Boulder Amateur Television Club
TV Repeater's REPEATER

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BATVC web site: www.kh6htv.com

ATN web site: www.atn-tv.com

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2023: Geostationary Microwave Amateur Payload Proposal. Frank Zeppenfeldt PD0AP, ESA

BREAKING NEWS BULLETIN: 21 Dec. 2023

European Space Agency -- EXPLORES POSSIBLE MICROWAVE AMATEUR PAYLOAD ON SATELLITE for North America, including DTV !

from: Amateur Radio Newsline Report 2407 for Friday December 15th, 2023

Is there room aboard a satellite for a geostationary microwave amateur payload to cover part of North America? --- Jeremy Boot G4NJH looks at that question.

JEREMY: The European Space Agency has an approved proposal to investigate sharing a commercial geostationary satellite contract to piggy-back a microwave amateur payload on it to cover Europe and part of North America.
The investigatory project was presented by ESA's Frank Zeppenfeldt, PDØAP, to the AMSAT-UK Colloquium in Milton Keynes on the 14th of October. Frank described a payload that would have both an amateur radio and educational role, with two uplink transponders on 5.6 GHz and two downlink transponders on 10 GHz.
The payload would be capable of handling narrow-band modes such as CW and SSB and narrow-band digital modes ***but would also have the capacity for wide-band modes such as amateur TV.*** To see Frank's presentation, follow the link to a YouTube video that appears in the text version of this week's newscast at arnewsline.org
(***https://www.youtube.com/watch?v=_FTvlEyDa1Y***)

The proposal from AMSAT-UK and the British Amateur Television Club has input and support from the newly incorporated AMSAT-CA's Technical Working Group as well as from AMSAT-USA.
According to a November 30th position paper from AMSAT-CA's president Stefan Wagener, VE4SW, and technical director Levente Buzas, VA7QF, a number of amateur radio satellite associations are helping Frank promote the project to commercial satellite operators in 2024 during the World Satellite Business Week.

Stefan told Newsline that Frank hopes to use the QO-100 geostationary amateur payload on Qatar's Es'hail 2 satellite as an example so another commercial partners can be identified to carry a similar payload in a position over the Atlantic to cover Europe and Canada. The study is being undertaken with the help of €250,000 in ESA funds.
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Special Issue on Japan's ISDB-T

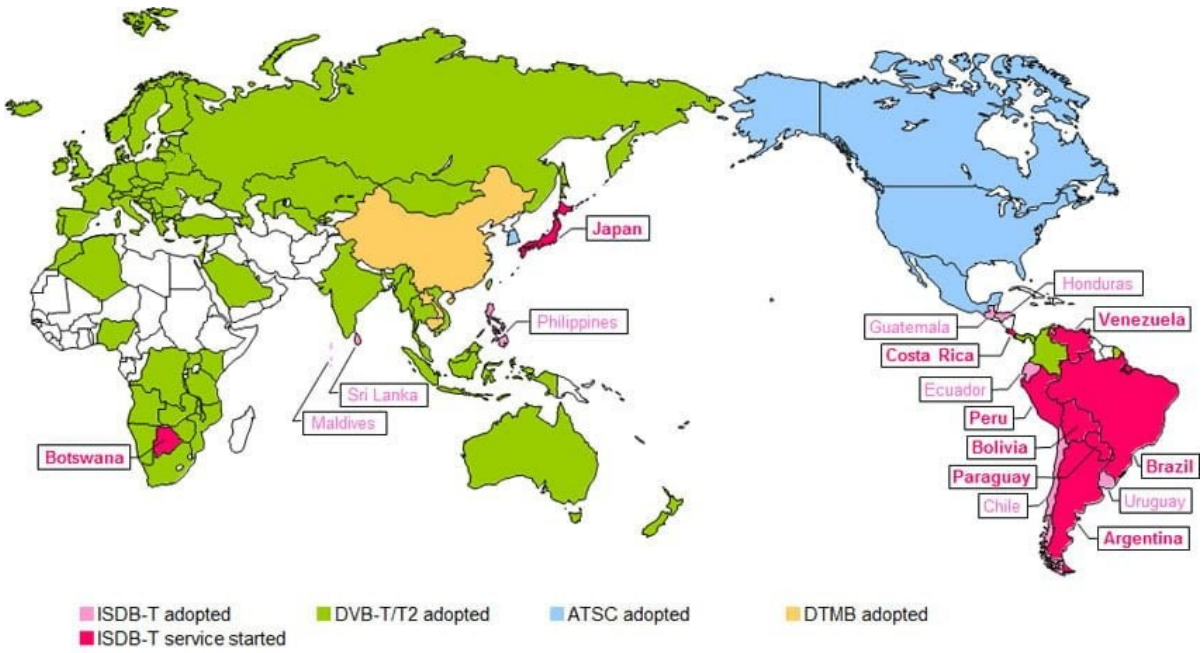
What is the Difference between DVB-T and ISDB-T ?

Mijo Kovacevic, S51KQ, Vojnik, Slovenia

Four transmission standards are currently in use for terrestrial digital TV.
most of the world: DVB-T and DVB-T2
USA , Canada, Mexico & S. Korea: ATSC
China, Asia: DTMB
South America, Botswana, Japan, Philippines: ISDB-T

The **DVB-T** system enables transmissions in bandwidths of 6, 7 and 8 MHz, which also means three different symbol rates. **ISDB-T** only knows 6 and 8 MHz bandwidths.

Both transmission methods use **COFDM** modulation (orthogonal freq. division multiplexing), so they offer users similar connection and image qualities



ISDB-T is a much less widespread alternative to the real DVB-T. ISDB was developed in Japan for the needs of Japanese people, for the transmission of digital radio and television. They also know ISDB-S (satellites) and ISDB-C (cable TV). The ISDB standard provides compression for multiplex in MPEG-2 and MPEG-4 standard, as well as video/audio coding (MPEG2 or H.264). The latter enables the HDTV image standard. The difference in picture quality and bandwidth compared to DVB-S2 is huge. With DVB-S2 and H.265 compression, you can easily achieve a high-quality image at a very low bandwidth (SR 333 KS), which is impossible to achieve in H.264 compression. The difference is roughly as follows: with H.265, the image is almost 1x better than the lower standard with the same bandwidth and higher resolution. However, H.265 requires much more capable processing both on transmission and reception, and in real time! For comparison, I add below a couple of images captured from live video on the QO-100.

It's also no surprise that the Japanese are making ATV in their native ISDB standard. They are mostly active at 5.7 GHz and above. On frequencies below 1.2 GHz it is probably impossible for them to work due to the bandwidth required for ISDB. Here are a couple of interesting links:
https://www.youtube.com/@sekizakifumio3709/videos
https://www.facebook.com/groups/2375023609443269/

The above image was captured from H.264 and 333 KS, with 60% less image data - lower resolution, because as big as it is above, in H.264 and with this small bandwidth (333 KS) it would not be fluid, or it would not pass through at all ...

Images captured from live video, H.265 encoding and 333 KS

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Successful Single Frequency ISDB-T Transmission Relay

Fumio Sekizaki, JA0RUZ

On December 3rd, Japan's digital ATV (ISDB-T system) successfully relayed full high-definition transmission using the same frequency using 5745MHz. We tested with the following configuration:

① Kimitsu City, Chiba Prefecture: JH1AOY/1 5745MHz transmission, Span = 96km
② Dodairayama, Saitama Prefecture: 7K2HKS/1 5745MHz reception, 50m apart, HD-SDI connection
　　＊Scenery footage from the relay location is mixed with the relay video and sent.

③ Dodairayama, Saitama Prefecture: JA0RUZ/1 5745MHz transmission, Span = 62k m
④ Gunma prefecture observation deck: JA0SIO/1 reception

① to ④ are surrounded by mountains and cannot be seen, so 5.7GHz FHD-ATV waves cannot directly reach them.

Please see the received videos sent from ① to ④ ***https://www.youtube.com/watch?v=-_hm2U6tEX4***
The videos sent from ④ to ③ are ***https://www.youtube.com/watch?v=uCduUpMGWcI***

Normally, when transmitting the same frequency wave at a close distance, it loops around to the receiving station and the target wave becomes unreceivable, but in the case of ISDB-T, if certain conditions are met, relaying on the same frequency (Single Frequency Network) becomes possible. I've never heard of this type of "relay using the same frequency" on a full high-definition ATV, so I guess this is the first time it's happened in amateur radio.

Please note that it is also written on my blog for your reference.
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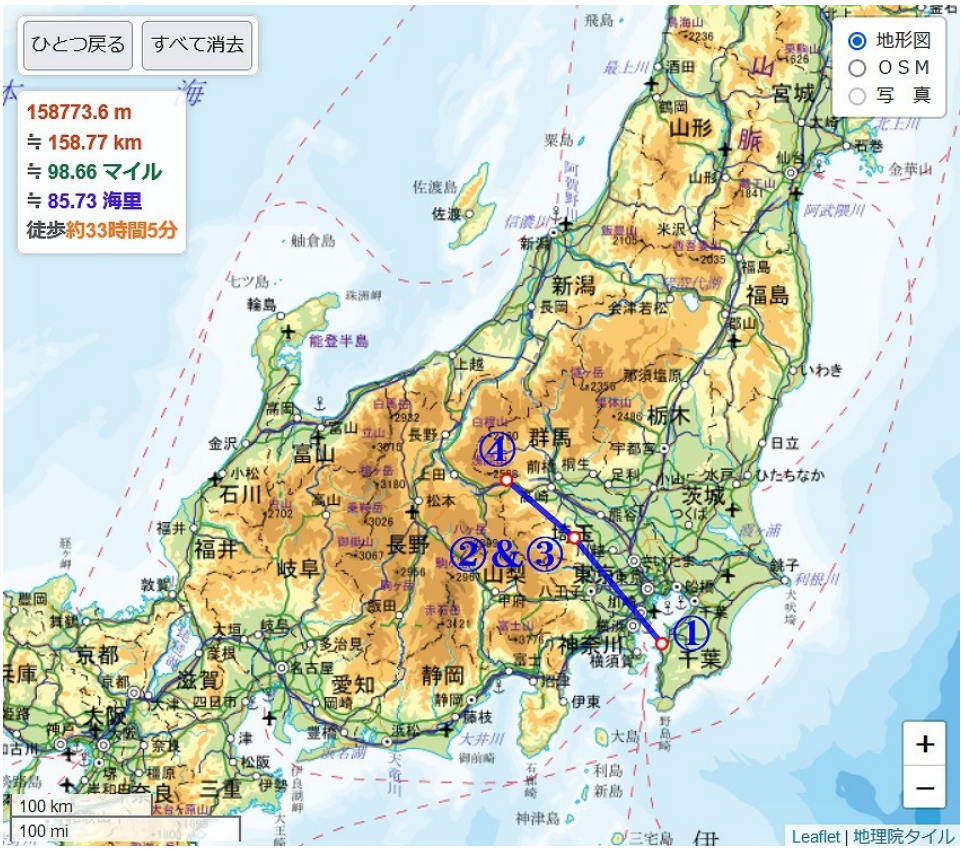

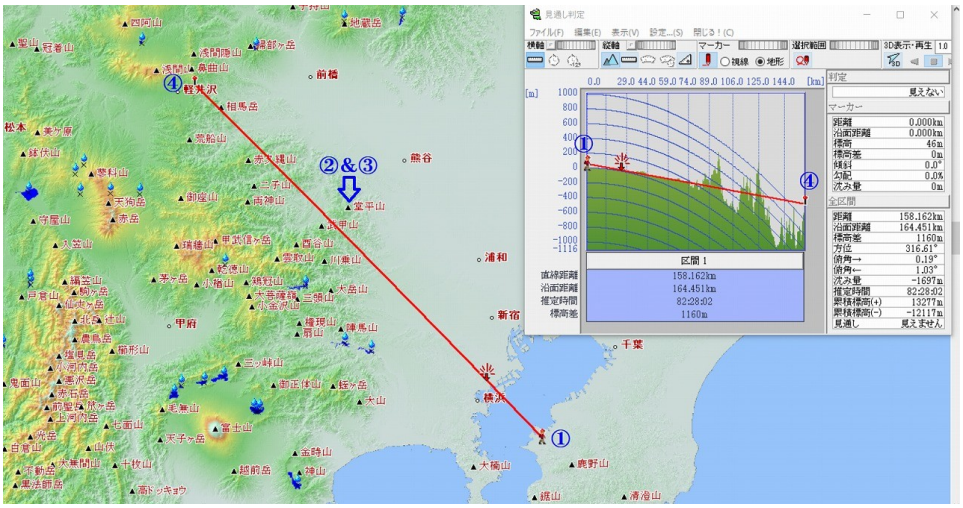
④
軽井沢
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5745MHz RX ANT
TRX (RX)
堂平山（doudaira Mountein）


我開山
軽井沢向け
5.7G TRV
IF信号を約40dB
落とせます
ディスプレー内部に
結露がありました！
方向合わせ用FM親機
TX：堂平山（doudaira Mountein）

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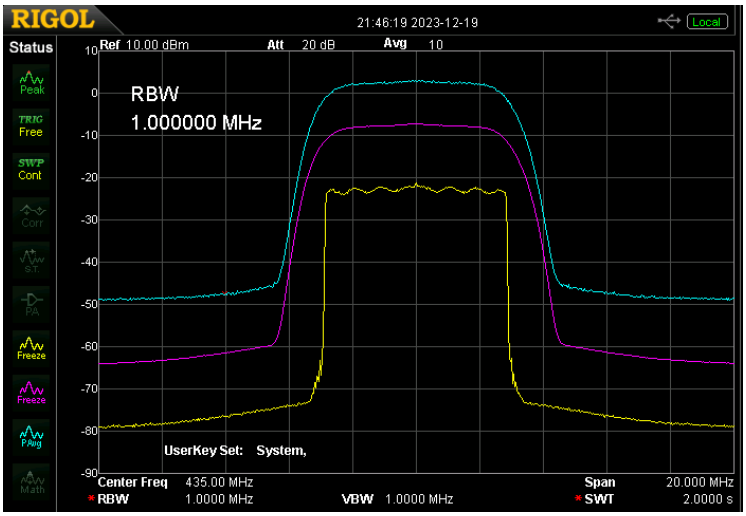
DVB-T Peak Power vs. Average

Jim, KH6HTV



I recently had an inquiry from a customer who was concerned about the PEP (peak envelope power) out of one of my rf linear power amplifiers. He had an application using the amplifier in a high altitude rocket and was concerned about exceeding limits at which arcing might occur when the air pressure drops to almost vacuum.

So to answer his question -- back to the text books and the test bench to verify some numbers.

First from the DVB-T Bible [1] -- What does it say ? "The theoretical Crest Factor (i.e. the ratio between the maximum peak amplitude and the RMS value of the DVB-T signals) is 41 dB in 8K mode (35 dB in 2K mode). ..... It must be noted that these are theoretical values which, due to the limited resolution of signal processing and clipping, cannot occur in practice. Practical values are of the order of magnitude about 15 dB (for modulators) and about 13 dB for commercial, broadcast, DVB-T high power transmitters." (page 401)

Reference [1] "Digital Video and Audio Broadcasting Technology - A Practical Engineering Guide", by W. Fischer (Rhode & Schwartz TV engineer), 3ed edition, Springer, 2010.

Test Bench: The above screen grab from my Rigol DSA-815 spectrum analyzer shows the measurement of a DVB-T, 6 MHz BW, QPSK, 8K signal. The signal source was a Hi-Des model HV-320E modulator. The internal attenuator was set to -7dB, to set the rf output rms power level to about 0dBm. The actual value measured on an HP-432A, thermistor power meter was +0.5dBm.

The bottom, yellow trace, is the normal measurement of such a signal using the ITU recommended analyzer settings [ref. 1, pp. 425-428] of: span = 20 MHz, resolution band-width = 30 kHz, video band-width = 300 kHz, detector = RMS, sweep = 2 seconds. I also use 10 averages.

The middle, magenta trace, is with the same settings with the RMS detector, except both the resolution and video band-widths were set to the max. of 1 MHz.

The top, cyan trace is again with 1 MHz BW settings, but the detector has now been changed from RMS to Positive Peak. This will help us measure the Crest Factor.

Now the marker function was used to measure the displayed signal level in dBm at the center frequency on each trace. Yellow = -22.18 dBm, Magenta = -7.46 dBm, and Cyan = +2.62 dBm.

So what do these numbers tell us ?
(1) Well first, with the normal measurement (yellow trace), it tells us there is an offset of 22.6 dB between the power measured at the center frequency (30kHz BW) and the total RMS channel power as measured by the HP thermistor power meter. (Note: Analyzers such as the TinySA-Ultra can be configured to measure the Total Channel Power by integrating the power measurement across the whole width of the TV channel. The Rigol can also measure total channel power, but only if an expensive optional upgrade is paid for and enabled.) This total channel power value would then match that obtained using the HP power meter.

(2) When we use the max. 1 MHz BW, we are assured of capturing any possible peaks in the DVB-T signal. Thus the difference between using the RMS detector and the Peak detector tells us the crest factor. For our HV-320 modulator it is = +2.62 dBm - (7.46 dBm) = 10.08 dB ≈ 10 dB
This is in the ball park of what W. Fisher told us in the "DVB-T Bible".

I also repeated this same test, but looked at the RF output of one of my model 70-9B, amplifiers. It was putting out about 10 Watts (+40dBm) RMS of DVB-T power with shoulder break-points of about -31dB. These amplifiers are capable of max. saturated power of the order of 70 Watts. The presence of the out of channel power evidenced by the spectrum shoulders is also an indication that some clipping, and hence distortion, is occurring within the amplifier. This means we typically are leaving about 8-9 dB of head-room to accommodate the peaks in the random, noise-like, digital signal. Looking at the spectrum displays at 1 MHz BW (magenta & cyan traces) for the amplifier for the RMS vs. Peak detectors, I saw a Crest Factor of about 9 dB. Very consistant with the 10W / 70 W headroom setup.

73 de Jim, KH6HTV, Boulder, Colorado

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KH6HTV Video Announces a Break-Through in 23 cm, DTV Amplifier Efficiency

New 23-12 Amplifier

rear view of 23-12

In the past, the use of Digital ATV on the 23 cm band for out in the field, portable, battery powered, emergency operations for ARES has been hampered by the very poor DC to RF conversion efficiency of available linear, rf power amplifiers. Most DATV hams have been using the Mitsubishi brick amplifier modules as the heart of their amplifiers. These bricks work well as linear amplifiers for digital TV service, but at the expense of being DC power hogs. For 23 cm, Mitsubishi only offers one brick, their model RA18H1213G.

Since 2016, KH6HTV Video has been selling a single model of amplifier for 23 cm DTV service, it's the model 23-11A, which uses the Mitsubishi brick. With it, we are able to achieve 4.5 Watts (+36.5dBm) of DTV rf power at 23 cms. But at the expense of 90 Watts of DC power (6.5 Amps @ +13.8Vdc). A measly 5% dc to rf power conversion efficiency. Who wants to lug a big heavy battery out in the field for ARES for an amplifier that sucks 6.5 Amps and only gives out 4.5 Watts of RF ? ? ! !

Now, with the introduction of the NEW model 23-12 amplifier, we are able to achieve a much better dc to rf conversion efficiency of 27% for DTV service. (45% for FM/CW). The new 23-12 amplifier has a very linear Pout vs. Pin curve. 13 Watts (P saturated), 9 Watts (-1dB gain compression), 8 Watts (- 0.5dB gain compression) Thus for FM/CW service, one obtains 13 Watts. For SSB or Analog TV service 8 Watts PEP. And for Digital TV service 2 Watts (+33dBm) average power. Running 2 to 2.2 Watts DTV, it only pulls 0.9 Amps at +13.8Vdc.

For more details, see the web site: ***www.kh6htv.com***

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Pete, WB2DVS & Debbie, WB2DVT as seen by Bob

test pattern signals from KH6HTV relayed by W0BTV

BATVC NEWS: ATV viewer, Bob, WB0NRV, in Firestone, Colorado, on the Dec. 21st, ATV net reported success finally in receiving P5/Q5 pictures from the W0BTV, DVB-T repeater in Boulder. The distance was 21 miles (34km). He has sent us the above photos as his ATV QSL confirmation. Bob used this time a Comet GP-3, 2m/70cm, omni-directional antenna at 16 ft. with about 40 ft. of Belden 9913 coax cable. He first received the picture on the left using a very low cost Pantesat receiver. He then switched to a Hi-Des HV-110 to make actual signal strength measurements. The HV-110 showed an excellent received signal of -80 dBm with a s/n of 16 dB.

Dec. 28th -- A week later, after our regular Thursday afternoon ATV net, Bob then tried transmitting to W0BTV repeater again using the GP-3 antenna. He was able to successfully key up the repeater as shown by the above two off the air photos. Looking at the repeater's S meter reading of -61dBm and throwing in the know offset of 24dB, Bob was hitting the repeater with a -85dBm signal. His picture was not perfect, with a lot of freeze frames. If our repeater site were free from 70cm RFI, he would have gotten perfect pictures through the repeater.

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BATC - U.K.

The latest issue #282 of the BATC's quarterly magazine, **CQ-TV** is just out. Again, it has several articles of interest. Their big news to share is their major problem of losing their supplier of the Serit FTS-4334 NIM / RF Tuner has been solved. This tuner was a Key component in several of the BATC's digital TV receiver projects. Chris, PA3CRX, has an article of interest to analog TV types. "Evaluation of the Quality of Transmitted and Received Analogue Video Signals". Several other articles, mostly of interest locally in the U.K. The magazine is 36 pages.

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Feed-Back:

ATV Antennas: Bill, K0RZ, writes -- "Looks like the M-Squared and the KLM Yagis perform as expected. In case you aren't aware of the connection, Mike, K6MYC, (the M in KLM) played in these two Yagi antennas, he designed the KLM 6 element and now is the owner of M-Squared and the 440-6SS is his latest design."

Interesting reading Mike's QRZ.com bio with includes ... " I soon started KLM electronics with (K)en Holladay K6HCP, (L)eland Ferrar K6KBE and (M)ike Staal in 1971. I designed the KT34A and 'XA along with hundreds of other antennas and soon we were building C band satellite dishes and receivers. KLM was sold in 1982 and a couple years later my wife Myrna (K6MYM) and I started M2 Enterprises later to become M2 Antenna Systems Inc. See our web site at www.m2inc.com"


Mike, K6MYC

Editor's Note: We got a lot of Feed-Back from the previous issue #150 on ATV antennas. We will be publishing it in our next issue #152.

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W0BTV Details:

Inputs: 23 cm Primary (CCARC co-ordinated) + 70 cm secondary all digital using European Broadcast TV standard, DVB-T 23cm, 1243 MHz/6 MHz BW (primary), plus 70cm (secondary) on 441 MHz with 2 receivers of 6 & 2 MHz BW

Outputs: 70 cm Primary (CCARC co-ordinated), Channel 57 -- 423 MHz/6 MHz BW, DVB-T Also, secondary analog, NTSC, FM-TV output on 5.905 GHz (24/7 microwave beacon).

Operational details in AN-51c Technical details in AN-53c. Available at: ***https://kh6htv.com/application-notes/***

W0BTV ATV Net:

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. A DVD ham travelogue is usually played for about one hour before and 1/2 hour after the formal net. 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*).

Newsletter Details: This is a free newsletter distributed electronically via e-mail to ATV hams. The distribution list has now grown to over 500+. 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. All past issues are archived at: **https://kh6htv.com/newsletter/**

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.*

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Wanted - 70cm Amplifier:

I am looking for an Amplifier for my mobile ATV unit. At this point, I am still using analog video with a VM – 70 from Videolynx.

Do you know if any amplifiers are available in the sub $300 price range? Used of course. And where I might be able to buy one. It is pretty tricky to find one. I was thinking somewhere in the neighborhood of 100 Watts. Jack McNulty, KE8PYF, *McNultyj@gojo.com*

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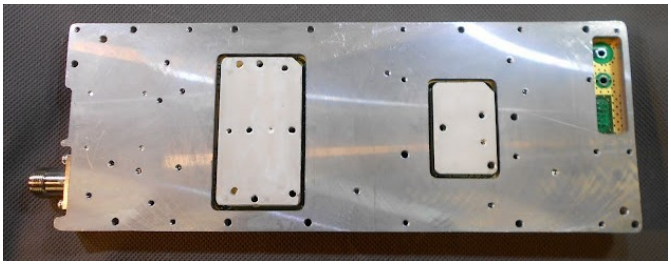

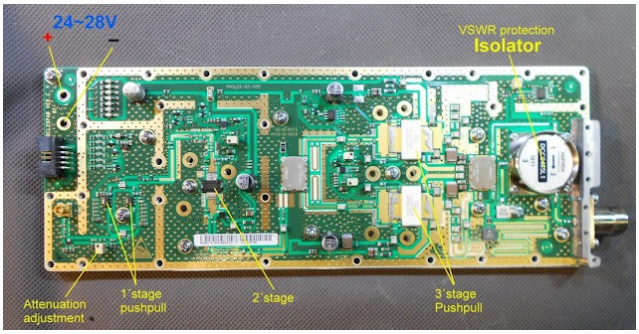

Commercial 70cm, DVB-T Amplifier

... NEW old stock ... For Sale

420-470 MHz, Max. Output DVB power: 60 Watt, Max. Output power CW mode: more than 150W, 43-51dB Gain (adjustable), requires +28Vdc & +8Vdc, sold without heat sink, but with PCB cover. Price is 470 Euros, including shipping. More details at:

https://oe7dbh.blogspot.com/2023/11/70cm-dvb-t-50w-amplifier.html

interested ? - contact Darko Banko 9a6rzn@gmail.com

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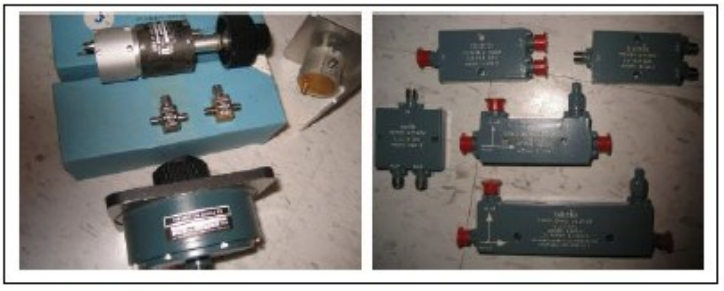
Marconi 6970 RF Power Meter



Baseband variable attenuators and test equipment

Model 23-12
23 cm, 48 dB, 13/8/2 Watt
RF LINEAR
POWER AMPLIFIER

The KH6HTV-VIDEO Model 23-12, RF Power Amplifier is for use in the amateur radio 23 cm band. It is a Class A-B amplifier designed for linear service. It can be used to produce an 8 Watt (pep), analog TV or SSB signal, or 13 Watts for FM/CW service. It can also produce a 2 Watt, high-definition (1080P), digital TV (DTV) signal. For DTV service with it's low DC current draw of only 0.9 Amps at 13.8 Vdc, it is ideal for in the field battery operations, such as for ARES emergency operations.

PARAMETER	Typical Performance	Notes
Output Power (Digital TV)	2 Watts, +33dBm	average power
Output Power (analog TVor SSB)	8 Watts PEP, +39 dBm	peak power on sync tips
Output Power (FM, CW)	13 Watts, +41dBm	saturated output
Output Power (-1 dB comp)	9 Watts, +39.5dBm	
Output Power (-1/2 dB comp)	8 Watts, +39dBm	
RF Power Amplifier Gain	48 dB, nominal	
Amplifier Gain Flatness	± 0.5 dB	1240 - 1300 MHz
Gain Band-Width	140 MHz	-3dB
Amplifier Max Input Power	10 mW, +10 dBm	
Spectrum Regrowth (Digital TV)	-30 dB at +33dBm (2 Watts)	-35dB at 1W, -40dB at 1/2W
LSB Rejection (analog VUSB)	better than -20dB	at 8 W peak sync
Duty Cycle	100 %	heat sink & cooling fan included
DC Supply Voltage	13.8 Vdc	10 to 15 Vdc
DC Current	0.9 Amps (2W DTV), 0.5A idle 1.6 Amps (10W FM/CW)	@ 13.8Vdc
RF Connectors	SMA input & N output	
Dimensions & Weight	4.2" x 3.5" x 7.4"	1.5 lbs
Accessories Included	instruction manual, test report, & DC power cable	

KH6HTV-VIDEO Boulder, CO USA www.kh6htv.com kh6htv@arrl.net 303-594-2547

Notice: This amplifier is not FCC type accepted. Therefore, the use of this amplfier is only legal in the USA amateur radio, 23cm band (1.24-1.3GHz). Owners and operators of this amplifier must be licensed amateur radio operators.