NEWSLETTER-AMSAT-EA

12/2020 DECEMBER

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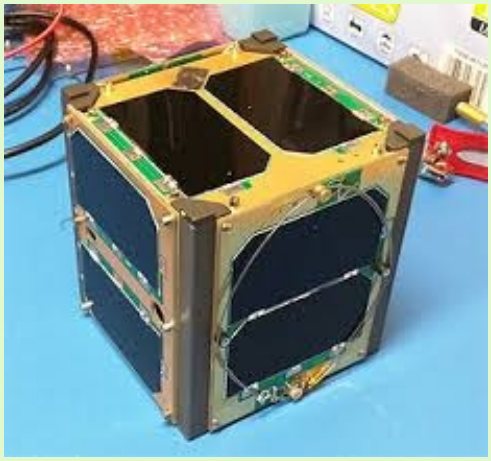
Fox-1E



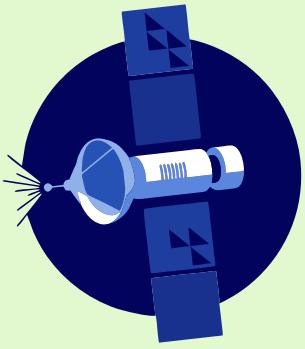
Virgin Orbit has announced that the launch window for the Launcher One Launch Demo 2 opens on december 19. This launch will put in orbit Amsat´s RadFxSat-2 / Fox-1E. RadFxSat-2, as RadFxSat / Fox-1B,is an opportunity for AMSAT an Vanderbilt University to join forces to carry out an experiment of the effects of radiation, studying the new FinFET technology. RadFxSat-2 is the fifth and last Fox-1 satellite built by AMSAT.

The RadFxSat-2 spacecraft bus is built on the Fox-1 series but features a linear transponder "upgrade" to replace the standard FM transponder on Fox-1A to D. In addition, the uplink and downlink are reversed from previous Fox satellites in a Mode V / u (J) configuration using an uplink on 2 meters and a 70 cm downlink. The downlink has a 1200 bps BPSK telemetry channel to transport the scientific Vanderbilt data, plus a 30 kHz wide transponder for use by radio amateurs. Telemetry data and experiments can be decoded using FoxTelem version 1.09 or later.

RadFxSat-2 / Fox-1E frequencies:

Telemetry	435.700
Uplink transponder lineal inv.	145.860 - 145.890
Downlink transponder	435.760 - 435.790

HAPPY XMAS and a better 2021



QFH DUALBAND ANTENNA (Origin, development and experiences)

EA1PA - Salva

I decide to write my first words in this newsletter to share my experiences with all those who want to incorporate new knowledge to the successful VHF QFH antenna. This antenna has been described in detail, in this same bulletin, in the article entitled "QFH ANTENNA" by EA5WA - Juan Carlos back in November (11/2020 edition). This collaboration will be a complement to that article and many more out there.

Fig. 1: General view of the QFH dualband

Having that in mind and verifying the good results obtained, both by him and by other colleagues, I finally adopted it as a project to be executed during the period corresponding to the first covid lockdown. Initially I was reluctant but eventually they convinced me, it was not difficult since with the "other radio" I also enjoy a lot, always making room for homebrewing and experimentation.

First I followed the instructions of Juan Carlos completing the antenna in less time than I thought. As is logical in these struggles, some difficulties arose but they can be easily solved with utilities we normally have at home. It is not necessary to be a professional or use expensive tools.

Below I list the “sticking points” that I came across and the solution taken to move forward with the construction of the original QFH antenna:

- The correct alignment between holes for the upper threaded rods and lower and perpendicularity of the threaded rods. Solution: I placed the tube in the shape of a house door frame. Leaning a marker on it, I traveled the entire length. With the reference line and with the prescribed distances, I used a template of circles to mark the four quadrants, both in the upper and lower part. The result is that all the marks were aligned and with the correct perpendicularity. Once this was done I proceeded with the drilling.

- My use of a Ø25 PVC pipe made it difficult to connect the power supply and place the nuts due to lack of space. Solution: I was forced to use M5 rods and nuts, that millimeter seems scarce but it made the difference. With a little patience and with the cuts of the rod rounded to facilitate the entry of the thread finally it was achieved.

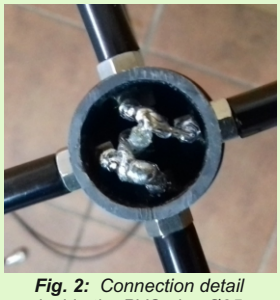


Fig. 2: Connection detail inside the PVC pipe Ø25.

- Uniform bending of the aluminum plates. Solution: I initially tried to do it by hand but I didn't like how it turned out. However, this helped me to know the approximate radius that was needed and I started looking for something with that curvature. As I was working in the garage my car was close by. Turns out, the perimeter of the tire almost matched. Therefore, I used the vehicle wheel as a support tool and guide for curving; the result was so good obtaining a uniform shape.

- Final resonance at a lower frequency. Solution: Juan Carlos´s superb idea of using threaded rods makes it possible to adjust the dimensions by playing with the nuts. The antenna was long, I just brought the nuts a little closer to the center tube, all the same. It improved substantially by sticking to the desired center frequency.

With the antenna ready it was time for the second phase, the first performance tests. It was time to take advantage of my usual portable activations to check the behavior at reception. I was pleasantly surprised to hear strong and clear signals on the 145Mhz downlinks, both FM and low orbit SSB. I also immediately detected that the QSB was quite smooth. I remember that I was so excited that at that moment the fact of doing the uplink on 435Mhz crossed my mind to see what would happen even knowing that the SWR would be excessive, but perhaps the famous third harmonic would help. I pressed PTT and... wow!..., I heard myself on the downlink with such a good signal. I couldn't believe it. At that moment I realized the possible potential of the antenna not only for VHF but, perhaps, in UHF it could have some application and thus work some LEO satellites. Before that I should have to think of something to minimize the ROE and not put the trig in danger.

During the following week I was on duty at my job, but with the thought of the QFH that I could not get out of my mind. At that time, due to my installation and to avoid complications, I imposed a requirement that It´d have a coaxial cable drop, so the option of building another independent UHF QFH inside or on top of the VHF one was ruled out.

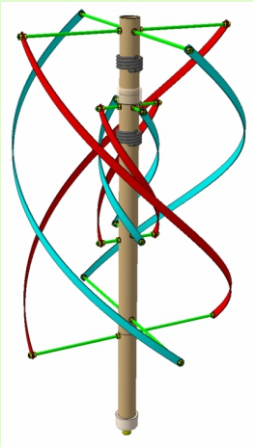


***Fig. 3**: QFH of 435Mhz within the QFH of 145Mhz*

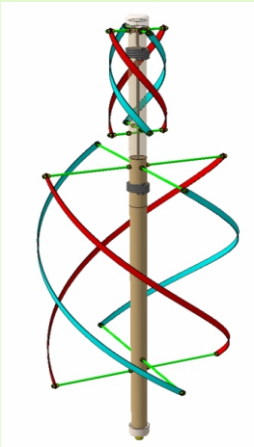


***Fig. 4:** QFH of 435Mhz above the QFH of 145Mhz*

I had experience in the installation of parasitic and self-excited elements in other types of antennas and I decided to go that way. There was another alternative that I would have liked to carry out, but I admit it, I decided to follow... the easy way.

That other option, which I refer to in the paragraph , previous, consists of integrating the UHF QFH antenna into a VHF antenna using the upper rods. That is, the threaded rods at the top are common for both antennas using a single coaxial cable drop. I do not rule out building and experimenting in the near future with this configuration, it could also serve as a test of the behavior of the QFH with lower D / H (diameter-height) ratio so that it is more favorable at low elevations, in exchange for sacrificing the high elevation passes.

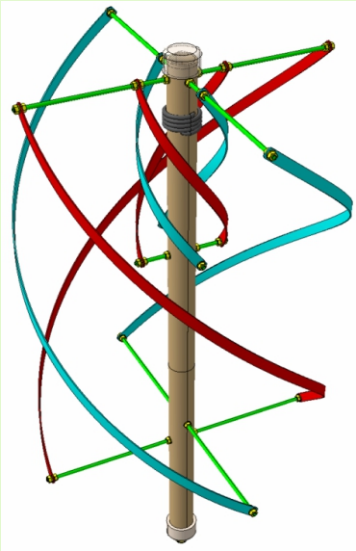


Fig. 5: *QFH of 435Mhz within the QFH of 145Mhz using common power supply through the upper rods*

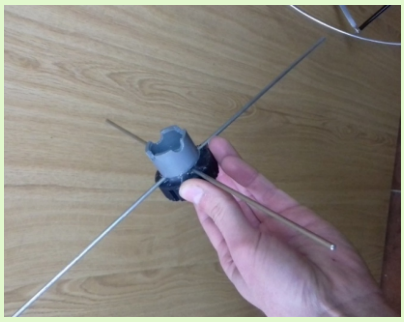


Fig. 6: Cross rods of Ø3.2mm

From what I have experienced so far, the performance of the antenna using Juan Carlos´ measurements works quite well in high passes. So, not a problem. Like everything in life, one thing is theory, but in practice you have to have in mind many other factors. Not adopting hasty conclusions in a few passes is a must. As Juan Carlos says, "each pass is a world", and he is right, as well as the location, wx conditions, orientation etc, ...

After this endless narrative, (sorry), we enter the subject that many are waiting for: the final “dual band” concept and the details to do it. The configuration finally implemented consists of including in the upper part two crossed rods, isolated from each other, at a certain distance from the main threaded rods. They must be aligned, with the same orientation and placed in a parallel plane. It is a kind of capacitive cap or hat with rods adjusted to the frequency of 435Mhz. Having a good swr meter or antenna analyzer is highly recommended for the fine tuning process and to know the resonance in both bands. I have to emphasize that the addition of these parasitic elements at the top, as a pseudo turnstile antenna for 435Mhz, hardly affects the 145Mhz part as far as SWR is concerned. As is already known and we have to be aware of it, the SWR value is not enough for an antenna to work and perform well but it can at least be a good indication. A low SWR is not everything, it is only part of that whole.

One thing that worries me is to know to what degree this configuration distorts the original circular polarization of the antenna, in the VHF part, and if in the UHF part that circular polarization is also induced in a correct way. I think that the polarizations changes but I would not know how much. Simulating the antenna in some specialized software could help.

Fig. 7: *QFH of 145Mhz with “cap” for 435Mhz*

After several adjustments a good balance was achieved. Basically modifying the length of the cap rods and their distance from those of the QFH, we move up and down. Highlighting the great influence of this last distance is critical, and a small change substantially affects the resonance point. I would say that its more important than the length of the elements of that "turnstile" . The final dimensions are shown in figure 8, with them and in my case I was finally satisfied.

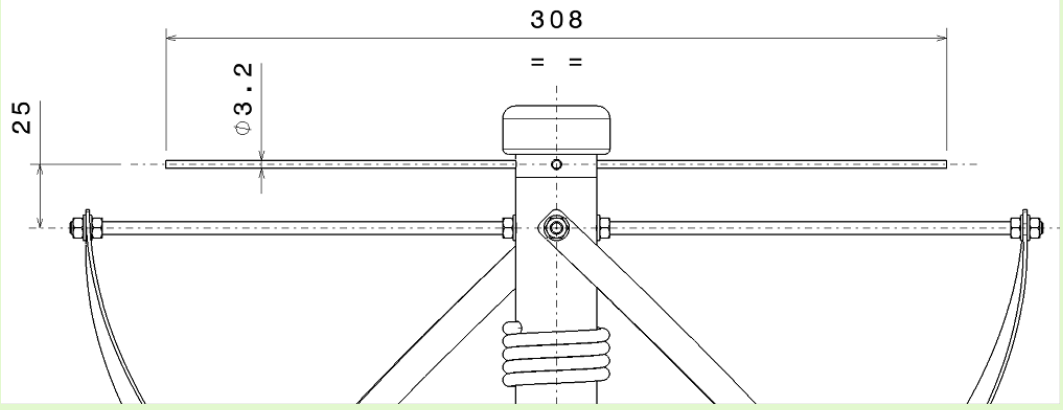


Fig. 8: *Position and dimensions of the "cap" for 70cm.*

The rods used are Ø3.2 and are used as filler material in the TIG welding procedure. As always, it is advisable to cut them in excess to progressively shorten and fine-tune them. As we mentioned before, you have to play with the 25mm distance to find the better position.

With all of the above ready in the garage, it was again the field test. On this occasion, home confinement prevented me, so we went to other less favorable scenarios. The test labs were now the small backyard of the house, with the fixed antenna, and the windows of the upper floor practicing the “free” style as a handheld antenna. The reception was still quite good in VHF, in UHF quite poor but at least it allowed me to work the uplink comfortably on the FM satellites, U / V mode. I also realized the importance of cable length so, coupled with the low noise band in my environment, I understand that connecting an RX preamplifier the result would be excellent for an omnidirectional antenna. We have to keep our feet on the ground and not pretend to compare the QFH antenna with any beam antenna. They are not at the same level , but within the family of omnidirectional antennas it would be placed in the first positions. The best omni-directional antenna doesn't come close to the worst directional antenna.

Fig. 9: *QSO with Jérôme - F4DXV from the window during the 1st confinement*

I get goose bumps when I recall the moment of my first QSO with the finished antenna. I had the great pleasure of completing the exchange , signal and locator, with F4DXV - Jérôme, tireless operator well known in the LEO satellite community. This was followed by the highly regarded M0NPT - Abdel, EB3A - Pere and SP1B - Luk.

Very happy with the result, I had to wait a very long time to place it on the roof. Already in its fixed position it is an antenna that I use regularly and it allows me to work LEO U / V satellites of FM and SSB (downlink in the 2m band and the 70cm band for the uplink). It is true that I practice its use in combination with my other vertical antennas, switching between them, to cover as much as possible the entire pass over the sky. Even under certain circumstances, generally with high elevations, I can also work RS-44 , in this case receiving in the UHF band. I recently remember a long QSO at dawn with my friend EA3CAZ - Josep on this Russian satellite, we were exchanging comments on a relaxed way as if it were a terrestrial repeater. It was something exceptional, it was already mentioned that each pass is different, but it´s such a wonderful experience when you can intensely enjoy the simplest things.

Fig. 10: *Dual-band QFH antenna in its final location with the rest of the verticals.*

Recently, our colleague Alejandro - EA4BFK, who planted the seed of the QFH antennas in the IberRadio 2018 technical talks, slipped the existence of a more favorable direction within the radiation pattern. Mostly the most common passes follow a SN or NS trajectory (almost polar), which is why he told us to orient the long loop of the QFH in that direction. Fortunately, I didn't have to go up on the roof to reorient it as my antenna happened to be in the recommended position.

Juan Carlos's method of comparison between antennas, counting the captured telemetry packets, shows that the “ear” of the dual-band QFH on VHF continues to be at the same level as the original single-band antenna.

In order to finalize this, I am about to express my conclusions about this "homemade" antenna based on the good work of Alejandro and Juan Carlos.

PROS:

- Low cost of materials.
- Easy construction with possibility of adjustment.
- Good VHF reception with a fairly good signal-to-noise ratio. Valid for telemetry and meteo sats reception.
- Its circular polarization gives it less fading than a conventional vertical antenna.
- Possibility of transmitting in the UHF band with a contained SWR value.
- Very acceptable performance for high elevations and for LEO satellites of the U / V, FM or SSB type.
- Compact and handy size.

CONS:

- The circular polarization of the antenna supposes an attenuation of about 3dB with respect to a linear polarization antenna when receiving the maximum signal.

- Poor performance for low angles and terrestrial communications.
- In general in UHF its no good, its my impression when receiving.
- Consider the possibility of inserting a preamplifier in low noise environments without inhibitors, which would make the installation more expensive.
- Of course it does not reach the performance of any dual band yagi or similar

Fig. 11: *Experimenting with a QFH antenna for the 70cm band.*

And now I have finished this article showing the new homebrew version of QFH for the UHF band. I am now testing it, I still don´t have an opinion about it. It will be studied soon.

Thank you so much for your attention.

Greetings and enjoy radio,

EA1PA, Salva

Announced activities

@N4DCW will be working some passes from EM87 December 10-13.

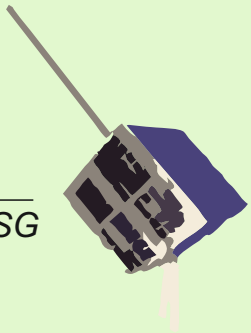
@ KL7TN : DM67 / 68: If plans don´t change, will be active from december 2 to the 13 for DM67 / 68.

@Wi7p DM51,52,53 and maybe from DM54 december 10

@ AD7DB : DM22: December 17-20 ,maybe from DM13,23,32 Holiday Style on FM sats.

The other Satellites:
Databases, websites and tools useful for SWLs

EA4SG



This monthly article will be interesting and useful. Or at least that is intended.

When the listener likes following these "other satellites" , he quickly realizes that the most precious thing is information. And is that, when a satellite is already “controlled”, the SWL's challenge is to go for the next one. On this newsletter its main editors and collaborators keep us informed about the new launches, but sometimes satellites are launched which use ham frequencies with hardly any advertising and that can even be of "Exclusive" use for their control teams. This is where the work of the radio amateurs takes value and where the webs, ham satellite databases and the Information on social media are of vital importance.

In this article we will share links and twitter accounts that will be useful to know what satellites we have over us, which frequencies they use, modes of transmission, characteristics and actual status.

The order does not imply more or less importance and , after all, each user has their "Favorites". As you will understand, everything is in English, but a lot of technical data (as frequencies) will be easy to understand for everyone. Comments on websites are personal and may differ on yours.

List and databases

Satnogs DB.

Continuously growing, the well-known Satnogs community offers two useful tools: Satnogs Network, which is the platform where sat "passes" both voice and telemetry and Satnogs DB. Their DB is a database that shows us data from satellites, NORADs, last received frames, transmitter frequencies and even “where available” dashboards for a graphical representation of the telemetry data. Actually, this page is one of the most consulted and visited by the satellite listening community both at an amateur level and at an educational level and control stations. If a satellite is not in the SatNogs DB, maybe it does not exist

https://db.satnogs.org/

AMSAT Status.

It is a simple web that gives you the information about the satellite status. No need to navigate thru a menu. It´s update by members of AMSAT-NA and mainly covers satellites with a repeater or transponder,although it also allows you to see the current status of "other satellites". It is essential to remember that this page must be fed, therefore the more listening reports we upload, the more updated it will be.

https://www.amsat.org/status/

Full list of frequencies and amateur satellites by JE9PEL

A timeless classic. A database containing a history that it starts even from Oscar-1. Graphically it is a list that does not result attractive, but JE9PEL keeps you very up-to-date with vital data to receive satellites: frequency, transmission mode and status. Both of the active satellites as well as those to be launched.

http://www.ne.jp/asahi/hamradio/je9pel/satslist.htm

Nanosats.eu Database by Erik Kulu

Very complete. Essential. Its expanded version includes useful filtering tools that make it much easier i ts use and consultation.

https://www.nanosats.eu/database

https://airtable.com/shrafcwXODMMKeRgU/tbldJoOBP5wINOJQY (Versión ampliada)

Status List del la web DK3WN Satblog

For years perhaps the most used at the amateur radio level. In addition to frequencies and modes, it offers links to a history of reports and, the most important part, a section with decoders programmes made by Mike DK3WN. The list is very updated and sometimes the list of the newest sats is delayed.

https://www.satblog.info/status-2/

IARU list of satellites with coordinated frequency

If the satellite has a downlink in amateur radio frequencies, it should inform IARU so that its frequency can be coordinated or revised. And also it has to have a purpose or utility for the community of radio amateurs as well as a radio amateur with a call sign that is its controller or responsible to IARU. All

this data is shared and reflected in the following list.

http://www.amsatuk.me.uk/iaru/finished.php

Gunter's Spatial Data Web

A satellite always has a launch. Among many other data, this website provides us with useful data on when, where, how and with whom the satellite from which we need information was launched, as well as information on payloads, orbital data and links to the projects of each satellite . It is not exclusive to ham satellites, but it does include them

https://space.skyrocket.de/

ESA Earth Observation Website

Another list of satellites including many with downlinks in the amateur radio frequencies, focused on the explanation of the missions and scientific projects behind each satellite. For those who want to reach beyond just listening.

https://directory.eoportal.org/web/eoportal/satellite-missions/a

Blogs y webs relacionadas

Technical and Scientific Amateur Radio by Daniel Estevez

The blog of our colleague EA4GPZ it´s all about satellites and space events, and it is always useful to obtain data and understand events

https://destevez.net/

Riddles in the sky

VE7TIL has a blog about classified satellite listening experiences and therefore, alternative. https://skyriddles.wordpress.com/

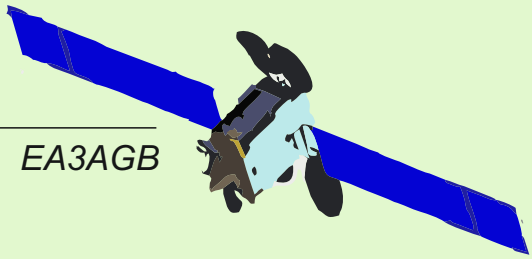
Twitter accounts

In search of updated information on amateur radio satellites, Twitter could be the most used and useful social network. This list could be endless but it includes colleagues who focus their messages on listening to ham satellites ham and that always provide very valuable and updated information.

@scott23192 @uhf_satcom @pe0sat @w2rtv1 @ppapadeas @bg2bhc @JA5BLZ @ea4gpz @n6rfm @coastal8049 @yc5abk @CX8AF @JA0CAW @JA1GDE @EU1SAT @avdeur @dk3wn
@supertrack_it

73s de David EA4SG
Email: at746david@gmail.com
Twitter: @EA4SG

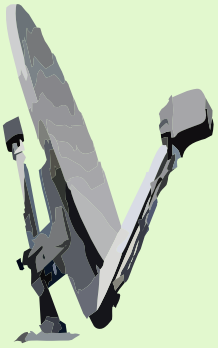
QO-100



EA3AGB

CALL	LOCATOR	MODE	QSL VIA
4X0ARF	KM70IK	SSB	LOTW/EQSL
4X0AAP/78	KM71MW	SSB	LOTW/EQSL
9K2OK	LL49AE	SSB	LOTW/EQSL
7Q7RU	KH67RU	SSB/CW	OQRS/LOTW
A41ZZ/P	LL74WF	SSB	LOTW/EQSL
A41ZZ/P	LL81RW	SSB	LOTW/EQSL
A41ZZ/P	LL82SP	SSB	LOTW/EQSL
A41ZZ/P	LL84GI	SSB	LOTW/EQSL
A450ZZ	LL93IF	SSB	LOTW/EQSL
A92GR	LL56HF	SSB	LOTW
CN8JQ	IM64OA	SSB	QRZ.COM
EU2AA	KO34KI	CW	LOTW
FR4OO	LG79RC	SSB	QRZ.COM
FR4OZ	LG79SB	SSB	DIRECT
G4VFL/PJ	O02DK	SSB	QRZ.COM
HB0TR	JN47SD	SSB	LOTW/EQSL
OE8XDX	JN71JV	SSB	QRZ.COM
OH9FTW	KP26UL	SSB	LOTW/EQSL
PR1S	GG99VW	SSB	PY1SAN
ZY1AMR	GG87Q	BSSB	PY1MZ
PY1AX	GG87QB	SSB/CW	LOTW/EQSL
PY2RN	GG52TN	SSB	LOTW
ZX6BA	HH02JN	SSB/CW	LOTW/EQSL
UA3AVY	KO95BI	SSB	LOTW/EQSL
R0AU	NO66KA	SSB	LOTW/EQSL
R9YA	NO22QN	SSB	LOTW/EQSL
S0S	IL11LE	SSB	LOTW
S0S	IL32KE	SSB	LOTW
ST2NH	KK65GP	SSB	QRZ.COM
SV1QFF	KM28AD	SSB	DIRECT/BURO
TF8YY	HP84BF	SSB	QRZ.COM
TR8CA	JJ40QL	SSB	LOTW/EQSL
V51WC	JG77GI	SSB	QRZ.COM
V51HZ	JG77FA	SSB	LOTW/EQS
LZ61DX	KN02LT	SSB	CLUBLOG
ZS6AAG	KG54	SSB	EQSL

A41ZZ/P



In this last period two new valid entities for the DXCC, were active:

TT8SN (Chad) operator Nico and 7Q7RU (Malawi) operator Vlad

Note that Khalid from A4, has been very active from 4 different Locator grids using the call A450ZZ

If you want to post future events or see photos of your activities or your sat station in this newsletter, please send the info to :contacto@amsat-ea.org or eb1ao@amsat-ea.org

AMSAT-EA products in the URE store

For several weeks you have at your disposal several products of AMSAT-EA personalized with your callsign on the URE website.

Don´t hesitate

Support AMSAT-EA