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QO-100 The Ultimate Ham Repeater

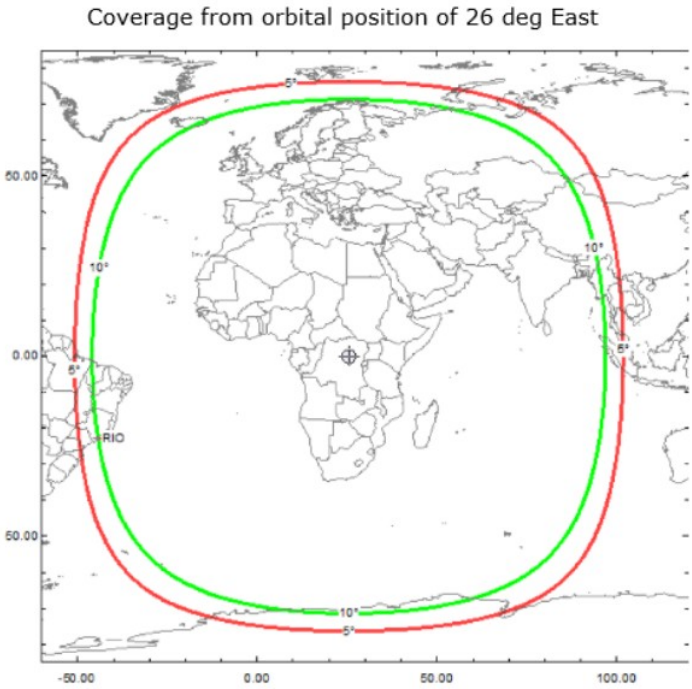
(both SSB & DATV)

Thanks to Christian, F1GWR, for sending us these tech details about the min. system requirements to access QO-100 and it's foot-print.

QO-100 (Qatar-OSCAR 100) is the world's first amateur radio geostationary satellite payload. Launched on November 15, 2018, it is hosted on the commercial Qatari Es'hail-2 television broadcast satellite positioned at 25.9° East longitude.

The up-link is on S band while the down-link is on X band.

For the narrow-band transponder, the up-link is 2400.050 to 2400.300 MHz. The NB down-link is 10489.550 to 10489.800 MHz.



QO-100 is not for N. America. It is a European project lead by a German OM (Peter DB2OS), using a telecommunication/television satellite named Es'hail-2 owned by Qatar and built by Mitsubishi, Japan, whose part of payload is an amateur dual linear transponder:
- one narrow-band for vocal, digital and CW traffic https://eshail.batc.org.uk/nb/
- and one wide-band for DATV https://eshail.batc.org.uk/wb/

You can watch DATV QSO online here:
https://www.twitch.tv/pa3fbx
https://www.youtube.com/@qo100datvwwnet9
All this arose because the Secretary of Telecommunications of Qatar is also a radio-ham. Ground segments are located in Bochum, Germany and Doha, Qatar.

Minimum setup for **SSB** communications:

RX Antenna	60-90 cm SAT-TV dish
Receiver	LNB with power injector and DVB-T dongle + SDR software (for example SDR#) OR 3 cm LNA with downconverter to 70cm
Transmitter	10W PEP in 60-90 cm dish plus upconverter from 144 MHz

Minimum setup for **DATV** (DVB-S2) communications:

RX Antenna	60-90 cm SAT-TV dish
Receiver	modified LNB with standard satellite receiver box (DVB-S2) OR modified LNB with PCI DVB-S2 cards for PC use
Transmitter	25W PEP in 2.4m dish plus DVB-S2 modulator for a 2MSym/s videostream

Feed-Back from F1GWR:

(*note: the last issue including photos of Christian's ham shack*)
Hi Jim, --- Thanks for the latest ATV Journal issue. Ah ha ha! You found my pics on qrz.com and included them in the issue! Sorry for the big mess on the desk, but you know, while busy at DIY and development, you accumulate a lot of stuff around you... Those pictures are for most of them quite old. The many SD monitors and cams you see on the pictures come from a production dept at a well known place, at least in France and Germany: ARTE headquarters in Strasbourg, France (https://arte.tv).



Christian, F1GWR

Nowadays local DATV traffic, here in the eastern France, Strasbourg area, stopped for various reasons, unfortunately. Including the local DATV relays which were dismantled. My ultimate ATV project will be to complete my DVB-S2 station, to be able to uplink DATV with a 3-meter dish over the QO-100 geostationary satellite, which sadly doesn't spread over Americas (except far eastern Brazil). But my hope is that the second next European Geostationary Satellite project will become reality (I was part of the French reflection team and pushed for an orbit located over the Atlantic Ocean). When I went in

Xenia (former Dayton) in 2018, a similar project in the US was mentioned, but since didn't hear about any further development.
(***editor's note: Has anyone else heard about the possibility of a similar ham American TV satellite for the western hemisphere ?***)

Beside that as a former reservist I'm part of the single remaining military radio-club in the country, F5KBB located in the 44e Régiment de Transmission barracks in Mutzig ("big ears" of the Mil Intelligence dept), and also AGEAT (Association de Guerre Electronique de l'Armée de Terre) which collects receivers, processing and locating equipment since WWI.

73 de Christian, F1GWR

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AMSAT Francophone
Conference report

QO-100+ / futureGEO

AMSAT-DL Conference — Ham Radio 2026, Friedrichshafen

Schwarzwald Room, Conference Center West
June 27, 2026 | Rapporteur: Christian Furst, F5UII

Introduction

At the Ham Radio 2026 conference in Friedrichshafen, AMSAT-DL presented a talk covering two complementary topics: a review of the operational performance of the QO-100 (Es'hail-2) satellite, the world's first geostationary amateur radio transponder, and a presentation of the futureGEO initiative conducted in partnership with the European Space Agency (ESA). This report is written for the French-speaking members of AMSAT who have followed and worked on this project since its inception.

1. A look back at QO-100 — From genesis to exploitation

1.1 History and role of Peter Gülzow, DB2OS

Peter Gülzow (DB2OS), lead designer of the Qatar-OSCAR 100 project, was present at the conference. He recounted the history of this satellite, which originated from an idea launched in 2012 at a conference in Doha. It was at this conference that key collaborations were established between AMSAT-DL, QARS (Qatar Amateur Radio Society), Es'hailSat, and MELCO.

The Es'hail-2 satellite was launched on November 15, 2018 aboard a SpaceX Falcon 9 rocket. As of February 15, 2019, the amateur radio service officially opened under the name OSCAR 100. Since then, QO-100 has enabled continuous 24-hour links between Brazil and China, thus covering Europe, Africa, the Middle East and a large part of Asia.

1.2 Transponder Architecture

Peter DB2OS presented/reviewed the block diagram of the onboard transponder architecture. The satellite integrates two separate amateur radio transponders:

- A narrowband linear transponder (500 kHz) for SSB and CW;
- A broadband transponder (8 MHz) dedicated to DATV (Digital Amateur Television).

A notable technical point raised during this presentation: the amateur radio architecture incorporates two Traveling-Wave Tube (TWT) amplifiers.
However, these TWTs also serve as spare parts for the satellite's commercial payload. This dual function implies a significant constraint:

> ***In the event of a failure of a commercial TWT and the use of one of these replacement parts, the current configuration of amateur radio transponders would be modified — or even reduced.***

This information, little known until now in the amateur radio community, deserves to be highlighted.

Furthermore, it was specified/recalled that the LEILA beacons of the narrowband transponder are continuously transmitted from Bochum, while the DATV beacon is emitted from the control center in Qatar.

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2. The futureGEO project — Towards a second geostationary amateur radio satellite (QO100 Plus)

2.1 Context and involvement of the ESA

The success of QO-100 highlighted the need for a second geostationary amateur radio satellite. The IARU brought this request to the attention of the ESA, which launched the future(Amateur)GEO initiative. The ESA commissioned AMSAT-DL to conduct a design study, with the objective that "the useful coverage be designed to benefit European and Canadian amateur radio operators in particular, without excluding broader international cooperation."
"

This first phase of the ESA study was to be finalized at Ham Radio 2026. From the presentation date, approximately one month remains to define and finalize the missions of the future satellite. A consultation will then be launched to identify professional and commercial payload operators capable of hosting this additional payload.

The names of EuTelsat and Airbus were mentioned during the session as examples of potential platforms, without any formal commitment at this stage.

2.2 Key stages of the project — Participation of AMSAT Francophone

The presentation outlined the steps already known by our association:

- The initial consultation of the ESA with the international amateur radio community;
- The questionnaire on the capacity to participate in the project, distributed to the AMSAT sections national;
- The technical workshop organized in Bochum, with remote participation — including Three members of AMSAT Francophone were present. A slide presented during the meeting displayed the names and call signs of these participants. A slight misunderstanding occurred on the screen: an amateur radio call sign had been mistakenly associated with the first name Christophe.



Figure 1 Capture Lucien F1TE

2.3 Target Architecture — Three Payload Levels

The main result of this workshop is the definition of a modular architecture in three layers, represented in the form of a pyramid on the leaflet distributed at the AMSAT-DL stand:

- **Basic level (green)** — "Enhanced QO-100+ bent-pipe": the functional equivalent of the current QO-100, that is to say a classic linear transponder. This is the minimum guaranteed by the project.

- **Extended level (blue)** — "Digital Innovation Lab": a major technological enhancement, based on an embedded reconfigurable SDR (Software Defined Radio).
  Software containers could be loaded and downloaded remotely, paving the way for scalable features — similar to what is already done on some professional satellites.

- **Optional level (red)** — "High Frequency Pathfinder": a layer dedicated to specific sensors and effectors (especially high frequencies), used on board for advanced scientific or experimental missions.

2.4 Orbital positioning — An indicative value

The graphic representations of the futureGEO project place the satellite at 47° West. It was explicitly stated during the meeting that this positioning is an illustrative value chosen arbitrarily for the purposes of coverage simulations. There is currently no formal agreement on a precise orbital location. A satellite at this longitude would cover South America, North America, Europe, and part of Africa—hence the value of this position for illustrating the project's potential.

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3. Conclusion and perspectives

This conference confirms that the futureGEO project has reached a decisive milestone. AMSAT-DL, supported by ESA under the ARTES FPE 1A.126 program, has a target architecture validated by the international community, including AMSAT Francophone.
actively contributed to defining the outlines.

The next expected steps are:

- The final completion of the satellite missions within the following month, Ham Radio 2026;
- The launch of a consultation to identify the host platform (commercial satellite) (Understood as being taken into account by the ESA)
- Continued exchanges between AMSAT-DL, ESA and industrial partners potential.

Attached: AMSAt-DL FutureGeo / QO 100+ paper leaflet

Written by Christian Furst, F5UII
AMSAT Francophone

From the first geostationary QO-100 ...

Peter Gülzow DB2OS is the mastermind behind Qatar-OSCAR 100 (QO-100) – the world's first geostationary amateur radio transponder as a hosted payload on a commercial GEO satellite.



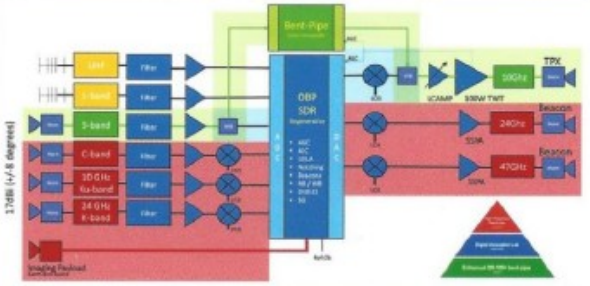
He provided the impetus in 2012 during a talk in Doha, which led to the formation of the key partnerships. As project manager for AMSAT-DL, he coordinated the collaboration with QARS, Es'hailSat, MELCO and specified the payload: a 500 kHz linear transponder (SSB/CW) and an 8 MHz broadband transponder for DATV. Es'hail-2 was launched on 15 November 2018 aboard a SpaceX Falcon 9. On 15 February 2019, the amateur radio service was officially opened by A71AU during the inauguration ceremony. On 3 February 2019, the satellite was assigned OSCAR number 100. Since then, QO-100 has enabled round-the-clock connections from Brazil to China. The QO-100 stations at Neumayer Station III (DP0GVN) in Antarctica and on the research vessel Polarstern (DP0POL/mm) were built by AMSAT-DL. The LEILA beacons of the narrowband transponder are transmitted continuously from Bochum, whilst the DATV beacon is transmitted from the control centre in Qatar. Both ground stations were built by AMSAT-DL.



... on ESA's futureGEO initiative

QO-100 sent shockwaves through the European satellite industry and highlighted the need for a second geostationary amateur radio satellite. The IARU brought this request to the attention of ESA, which led to the creation of the future(Amateur)GEO initiative. ESA commissioned AMSAT-DL to carry out a design study: "The payload coverage should be designed in such a way that European and Canadian radio amateurs in particular benefit from it, without ruling out further international cooperation with other radio amateurs." and "ESA proposes to implement this activity through a combination of internal, industrial and amateur radio efforts." This first phase is due to be completed at HAM RADIO 2026.

Bent-Pipe + Digital Innovation Lab +mmW-Pathfinder





esa AMSAT-DL

DBV-T2 vs. DVB-T

On a recent BATVC ATV net, Steve, WA0TQG, asked the question -- "What is the differences and advantages of the newer DVB-T2 vs. DVB-T ? " Well, Debbie, WB2DVT, dug into it and came up with a link to a short summary on RF-Wireless World. See the table below.

Both methods use OFDM, but T2 has more options for modulation, FEC, # of sub-carriers & guard intervals. Of particular notice for those ATV hams in major metro areas where a 6 MHz TV channel is impossible due to 70 cm spectrum congestion is the inclusion of a 1.7 MHz band-width possibility with DVB-T2. T2 ups the max. throughput / data rate from 32 to 45 Mbs. T2 supports H.265 and up to 4K broadcasts.
Many of the low cost, consumer grade, set-top boxes, available on E-Bay now support dual DVB-T/T2. It should be noted that our older Hi-Des equipment only supports -T, not T2.

Features	DVB-T	DVB-T2
FEC coding	Convolutional coding + RS: 1/2, 2/3, 3/4, 5/6, 7/8	LDPC + BCH: 1/2, 3/5, 2/3, 3/4, 4/5, 5/6
Modulation	QPSK, 16QAM, 64QAM	QPSK, 16QAM, 64QAM, 256QAM with constellation rotation
Guard Interval	1/4, 1/8, 1/16, 1/32	1/4, 19/128, 1/8, 19/256, 1/16, 1/32, 1/128
FFT Size	2K, 4K, 8K	1K, 2K, 4K, 8K, 16K, 32K
Scattered pilots	8% of total	1%, 2%, 4%, 8% of total
Continual Pilots	2.0% of total	0.4%-2.4%
Bandwidth	5, 6, 7, 8 MHz	1.7, 5, 6, 7, 8, 10 MHz
Typical data rate	24 Mbit/s	40 Mbit/s
Max. data rate (@ 20dB C/N)	31.7 Mbit/s	45.5 Mbit/s

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Ron Hill, KD6NIZ - Silent Key

Roland (Ron) Hill, KD6NIZ, the oldest of the Hill brothers, became a Silent Key on October 10, 2026. Roland was the first of the Hill brothers to get his HAM license. He encouraged his brother Norman (Norm), KD6OMV, to get licensed, and finally his brother Don, KE6BXT. After getting involved with UHF, VHF, and Packet, the brothers discovered Amateur Television and the ATN. Operating from his home in Arcadia, California, he frequently used the Mt. Wilson ATN repeater (W6ATN) to check into the weekly net. He enjoyed going to the Dayton Hamfest with his brothers and meeting other ATVers at the Friday night dinners. He will be missed.



Hill Brothers: Don, KE6BXT, Ron, KD6NIZ & Norm, KD6OMV

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ARRL National SET
BCARES + ATV

Every year, the ARRL encourages local ARES groups to hold a Simulated Emergency Test (SET) sometime during the month of October. This year the Colorado ARES groups held their state-wide SET on Saturday, Oct. 24th. Our local Boulder ARES group, BCARES, also participated. The BCARES E.C., Allen Bishop, K0ARK, also included ATV in the exercise.



BCARES command post at EOC

BCARES has an equipment cache at the Boulder EOC for immediate 24/7 access. The cache includes ATV gear. They have four portable 70cm DVB-T pack sets including Sony camcorders, 3 watt DVB-T transmitters, batteries, antennas, etc. Also in the cache is a portable 70cm DVB-T repeater for deployment in the mountains as needed. BCARES has an operating, HF/VHF/UHF amateur station in the EOC in a seperate office immediately adjacent to the large EOC situation room. BCARES has 70 cm ATV receive capability there and can display in the sit. room on a large screen video monitor a quad display of all four ATV channels (57, 58, 59 & 60).

(Editor's comments:) For this SET exercise, BCARES had a very poor showing of members. There were only eleven participants out of a much larger membership. Needless to say this was a big disappointment in the lack of interest. It is a poor reflection on the amateur community for supporting future emergencies in Boulder County. The BCARES board is going to need to take a long hard look at what we can really promise our served agencies in the future as a result. With only a dozen committed folks, we can't accomplish a whole lot. We have more technical equipment than personel to operate it appears. Some major changes no doubt need to be made to weed out those folks who are members, but never show for training, nor when we have real call outs for actual real operations.

Due to the poor turn-out, the original SET objectives set forth by Allen, K0ARK, E.C., were cut back to use the personel available. Some members were assigned to staff the command center at the E.O.C. A team was sent to a simulated shelter to setup a VHF Winlink communications back to the E.O.C. Three other teams with DATV gear were distached to high points overlooking the Boulder Valley. One went to Legion Hill. One to Flagstaff mountain. The third took two TV cameras/transmitters to the US-36 Overlook to monitor the traffic to/from Denver with one camera looking south-east and the other south-west. All groups were successful in establishing Winlink & DATV communications links directly back to the E.O.C. All four 70 cm ATV channels (57, 58, 59 & 60) were on the air simultaneously and displayed as a quad image on the big screen monitor in the E.O.C. The TV paths were so good, that all of the TV transmitters were able to be throttled back to their low power setting of 300 mW. The EOC also was able to communicate directly with the State ARES command in Denver via D-Star.



ATV operation from Legion Hill



view of Continental Divide



70cm DATV pack set



Boulder from Flagstaff mtn



Downtown from Flagstaff mtn



US-36 Overlook

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N8GGG's Ham Shack & ATV Studio

In the previous issue, we sent out a request for our readers to send in photos of their ham shacks. The first to respond was Larry, N8GGG. Larry has made heroic efforts to participate in our Boulder ATV activities. He lives 23 km east of the Boulder repeater in the north-east part of Westminster, close to I-25. Unfortunately for Larry, the TV signal has to make a flat grazing path at eye-ball level over the last 3-4 kms to get to Larry's QTH. Larry struggled a lot to finally get a picture at his qth. At that his treshold is perhaps only 1 or 2 dB above the absolute minimum. When propagation conditons are bad, he does loose the signal. He decided to forget, even trying to transmit back to the repeater. So, Larry made a work-around. He worked with Bill, AB0MY, who lives in north Boulder with a visual line-of-sight path to the repeater. Larry sends his video/audio to Bill via the inter-net. Then Bill patches it onto his TV transmitter and "Voila" we can now see Larry's smiling face on our TV Net.

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LYNX Amateur TV: Justin, G8YTZ, has posted a notice on Digital Amateur Television - Groups.io web site (https://groups.io/g/digitalatv/) He says "I am pleased to announce the public beta of ***Lynx Amateur TV,*** a native Apple TV app in the Lynx receiver family." It is basically an "app" to run on an Apple TV which makes it an ATV tuner. For further details, check it out on the DATV users group site.

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BATVC Members: The Boulder, Colorado ATV group has at present 14 active hams. They are: Don Nelson, N0YE; Bill Eberle, AB0MY; Jack Quinn, K0HEH; Colin Bradley, WA2YUN; Pete Goldman, WB2DVS; Debbie Goldman, WB2DVT; Steve Maddy, WA0TQG; Chris Grund, K0CJG; Bill McCaa, K0RZ; Allen Bishop, K0ARK; Bob Henderson, N8GGG; Larry Nussbaumer, N8GGG; & Joe Dempster, K2EVK + myself, Jim, KH6HTV. We have lost a few drop-outs over the years. A silent key. We do have also a few viewers, some who watch the repeater directly and others who watch our BATC inter-net stream of our Thursday afternoon, weekly ATV net. Plus our local ARES group, BCARES, provides ATV service to our local O.E.M, Sheriff, Police and Fire depts. using our repeater. So we can also count as part-time viewers our local public safety agencies.

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VeraTune Receiver Status Up-date: In Art's latest issue (Oct. 2026) of the ATCO Newsletter, he brings us up to date on his DTV receiver project.
"The VersaTune-mini receiver project is becoming a possible failure issue. I initially found a possible replacement for my VersaTune project, doomed because of an obsolete tuner module with no replacement. During a search for something else, I stumbled upon a company that has a network tuner module using DVB-T/T2 operation. It seemed it may work for 70cm DATV so I contacted the manufacturer. Long story short, it CAN be used almost as is for 70cm DATV and can be easily software modified to get all the features we need with better sensitivity to boot! The best part is that they said they'll work with us to create the unit we need at an affordable price. Now, it seems the manufacturer hasn't turned us OFF per se, but lately they have been unresponsive. I'm holding out hopes for a successful end to the design but it's looking dimmer as day goes on. I'll still press on but don't hold your breath. More news as I get it. (Check out my VersaTune-mini article later in this Newsletter for the existing details). I have a working prototype with the specifications already incorporated. Wish me luck!" A lot more details about Art's VersaTune are found in his newsletter on pages 4 & 5. de Art Towslee, WA8RMC, Westerville, Ohio

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Newsletter Details:

This newsletter was started in 2018 and originally published under the title "*Boulder Amateur Television Club - TV Repeater's REPEATER*" Starting with issue #166, July, 2024, we have changed the title to "*Amateur Television Journal.*" This reflects the fact that it has grown from being simply a local club's newsletter to become the "de-facto" ATV newsletter for the USA and overseas hams. This is a free ATV newsletter distributed electronically via e-mail to ATV hams. The distribution list has now grown to over 900+, both in the USA and overseas. News and articles from other ATV groups are welcomed. Permission is granted to re-distribute it and also to re-print articles, as long as you acknowledge the source.
Newsletter Archive: All past issues of the newsletter are archived on the web site: ***https://kh6htv.com/newsletter/*** A **free DVD** with all past issues is available upon sending an e-mail request to the editor.

Boulder CO - W0BTV Details:

Inputs: 23 cm Primary (CCARC co-ordinated) + 70 cm & 3 cm secondary all digital using European Broadcast TV standard, DVB-T with standard 6 MHz wide TV channels. Frequencies listed are the center frequency of the TV channel.
23 cm = 1243 MHz (primary), 70 cm = 441 MHz & 3 cm = 10.380 GHz
Outputs: 70 cm Primary (CCARC co-ordinated), Channel 57 -- 423 MHz with 6 MHz BW, DVB-T
Also, secondary analog, NTSC, FM-TV output on 5.905 GHz (24/7 microwave beacon).
Operational details in AN-51d Technical details in AN-53d. Available at: *https://kh6htv.com/application-notes/* We hold a social ATV net on Thursday afternoon at 3 pm local Mountain time (22:00 UTC). The net typically runs for 1 to 1 1/2 hours. ATV nets are streamed live using the British Amateur TV Club's server, via: ***https://batc.org.uk/live/*** Select ***ab0my or n0ye***. We use the Boulder ARES (BCARES) 2 meter FM voice repeater for intercom. 146.760 MHz (*-600 kHz, 100 Hz PL tone required to access*).

ATV HAM ADS -- *Free* advertising space is offered here to ATV hams, ham clubs or ARES groups. List here amateur radio & TV gear

For Sale - or - Want to Buy