



AMSAT

NEWSLETTER-AMSAT-EA

05/2020

MAY

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Translation by Fernando EC1AME

DOSAAF-85 (RS-44)

The DOSAAF-85 scientific satellite (Radio-2017 / RS-44) built by Siberian Aerospace State University students (SibSAU) and that celebrates the 85th anniversary of the Voluntary Society for the Assistance to the Army, Aviation and Navy (D O S A A F), where young military are trained.

They have activated its linear transponder to be used by radio amateurs. This satellite, which was launched in December 2019 from the Plesetsk Cosmodrome has an elliptical orbit with perigee of 1,175 km and apogee of 1,511 km, which gives it a large footprint. Its Orbital inclination is 82.5 degrees and the power of its transmitter is 5W.



The frequencies are: Beacon: 435.605 Mhz, Inverted transponder with uplink centered on 145.965 +30 khz and downlink centered on 435.640 +30 khz.

QUETZAL-1

Guatemala's first satellite, a small CubeSat called QUETZAL-1, was deployed from the International Space Station (ISS) on Tuesday, 28 April 2020. Its main mission is to test a sensor for the remote data acquisition for the management of natural resources that could be used to monitor water quality in continental water bodies.

The operating frequencies were chosen with the cooperation of Guatemalan radio amateurs and IARU.



Downlink at 4800 bps GMSK is on 437.200 MHZ.

The director of the Quetzal-1 project team is the Guatemalan engineer José Bagur, TG8JAV, graduate in mechatronic engineering at the Universidad del Valle.

Announced Activations



Due to COVID-19
no activations are planned these days.
As soon as we get news from some, you will be updated.
In the meantime, stay safe and do contacts from home



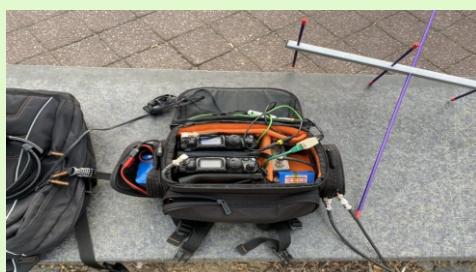
KOFFY Setup, ready (COVID-19 free)



EA1PA, Salva from his window



Juan Carlos, EA5WA



Portable setup of N8HM, Paul



Dave, KG5CCI

AMSAT-EA FORUM

From AMSAT-EA we want to promote among the community of Spanish amateur radio ops to spread the knowledge about our hobby through the internet. That's why we remember that our association has a forum in which anyone can participate , even if you are not a member. We encourage you to take advantage of this space to make your inquiries, start debates, share your concerns or help others.

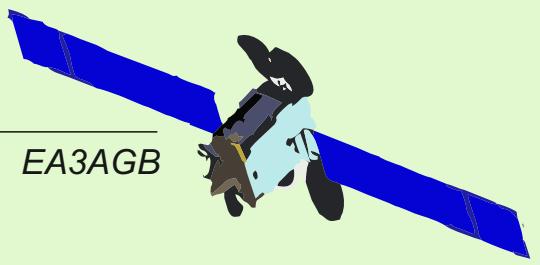
Here is a link to the AMSAT-EA FORUM:

<http://foro.amsat-ea.org>



QO-100

EA3AGB



9G5GS	IJ48SX	SSB	LOTW-EQSL
9V1HY	OJ11VH	SSB	LOTW-EQSL
A75GR	LL55SI	SSB	M00XO
A92GR	LL56HF	SSB	LOTW-EQSL
DK3ZL	JO40PV	SSB	LOTW-EQSL
DP0GVN	IB59UH	SSB	LOTW
E7STAYHOME	JN84OS	SSB	QRZ.COM
EB1AO	IN52PE	SSB	BURO-LOTW
AN100L	IN80DK	SSB	BURO
EA4CMV	IN80DK	SSB	QRZ.COM
EA7OC	IM77NU	SSB	BURO-DIRC
EI4KP	IO52QP	SSB	LOTW-EQSL
ES3RF	KO29IF	SSB	LOTW-EQSL
FR4OM	LG78SR	SSB	QRZ.COM
HB9CGE	JN47OO	SSB	??
MM0TWX	IO75UU	SSB	LOTW-EQSL
LA9TKA	JO59ES	SSB	EQSL
LZ1PKS	KN12QP	SSB	QRZ.COM
R50VAZ	LO43PK	SSB	BURO
UA6XD	LN13TL	SSB	QRZ.COM
UA0AET	NO65KX	SSB	QRZ.COM
RU0AOA	NO66MA	SSB	QRZ.COM
ST2NH	KK65GP	SSB	EA7FTR
SV9IOQ	KM25AL	SSB	LOTW
VU2AVG	MK76CQ	SSB	DIRECT
VU3ZHD	NL34OG	SSB	QRZ.COM
YO3APJ	KN25SJ	SSB	LOTW
ZS1J	JF96GC	SSB	QRZ.COM



Portable setup of DM5TU



Setup of SV5BYR



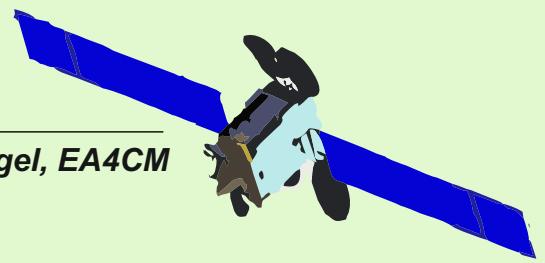
Setup of SP5GN1



Setup of OM0A

QO-100 PROJECT

Angel, EA4CM



I've been thinking about getting into QO-100 for a long time, as the conditions on HF are not always good and taking in consideration that QO-100 life-time is expected to be around 15 years, it was not a bad idea to try it.

The first thing I did was learn as much as I could, because the best thing you can do is to have all kinds of information so as not to make any mistakes and see all the possibilities that exist either to receive or to transmit.

Let's start with the reception part where we find multiple ways to do it:

- The first way and perhaps the easiest is using the Qatar Oscar 100 WebSDR.



USB SDR's used

- The second option is to acquire a parabolic of 80 cms with a universal LNB and with one of the sdr in the pic you see on the right and the sdrconsole software, to receive the QO-100 simply and inexpensively. The price of a parabolic with its corresponding anchor, coaxial cable and connectors are around 35 euros depending on where you buy it. In addition, now the displacement suffered by these LNBs is corrected with that software, so one of the problems of stability produced by this type of LNB is fixed. The price of a universal LNB and an sdr is around 50 euros.
- Another option on the market is to use a modified LNB which makes the downlink in 432 Mhz. so we only need to use a 432 Mhz rig in order to receive the QO-100. This is the option that I liked the most since my intention was to use the Icom 9700 to rx and tx. This LNB can be acquired on the Remoteqth website. Let me say that this LNB is quite stable, at least the tests that I have carried out with such system, the stability it is such that in no case have I had to modify the frequency during a qso in phone or cw. All this together with the fact that those LNBs are designed for television reception setups, making the gain very high, so you can use 75 ohms coaxial cable for the descent line till the bias and even having to reduce the reception gain by adjusting the potentiometer seen in the bias photograph, to reduce saturation. For its operation we must feed it with 12 volts from the equipment power supply. At the exit of the bias we have two options, 75 Ohms coaxial cable to the rig or use a cable assembly with sma connector, or any other you like. On the remoteqth website you can find different purchase options and the final price it's around 60 euros. The following photo shows the set and the purchase website.



LNB in place



BIAS to feed the LNB



LNB and Bias used, www.remoteqth.com

- There are more ways to receive the QO-100 like the famous QX Patrol Down Converter but both for what I read and for its price, I did not even have it in mind. With this I don't want to say that it is a worse system, simply that I did not want to take it into account when considering this option.

It is time to install the receiving part. It is assumed that before all this QO-100 process starts, we have been careful to see if from where we can put the antenna (parabolic) we have line of sight towards the satellite. To get an idea. There is a webpage where introducing some data it will give us the exact orientation of the antenna. Here is the link: https://www.satlex.it/es/azel_calc.html.

Once the parabolic has been fixed, we will vertically place the LNB and connect the LNB with 75 ohm coaxial cable to the Bias which we will connect to an sdr connected to a laptop or computer. We run the sdrconsole program and tune to 432500 which, more or less, will coincide with the beacon on the left margin of the width of the QO-100. The receiving margin with this LNB goes from 432,500Mhz to 433,000Mhz. where is the beacon of the right margin of the band. Let me say that holding the LNB in your hands and running sdrconsole we can do a first reception test. We will start searching the horizontal plane for the maximum signal and once achieved we will do it in the vertical plane raising the parabolic until achieving the same effect, maximum signal. Performed this process several times to refine as much as possible, we will only have to fix the parabolic and find the maximum signal by turning the LNB left or right to get the maximum signal. At this stage, we will finish the installation of the reception part., We will only have to adjust the Bias to the lowest noise and I remind you that the LNB has a lot of gain so maybe you will have to get gain down a bit.

Now comes the somewhat more complex part, the **upload or transmission**. Here things get complicated since costs are somewhat higher and complexity is bigger, at least for people with little knowledge such as in my case.

- In the market there are different ways of acquiring equipment for the upload, for example the UpConverter by **Dx Patrol** which allows to do the uplink on 28Mhz, 144Mhz, 432Mhz and 1296Mhz. with an output of 250mW that will serve to excite an amplifier which will give us the necessary power to be heard. Some like to use the famous chinese WIFI amplifier that, as they say, will give you some 8 watts of power.
- **Adalm Pluto** is another way to get on the QO-100 with plenty of information about it which I won't repeat since , as in the previous case, I did not opt for this type of uplink.

- **BU-500** This was the option that convinced me the most and which I will focus on. This Upconverter allows uplink in 144Mhz, 432Mhz, 1296Mhz. According to the experts within all the possibilities that this UpConverter offers, the closer to the QO-100 frequency the better, so I decided to go up in 1296. There are two versions on the market, the one that gives a power output of 500mW and the other which gives 1.8 w. Both the design and the components, manuals and finishes are very good, resulting in a very good product for an approximate price of about 160 euros shipping included the 1.8wts version. It's curious...all the UpConverters are



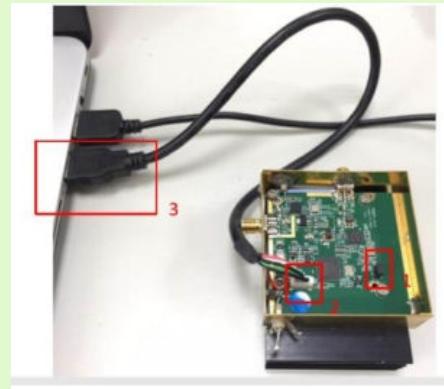
BU500 the option I choose

tested by the owner and he includes a table with the results... Check the included picture here you can perfectly observe all the measurements he has made for checking the perfect functioning of the equipment. This data will be very useful when starting it bought the 1.8 w version and it took about 15 days to arrive. It came packed in a cardboard box with all its documentation, test sheet made by the owner and a programming cable.

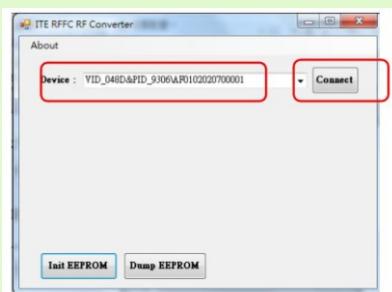


We will start by downloading the driver and the BU-500 programming software using the link he provides in the documentation. Once downloaded we will install the BU-500 driver.

After installing the driver what we have to reset the computer. When finished, firstly the bridge number 1 that appears in the photo we will put in such a way that it short circuits its two legs/pins, then we will put the cable that arrived with the BU-500 and we will connect, on the one hand to point number 2 of the board and on the other side to the computer.



Where you must connect the USB

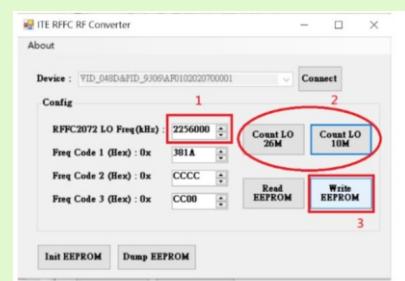


Selecting the hardware to be programmed.

Then, we execute the software to programme the BU-500.

Once executed it will detect the BU-500 so we can connect it.

Now we will read the Eeprom.



Selecting the values to programme

Once the Eeprom has been read, we have to select the frequency that we will use with the BU-500. In my case I wanted to use 1296 so if we subtract 2400 1296, we will get a value of 1104000. Once this value has been entered in box number 1, we must know the frequency of the TXCO that we can see located like in the photo below. If the frequency is on 10m we will click on box number 2 corresponding to 10m and to end the operation, we will click on box number 3 to write all data in the Eeprom.

Now we just have to disconnect the BU-500 from the computer, remove the jumper that shorted the two legs and close it. Before closing it, we will put 12 volts on it and check that it lights up a green led.

We continue with the transmission part for which we will need an antenna. In the market we can find many possibilities but as in previous cases, I personally opted for what most ham radio ops commented on quality, performance and assembly. A helix with 4 turns that is placed directly in front of the LNB. That easy and simple. This antenna can be obtained for some 95 euros buying it from EB5AQ, Alex. He can also sell us the patch cord that goes from the antenna to the BU-500 with the connectors you prefer. I recommend using sma.

This antenna will not need to be oriented because the LNB clamping already gives you the right orientation for your focus.

Now comes the most delicate part, at least for me. The manufacturer of the BU-500 tells us that the maximum excitation will be 190 mW , so necessarily we must attenuate enough so that it does not arrive beyond what the life of the UpConverter guarantees us. How will we do it? in my case , I decided to purchase a 15 dB attenuator placed at the output of the 1296Mhz rig.



here you can spot the antenna in front of the LNB

I bought that attenuator in Amazon for some 17 euros, shipping included.

As expected there was not enough attenuation and for these measurements I had to use a meter that would allow me to measure those very small powers, on this, I got the invaluable help from EA4GMY, Julio, who lent me this meter that appears in the following photo.



The meter provided by EA4GMY



The attenuator used

This meter is capable of measuring up to 1w in 1296 and incorporates a dummy load of 50 ohms, so the measurement will be very accurate. This meter is usually used mainly to measure the transmission power of drones and their cost has been around 85 euros and if you want to investigate a bit... More about this meter, in this link: <https://www.immersionrc.com/fpv-products/rfpwr2/>.

After thinking about how to attenuate and how to do it, I concluded that safer was to attenuate enough so that in the case of transmitting with the maximum power of the 9700, it never exceed the maximum excitation of the BU-500. I put the att on, then I put a patch of RG213 coaxial cable of about 11 meters and with the power control of the equipment to its minimum, I started to increase the power and taking notes on the power indicated by the meter. Be aware that on this frequency, 1296, the attenuation caused by coaxial cables is considerable, especially with older cables, greater length and worse quality. The same happens with the connectors used. I did several tests with different types of cable and connectors, achieving an attenuation that meets the requirements imposed by my way of thinking and the security I wanted to establish throughout the whole process.

If anyone does not have the possibility to get a wattmeter of these characteristics, they have the possibility of using the data provided by the manufacturer by measuring the tension that the BU-500 will give us in its RF Monitor and with the equivalence provided in the table, we will know how we are going.

Here are some pictures of the tests carried out with different types of cables and lengths so you can get used to the idea of the difference between them. I recommend that once you do the tests and you achieve the objective, if for any reason we change a connector, transition or cable length, then check again the excitation to avoid surprises.

Cable RG-213 12 metros.	
Potencia % IC-9700	Potencia en vatímetro en mW
50	49
60	57
70	66
80	76
90	86
100	98

Cable RG-58 11 metros	
Potencia % IC-9700	Potencia en vatímetro en mW
40	11
50	15
60	17
80	23
90	26
100	30

Cable LMR 195 6 metros	
Potencia % IC-9700	Potencia en vatímetro en mW
40	68
50	92
60	107
70	125
80	144
90	164
100	187

Once we have reached this point, we only need to connect the equipment, tune in to both frequencies, transmit and receive, and start transmitting. With an excitation of 66 mW I'm getting 1.2 wt more which is enough to reach the QO-100 and enjoy this satellite for a few years.

Final conclusions: Regarding the stability of the receiving part, I am very happy. On the quality of finish, components and design of the BU-500, I think it exceeds My expectations and in terms of final cost of the entire project, about 367 euros in total.

Acknowledgments: First of all to the AmSat-EA WhatsApp group, QO-100 Geo and V-UHF DX · EA Chat for all the help provided with my questions. Special mention to EA4GMY, Julio; EA4BFK, Alexander; EA3AGB, Javier; EA2BJM, Miguel and all those I do not name for not filling this page, without them almost certainly I would not be writing this page today whose sole purpose is to return in the measure of my possibilities and knowledge what I have received to get here.

73, Angel - EA4CM

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