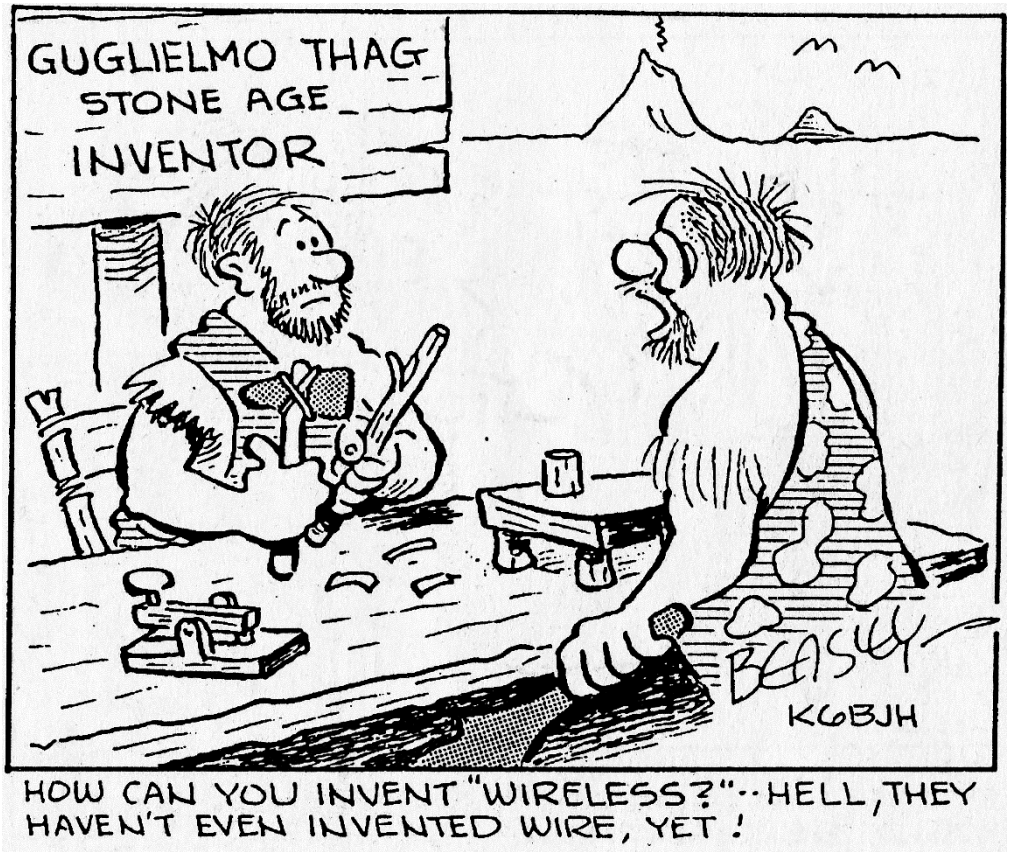
ATCO NEWSLETTER

VOLUME 40 NUMBER 4 **October 2023**

The ATCO newsletter is the official publication of a group of amateur television operators known as "AMATEUR TELEVISION IN CENTRAL OHIO Group Inc" published quarterly (January, April, July, October)

ATCO SPOTLIGHT TOPIC



ACTIVITIES ... from my Workbench

Hello again ATVers! Where in the world did summer go? It seems like I just finished the last ATCO Newsletter. Let's skip the banter about my summer activities and jump right into ATV stuff.

Well, actually, there's not much going on ATV wise. There have been no band openings that I know of around here to report and ATCO repeater activity has almost stopped. The only signals I hear come from Roger, WB8DZW, Jay, KB8YMQ, and Phil, W8MA on 147.48. When I'm in the shack and hear them, I usually reply. That's great but others ought to chime in also from time to time. I DO hear Charles, WB8LGA, on the 7:30 AM daily get-together but I admit, I have trouble getting up early enough to jump in. By the time I get up, shower, go to Tim Horton's for coffee, have breakfast and check the local TV news, they are usually long gone. I really **must** change my daily routines.

The ATCO repeater needs some attention as the DVB-S output changed to a blank screen recently. It was still producing a DVB-S signal but no video. I made a trip there to check things out only to find the LCD monitor which had been in service for over 10 years was now non-functional. I did not take a separate monitor because I knew there was one there. Apparently, the florescent back light in it decided it had enough and quit. Without a working monitor, I couldn't do anything productive so I just checked all RF Heliax cables, verified color code markings and adjusted all RCA plugs. (I don't need to remind you how intermittent those things can be). I've replaced most RCA plugs with BNC connectors except for the controller which would have meant taking it out of service and removing all cables going to it. Getting things back to normal would be problematic so I kept putting it off. Well, long story short…I just removed each RCA plug then re-inserted and rotated them to "shake off" any corrosion and left the scene. When I returned home, I found everything is now working. How about that???? Sometimes, you win one!

Everything works now except for a weaker than normal signal coming in on 439.25 analog and 439 DVB-T digital. (They share a common antenna). I swapped the preamp but no help. Hope it isn't the 439 slot antenna. That antenna has been working OK for 20+ years now. I replaced the radome on it about 5 years ago and checked it at that time. It was Ok then. It's too late in the season to be messing around with antennas so if the issue is antenna related, it will have to wait until spring. In addition, since the city replaced and re-located their 161 MHz NOAA weather transmitter antenna to within 10 feet of ours, work on our antenna must be done with theirs shut down since it outputs over 6kW ERP. (I don't want to glow GREEN!) Columbus city engineering would have to get involved.

The 147.48 MHz input sensitivity seems to be reduced lately so I'm investigating that. The antenna for that has been in place and untouched since inception over 25 years ago so it wouldn't surprise me that it too needs replacement. That is a dual band antenna used for 147.48 receive and 446.350 transmit. The common feedline goes through a hi/lo band splitter then to the respective equipment. I plan to replace the 5 dB antenna with a single band 12 dB antenna replacing the now unused 2411 MHz antenna and feedline. I have an 11" dia. 24" long cavity filter (**0. 3 dB insertion loss!!**) to replace the smaller dual cavity filters in place now. The overall gain of the new combination will be over 10 dB better than it is now. That should improve the input capability. Then, all we will need is more activity!!! With that much more sensitivity, will the Dayton guys be able to get into it?????

OK, last topic. It seems the desire to have Spring and Fall events are diminishing. I sent out an Email recently asking how many people would attend a Fall event. I said that if no more than 10 people were interested, it wasn't worth the effort. Last spring, we had about 22 attendees but that was because Marshall McPeek from TV channel 6 / 28 spoke to us. Thirty-five people confirmed that they would be there but 12 didn't show up. As a result, we had a lot of food left over. So, now I asked who would come to the Fall Event. Only 9 people responded and only 5 said "YES" so it's off for this year. We'll re-assess the situation next spring. In the meantime, if anyone is interested in a Pizza party, let me know. …WA8RMC

NASA REGAINS FULL CONTACT WITH VOYAGER 2

(From JPL Labs)

After a 12.3-billion-mile 'shout,' NASA regains full contact with Voyager 2. The Jet Propulsion Laboratory lost contact with Voyager 2 on July 21 after mistakenly pointing its antenna 2 degrees away from Earth. On Friday, contact was fully restored. Talk about a long-distance call.

NASA/Getty Images

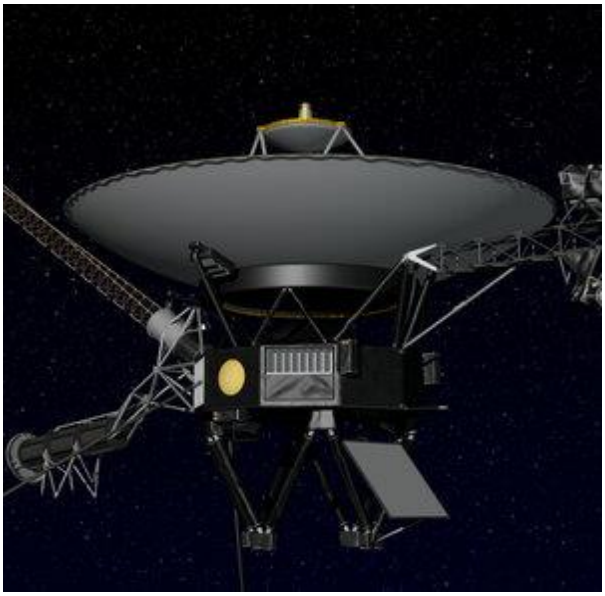
NASA said it resumed full communications with the Voyager 2 on Friday after almost two weeks of silence from the interstellar spacecraft. The agency's Jet Propulsion Laboratory said a series of ground antennas, part of the Deep Space Network, registered a carrier signal from Voyager 2 on Tuesday but the signal was too faint.

A Deep Space Network facility in Australia then sent "the equivalent of an interstellar 'shout' " to the Voyager 2 telling it to turn its antenna back toward Earth. The signal was sent more than 12.3 billion miles away and it took 37 hours to get a response from the spacecraft, NASA said. Scientists received a response at about 12:30 a.m. ET Friday. Voyager 2 is now operating normally, returning science and telemetry data, and "remains on its expected trajectory," NASA said.

NASA said Friday that it lost contact with Voyager 2 on July 21 after "a series of planned commands" inadvertently caused the craft to turn its antenna 2 degrees away from the direction of its home planet. What might seem like a slight error, had big consequences: NASA previously said it wouldn't be able to communicate with the craft until October, when the satellite would go through one of its routine repositioning steps.

"That is a long time to wait, so we'll try sending up commands several times" before October, program manager Suzanne Dodd told The Associated Press.

These are astronauts who'll take a trip around the moon next year

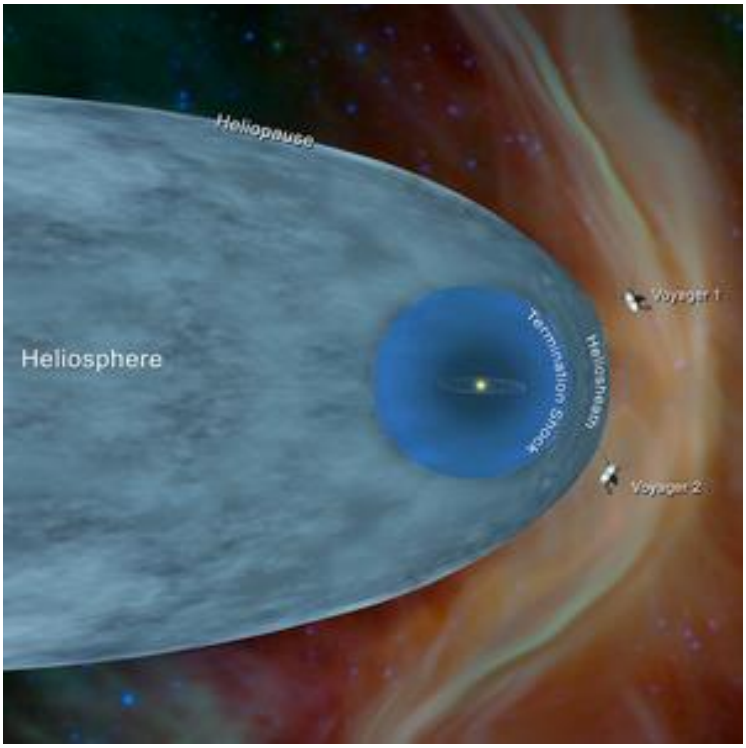


Even if Voyager 2 had failed to reestablish communications until fall, the engineers expected it to stay moving on its planned trajectory on the edge of the solar system.

Voyager 2 entered interstellar space in November 2018 — more than 40 years since it launched from Cape Canaveral, Fla. To this day, Voyager 2 remains one of only two human-made objects to ever operate outside the heliosphere, which NASA defines as "the protective bubble of particles and magnetic fields generated by the Sun."

Its primary mission was to study the outer solar system, and already, Voyager 2 has proved its status as a planetary pioneer. Equipped with several imaging instruments, the spacecraft is credited with documenting the discovery of 16 new moons, six new rings and Neptune's "Great Dark Spot."

Voyager 2 Bids Adieu To The Heliosphere, Entering Interstellar Space



Voyager 2 is also carrying some precious cargo, like a message in a bottle, should it find itself as the subject of another world's discovery: a golden record containing a variety of natural sounds, greetings in 55 languages and a 90-minute selection of music.

Last month's command mix-up foreshadows the craft's inevitable end an estimated three years from now.

"Eventually, there will not be enough electricity to power even one instrument," reads a NASA page documenting the spacecraft's travels. "Then, Voyager 2 will silently continue its eternal journey among the stars."

Meanwhile, Voyager 2's sister spacecraft, Voyager 1, is still broadcasting and transmitting data just fine from a slightly farther vantage point of 15 billion miles away.

Correction Aug. 3, 2023

A previous version of this article implied that Voyager 2 flew past Uranus in 2018 when, in fact, the spacecraft concluded its encounter with the planet and started heading toward Neptune in 1986. Voyager 2 entered interstellar space in November 2018.

BOULDER, COLORADO BATVC & W0BTV-ATV REPEATER NEWS

Attention,

Below is a look at what the guys in Colorado are doing now. I thought it interesting to look at their setup and see how far they have come in the last few years. Also, we are not the only ones with operational issues. Our ATCO system however has been running well for over 20 years or so but now becoming the victim of "OLD AGE". Read on…. WA8RMC

(reprinted with permission from the "TV Repeater's REPEATER" Newsletter Boulder, Colorado)

Jim, KH6HTV, & Don, N0YE, W0BTV explain:

We have still been struggling with the issue of poor sensitivity of the 70 cm receivers on the W0BTV, DATV repeater. This is after our exciting report in the recent July 16th newsletter (issue #136) that our RFI had disappeared Unfortunately, we now need to report it has returned. Plus, now another serious issue has arisen. Something has failed in our remote control, radio circuit. We use a 2-meter FM radio with touch-tones (DTMF) to control various functions, plus the FCC requirement to remotely disable the repeater in the event of a mal-function. Also, the 5.9 GHz, FM-TV beacon had again failed.

So, trustees, Don, N0YE, & Jim, KH6HTV, once again made a trip to the repeater site. As always, we needed to call in advance and make an appointment for access. This time, we asked for a 2-hour time slot to make a bunch of spectrum analyzer measurements on the 70 cm band, plus do other trouble shooting and climb on the roof to remove the 5.9 GHz transmitter. As it turned out, 2 hours was not nearly enough time, we stretched it to 3 hours, pushing the limits of our welcome. Even then we didn't finish all the experiments and measurements we wanted to do. We did find that the DTMF decoder was receiving the proper tones, but was not responding to them. The DC power to the remote, roof top mounted, 5.9 GHz transmitter was not working. At the end of the session, we removed both the main repeater rack and the 5.9 GHz transmitter box and they are now resting in Jim's ham shack for repairs.

We did learn quite a bit more about our poor 70 cm receiver sensitivity problem using our Rigol DSA- 815 spectrum analyzer. We measured signals directly from the repeater's Diamond, X-6000, tri-band (2m/70cm/23cm) antenna. We also measured the signals later internal to the repeater's receiver at the output of the 3dB signal splitter, just before it went to the Hi-Des DVB-T receivers. At this point the antenna signals had gone through the input circuits of the triplexer, 70cm - 6 MHz band-pass filter, low noise pre-amp and 3 dB

power splitter. We captured lots of various screen images on a USB memory stick for later study. The most relevant are shown here as Figs 1-3. The same settings were used for all three figures. They were the same as recommended by ITU for measuring DVB-T signals. Center Freq = 439 MHz, Span = 20 MHz (i.e., 2 MHz/div). Vertical settings were: 10 dB/div, 0 dB input attenuation, LNA turned on, RMS detector, IF resolution bandwidth = 30 kHz, video bandwidth = 300 kHz, sweep scan time = 2 seconds.

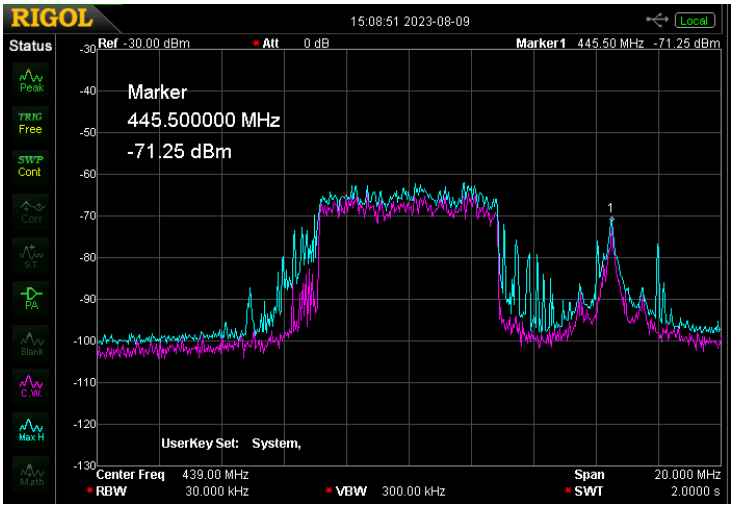


Figure 1.

Fig. 1 Baseline Noise from Receive Antenna - with no DATV signal present at 439 MHz. Yellow trace = "live" single sweep. Magenta trace = peak hold after 1 minute of sweeping. Other ham signals were seen above 444 MHz.

Fig. 2 A DVB-T, 439 MHz, 6 MHz BW signal from Jack, K0HEH --- marginal. Decoded signal did have live motion with audio - But also suffered from intermittent freeze frames. Signal measured inside the repeater at the output of the 70 cm 3 dB power splitter. Signal had passed through the input circuits of triplexer, 6 MHz band-pass filter, low noise pre-amp and then the 3 dB splitter. Magenta (purple) trace is "live" single sweep taken at a time with RFI was minimum Cyan (blue) trace is peak hold after 2 minutes of sweeping. It captures both TV signal and the max. amount of RFI

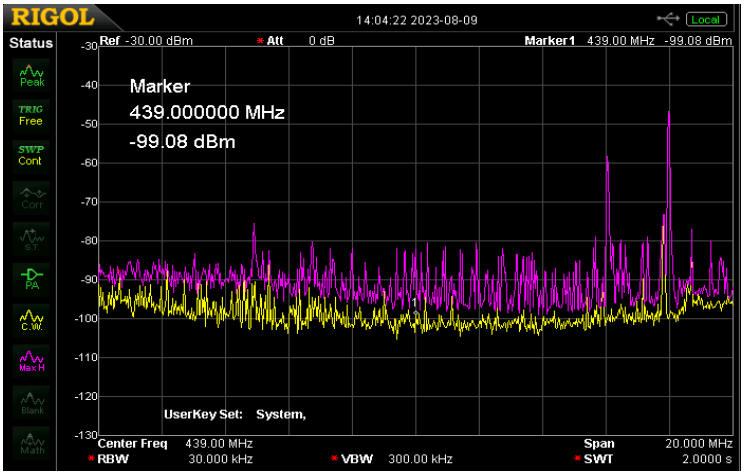
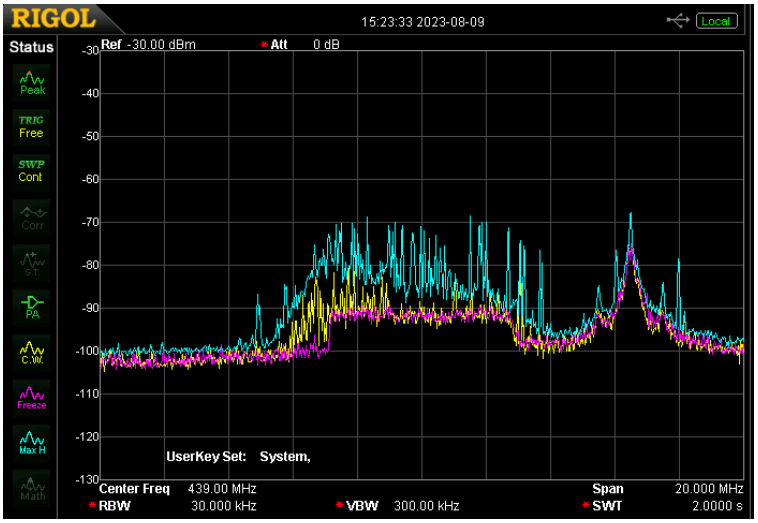


Figure 2.

Fig. 3 Same set-up as Fig. 2. Receive antenna is connected. This time no external DTV signal present. But our own locally generated, weak DVB-T test signal is inserted via directional coupler.

For Fig. 3, the test signal was set at digital threshold of the repeater's receiver. Magenta (purple) trace was just the test DVB-T signal without the receive antenna attached. A 50 Ω termination was substituted for the antenna
. This trace was then "frozen". Then the antenna was attached to the directional coupler and the repeater receiver for the remaining two traces. The test signal was still being injected. There were no other DTV signals on the air at this same test time. The yellow trace is a "live" single sweep. The cyan (blue) trace is the same, but in the peak hold mode for about 2 minutes of sweeps. The spikes seen at 445.5 MHz in both Figs. 2 & 3 was some other ham's signals or voice repeaters.



So, What Do These Tests Tell Us?

#1 Our repeater is in a very noisy environment with way too much very broad band, RFI, noise present

#2 The noise is always there, but bursts sometimes 15 dB higher and recurs quite often, every few seconds.

#3 Nothing we can do with further band-pass filtering, etc. will cure the problem. Our problem is the external EM environment at our repeater site.

Figure 3.

Let's analyze Fig. 1 further. First the spectrum analyzer background noise level is much less than shown here. With the same identical setup at KH6HTV's QTH in a residental area and an outdoor yagi antenna attached to the analyzer, the baseline noise seen is of the order of -112 dBm. The yellow trace in Fig. 1 is showing a min. level of about -100 dBm. Easily 10-12 dB worse. If you look carefully on the yellow trace at 433-434 MHz, you will see some higher level RFI moving across the sweep with peaks up to almost -90 dBm. Now look at the magenta trace for the peak hold of anything which occurred over a minute time frame. We now see RFI peaks reaching as high as about -82 dBm. Easily 20 dB higher than seen in a quiet RFI environment.

Figs. 2 & 3 taken inside the repeater vividly demonstrate that our band-pass filter and preamp are working and working quite well. They have wiped out most everything else out which is outside of the BPF's passband, plus amplified the in-band signals properly.

Fig. 3 demonstrates the impact of external RFI upon our ability to receive weak DVB-T, 70 cm signals. When the antenna was removed and replaced with a 50 Ω termination, the level of the DVB-T test signal was then adjusted with a step attenuator. More and more attenuation was cranked in until the digital threshold was reached. This was at the point where the received picture was still P5 with Q5 audio. Adding 1 more dB beyond this point caused freeze framing. The attenuator settings were then recorded. This then showed the basic sensitivity of the repeater's 439/6 MHz receiver was approximately -89 dBm. That spectrum level was then "frozen" on the Rigol's screen as the magenta trace seen in Fig. 3. The 50 Ω termination was then removed and the repeater's outside antenna was once again connected to the repeater. The yellow and cyan traces now show the effects of adding the outside world RFI. The yellow trace is a "live" single sweep, while the cyan trace was the peak hold. Now the receiver would no longer decode the test DVB-T signal. We then proceeded to reduce the step attenuator settings and note what happened to our decoded TV picture. With stronger test signals, we started to get some motion and audio but with intermittent freeze framing. When the test signal was finally about -63 dBm, we were finally able to get above the level of the RFI and once again see perfect P5 pictures with Q5 audio. This -63 dBm number correlated quite well with in the field measurements we had performed during previous ATV nets. They too had showed that a very strong signal into the repeater was required for good performance, free from freeze-framing. So, now what do we do? --- This is a discussion to be continued.

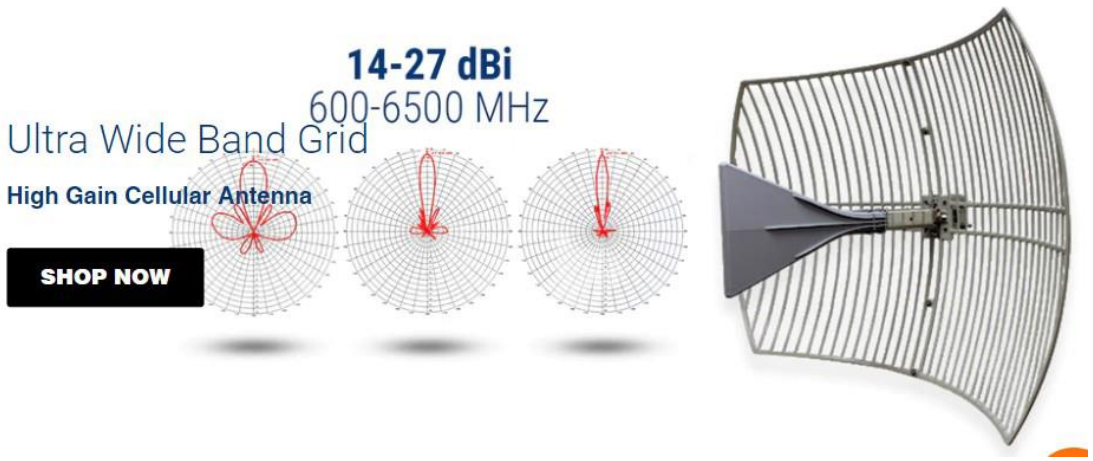
W0BTV - ATV Repeater Status Update:

Our regular Boulder ATV repeater, W0BTV, is presently out of service. It is in KH6HTV's ham shack for repair and modification. The control receiver's touch tone decoder has been repaired. The 5.9 GHz, FM-TV transmitter is again functioning. Don, N0YE, is modifying the Arduino's firmware to correct some issues, including audio routing. A new 7", hi-res, flat screen monitor has been added to replace the 10+ year old Haier, low-res (240 line) monitor. Based upon Colin's (WA2YUN) spectrum observations and recommendations, we will be moving the input frequency of the 70 cm receivers back to the original 441 MHz. We had recently moved to 439 MHz in an unsuccessful attempt to get away from the RFI. A new, 70 cm, 2 MHz band-width, channel filter has been on order for quite some time now from a ham radio store in Hong Kong. When it arrives it will be installed in front of the Hi-Des HV-110, 441 MHz, 2 MHz BW receiver. We hope it arrives soon. USPS tracking shows it has arrived at US Customs in Los Angeles. In the interim, we have installed the BCARES, portable, W0BCR, DVB-T repeater. It is strictly a 70 cm in/out, in-band repeater. Our W0BTV is primarily a cross-band repeater with 23 cm input and 70 cm output. It also has a pair of secondary 70 cm receivers for 6 MHz and 2 MHz band-widths. However, due to the extremely high level of 70 cm RFI at the site, the BCARES 70 cm receivers have very limited usefulness. The RFI is so strong that an incoming 70 cm DVB-T signal needs to be stronger than -60 dBm to override the RFI. We are taking at least a 30 dB hit in sensitivity. Thus, currently only 2 or 3 members are able to access the repeater. We were considering moving the W0BTV repeater to a different,

quieter location. We had a good mountain top site in mind, but were unable to gain access to it. We thus will continue to keep the repeater at its current location on the noisy mesa south-west of the city of Boulder. We will continue to encourage all ATV users to only use the 23 cm input (1243 MHz) and forget about the 70 cm inputs. The 23 cm input is RFI free. We had the 70 cm inputs on the repeater historically dating back to the early 1990s. When the Boulder ATV repeater was first frequency coordinated with the CCARC in early 90s, it was even then as a cross-band (23 cm in / 70 cm out) repeater. The 70 cm inputs were put there mainly to be able to support BCARES. All of the BCARES, ATV gear was then and is still now on the 70 cm band. In the next issue, we will discuss how we might implement some remote 70 cm, DVB-T receive sites for W0BTV to still be able to support BCARES.
73 de Jim, KH6HTV, trustee for W0BTV

NEW MICROWAVE ANTENNA SUPPLIER

The latest, Sept. issue of QST had a small ad on page 118 for microwave antennas for the C-905. I was unaware of this company before and it was the first time they advertised in QST. Technical Antennas



www.technicalantennas.com The ad featured two dish antennas with very broad frequency coverage, so I decided to at least check out their web site. The dish shown here with 0.6-6.5 GHz coverage appears to be the classical BBQ grill, grid parabolic dish we have seen for many years for 2.4 GHz, but with a different feed assembly. The feed assembly looks to be a log-periodic antenna thus accounting for the broad frequency coverage. The BBQ grill measures 24"x39". They are asking $189 for it. Amazon offers on its web site what appears to be the same antenna, with same specs., for $200 with two-day prime shipping. Their ad also featured an even larger 48" dia. circular mesh dish with coverage up to 10 GHz. They are quite proud of it as they are asking $979 for it. If anyone has any microwave experience with this company and these antennas, we would like to hear from you and pass on your observations to our readers.
….Author unknown

11th Annual International ATV QSO Party

Peter Cossins, VK3BFG, once again organized and moderated this ATV QSO party. Thanks to Mick, VK3CH, editor of NEVARC-NEWS for this summary and the photos of participants. The annual Digital ATV QSO Party was held on Friday August 25 starting around 0930 UTC with mainly VK stations with Saturday morning/afternoon on August 26 being the link with USA. It was Friday night in the USA. Stations acting as local Anchors were Bevan VK5BD inPort Pirie, Gary VK2CRJ in Sydney, Art WA8RMC in Columbus Ohio, Bill AB0MY in Boulder Colorado and Roland KC6JPG in Los Angeles. The USA audio link failed however, so we only were able to see the video. Had we known the audio was on U-TUBE, we could have patched it in. There is always next year for improvements. The USA **participants** are shown below but WHERE ARE YOU? …WA8RMC

Peter, VK3BFG

W8MA

WA6NUT

WA8RMC

K6JPG

WB6KYH

N6GKB

M2MJF

K0CCU

WB9KMD

WS6SVT

W6KVC

K6SOE

HDMI QUAD VIEWER

(reprinted with permission from the "TV Repeater's REPEATER" Newsletter Boulder, Colorado)

OK guys! If you want to expand the flexibility of your ATV station and preserve HD quality, some form of an HDMI switcher will be necessary. Although a unit like this probably won't be necessary for the future enhancement of the ATCO repeater, it could be ideal for individual use. My upcoming use of the VersaTune receiver I am working on will include receiver switching and an HDMI output for the transmitter connection. That will mean an HDMI quad switcher probably won't be necessary unless we want to switch multiple local video sources. That said, a quad switcher with HDMI capability is desirable in many cases. Jim Andrews, KH6HTV, has already researched this and gives a number of possibilities which will narrow down your search if you'd like to explore this. Give us feedback if you choose to investigate it. Jim's description follows.

A very simple DATV repeater can be put together almost instantly. Especially if it is a cross-band repeater. The KH6HTV application notes, AN- 23e & AN-48, discuss DATV repeaters. For a simple one, simply patch the HDMI output from your receiver into the HDMI input of your transmitter. Add an on-site control operator to manually switch the transmitter on/off and you are on the air as a repeater.

If you want a more sophisticated DATV repeater, the complexity then starts to go up exponentially. Our Boulder, Colorado, W0BTV repeater is an example. It is documented in our app. notes, AN-51d & AN-53d. (all *app. notes available at* ***www.kh6htv.com)*** If you are going to add additional receivers, or a local camera, and/or also want to add a video IDer, then you will be needing a means of automatically switching your video sources. Perhaps the easiest method is to use a "Quad Processor", or today's preferred internet search term "Quad Viewer". For digital video with HDMI, they used to be extremely expensive, costing well over $1K. But today, their prices now are dirt cheap. A quick google search will come up with a whole lot of "hits". I even found one listed for as low as $30 bucks (but with no audio).

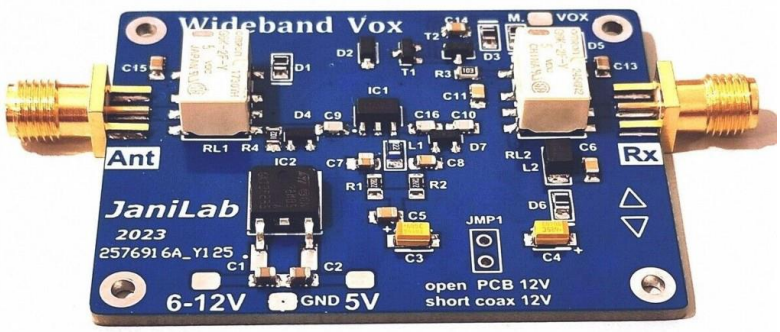
However, for a repeater, you will need to have some means of automatically controlling the Quad Viewer. All of them come standard with an IR remote control. But if that is the only way to control the box, that means you then need to start hacking the remote to operate it automatically by your repeater's controller. What is more elegant is to find a Quad Viewer which provides a true computer control input port, such as USB or RS-232. Be careful however, when shopping, the photos of some boxes show a USB connection, but they most times are not actually for computer control, but simply for the factory to install the firmware, or they advertise as "firewire up-grade capability". Careful shopping, (i.e., google surfing), and you will find some boxes which in fact have an RS-232 interface. They typically will be a bit more expensive, but not a deal breaker and definitely easier than trying to hack an IR remote control. A quick google search and I found right away three quad boxes with RS- 232 or USB ranging in price from $90 to $190

Way back in 2018, when we built our W0BTV repeater, the quad viewer with RS-232 we used then was made by the OREI company and was their model HD-401MR and cost us $90. OREI still sells that model, but it no longer includes the RS-232 interface. Plus, then OREI did not supply as part of the documentation how to use the RS-232 port. We had to beg the factory to provide us the code and then Don, N0YE, had to figure out how to proceed from there. OREI now sells a similar unit with RS-232 for $200. It is their model UHD-401MV.

OK, here comes the rub --- documentation. When selecting a quad viewer with RS-232 (or USB) interface control capability, make sure first before ordering that they will also supply you with the appropriate documentation on how to use not just the front panel buttons, but also the RS-232 or USB commands.

The first box I found at www.parts-express only cost $90, but no documentation included. The next box I found at www.gofranco.com (also Amazon) cost $115. It had a micro-USB port to be used for either software control or firmware update. Their web site does provide a downloadable USB driver for either Windows, Mac or Linux. The most expensive box I found was $189 from Amazon was made by Yinker with RS-232. It did in fact have a downloadable manual which included the RS-232 commands. (Disclaimer*: ---- I have not purchased, nor evaluated any of these mentioned items. So I can't vouch for their performance, or lack thereof*)
Another nice, but not mandatory feature for a quad viewer is what is the power source? Most A/V gear seems to all like to be powered by USB, 5 Vdc wall warts. For our repeaters and other DATV ham gear, we like to use 12Vdc. So, finding a 12Vdc quad viewer is a plus.
… 73 de Jim Andrews, KH6HTV, Boulder, Color

AH2AR FINDS A NEW, LOW COST, PRE-AMP



An interesting and very inexpensive ($50 = $40+ $10 shipping), T/R relay-equipped preamp suitable for 70 cm ATV use is available on E-Bay. It allows for in-line insertion in front of a transceiver. The documentation states that it can pass up to 100 watts RF. The preamp is manufactured by JaniLab located in Hungary. 70 cm gain of the preamp was measured at 19.7 dB with a measured noise figure of .75 dB (Thanks N8ZM). When used in the hamshack, it improves both the MER and the Signal Strength of the received DVB-T ATV repeater signal on 421.250 MHz. It also raises the received signal level of a weak, 70 cm A5 signal well over 1 P Unit. The pre-amp uses a PGA-103A MiniCicuits monolithic amplifier. It is equipped with diode limiters on the input and output. Insertion loss, when the preamp is unpowered measured at 0.5 dB. This is relatively remarkable as it uses two relays which are not expected to be optimum for RF at 70 cm. It will also allow for either a 13.8 vdc or 5 vdc power source. Several things to keep in mind: There are a number of tradeoffs with this preamp, (no filter circuit and the relays are not designed for RF... but surprisingly works for this application) but the "proof is in the pudding" as insertion of the preamp, either in front of a TC-70 Series transceiver or a DVB-T, ATV transceiver shows a marked improvement of the incoming ATV signal. Additionally, finding a very cheap preamp with a T/R relay configuration that exhibits low insertion loss is somewhat unheard of... and it does not come out of China....until now.
…Dave AH2AR, DARA, Dayton, Ohio

5 THINGS TO KNOW ABOUT NASA'S DEEP SPACE OPTICAL COMMUNICATIONS

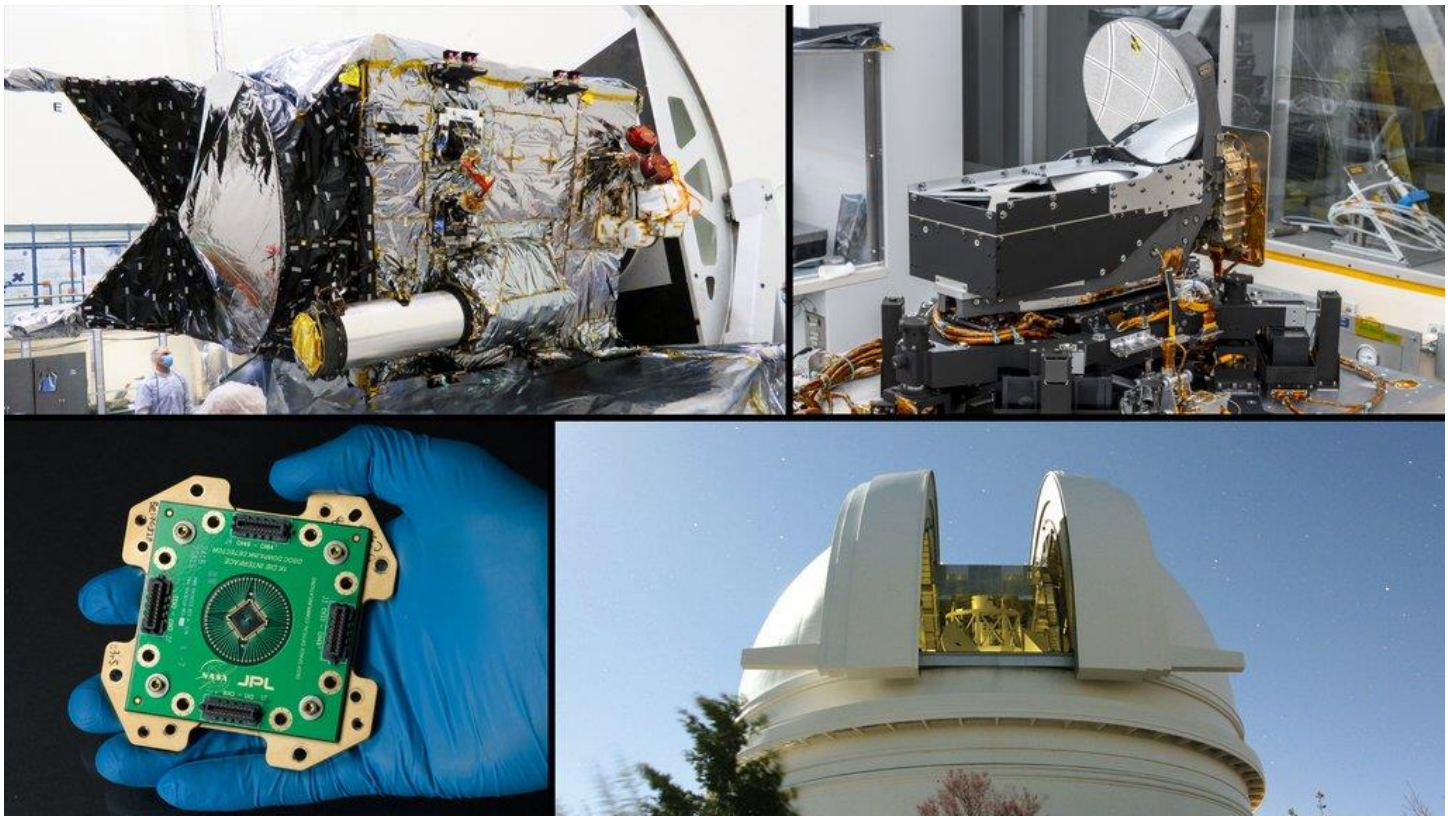
(DATV to the moon or Mars??? Check this out) …WA8RMC
From JPL Laboratory Oct. 12, 2023

The Deep Space Optical Communications (DSOC) experiment is a pioneering technology demonstration that will take laser communications to the next frontier: deep space. The DSOC transceiver will launch aboard the Psyche spacecraft, NASA's first mission to the metal-rich asteroid Psyche, and test high-bandwidth optical communications to Earth during the first two years of the spacecraft's journey to the main asteroid belt.

With new deep space missions producing ever more data, laser-based communications offer a significant augmentation of radio frequency telecommunications, the current standard. Managed by NASA's Jet Propulsion Laboratory, DSOC will allow data rates at least 10 times higher than state-of-the-art radio telecommunications systems of comparable size and power, enabling higher resolution images, larger volumes of science data, and even streaming video.

The Optical Communication Telescope Laboratory (OCTL) at NASA's Table Mountain Facility near Wrightwood, California, will use a powerful modulated laser to transmit low-rate data to the transceiver (while also serving as a beacon pointing reference) during Psyche's journey. A sensitive superconducting nanowire photon-counting receiver, also developed by JPL, installed at Caltech's Palomar Observatory in San Diego County, California, will receive high-rate data returned by the space transceiver.

A division of Caltech in Pasadena, California, JPL manages the project for the Technology Demonstration Missions program within NASA's Space Technology Mission Directorate and the Space Communications and Navigation program within the agency's Space Operations Mission Directorate.



NASA's **D**eep **S**pace **O**ptical **C**ommunications (DSOC) is composed of a flight laser transceiver attached to the "Psyche Mission" and a ground system that will send and receive laser signals. Clockwise from top left: the Psyche spacecraft with DSOC attached, flight laser transceiver, downlink ground station at Palomar, and downlink detector. Credit: NASA/JPL-Caltech

Slated to launch on Oct. 13, DSOC will demonstrate technologies enabling the agency to transmit higher data rates from deep space. NASA's pioneering DSOC experiment will be the first demonstration of laser, or optical, communications from as far away as Mars. Launching with NASA's Psyche mission to a metal-rich asteroid of the same name on Friday, Oct. 13, DSOC will test key technologies designed to enable future missions to transmit denser science data and even stream video from the Red Planet.

Here are five things to know about this cutting-edge technology demonstration:

1. DSOC is the first time NASA will test how lasers could increase data transmission from deep space.

Until now, NASA has used only radio waves to communicate with missions that travel beyond the Moon. Much like fiber optics replacing old telephone lines on Earth as demand for data grows, going from radio communications to optical communications will allow increased data rates throughout the solar system, with 10 to 100 times the capacity of state-of-the-art systems currently used by spacecraft. This will better enable future human and robotic exploration missions, along with supporting higher-resolution science instruments.

Learn more about how DSOC will be used to test high-bandwidth data transmission beyond the Moon for the first time – and how it could transform deep space exploration.

2. The tech demo involves equipment both in space and on Earth.

The DSOC flight laser transceiver is an experiment attached to NASA's Psyche spacecraft, but Psyche relies on traditional radio communications for mission operations. The laser transceiver features both a near-infrared laser transmitter to send high-rate data to Earth and a sensitive photon-counting camera to receive a laser beam sent from Earth. But the transceiver is just one part of the technology demonstration.

There is no dedicated infrastructure on Earth for deep space optical communications, so for the purposes of DSOC, two ground telescopes have been updated to communicate with the flight laser transceiver. NASA's Jet Propulsion Laboratory in Southern California will host the operations team, and a high-power near-infrared laser transmitter has been integrated with the Optical Communications Telescope Laboratory at JPL's Table Mountain facility near Wrightwood, California. The transmitter will deliver a modulated laser signal to DSOC's flight transceiver and serve as a beacon, or pointing reference, so that the returned laser beam can be accurately aimed back to Earth.

Data sent from the flight transceiver will be collected by the 200-inch (5.1-meter) Hale Telescope at Caltech's Palomar Observatory in San Diego County, California, which has been equipped with a special superconducting high-efficiency detector array.

3. DSOC will encounter unique challenges.

DSOC is intended to demonstrate high-rate transmission of data of distances up to 240 million miles (390 million kilometers) – more than twice the distance between the Sun and Earth – during the first two years of Psyche's six-year journey to the asteroid belt.

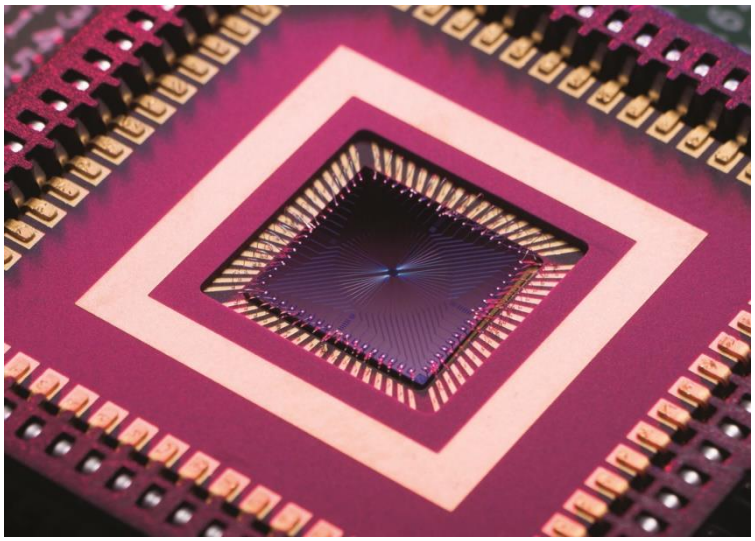
The farther Psyche travels from our planet, the fainter the laser photon signal will become, making it increasingly challenging to decode the data. As an additional challenge, the photons will take longer to reach

their destination, creating a lag of over 20 minutes at the tech demo's farthest distance. Because the positions of Earth and the spacecraft will be constantly changing as the photons travel, the DSOC ground and flight systems will need to compensate, pointing to where the ground receiver (at Palomar) and flight transceiver (on Psyche) will be when the photons arrive.

4. Cutting-edge technologies will work together to make sure the lasers are on target and high-bandwidth data is received from deep space.

The flight laser transceiver and ground-based laser transmitter will need to point with great precision. Reaching their targets will be akin to hitting a dime from a mile away while the dime is moving. So, the transceiver needs to be isolated from the spacecraft vibrations, which would otherwise nudge the laser beam off target. Initially, Psyche will aim the flight transceiver in the direction of Earth while autonomous systems on the flight transceiver assisted by the Table Mountain uplink beacon laser will control the pointing of the downlink laser signal to Palomar Observatory.

Integrated onto the Hale Telescope is a cryogenically cooled superconducting nanowire photon-counting array receiver, developed by JPL. The instrument is equipped with high-speed electronics for recording the time of arrival of single photons so that the signal can be decoded. The DSOC team even developed new signal-processing techniques to squeeze information out of the weak laser signals that will have been transmitted over tens to hundreds of millions of miles.



This is a close-up of the downlink detector prototype that was used to develop the detector attached to DSOC's receiving ground station at Palomar. The active area – at the center of the dark square – measures about 0.0126 inches (0.32 millimeters) across. It can detect a billion photons per second.
Credit: NASA/JPL-Caltech

5. This is NASA's latest optical communications project.

In 2013, NASA's Lunar Laser Communications Demonstration tested record-breaking uplink and downlink data rates between Earth and the Moon. In 2021, NASA's Laser Communications Relay Demonstration launched to test high-bandwidth optical communications relay capabilities from geostationary orbit so that spacecraft don't require a direct line of sight with Earth to communicate. And last year, NASA's TeraByte InfraRed Delivery system downlinked the highest-ever data rate from a satellite in low-Earth orbit to a ground-based receiver.

DSOC is taking optical communications into deep space, paving the way for high-bandwidth communications beyond the Moon and 1,000 times farther than any optical communications test to date. If it succeeds, the technology could lead to high-data rate communications with streaming, high-definition imagery that will help support humanity's next giant leap: when NASA sends astronauts to Mars.

More About the Mission

DSOC is the latest in a series of optical communication demonstrations funded by NASA's Technology Demonstration Missions (TDM) program and the agency's Space Communications and Navigation (SCaN)

program. JPL, a division of Caltech in Pasadena, California, manages DSOC for TDM within NASA's Space Technology Mission Directorate and SCaN within the agency's Space Operations Mission Directorate.

The Psyche mission is led by Arizona State University. JPL is responsible for the mission's overall management, system engineering, integration and test, and mission operations. Psyche is the 14th mission selected as part of NASA's Discovery Program, managed by the agency's Marshall Space Flight Center in Huntsville, Alabama. NASA's Launch Services Program, based at the agency's Kennedy Space Center, is managing the launch service. Maxar Technologies in Palo Alto, California, provided the high-power solar electric propulsion spacecraft chassis.

For more information about DSOC, go to:

https://www.jpl.nasa.gov/missions/dsoc

USA ATV REPEATER DIRECTORY April 2023

NOTES:

1. All repeaters are NTSC, VUSB-TV, 6 MHz channel, unless otherwise noted. Some repeaters use non-standard lower sideband inputs VLSB to reduce interference with FM repeaters in upper portion of band. The frequency listed is the video carrier frequency.
2. Digital TV lists center frequency. 6 MHz channel, unless otherwise noted. dt = DVB-T, ds = DVB-S, da = ATSC
3. For full details, go to the listed web site, or send an e-mail to the contact person
4. Some ATV groups also post repeater info on www.qrz.com under their call sign

Location	Call Sign	Output(s)	Input(s)	Modes	Web Site & Contact for info
ARIZONA					note: AZ is linked to W6ATN in S. CA & NV www.atn-tv.org
Phoenix, White Tank	W7ATN	1253.25	434.0 434 / 2 dt 2441.5 fm	VUSB, FM DVB-T	wb9kmo@gmail.com kwjacob@icsaero.com
Mesa	W7ATN	1289.25	434.0 434 / 2 dt 2441.5 fm	VUSB, FM DVB-T	wb9kmo@gmail.com kwjacob@icsaero.com
Tucson, Mt. Lemmon	W7ATN	1277.25	434.0 434 / 2 dt 2441.5 fm	VUSB, FM DVB-T	wb9kmo@gmail.com kwjacob@icsaero.com
N.E. AZ & NM Green's Peak	W7ATN	1289.25	434.0	VUSB	wb9kmo@gmail.com kwjacob@icsaero.com
CALIFORNIA					W6ATN rptrs linked to AZ & NV
Orange Santiago Peak	W6ATN	1253.25 5910 fm	434.0 434 / 2 dt 2441.5 fm	VUSB, FM DVB-T	www.atn-tv.org wa6svt@gmail.com
Los Angeles, central Mt. Wilson	W6ATN	1265.25	434.0 434 / 2 dt 2441.5 fm	VUSB, FM DVB-T	www.atn-tv.org wa6svt@gmail.com
Los Angeles, north Oat Mtn.	W6ATN	919.25 3380 fm	434.0 434 / 2 dt 2441.5 fm	VUSB, FM DVB-T	www.atn-tv.org wa6svt@gmail.com
Jobs Peak	W6ATN	1253.25	434.0 434 / 2 dt 2441.5 fm	VUSB, FM DVB-T	www.atn-tv.org wa6svt@gmail.com
San Bernardino Snow Peak	W6ATN	1242 / 4 dt	434.0 434 / 2 dt 2441.5 fm	VUSB, FM DVB-T	www.atn-tv.org wa6svt@gmail.com
Santa Barbara	WB9KMO	1289.25	434.0 434 / 2 dt 2441.5 fm	VUSB, FM DVB-T	www.atn-tv.org wb9kmo@gmail.com linked with W6ATN
San Diego	KD6ILO	423 dt 1243 dt 1268 ds	441 dt 1286 ds 5885 fm	DVB-T, DVB-S, FM	kd6ilo@yahoo.com also AREDN mesh
San Jose	W6SVA	427.25	910 fm, 1255 fm	VUSB, FM	www.k6ben.com :w2nyc@pacbell.net
Clayton	W6CX	1244.5 ds	1292.5 1273 915 ds 1273 fm	DVB-S, FM	www.mdarc.org info@mdarc.org
Palomar	W6NWG	1241.25	915 fm 2441.5 fm	VUSB, FM DVB-S	w6nwg@palomararc.org mountain.michelle@gmail.com
COLORADO					
Boulder	W0BTV	423 / 6 dt or 421.25 5905 FM	1243 / 6 dt 441 / 6 dt 439.25	DVB-T, VUSB, FM	www.kh6htv.com kh6htv@arrl.net
Pueblo	W0PHC	423 / 6 dt	441 / 6 dt	DVB-T	billn@billnicoll.com www.puebloradio.org
DELAWARE					
Wilmigton	KC3AM	423 / 6 dt	439.25 LSB	DVB-T AM	KC3AM@verizon.net qrz.com
FLORIDA					
Cape Coral	W1RP	421.25	439.25	VUSB	paul@cardlink.com
Cocoa Beach	K4ATV	427.2	439.25	VUSB	www.lisats.org
Panama City	KV4ATV	434.0	919.25	?	kv4atv@gmail.com
S.W. Idaho	WI7ATV	1257 fm	426.25	VUSB, FM	ka7anm@yahoo.com under construction
IOWA					
Davenport	W0BXR	421.25	439.25	VUSB	http://www.arcsupport.com/drac/

Location	Call Sign	Output	Input(s)	Modes	Web Site & Contact for info
KANSAS					
Wichita	KA0TV	421.25	439.25	VUSB	k0wws@arrl.net
KENTUCKY					
Bowling Green	KY4TV	421.25 423.0 /2	439.25 1280 fm	VUSB FM DVB-T	w4htb@ieee.org www.qrz.com www.atn-tv.org
LOUISIANA					
New Orleans	WD0GIV	421.25	439.25	VUSB	wd0giv@att.net
MARYLAND					
Laurel	W3BAB	421.25	434.0	VUSB	www.qsl.net/w3bab
Towson	W3BAB	1291 fm	434	VUSB, FM	www.qsl.net/w3bab
Baltimore	W3WCQ	439.25 911.25	426.25 1253.25	VUSB	http://bratsatv.org/ brats@bratsatv.org
MICHIGAN					
Jackson	KC8LMI	923.25	439.25, LSB	VUSB	KC8LMI@hotmail.com
Grand Rapids	K8DMR	421.25	439.25	VUSB	ron_fredricks@att.net
Flushing	KC8KCG	1253.25	439.25 LSB	AM	kf8ui@mscginc.org
Flint	KC8KGZ	1253.25	439.25	VUSB	www.mscginc.org kf8ui@mscginc.org
MINNESOTA					
Wabasha	KD0HWX	421.25	439.25	VUSB	jonmcpete@yahoo.com
MISSOURI					
St. Louis	W0ATN	426 / 4 dt	440 / 4 dt	DVB-T	k0pfx@arrl.net
NEBRASKA					
Omaha	WB0CMC	421.25	434.0	VUSB	wb0cmc@cox.net
NEVADA					
Las Vegas	N7ZEV	1253.25 912 fm	434.0 434.0 / 2 dt 2441 fm	VUSB FM DVB-T	frank.n7zev@gmail.com linked to W6ATN S. CA & AZ
NEW JERSEY					
Vernon	W2VER	5885 fm	5665 fm	FM	jaythienel@yahoo.com
OHIO					
Columbus	WR8ATV	423 / 2 dt 427.25 1258 fm 1268 ds 2397 mesh 10350 fm	439 / 2 dt 439.25 1288 fm 1288 ds 10450 fm	VUSB AM FM DVB-T DVB-S MESH	www.ATCO.tv gkenmorris@gmail.com towslee1@ee.net
Dayton	W8BI	421.25 428 / 2 dt 1258 fm	439.25 439 / 2 dt 1280 fm 1280 dt	VUSB FM DVB-T	www.w8bi.org dpel@aaahawk.com
Van Wert	W8FY	434.0	923.25	VUSB	ka8zge@w8fy.org
OREGON					
Portland	W7AMQ	1257 fm	426.25	FM VUSB	belles73@comcast.net
Portland	WB2QHS	426.0	910 fm	VUSB FM	emellnik@emavideo.com
PENNSYLVANIA					
Delaware County	KC3AM	421.25	439.25 LSB	VLSB AM	KC3AM@verizon.net
PUERTO RICO					
Aguas Buenas	KP4IA	426.25	439.25 1252 fm	VUSB FM	kp4ia@yahoo.com
WASHINGTON					
Seattle	WW7ATS	1253.25	434.0	VUSB	https://www.qsl.net/ww7ats/ ww7ats@gmail.com qrz.com

Revision Notes:
Aug. 2019 --(1) corrected data for Kentucky (2) changed call sign for Boulder, CO Sept. 2019 - -added Pueblo, CO
Oct. 2019 --added San Diego, CA Feb. 2020 -- changed K6BEN to W6SVA, CA --added KC8KGZ, MI Mar. 2020 -- added Davenport, IA May 2020 -- corrected typos Jan. 2021 -- updated Boulder, CO repeater info June 2021 -- found 20 more ATV repeaters listed on www.repeaterbook.com -- attempted to contact all of their trustees to confirm them. Most are obsolete listings and are no longer on the air. Added only two -- Cocoa Beach, FL, Wichita, KS,
April 2023 – re-configured most listings, added 1280 for W8BI

LOCAL HAMFEST SCHEDULE

This section is reserved for upcoming Hamfests. They are limited to Ohio and vicinity easily accessible in one day. Anyone aware of an event incorrectly or not listed here; notify me so it can be corrected. This list will be amended, as further information becomes available. To see additional details for each Hamfest, Control Click on the blue title and the magic of the Internet will give you the details complete with a map! To search the ARRL Hamfest database for more details, CTL click ARRLWeb: Hamfest and Convention Calendar …WA8RMC.

10/29/2023 - Massillon (OH) Hamfest (& auction)

Location: North Canton, OH
Type: ARRL Hamfest
Sponsor: Massillon Amateur Radio Club
Website: http://www.w8np.net

12/03/2023 - FCARC WinterFest

Location: Archbold, OH
Type: ARRL Hamfest
Sponsor: Fulton County Amateur Radio Club
Website: https://k8bxq.org/hamfest

01/14/2024 - Sunday Creek Amateur Radio Federation Hamfest

Location: Shade, OH
Type: ARRL Hamfest

03/10/2024 - WINTERHAMFEST

Location: Elyria, OH
Type: ARRL Hamfest
Sponsor: Northern Ohio Amateur Radio Society
Website: http://winterhamfest@noars.net

03/17/2024 - Toledo Mobile Radio Association Hamfest and Computer Fair

Location: Perrysburg, OH
Type: ARRL Hamfest
Sponsor: Toledo Mobile Radio Association
Website: http://www:w8hhf.org

WEDNESDAY NITE ZOOM NET

Every Tuesday night @ 8:00 PM WA8RMC **used to** host a net for ATV topic discussion. However, in order to consolidate the two nets, ATCO on Tue. and the DARA on Wed. we'd like to have only one net on Wednesday, same time at 8 PM. We'll rotate the net control host duty so you won't be bored with just me. All are invited as we get check-ins from all around the USA and sometimes from international participants. We normally have 12-20 check-ins.

To join ZOOM for the first time, simply type **https://zoom.us/join** then download, install the .exe program and run it. ZOOM will start. Click on **join**, enter the **9670918666 meeting ID** then the **191593 password.** Use video or just audio if you don't have a camera.

ATCO TREASURER REPORT - de N8NT

OPENING BALANCE (7/25/23)..……	$ 5447.42
Receipts (dues)……...	$ 20.00
PayPal fee.…….…..…….….	$ (0.84)
70 cm preamp for repeater……	$ (93.00)
CLOSING BALANCE (10/24/23) ……	$ 5373.58

ATCO REPEATER TECHNICAL DATA SUMMARY

Location:	Downtown Columbus, Ohio
Coordinates:	39 degrees 57 minutes 47 seconds (latitude) 82 degrees 59 minutes 58 seconds (longitude)
Elevation:	630 feet above the average street level of 760 feet ASL (1390 feet above sea level)
TV Transmitters:	423.00 MHz DVB-T, 10W FEC=7/8, Guard=1/32, Const=QPSK, FFT=2K, BW=2 MHz, PMT=4095, PCR=256, Vid=256, Aud=257
	427.25 MHz Analog VSB AM, 50 watts average 100 watts sync tip (cable channel 58)
	1258 MHz 40 watts FM analog
	1268 MHz DVB-S QPSK 20W SR=3.125MS, FEC=3/4, PMT=32, Video=162, Teletext=304, PCR=133, Audio=88, Service =5004) **Two video channels on this output:** Channel 1 is fed from all receivers. Channel 2 is fed from 439.25 analog receiver.
	2397 MHz Mesh Net transceiver 600 mw output (channel 1 minus 2). ID is WR8ATV-2
	10.350 GHz: 1W continuous analog FM
Link transmitter:	446.350 MHz: 5W NBFM 5 kHz audio. This output used for control signals & to repeat 147.48 MHz and 449.975 MHz input.
Identification:	423, 427, 1258, 1268 MHz, 10.350 GHz transmitters video ID every 10 min. with active video and information bulletin board every 30 min.
	423 MHz digital, 1268 MHz digital & 10.350 GHz analog - Continuous transmission of ATCO & WR8ATV with no input signal present.
Transmit antennas:	423.00 MHz - Single slot rib cage horizontally polarized 3 dBd gain "omni"
	427.25 MHz - Dual slot horizontally polarized 7 dBd gain "omni" major lobe east/west, 5dBd gain north/south
	1258 MHz - Diamond vertically polarized 12 dBd gain omni
	1268 MHz - Diamond vertically polarized 12 dBd gain omni
	2397 MHz - Ubiquiti dual polarity omni 13dBi gain slot for channel 1 minus 2 MESH Rx/Tx operation
	2397 MHz - Comet Model GP24 vertically polarized 12 dBd gain omni (Used for experimental Mesh operation)
	10.350 GHz - Commercial 40 slot waveguide horizontally polarized 16 dBd gain omni
Receivers:	147.480 MHz - F1 audio input with touch tone control. (Input here = output on 446.350)
	439.000 MHz - DVB-T QPSK, 2MHz BW. Receiver will auto configure for FEC's. (Input here = output on all TV transmitters)
	439.250 MHz - A5 NTSC video with FM subcarrier audio, Upper sideband. (Input here = output on all TV transmitters & also direct output to 1268 MHz DVB-S output channel 2.)
	449.975 MHz - F1 audio input aux touch tone control. 131.8 Hz PL tone. (Input here = output on 446.350).
	1288.00 MHz - F5 video analog NTSC. (Input here = output on all TV transmitters)
	1288.00 MHz - DVB-S QPSK SR=4.167MS, fec=7/8. PIDs: PMT=133, PCR=33, Vid=33, Aud=49 (In here=out on all Trans.)
	10.450 GHz - F5 video analog NTSC. (Input here = output on all TV transmitters)
Receive antennas:	147.480 MHz - Vert. polar. Diamond 6dBd dual band (Shared with 446.350 MHz link output transmitter)
	439.00/439.250 MHz - Horizontally polarized dual slot 7 dBd gain major lobe west (Shared with 439 digital & 439.25 analog receivers)
	1288.00 MHz - Diamond vertically polarized 12 dBd gain omni (shared with analog and DVB-S receivers)
	2398.00 MHz - Comet Model GP24 vertically polarized 12 dBd gain omni (inactive at this time because MESH is on 2397)
	10.450 GHz - Commercial 40 slot waveguide horizontally polarized 16 dBd gain omni

Auto mode Input control:	Touch Tone	Result (if third digit is * function turns ON, if it is # function turns OFF)
	00*	turn transmitters **on** (enter manual mode-keeps transmitters on till 00# sequence is pressed)
	00#	turn transmitters **off** (exit manual mode and return to auto scan mode)
	264	Select Channel 4 Doppler radar. (Stays on for 5 minutes) Select # to shut down before timeout.
	004	Select 10.450 GHz receiver. **(Always exit by selecting 001)**
	001	Select 2398 MHz receiver then 00# for auto scan to continue
Manual mode analog)	00* then 1 for Ch. 1	Select 439.25 analog /439 digital receiver (if video present on digital, it is selected. Otherwise,
Functions:	00* then 2 for Ch. 2	Select 1288 digital receiver
	00* then 3 for Ch. 3	Select 1288 analog receiver
	00* then 4 for Ch. 4	Select 2398 receiver
	00* then 5 for Ch. 5	Select video ID (17 identification screens)
	01* or 01#	Channel 1 439.25 MHz analog/439 digital rcvr. scan enable (01* to scan this channel & 01# to disable it)
	02* or 02#	Channel 2 1288 MHz digital receiver scan enable
	03* or 03#	Channel 3 1288 MHz analog receiver scan enable
	04* or 04#	Channel 4 2398 MHz scan enable
	A1* or A1#	Manual mode select for 439.25 receiver audio
	A2* or A2#	Manual mode select for 1288 digital receiver audio
	A3* or A3#	Manual mode select for 1288 analog receiver audio
	A4* or A4#	Manual mode select for 2398 receiver audio
	C0* or C0#	Beacon mode – transmit ID for twenty seconds every ten minutes
	C1* or C1#	No function at this time
	C2* or C2#	No function at this time

ATCO MEMBERS as of October 2023

Call	Name	Address	City	St	Zip	
KD8ACU	Robert Vieth	3180 North Star Rd	Upper Arlington	OH	43221	614-457-9511
KC3AM	Dave Stepnowski	735 W Birchtree Ln	Claymont	DE	19703	
AH2AR	Dave Pelaez	1348 Leaf Tree Lane	Vandalia	OH	45377	937-264-9812
W8ARE	Terry Meredith III	6070 Langton Circle	Westerville	OH	43082-8964	
K9BIF	Charlie Short	415 West Pike Street	Goshen	IN	46527-0554	
VK3BFG	Peter Cossins	14 Coleman Road	Melbourne	Au	03152	
N9BNN	Michael Glass	6836 N. Caldwell Rd	Lebanon	IN	46052	
N8COO	C Mark Cring	8774 Jersey Mill Rd	Alexandria	OH	43001	614-836-2521
N3DC	William Thompson	6327 Kilmer St	Cheverly	MD	20785	301-772-7382
K8DMR	Ron Fredricks	8900 Stonepoint Ct	Jennison	MI	49428-8641	
WA8DNI	John Busic	2700 Bixby Road	Groveport	OH	43125	614-491-8198
WB8DZW	Roger McEldowney	5420 Madison St	Hilliard	OH	43026	614-405-1710
KB8EMD	Larry Baker	4330 Chippewa Trail	Jamestown	OH	45335-1210	
WB4IR	Bob Holden	7725 Tressa Circle	Powell	TN	37849	865-314 - 4285
WA8HFK,KC8HIP	Frank & Pat Amore	P.O. Box 2252	Helendale	CA	92342-2252	760-503-8106
W8KHP	Allen Vinegar	2043 Treetop Lane	Hebron	Ky	41048	
WA8KKN	Chuck Wood	5322 Spruce Lane	Westerville	OH	43082-9005	614-523-3494
WB9KMO	Rod Fritz	8334 E. Culver Street	Mesa	AZ	85207	
WB8LGA	Charles Beener	2540 State Route 61	Marengo	OH	43334	
W8MA	Phil Morrison	154 Llewellyn Ave	Westerville	OH	43081	
KA8MID	Bill Dean	2630 Green Ridge Rd	Peebles	OH	45660	
N8NT	Bob Tournoux	135 Barrett Hill Road	Center Rutland	Vt	05736	614-563-7443
W8NX, KA8LTG	John & Linda Beal	5001 State Rt. 37 East	Delaware	OH	43015	740-369-5856
WU8O	Tom Walter	15704 St Rt 161 W	Plain City	OH	43064	614-309-7134
KB8OFF	Jess Nicely	1888 Woods Drive	Beavercreek	OH	45432	
W6ORG,WB6YSS	Tom, Maryann O'Hara	2522 Paxson Lane	Arcadia	CA	91007-8537	626-446-2750
KE8PN	James Easley	1507 Michigan Ave	Columbus	OH	43201-2636	
WA8RMC	Art Towslee	438 Maplebrooke Dr W	Westerville	OH	43082	614-891-9273
W8RUT,N8KCB	Ken & Chris Morris	2895 Sunbury Rd	Galina	OH	43021	
KB8RVI	Dave Jenkins	100 Miller Ave Apt. 108	Ashville	OH	43103	740 954-9221
WA8RR	Richard Robbins	10483 Cambridge Place	Powell	OH	43065	
W8RWR	Bob Rector	135 S. Algonquin Ave	Columbus	OH	43204-1904	614-276-1689
W8RXX, KA8IWB	John & Laura Perone	3477 Africa Road	Galena	OH	43021	614-579-0522
WA6SVT	Mike Collis	PO Box 1594	Crestline	CA	92325	
NR8TV	Dave Kibler	243 Dwyer Rd	Greenfield	OH	45123	937-981-1392
KB8UWI	Milton McFarland	115 N. Walnut St.	New Castle	PA	16101	
WA8UZP	James Reed	818 Northwest Blvd	Columbus	OH	43212	614-297-1328
KC8WRI	Tom Bloomer	PO Box 595	Grove City	OH	43123	
AA8XA	Stan Diggs	2825 Southridge Dr	Columbus	OH	43224-3011	
AC8XP,KE8GTT,KE8HPA	Troy,Seamus Bonte	5210 Smothers Road	Westerville	OH	43081	
AC8YE	Larry Howell	4080 Dill Road	Centerburg	OH	43011-9771	
KB8YMQ	Jay Caldwell	4740 Timmons Dr	Plain City	OH	43064	614-879-9946
KD8YYP	Anna Reed	818 Northwest Blvd	Columbus	OH	43212	
WB8YTZ	Joe Coffman	233 S. Hamilton Rd	Gahanna	OH	43230-3347	
N8YZ	DaveTkach	2063 Torchwood Loop S	Columbus	OH	43229	614-882-0771
W8ZCF	Farrell Winder	6686 Hitching Post Ln.	Cincinnati	OH	45230	513-218-3876
N8ZM	Tom Holmes	1055 Wilderness Bluff	Tipp City	OH	45371	

ATCO CLUB OFFICERS

President: Art Towslee WA8RMC
V. President: Ken Morris W8RUT
Treasurer: Bob Tournoux N8NT
Secretary: Mark Cring N8COO
Corporate trustees: Same as officers

Repeater trustees: Art Towslee WA8RMC
Ken Morris W8RUT
Statutory agent: Stan Diggs AA8XA
Newsletter editor: Art Towslee WA8RMC

NEW MEMBER(S)

Let's welcome the new members to our group! If any of you know anyone who might be interested, let one of us know so we can flood them with information. New members are our group's lifeblood so it's important we aggressively recruit new faces.
No new members this time.

ATCO MEMBERSHIP INFORMATION

Membership in ATCO (Amateur Television in Central Ohio) is open to any licensed radio amateur who has an interest in amateur television. The annual dues are $10 per person. Additional members within an immediate family and at the same address are included at no extra cost.

ATCO publishes this Newsletter quarterly in January, April, July and October. It is sent to each member without additional cost. All Newsletters are sent via Email unless the member does not have an internet connection. Dues payments are as of the date paid and will expire on the same month/year on the due date year.

Your support of ATCO is welcomed and encouraged.

Membership expiration notices will be sent out weekly via Email starting 30 days prior to expiration date.
NOTE: Dues records on your individual portion of the ATCO website are listed as the date money is received if after the due date. If before the due date then it is due one year from the due date.

ATCO MEMBERSHIP APPLICATION

RENEWAL ○ NEW MEMBER ○ DATE _____
CALL _____
OK TO PUBLISH PHONE # IN NEWSLETTER YES ○ NO ○
HOME PHONE _____
NAME_____
INTERNET Email ADDRESS_____
ADDRESS _____
CITY _____ STATE _____ ZIP _____-_____
FCC LICENSED OPERATORS IN THE IMMEDIATE FAMILY
_____
COMMENTS_____
_____
_____

ANNUAL DUES PAYMENT OF $10.00 ENCLOSED CHECK ○ MONEY ORDER ○
Make check payable to ATCO or Bob Tournoux & mail to: Bob Tournoux 135 Barrett Hill Road, Center Rutland, Vermont 05736.
Or, if you prefer, pay dues via the Internet with your credit card. Go to www.atco.tv log in, click on **Members** then **Pay Dues** and fill out the details. Credit card payment is made through "PayPal" but you DO NOT need to join PayPal to send the dues. Simply DO NOT fill out the password details and there will be no "PayPal" involvement.

ATCO Newsletter
c/o Art Towslee -WA8RMC
438 Maplebrooke Dr. West
Westerville, Ohio 43082

FIRST CLASS MAIL

REMEMBER...CLUB DUES ARE NEEDED.
CHECK THE
MEMBERS PAGE OF ATCO WEBSITE FOR THE EXPIRATION DATE.
SEND N8NT A CHECK OR USE PAYPAL IF MEMBERSHIP IS EXPIRED.