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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

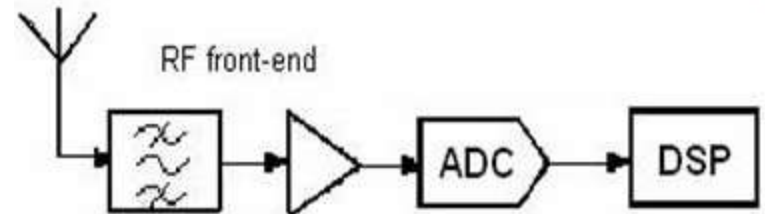
A software-defined radio system, or SDR, is a radio communication system where components that have been typically implemented in hardware (e.g. mixers, filters, amplifiers, modulators/demodulators, detectors, etc.) are instead implemented by means of software on a embedded computing devices or a personal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

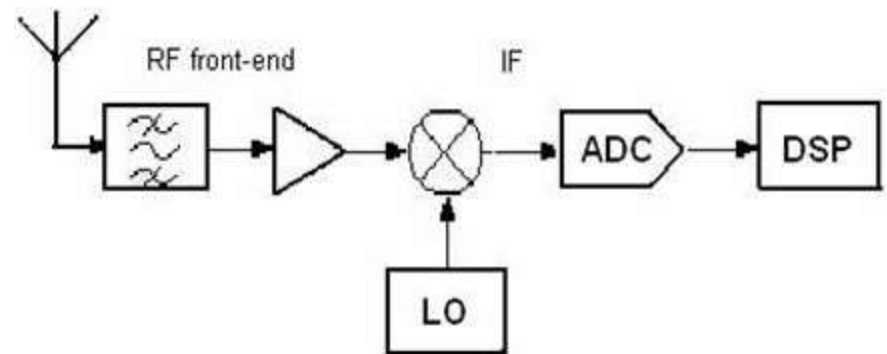
A basic SDR system may consist of a personal computer equipped with a sound card, or other analog-to-digital converter, preceded by some form of RF front end. Significant amounts of signal processing are handed over to the general-purpose processor, rather than being done in special-purpose hardware.

Software Defined Radio

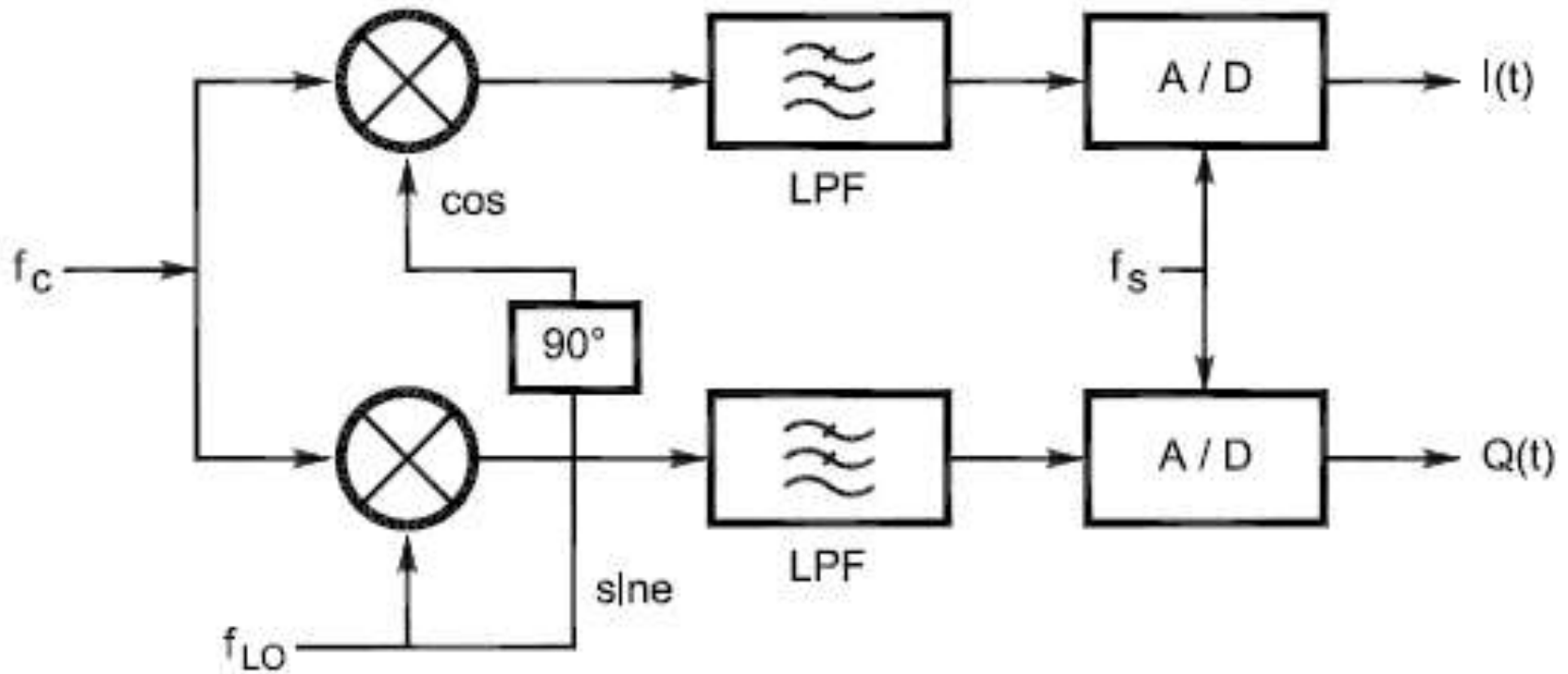
**Ideal software defined radio
(Direct sample receiver)**



IF-sampled Software Defined Radio.

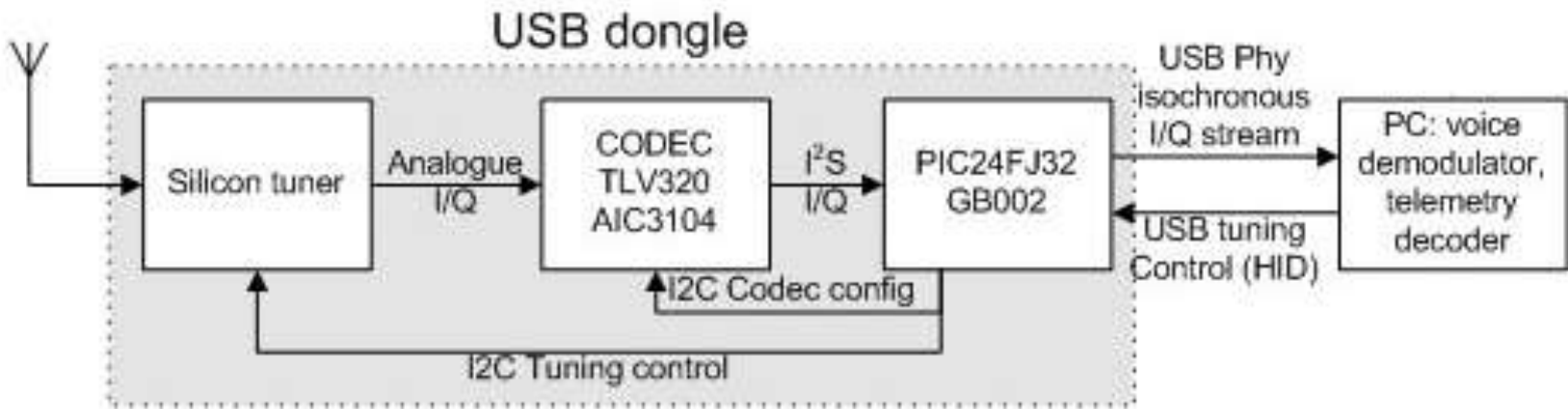


Quadrature Sampling Detector (QSD)

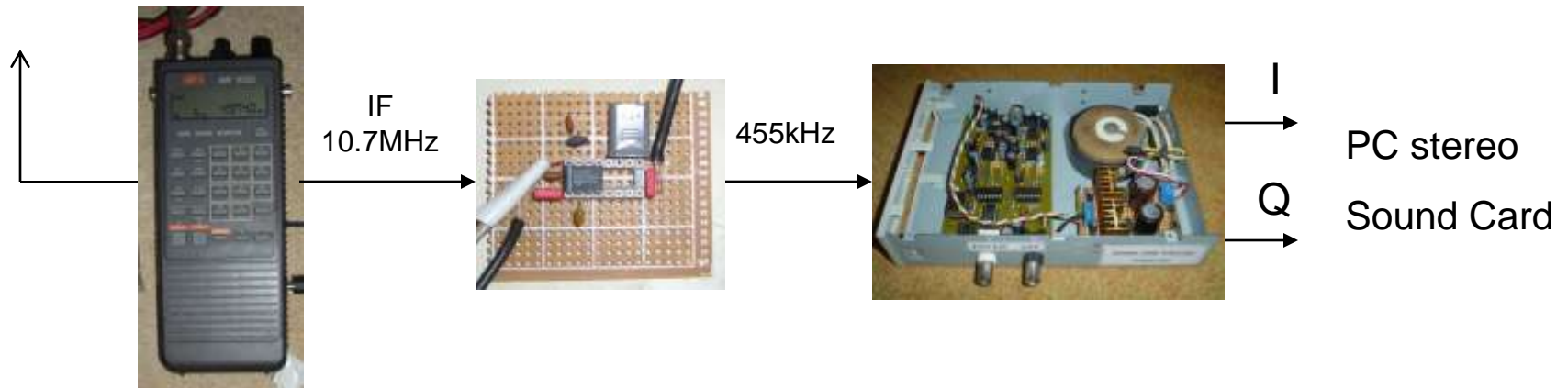
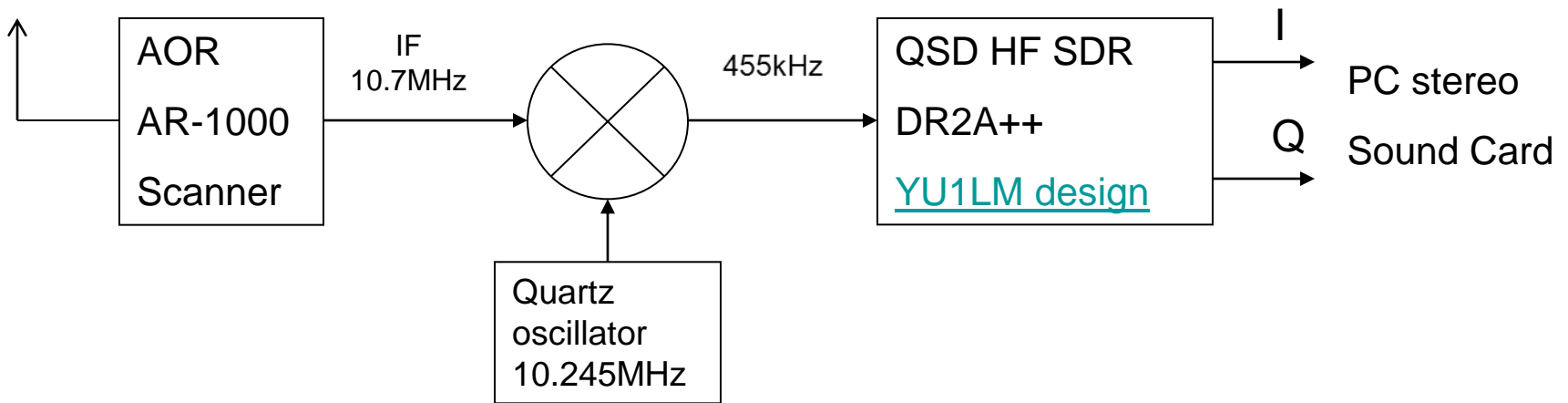


News!!! FUNcube Dongle

64MHz to 1,700MHz Software Defined Radio



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



SDRs for 9 /10.7 MHz IF



<http://www.box73.de>

<http://www.funkamateurl.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>



This is a WebSDR receiver located at the [Astronomical Observatory Department](#) of "Stefan cel Mare" University in Suceava, Romania. It is operated by Andrei - YO8SSQ, e-mail andrei-at-avatar. afraid.org.

The hardware consists of two [SDR receivers](#) which are fed into 48 kHz sound cards on an AMD Sempron 2600+ computer running Vector Linux.

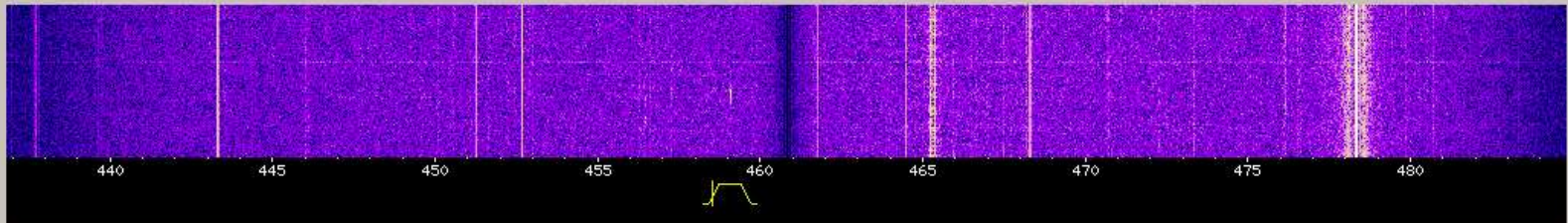
More information about the WebSDR project can be found on <http://www.websdr.org>.

Note: you need both *Java* and *JavaScript* enabled for this page to work properly. If you don't hear anything, probably Java is disabled or its version is too old (i.e., pre-1.4.2).



Please log in by typing your name or callsign here (it will be saved for later visits in a cookie):

View:
 all bands others slow one band blind



Frequency: kHz
- - - + ++ +++
Band: 80m 40m
Or tune by clicking/dragging on the freq. scale.

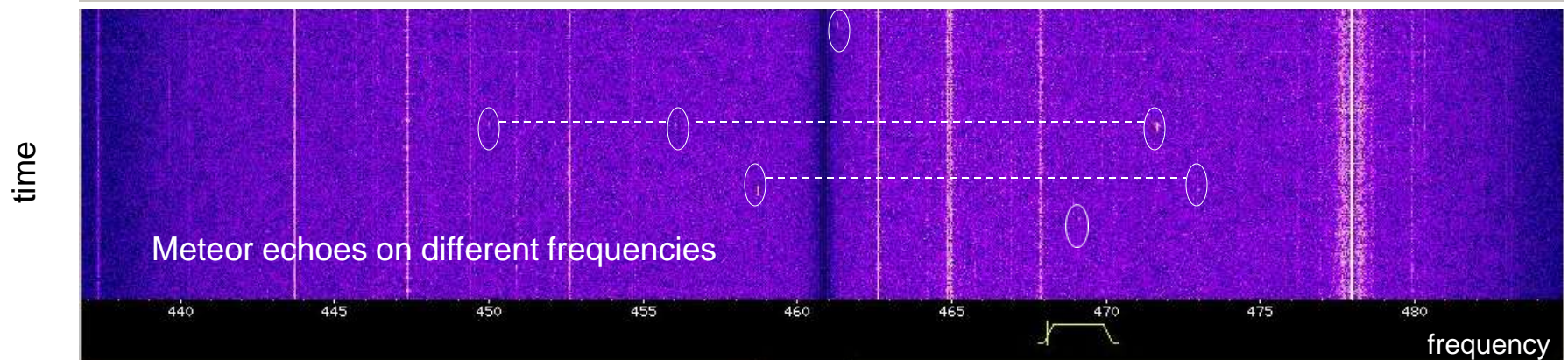
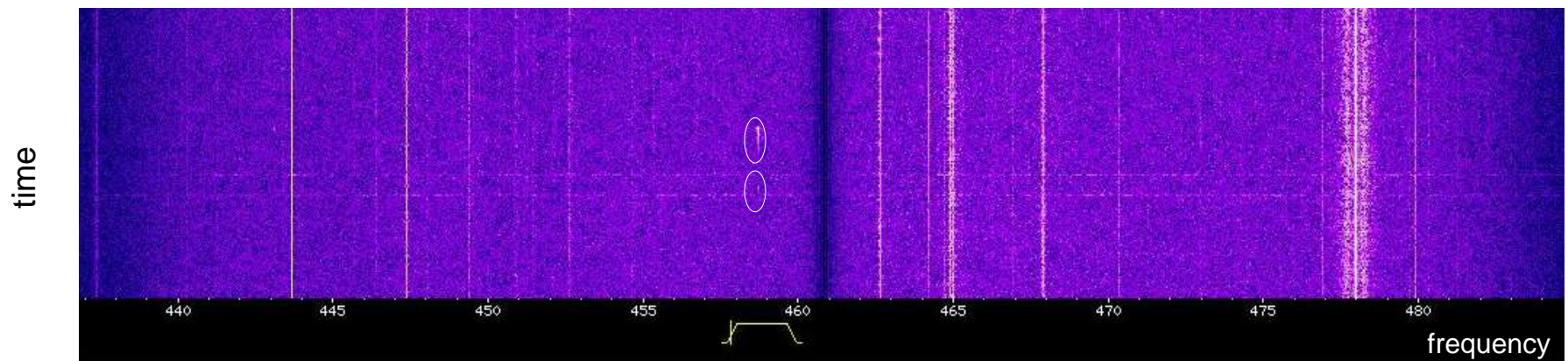
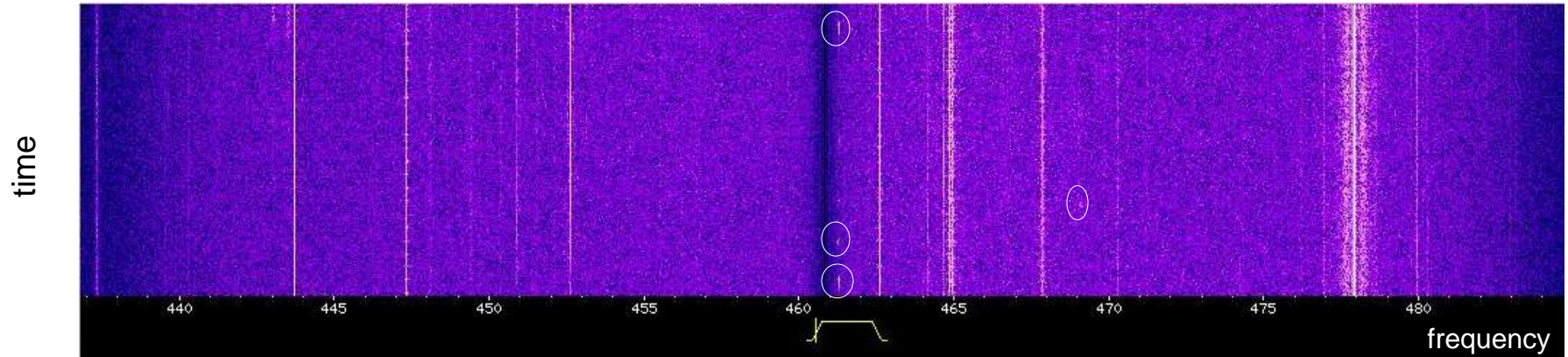
Bandwidth:
0.62 kHz @ -6dB, 1.08 kHz @ -60dB.

Or drag the passband edges on the frequency scale.

Waterfall settings:
Speed: slow medium fast
Size: small medium large
View: spectrum waterfall weak sigs strong sigs

-85.6 dBm; peak -85.6 dBm;

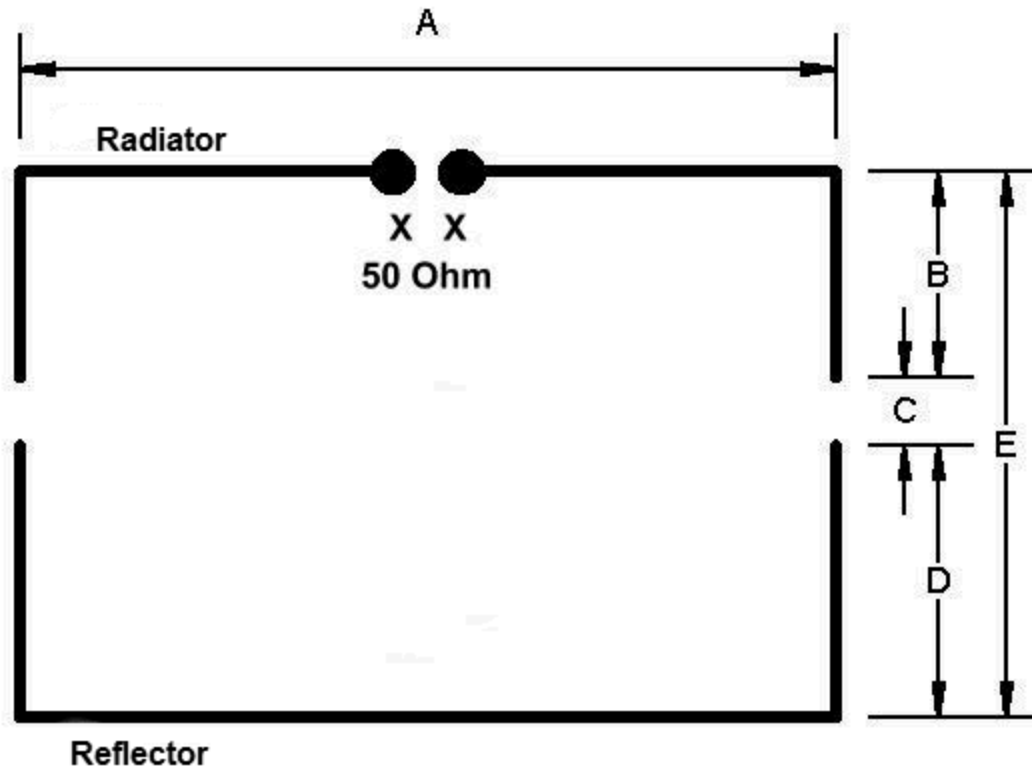
Radio meteor echoes WebSDR waterfall display



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)



Moxon Rectangle Generator freeware

<http://www.moxonantennaproject.com/>

Moxon Rectangle Generator

Frequency: 50 MHz Wire size: 1 mm

Calculate

Generate Model

Format:
 EZNEC
 NEC

Polarization:
 Horizontal
 Vertical

Main lobe:
 On X axis
 On Y axis

Results Units:
 Feet
 Inches
 Meters
 Millimeters

Print

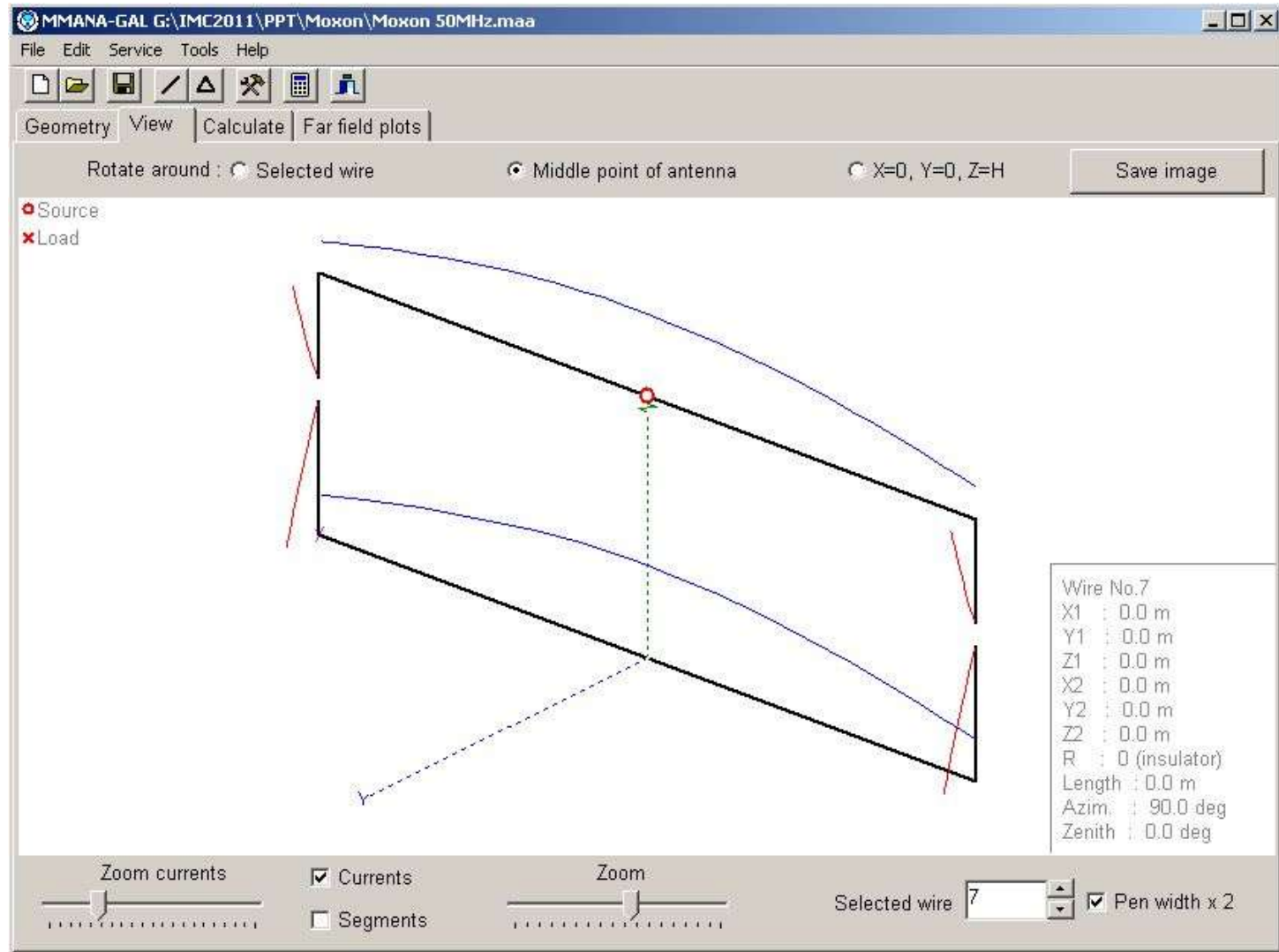
Close

Diagram labels: A, B, C, D, E, Feedpoint, Driven Element, Reflector

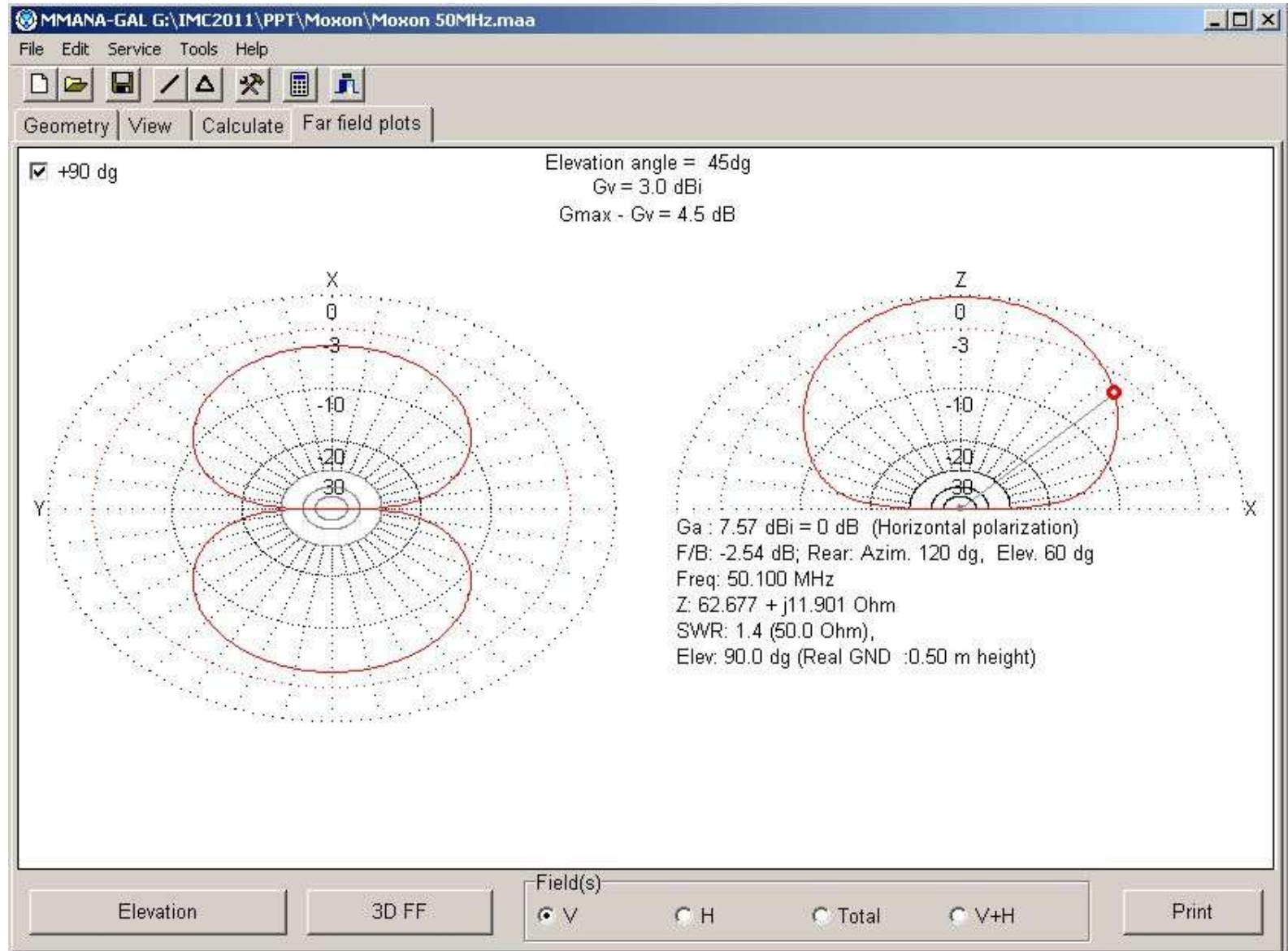
Dimension	Value (m)
A	2.1812
B	0.3274
C	0.0611
D	0.4078
E	0.7963

MMANA-GAL antenna analyzer freeware

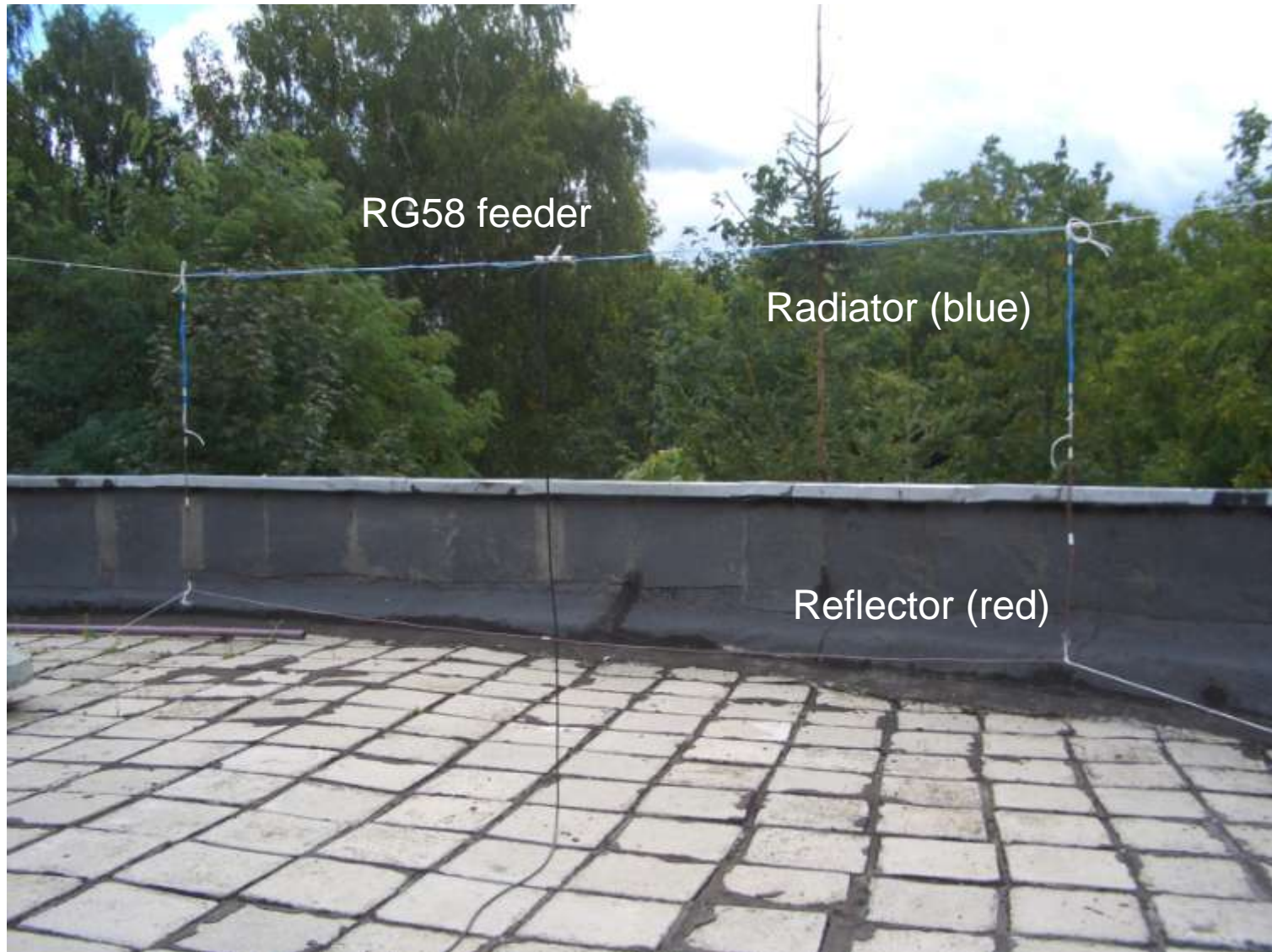
<http://hamsoft.ca/pages/mmana-gal.php>



Far field plot

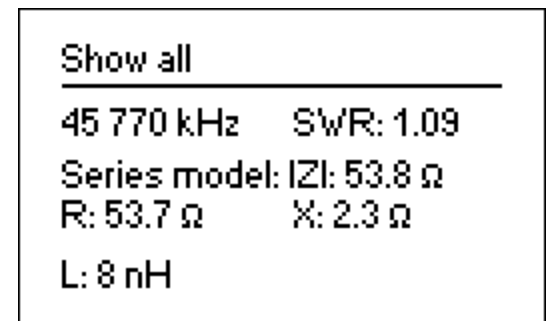
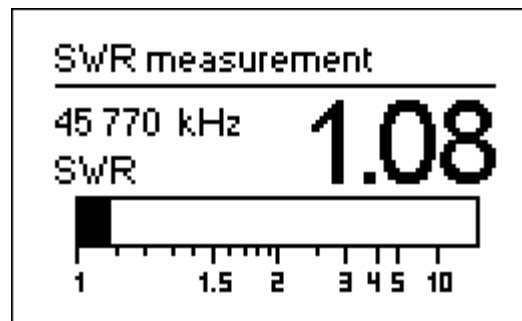
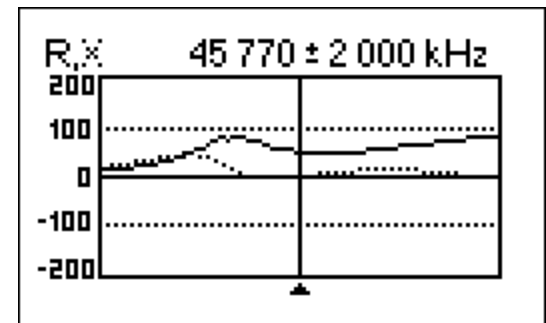
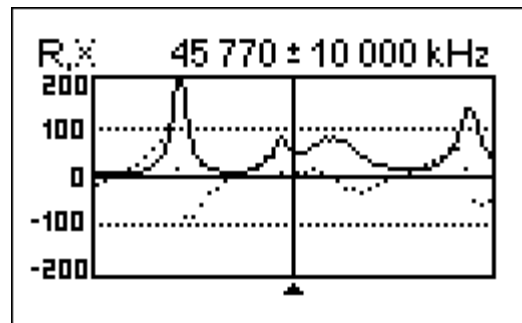
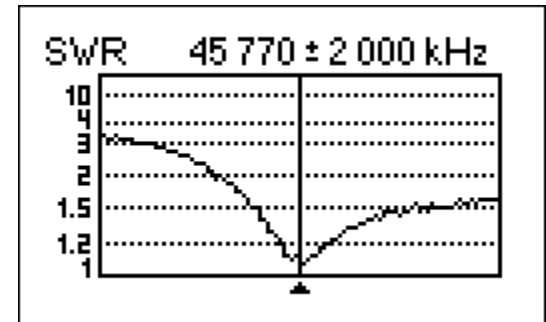
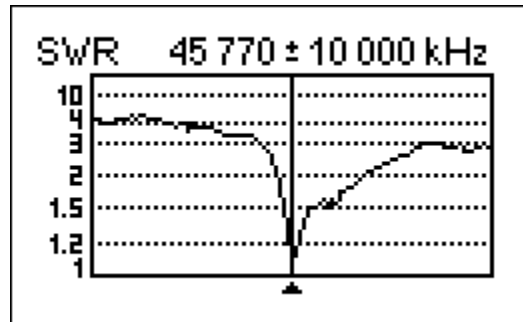


Easy 50MHz Moxon wire antenna (multi-strand 1.5mm Cu wire, plastic rope, RG58 Coax cable)



Antenna measurements

RigExpert AA-200 antenna analyzer
(tnx Cornel YO8SKY)



Turnstile Moxon configuration

Omnidirectional, circular polarised

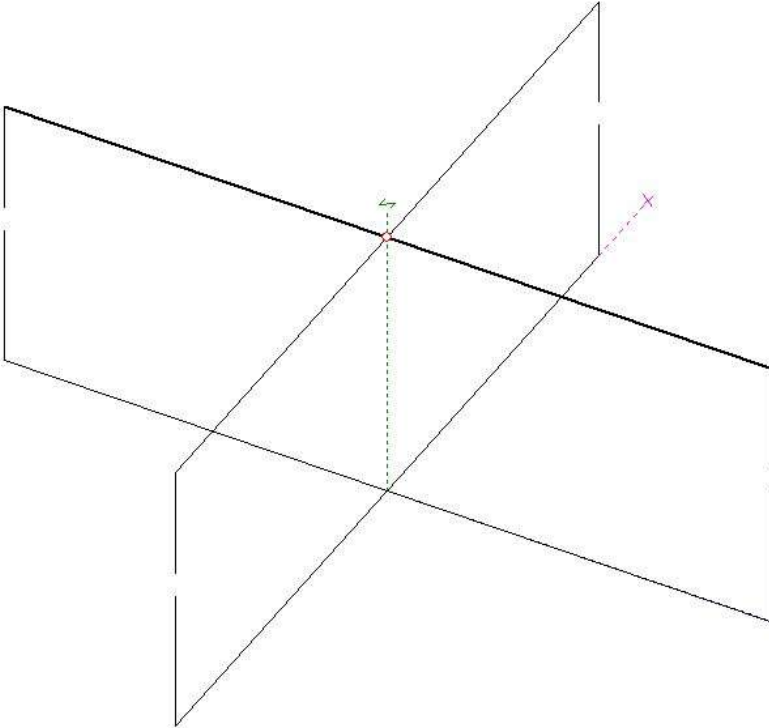
MMANA-GAL C:\Documents and Settings\cezar\My Documents\Planetariu\Solar Observatory\Moxon 50MHz turnstiled.maa

File Edit Service Tools Help

Geometry View Calculate Far field plots

Rotate around : Selected wire Middle point of antenna X=0, Y=0, Z=H Save image

◦Source
×Load

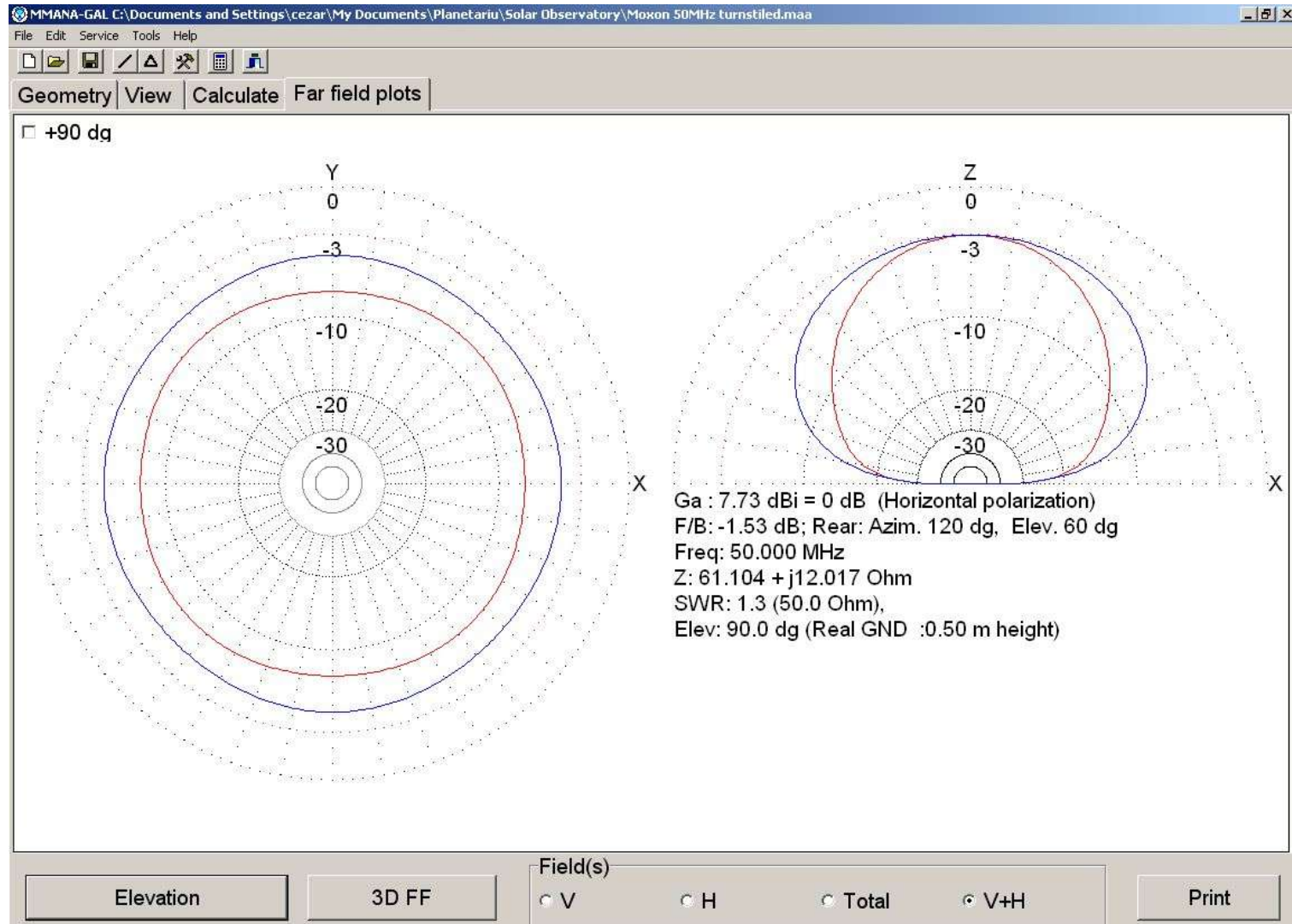


Wire No.12
X1 : 0.0 m
Y1 : -1.088 m
Z1 : 0.798 m
X2 : 0.0 m
Y2 : 1.088 m
Z2 : 0.798 m
R : 2.0 mm
Length : 2.175 m
Azim. : 0.0 deg
Zenith : 90.0 deg

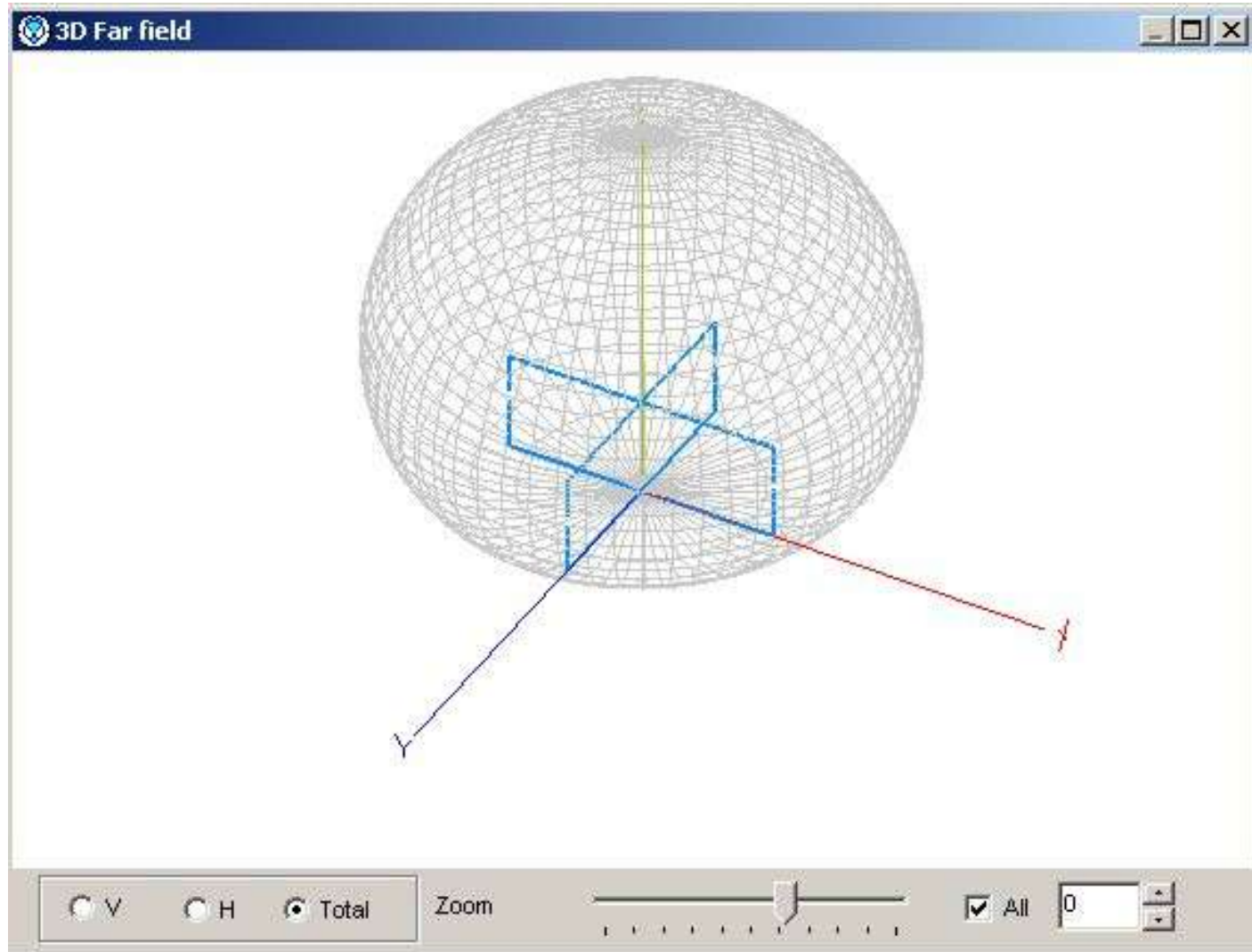
Zoom currents Currents Segments Pen width x 2

Zoom Selected wire 12

Far field plot



3D far field plot

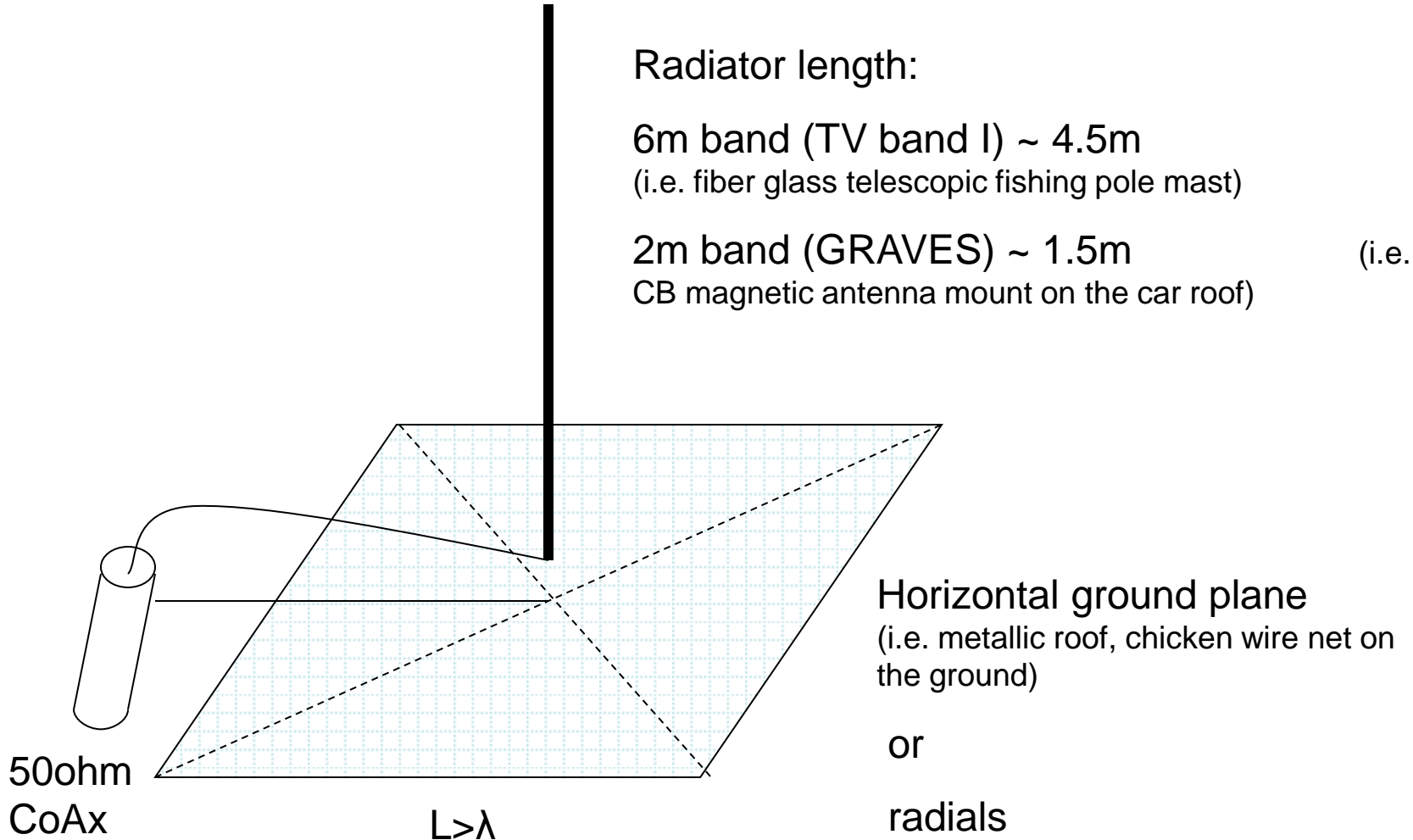


Vertical $\frac{3}{4} \lambda$ antenna

Radiator length:

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

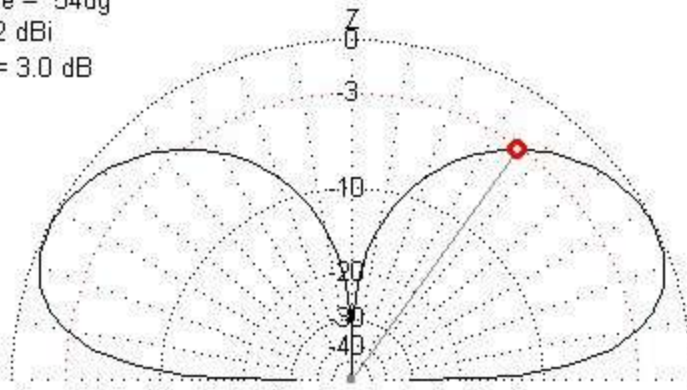
2m band (GRAVES) ~ 1.5m (i.e. CB magnetic antenna mount on the car roof)



Far field plot

Vertical $\lambda/4$

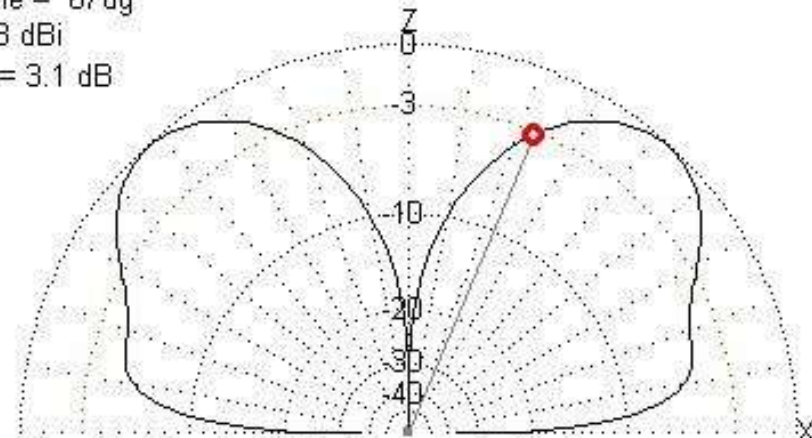
Elevation angle = 54dg
Ga = -3.2 dBi
Gmax - Ga = 3.0 dB



Ga : -0.13 dBi = 0 dB (Vertical polarization)
F/B: 0.00 dB; Rear: Azim. 120 deg, Elev. 60 deg

Vertical $3\lambda/4$

Elevation angle = 67dg
Ga = 1.3 dBi
Gmax - Ga = 3.1 dB



Ga : 4.4 dBi = 0 dB (Vertical polarization)
F/B: 0.00 dB; Rear: Azim. 120 deg, Elev. 60 deg

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!