- **Two TotalPower V8 use cases**
  - ✓ **VK2CMP**
  - ✓ **W1GHZ**

Transverters – Veryifying Performance using TotalPower

Paul W1GHZ - QST Oct 2024



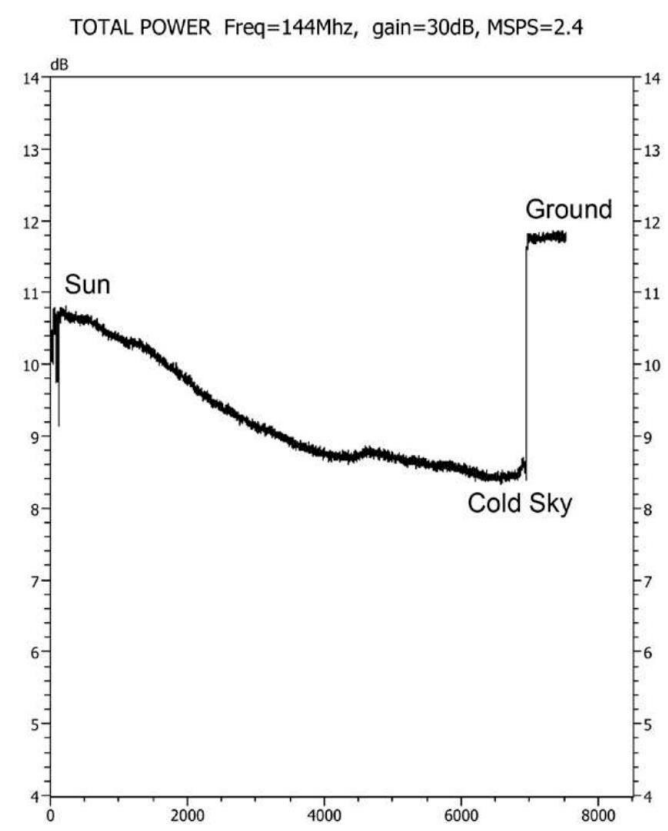


Figure 3 — 10 GHz transverter noise drift plot from *TotalPower* as the Earth rotates and moves the sun out of the beam of the dish until only the cold sky is left. Then the dish is pointed at the ground.

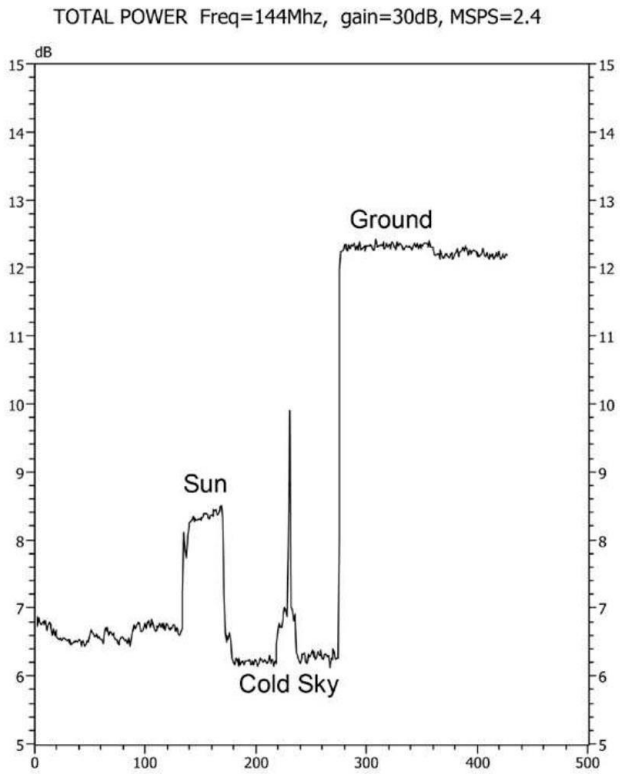


Figure 2 — The noise plot from the *TotalPower* program as a small horn is pointed toward the sun, cold sky, and ground, measured at the 144 MHz IF frequency.

	A	B	C	D
1	Noise Figure Measurement from Earth/Cold Sky Comparison			4/27/2002
2	using decibel change value			W6OYJ
3				
4	Point your antenna at Earth then Cold Sky (Elev above 50 degrees)			
5	Determine Rcvr i.f. noise power output change in dB. Output must be			
6	linear (not saturated) (no AGC action) and include no extraneous signals.			
7				
8	Enter result here	6.1	dB	(Y factor in dB)
9				
10	Calculated Values			
11	Earth Temperature	290	Kelvin	(assumed value)
12	Cold Sky Temp.	30	Kelvin	(assumes Earth sidelobe contribution *)
13				
14	Y factor	4.0738	(ratio)	(converted from dB)
15				
16	System Noise Temp.	54.586	Kelvin	
17	System Noise Figure	0.749	dB	
18				
19	*Note: If your antenna has very low sidelobes this temp can be reduced to			
20	as low as 6 degrees Kelvin, the Noise Temp of coldest part of the sky			
21				

From October 2024 QST – Microwavelengths
Transverters – Verifying Performance

Paul Wade – W1GHZ

VK2CMP
- to use SAW filters or not?

The problem:

1. Will adding SAW filters to my V & H EME RX chains improve performance?
2. They have 2.2dB Insertion Loss
3. I already have 3 stages of filtering
4. One more thing to go wrong
5. There is a contest coming up – now is not the time to f#ck up…



AFS434S3 434MHz Filter

- Brand: Abracon
- Product Code: AFS434S3
- Quantity In Stock: 88

$3.30

Export: $3.00

Qty

1

Add to Cart

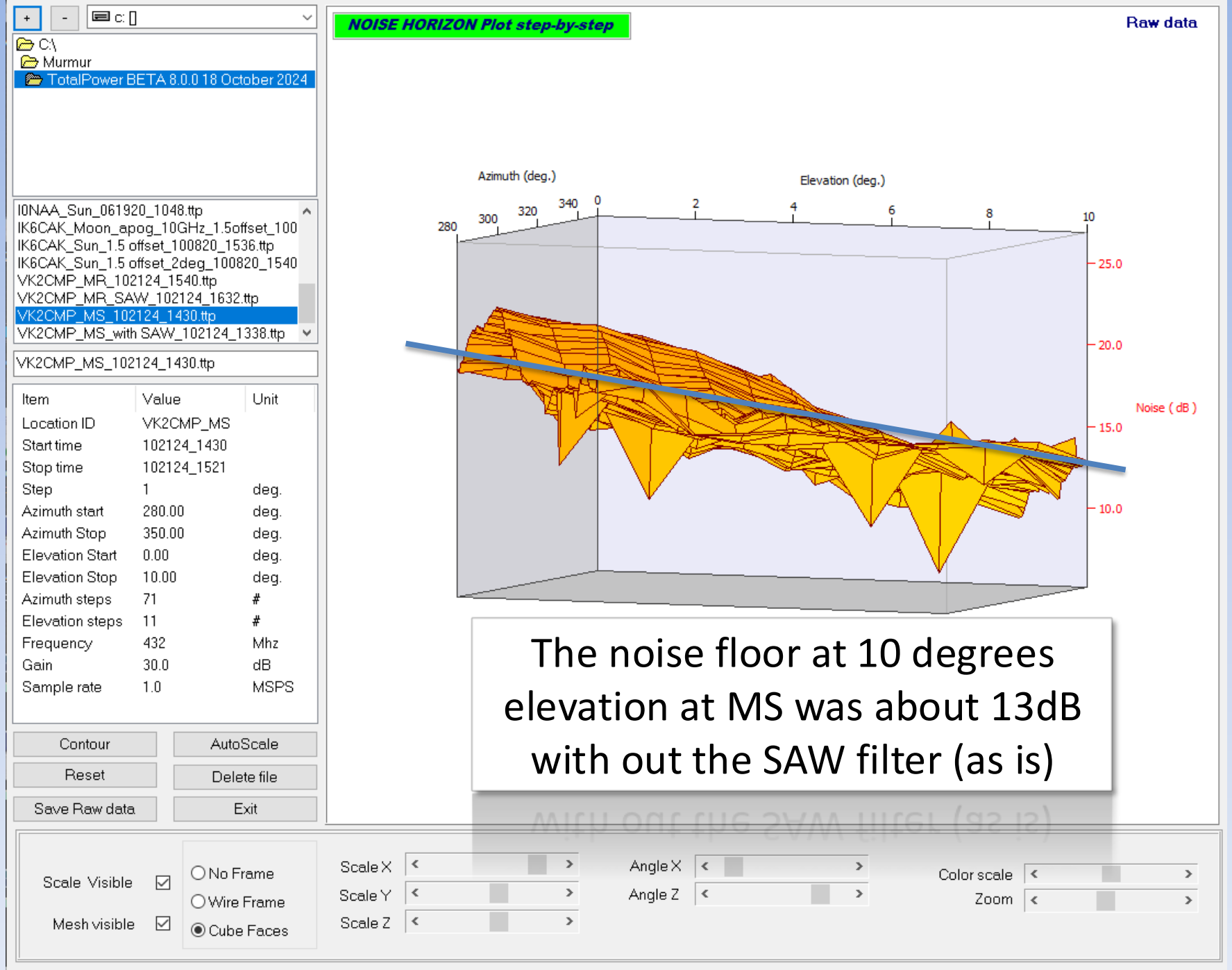
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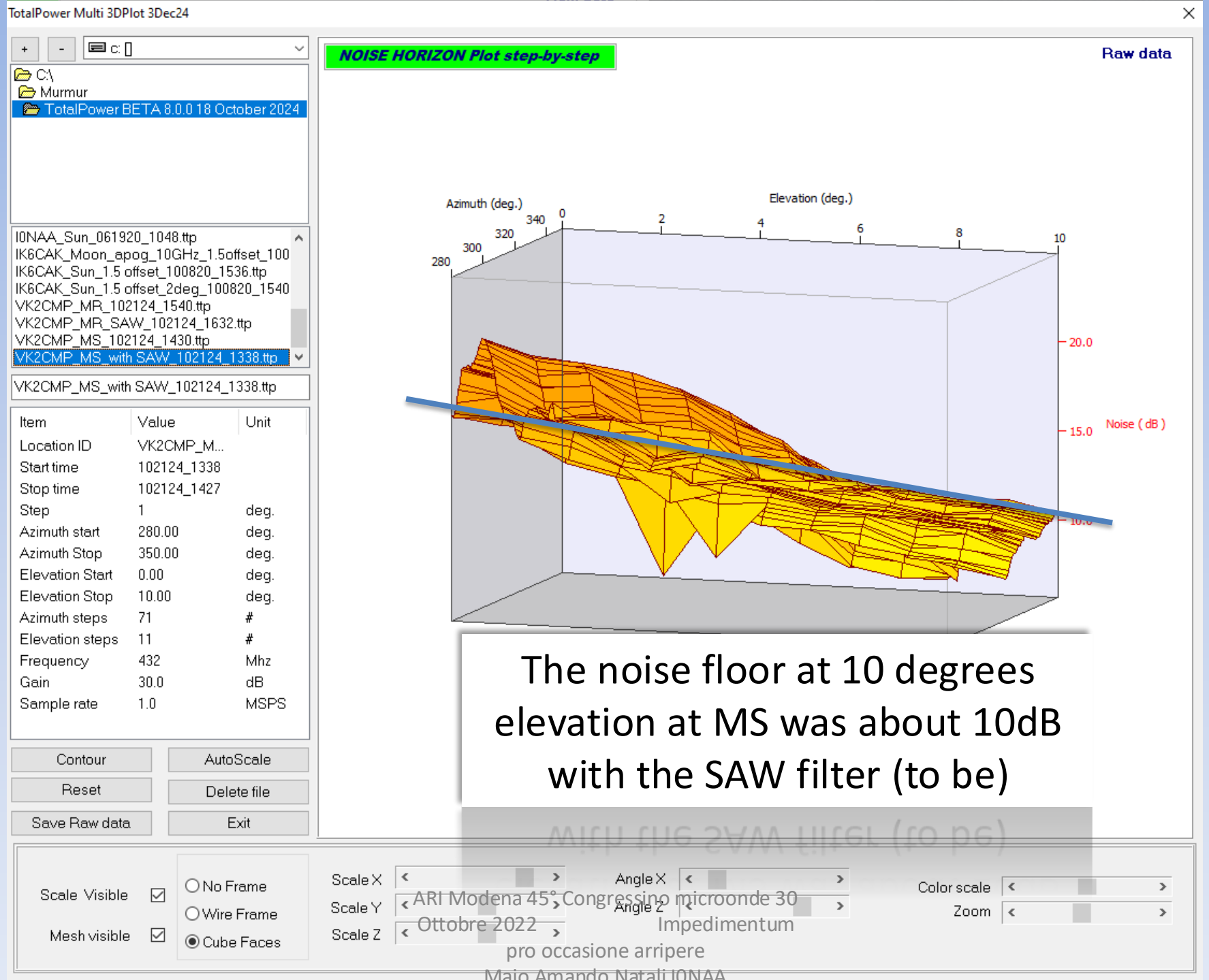
Abracon 434MHz SAW filter, 4MHz bandwidth, 50ohm. These are ideal to construct a low cost 70cm Transverter for 432MHz SSB operation.

Please refer to the AFS434S3 Data Sheet for further information

Price is for 1pcs.

TotalPower Multi 3DPlot 3Dec24





The noise floor at 10 degrees elevation at MS was about 10dB with the SAW filter (to be)

ARI Modena 45° Congresso microonde 30 Ottobre 2022

Impedimentum pro occasione arripere

Maio Amando Natali I0NAA

Results

2023 ARRL EME contest

281,400 points

67 contacts x 42 multi

2nd place - 432Mhz single op

No SAW filter

2024 ARRL EME contest

530,400 points

78 contacts x 68 grids

? place - 432Mhz single op

With SAW filters (V & H)

2023 ARRL International EME Contest

Last year, the 2.3 GHz and Up weekends of the ARRL International EME Contest were held August 12 – 13 and September 9 – 10. The 50 – 1296 MHz weekends took place October 28 – 29 and November 25 – 26.

Multioperator Scores by Category

Call Sign	Score	QSOs	Mults
Multioperator, All Mode, All Band			
UA5Y	8,140,500	405	201
K5QE	7,924,800	381	208
W2ZQ	5,767,200	324	178
NC1I	1,327,200	158	84
OH1LRY	1,307,200	152	86
DL3WDG	1,177,100	149	79
W3SZ	775,000	125	62
W4ZST	700,000	100	70
LU8ENU	499,200	96	52
OZ9KY	138,000	46	30
Multioperator, All Mode, 144 MHz			
S51ZO	819,000	130	63
SK6EI	455,700	93	49
JF1AMX	369,600	88	42
N4SVC	366,600	78	47
W9VW	234,000	60	39
F6HEO	188,700	51	37
KE4HAM	400	2	2
F5JWF	58,000	29	20
KØDSP	15,400	14	11
W8TN	12,100	11	11
DJ3AK	4,900	7	7
SM5EPO	2,500	5	5
Single Operator, All Mode, 50 MHz			
KJ9I	702,100	119	59
N3FTI	400	2	2
Single Operator, All Mode, 144 MHz			
OK1DIX	1,497,600	192	78
IW4ARD	889,600	139	64
W9IP	888,300	141	63
SM2BYC	792,000	132	60
OG3Z	736,600	127	58
7K3LGC	565,000	113	50
G8RWG	417,600	87	48
WB9UWA	417,600	87	48
VE7PS	410,000	82	50
KA1W	403,200	84	48
K1FMS	332,100	81	41
PJ4MM	252,000	63	40
UA9YJM	240,500	65	37
JP3EXR	219,600	61	36
KG6NK	187,000	55	34
K1DG	183,600	51	36
Single Operator, All Mode, 432 MHz			
SM4GGC	322,500	75	43
VK2CMP	281,400	67	42
KD2LGX	218,300	59	37
VK4EME	179,200	56	32
S56P	127,600	44	29
OK1TEH	63,000	30	21
RD3FD	58,900	31	19
DL1VPL	58,800	28	21
SP2WRH	55,000	25	22
W7TZ	42,500	25	17
GDØTEP	41,400	23	18
DM9EE	39,900	21	19
BV3CE	35,200	22	16
AE6EQ	28,500	19	15
JRØWFY	8,000	10	8
OM4EX	7,200	9	8
K7ATN	5,600	8	7
UT5DL	4,200	7	6
VE3GKT	3,600	6	6
UD2F	3,000	6	5
NY1V	1,600	4	4
XQ3SA	900	3	3
JAØRWF	400	2	2
JG2XWH	400	2	2
KGØD	400	2	2
OH3MCK	28,800	24	12
DL7AIG	20,900	19	11
F6KRK	15,400	14	11
F8DBY	15,300	17	9
GØHIK	12,600	18	7
OH3DP	12,600	14	9
OH3LWP	11,700	13	9
K5WO	7,000	10	7
JA4UMN	6,600	11	6
PJ2BR	4,000	8	5
W3IPA	2,400	6	4
4X1AJ	2,000	5	4
RX6AIA	1,800	6	3
JA4LJB	400	2	2
Single Operator, All Mode, 2.3 GHz			
KL6M	19,200	16	12
KU4XO	8,800	11	8
SQ6QV	100	1	1
Single Operator, All Mode, 5.7 GHz			
OK1CA	33,600	21	16
PY2BS	14,300	13	11
Single Operator, All Mode, 10 GHz			
OZ1LPR	198,400	64	31
PAØPLY	112,000	40	28

ARI Modena 45° Congres
Ottobre 2022
pro occasione
Maio Amando Na

TotalPower 8.0.0

Hornsby & District Amateur Radio Club

February 2025

Translation of presentation by the author of TotalPower - Mario Armando Natali, I0NAA

mario.natali@gmail.com

TotalPower 8.0.0

Informazioni generali

- **TotalPower is a Windows program designed to enable RF band monitoring and RF noise measurements using the low-cost SDR (Software Designed Radio) known as RTL-SDR.**

- **The program was developed in C++ using the Embarcadero® C++ Builder 10.2 IDE (starter edition), the "SDL Delphi Component Suite" libraries of "EPINA Softwares Lab" for graphics and "FFTW" for transforms.**

- **TotalPower has been downloaded about 3700 times, in use in many parts of the world. It has been illustrated on Radio Rivista, on Dubus and presented in many technical sessions including the EME Conference in Trenton last August and the SARA "Eastern conference" in 2022.**

TotalPower is distributed free of charge through Mario's website
https://i0naa.altervista.org

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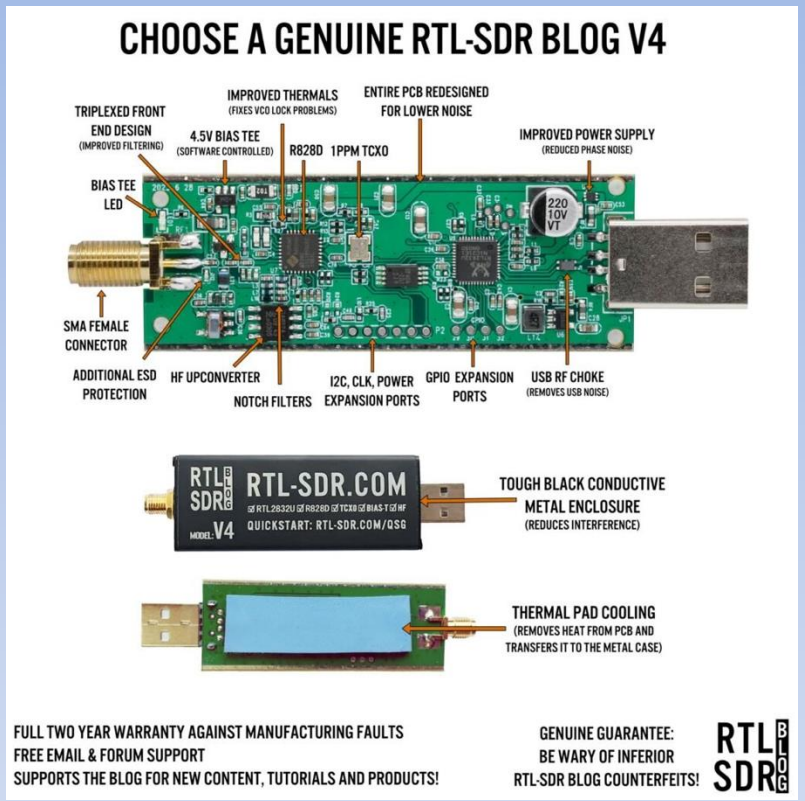
II set-up



- **TotalPower uses the web to check the version of the program and to download the latest solar flux data from the NOAA (National Oceanic and Atmospheric Administration) ftp site which is then interpolated in order to predict the current solar noise at the frequency of interest.**
- **The interaction with PstRotator (https://www.pstrotator.com/) implemented with the UDP protocol, allows you to drive almost any antenna rotor on the market.**

TotalPower 8.0.0

La SDR RTL-SDR



- ✓ **The RTL-SDR SDR samples the incoming data and makes it available in a 65536 bytes long buffer that contains a sequence of I and Q values.**
- ✓ **The I and Q values represent the value of the phase and quadrature components of the RF signal vector and through them it is possible to reconstruct and process the input signal.**

- ✓ **Frequency range (R820T): ≈ 24 – 1766 MHz**
- ✓ **ADC (Analog to Digital Conversion) : 8 bit (7+1)**
- ✓ **Sampling up to 3.2MSPS equivalent to 3.2 Mhz BW**

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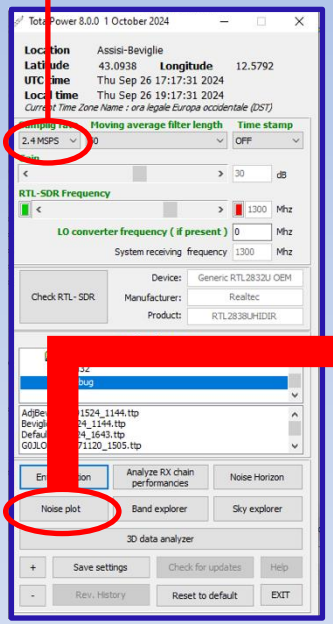
Key features of TotalPower

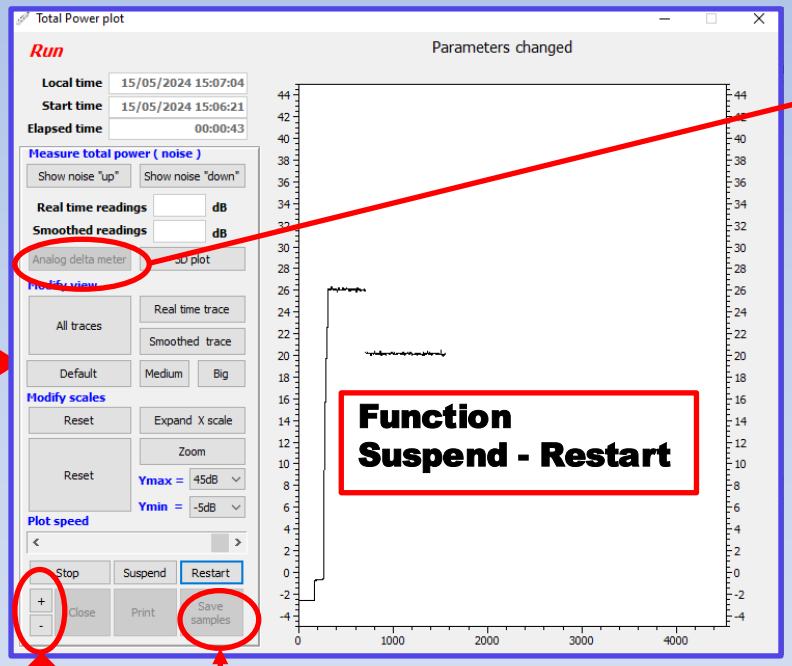
- **Time-domain analysis and charting.**
- **Frequency domain analysis and graphs.**
- **Predictive analytics.**
- **Dynamic analysis of the radium.**
  (working in conjunction with the PstRotator program)
- **3D analysis of the radium.**
  (working in conjunction with the PstRotator program)

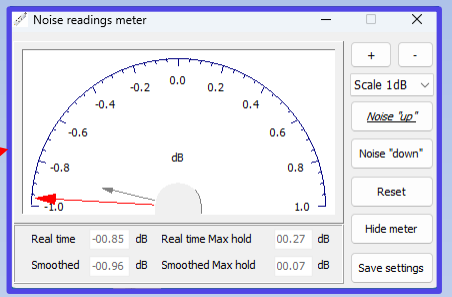
TotalPower 8.0.0

Time-domain analysis and charting

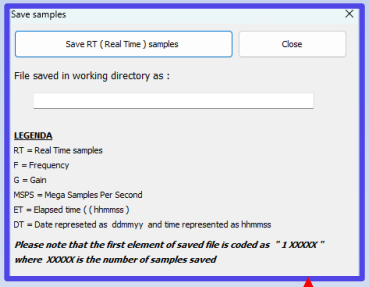
MSPS (mega samples per seconds) is equivalent to bandwidth:
2.4 MSPS = 2.4 Mhz 1.0 MSPS = 1.0 Mhz 0.3 MSPS = 0.3 Mhz







Function
Suspend - Restart

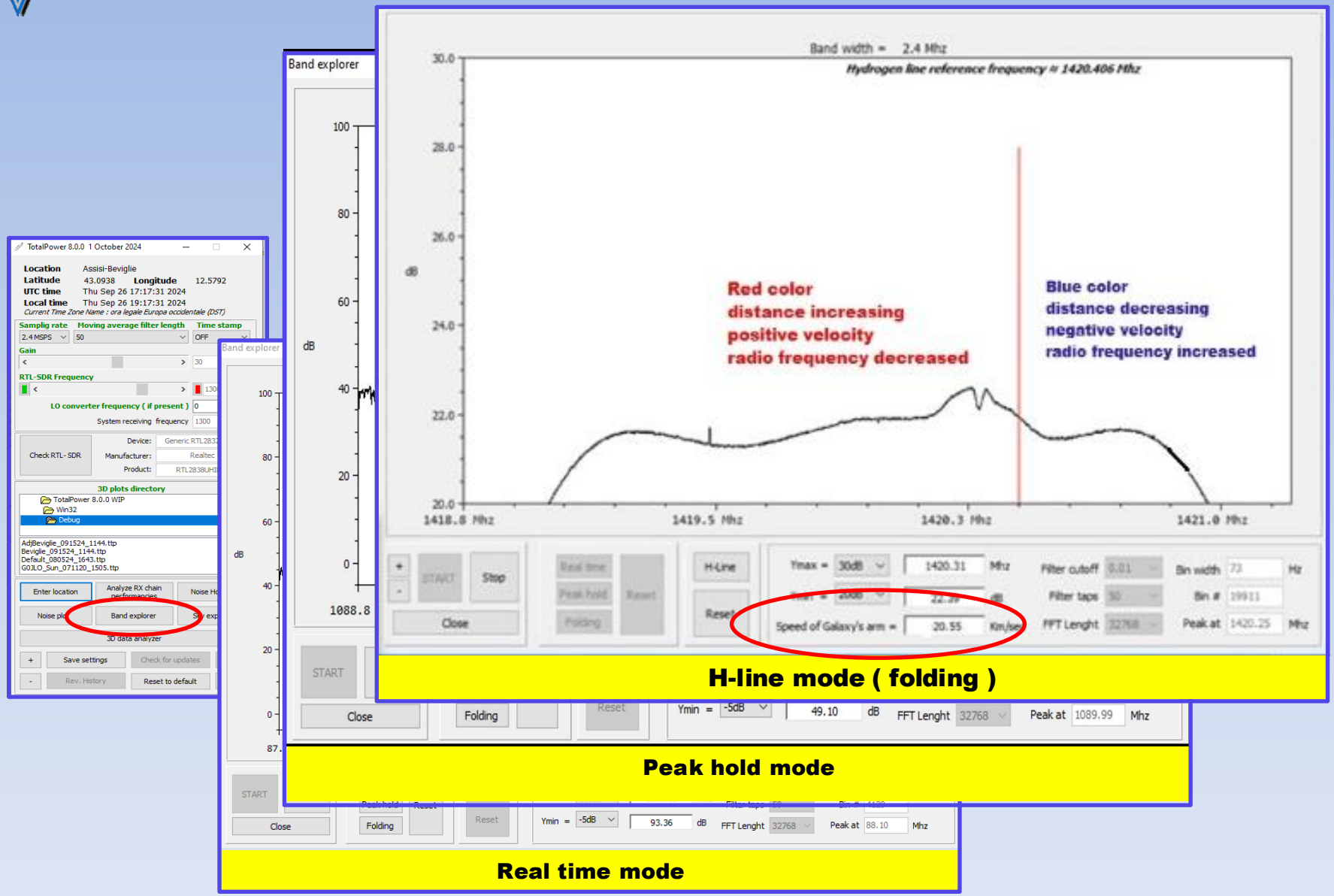


User interface zoom

"Save samples" allows you to save all samples of the session in .csv format

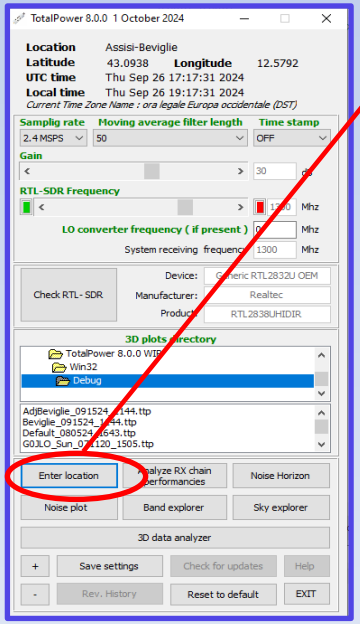
TotalPower 8.0.0

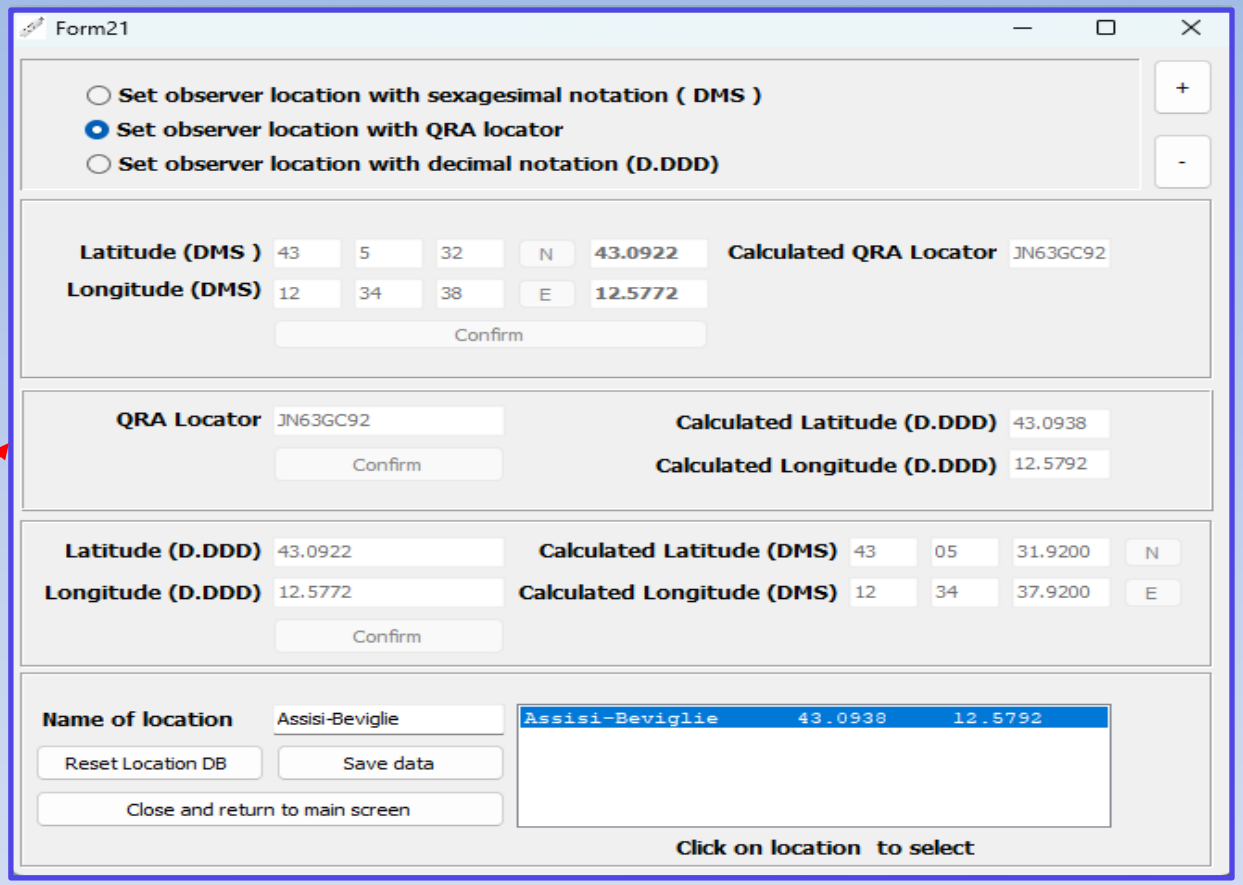
Frequency domain analysis and graphing



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Predictive analytics

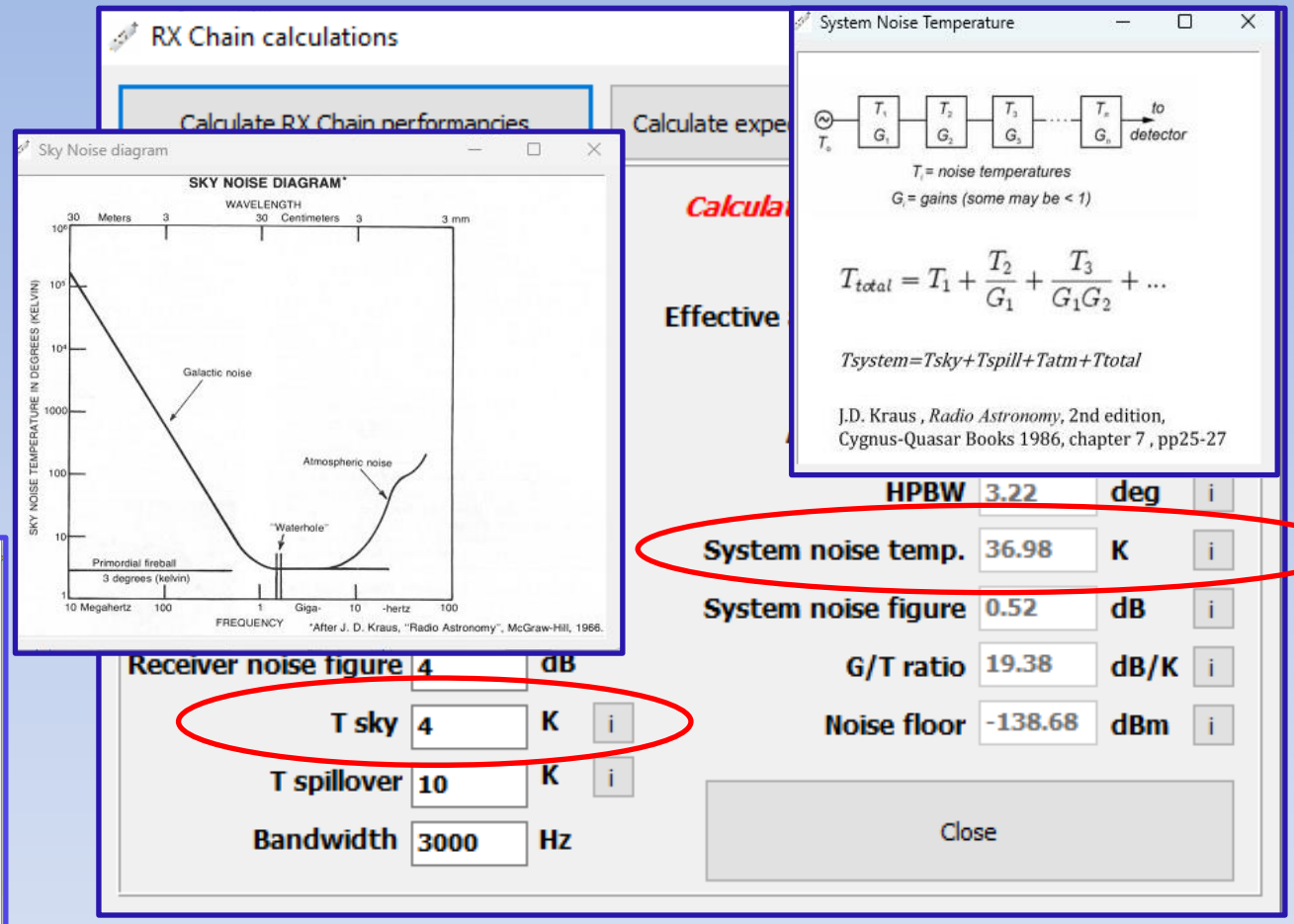




✓ **SET LOCATION allows you to enter the locations both with the locator QRA (up to 8 digits) and with the sexadecimal or decimal geographical coordinates.**

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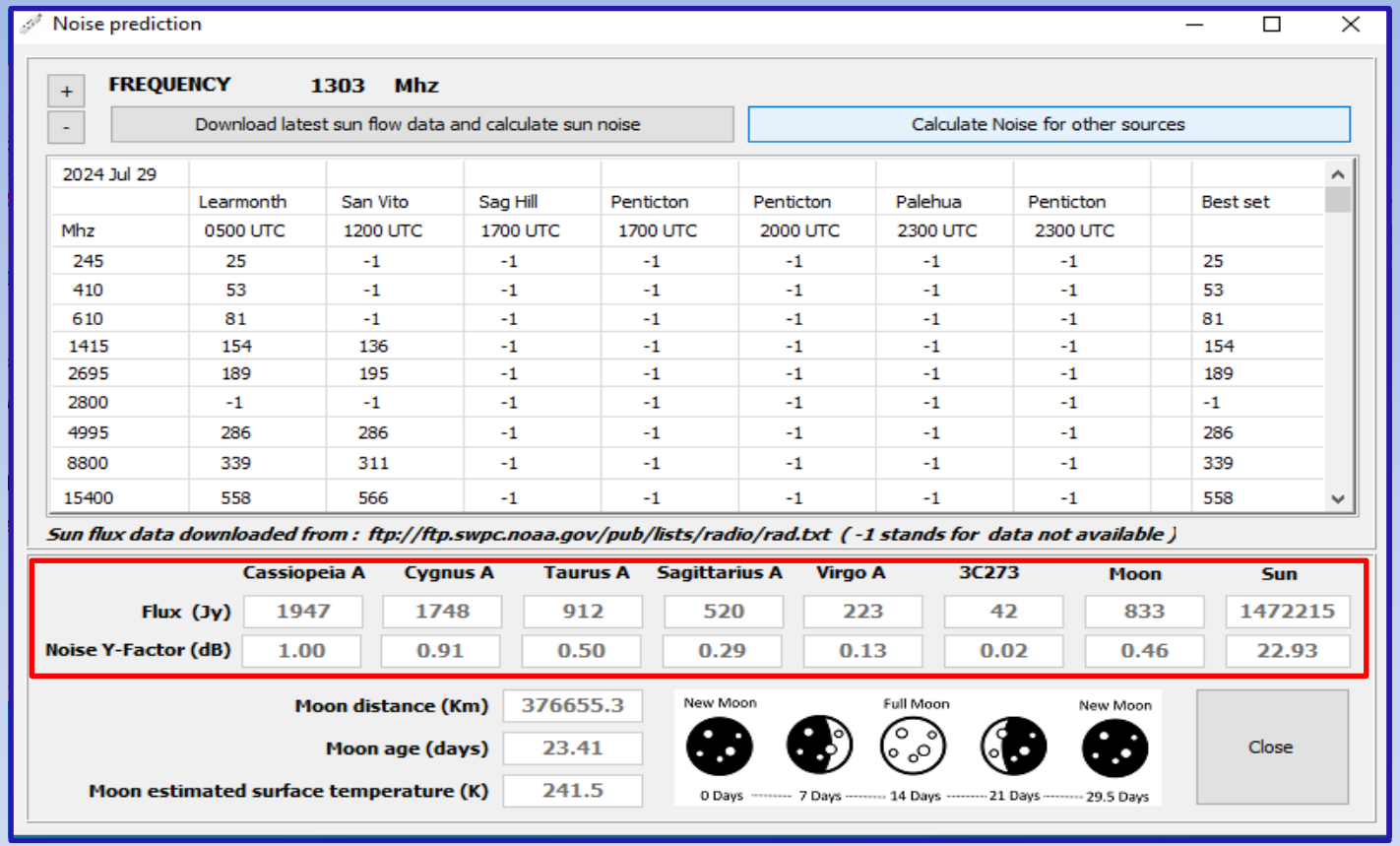
Predictive analytics



✓ **SYSTEM EVALUATION derives the fundamental parameters of the RX chain from the input parameters entered by the user.**

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Predictive analytics

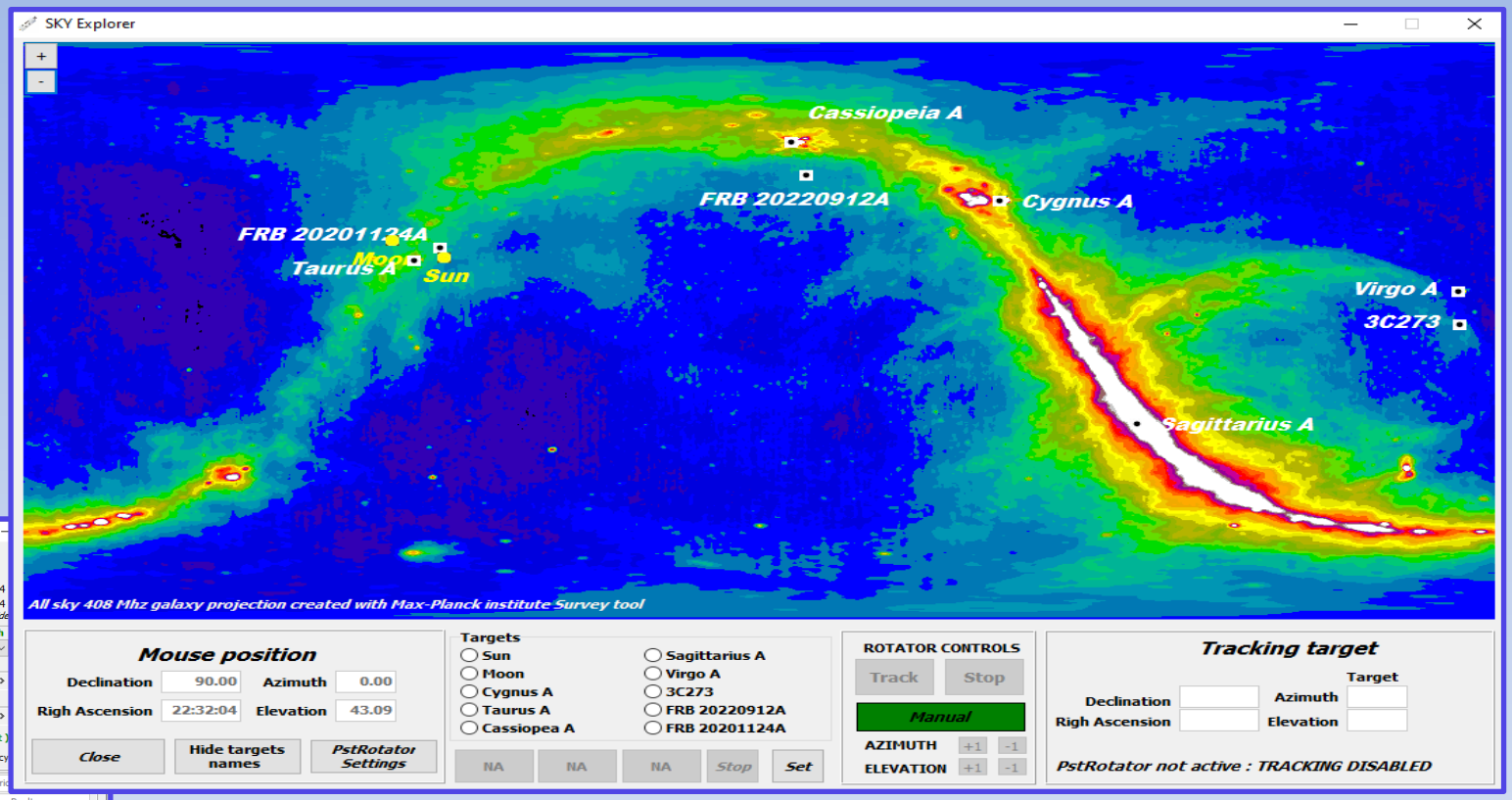


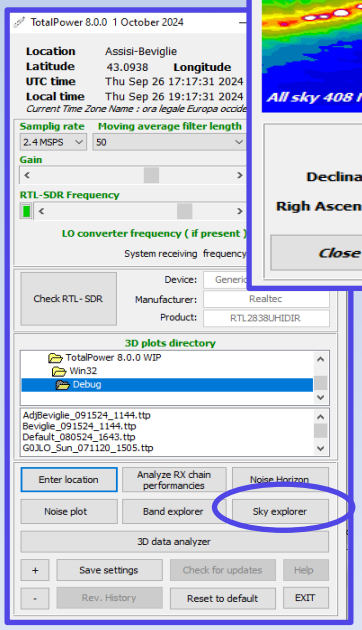
Mhz	Learmonth 0500 UTC	San Vito 1200 UTC	Sag Hill 1700 UTC	Penticton 1700 UTC	Penticton 2000 UTC	Palehua 2300 UTC	Penticton 2300 UTC	Best set
245	25	-1	-1	-1	-1	-1	-1	25
410	53	-1	-1	-1	-1	-1	-1	53
610	81	-1	-1	-1	-1	-1	-1	81
1415	154	136	-1	-1	-1	-1	-1	154
2695	189	195	-1	-1	-1	-1	-1	189
2800	-1	-1	-1	-1	-1	-1	-1	-1
4995	286	286	-1	-1	-1	-1	-1	286
8800	339	311	-1	-1	-1	-1	-1	339
15400	558	566	-1	-1	-1	-1	-1	558

- ✓ **Solar noise is calculated by interpolating NOAA data.**
- ✓ **The noise of the moon is calculated with an algorithm that takes into account the heating of the lunar soil.**
- ✓ **The noise of the other sources is calculated by interpolating the data found in the papers reported in the manual.**

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Analisi dinamiche del radio cielo



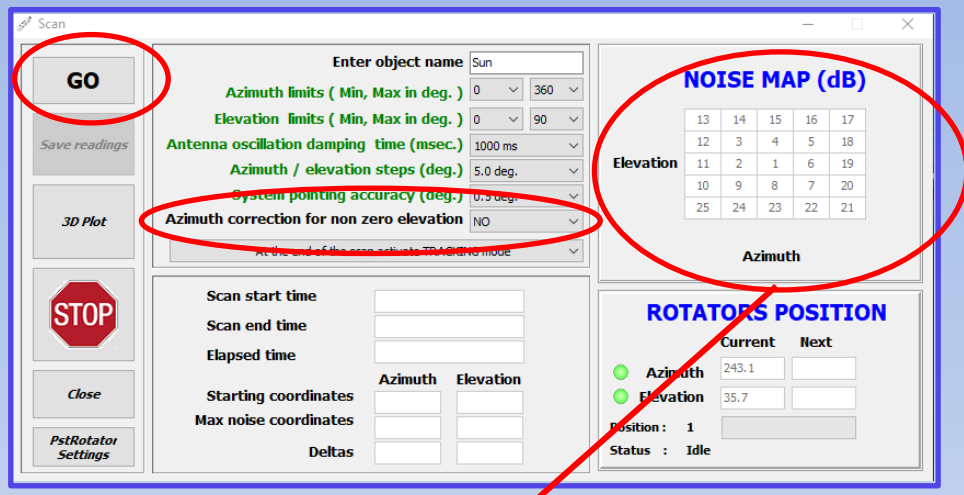


✓ **The SKY EXPLORER function, based on a map of the radio sky @ 408Mhz generated with a tool of the Max Planck institue, allows you to automatically trace some pre-installed objects and to use the mouse with the CAP (Click And Point) function.**

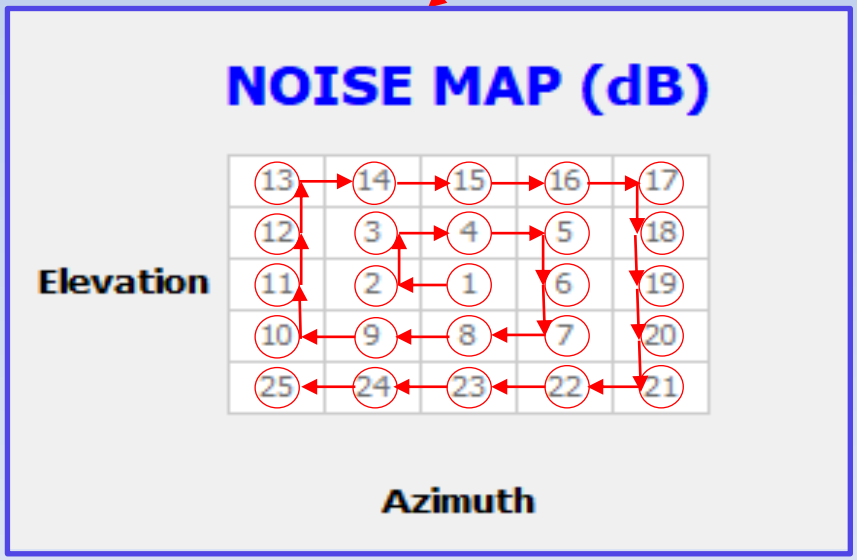
TotalPower 8.0.0

3D analysis of the radio sky : NOISE SCAN

- ✓ **"GO" initiates a spiral trajectory of the antenna implemented as a sequence of 25 "stop and go" movements from point 1 to point 25.**

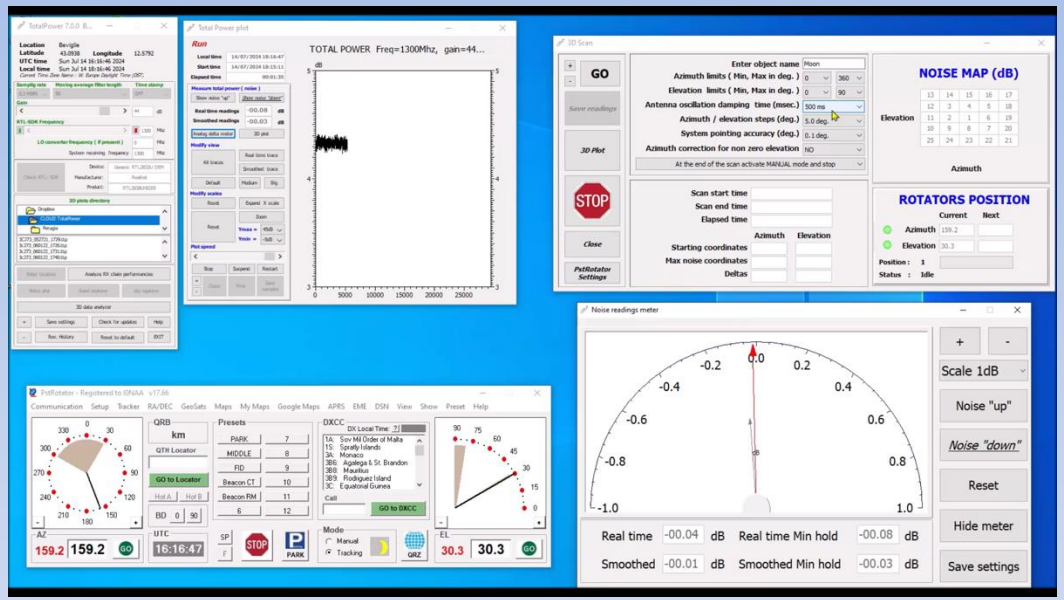


- ✓ **An automatic correction keeps the length of the spherical arc of the azimuth traveled constant regardless of elevation.**



TotalPower 8.0.0

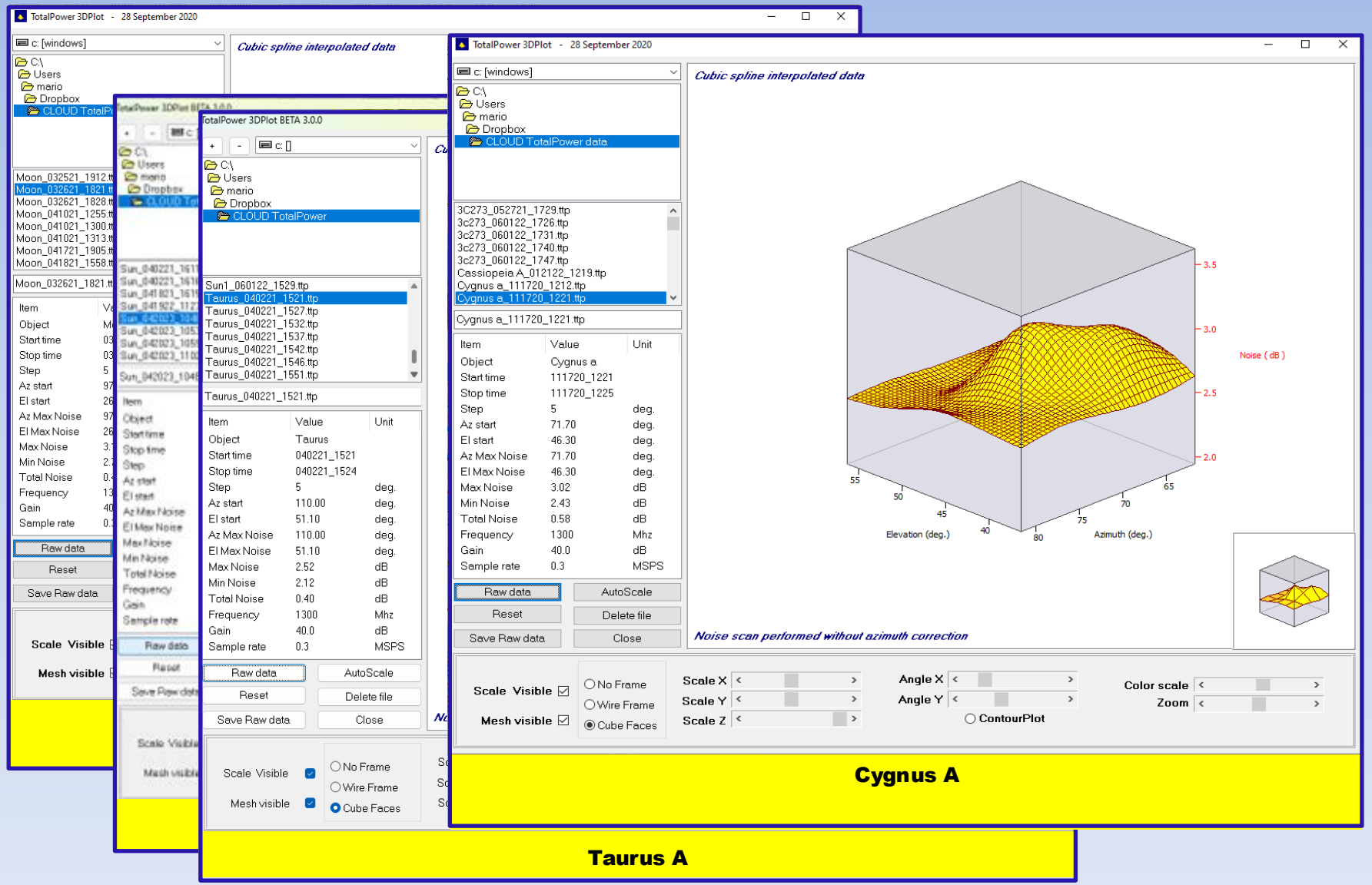
3D analysis of the radio sky : NOISE SCAN





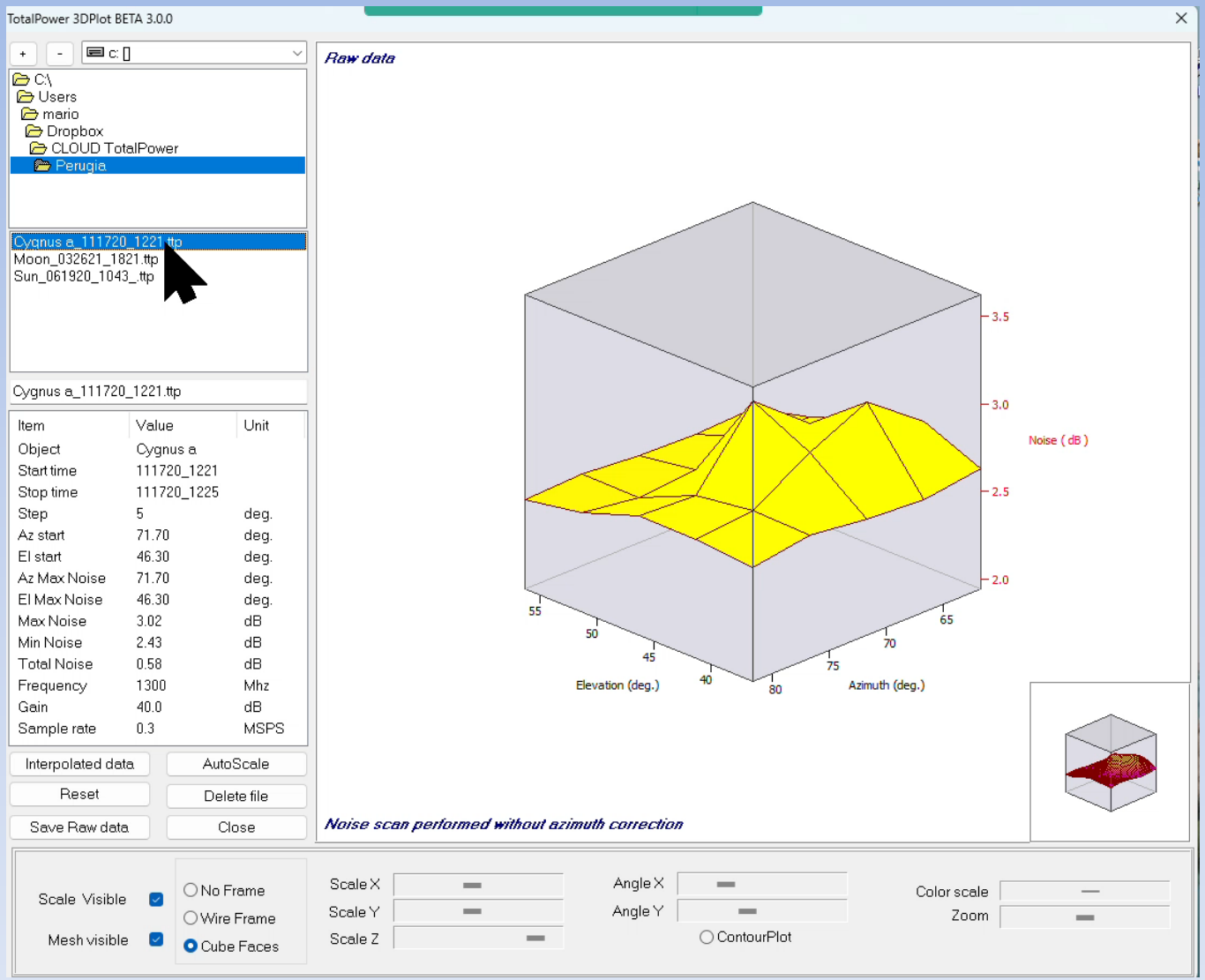
TotalPower 8.0.0

3D analysis of the radio sky : NOISE SCAN



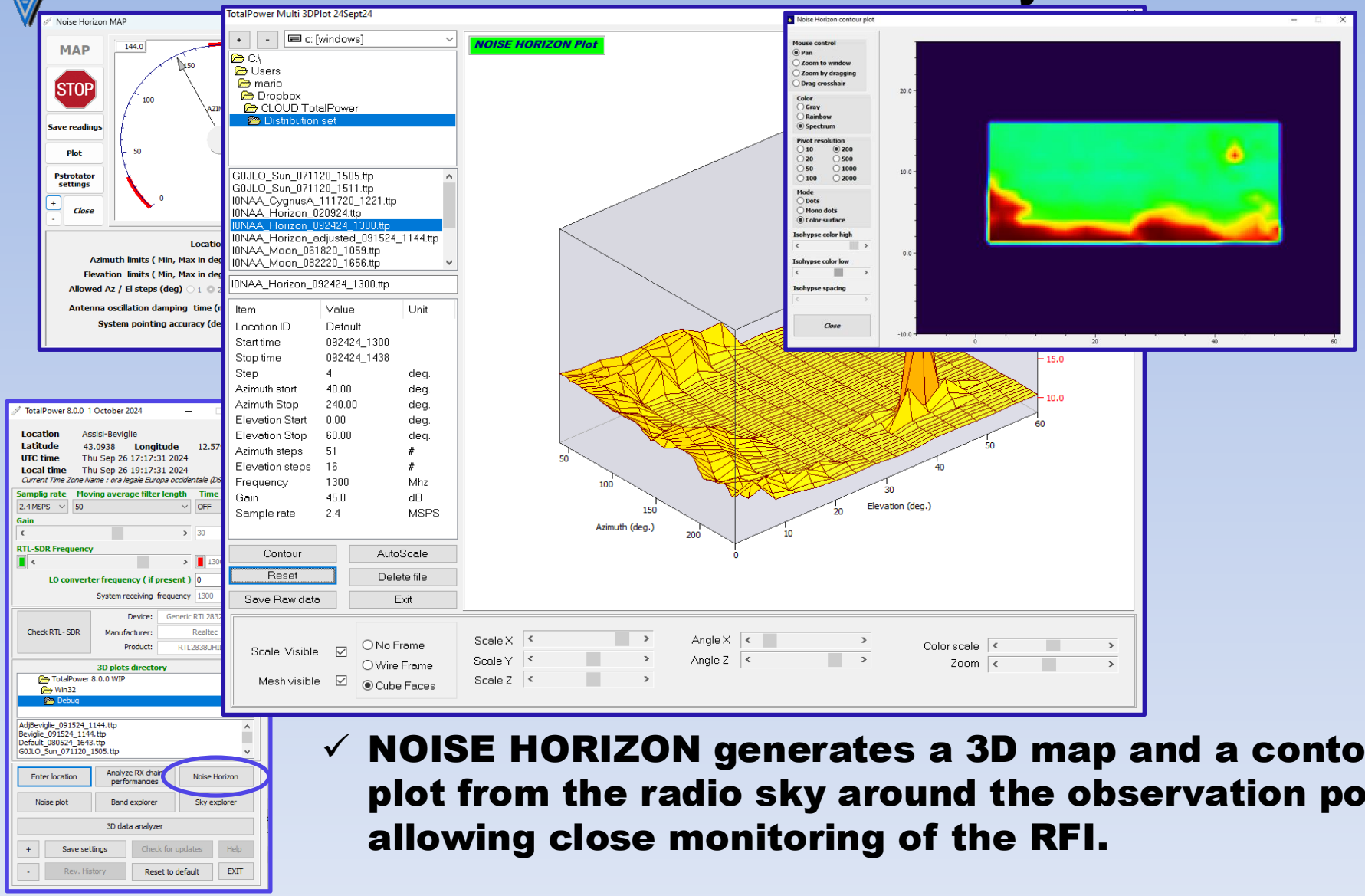
TotalPower 8.0.0

3D analysis of the radio sky : NOISE SCAN



TotalPower 8.0.0

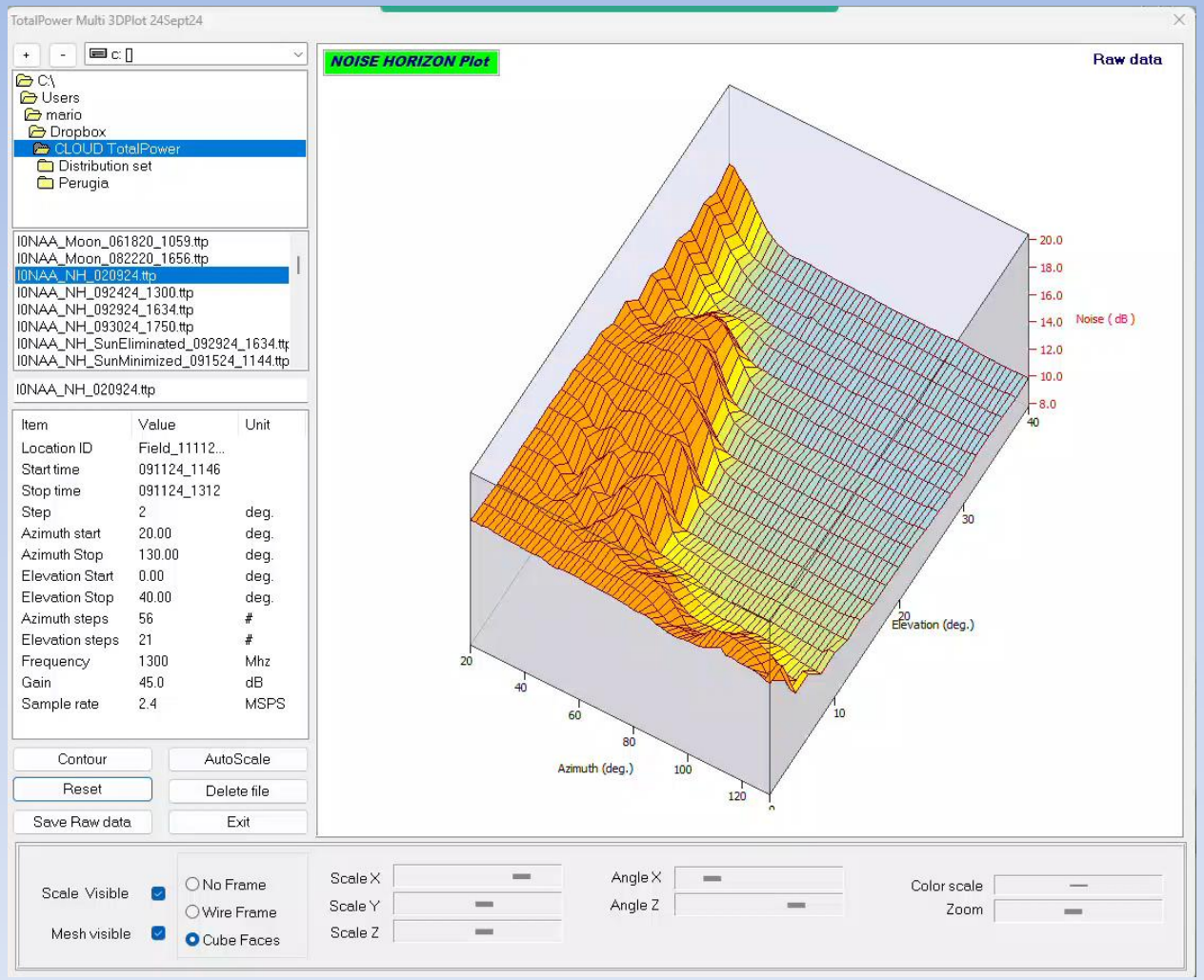
Sentirsi Jansky... : NOISE HORIZON



✓ **NOISE HORIZON generates a 3D map and a contour plot from the radio sky around the observation point allowing close monitoring of the RFI.**

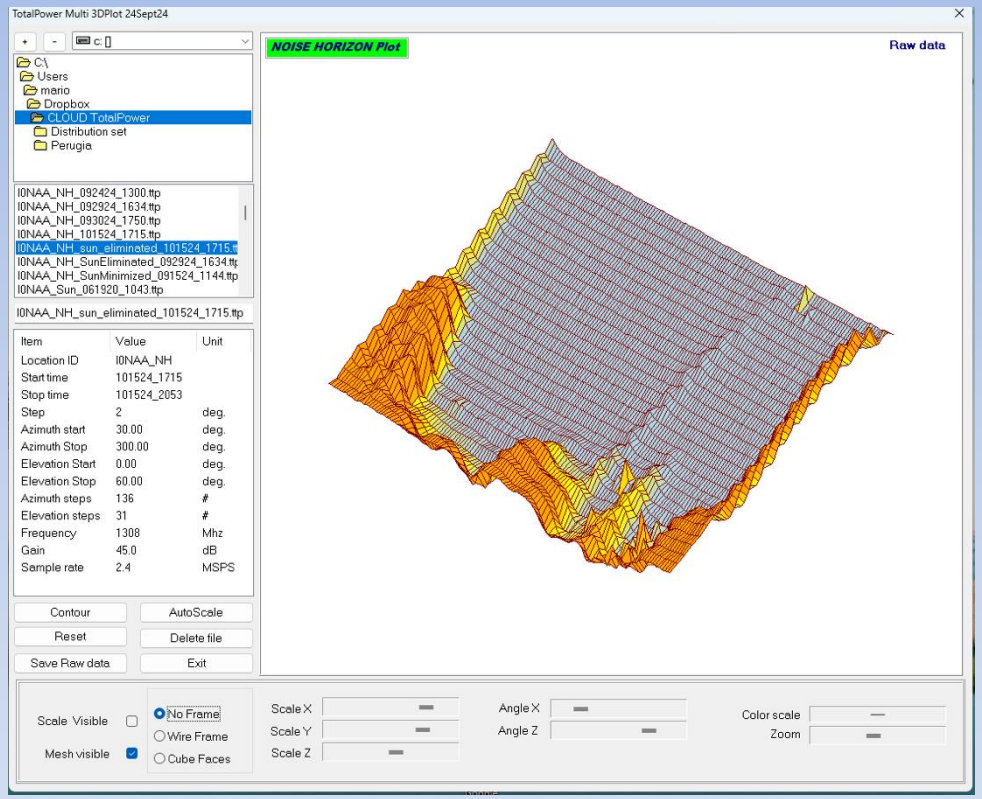
TotalPower 8.0.0

Sentirsi Jansky… : NOISE HORIZON



TotalPower 8.0.0

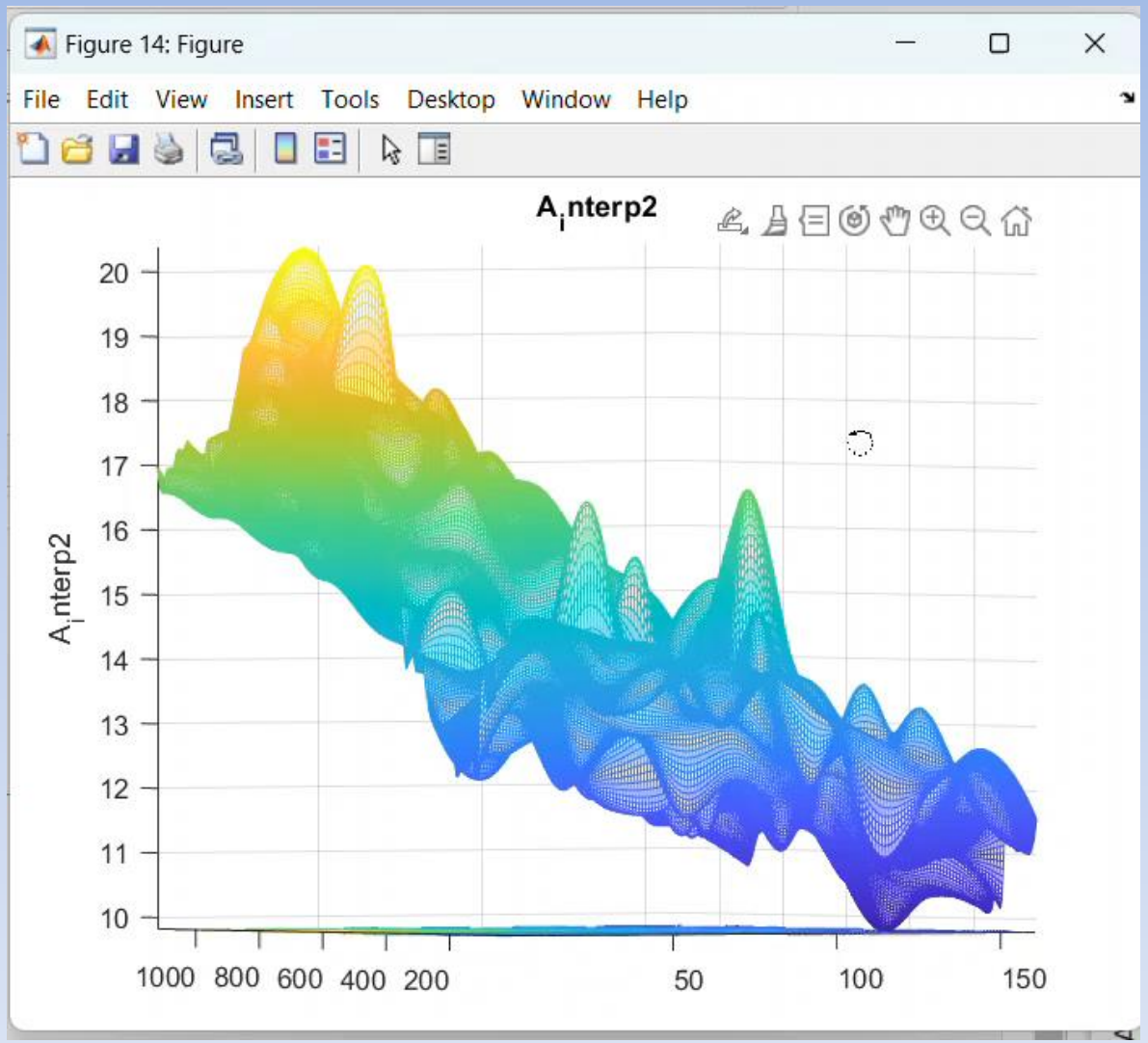
Sentirsi Jansky... : NOISE HORIZON





TotalPower 8.0.0

Sentirsi Jansky... : NOISE HORIZON



Mick, VK2CMP Noise Horizon scan with MATLAB

Grazie !