



NEWSLETTER-AMSAT-EA

05/2021

MAY

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Translation by Fernando EC1AME

Satellite telecommand station at URE, already

URE's satellite tracking and telecommand station, located at the main Hqs in Madrid is now fully automated thanks to the efforts made during last weeks.

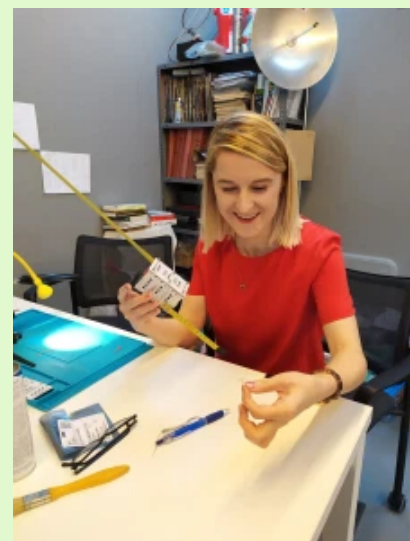
These works, which began before the pandemic lockdowns, have consisted in the change of lifting rotor, which due to its long time without maintenance had been rendered useless, the alignment of the antennas, both VHF and UHF, circular

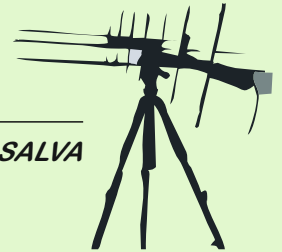
polarization, the installation of a computer running Linux, configuring the receiving software with SDR and tx using Pluto hardware, acquired by URE, as well as the Rotor control automation with hardware provided by EA4TX (ARS).



This station will allow to automatically record and analyze telemetry of the twin satellites GENESIS, as well as EASAT-2 and Hades, all of them designed and built by AMSAT EA, as well as remote control in case of actions are necessary on the on-board computer, which, once in the space, will be able to receive instructions from Earth to modify its operation, although the satellites themselves implement the needed intelligence to adapt to adverse circumstances that can occur in space.

GENESIS satellites should be launched soon, once Firefly, the American company that builds the launch vehicle, finish the static tests of its Alpha rocket, which is already prepared in the space base of Vandenberg in California. As for Hades and EASAT-2, both are currently in the facilities of the Momentus space integrator in Santa Clara, also in California, and it is expected to be launched aboard the Falcon-9 rocket from SpaceX in late June from Cape Canaveral, once the problems of the Momentus company were solved after its launch failure back in January 2021.





I find it very interesting to make a small point to compare several handheld antennas based on simulations that I had scattered on my computer's hd. The preparation of this article has served as a perfect excuse for ordering all that information as a compilation and summary in a single document. Additionally, to be able to share it and capture it through this bulletin has also motivated me enormously.

As is logical to draw valid conclusions, the comparative and the Resulting simulations have been carried out under the same working conditions. That is, external variables such as height, type of soil, arrangement, frequencies, ... have remained constant in all studies:

- a. Simulation frequency in VHF: 145MHz
- b. Simulation frequency in UHF: 435MHz
- c. Antenna height: 1.5m (approx. Hand height, 0° elevation).
- d. Soil type: Real (moderately dry soil).
 - Relative permittivity (dielectric constant): 15
 - Conductivity (depends on frequency): mean value, 6mS / m.
 - 2mS/m approximately for VHF.
 - 10mS/m approximately for UHF.
- e. Elements material: Aluminum.
- f. Polarization / arrangement:
 - VHF part: Horizontal polarization, horizontal elements parallel to the ground.
 - UHF part:
 - In crossed antennas: Vertical polarization with elements perpendicular to the ground.
 - In flat antennas: Same as the VHF part.

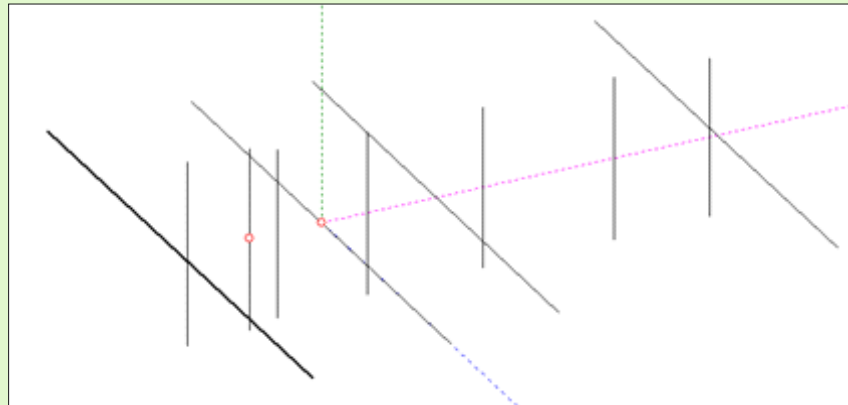
The antennas that we are going to compare are designed to be used as “handheld” antennas due to their low weight and manageability. They are also ideal to build them with little budget. Below is the list of the 5 antennas we're going to compare:

1. Yagi antenna, crossed 4 + 7 “PArrow”, DK7ZB type.
2. IOio antenna in cross arrangement.
3. “ELK” type log periodic antenna.
4. Moxon ZBZ antenna with 5 elements for UHF.
5. Yagi dualband antenna 4 + 5 “DK7ZB” type, with a single feeding point.

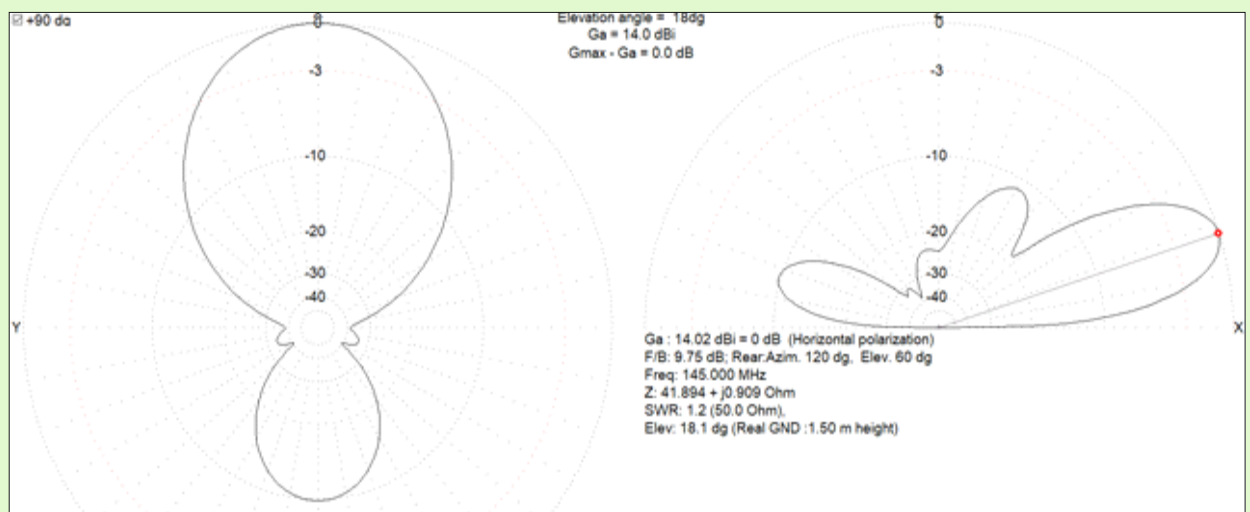
RESULTS OF THE SIMULATIONS AND RADIATION DIAGRAMS:

1. “Parrow” antenna.

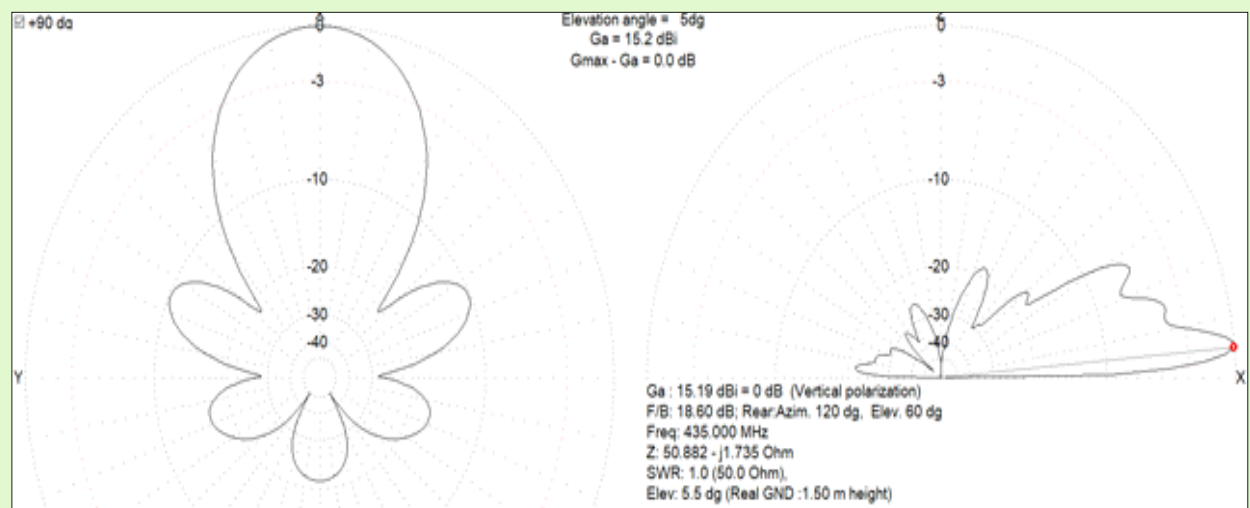
GEOMETRY:



VHF:

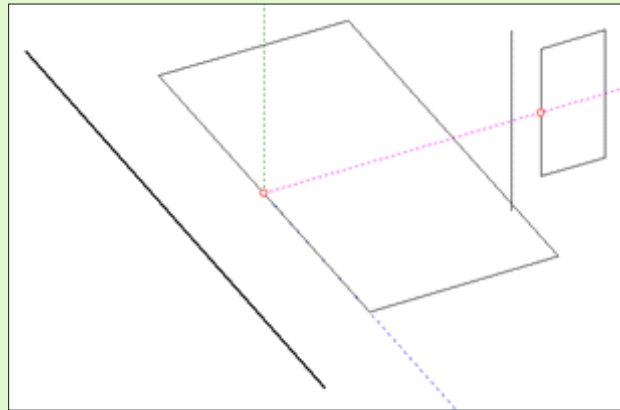


UHF:

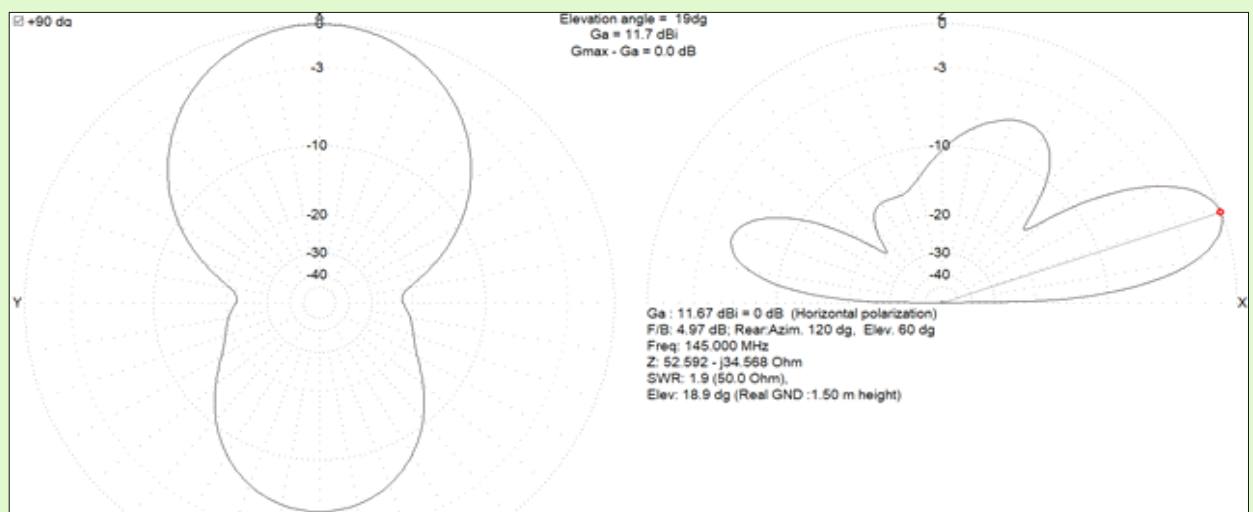


2. "IOio" antenna.

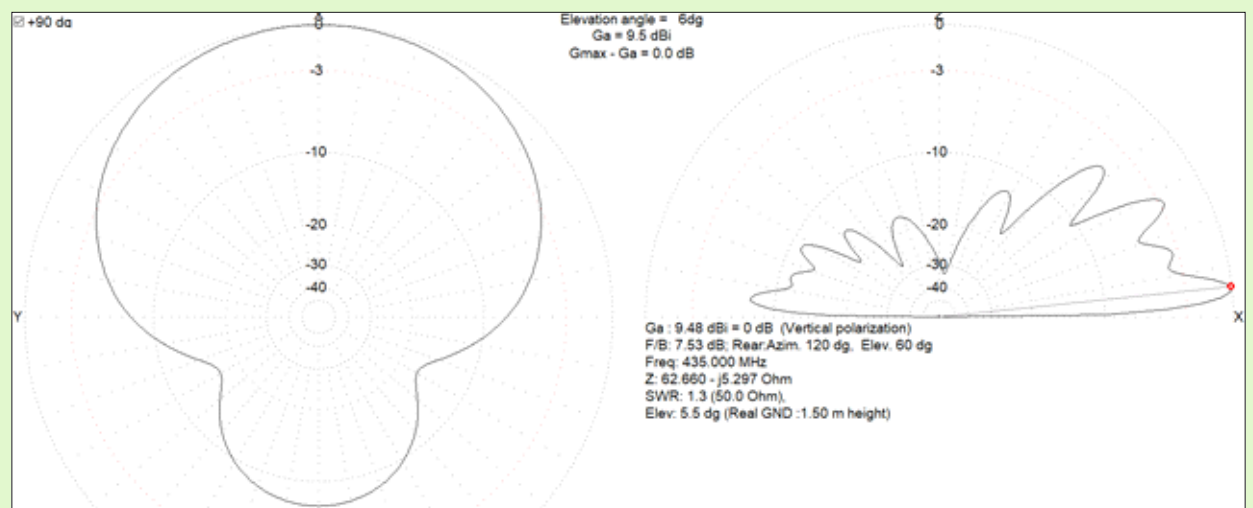
GEOMETRY:



VHF:

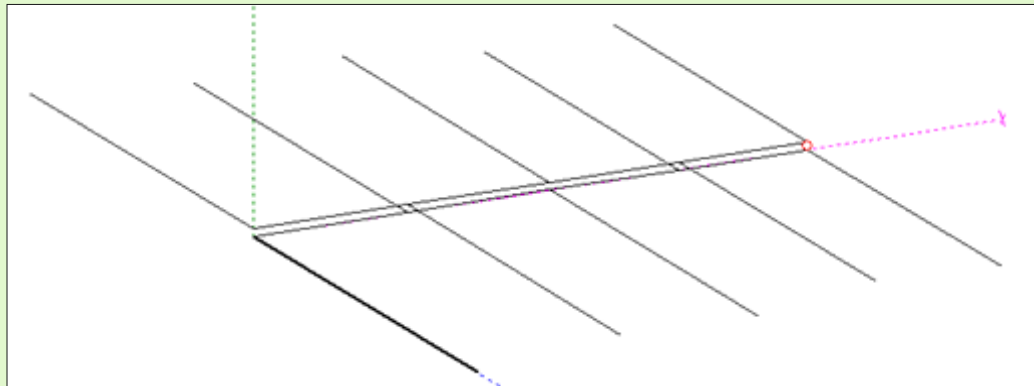


UHF:

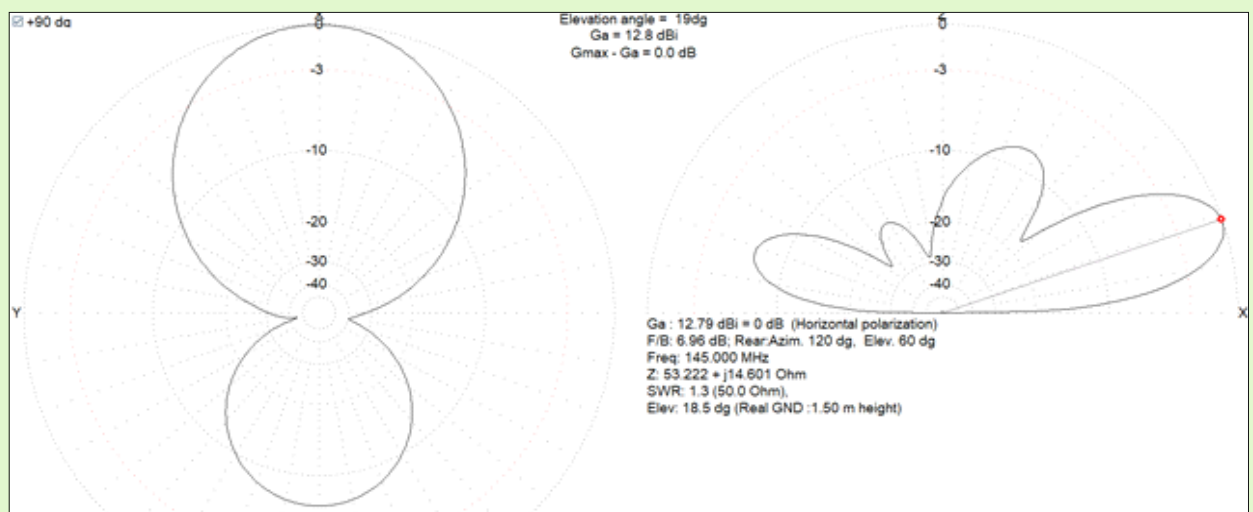


3.- “ELK” antenna.

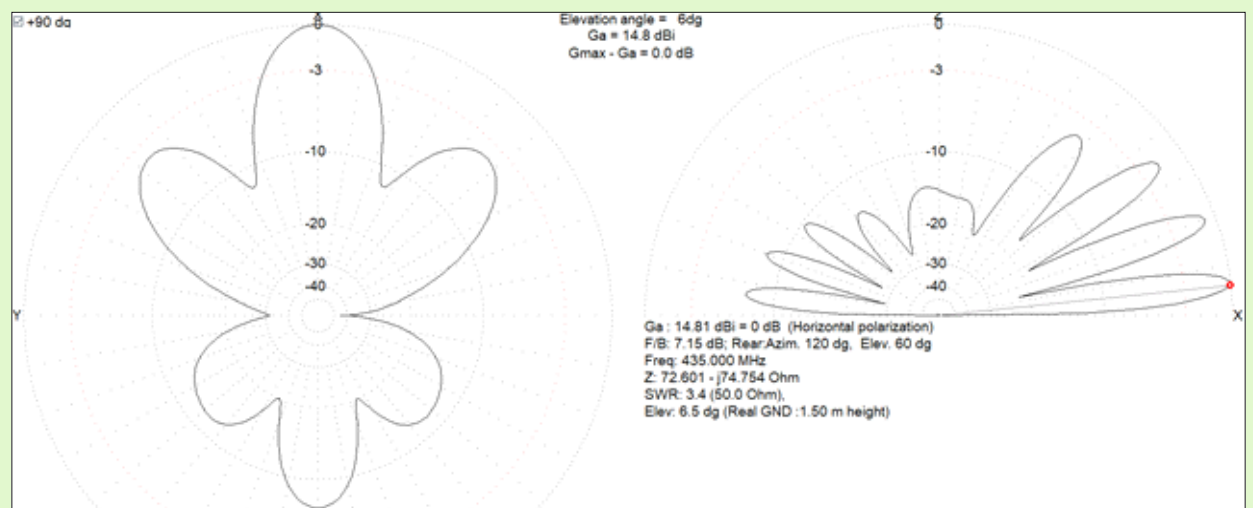
GEOMETRY:



VHF:

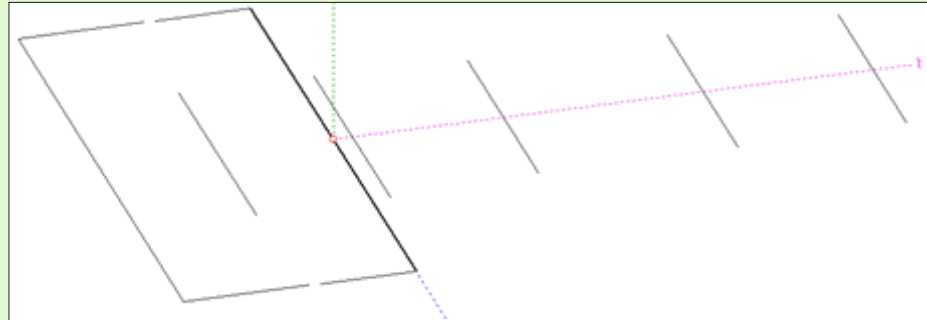


UHF:

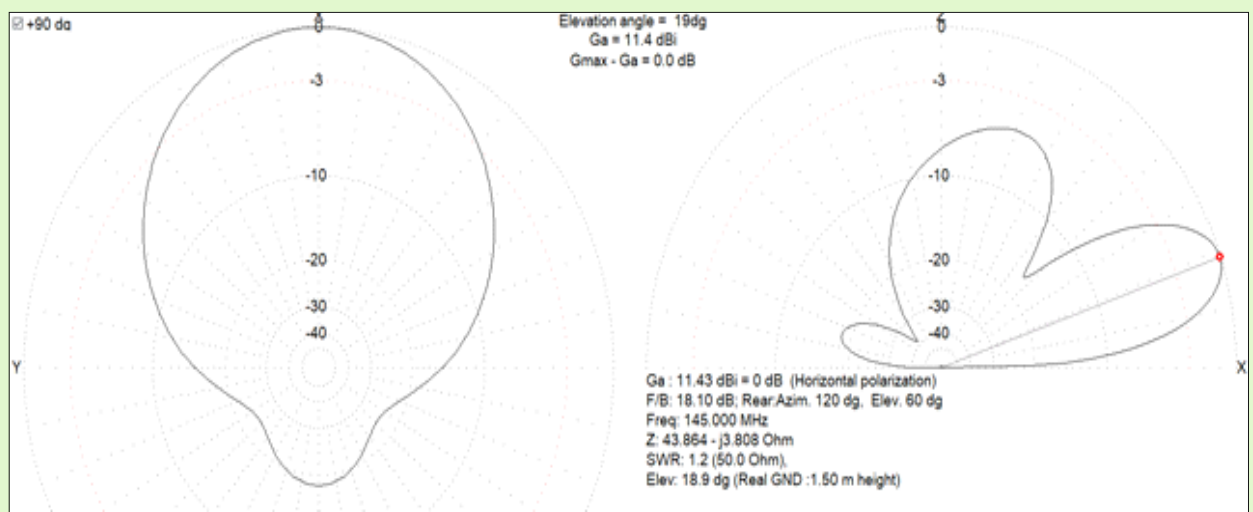


4.- “Moxom ZBZ” antenna.

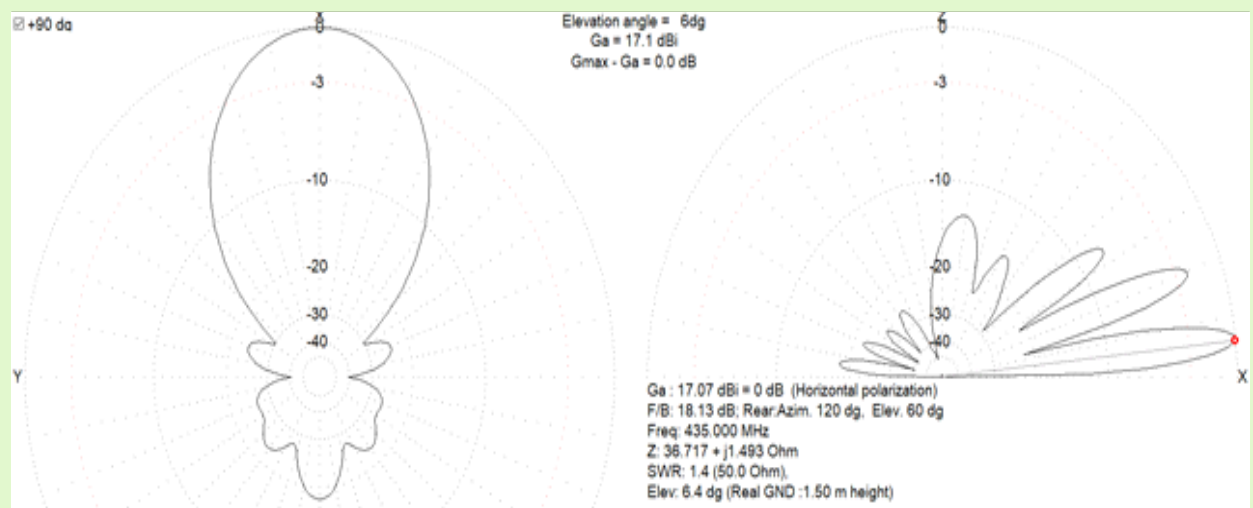
GEOMETRY:



VHF:

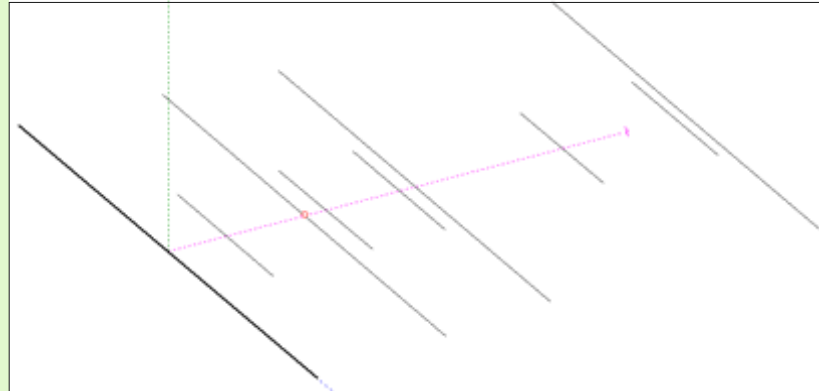


UHF:

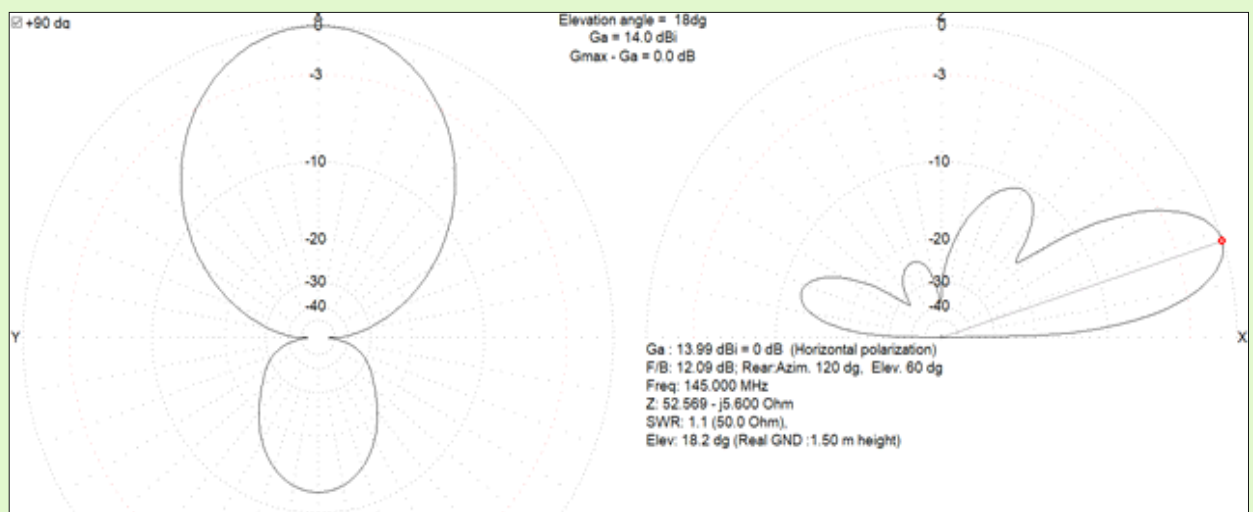


5.- Dual band Yagi antenna.

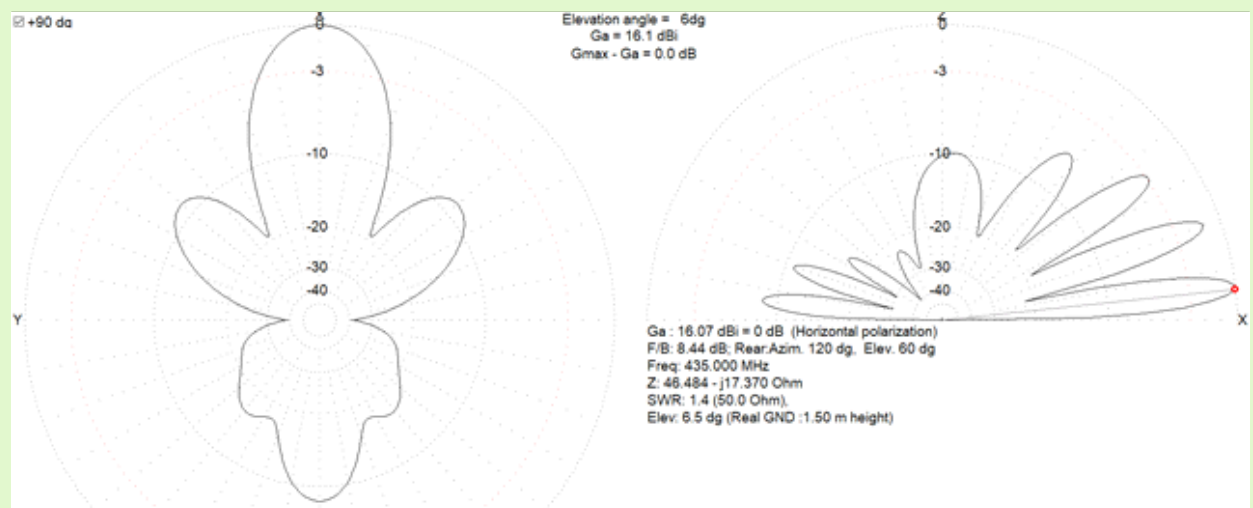
GEOMETRY:



VHF:



UHF:



SUMMARY TABLE AND CONCLUSIONS:

ANTENNA	1		2		3		4		5	
	PArrow		IOio		ELK		Moxon ZBZ		Yagi Dual DK7ZB	
Boom length (cm)	98.5		73.5		60.2		93.5		98.5	
Feedpoint	2 (one per band)		2 (one per band)		1 (unique)		1 (unique)		1 (unique)	
BAND	VHF	UHF	VHF	UHF	VHF	UHF	VHF	UHF	VHF	UHF
Freq. Simulation (MHz)	145	435	145	435	145	435	145	435	145	435
Polarization	Hor	Vert	Hor	Vert	Hor	Hor	Hor	Hor	Hor	Hor
Antenna Elevation (°)	0	0	0	0	0	0	0	0	0	0
Antenna Height (m)	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Max. Gain (dB)	14.02	15.19	11.67	9.48	12.79	14.81	11.43	17.07	13.99	16.07
Elev. max. Gain (°)	18.1	5.5	18.9	5.5	18.5	6.5	18.9	6.4	18.2	6.5
Bandwidth SWR<2 (kHz)	6800		3900		11500		5900		7800	
Beam Width (-3dB)	58°	48°	68°	128°	64°	26°	80°	26°	58°	29°
F/B (dB)	9.8	21.2	5.0	7.5	7	7.1	18.3	18.1	12.1	8.4
Side Lobe Level (dB)	33.2	10.1	-	-	-	4.1	-	23.6	-	8.5
V. Side Lobe Level (dB)	11.1	4.2	6.1	2.7	7.9	0.6	5.2	1.6	10.4	1
Z (Ohm)	41.89	50.88	52.59	62.66	53.22	72.6	43.86	36.71	52.56	46.48
	0.91j	-1.73j	-34.56j	-5.29j	14.60j	-74.75j	-3.81j	1.49j	-5.6j	-17.37j
SWR (50 Ohm)	1.2	1	1.9	1.3	1.3	3.4	1.2	1.4	1.1	1.4

With all the data from the table above on the table, along with the radiation patterns, and in the simulation circumstances considered, we observed that:

- Through the “boom length” parameter we can recognize the size of the antenna, an important issue for portable operation. The ELK antenna turns out to be the most compact antenna of the five, it is located in the first place. On the contrary, the yagis type DK7ZB, PAntenna and the dual yagi, are those that have the greatest boom, and consequently will suppose a greater effort that should counteract our arm in the entire pass (assuming a similar weight for all antennas). I have not analyzed the mass of the antennas since it is very variable, it depends on the materials used and the constructive solutions applied.
- The highest gain in VHF corresponds to the PArrow antenna while the 5-element U-element Moxon outperforms the rest at 435MHz.
- Maximum gains are obtained at very high elevation angles similar for all antennas, about 18° for the VHF part and 6° for UHF.
- The presence of the ground at such a close distance causes a deformation of the lobes diverting them upwards. It also favors the presence of the typical curl of secondary lobes in higher elevations to that of the main lobe.

- Regarding the front / back ratio, that gives us an idea of the ability of a directional antenna to concentrate the main lobe on the direction required, the Moxon antenna in VHF is the best. If we focus on the results for UHF the PArrow antenna is again the best.
- The beamwidth, at -3dB, is another interesting indicator that measures the directivity of the antenna. We can clearly see that the Moxon antenna has a large lobe for 145MHz but, however, it is the most pointed in UHF, it occurs in both extremes. The UHF part of the IOio, the magic CJU antenna, features a spectacular 128° opening, leaving the rest behind
- If we pay attention to the indicator that considers the level of the secondary vertical lobes, VSLL, the highest capacity is immediately detected on the PArrow to focus energy on the main lobe. In contrast, ELK and Moxon have highly marked secondary lobes when perpendicular to the ground.
- On the other hand, if we look at the perpendicular plane and analyze the horizontal side lobes, SLL, IOio antenna has no appendages. Just the opposite of the ELK antenna working in UHF, a lot of energy is scattered laterally
- The ELK antenna seems to be somewhat unbalanced in UHF since its impedance is far from 50Ω. Despite that, it is the one with the highest bandwidth, as you would expect from a periodic log antenna. It should be needed to tweak the geometry to try and improve the resonance at 435MHz. I honestly have not worked on the set-up of some of the antennas studied here, limiting myself to taking the dimensions from the sources consulted.
- Something similar happens with the IOio antenna, it would also need some retouching, although it is difficult to obtain an optimal impedance with that closed frame with feed in the middle. Fortunately the lengths of coaxial cables are supposed to be small when dealing with handy antennas

Apparently we can already sketch some general conclusions linked to certain personal experiences.

- Antenna Moxon ZBZ: Small Antenna with a acceptable performance And a very easy construction that its a very good alternative to start (there are versions of 5, 4 and 3 elements). Maybe a little short in VHF for its gain, it really is 2 elements with the edges folded, but has a large lobe. On the opposite side, In UHF, we have a considerable but very directive gain that implies that you have to point accurately to the sat. This fact can make it difficult to constantly look for the correct alignment.
- Antena IOio antenna: Antenna of easy handling and operation since it allows us not to be so exquisite when it comes to pointing in the right direction. Owns a large beam opening in both bands that favors bilateral contacts under "strange" orientations. In field tests it is amazing the performance of the UHF part; the so-called CJU antenna very pleasantly surprised allowing reception under compromised and hampered conditions. It is critical to minimize the losses of coaxial cable lines avoiding excess lengths.
- ELK antenna: Very compact but without significantly detracting from performance. I guess it is prone to "rebound", by the presence of very marked secondary lobes, so working with it can turn out to be a lot of fun.

Unfortunately I have not tried it.

- Dual Yagi antenna: On paper it presents a good balance of all the values obtained being a very wise option. In general terms highlights the VHF part. In the reception tests carried out I had the impression that the gain on the UHF band is not as high as the predicted by the simulation. Does 5 elements really exceed the 7 of the PArrow ?..
- Parrow Antenna: Good overall balance on both bands, gain, beam opening, directivity, ... Good results in tests out in the field. I have personally seen a real better performance than its sister antenna, the dual Yagi. The crossed arrangement avoids the interaction of an antenna on the other, taking advantage of the central neutral plane.

ANTENNA	Boom length	Band	Gain	F/B	SLL	VSSL	Beam Width	SWR	Band Width
1. PArrow		VHF	1º	3º	2º	1º	4º	2º	3º
		UHF	3º	1º	4º	1º	2º	1º	
2. IOio	2º	VHF	4º	5º	1º	4º	2º	5º	5º
		UHF	5º	4º	1º	2º	1º	2º	
3. ELK	1º	VHF	3º	4º	1º	3º	3º	4º	1º
		UHF	4º	5º	3º	5º	4º	4º	
4. Moxon ZBZ	3º	VHF	5º	1º	1º	5º	1º	3º	4º
		UHF	1º	2º	2º	3º	4º	3º	
5. Yagi Dual DK7ZB	4º	VHF	2º	2º	1º	2º	4º	1º	2º
		UHF	2º	3º	5º	4º	3º	3º	

Note: Do not take literally the numerical results and conclusions of this article as universal truths, I do not consider myself an expert in this type of simulations, calculations and antennas. It has simply been approached as a study qualitative, not quantitative, to predict the general behavior of each antenna. Logically the radiation patterns will be modified in the moment the antenna is pointed towards the satellite and its elevation angle changes, I do not know to what extent. The ratification of the general conclusions with Empirical field testing is highly recommended. How do you say “every Orbiy and pass is different ”and what counts is to identify global trends throughout a long enough use time.

Thank you for your attention. Good radio and good luck.

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LINK SATPC32 TO SDR # (SDRSharp or SDR Trueno)

EA5WA - JUAN CARLOS

For people who use SDR # software (SDR sharp or SDR Trueno) to receive amateur satellites and do not want to have to be manually with the mouse tracking the frequency of the downlink (which as you know, varies due to the Doppler effect), these Instructions for pairing the SatPC32 with Sharp SDR will be useful.

To link them we will need to install a plugin in SDR Sharp. It's called "CALICO CAT" together with a "virtual serial port cable", two ports virtual connected between them. The Calico CAT plugin makes any CAT software, treats sdr-sharp as it was a Kenwood TS-2000.

Therefore, it will help us to control the sdr from any software with CAT: N1MM Logger, Ham Radio Deluxe, Log4OM, Klog

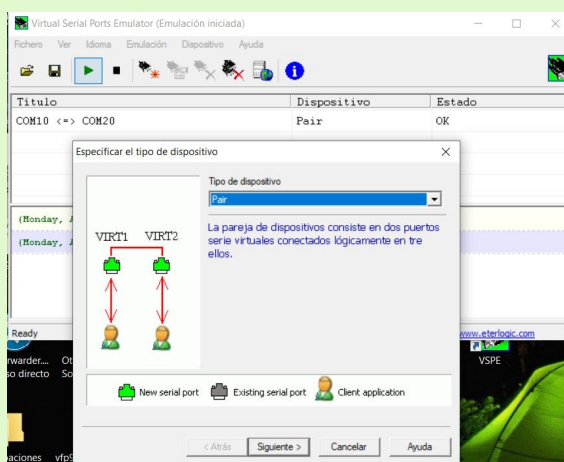
In the SatPC32 we will configure the radio with one of the virtual ports, and In the Calico CAT plugin of the SDR Sharp we will use the other virtual port, so both programs will be linked by this virtual cable.

Software we need:

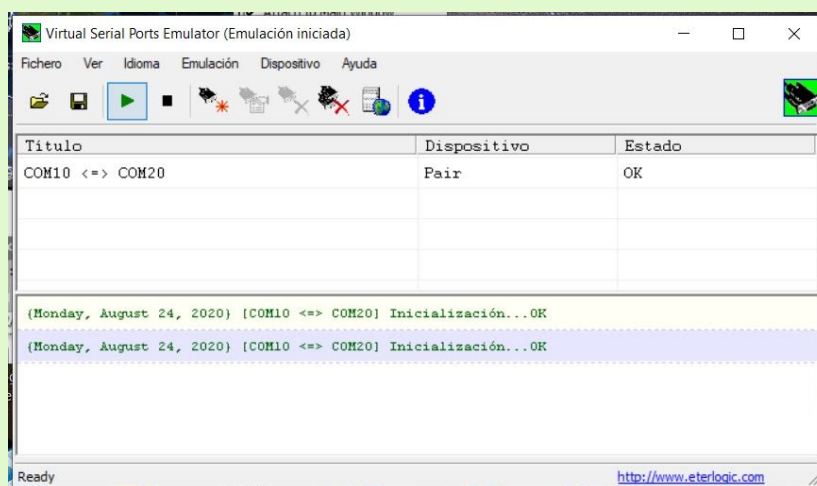
- SatPC32: www.dk1tb.de/downloadeng.htm
- PCalicoCat Plugin for SDRsharp :
<https://gridtracker.org/sdr/CalicoCAT-SDRSharpPlugin-1.19.9.22.zip>
- VSPE: <http://www.eterlogic.com/Products.VSPE.html>
- And our SDR#, SDR Sharp, SDR Trueno.... you name it!.

Creating a serial virtual cable:

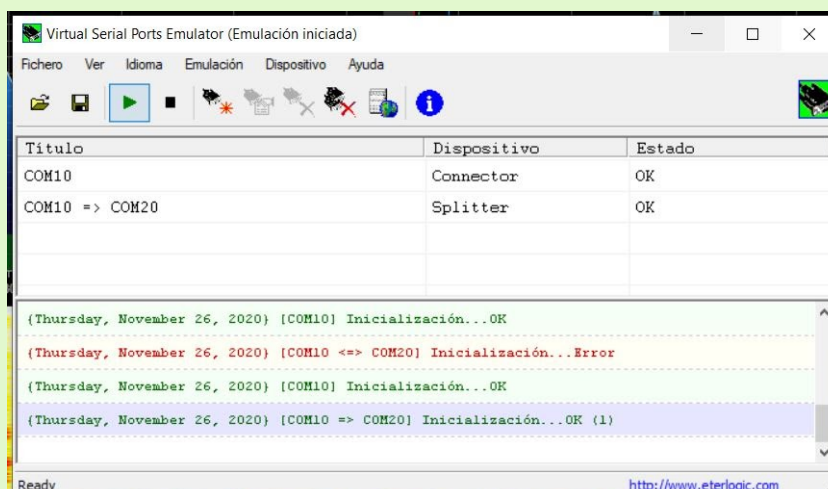
Having previously installed the VSPE software, creating this virtual cable is simple, we will simply have to create a new device type "PAR" and choose the number of ports at the ends of this cable. On my case I have selected ports 10 and 20, but it can be done with any unused port:



Once created, it should look like the following image. Then , just press "play" and it will be ready to use:



If it does not work for you with the pair (I have found errors sometimes), try this VSPE configuration, Port 10 as "connector" and a "splitter" between ports 10 and 20:



To automatically start the VSPE with the ports created when windows starts, we will have to save the file created with VSPE in the Windows "Start" folder. This folder is in the following path:

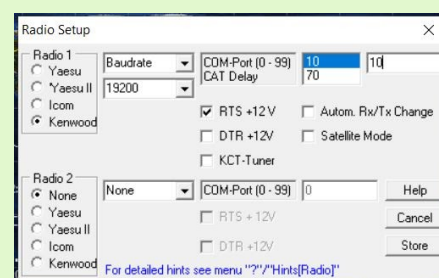
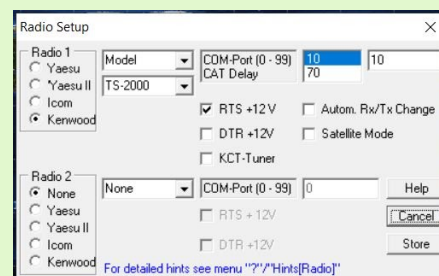
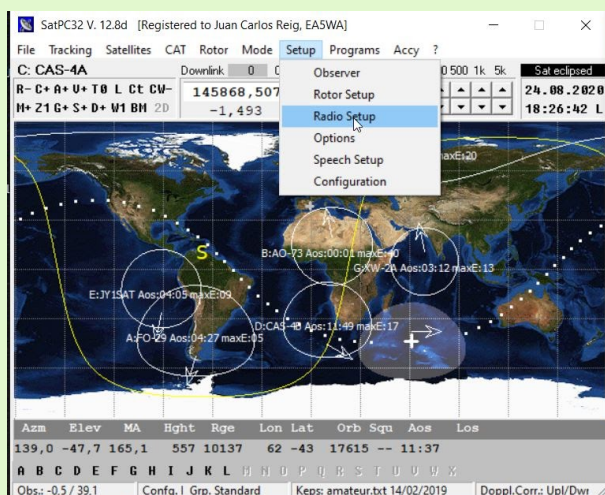
C:\Users\username\AppData\Roaming\Microsoft\Windows\StartMenu\Programs\Startup

Configuration required in SatPC32

Once SatPC32 is installed and working, the only thing that we will have to do is tell it to communicate with a TS-2000 at 19,200 baud on one of the virtual ports created in the previous step.

From the "Setup" menu choose the "Radio Setup" option and select a Kenwood radio such as the TS2000, since the protocol used for communication is the Kenwood protocol. Choose as COM Port one of the virtual ports of the pair created with the VSPE, in my case port 10 and the speed (Baudrate) we will set it to 19,200 which is the value that CalicoCAT admits.

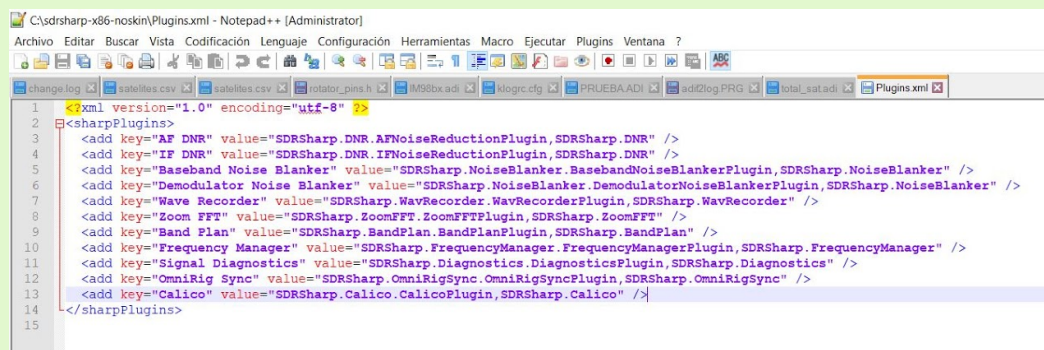
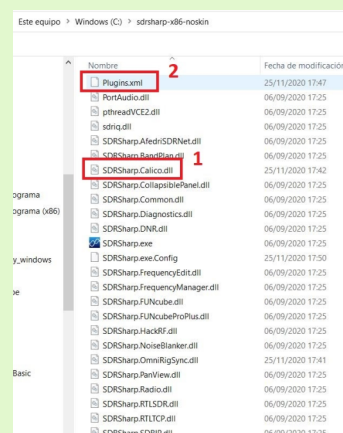
Do not forget to save the changes with the "Store" button, if not, it won't work...



Configuration required in SDR Sharp: Calico CAT Plugin Installation.

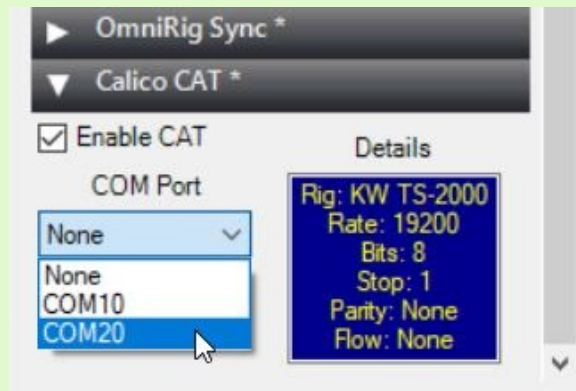
The first thing we will have to do in SDRSharp is to install the Calico CAT plugin. All the SDR Sharp plugins are installed in the same way:

1. Paste the downloaded DLL file in the SDR Sharp folder
2. Edit the file "Plugins.xml" to add the line "Magic Line" that we will have in the downloaded text file. To edit this file, you can use the windows Notepad or the Notepad ++.



Once the plugin is installed, we open the Sharp SDR and go to the tab "Calico CAT" and we choose the other port of the two we created in the virtual pair.

We enable the CAT and ready to go ...



Once the process is finished, we can open the SatPC32, choose a satellite, and we will see how the Sharp SDR will tune to the satellite frequency.

In addition, if we have the VFO (V +) option activated in the SatPC32 we can move through the transponder of the SSB satellites without any problem.

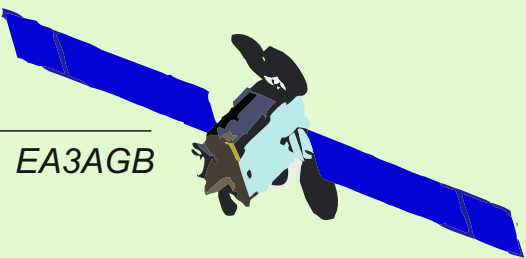
If we also add a second rig as a transmitter in the SETUP of the SatPC32, we already have a station ready for FULL-DUPLEX satellites that will allow us to hear ourselves in the downlink.

Juan Carlos

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PORTABLE STATION OF THE MONTH - (EA4M - RICKY)





CALLSIGN	LOCATOR	MODE	QSL VIA
4X70ZM	KM72	SSB	LOTW
9A10FF	JN75	SSB	QRZ.COM
B0/BA4TB	NN33	SSB	QRZ.COM
C37AC	JN02	SSB	LOTW
C91DRX	KG64	SSB	R9LR
C92RU	KG76	SSB	QRZ.COM
A41OK	LL90	SSB	LOTW/EQSL
CN8NIL	IM63	SSB	QRZ.COM
DP0POL/MM	HH20	SSB	QRZ.COM
DP0POL/MM	HH21	SSB	QRZ.COM
DP0POL/MM	HH34	SSB	QRZ.COM
DP0POL/MM	HH35	SSB	QRZ.COM
DP0POL/MM	HH49	SSB	QRZ.COM
DP0POL/MM	HI53	SSB	QRZ.COM
DP0POL/MM	HI68	SSB	QRZ.COM
DP0POL/MM	HJ71	SSB	QRZ.COM
DP0POL/MM	HJ72	SSB	QRZ.COM
DP0POL/MM	HJ76	SSB	QRZ.COM
DP0POL/MM	HK81	SSB	QRZ.COM
DP0POL/MM	HK85	SSB	QRZ.COM
DP0POL/MM	HL90	SSB	QRZ.COM
DP0POL/MM	IL17	SSB	QRZ.COM
DP0POL/MM	IM21	SSB	QRZ.COM
DP0POL/MM	IM35	SSB	QRZ.COM
DP0POL/MM	IM36	SSB	QRZ.COM
A71EM	LL55	SSB	LOTW/EQSL
A71AE	LL55	SSB	EC6DX
AP2MS	MM64	SSB	QRZ.COM
EM9WFF/P	KN87	SSB	QRZ.COM
EU2AA	Kn34	SSB	LOTW/BURO
EL2E	IJ46	SSB	QRZ.COM
J28PJ	LK11	SSB	LOTW
LX5WARD	JN39	SSB	LX1JH
PP2CC	GH63	SSB	LOTW
S0S	IL57GB	SSB	LOTW
YC5YC	OJ00RL	SSB	LOTW/EQSL



M0JFP



DJ9FT FRITZ WITH HIS GRANDSON OSKAR



4X70ZM



C9 - MOZAMBIQUE New valid entity for the DXCC Activated by the same group that has been active as A25RU

DP0POL / MM again very active on his return from the Neumayer III base in Antarctica.

YB- INDONESIA YC5YC Dave, has come across pile-up demonstrating that this entity was still in great need.

AMSAT-EA products in the URE store

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