Amateur Television (ATV)

This presentation is a brief introduction to give insight of ATV, how to get started, and how to get more information on ATV.

by Michael Wright, K6MFW

Download this presentation from http://www.mfwright.com/ATVpresentation.pdf

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Amateur Television is *NOT*

- Cellphone cam or webcam
- Bluetooth, PDAs, Blackberries, etc.
- WLAN, WIFI, or Internet related
- Broadcast TV, Cable TV, Satellite TV
- Activity available only to the very rich

What kind of TV programs?

- Anything you want in the spirit of amateur radio.
- Experiment, show your friends, try new designs, etc.
- Televise club meetings, ham radio events (i.e. Parachute Mobile)
- NASA-TV retransmission (Intl Space Station, special ham radio events).
- Televise techie activities from the field
- Televise parades, public events in support of ARES/RACES.

Real television! Similar technology, different frequencies and applications

FCC Part 73 Broadcast: Entertainment, advertisements, paid programming
FCC Part 97 Amateur: Experimentation, hobby, ARES/RACES, cannot make money
"Amateur" is a legal term meaning compensation free.

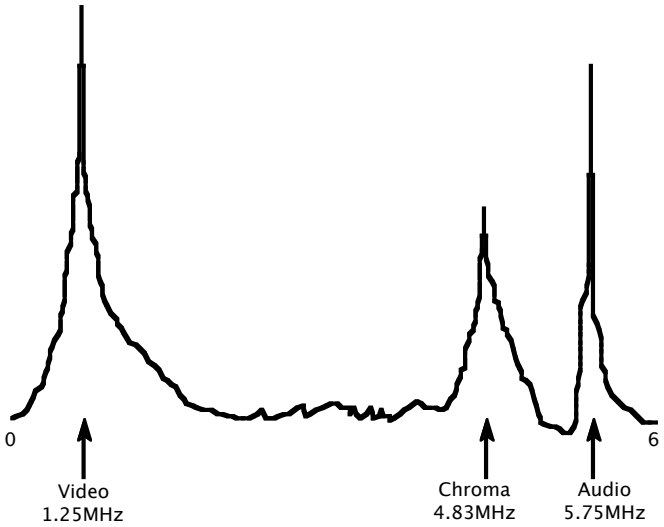
ATV transmits over a wide area but should be directed to other hams, not the general public (that is what Part 73 broadcast services do). Though it is possible general public can tune their TV sets to view hams like using a scanner to listen to hams on 2m or HF.

Amateur Television (ATV) Basics

ATV is transmitting television through the air like commercial broadcasters. Many amateur radio operators, hams, still use analog television (NTSC) as lots of legacy analog equipment available at flea markets, ham fests, and ebay. Digital TV is becoming more common and many prefer the DVB-T mode (products listed in later pages) because it uses lower bandwidth than US broadcast standard of ATSC of 6 MHz bandwidth. Slowscan television (SSTV) is form of ATV used to send still pictures (jpegs) over voice bandwidth channels.

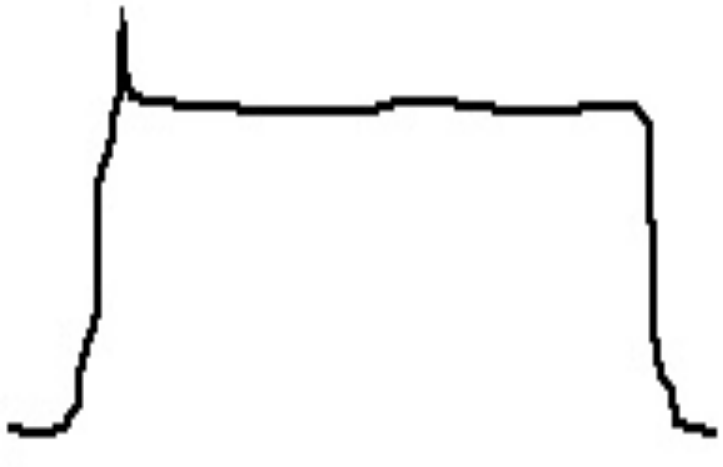
Legacy NTSC analog, 6 MHz bandwidth,
Voice (link) and wireless mic can be transmitted between these peaks with little affect on video.

AM video carrier at 1.25 MHz,
Color chroma about 4.38 MHz,
FM audio at 5.75 MHz

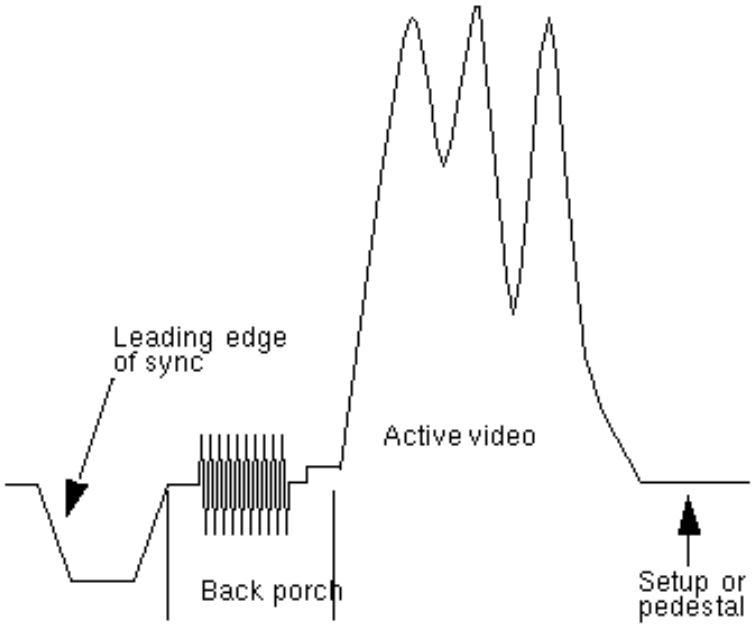


Broadcast ATSC digital, 6 MHz bandwidth with no gaps in between which leaves no room for auxiliary transmissions.

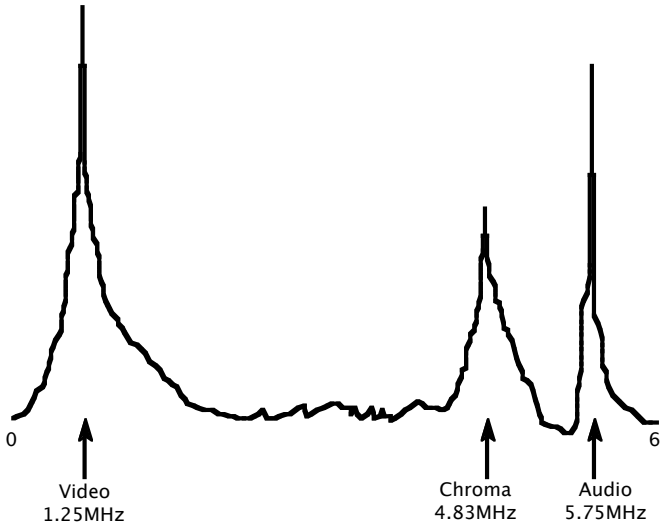
small peak is the ATSC pilot signal



Camera (camcorder) provides a 1 volt composite signal to a video transmitter (or modulator), typically with a yellow RCA connector. Transmitter emits a 6MHz AM signal. Video carrier centered at 1.25MHz from beginning of spectrum, audio carrier 5.75MHz from beginning of spectrum. Peak in between is the chroma signal. Shown below is the upper sideband of AM video signal (vestigial sideband, VSB). Amateur TV transmitters from sources such as PC Electronics transmit both upper and lower sidebands (dual sideband, DSB).

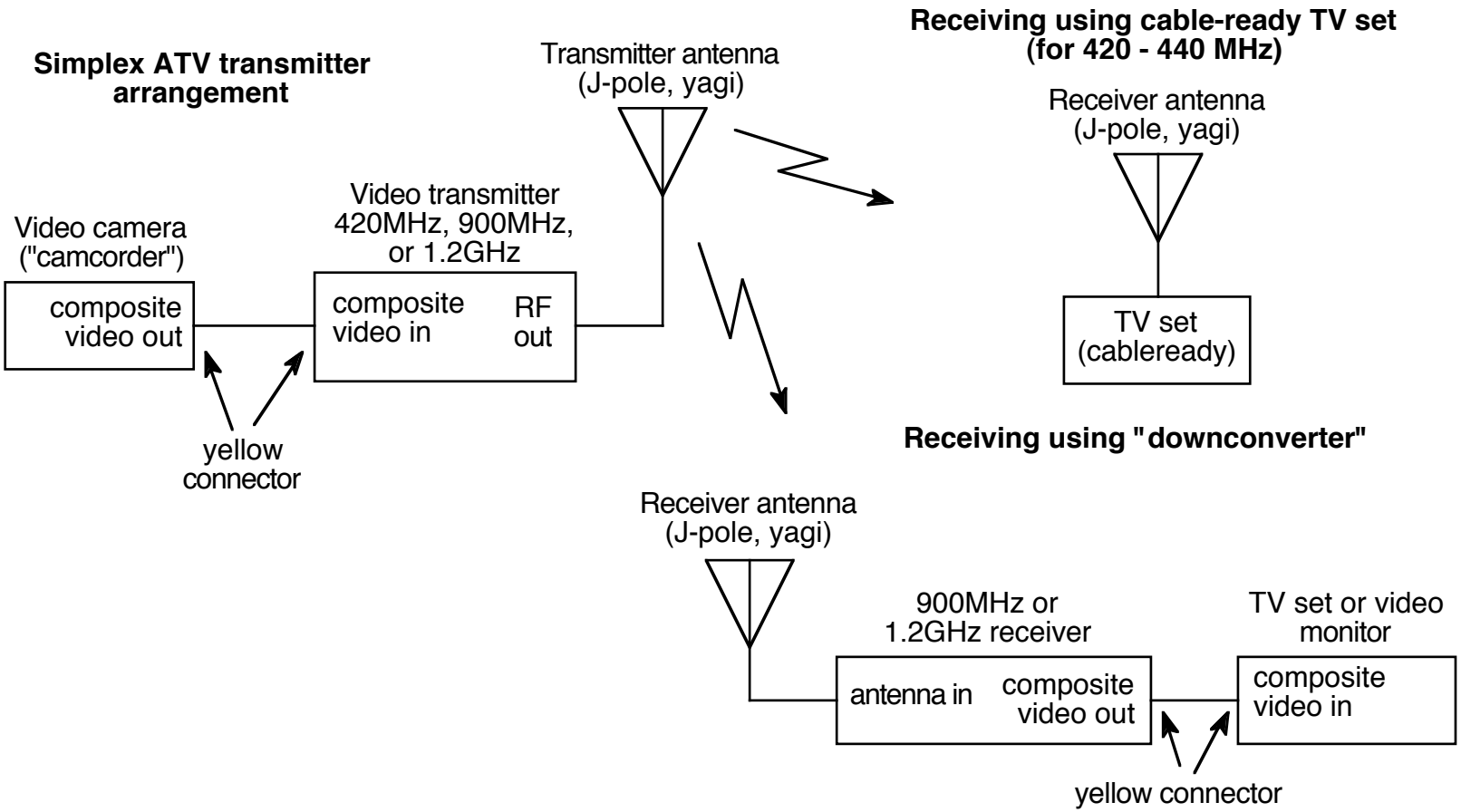


Waveform of a 1 volt composite video signal



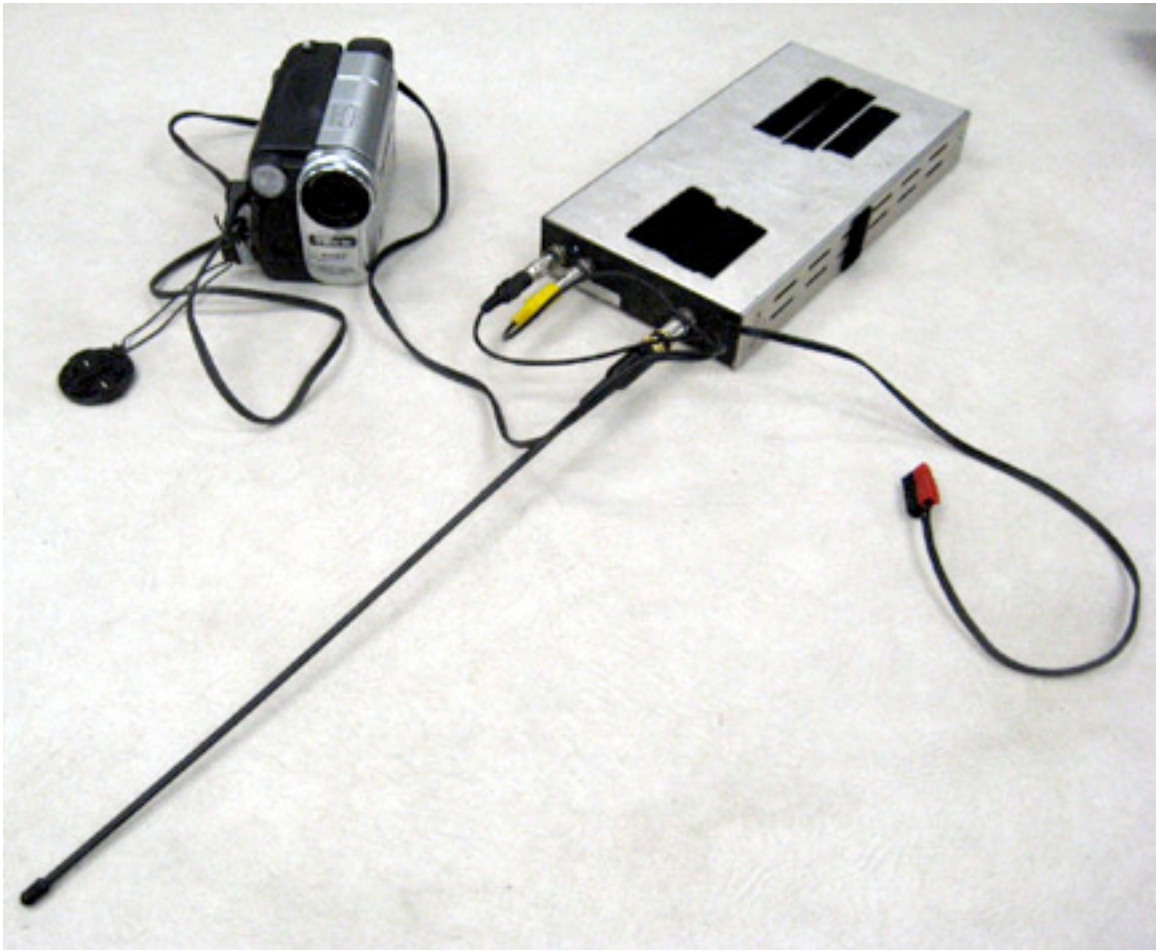
Freq spectrum (vsb) of a video transmission

Simplex ATV



Compare this block diagram to actual simplex ATV transmitter packages shown on next pages.

Camera and UHF cable TV modulator used for Simplex ATV

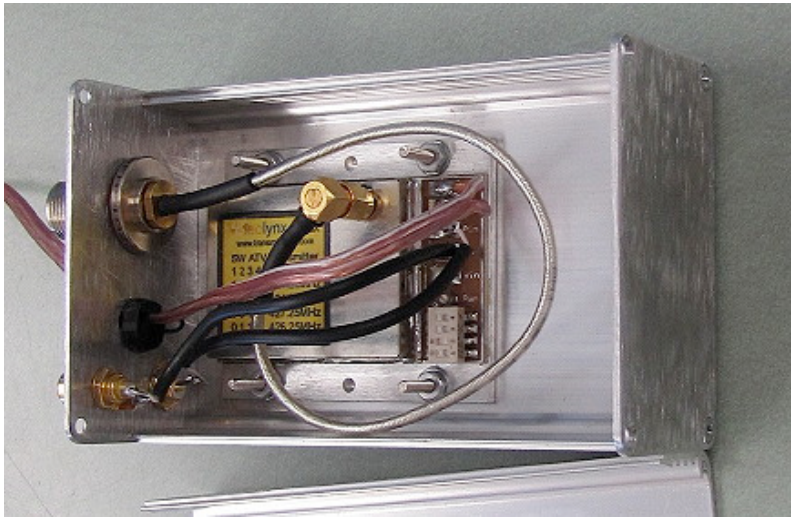


Cable from camera has video (yellow RCA connector) and audio (black RCA connector). Powerpole connector on end of power cable for modulator (significant is this unit only needs 12VDC). Modulator shown is the Vecima model purchased from charleslidstone.com although no longer available, this shows effective packaging using direct power cable with powerpole (DC inline power receptables unreliable for field use), F-connector to RCA adapters, and F-connector to BNC to make use of a 1/4 wave antenna. Fast and easy field ATV transmitter!

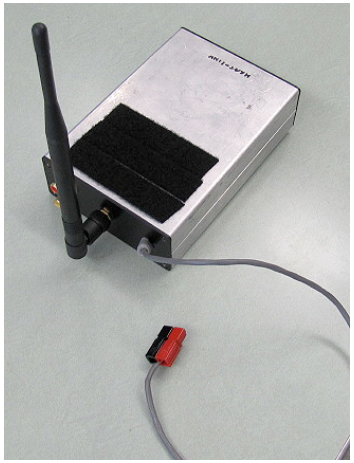
Suggested Packaging of ATV Transmitters and Receivers

Many ATV systems are sold board level. These must be packaged in boxes with common non-proprietary connectors. RCA for video/audio connections, powerpole for DC power, SO-239, SMA, or N-connectors for RF.

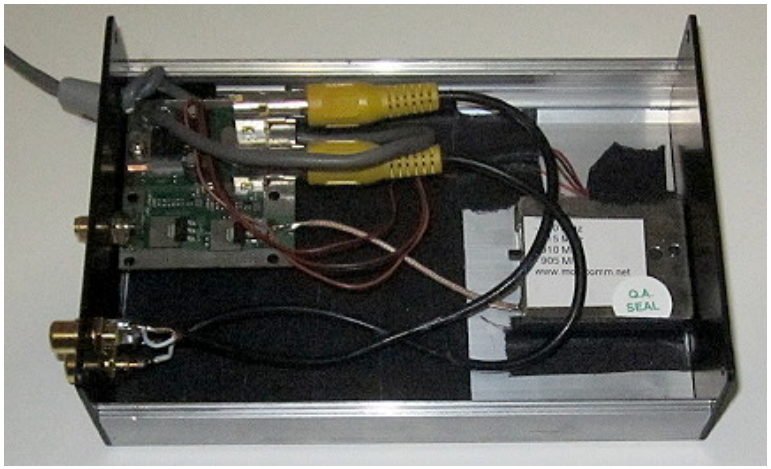
UHF transmitter box



VideoLynx VM-70X inside UHF transmitter box



900 MHz transmitter



Mobicomm board inside 900 MHz transmitter box

Camera and 1.2GHz transmitter used for Simplex ATV

Packaged inside black box is a Mobicomm 1.2GHz transmitter board. RCA connectors for video input (yellow) and audio input (black). Powerpole connector for 12VDC.

Mobicomm, ebay seller ID gnupic, transmitter is a single circuit board with connectors. For field use, I recommend a package as shown above. Video and audio connectors can be mounted on top but should be readily available like antenna mount (an sma receptacle). Use a cord with powerpole instead of DC power inline connectors which are not reliable for field use. Less detachable cables means less chance of forgetting something behind.

Examples of ATV Reception

Actual received amateur television transmissions using consumer cable-ready TV sets

ATV demo during Ames Emergency Prepardness Fair in 2007

ATV reception using portable (12VDC) TV set

ATV views of bridges during SJ Grand Prix in 2007

ATV in use at SVECS breakfast meeting, note J-pole on right for receiving antenna

Examples of ATV Transmission

Actual amateur television transmitters, not models or toys

ATV demo at Raynor Park Sunnyvale on Field Day

ATV transmission from field off Hwy 35 overlooking SF bay area

ATV demo at WVARC Field Day site

ATV demo at FARS Field Day site

ATV Benefits

- ATV enables hams to impress their friends with technical prowess.
- ATV provides direct hands-on experience in transmitting television.
- ATV is independent of Internet, networks, centralized systems, and cable TV.
- ATV is independent of media companies, government agencies and budgets.
- ATV is independent of subscriber fees, codecs, TCP/IP addressing, software licenses, …

Getting started in ATV

- Get a cableready TV set or VCR (channels 57, 58, 59, 60 are in 70 cm band)
- Commercial video modulators can be used for lowpower 70cm transmitters
- 70 cm (UHF) ATV transmitter from PC Electronics or "allgizmo" (ebay seller)
- 900 MHz, 1200 MHz, or 2400 MHz transmitter and receiver boards from Mobicomm (gnupic on ebay) or Comtech (ATVQ magazine)
- 70 cm and 23 cm 1 to 25 watt, VSB and DTV, transmitters from KH6HTV at kh6htv.com

Save those old VHS VCR recorders!

Most are cableready and make excellent UHF ATV receivers. They have video outputs for monitors, better sensitivity than most TV sets, and can record ATV events.

Why more CATV channels than broadcast TV channels?

- CATV uses frequencies of other radio services, as long as it stays inside the cable!
- These frequencies include amateur radio (i.e. cable channel 58 is 427.25MHz)

ATV Frequencies in Reference to Broadcast and CATV Frequencies

Broadcast OTA television now uses ATSC which occupies same spectrum except 698 MHz and above (re-allocated to other uses in 2009). Because large numbers of legacy television and VCRs still exists, this table can still be used. Also note many cable services digitize higher channels, that is, Channels 2 thru 30 (or about) still NTSC but those higher are QAM (or whatever CATV digital mode used)

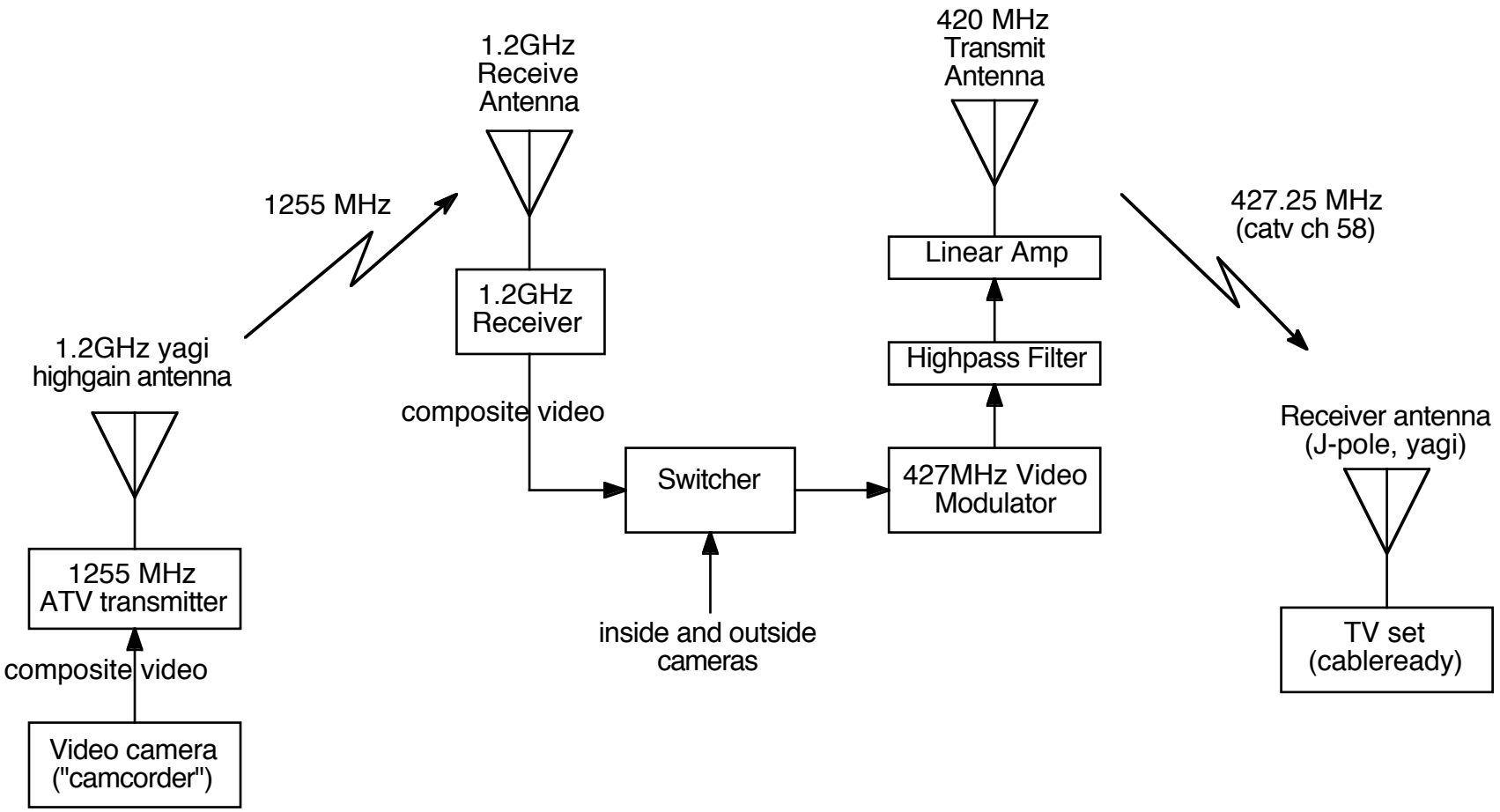
Partial listing:

Broadcast TV*				Cable TV			
CH	BAND	VIDEO	AUDIO	CH	BAND	VIDEO	AUDIO
2	54- 60	55.25	59.75	2	54- 60	55.25	59.75
3	60- 66	61.25	65.75	3	60- 66	61.25	65.75
4	66- 72	67.25	71.75	4	66- 72	67.25	71.75
14	470-476	471.25	475.75	14	120-126	121.25	125.75
15	476-482	477.25	481.75	15	126-132	127.25	131.75
57	728-734	729.25	733.75	57	420-426	421.25	425.75
58	734-740	735.25	739.75	58	426-432	427.25	431.75
59	740-746	741.25	745.75	59	432-438	433.25	437.75
60	746-752	747.25	751.75	60	438-444	439.25	443.75
82	Cellphones and 2-way radios			82	570-576	571.25	575.75
83	Cellphones and 2-way radios			83	576-582	577.25	581.75
84	none			84	582-588	583.25	587.75
85	none			85	588-594	589.25	593.75

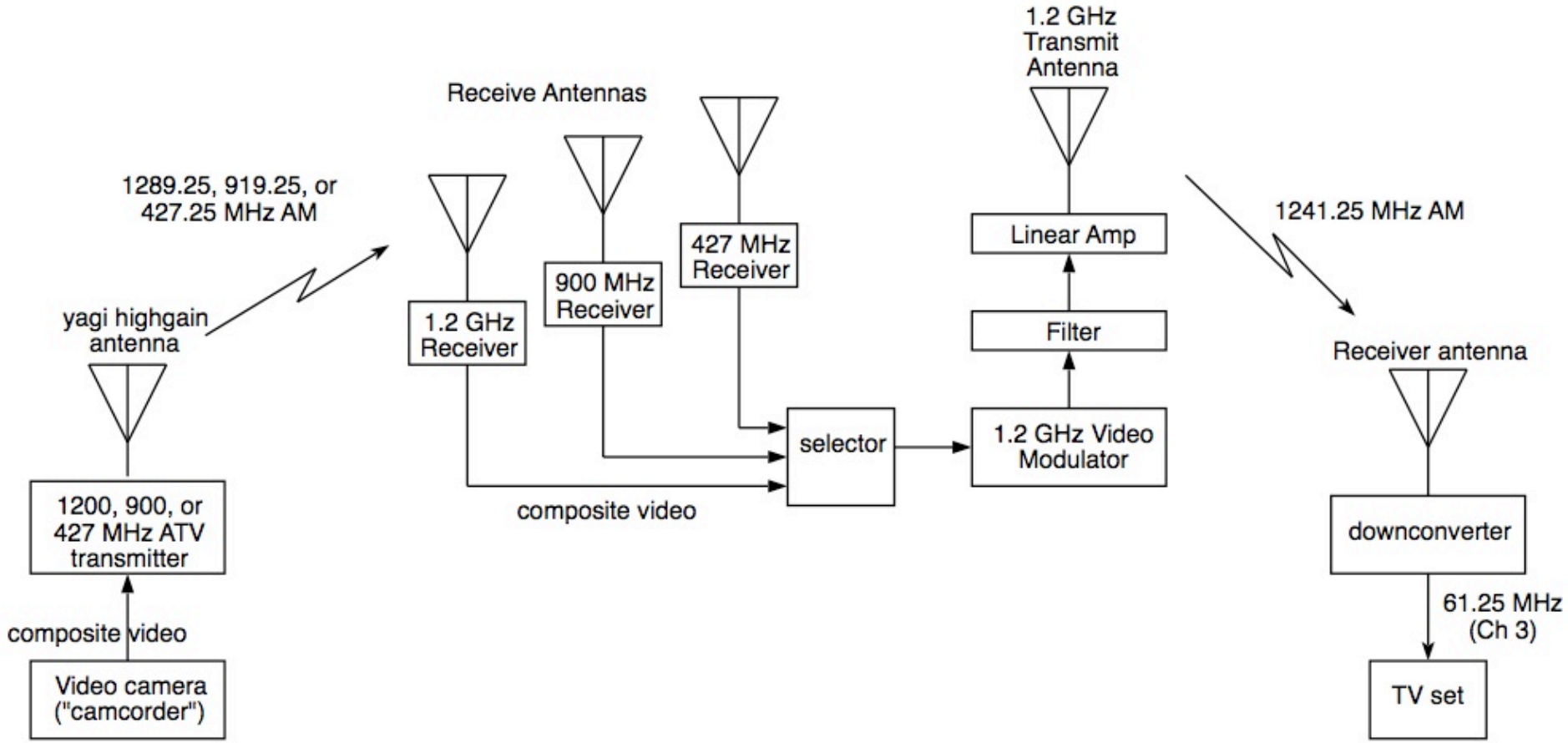
*OTA broadcast is now DTV, there are no center video and audio freq, these frequencies are shown as many legacy systems still exist.

Complete list of NTSC frequencies: http://www.svecs.net/ntscfreq.html

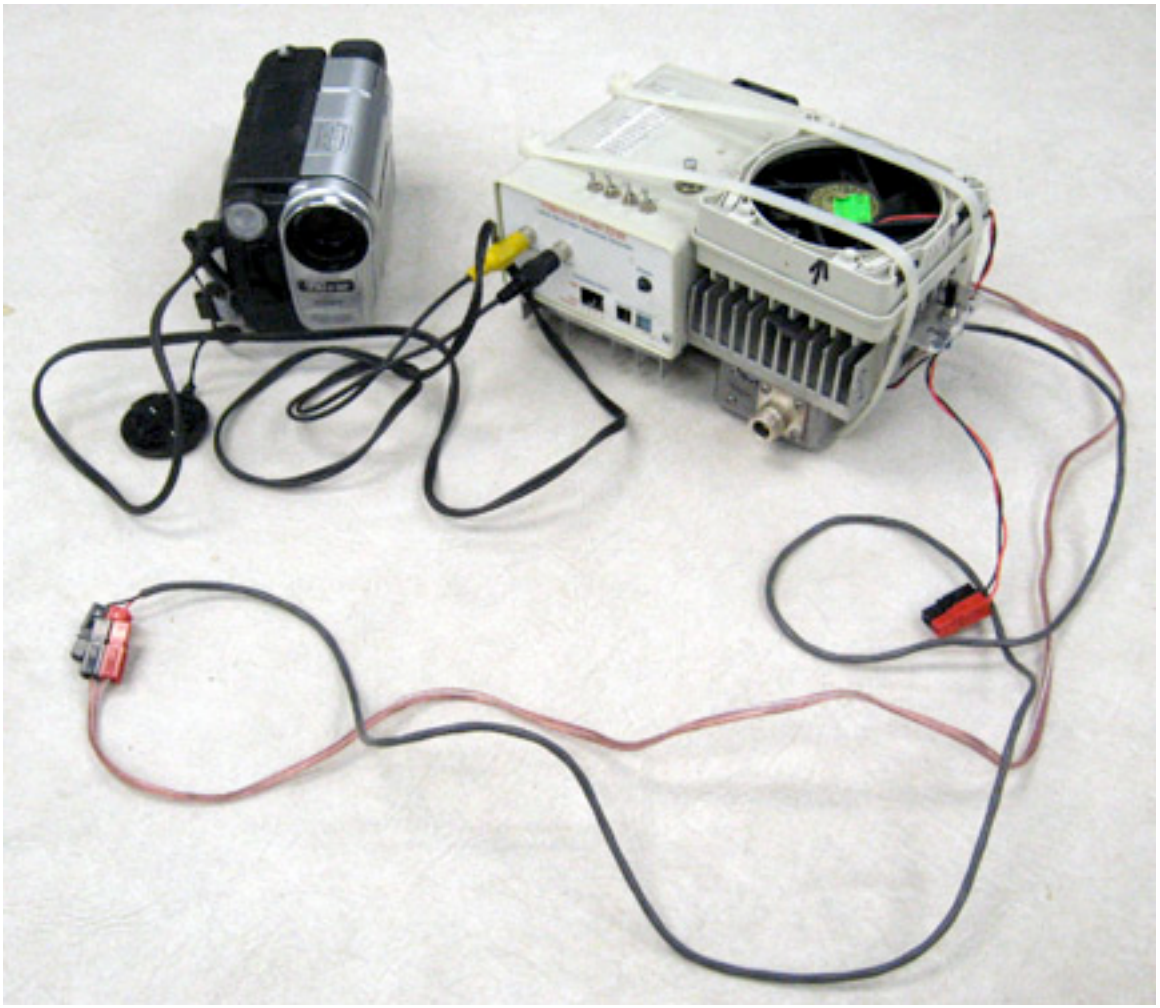
K6BEN: South SF Bay Area Amateur Television Station on Loma Prieta



W6CX: East San Francisco Bay Amateur Television Station on Mount Diablo



Camera and 1.2GHz transmitter used for K6BEN Repeater ATV



Videolnyx 1.2GHz transmitter on left, Downeast Microwave 1.2GHz linear amp on right. A cooling fan is used on the linear amp, powerpole connectors for 12VDC to Videolnyx, RF linear amp, and cooling fan.

ATV in the Field

- Transmitting from field is more exciting and interesting than from a ham shack
- Equipment (transmitters, TVs, cameras) should be 12VDC devices.
- For AC inverters, use smaller units i.e. 100 watts maximum.
- Field kits should be simple enough for any reasonable amateur radio person to operate, and quick to setup or delegate tasks (someone to deploy cables, another to raise antenna, one to connect power sources, etc.).
- Highly specialized systems prevents ability to delegate.
- Batteries, batteries, batteries,… you must have plenty of batteries to maintain operations.
- Be prepared to carry lots of equipment long distances on foot, probably multiple trips.
- Most important for ARES/RACES events is to know what to view and from where. It is not what is good for you, it is what emergency managers (fire, police, EOC) want.
- ARES/RACES footage is boring (view of bridges, rivers, overview of disaster scene), it is not entertainment, but there are serious viewers (emergency managers).

*Note about ARES/RACES applications: ATV should **not** be considered an emergency response system (i.e. rapid deployment to a unscheduled event). Overall it has several interconnecting systems which all must work, operators must have considerable experience to deal with unexpected problems which make too complex for unplanned events.*

ATV Transmitters (go few more pages for digital TV transmitters)

Bands to consider:

- UHF (70cm) to transmit directly to cableready TV sets (421, 427, 434, 439 MHz)
- 900 MHz, becoming more popular
- 1.2GHz (23cm), transmit to K6BEN repeater
- 2.4GHz (13cm), same band with Part 15 wireless video monitors

RF Transmission Cable… very important

- Use the highest of quality lowloss coax.
- Cheap cable WILL NOT work. Don't use RG-8, RG-58 except patch cables
- Recommended cable is Belden 9913, LMR400, Heliax.
- Lowloss cable is absolutely a must for 1.2GHz and 2.4GHz including receiver use

Cameras

Any camera with composite video output with 12vdc capability, no need to send sound

- Camera with 12VDC adapter. If no 12VDC adapter, use a small inverter for efficiency
- Camera with built-in titlemaker and is not "auto shut-off" a real plus
- A recommended camera is Sony TRV-138 (probably discontinued, search used on ebay)

Don't forget a tripod for the camera! Most ATV events use stationary cameras.

420MHz, 70cm UHF Transmitters

Main advantage is consumer TV sets (cable-ready) can directly receive transmissions

- 70-10AD 70cm Transmitter (10W/3W/1W), $1,000, http:// kh6htv.com

  NEW! Jim Andrews, KH6HTV started a new business with products that are excellent match for ATV field use. Transmitters use much less spectrum (true VSB) and power levels can be selected from 1 to 25 watts to better fit requirements of power transmission from the field. Most other products splatter lot of RF in adjacent channels and/or are either too under or over powered. Jim has many detailed tech notes at his site, http:// kh6htv.com

- RTX70-1 (1w crystal controlled), $300 from PC Electronics, http://www.hamtv.com
- VM-70X (5w 4-channel), $200 from VideoLynx, buy from PC Electronics
- ATV12-440MK2 2W ATV Transmitter, $125 kit, buy from North Country Radio http://www.northcountryradio.com
- 430MHz AM ATV Transmitter, 100mW, http://www.minikits.com.au/kits1.html

Using linear amps for television transmissions.

Linear amps must be class A type (do not want distortion) for television transmissions.

Model 70 linear amp (several versions from 1/4w to 25watts, $275 to $450, http://kh6htv.com

Downeast Microwave, 7025PA (35W), $210, www.downeastmicrowave.com (long lead times)

Mirage Amplifiers, D-1010-ATVN (50W) $440, http://www.mirageamp.com

Cable TV RF Modulators used as ATV UHF Transmitters

Advantages of transmitting non-interfering signals directly to consumer TV sets

Video (CATV) modulators are VSB (only transmits upper AM sideband) and units have significant filters which have virtually no interference into the 440 MHz voice frequencies. Search used markets, i.e. ebay, new from manufacturers are expensive. Recommended models are:

- Drake VM2551 Agile Commercial Video Modulator
- Drake VMM860AG Mini Video Modulator
- CATV Channel Modulator on ebay by seller "allgizmo" ($80)
- Used modulators at http://www.charleslidstone.com/for_sale/A2020/ (probably sold out)

Modulators have superior video quality, very low outside-of-band interference, some are 12vdc, many are frequency agile. Disadvantage are low power, RF amps need to be very linear.

R.L. Drake (http://www.rldrake.com) is a well known manufacturer of CATV modulators

Frequency agile mini-modulators (light weight for portable use):

Drake DMM 806 mini-modulator,10x1x4 inches, easily set to 421, 427, 433 MHz. Attach 1/4 wave whip for a 100 mW NTSC ATV transmitter, see http://www.rldrake.com/pdf/dmm806.pdf

HMMA Holland Electronics mini-modulator, $195 from ATV Research
http://www.atvresearch.com/hmma.aspx

MMA860 Pico-Macom mini-modulator, $168 from ATV Research
identical to Drake DMM 806, http://www.atvresearch.com/mma806.aspx
http://www.atvresearch.com/specinfo/mma860.pdf

900 MHz Transmitters and Receivers

Used to be popular until overrun by Part 15 devices, now has renewed interest as many Part 15 services migrated to 2.4GHz. Easier to find commercially produced antennas.

MobiComm Communications (Netherlands) on ebay, Seller ID: gnupic

2 Watt 915 MHz ATV FM Transmitter, $135, 915 MHz ATV FM Receiver, $90*

Note: I've recently purchased 900 MHz and 2.4 GHz receivers from gnupic and both have loose connections somewhere on boards rendering them useless (they claimed boards are carefully checked). Though their 900 MHz transmitters seem to work. (Sept 2011).

Comtech http://www.hampubs.com/comtech.html

40mW 900 MHz, 1.2 GHz FM ATV transmitter, $70

900 MHz, 1.2 GHz FM ATV receiver, $70*

North Country Radio http://www.northcountryradio.com

ATV12-915 1.5W 3ch 902-928 MHz ATV Transmitter, $145 kit

RF amp and receiver preamps from Downeast Microwave at http://downeastmicrowave.com

900MHz linear amp 3340PA (40W), $235

900MHz DEM 33LNAWPQ - 33cm ATV Low Noise Amplifier, $120

Verify these will work for ATV (Downeast has very long lead times)

Most ATV transmitters and receivers will need to be packaged for easy field use:
Container box with antenna connector, RCA jacks, powerpole connections

1.2GHz Transmitters and Receivers

Warning! Verify 1.2GHz transmitters operate only on amateur radio frequencies.
Never buy anything else, most likely operates on aero-nav frequencies
If company or dealer cannot say exact frequency, then illegal to operate

Jim Andrews, KH6HTV http://kh6htv.com
3 watt 23cm model 23-1 FM-TV transmitter, $550

MobiComm Communications (Netherlands) on ebay, Seller ID: gnupic
1 Watt 1.2GHz FM ATV transmitter, $130, 1.2 GHz FM ATV receiver, $90

Comtech http://www.hampubs.com/comtech.html
40mW 1.2 GHz FM ATV transmitter, $70, 1.2 GHz FM ATV receiver, $70

North Country Radio http://www.northcountryradio.com
ATV12-1300 1W 3ch 1240-1300 MHz ATV Transmitter, $145 kit

Mini-Kits EME23TX-ATV 1.2GHz transmitter, http://www.minikits.com.au/fmatv.html

1.2GHz systems from www.hamtvstore.com ATVQ magazine says it is a scam site.

RF amp and receiver preamps from Downeast Microwave at http://downeastmicrowave.com
1.2GHz linear amp 2330PATV (30W), $240
1.2GHz receiver preamp 23LNAWPQ LNA $120
Verify these will work for ATV (Downeast has very long lead times)

Never Purchase or Use 1.2GHz That Do NOT List Actual Transmit Frequencies
Many sold on ebay, internet, Pacificon, etc. These transmit 1000 to 1180MHz aeronautical navigation (transponders) so don't contribute to knocking an airplane off course.

2.4GHz (13cm) 2300-2310 MHz, 2390-2450 MHz

Very common and compatible with Part 15 wireless video systems which are low cost. Disadvantages are excessive number of license-free devices besides video (microwave ovens operate at 2.450GHz), and extreme frequencies are mostly for point-to-point.

DFM2350TSIMP-WB, 200mW transmitter, $100 from Mobilcomm
DFM2400RTIM-B receiver, $80 from Mobilcomm*
X10, Swan wireless cameras at Frys, baby monitors, etc.

> *Note: I've recently purchased 900 MHz and 2.4 GHz receivers from gnupic and both have loose connections somewhere on boards rendering them useless (they claimed boards are carefully checked). Though their 900 MHz transmitters seem to work. (Sept 2011).*

Generally, 2.4 GHz is a crappy band…

Some amateur radio operators have formed groups to make bulk purchases of 3.5 GHz equipment.

5.8 GHz is becoming more common for Part 15 devices (lowpower, no license required) but hams can apply linear RF amplifiers, making this spectrum something to consider.

Antennas, Cables, ID Overlays

Antennas should be small for easy transport and setup, but “big” enough for RF gain.

- Small yagi antennas
- UHF J-pole, $25 from SVECS breakfast meetings and DeAnza electronics flea market
- Dualband VHF/UHF J-pole by Edison Fong WB6IQN, $20 from HRO
- Comet 1216E 1.2GHz multiple element yagi, $150 from HRO

Antenna tripod MFJ-1919, cost $80 from HRO.
MFJ-1919 is superior to ChannelMaster tripods. Lightweight, no tools required, more stable, etc.

Use the highest quality coax, i.e. LMR400 or 9913F. Do not use RG-8 or RG58.

Onscreen Titles, FCC requires callsign displayed, easiest to use are onscreen displays:

Intuitive Circuits onscreen displays: OSD-ID+ with Carrier Board: Standalone static character and graphic composite video overlay $129, http://www.icircuits.com

Jameco Electronics XBOB-NC video text module $190, http://www.jameco.com

ATV Receivers

Cable ready TV sets that are direct tune, not autotune.

Do not use “downconverters” for 70cm (not needed) unless for 900 or 1200MHz.

Ideal receivers are with built-in VCR to record events as needed.
Avoid DVD recorders (not reliable)

Stores sell new TVs that are digital, many models still have legacy NTSC analog.

http://roadtrucker.com has products to operate on 12VDC including cableready TV sets.

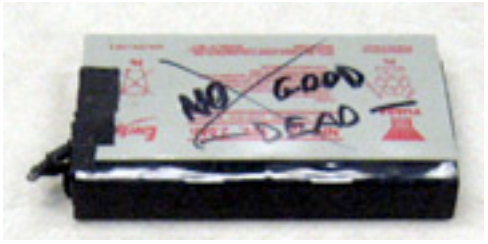
For 900 or 1200MHz, refer to products listed in previous slides.

Will need some kind of TV or video monitor with a composite video input.

Single Point Failures!

Lose one of these items and it is loss-of-mission for ATV in the field

Everyone grabs the big items (camera, transmitter, antenna)
but many times small stuff like these gets overlooked.



Insufficient battery(s) or battery has no connector

Video adapter cable from camera

"The Special Connector"

A classic example is using that "special" antenna
for ATV with uncommon connectors, and you are
stuck in the field with antenna, coax, and transmitter
but you don't have that N-to-PL-259 adapter.

Digital Television (DTV)

The Big Transition of 2009 applied only to commercial broadcast, hams can still use analog.

Future of ATV regarding DTV transition? Not immediate but in future will be an impact in terms of usable equipment and a decreasing lack of techie know-how in America. Commercial DTV modulators may be utilized, but are not cheap.

Jim Andrews KH6HTV of http://kh6htv.com sells ATV transmitters with provisions to connect an external CATV, QAM-64, HD, modulator/exciter. Jim wrote an article of analog vs. digital at http://kh6htv.com/application-notes/digital-tv-the-good-the-bad-the-ugly/

DTV signal uses "more" of spectrum as compared to analog NTSC. 6 MHz of spectrum is assigned to analog NTSC but it's AM carrier is relatively small portion of that 6 MHz. Digital ATSC transmission is a solid 6 MHz signal, however European DVB uses 2 MHz.

> See what the spectrum looks like (vs artwork) where N6QQQ "tours" TV broadcast spectrum with a spectrum analyzer just before the DTV transition, we can see how ATSC compares to NTSC at http://www.youtube.com/watch?v=DwECu6ljhmk

Digital satellite, digital cable TV, and digital OTA are all different. Can no longer do direct receive using consumer TV sets, must use "down-converters." 8-VSB is the RF modulation format utilized by the DTV (ATSC) digital television standard to transmit digital bits over the airwaves.

Nick N6QQQ has done experimentation with ATSC using systems from http://www.sr-systems.de and ATSC transmitting gear at http://www.youtube.com/watch?v=q0ky-tUrveI

Nick has additional info at his site, http://www.n6qqq.org and http://www.youtube.com/user/nsayer

DVB-T (Digital Video Broadcasting – Terrestrial) Equipment

DVB-T is preferred DTV mode over ATSC because it uses only 2 MHz of bandwidth, ATSC uses 6 MHz and difficult find that wide of uninterruptable spectrum. Unlike NTSC with low level signals between video and audio carrier peaks, other signals such as wireless mic and link channels can effectively be put in between (ATSC doesn't permit that). ATSC can be reduced to 2 MHz but that requires user being able to change that in transmitter and it is not clear if a regular TV set can receive such a lower BW signal.

Darko Banko, OE7DBH, recommended thess pages of extensive DVB-T discussion,
http://www.oe7forum.at/viewtopic.php?f=7&t=410&sid=59113315edf388157b0044f31ee81509#p1018
http://www.oe7forum.at/viewtopic.php?f=7&t=284&start=135#p1397

HiDes video in Taiwan is a provider for digital video transmission and playback equipment. Their modulators and receivers were featured in Winter 2015 issue of *Amateur Television Quarterly* and these are reasonable those wanting to get started in digital ATV. This equipment does HDTV using HDMI, and can do SDTV using composite. http://www.hides.com.tw

HV-310E modulator, $349
170 - 1350 MHz, +15dBm 474-930 MHz
Inputs: HDMI and composite video (CVBS)
HV-310EH modulator, $369
same as above but optimized for 1.2GHz for +5dBm
HV-110 receiver, $169
170 - 950 MHz
outputs HDMI and CVBS (composite)

HiDes also sells on ebay at http://www.ebay.com/usr/hides168

Digital Television (DTV) "Transmitter" Equipment

DSE24, R.L. Drake High Definition TV Encoder with QAM Modulator, $1,185
http://www.atvresearch.com/dse24.aspx
http://www.rldrake.com/pdf/dse24_cc_manual_11_2011.pdf (manual)

Tabletop digital TV modulator can be used as a lowpower (1/4 watt) ATV transmitter. Not cheap but quick way to "get on the air" (digital converter, transport stream processor, RF modulator). Input is VGA, HDMI, or component video. Output is QAM digital (what cable TV uses) and frequency selected from CATV Ch 2 to 158 (54 to 1000 MHz). Obviously transmit only on appropriate amateur radio frequencies, such as 420 to 430 MHz or 900 MHz.

DSP806, Pico-Macom All-in-One Analog/Digital Processor, $495
http://www.atvresearch.com/dsp806.aspx
http://www.atvresearch.com/specinfo/dsp806.pdf (manual)

Takes one frequency and converts it to another, any analog channel to another analog channel. Converts any digital HDTV channel to another in-house digital channel. Range: 54-806 MHz. Use this to convert a DTV commercial frequency to amateur TV frequency.

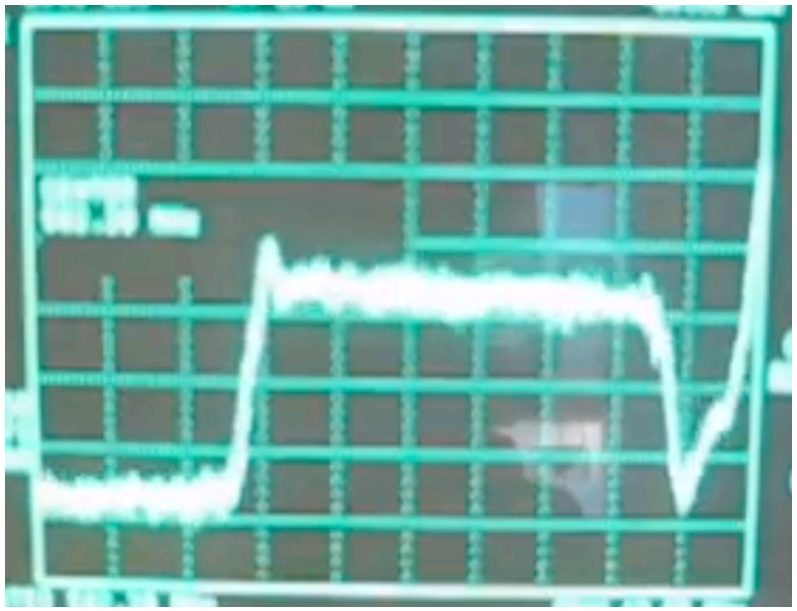
Professional 8VSB modulators (not cheap)

Equipment and chip test oriented 8VSB and 8VSB+QAM modulator test signal generators
http://www.dveo.com/broadcast-systems/professional-8VSB-modulator.shtml

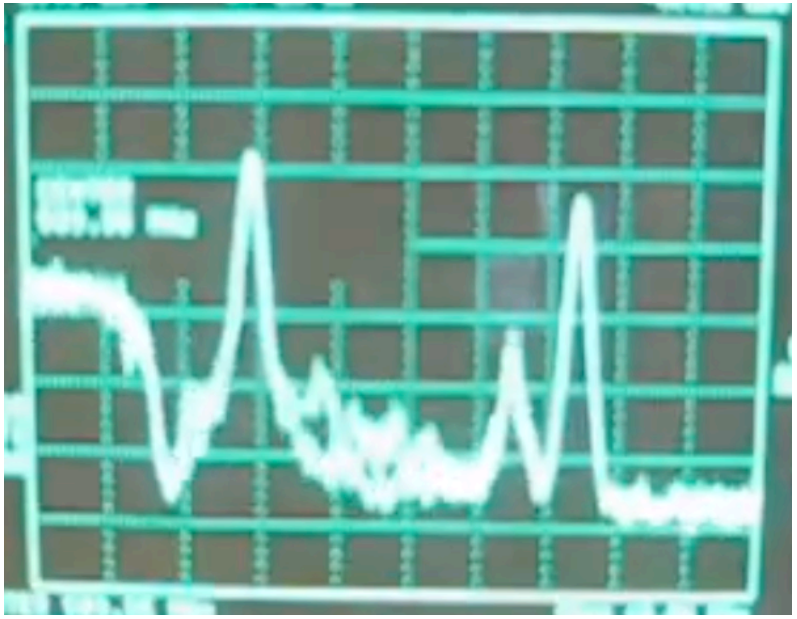
Spectrum of NTSC and DTV

From Nick N6QQQ youtube video, “San Francisco broadcast TV spectrum analyzer tour” taken before DTV transition at http://www.youtube.com/watch?v=DwECu6ljhmk

Over the air in October 2008:



ATSC spectrum (Ch 19, 500 to 506 MHz)



NTSC spectrum (Ch 20, 506 to 512 MHz)

DTV technical references:

“What Exactly is 8-VSB Anyway?” http://www.broadcast.net/~sbe1/8vsb/8vsb.htm

“What exactly is ATSC?” http://www.hdtvprimer.com/ISSUES/what_is_ATSC.html

8-VSB is the RF modulation format utilized by the DTV (ATSC) digital television standard to transmit digital bits over the airwaves to the home consumer.

Future of ATV?

iPhone making long distance ATV irrelevant:

streaming video over internet is preferred method over long distance ATV

Paradigm shift of television (hams follow broadcast TV technologies and methods):

Nobody watches realtime TV anymore
Most broadcast sports and news are prerecorded

Nobody watches over-the-air TV anymore
It is either cable, satellite, or internet streaming

NTSC may phase out, probably never have Part 97 gear for DTV (proprietary issues)

Probably never have Part 97 gear for DTV (proprietary issues), however, hams will adopt commercial formats when convenient DVB, ATSC, VSB, QAM (last will be tricky)

Amateur television is techie, hands-on, experimental (all are declining in today's society)

Local ATV Groups

Your first and fastest way to get into ATV is jump into a weekly net!

Silicon Valley ATV Group - K6BEN
http://www.mfwright.com/k6ben.html
http://www.k6ben.com (graphic intensive)
Input 1255 MHz, output 427.25 MHz (cable ch 58) NTSC AM video
Voice input 145.510 Mhz simplex
K6BEN video weekly net, visitors welcome, every Weds at 8:30 pm
Can also check in audio on 145.510 MHz simplex or 441.275+, PL123.0

Mt. Diablo W6CX ATV (Contra Costa Co.)
http://www.mdarc.org
Input 1289.25 MHz video, output 910.25 and 1241.25 (all video modes are AM)
W6CX video weekly net, Thurs at 8:00 pm, audio on 147.060+, PL100 MHz

Stanford Amateur Radio Club - W6YX probably not active
http://www-w6yx.stanford.edu/w6yx/
2433.75 MHz (X10 channel B)

Amateur Television (ATV) Info

Download this presentation from http://www.mfwright.com/ATVpresentation.pdf

Amateur Television Network (ATN)	http://atn-tv.org
Amateur Television Quarterly (ATVQ)	http://www.atvquarterly.com
Amateur Television Directory	http://www.qsl.net/atn/atv-tv.org

ATV application notes by Jim Andrews, KH6HTV at http://kh6htv.com/application-notes/

These include,

- DIGITAL TV – the Good, the Bad & the Ugly
- Antennas for Ham TV
- Add Television To Your ARES Tool Kit
- 70cm, 33cm & 23cm TV Frequencies
- Reception of Ham TV

and more

TV frequencies at http://www.standardcomm.com/_docs/_resources/Frequency-Charts.pdf

ATV on dxzone.com:
http://www.dxzone.com/catalog/Operating_Modes/Amateur_Television/index.shtml

My personal ATV page at http://www.mfwright.com/atvsetup.html
My youtube page with ATV clips at http://www.youtube.com/user/k6mfw
Lots of ATV links to sites, equipment, etc., http://www.mfwright.com/amateurtv.html