International Meteor Conference
Sibiu, 14-18 September 2011

SDR – radio meteor affordable approach

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Radio meteor forward scatter station hardware defined receivers

Icom PCR1000

AOR AR5000

Icom R75

Yaesu VR5000

Requirements:

- Frequency agile
- Single Side Band SSB demodulator
- Allowing to turn the AGC off

Software Defined Radio

A software-defined radio system, or SDR, is a radio communication system where components that have been typically implemented in hardware (e.g. mixers, filters, amplifiers, modulators/demodulators, detectors, etc.) are instead implemented by means of software on a embedded computing devices or a personal computer.

While the concept of SDR is not new, the rapidly evolving capabilities of digital electronics render practical many processes which used to be only theoretically possible.

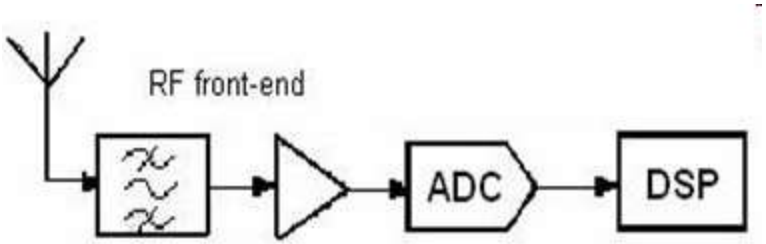
A basic SDR system may consist of a personal computer equipped with a sound card, or other analog-to-digital converter, preceded by some form of RF front end. Significant amounts of signal processing are handed over to the general-purpose processor, rather than being done in special-purpose hardware.

source: http://en.wikipedia.org/wiki/Software-defined_radio

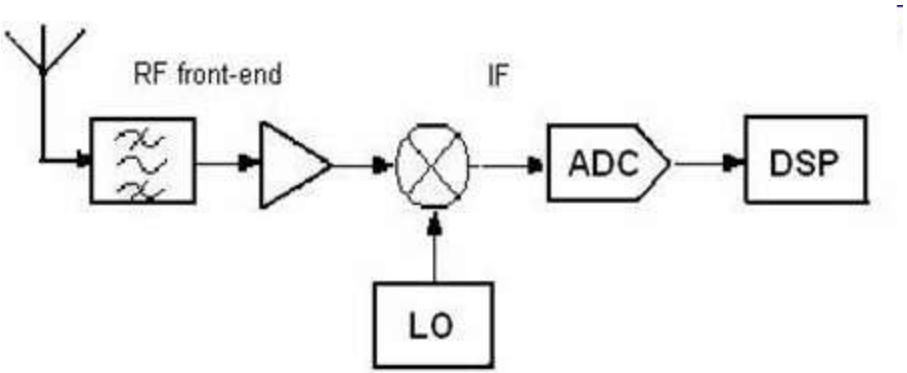
Software Defined Radio

Ideal software defined radio

(Direct sample receiver)

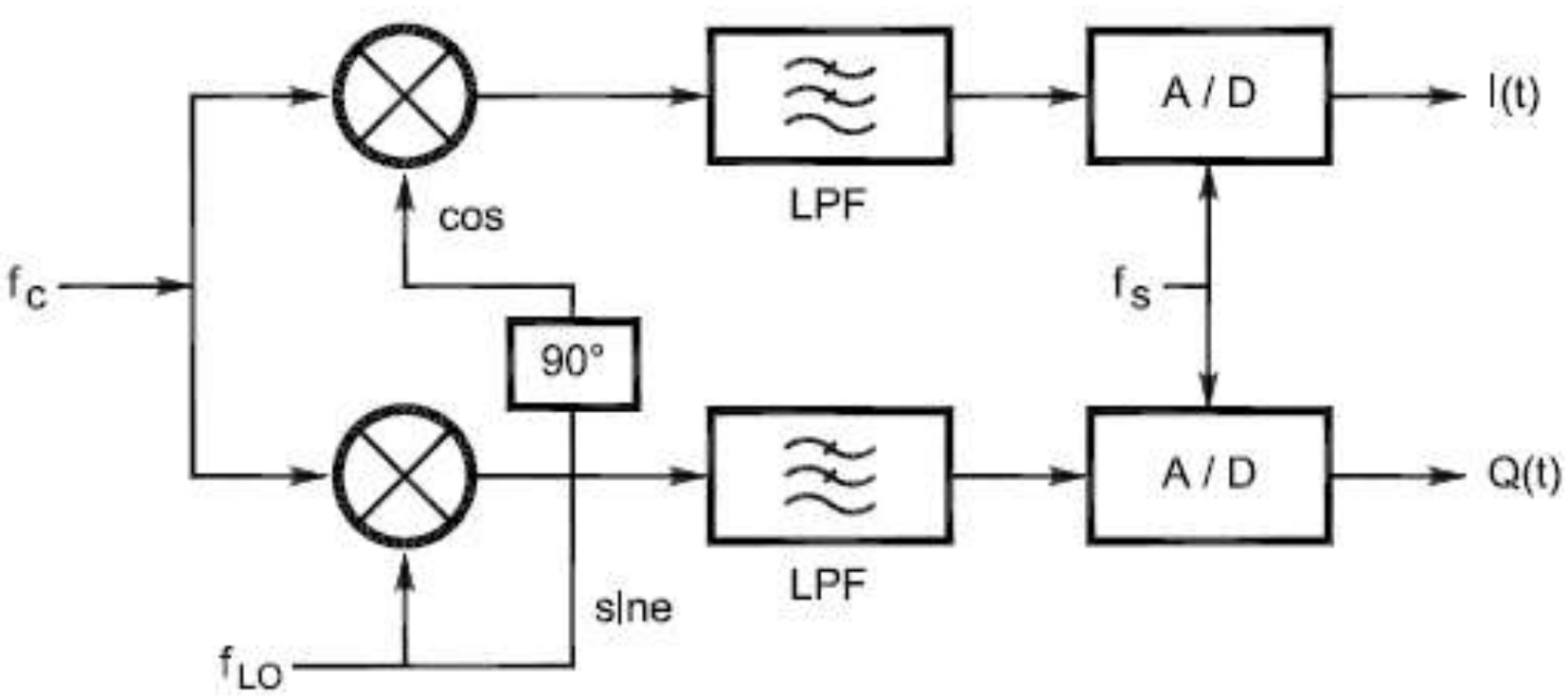


IF-sampled Software Defined Radio.



Source: http://hadmernok.hu/kulonszamok/newchallenges/popescu.html

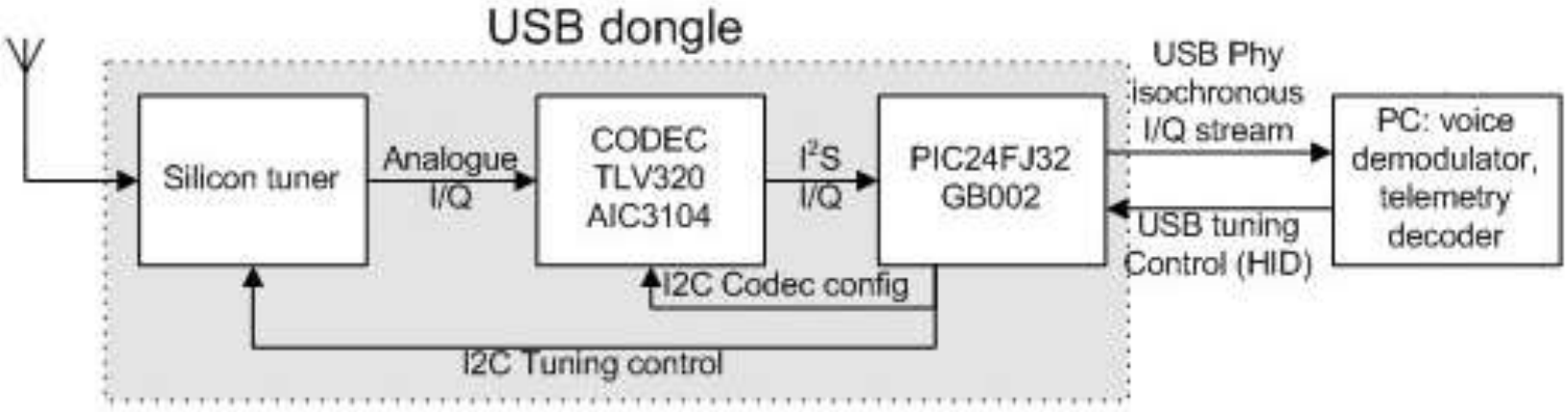
Quadrature Sampling Detector (QSD)



source: http://flex-radio.com/Products.aspx?topic=faq

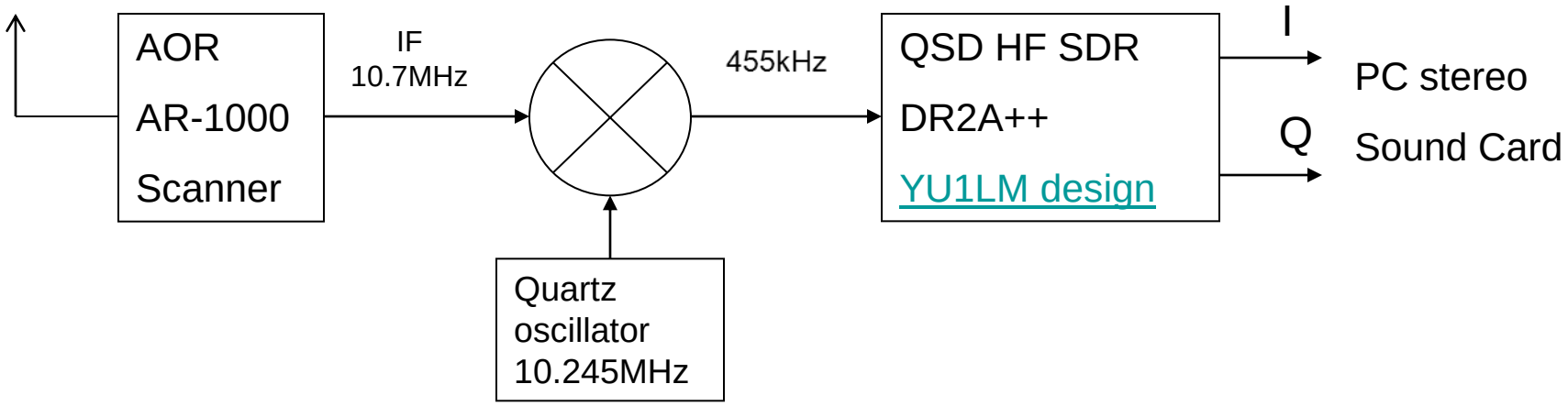
News!!! FUNcube Dongle

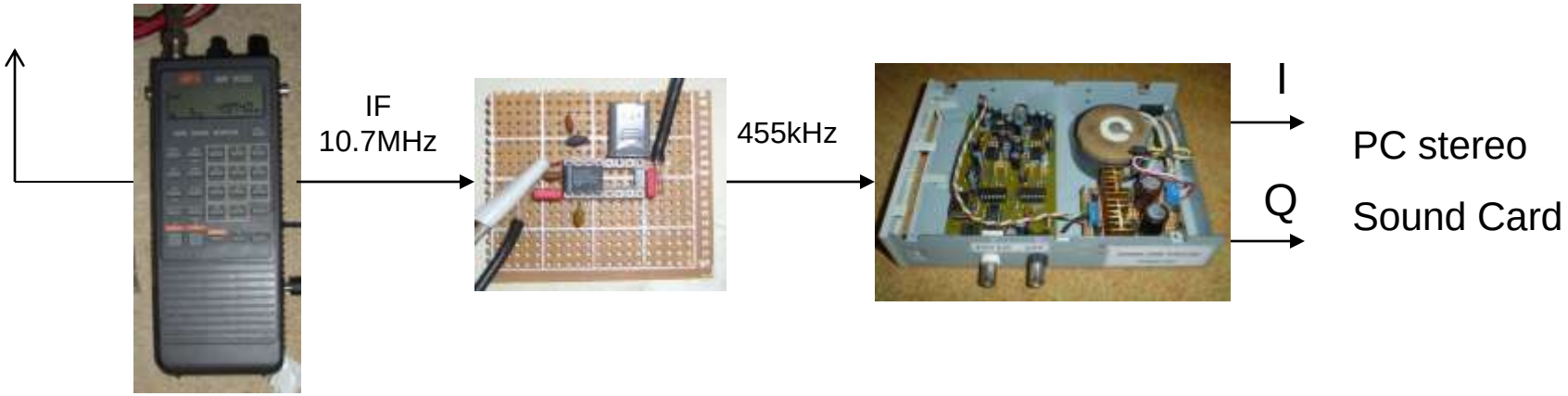
64MHz to 1,700MHz Software Defined Radio



source: http://www.funcubedongle.com/

New life for AM/FM scanners used as panoramic multimode adapters





SDRs for 9 /10.7 MHz IF

http://www.box73.de

http://www.funkamateur.de

WebSDR

“A WebSDR is a Software-Defined Radio receiver connected to the Internet, allowing many listeners to listen and tune it simultaneously.

SDR technology makes it possible that all listeners tune independently, and thus listen to *different* signals; this is in contrast to the many classical receivers that are already available via the Internet.

WebSDR was first conceived as a mean to make the 25 m radio telescope at Dwingeloo available to many radio amateurs for EME reception.”

The application was developed by Pieter-Tjerk de Boer PA3FWM, assistant professor at the Electrical Engineering, Mathematics and Computer Science department of the University of Twente.

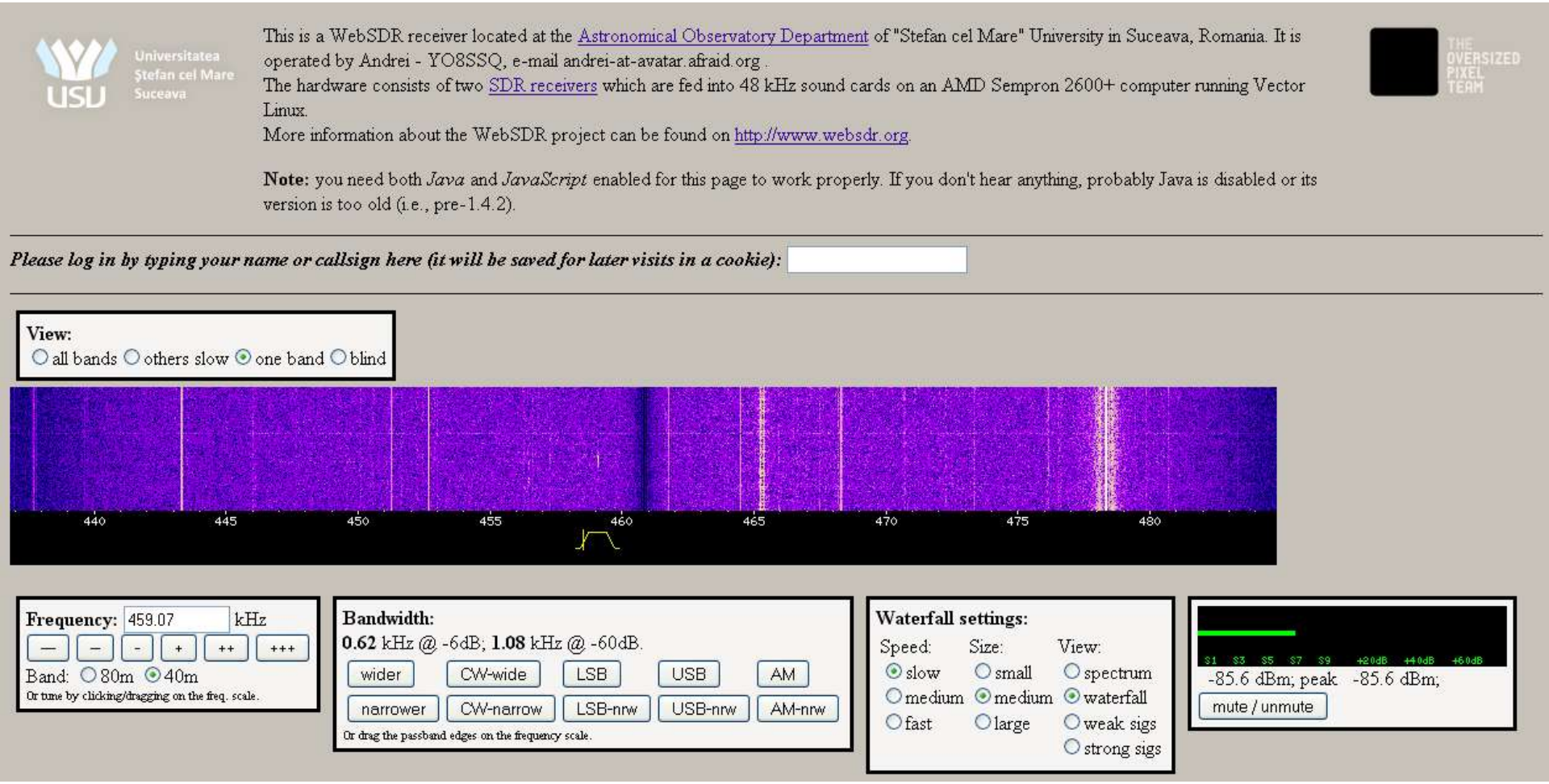
source: http://www.websdr.org/

C.A. Muller Radio Astronomie Station – Dwingeloo WebSDR screenshot.
http://websdr.camras.nl:8901/

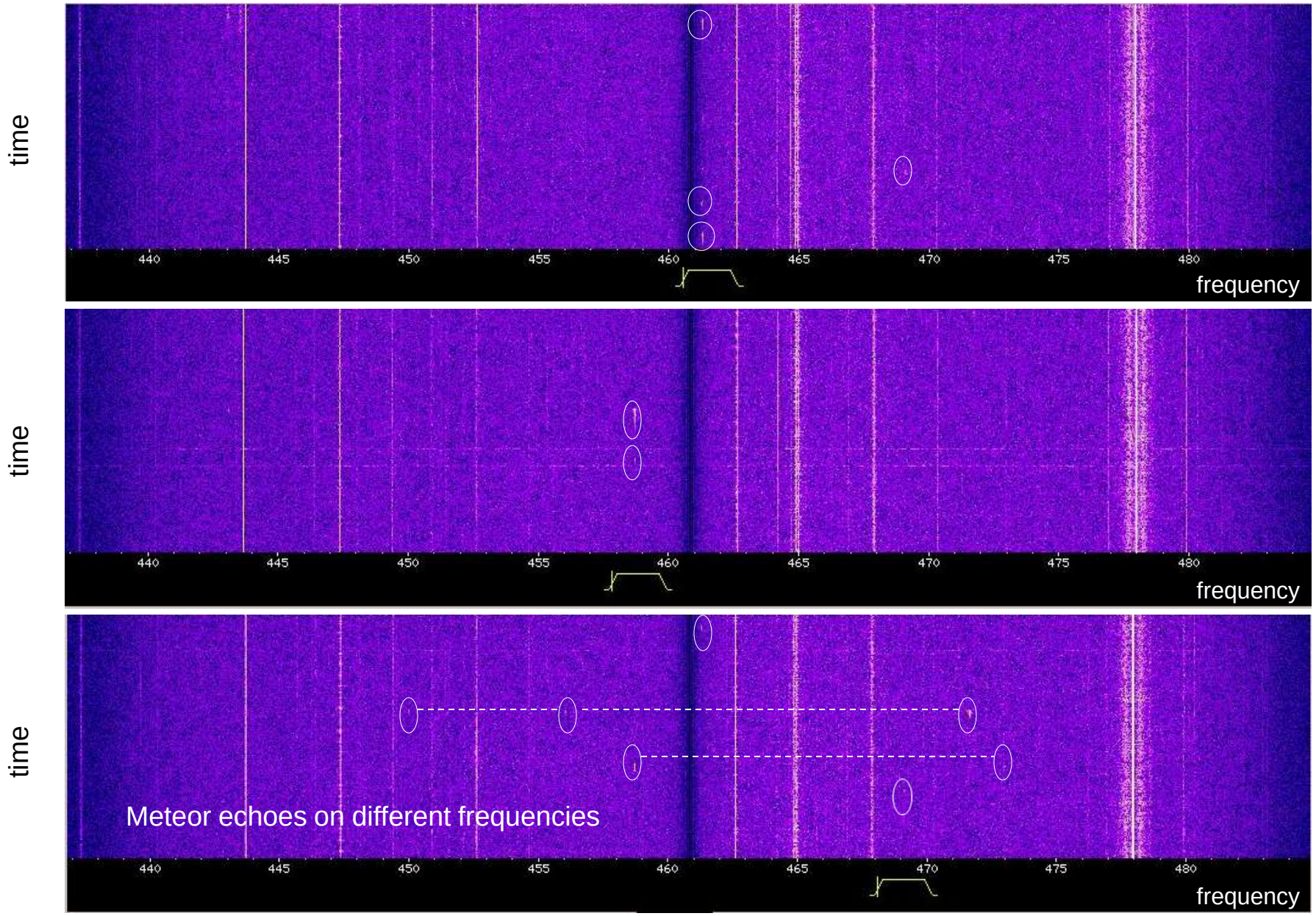
Radio Meteor WebSDR

University “Stefan cel Mare” of Suceava, Astronomical Observatory Department

http://websdr.opt.ro



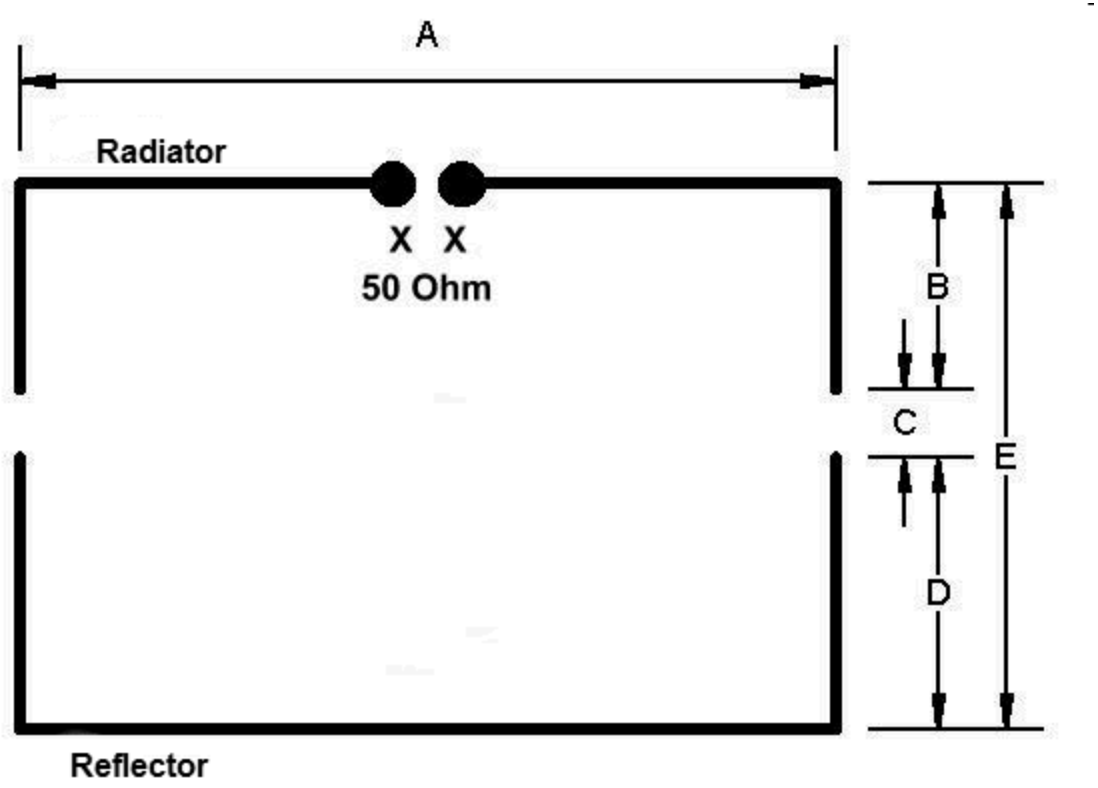
Radio meteor echoes WebSDR waterfall display



Easy antennas!?

Moxon rectangle antenna

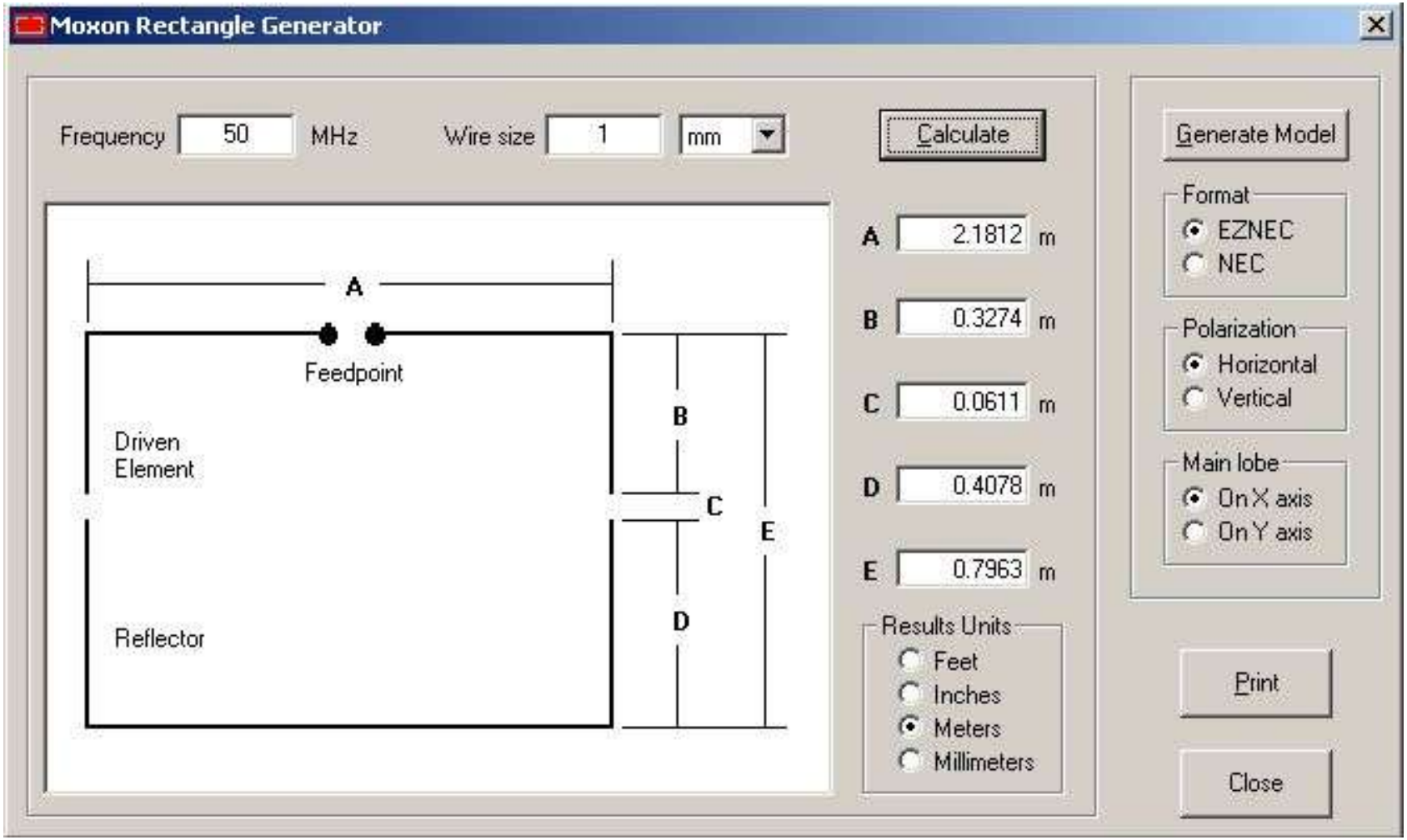
- Antenna footprint ~30% less than 2 elements Yagi antenna (folded reflector and radiator)
- By design 50ohm impedance – easy to feed with 50ohm CoAx cable
  (in order to have a symmetrical radiation pattern a 1:1 balun will be used)



Source: http://www.qsl.net/dk7zb/Moxon/Moxon.htm

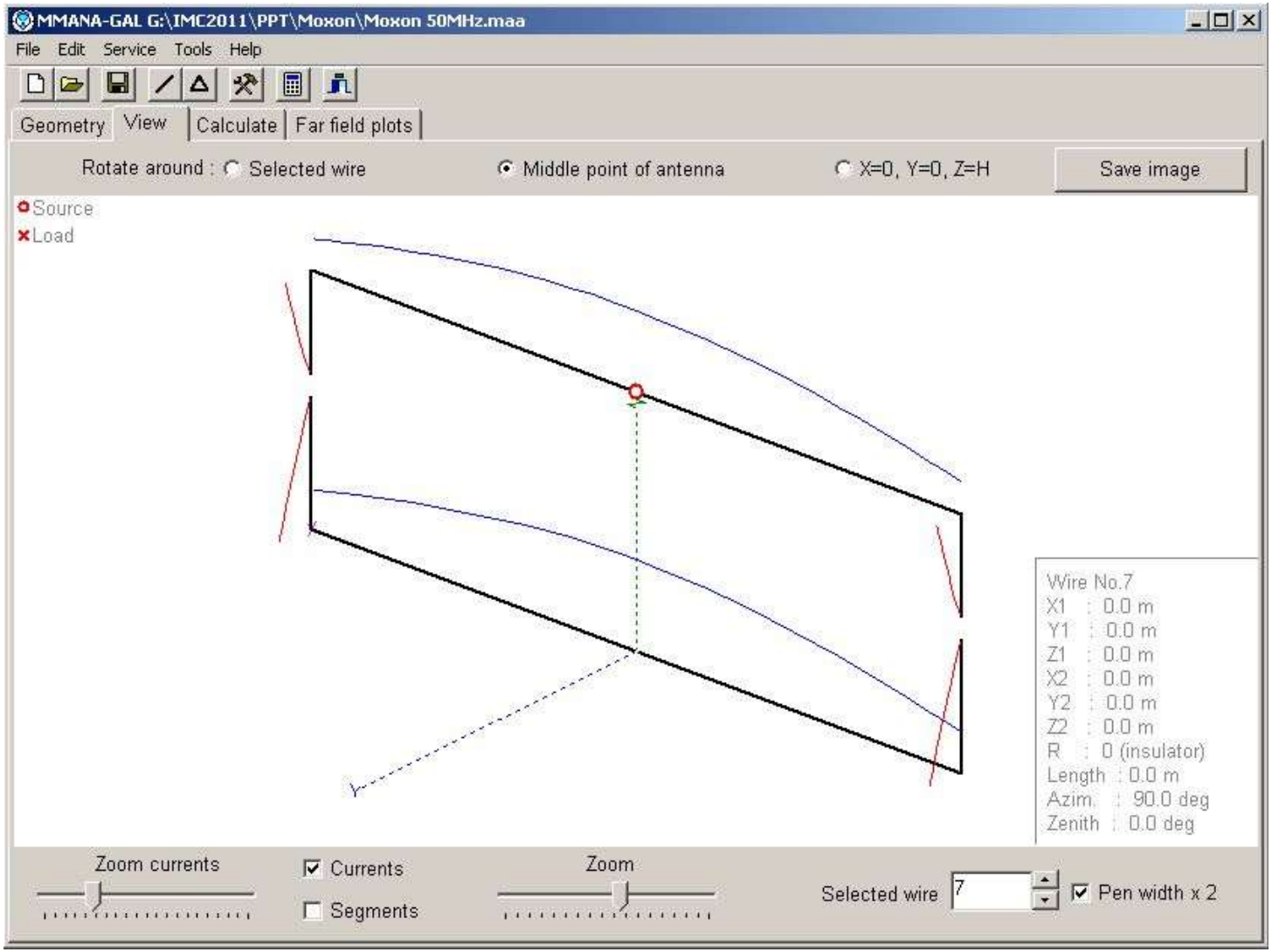
Moxon Rectangle Generator freeware

http://www.moxonantennaproject.com/

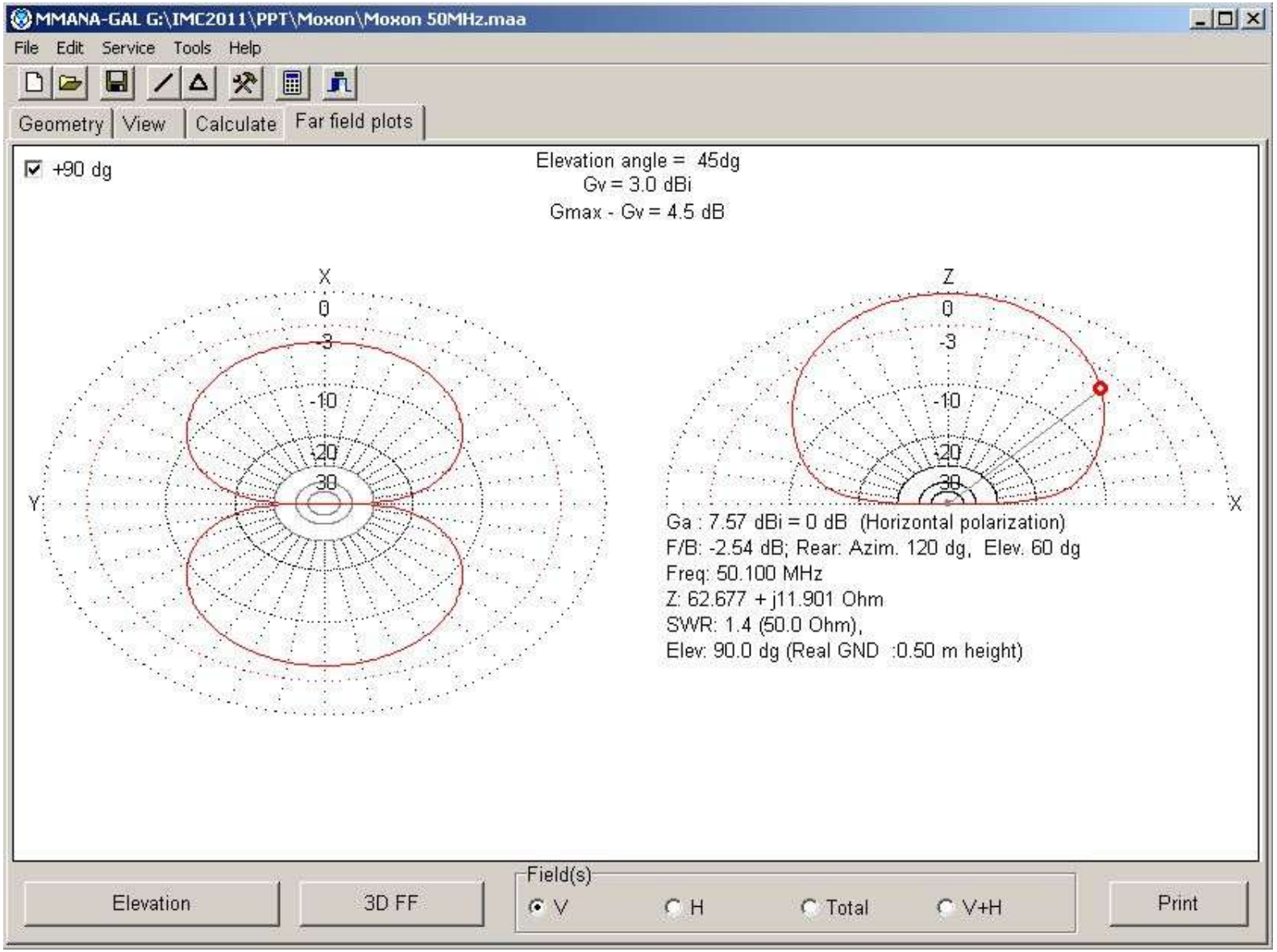


MMANA-GAL antenna analyzer freeware

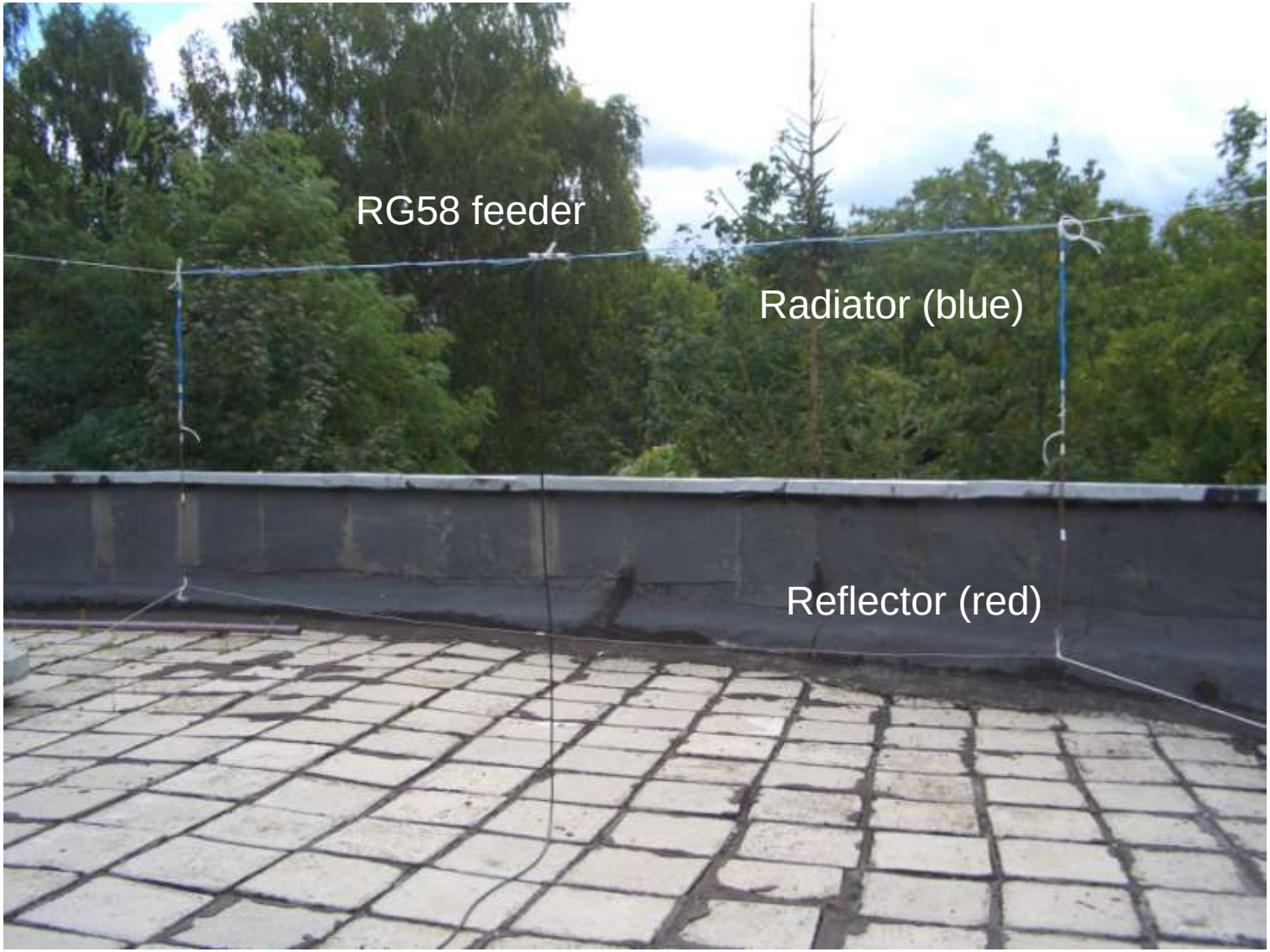
http://hamsoft.ca/pages/mmana-gal.php



Far field plot

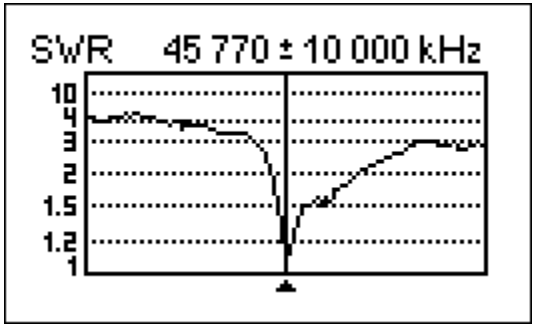


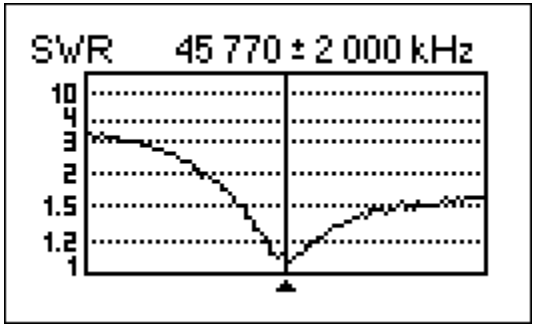
Easy 50MHz Moxon wire antenna
(multi-strand 1.5mm Cu wire, plastic rope, RG58 Coax cable)

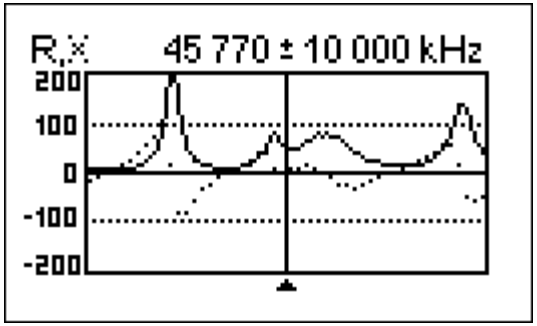


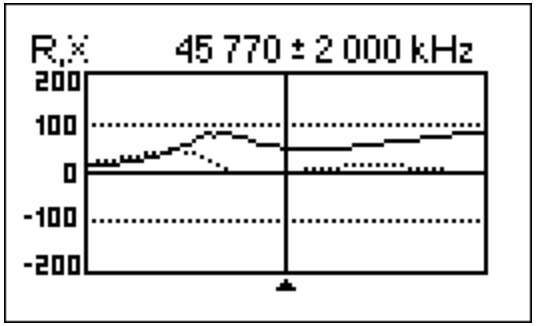
Antenna measurements

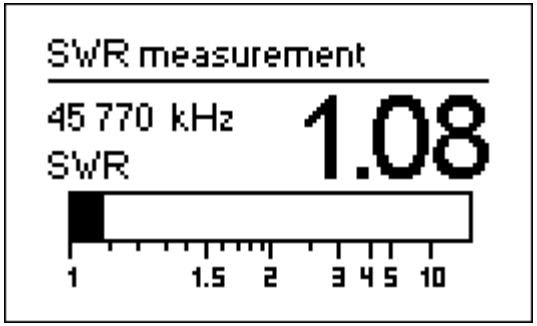
RigExpert AA-200 antenna analyzer
(tnx Cornel YO8SKY)

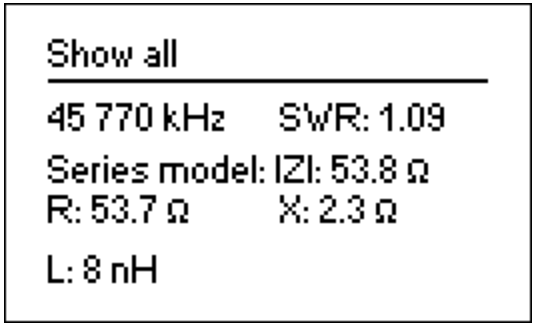






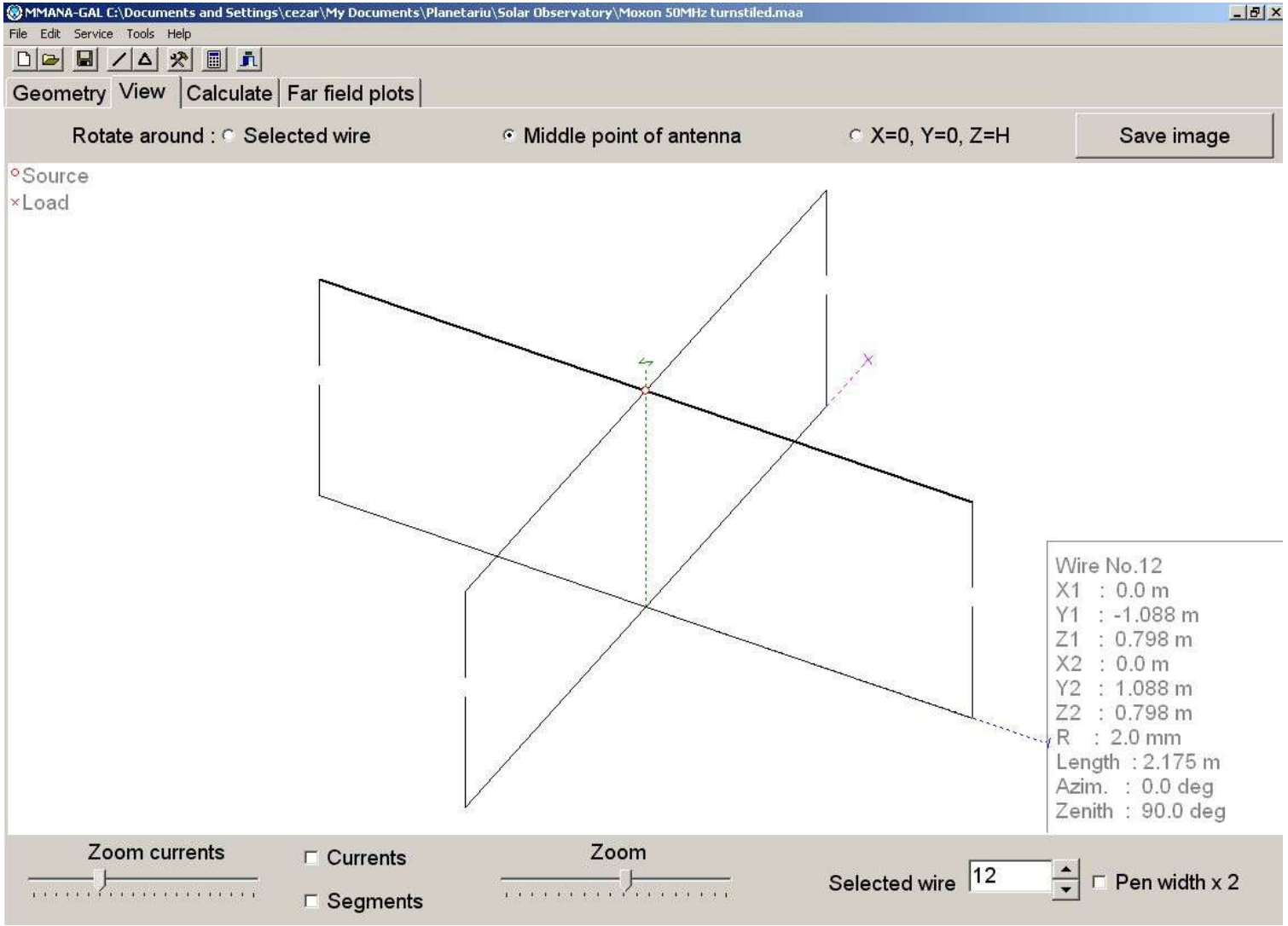




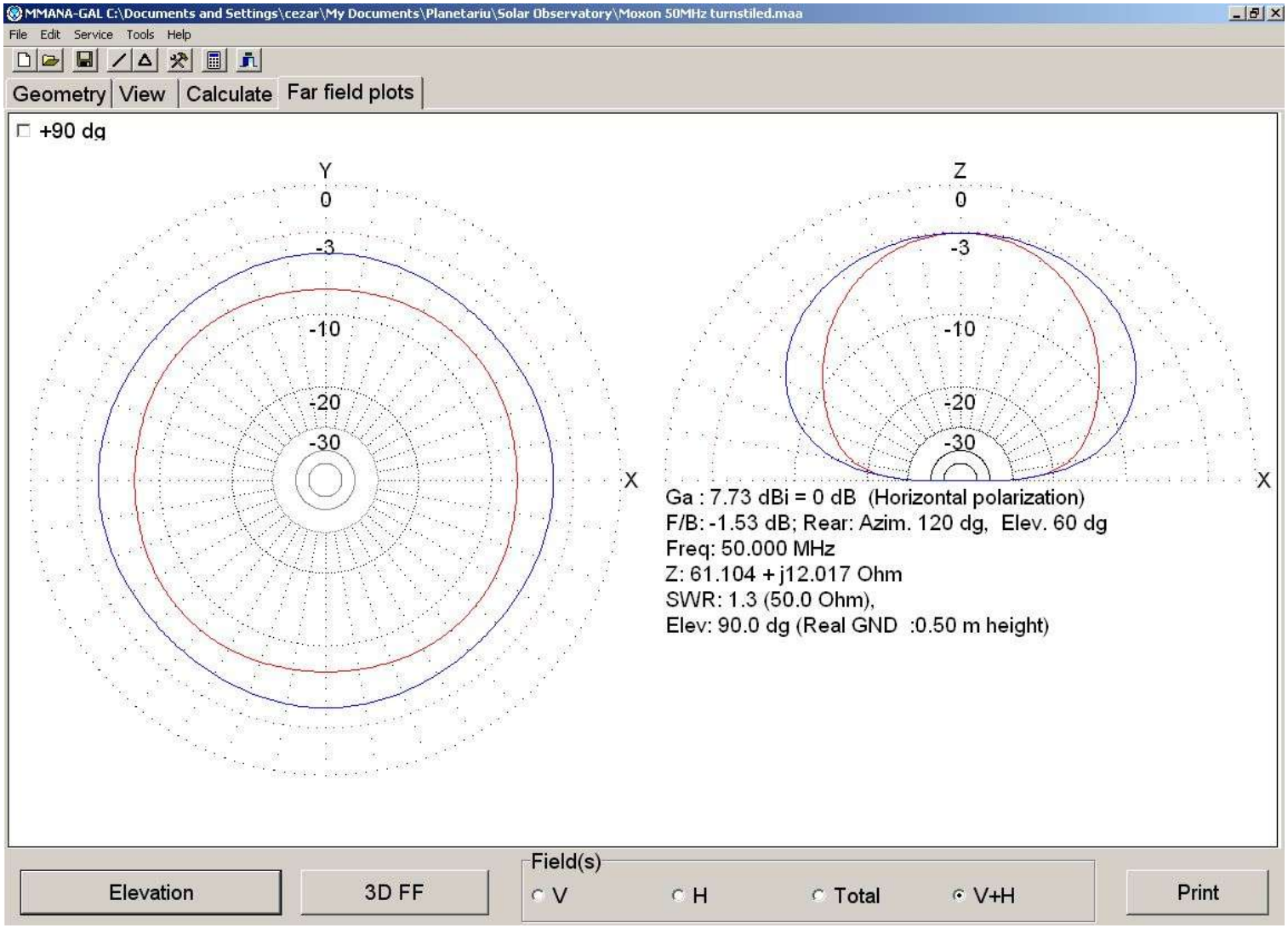


Turnstile Moxon configuration

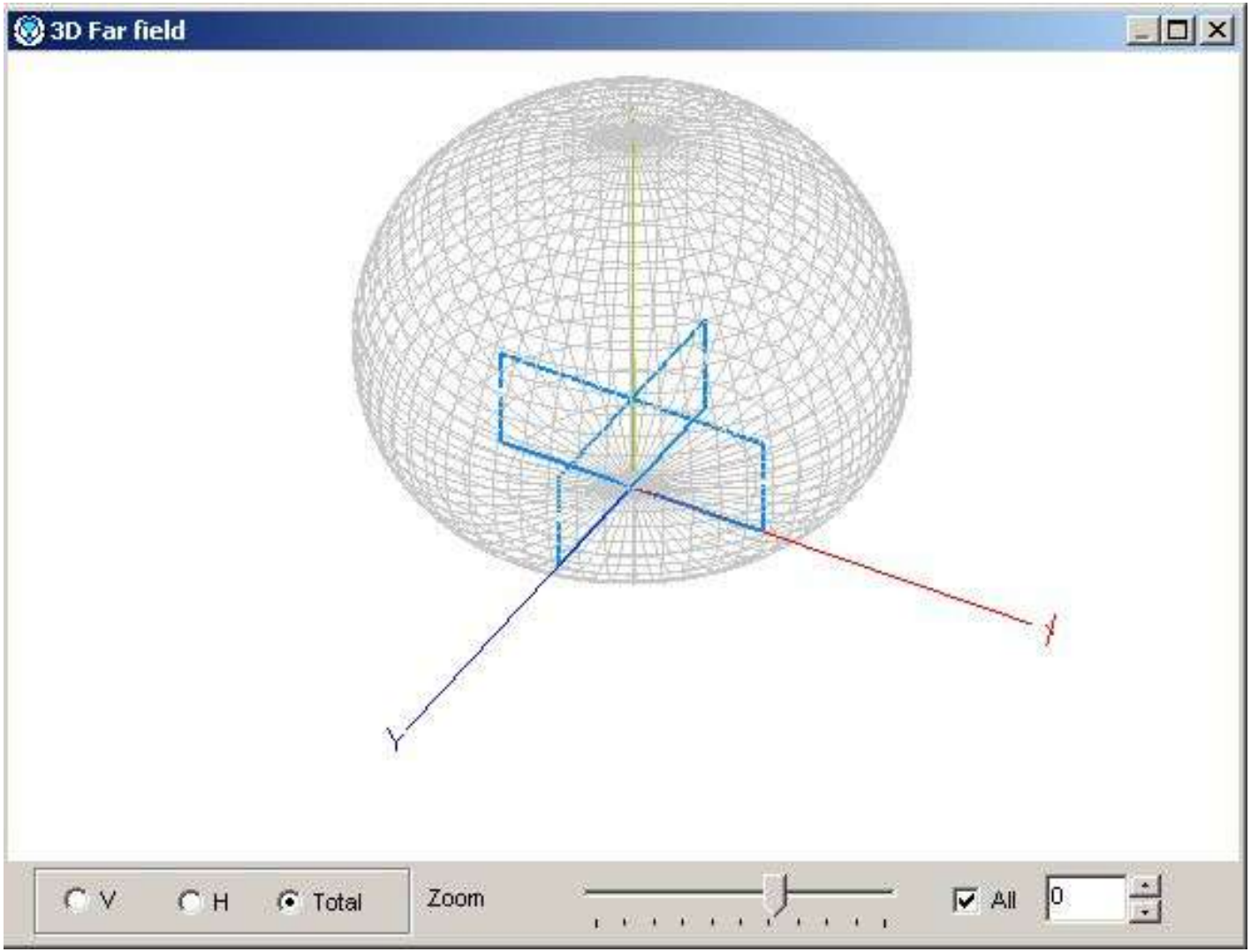
Omnidirectional, circular polarised



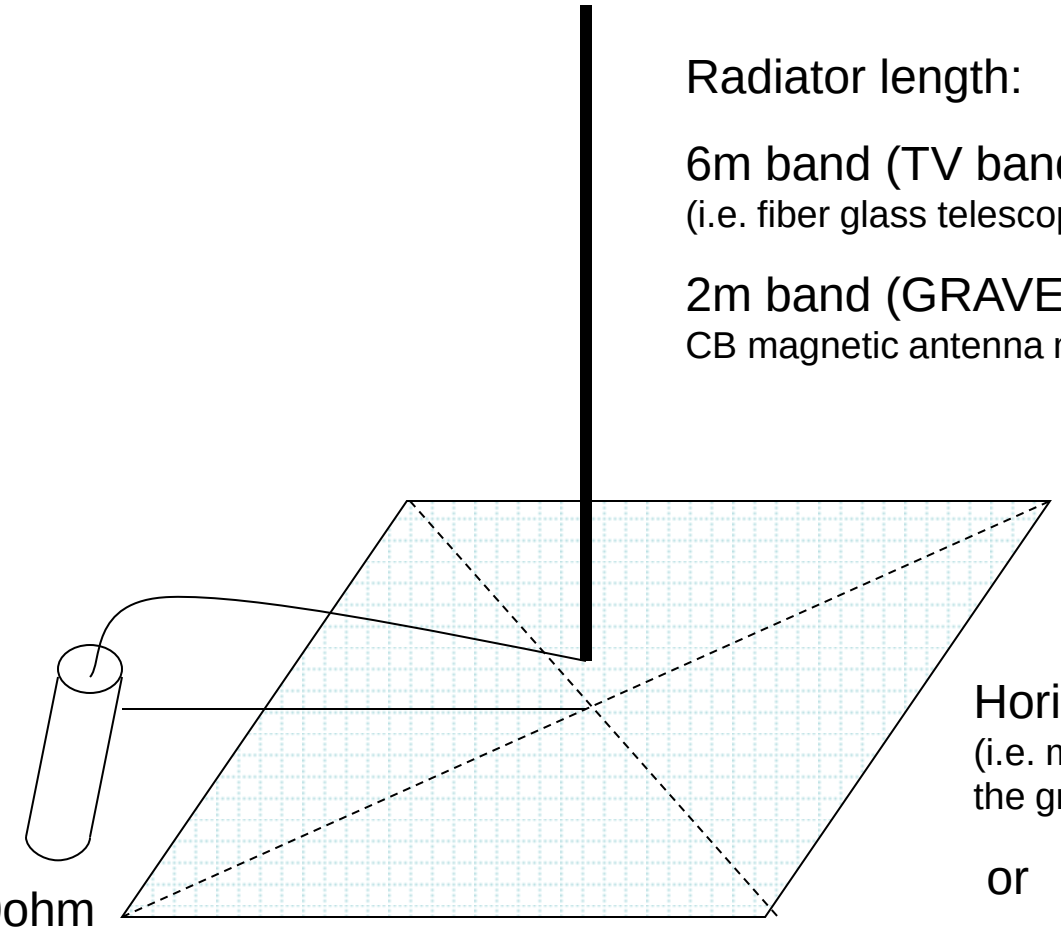
Far field plot



3D far field plot



Vertical ¾ λ antenna



Radiator length:

6m band (TV band I) ~ 4.5m
(i.e. fiber glass telescopic fishing pole mast)

2m band (GRAVES) ~ 1.5m (i.e.
CB magnetic antenna mount on the car roof)

Horizontal ground plane
(i.e. metallic roof, chicken wire net on the ground)

or

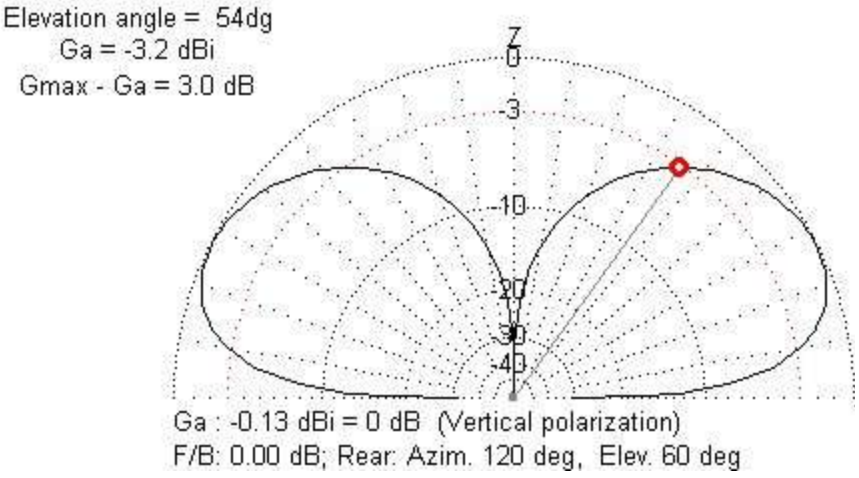
radials

50ohm
CoAx

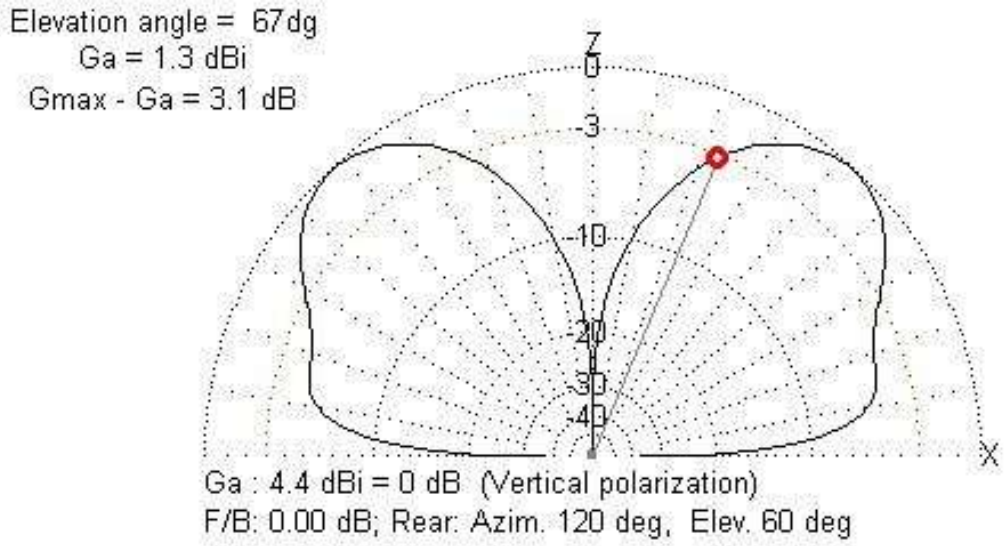
L>λ

Far field plot

Vertical λ/4



Vertical 3λ/4



Acknowledgements

- Andrei YO8SSQ
- Adrian YO8AZQ
- Corneliu YO8SCV
- Cornel YO8SKY
- Ovidiu YO8TPP
- Daniel YO8TVD

  .....
- And to my xyl Gabriela YO8TLD

Resources

- Tasić Siniša- Tasa YU1LM – HF SDR receivers (http://yu1lm.qrpradio.com/sdr%20rx%20yu1lm.htm)
- Pieter-Tjerk de Boer PA3FWM - WebSDR (http://www.websdr.org/)
- John Labutski KD6WD - Moxon Antenna Project (http://www.moxonantennaproject.com/)
- L.B. Cebik W4RNL - A Simple Fixed Antenna for VHF/UHF Satellite Work (http://www.w8mwa.org/Moxon_Sat_Ant.pdf)
- Antenna analyzing tool MMANA – GAL (http://hamsoft.ca/pages/mmana-gal.php)
- Andy Smith G7IZU radio meteor page - http://www.tvcomm.co.uk/radio/
- For every meteor enthusiast: at The Sky at Night on BBC 4 TV, “Meteor Mania” on Andy G7IZU page: http://www.tvcomm.co.uk/radio/video/meteormania.wmv

Wish upon a falling star

Thank you!