“Smalband” ATV (SATV)

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1 Introduction

This document describes “Smalband” ATV (SATV), an ATV mode popular in the Netherlands. In Dutch, “Smalband” means “narrow band” (“Schmalband” in German). Although this technique has been applied to PAL and SECAM analog ATV in Europe, it can also be used with NTSC analog ATV.

2 What is SATV?

SATV was first suggested by Heinz-Guenter Venhaus, DC6MR, in a 1972 article in *TV-Amateur*, the publication of AGAF, the German ATV club. DC6MR proposed using a 1 MHz lowpass filter between the video source and ATV transmitter, reducing the bandwidth of the ATV signal from about 10 MHz to 2 MHz. The narrow band signal lacks color and the FM sound subcarrier, but a voice signal can be added by FM modulation of the video carrier.[1]

Interestingly, the Aptron Labs AX-10B ATV transmitter allows the operator to select either the usual 4.5 MHz FM sound subcarrier or FM voice modulation of the video carrier. Alternatively, voice communication can accompany the SATV image signal by means of a 2-meter FM link.

3 Why SATV?

SATV has been popular in Europe, especially in the 70 cm band, since that band is only 10 MHz wide. A single 10 MHz wide double-sideband AM analog ATV signal would occupy the entire band! So SATV allows the band to be shared with other users.

In the U.S., the 70 cm band is wider, but really not wide enough for ATV signals with 10 MHz bandwidth, especially in populated areas. So the considerate ATV'er will transmit with bandwidths of 2 MHz or less, using SATV or digital TV (or at least transmit analog TV with suppression of the lower sideband).

4 Implementing SATV

Implementations of SATV are found in the BATC publication *CQ-TV* in articles by G8CHK, G8MNY and PA3CRX [2, 3, 4], and on PE1ITR's website.[5]

The author constructed the 1 MHz lowpass video filter described by PA3CRX and PE1ITR. See the PE1ITR website for a schematic. The author's filter is identical to their filter, except that the 27 µH inductor (L_5) is replaced by separate 4.7 µH (L_{5A}) and 22 µH (L_{5B}) inductors in series (the separate inductors have higher resonant frequencies than available 27 µH inductors). A parts list for the filter is shown on pp. 5-6. The author's filter is shown in Figure 1 appended to this document.

A video camera NTSC signal was applied to the filter, with its output monitored with a tinySA® spectrum analyzer. The spectrum, shown in Figure 2, provides an approximate indication of the filter's performance:

- 3 dB cutoff = 1 MHz (approx)
Stopband attenuation = - 50 dB (approx)

the same as measured by PA3CRX and PE1ITR.

Figures 3 and 4 show the received 439.25 MHz TV image before and after adding the lowpass filter. The transmitter is an Aptron Labs AX-10B. The receiver is a Sony Bravia receiver tuned to cable channel 60 and connected to an antenna. Figure 4 shows how the filter removes color and reduces resolution.

The voice signal from the Aptron transmitter, produced by FM modulation of the video carrier, was monitored on the author's BTech UV-25X2 VHF/UHF transceiver tuned to 439.240 MHz. The -10 kHz offset is probably due to the varactor circuit used for FM modulation of the Aptron's crystal oscillator. Audio quality was good.

The SATV signal is compatible with any analog TV receiver. However, improved signal-to-noise reception is possible using receivers with lower bandwidth. Dongle-type SDR receivers offer lower bandwidth suitable for receiving SATV. In his *CQ-TV* article, PA3CRX describes using an RTL-SDR dongle receiver with SDRSharp software to receive SATV. He used the PAL/SECAM/NTSC TV plugin, part of the "Community Plugin Package" released in 2019.

Parts List for SATV Filter (see PE1ITR website for schematic)
All components available from Newark Electronics

Ref. Desig.	Qty	Description
L_3, L_9	2	18 µH (Newark 63K2928)
L_4	1	3.3 µH (Newark 63K2936)
L_{5A}*	1	4.7 µH (Newark 63K2943)
L_{5B},* L_7	2	22 µH (Newark 63K2932)
L_6	1	10 µH (Newark 42AH0135)
L_8	1	8.2 µH (Newark 86K8305)

* L_{5A} and L_{5B} are connected in series to form L_5 = 27 µH

Parts list is continued on p. 6.

Parts List for SATV Filter (cont.)

C_4	1	2200 pF, silver mica (Newark 81K0666)
C_6	1	1500 pF, silver mica (Newark 81K0849)
C_8	1	1800 pF, silver mica (Newark 81K0858)

5 References

1 *VHF Managers Handbook,* 2016, IARU Region 1. A description of SATV is found on p.119.
https://thf.r-e-f.org/docs/Handbook_7.51.pdf

2 King, R., G8CHK "Video Filter for 70 Cm," *CQ-TV*, No. 153, February 1991, p. 20
https://batc.org.uk/wp-content/uploads/cq-tv153-1.pdf

3 Stockley, J., G8MNY "Narrow Video TX Filter," *CQ-TV*, No. 166, May 1994, pp. 79-80
https://batc.org.uk/wp-content/uploads/cq-tv166.pdf

4 van den Berg, C., PA3CRX "Reduced bandwidth analogue ATV, the easy (lazy?) way," *CQ-TV*, No. 269, Autumn 2020, pp. 38-41
https://batc.org.uk/cq-tv/cq-tv-download/
(available only to BATC members)

5 Hardenberg, R., PE1ITR. PE1ITR web page. Use Google Translate for a version in English.
http://pe1itr.com/432mhz/satv-met-70cm-zender.htm

Last revision: 4/2/21

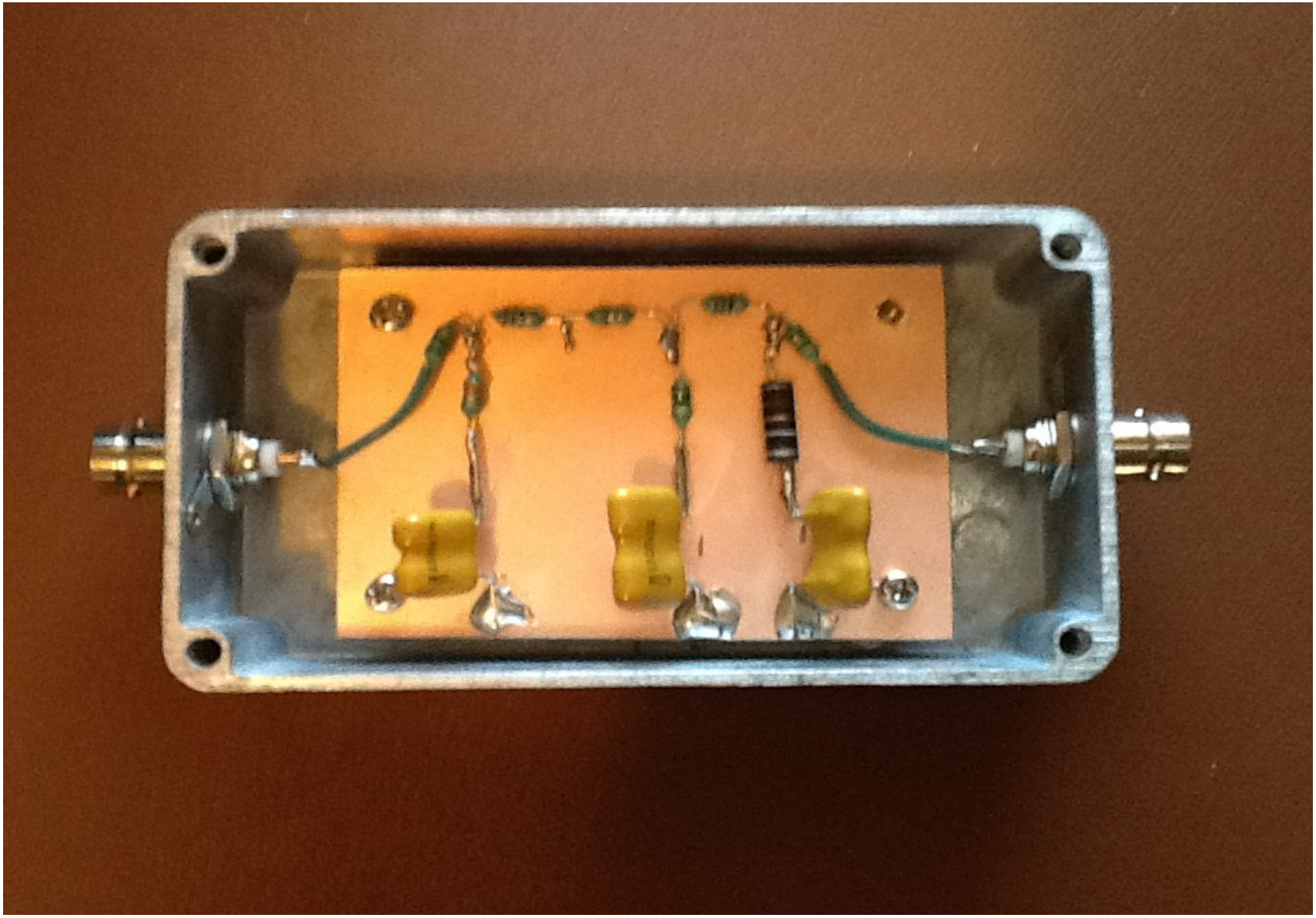

Figure 1: The assembled 1 MHz lowpass video filter (housed in a Hammond 1590B enclosure)

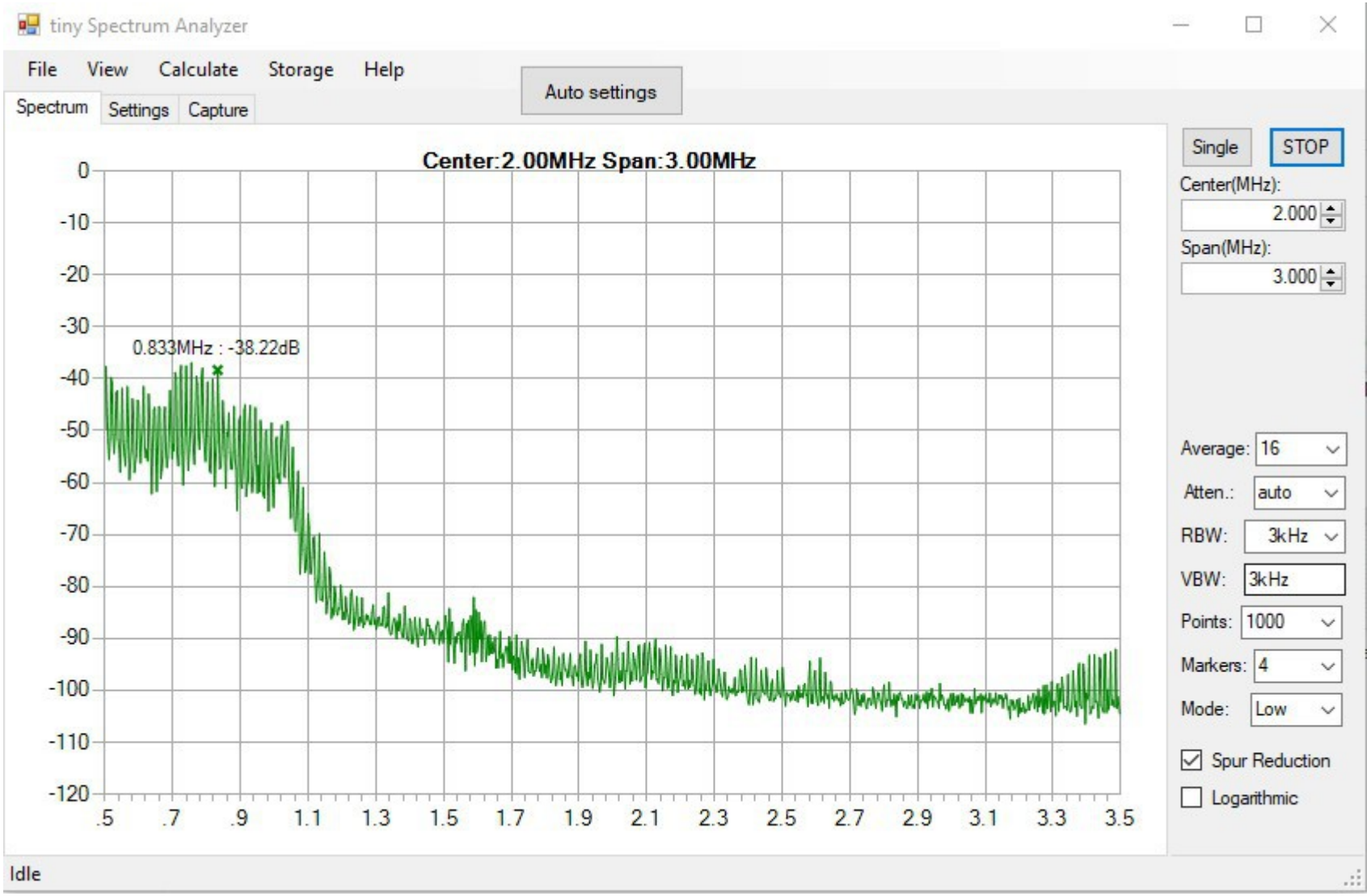

Figure 2: The spectrum at the output of the 1 MHz lowpass video filter, with its input fed from an NTSC video camera (measured with a tinySA® spectrum analyzer)

Figure 3: The received ATV image, <u>without</u> the lowpass video filter (it's <u>not</u> SATV)

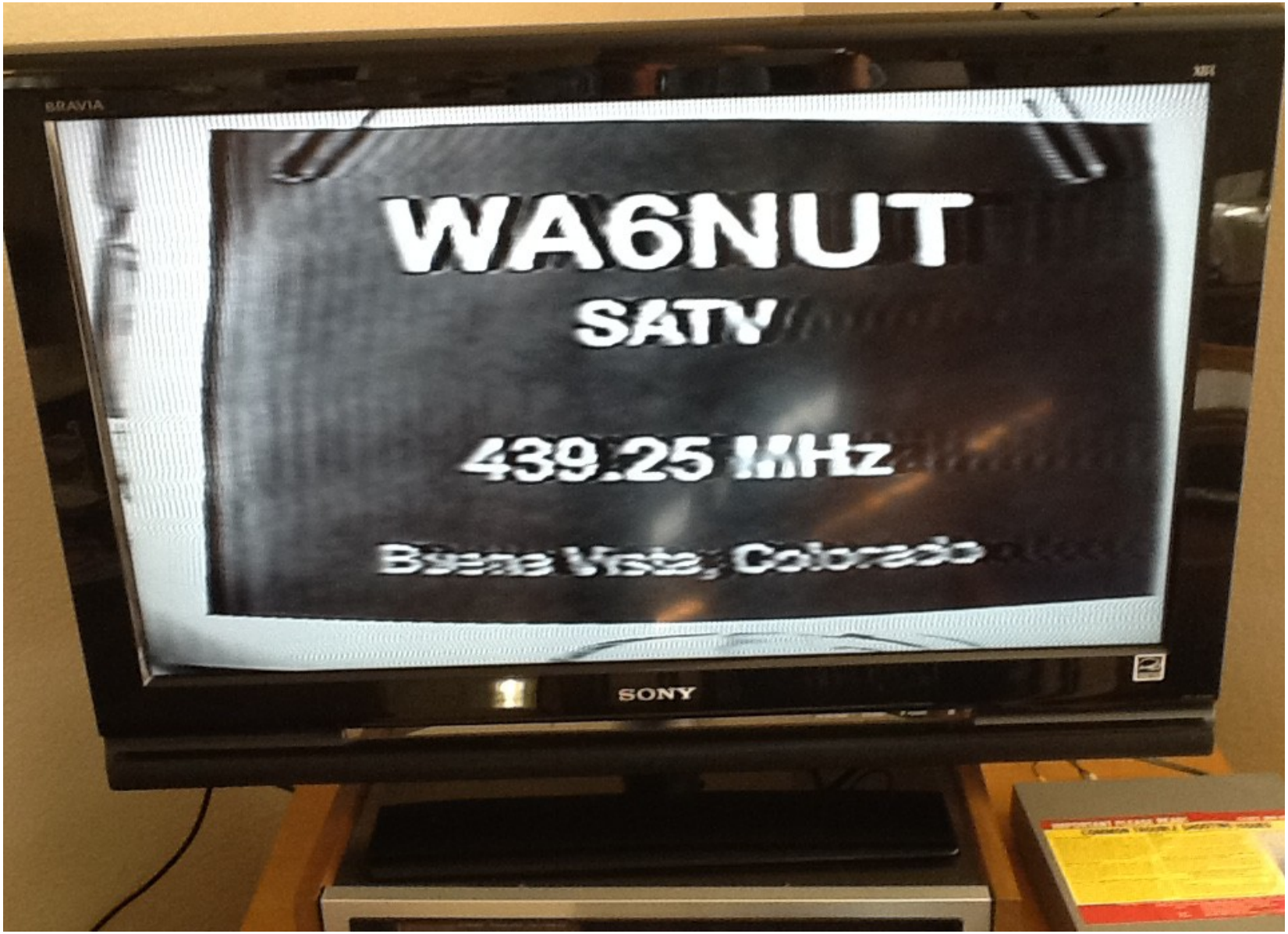

Figure 4: The received SATV image. Note the distortion in the QTH ID and lack of color. Page 10