



**Application Note**  
**AN-4**  
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## **Antennas for Ham TV**

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One word summarizes the major spec. requirement for ham TV antennas -- ***Broad-Band.*** Buyers should be cautioned before buying any antenna for ham TV to verify that it has sufficient bandwidth to cover the entire ham band. Many antenna manufacturers' specs. fail to include sufficient bandwidth information. For example many 70cm yagis are quite narrowband and tuned to operate only on 432 MHz for ssb, moon-bounce, etc. Likewise, many 70cm base station and mobile antennas are designed only to operate on the high end, 440-450 MHz, FM voice portion of the band. None of these have adequate bandwidth for ham TV service. This app. note recommends antennas which we have found to perform satisfactory for ham TV. Not all possible antennas were tested.

In the summer of 2011, the Boulder County ARES (BCARES) was having some issues with their ham TV installation on the new county EOC & 911 center. It appeared that some antennas were not performing up to the manufacturers specs. I was asked by the BCARES chairman, Allen, K0ARK, to look into the situation. I thus decided to run an exhaustive set of tests on these antennas and also many other different 70 cm and 23 cm antennas. I set up an antenna range in my back yard to measure the antenna gains. I also set up a network analyzer to measure their VSWR. A very exhaustive report was provided to BCARES and we were able to solve their antenna issues as a result. In this app. note, I summarize the findings. Only antennas that are presently commercially available are listed here. A copy of the complete BCARES Antenna Report is available upon request to: [kh6htv@arrl.net](mailto:kh6htv@arrl.net)

As a side-note, the question always comes up among hams --- "Should I use horizontal or vertical polarization ? " BCARES answer is always use vertical. Our reason is that many of our field operations involve portable pack-sets with small, rubber-duck style antennas and also mobile ops with mag. mount, vertical, whip antennas.

**Table 1 --- 70 cm Antenna Gains in dBi** ( Uncertainty =  $\pm 1.5$  dB )

ANTENNA (freq in MHz)	421.25	427.25	433.25	439.25	445.25
(TV channel)	Ch 57	Ch 58	Ch 59	Ch 60	Ch 61
<i>Pack Set Whip Antennas</i>					
Diamond RH951S	-0.8 dBi	2.4	1.9	2.2	0.9
Diamond SRH999	-6.3	-3.1	-1.1	0.7	2.7
<i>Mobile Whip Antennas</i>					
Diamond NR2000NA	2.2	6.4	7.5	8.9	9.1
Larson 5/8 $\lambda$ NMO-UHF	5.3	8.1	7.5	6.7	5.4
<i>Base Station Omni Verticals</i>					
Diamond X6000A	1.3	4.3	4.7	6.5	10.7
Diamond X50NA	11.7	12.9	11.8	12.2	14.1
<i>Yaggi Antennas</i>					
M2 440-6SS, 6 element	11.2	10.2	10.4	10.1	15.2
M2 420-50-11, 11 element	14.7	13.8	13.7	13.9	18.4
Diamond A430S10, 10 element (center mt. -- PVC mast)	13.4	13.1	13.4	13.6	16.6
Diamond A430S10,10 element (center mt -- metal mast)	9.9	9.4	10.1	10.6	15.1
Diamond A430S15, 15 element (center mount -- PVC mast)	15.7	14.4	14.5	16.2	19.5

**Table 2 --- 23 cm Antenna Gains in dBi** ( Uncertainty =  $\pm 3$  dB )

ANTENNA	1247 MHz	1277 MHz	1292 MHz
<i>Pack Set Whip Antennas</i>			
Diamond RH951S	1 dBi		4 dBi
Diamond SRH999	4 dBi	4 dBi	7 dBi
Diamond SRH815	-10 dBi	-8 dBi	-5 dBi
<i>Mobile Whip Antennas</i>			
Diamond NR2000NA	7 dBi	7 dBi	7 dBi
<i>Base Station Omni Verticals</i>			
Diamond X6000A	7 dBi	7 dBi	8 dBi
<i>Directional Antennas</i>			
Directive Systems 2414LY, Loop Yaggi, 14 ele	18 dBi	17 dBi	17 dBi
Directive Systems 2424LY, Loop Yaggi, 24 ele	20 dBi	18 dBi	18 dBi
Olde Ant Lab - 23/13cm, 15 turn, Helix	18 dBi	13 dBi	12 dBi

**Table 3 --- KH6HTV Recommendations  
ANTENNAS for BROADBAND, HAM TV SERVICE  
(420-450 MHz & 1240-1300 MHz)**

*Pack Set Whip Antennas:*

for 70 cm, use the Diamond model RH951S, 2 dBi nom. gain

for 23 cm, use the Diamond model SRH999, 4 to 7 dBi nom. gain

*Mobile Whip Antennas:*

for 70 cm TV only, use the Larsen NMO-UHF, 5 to 8 dBi nom. gain

use the Diamond model NR2000NA for 2m (voice), 70cm (2 to 9dBi), & 23cm (7dBi)

*Base Station Omni-Directional Antennas:*

for 70 cm, use the Diamond model X50NA, 12 dBi nom. gain

for 23 cm, use either the Diamond model X6000A or NR2000A, 7 dBi nom. gain

*Directional Antennas:*

for 70 cm, Short Yaggi, use M2 440-6SS, 6 element with 11 dBi gain.

Long Yaggi, use Diamond A430S15, 15 element with 14 to 19 dBi gain

for 23 cm, use the Directive Systems model 2414LY, 14 element, 17 dBi, Loop Yaggi.

The 24 element version does not add significant extra gain to warrant the 2X size. The Olde Antenna Lab Helix antenna is a good, lower gain, 13 dBi, antenna in a more compact package, but considerably more expensive.