Amateur Television (ATV)

real TV, not cellphone cam

Michael Wright, K6MFW

Real television! Same 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.

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.
- NASA-TV retransmission (Space Shuttle, ISS).
- Televise techie activities from the field
- Televise parades, public events in support of ARES/RACES.

ATV Benefits

- ATV enables hams to impress their friends with technical prowess.
- ATV provides opportunities for people to experiment with television.
- 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 DRM, DCMA, EULAs, codecs, software licenses, …

ATV is *NOT*

- Webcam
- Cellphone cam
- Bluetooth, PDAs, Blackberries, etc.
- WLAN, WIFI, or Internet related
- Broadcast TV, Cable TV, Satellite TV
- Activity available only to the very rich
- Activities requiring subscriber fees, online registration, credit card #

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
- 900 MHz, 1200 MHz, or 2400 MHz transmitter and receiver boards from Mobicomm (gnupic on ebay) or Comtech (ATVQ magazine)

Save those old VHS VCR recorders!
Most are cableready and make excellent UHF ATV receivers. They have video outputs for monitors, recorders, and many have better sensitivity than TV sets.

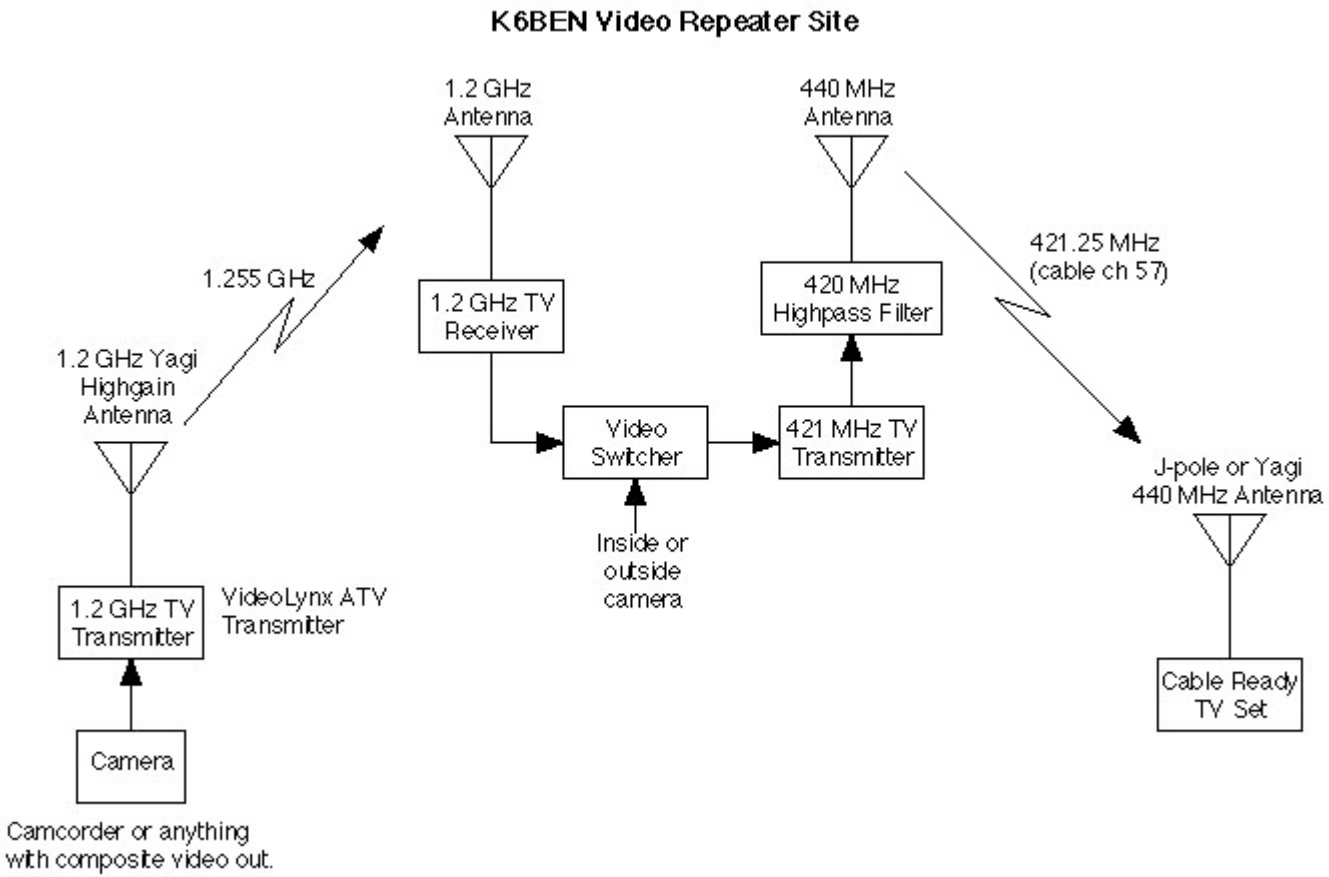
Why more CATV channels than broadcast TV channels?

- 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)
- Use “Part 73” receivers for view “Part 97” transmissions with external antenna

Digital TV. The Big Transition only applies to FCC Part 73 commercial broadcast.

Future of ATV regarding DTV transition? Not immediate but few years there will be an impact (in terms of usable equipment, lack of techie know-how)

K6BEN: South Bay's Amateur Television Station



ATV in the Field

because that's where the action is

"Shack" transmissions are boring and useless for ARES/RACES

Transmitting from the field offers excitement, TV transmissions of your own creation, show off your technical prowess, and be like the media guys reporting live on the scene.

Only use 12VDC devices (transmitters, TVs, cameras).

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.

Balance of simple systems/limited ability or flexible systems/messy.

Think like media ENG people. Slow movements, framed on subject, etc.

ARES/RACES footage is boring, it is not entertainment, but there are serious viewers.

Batteries, batteries, batteries,… whether you use a cheap camcorder, state-of-art HDTV, or dear old dad's Betamax, you must have plenty of batteries to maintain operations.

ATV Transmitters

Three bands to consider:

UHF (70cm) to transmit directly to cableready TV sets (421, 427, 434, 439 MHz)

1.2GHz (23cm) to transmit to K6BEN repeater

2.4GHz (13cm) for point to point, compatible with Part 15 wireless video monitors

RF Transmission Cable… really 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

UHF Transmitters

RTX70-1 (1w crystal controlled), $300 from PC Electronics, http://www.hamtv.com
VM-70X (5w 4-channel), $200 from VideoLynx, http://www.transmitvideo.com
Z70A Mini (100mW 4-channel), $150 from VideoLynx, http://www.transmitvideo.com

Video (CATV) modulators. These are VSB, not DSB as in "amateur TV" transmitters.

- Regular TV receivers are VSB, lower sideband not needed.
- Superior video quality, go with these and never use DSB ATV transmitters.
- Low power RF about 1/4watt, need linear amp for higher RF power

Excellent video modulator for sale at http://www.charleslidstone.com/for_sale/A2020/

- $30 plus $20 shipping
- Freq agile, 12VDC low current great for portable foot cam

R.L. Drake (www.rldrake.com) is a well known manufacturer of CATV modulators
Drake VM2551 Agile Commercial Video Modulator ($600 new)
Drake VMM860AG Mini Video Modulator (a few hundred dollars new)
however many used modulators can be found on ebay

Linear amps must be class A type (do not want distortion) but verify amplifiers will work for television transmissions.

Downeast Microwave, http://www.downeastmicrowave.com (very long lead times)
Made specifically for ATV: UHF 7025PA (35W), $210

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

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-navigation frequencies
- If company or dealer cannot say exact frequency, then illegal to operate

MobiComm Communications (Netherlands) on ebay, Seller ID: gnupic
Sales are via buy-it-now

DFM1200TSIM, 50mW 1.2GHz ATV transmitter, $70
DFM1200TSIM1W 1watt 1.2GHz ATV transmitter, $130
DFM1200RTIM 1.2GHz receiver, $80 (needs preamp)

Linear amp from 1.2GHz Downeast Microwave 2330PATV (30W), $240

Receiver preamp 1.2GHz Downeast Microwave 23LNAWPQ LNA $120
verify will work for ATV (very long lead times)

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

Comtech 1.24 to 1.30 GHz Transmitters ($70) and Receivers ($70)
Transmitter power is 40mW, receiver may need de-emphasis circuit
available from http://comtech.hampubs.com

Never Purchase or Use 1.2GHz That Do NOT List Actual Transmit Frequencies
There are plenty on ebay, sold on-line, sold at Pacificon, etc. These transmit 1000 to 1180MHz range, this is aeronautical navigation (transponders) so don't be a contributor to knocking an airplane off course.

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

point to point, compatible with Part 15 wireless video monitors

DFM2350TSIMP-WB, 200mW transmitter, $100 from Mobilcomm
DFM2400RTIM-B receiver, $80 from Mobilcomm

X10, Swan wireless cameras at Frys, baby monitors, etc.
These are 4-channel, only 2 operate on amateur radio frequencies.

Microwave ovens operate at 2.450GHz

2.4GHz is a crappy band…

Digital Television

Most likely will never be Part 97 “amateur” gear (mpeg is a proprietary format)

Commercial products (maybe) from companies RL Drake, Vecima, Harris,…

DTV signal requires more power, uses “more” of spectrum as compared to analog NTSC

Analog NTSC uses 6 MHz spectrum but it’s AM carrier is relatively small slice

Digital transmission is a solid 6 MHz signal

Terrestrial and satellite use different modes.

ATSC vs. “DVB” Europeon mode

November 1, 2008 N6QQQ performed ATSC transmission on UHF ham band,
German DATV from (http://www.sr-systems.de) on 420-426 MHz with 1/10 milliwatt.

Nick does a tour of the ATSC transmitting gear at
http://www.youtube.com/watch?v=q0ky-tUrveI

“This is a capture of my ATSC ATV setup. This time, I am using the camera to give a tour of the equipment, including showing the transmitted signal on a spectrum analyzer.”

Cameras

Any camera with composite video output and 12VDC, no need to send sound

CCD cameras are typical, many on the used market. Avoid tubetype cameras.

Camera should be 12VDC with composite video output. If not 12VDC, it should be equipped with necessary inverter (but keep it small to maintain efficiency)

Camera with built-in titlemaker and that is not “auto shut-off” a real plus

A recommended camera is Sony TRV-138, $215 from B&H Photo or BestBuy

Antennas, Cables, ID Overlays

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

- 3-element UHF yagi, $40 from centerfireantenna.com
- "American Legion" 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, not as ugly, etc.

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

Intuitive Circuits onscreen displays: OSD-ID-SA $120, OSD-ID-PC $140, OSD232 $100
http://www.icircuits.com

Jameco Electronics XBOB-NC video text module (part # 283768) $190
http://www.jameco.com

ATV Receivers

Cable ready TV set that is direct tune, not autotune. Do not use “downconverters”

Ideal receiver is one with built-in VCR to record ARES/RACES events as needed. Avoid DVD recorders (not reliable)

Stores sell new TVs that are digital. Analog only no longer available including Icom R3.

Last year there were NO brand new small TV sets for sale, Best Buy, Circuit City are now beginning to stock with small lower cost TV sets.

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

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://k6ben_svatv.tripod.com/index.html (has sound file)

Input 1255 MHz video, output 421.25 MHz (cable ch 57) NTSC 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 443.125+, PL123.0

Mt. Diablo W6CX ATV (Contra Costa Co.)
http://www.mdarc.org

Input 1289.25 MHz video, output 910.25 and 1241.25
Can no longer use 427 MHz due to PAVE PAWS

W6CX video weekly net, Thurs at 8:00 pm, audio on 147.060+, PL100 MHz

Stanford Amateur Radio Club - W6YX
http://www-w6yx.stanford.edu/w6yx/
2433.75 MHz (X10 channel B)

Amateur Television (ATV) Info

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

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

Slow Scan TV (SSTV) software:
http://www.dxzone.com/catalog/Software/SSTV/index.shtml

NASA-TV retransmissions from Ames Amateur Radio Club to K6BEN:
http://hamradio.arc.nasa.gov/AARCatv.html

ATV presentation at SARA in 2008:
http://www.k6sa.net/media/SARAATVpresentationRev2.pdf

ATV presentation at SVECS in 2007:
http://www.svecs.net/ATVpresentation.pdf

ATV presentation at AARC in 2005:
http://hamradio.arc.nasa.gov/meetings/ATVpresentation.html

Lots of ATV links to sites, equipment, etc.
http://hamradio.arc.nasa.gov/amateurtv.html

ATV Frequencies in Reference to Broadcast and CATV Frequencies

	Over the Air Broadcast		Cable Television (coax enclosed)	
Ch	Video Freq	Audio Freq	Video Freq	Audio Freq
57	729.25	733.75	421.25	425.75
58	735.25	739.75	427.25	431.75
59	741.25	745.75	433.25	437.75
60	747.25	751.75	439.25	443.75

NOTE: Broadcasters no longer use 700 MHz frequencies after June 2009. Reallocated to wireless services and LMR.

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

Foothills Amateur Radio Society July 24, 2009 meeting:
ATV by Michael Wright K6MFW

“See you on the tube”

My personal ATV page at http://www.mfwright.com/atvsetup.html

My youtube page with lots of ATV clips among other items
http://www.youtube.com/user/k6mfw