The stealth dish

An update…

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ARI Perugia

The stealth dish … *one year later*

Why a stealth dish… : Challenges and advantages

CHALLANGES

- ✓ Accuracy and repeatibility of positioning.
- ✓ Complex mechanism.
- ✓ Much higher overall weight.
- ✓ Stability.

ADVANTAGES

- ✓ Very easy access to the feeder and to the rotators.
- ✓ Fast feeder exchange.
- ✓ Lower overall profile when in «resting» position that minimize lightening risk.
- ✓ «One man» operation.
- ✓ Fast Az El movements that allows fast object tracking.
- ✓ «curiosity» minimization…
- ✓ …. Good sleep during thunderstorms ……

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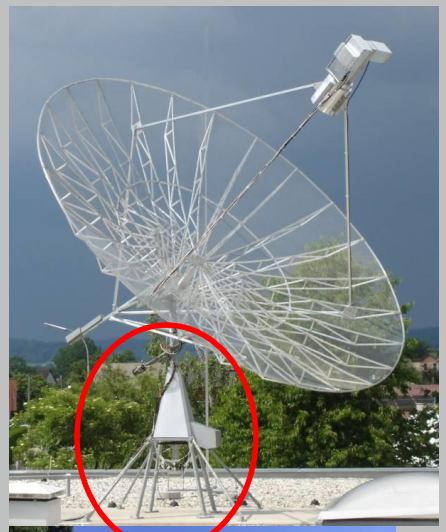
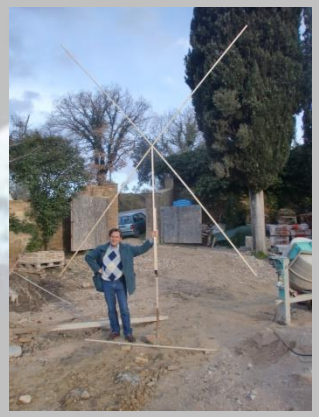
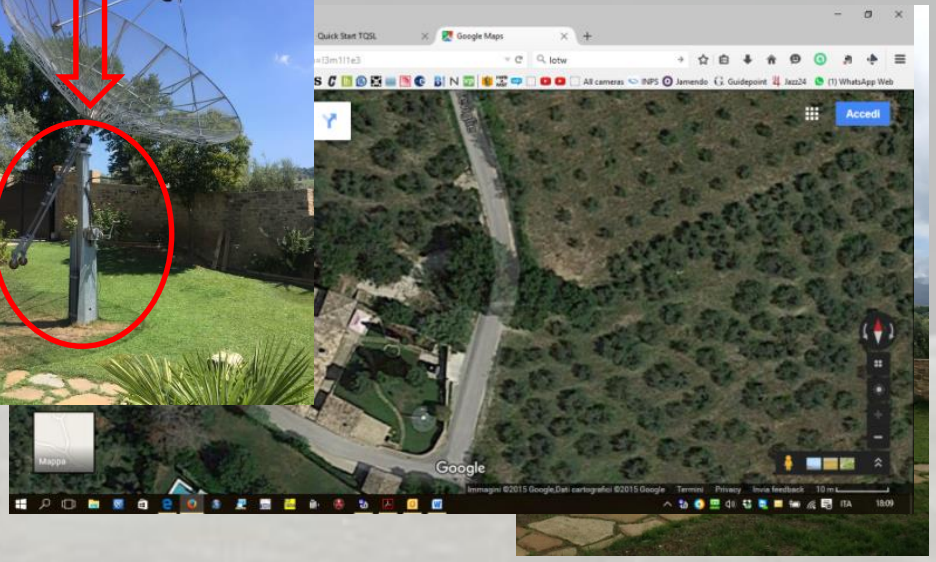
Why a stealth dish .... : a bit of history

..... From Braunau am Inn to Assisi







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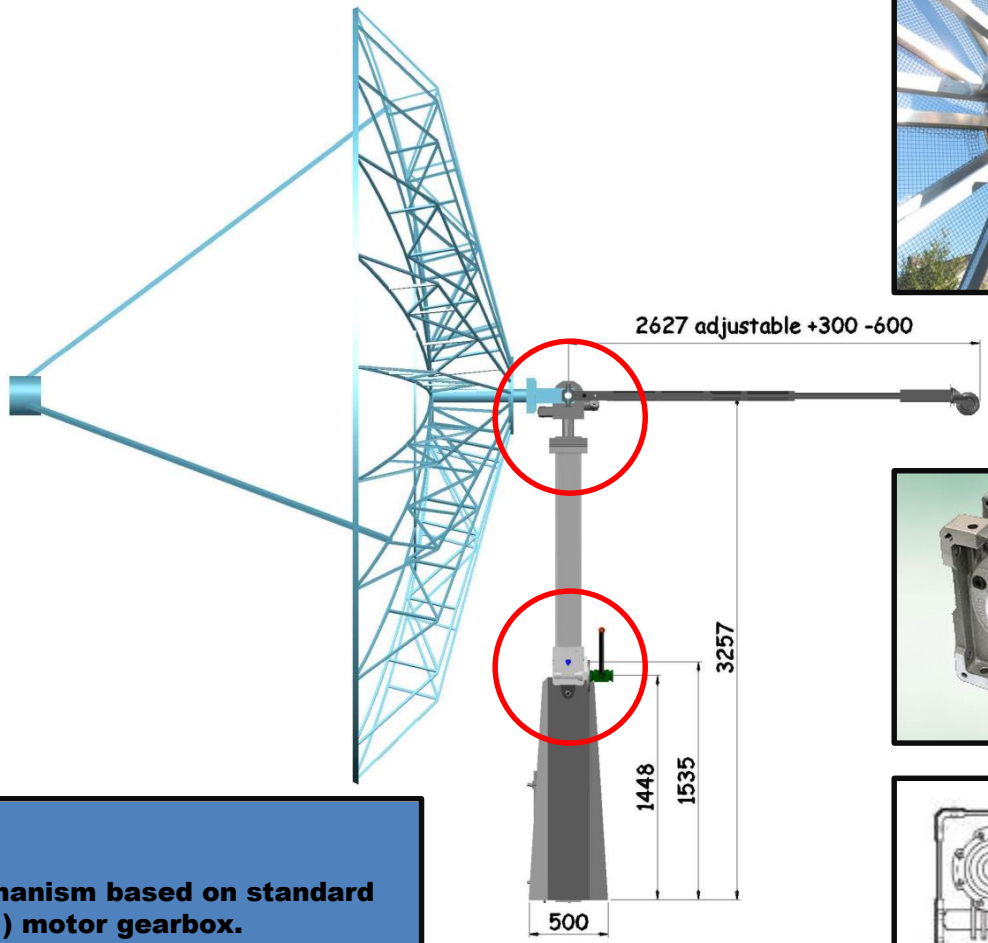
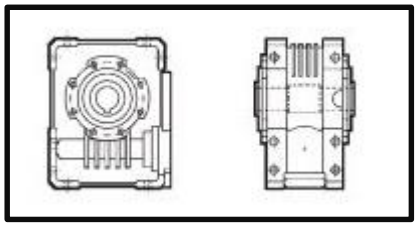
Mechanical design : tower design





- ✓ **5m dish.**
- ✓ **0,5 f/D.**
- ✓ **Tilting mechanism based on standard (Bonfiglioli) motor gearbox.**
- ✓ **Manual movement easily upgradable to motorized.**
- ✓ **SPID BIG – RAS/HR Az El rotator.**

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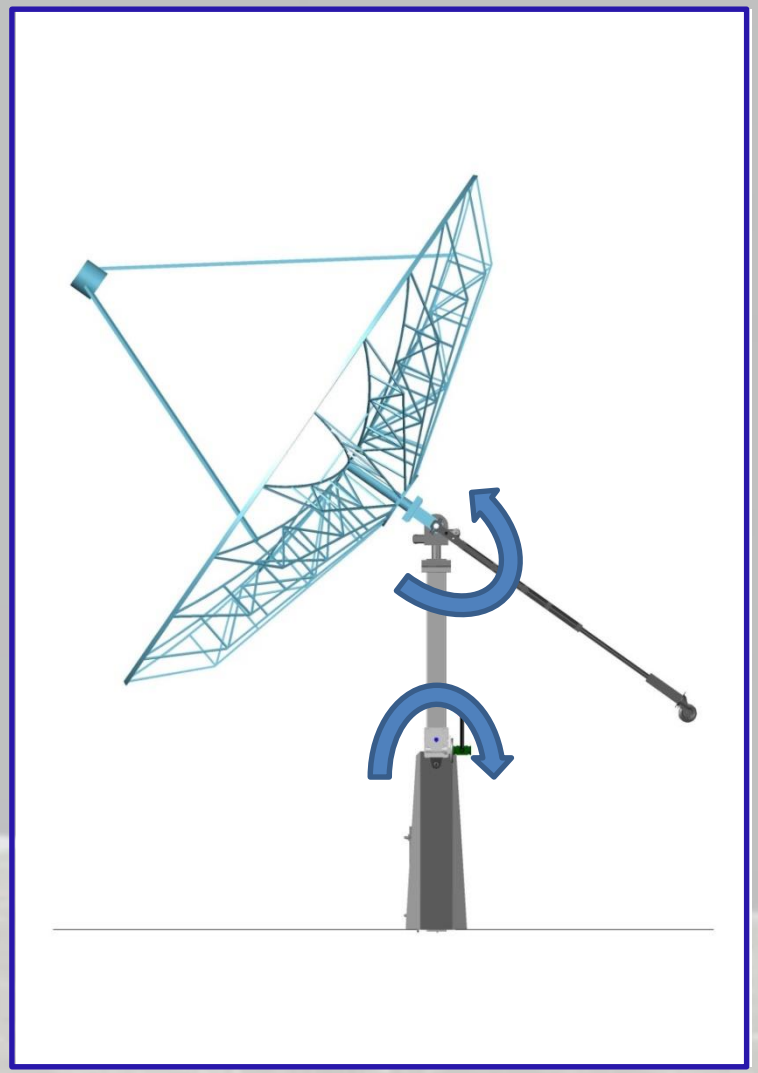
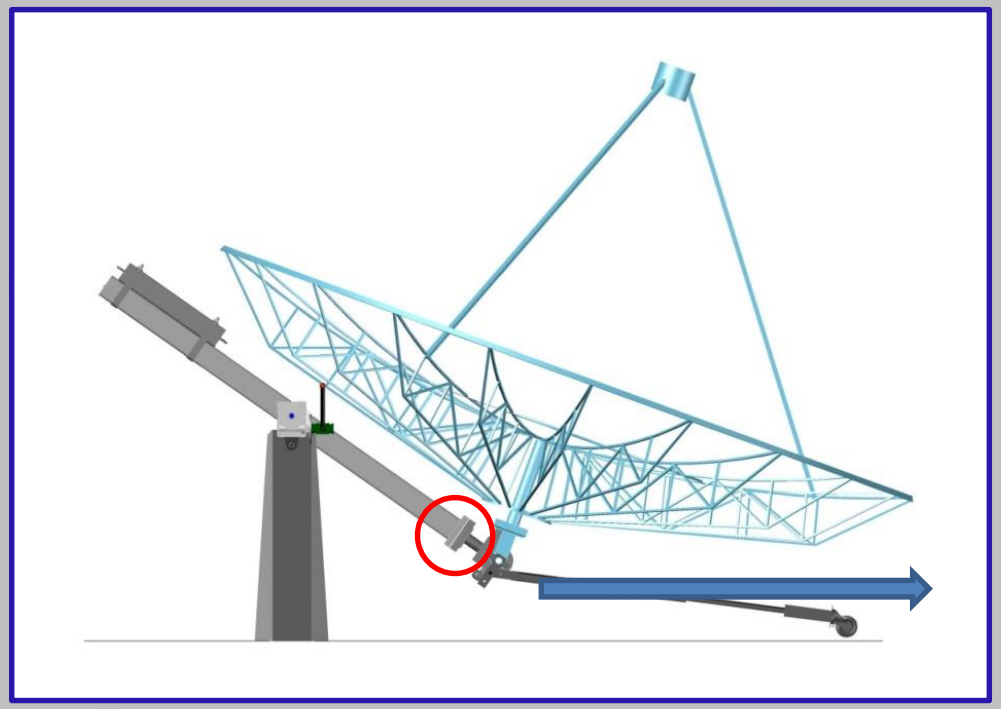
Mechanical design : tower design





- ✓ **Counterbalancing weights with wheels to allow easy maintenance and safe resting position.**
- ✓ **Removable tower top that allows tower extension.**

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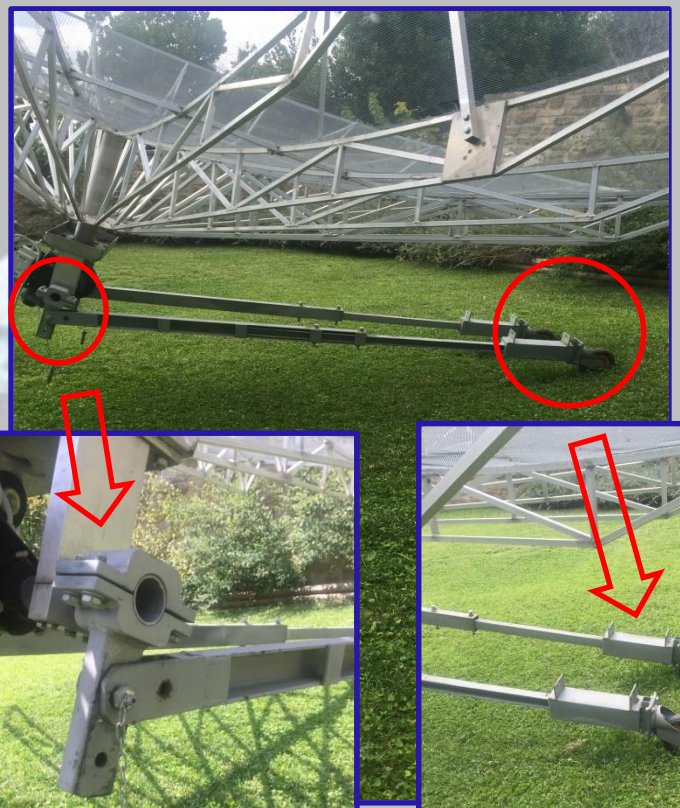
Mechanical design : tower design



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Mechanical design : tower design

Very easy access to the focus point that allows easy maintenace and fast feeder exchange.

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Mechanical design : the plinth

PLINTH CALCULATIONS					
Plinth					
Width	190	Cm	Weight of plinth (stabilizing moment)	144.40	KN
Lenght	190	Cm			
Height	160	Cm			
Specific weight of CLS	25	KN/mc			
Antenna					
Dish diameter	5	m	Dish area	19.63	M^2
Tower height	3	m	Total weight	8.83	KN
Tower weight	400	Kg			
Rotatotor weight	50	Kg			
Dish weight	200	Kg			
Counterbalance weight	100	Kg			
Extra weight due to snow	150	Kg			
Wind					
Max wind velocity	140	KM/H	Wind load per m^2	0.95	KN
Cx	1.33		Total force of wind	24.67	KN
Safety factor					
Safety factor	2		Tilting moment	67.0	KN
System is stable					

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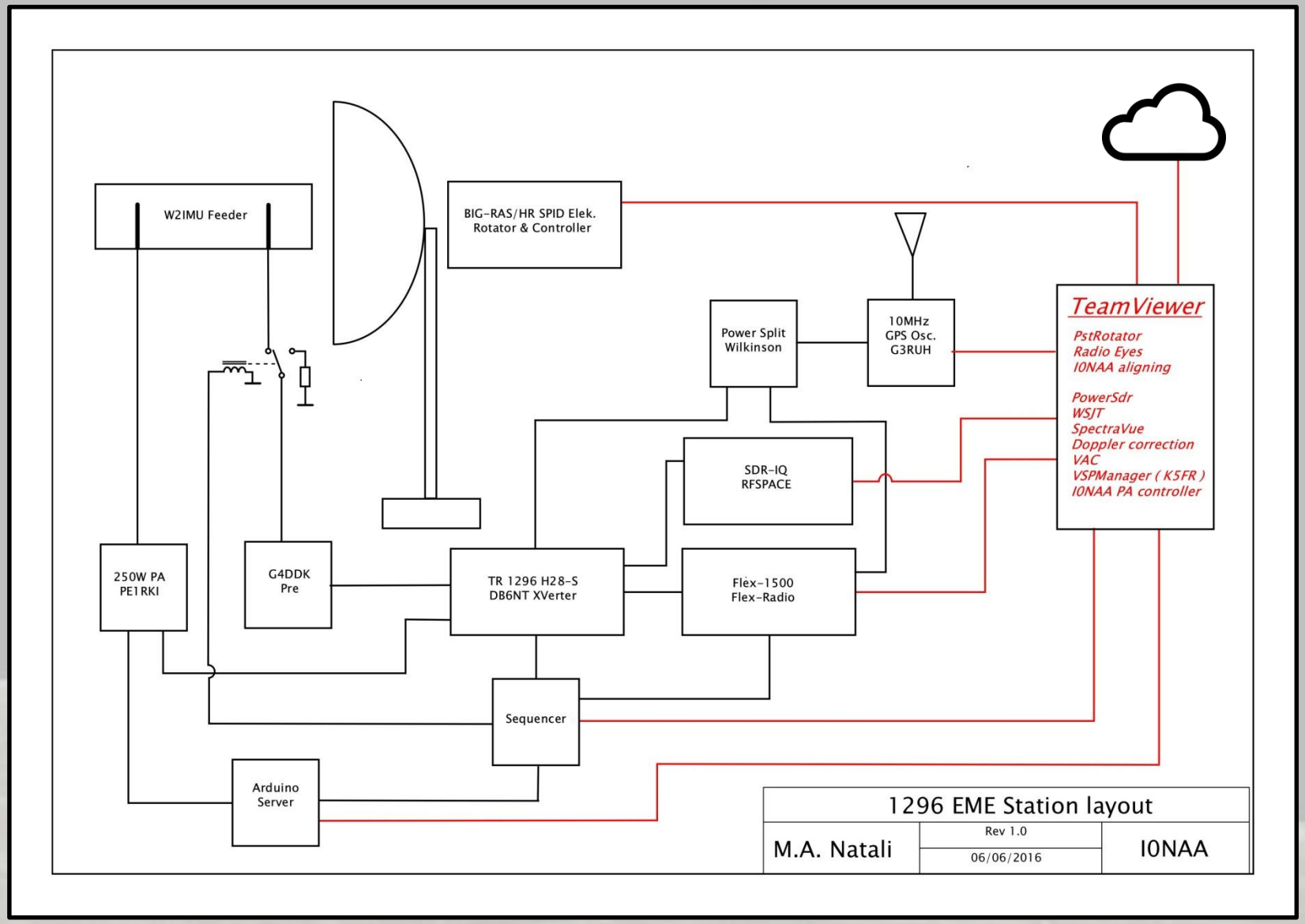
Technical characteristics : the station



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Technical characteristics : the results

Murmur Rev. 3.0.0 03-Apr-2017 - I0NAA mario.natali@gmail.com

Location	Latitude	Longitude	UTC Time	Local Time
Assisi-Beviglie	43.0922	12.5772	4/15/2017 3:13:34 PM	4/15/2017 5:13:34 PM

Rev. History

EXIT

SAVE current set as default | SET Observation location | CALCULATE

TRACK noise sources | Next 24h Pulsar visibility | Next 24h Pulsar tracking | 1 Month Pulsar visibility | 1 Month Pulsar tracking

◉ Dish antenna ○ Other antenna

Dish diameter	5	m
Dish efficiency	50	%
Sensitivity constant Ks	1	
Frequency	1296	Mhz
Line loss before LNA	0.1	dB
LNA Noise figure	0.28	dB
LNA gain	38	dB
Line loss after LNA	0.5	dB
Receiver noise figure	4	dB
T sky	10	K
T spillover	5	K
T atmosphere	0	K
Integration time	7200	sec.
Integration bandwidth	2000	KHz

Wave length	0.23	m
Effective ant. aperture	9.81	m^2
Dish area	19.63	m^2
Far field	216	m
Antenna gain	33.62	dBi
HPBW	3.24	deg
System noise temp.	41.60	K
System noise figure	0.58	dB
MDS	97.52	mJy

The analysis does not take into account the polarization of the signal as this parameter is strongly depending on the specific Pulsar. Please evaluate carefully case by case as this may deteriorate performance up to 3dB.

List of detactable PULSARS
based on ATNF Pulsar catalogue
(limited to the strongest 60 Pulsars)

Minimum S/N > 10
S/N >10 suggested for reliable results

Above horizon

B0329+54

Show all PSR List

Right Ascension (J2000)	53.25	deg
Declination (J2000)	54.58	deg
Width of pulse at 50% of peak	6.6	msec.
Barycentric period	0.71452	sec.
Dispersion measure	26.76	cm^-3 pc
Flow 400Mhz	1500.0	mJy
Flow 1,400Mhz	203.0	mJy
Max. integration bandwidwith (without de-dispersion)	34	Mhz
Calculated S/N	21.56	
Azimuth	310.29	deg
Elevation	66.47	deg

Evaluation done only for following frequency intervals :
390Mhz-500Mhz and 1,000Mhz - 1,500Mhz

Calculations done with «Murmur» program to predict Pulsar detectability

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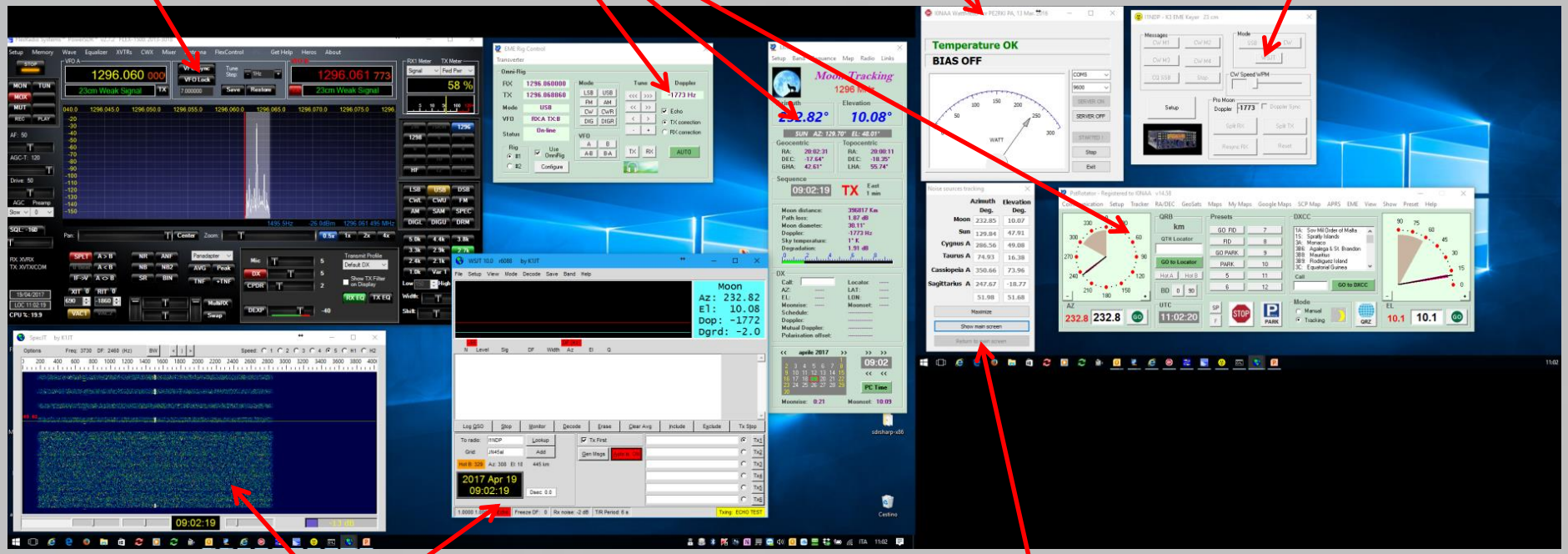
Technical characteristics : the results

PowerSDR

PstRotator

I0NAA PA Server

I1NDP doppler correction



WSJT10

Murmur

Echo with 250W.

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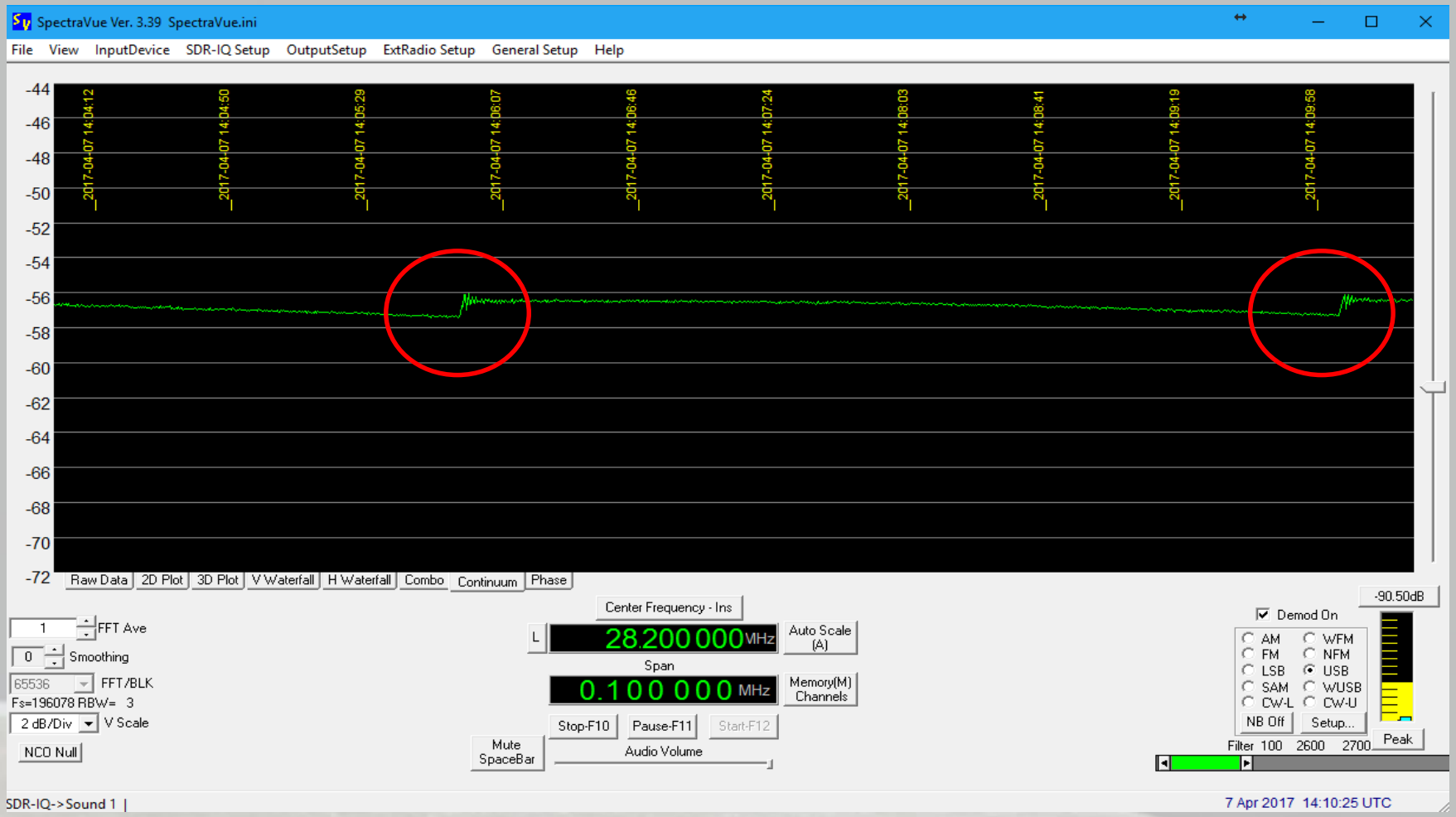
Space for improvement : Oscillations



Mechanical stability of the dish holder block must be improved and a dampen mechanism to the rotator elevation should be added to avoid oscillation @ start-stop.

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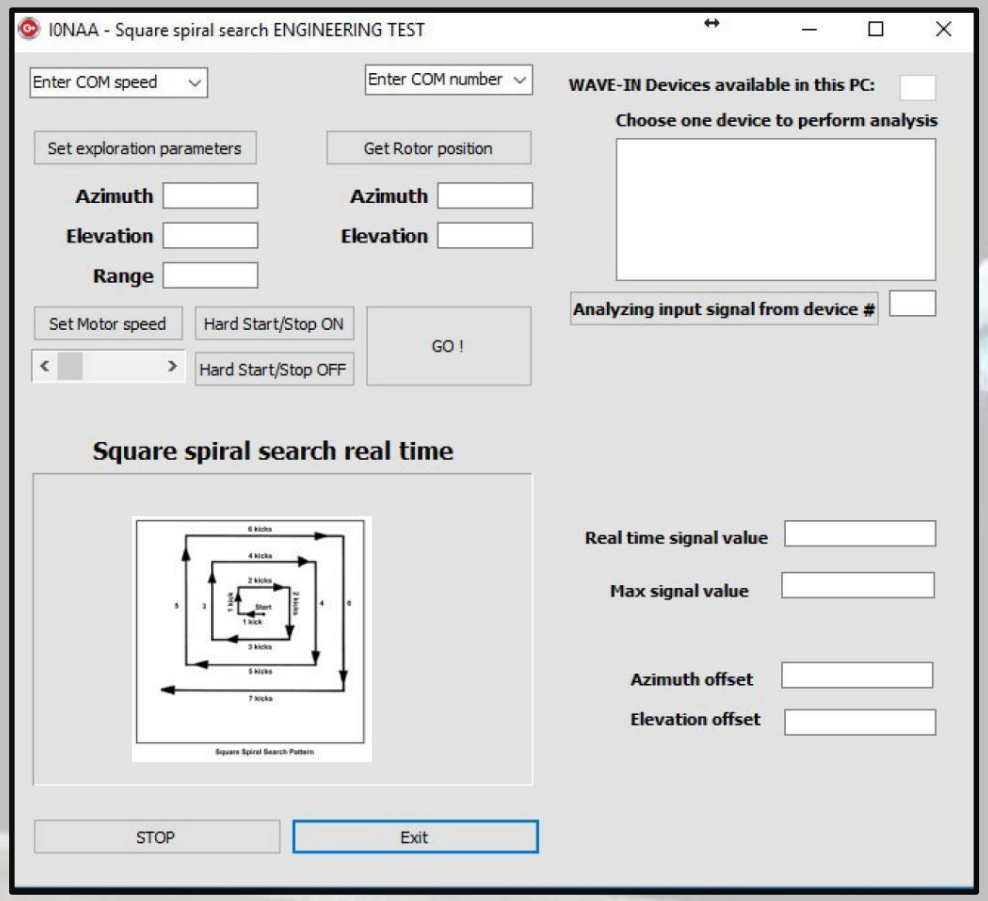
Space for improvement : Automatic pointing



Pointing repeatibility must be improved as incremental encoders (and moving tower) require at the beginning of each session a re-alignment of Az/El using sun noise. Square Spiral Search Pattern program is in development, but most likely absolute encoders will be the final fix.

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Some caveat .....

BIG DISHES ARE VERY INTERESTING TOOLS AND CAN GENERATE A LOT OF STIMULATING IDEAS .... BUT BE CAREFULL .. CAN ALSO BE VERY DANGEROUS .....

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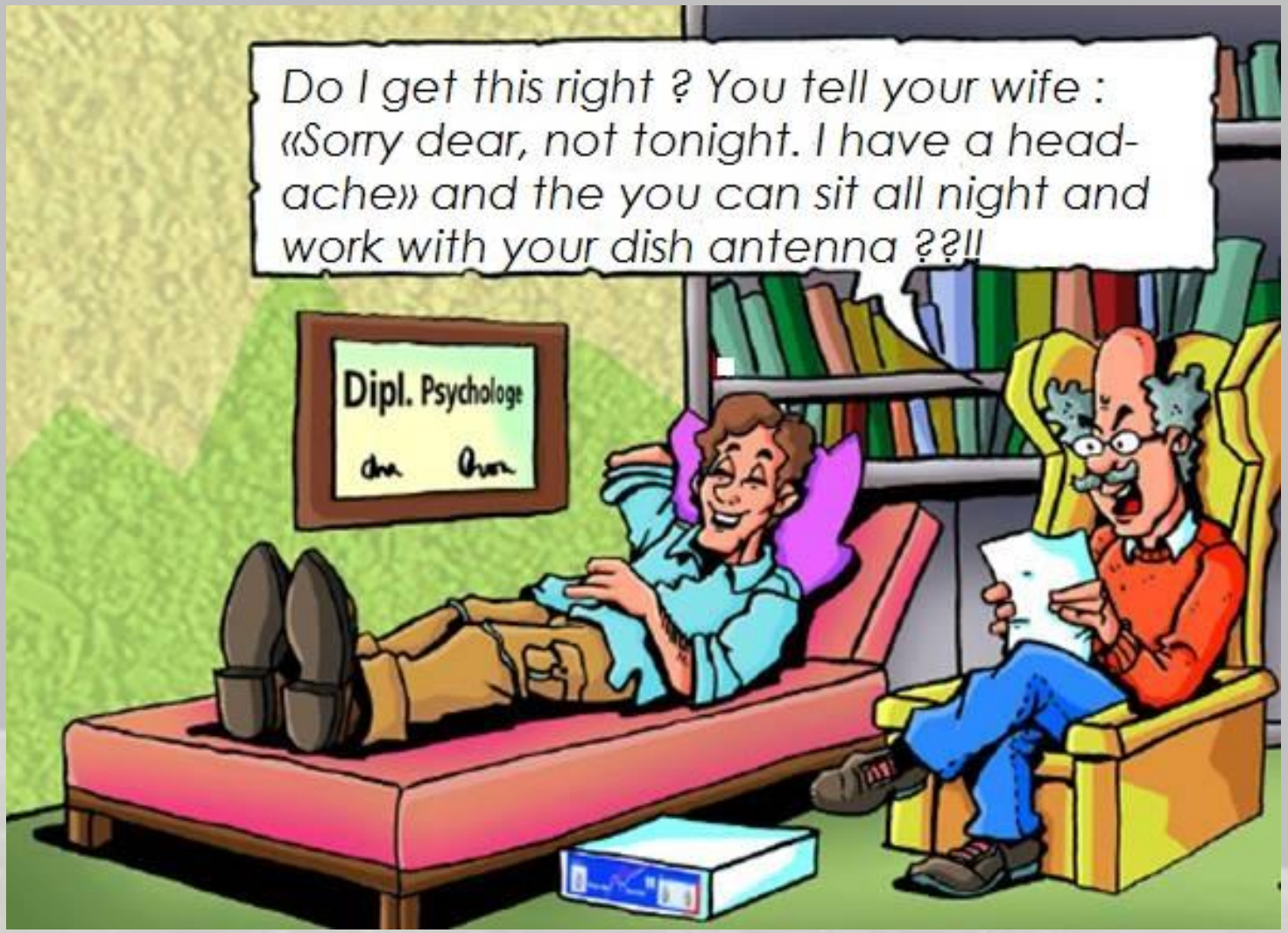
Some caveat .....



Derived from https://www.omicron-lab.com/fileadmin/assets/RFGeek_Jokes/Wife_Headache_Large.jpg

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Thank you !