yagi



3 el. 6m Yagi





The 'Radio garden' area 2016 vs 2018





In 2017 a new project started

- Again an aerial was set up for 2m reception.
- Also simultaneously one for 6m too.
- More stable RTL SDR dongles V3 aluminium cases and 1ppm TCXO.
- LOFAR 'coax 9' cable for 2m
- RG223 coax cable for 6m





At first a 5 element Yagi and a 2 element HB9CV were used





Later we installed a 3 element Yagi for 6m



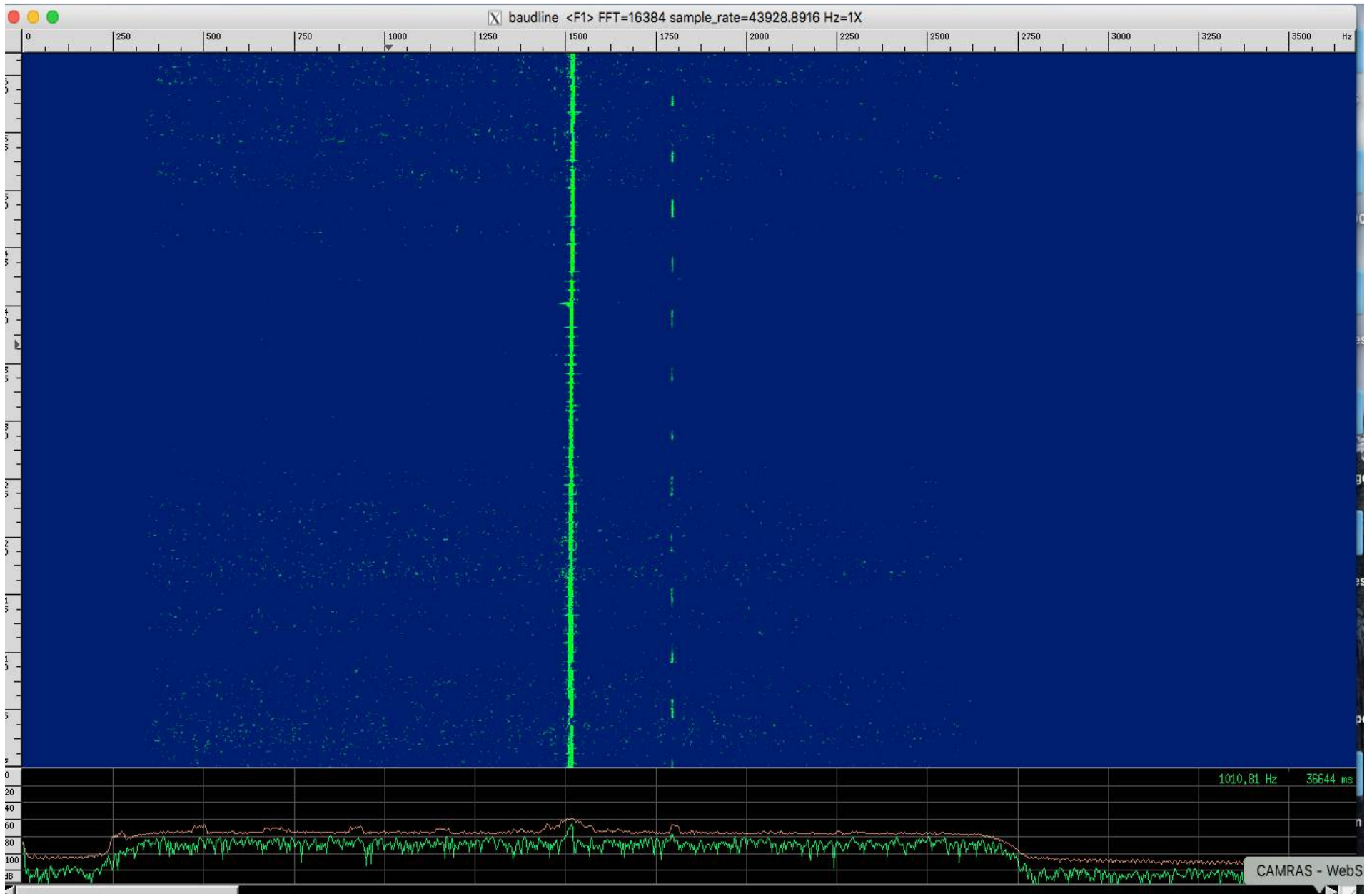


Now on seperate masts



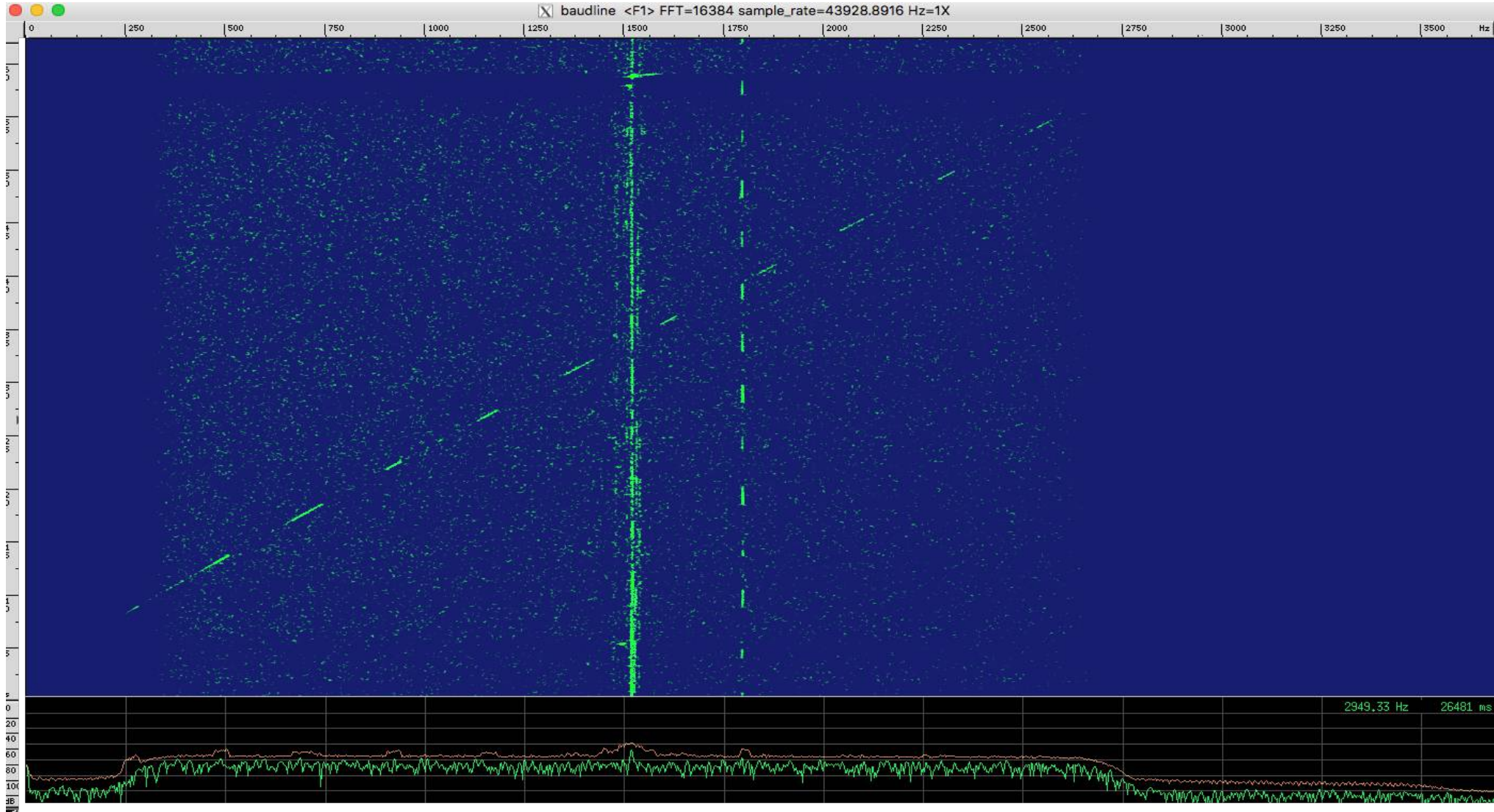


2m GRAVES Moon echoes





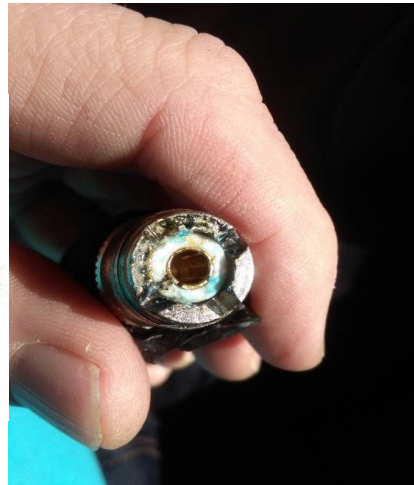
Satellites: here you can see ISS





Some difficulties again

- After a brief successful period interference occurred in both 6m and 2m reception.
- Discovery of a soaked 6m LNA box and connectors inside vulcanising tape. Fortunately the SSB Electronics LNA was not lost (LNA@0.25 dB NF factory specs. Not yet verified).
- Although still working well the 2m Trontech LNA was replaced for a G4DDK LNA with a lower noise figure (from 1.5 dB to 0.7 dB NF homemade and verified).





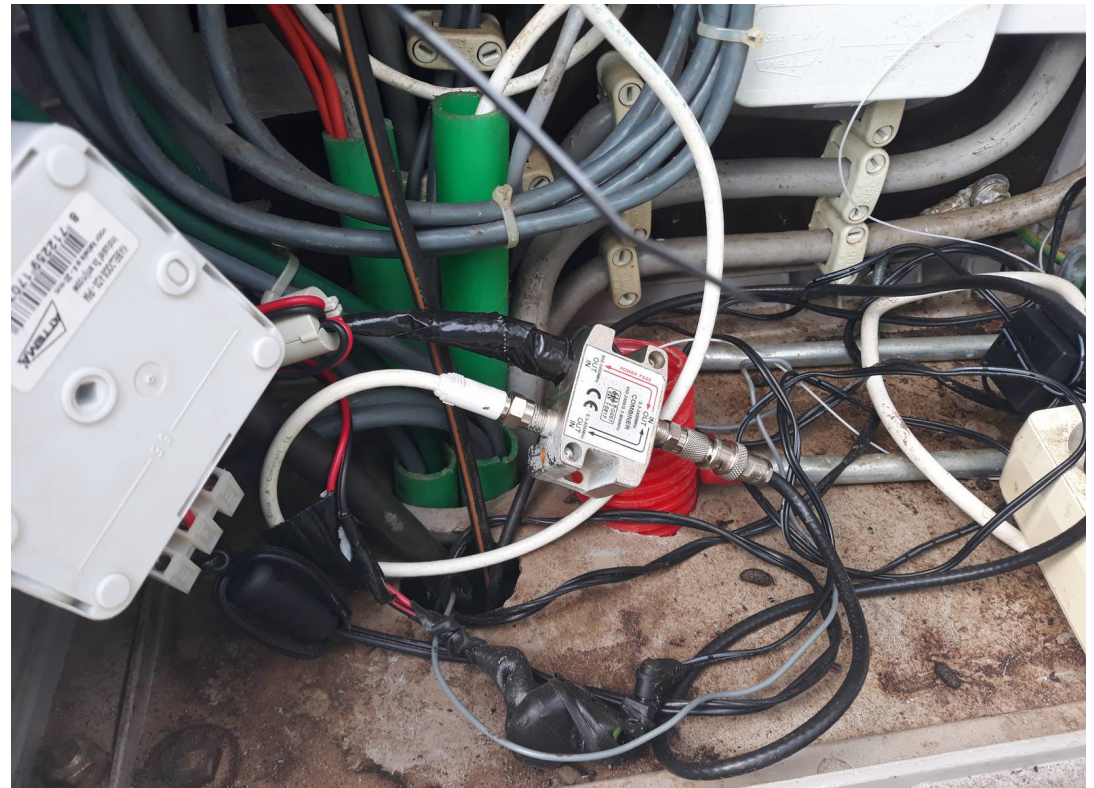
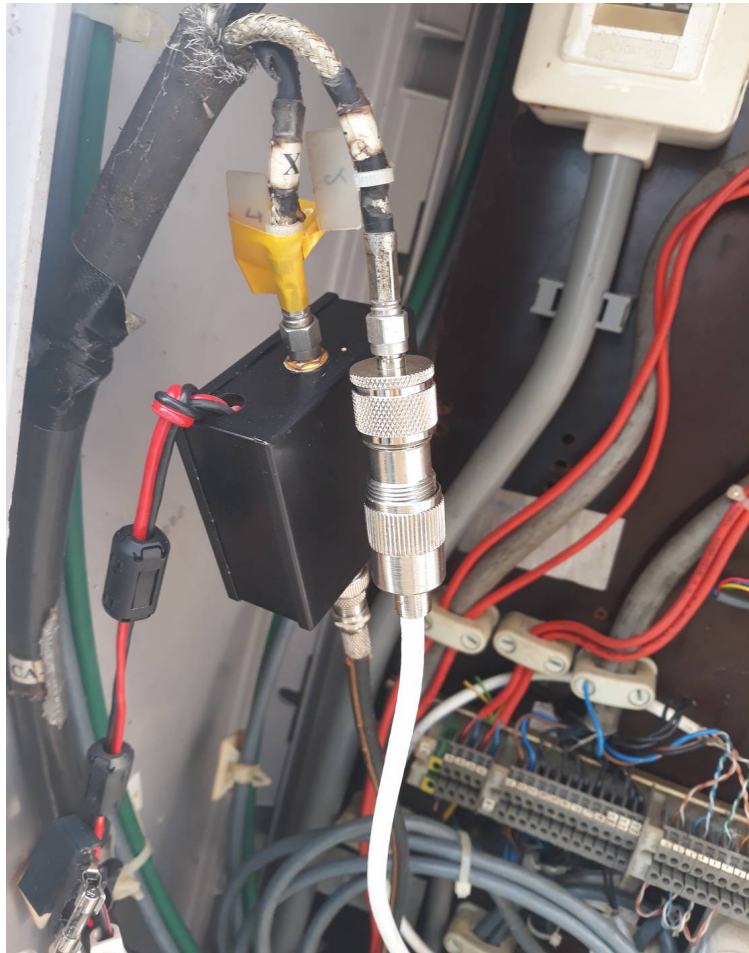


RaspberryPi





Bias Tee





RFI and birdies on 6m

- Our latest improvement was made by changing the RG58 patch cable by a teflon RG400 cable and installing a 20dB RF attenuator at the input of the RTL dongle.
- A lot less noise! Improved SNR
- Almost every birdie is gone!
- Sensitivity is still the same!
- Dozens of propagation beacons are heard from all over Europe and beyond on frequencies previously covered in birdies.





Improved SNR on 2m

Safari Archief Wijzig Weergave Geschiedenis Bladwijzers Venster Help

websdr.camras.nl

Startpage Web Zoek CAMRAS - WebSDR

The 6 m band receiver uses a 3-element yagi antenna bearing south, 5 m above ground in the radio quiet zone near the radio telescope. Its aim is to listen for meteor echoes from the Belgian beacons (Dourbes and Ieper).

More WebSDR receivers for other bands can be found via <http://www.websdr.org/>.

Your name or callsign: PA7SB

View: ☐ all bands ☐ others slow ☒ one band ☐ blind Allow keyboard: ☐

Waterfall: ☐ Java ☒ HTML5 Sound: ☐ Java ☒ HTML5

Frequency: 143048.60 kHz
Band: ☐ 70cm ☐ 23cm ☒ 2m ☐ 6m
Or tune by clicking/dragging/scrollwheel on the frequency scale.

Memories:

recall	erase	store	frequency	mode	callsign
			49968.50 kHz USB		Dourbes
			49988.50 kHz USB		Ieper
			50020.72 kHz USB		LX0SIX
			144473.50 kHz USB		DB0HRF
			144416.50 kHz USB		ON0VHF
			50423.50 kHz USB		PI7SIX
			50439.50 kHz USB		ON0SIX
			50481.50 kHz USB		DB0DUE
			143048.60 kHz USB		GRAVES

Bandwidth: 2.49 kHz @ -6dB; 2.95 kHz @ -60dB.
wider CW-wide LSB USB AM FM
narrower CW-narrow LSB-nrw USB-nrw AM-nrw
Or drag the passband edges on the frequency scale.

Waterfall view:
zoom out zoom in
max out max in
Or use scroll wheel and dragging on waterfall.
Speed: slow
Size: medium
View: waterfall
☐ Hide labels

Signal strength: -97.2 dB; peak -96.2 dB;
☐ mute ☐ squelch ☐ autonotch
Volume:
Audio recording: start
Signal strength plot: none

Logbook:
Call of station that you hear:
Comments, if any: submit
Note: time, frequency, your name/call, and DXCC information are added automatically.
View the [last 20 lines of the logbook](#), or the [entire logbook](#) (ctrl-click for new tab/window).



Improved SNR on 6m

Safari Archief Wijzig Weergave Geschiedenis Bladwijzers Venster Help

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6m receiver for meteor echoes

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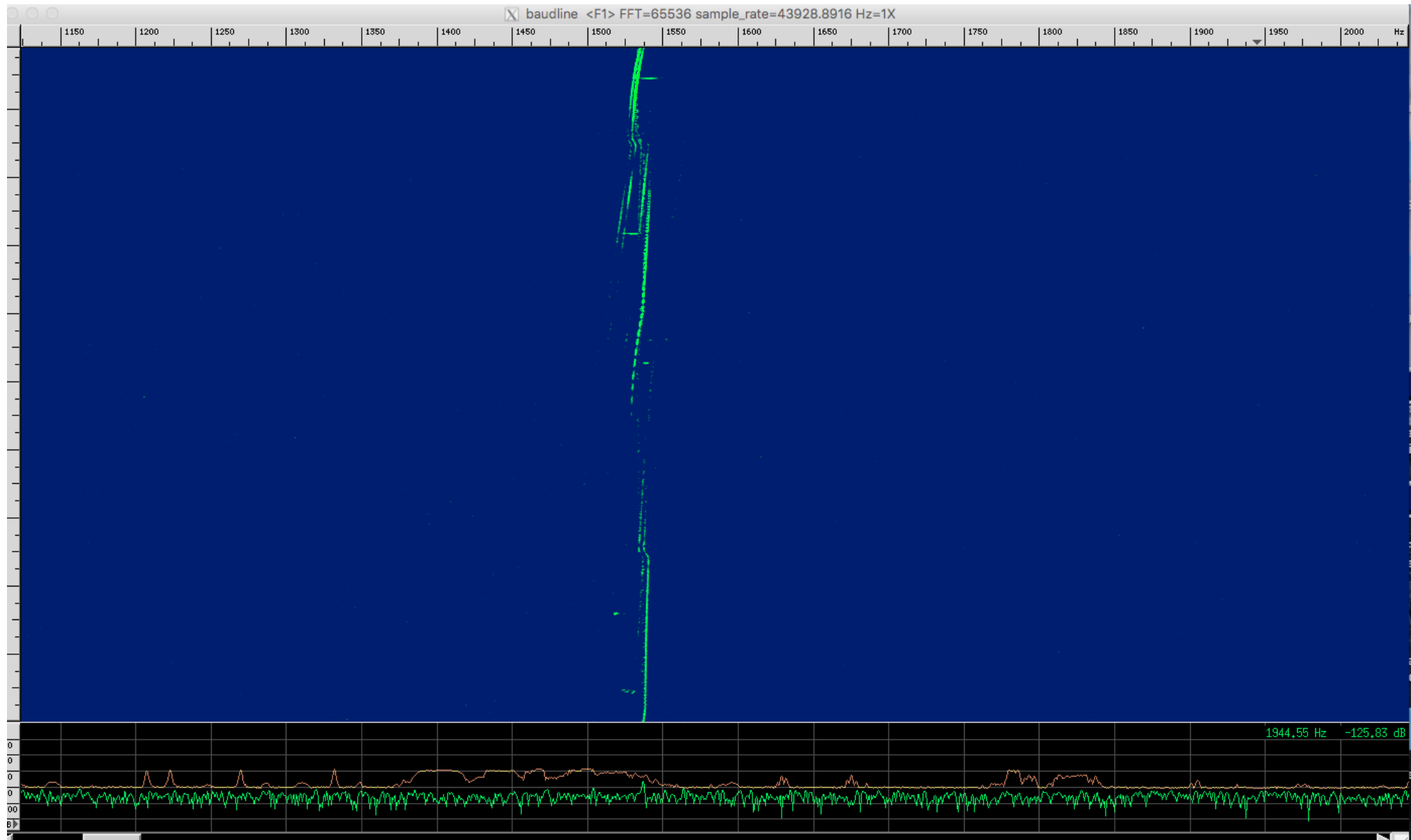
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Airplanes on the Dourbes beacon



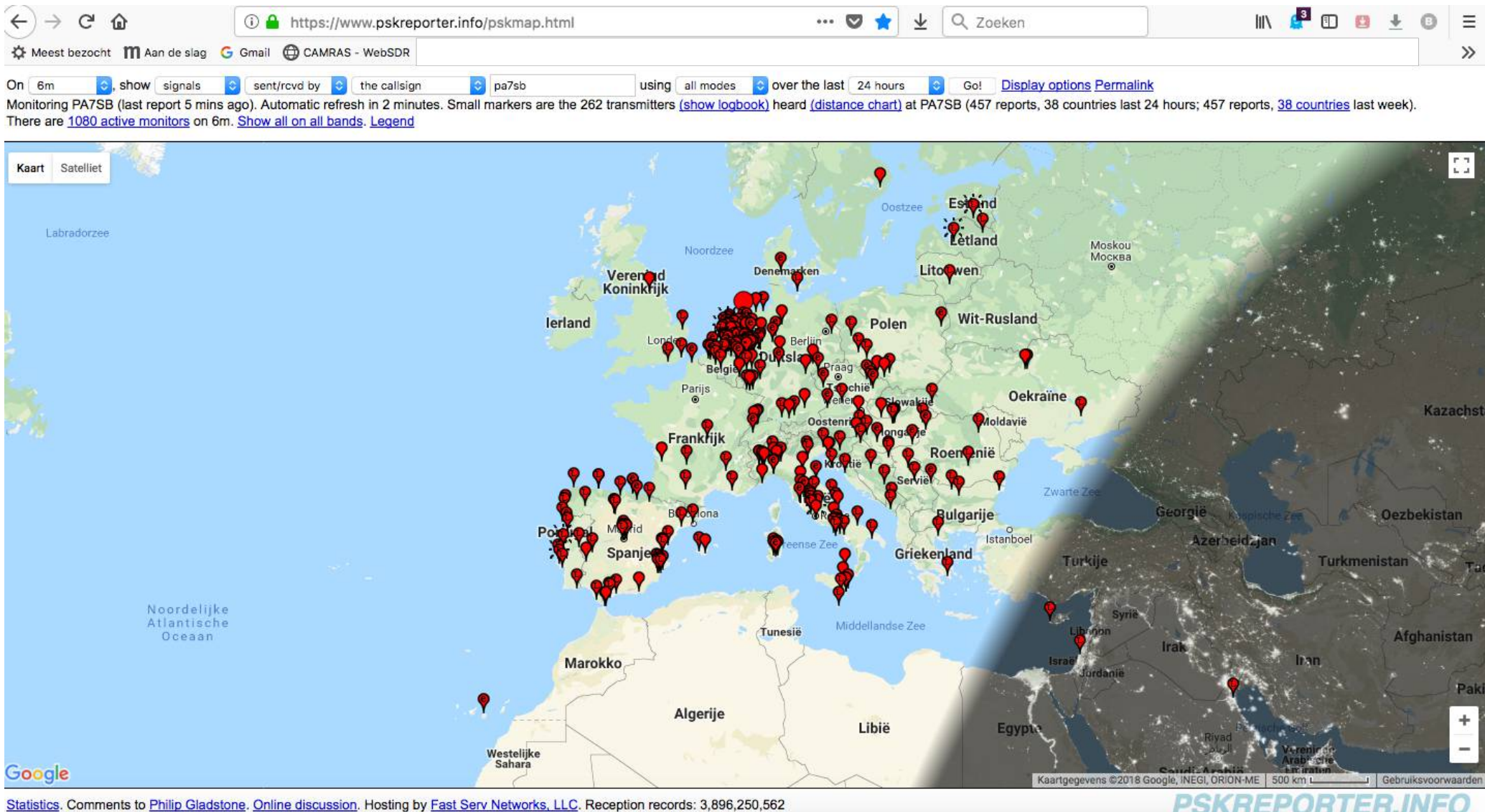


Some of the 6m Beacons heard with the webSDR

- LX0SIX C30SIX EA4KM IW3FZQ ED6YAI
- ON0SIX OH7SIX EI0SIX IZ1EMP F5ZMT
- DB0DUB 9H1SIX IK5ZUL I0JX GB3BUX
- PI7SIX JW5SIX IS0BSR HG88VD F6IKY
- HB9HG IQ8KK E73SIX IZ3GWJ IZ3OHR
- OK0ON IQ4FE TF1VHF SR1DAR IQ0SM
- GB3LP (FM repeater) GB3SL (FM repeater)
- unknown 50.400 MHz(Italian?) FM repeater
- unknown 50.420 MHz(Italian?)FM repeater



'PSK reporter' plots of received stations





Future development

- We aim to install a permanent 10m high mast for both 2m and 6m.
- Fibre optic internet connection.
- The receivers will be installed inside a shielded metal container (LOFAR).
- A setup for receiving 'radio JOVE' on 20.1 MHz
- 3m dish for EME and interferometry reception with the Dwingeloo telescope.





20.1 MHz 'Radio JOVE' antenna





Future 'Radio Garden' 2018?





Questions?

Thank You!

Please visit: <http://websdr.camras.nl:8901>



Simon Bijlsma PA7SB