



Report of Measurements
5000 Watt ATSC
Digital UHF TV Transmitter
Model AT75K0

Report of Measurements
AT75K0 DTV - ATSC UHF TRANSMITTER
June – 2009

Introduction

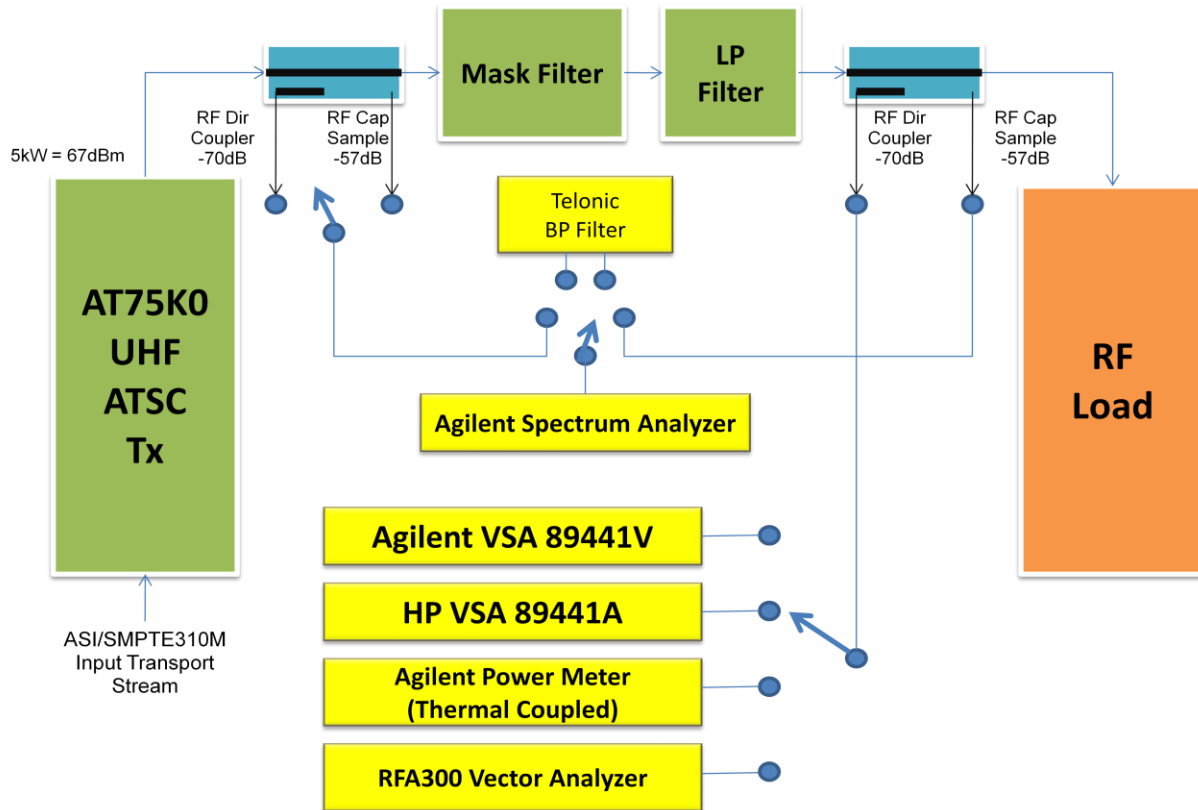
The following information intends to demonstrate the AT75K0 UHF DTV-ATSC transmitter meets the appropriate requirements applicable portions of Part 74, as summarized on the 6 items listed below:

1. Equipment Setup
2. RF Power Output Measurements.
3. Frequency Stability.
 - a. Versus Temperature
 - b. Versus Input Voltage
4. Out of Channel Characterization:
 - a. Adjacent Channels
 - i. Shoulders
 - b. Adjacent Channels
 - i. Full Power FCC Mask Compliance
 - c. Conducted Harmonic and Spurious Measurements
5. In Channel Signal Characterization.
 - a. EVM
 - b. SNR (MER)
 - c. Phase Noise
6. Cabinet Radiation; Harmonic and Spurious Measurements. ANNEX.

These parameters were measured at a power output level of 5000 watts and the range of power for which type certification is sought, 25% of that value (i.e. 1250 watts).

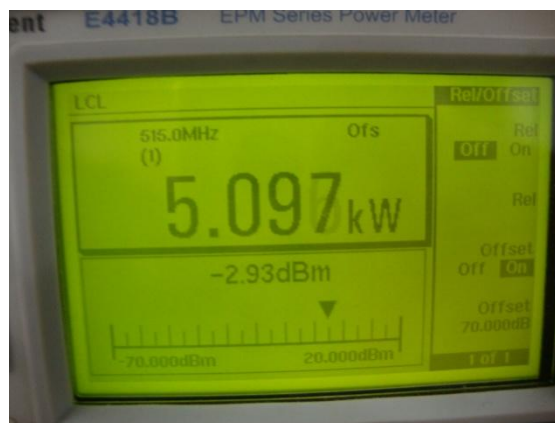
All instruments were calibrated at the time of the measurements.

1. Equipment Test Setup



2. RF Output Measurement

The loss through the RF cables and directional coupler was considered at the channel center frequency. The average power was read on the Agilent EPM Series Power Meter, and probe.



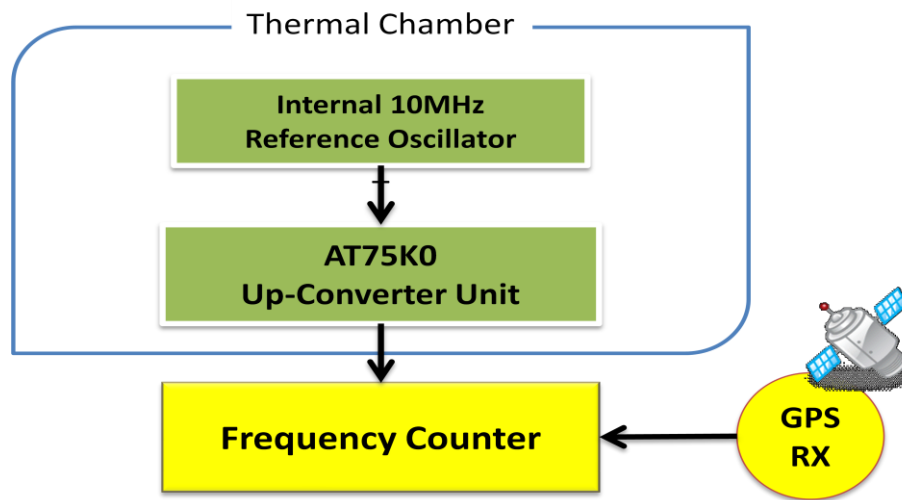
RF Output Power Measurement

3. Frequency Stability Measurements

The pilot carrier frequency is determined by a local oscillator which is synthesized by a Phase Locked Loop which is referenced by a 10MHz signal from an internal OCXO. The nominal pilot frequency for channel 21 is 512,309,441 Hz.

a. Versus Temperature

The oscillator circuitry was placed in a pre-warm +30°C temperature chamber and the temperature was raised and reduced +50°C to -30°C. The oscillator during 180 minutes was allowed to stabilize at each temperature before the measurements were recorded. Table below show the results.



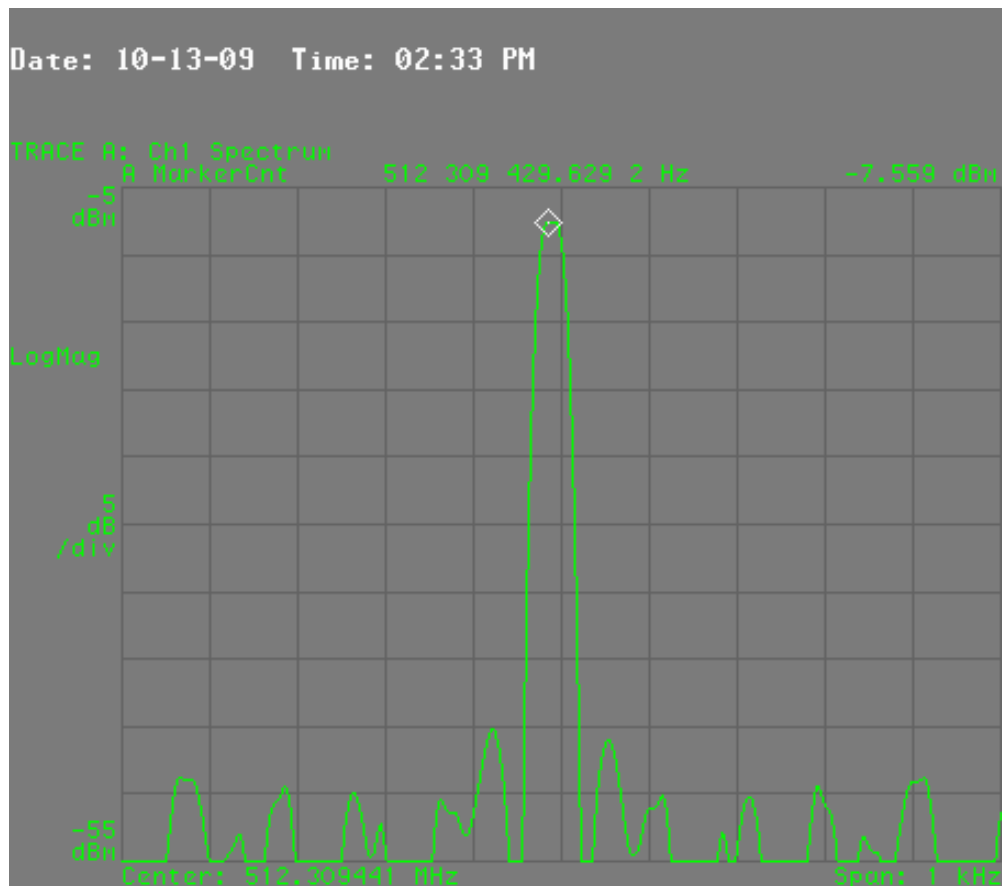
Ref. CH35 Pilot Frequency: 596,309,441

Temperature [°C]	Frequency [Hz]	Offset [Hz]
0	596,309,816	+375
+10	596,309,329	-112
+20	596,309,354	-87
+30	596,309,341	-100
+40	596,309,316	-125

b. Versus Input Voltage

The oscillator frequency was measured as the input line voltage of the exciter drawer was varied, using a Variac transformer, from 171Vac to 245Vac. The results are shown below.

Line Voltage [Vac]	Frequency [Hz]	Offset [Hz]
171	596,309,440	-1
208	596,309,440	-1
245	596,309,440	-1



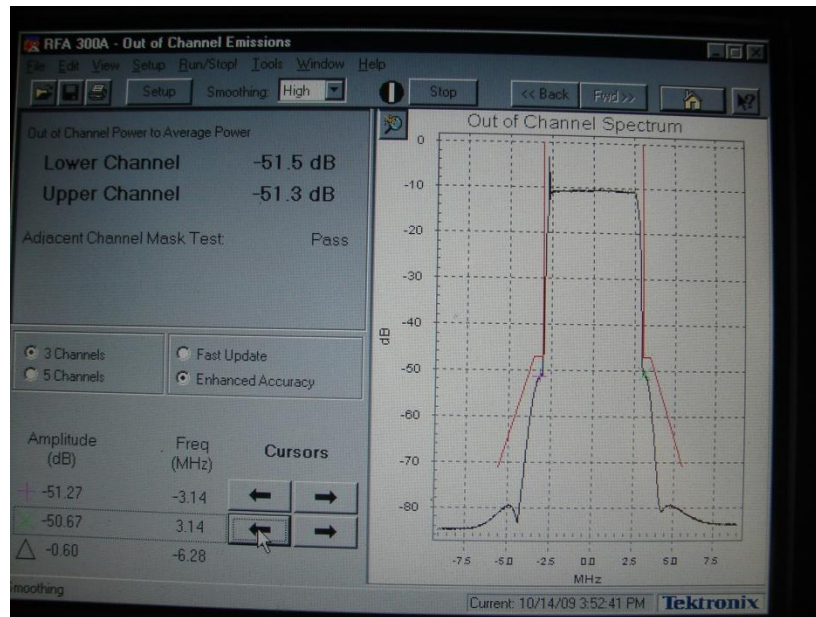
CH21 Pilot Frequency Measurement – 512,309,429.629 Hz

[Δ = -11.371 Hz]

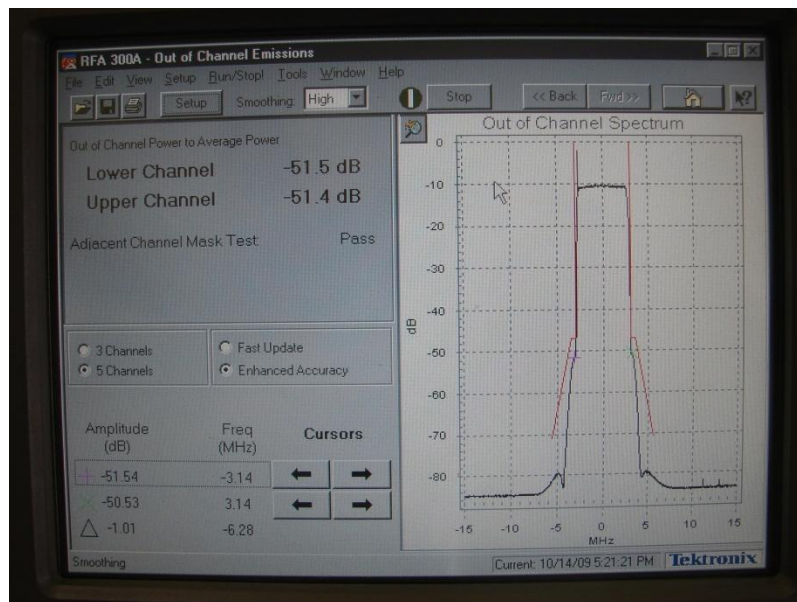
4. Out of Channel Characterization

a. Adjacent Channels

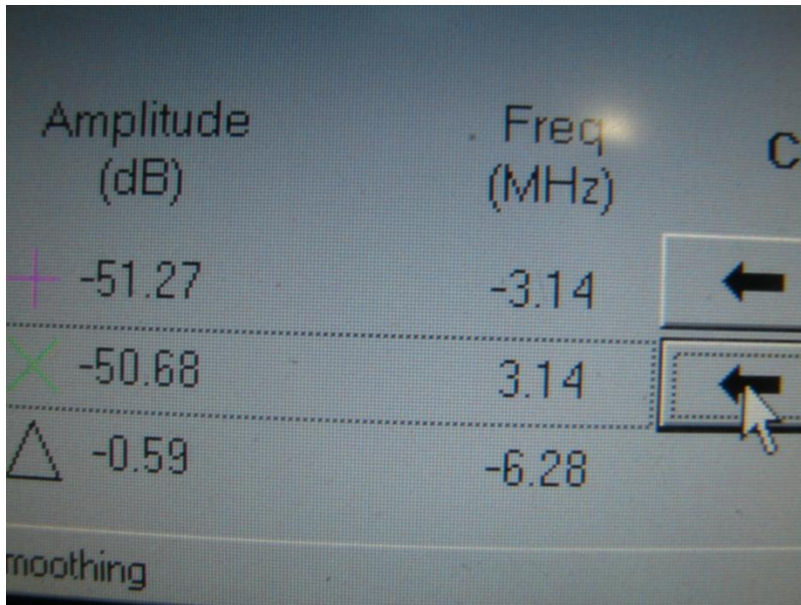
i. Shoulders



Adjacent Channels Power Spectrum – 3 CHANNELS

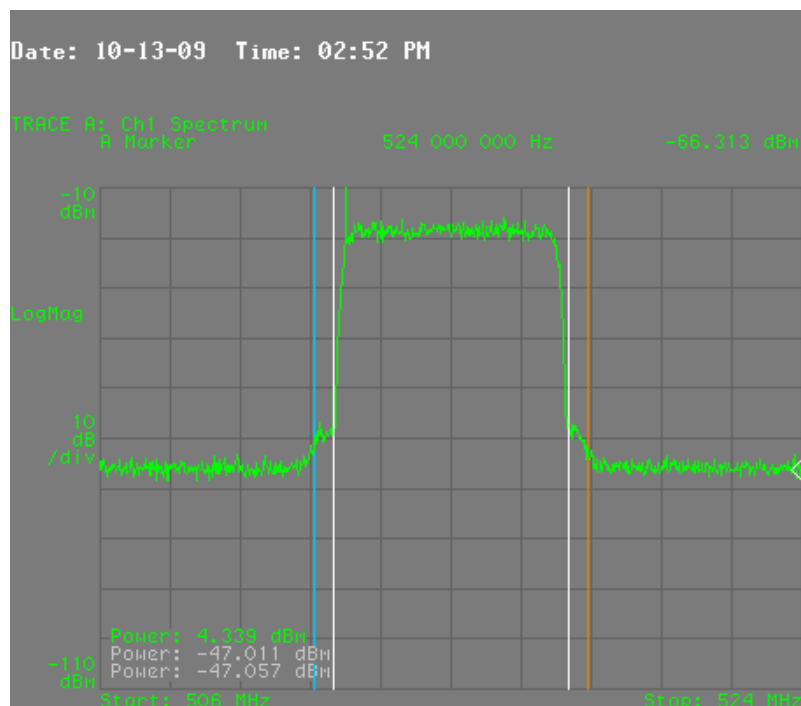


Adjacent Channels Power Spectrum – 5 CHANNELS



RFA300 - Shoulder Readings – MES: [-51.27dB/-50.68dB.] – STD: (-47dB/-47dB.)

$\Delta = -4.27\text{dB}/-3.68\text{dB}$. Positive numbers it is out of FCC specs.



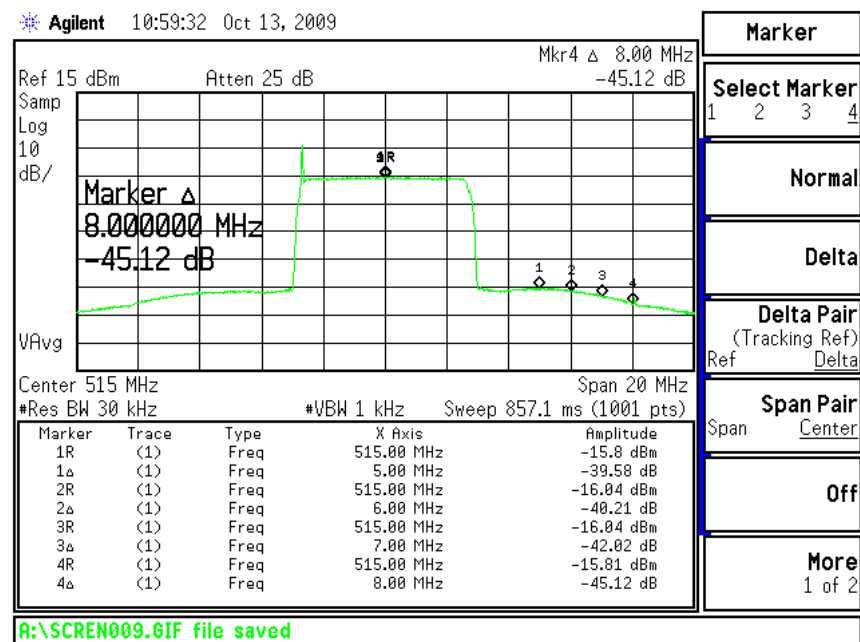
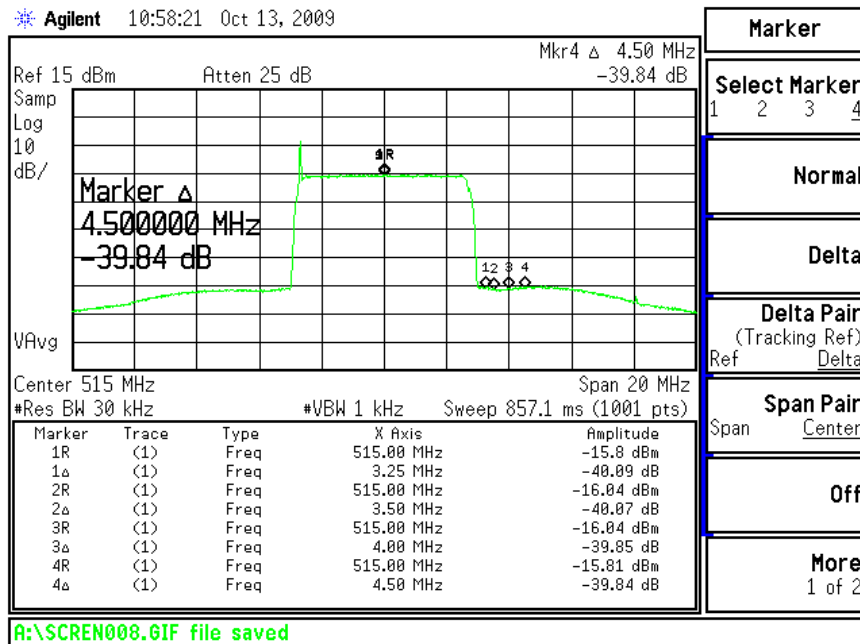
89441V – Shoulder Readings: [-51.41dB/-51.39dB.] – STD: (-47dB/-47dB.)

$\Delta = -4.41\text{dB}/-4.39\text{dB}$. Positive numbers it is out of FCC specs.

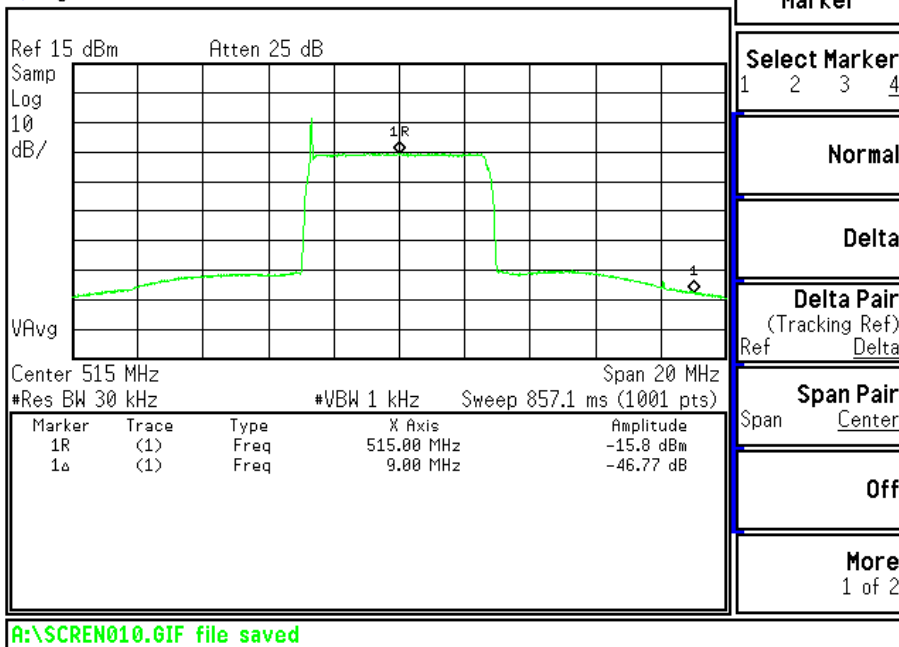
b. Adjacent Channels

i. Full Power FCC Mask Compliance

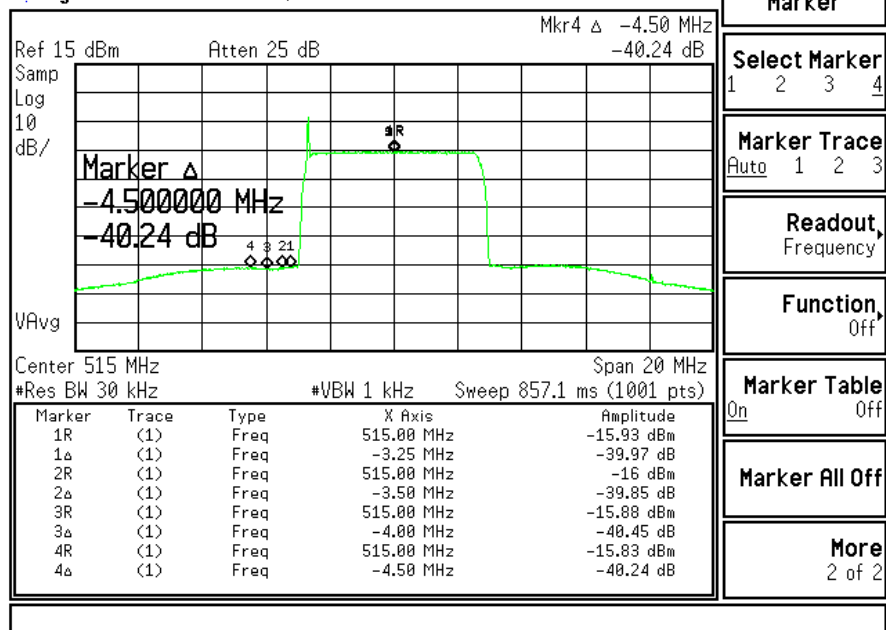
Following is shown a sequence of the TRANSMITTER RESPONSE, took by E4404B Agilent Spectrum Analyzer reading screens, on the adjacent channels BEFORE the FCC Mask Filter. The measurements are also shown on the FCC Mask Compliance Table.



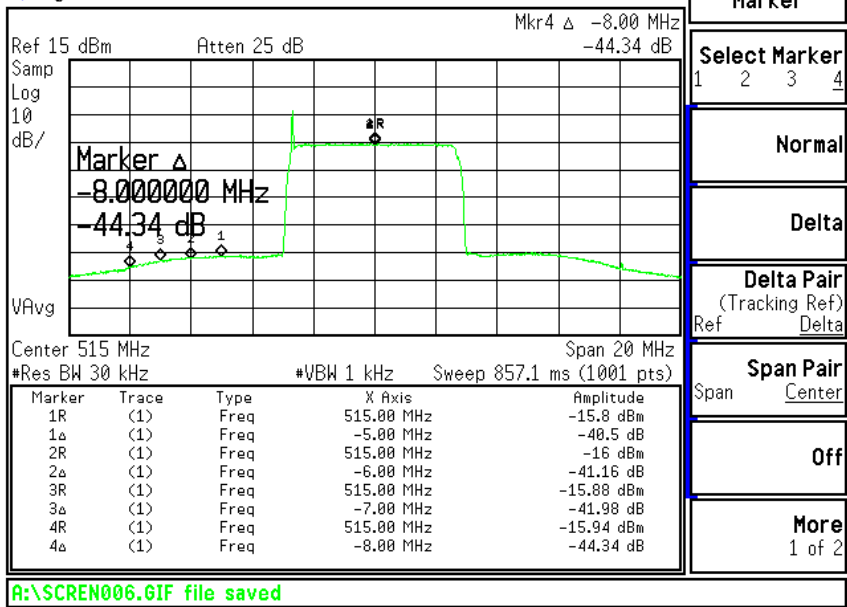
Agilent 11:00:25 Oct 13, 2009



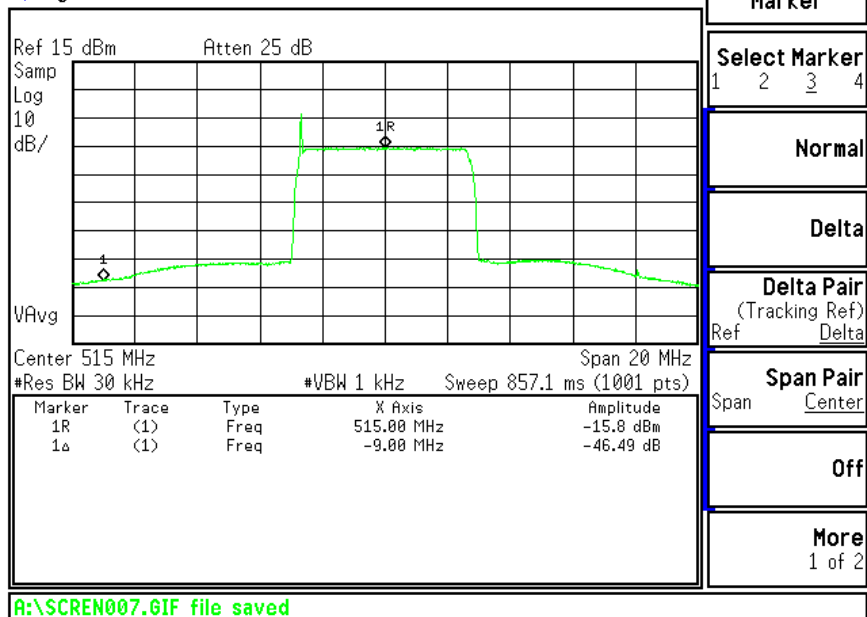
Agilent 10:50:02 Oct 13, 2009



Agilent 10:54:56 Oct 13, 2009

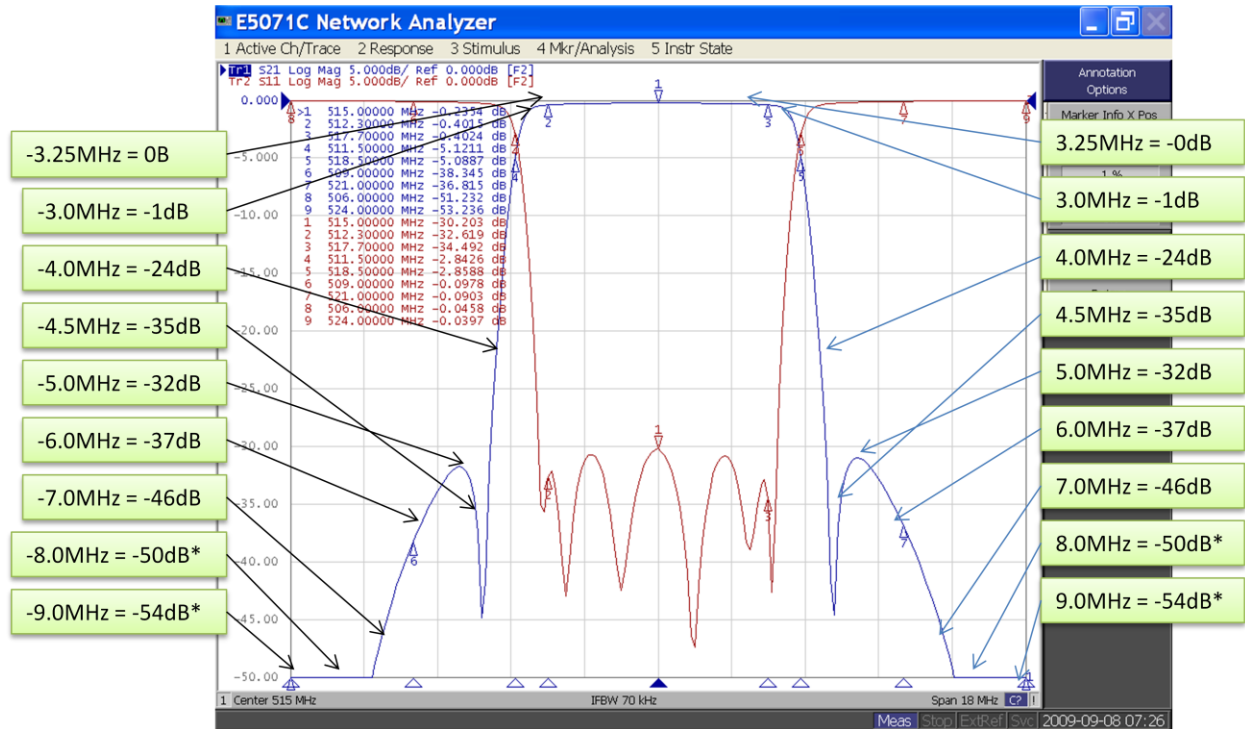


Agilent 10:56:33 Oct 13, 2009



FCC Mask Filter, factory final test report. Data extracted by extrapolation and transferred to the FCC Mask Compliance, FILTER RESPONSE.

CF± 9MHz, estimate: -54.00 dB.



FCC Mask Filter – S21: Frequency Response, blue trace.

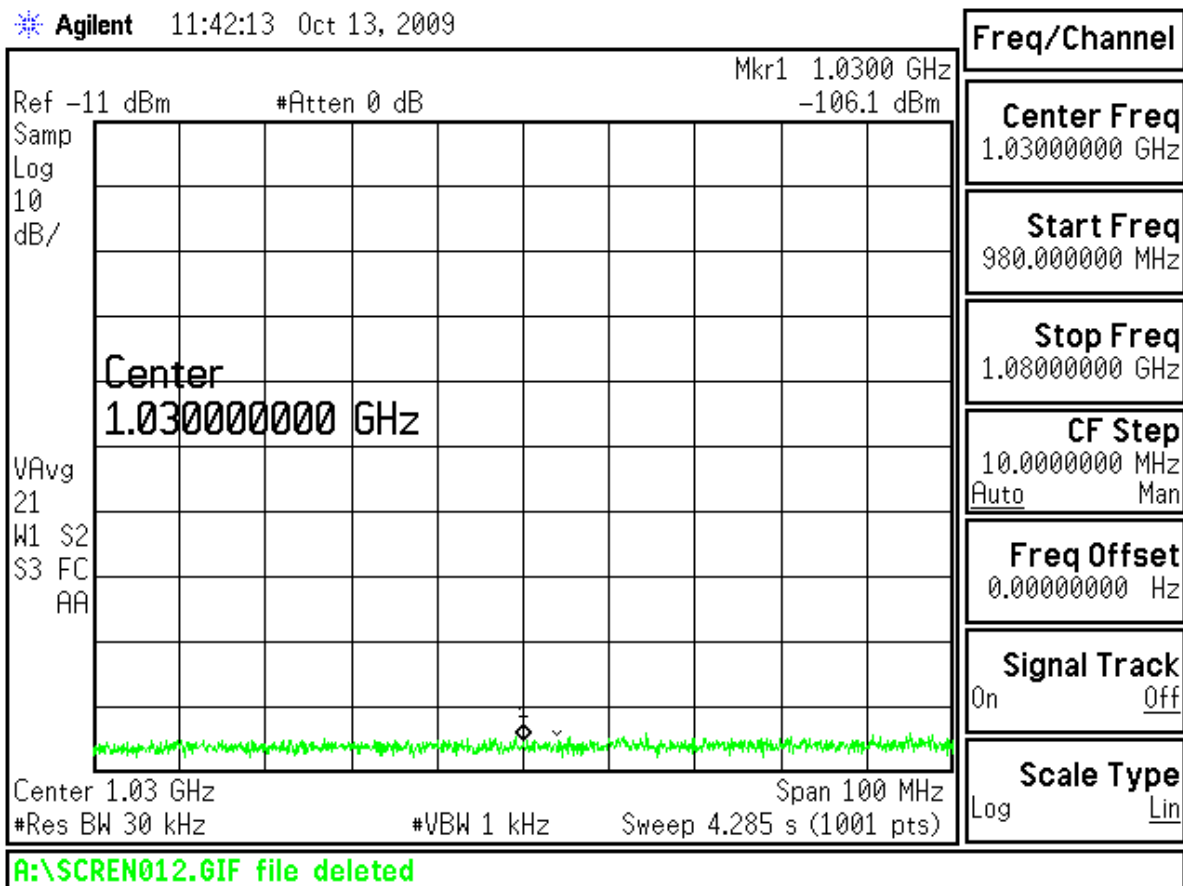
FCC Compliance Table.

The table below demonstrates that the AT75K0 comply with the FULL POWER FCC MASK requirements.

Frequency MHz	Filter Δ CF	Response	Transmitter Response	Net Response	FCC Mask Full Pwr	Negative # Out FCC spec.
506.00	-9.00	-54.00	-46.49	-100.49	-99.40	1.09
507.00	-8.00	-50.00	-44.34	-94.34	-88.40	5.94
508.00	-7.00	-46.00	-41.98	-87.98	-76.40	11.58
509.00	-6.00	-37.00	-41.16	-78.16	-65.40	12.76
510.00	-5.00	-32.00	-40.50	-72.50	-53.40	19.10
510.50	-4.50	-35.00	-40.24	-75.24	-48.40	26.84
511.00	-4.00	-24.00	-40.45	-64.45	-42.60	21.85
511.50	-3.50	-1.00	-39.85	-40.85	-36.40	4.45
511.75	-3.25	0.00	-39.97	-39.97	-36.40	3.57
515.00	CF					
518.25	3.25	0.00	-40.09	-40.09	-36.40	3.69
518.50	3.50	-1.00	-40.07	-41.07	-36.40	4.67
519.00	4.00	-24.00	-39.85	-63.85	-42.60	21.25
519.50	4.50	-35.00	-39.84	-74.84	-48.40	26.44
520.00	5.00	-32.00	-39.58	-71.58	-53.40	18.18
521.00	6.00	-37.00	-40.21	-77.21	-65.40	11.81
522.00	7.00	-46.00	-42.02	-88.02	-76.40	11.62
523.00	8.00	-50.00	-45.12	-95.12	-88.40	6.72
524.00	9.00	-54.00	-46.77	-100.77	-99.40	1.37

AT75K0 - FULL POWER FCC MASK Compliance Table

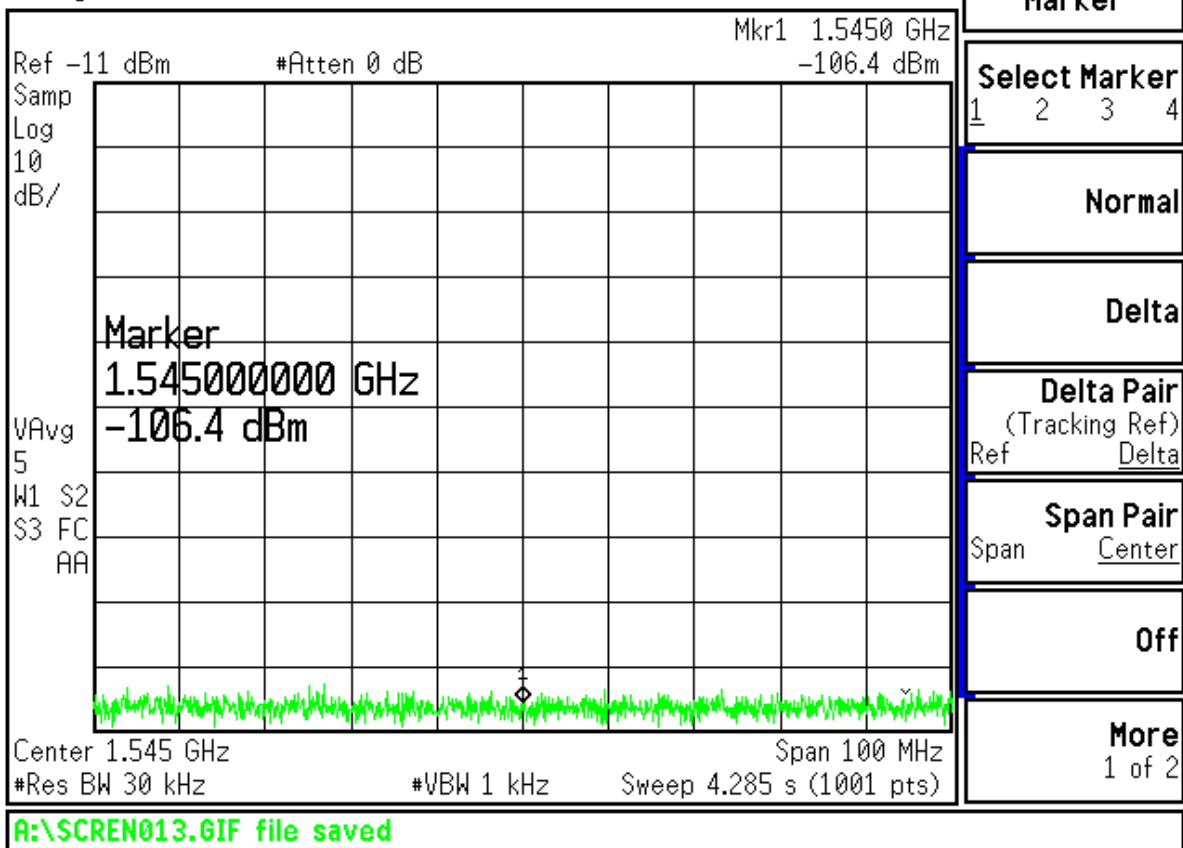
c. Conducted Harmonics and Spurious Measurements



E4404B Agilent readings for the 2nd harmonic, 1,030MHz, first tuned by Telonic Tunable model TTF1000-5-5E, from the after the filter RF Cap Sample [-57dB].

$$+67\text{dBm} - 57\text{Db} = +10\text{dBm}.$$

$+10\text{dBm} - 106.1\text{dBm} = 116.1\text{ dB} - [\text{STD: } 110\text{dB}] - \text{PASS on FCC FULL POWER MASK requirement.}$



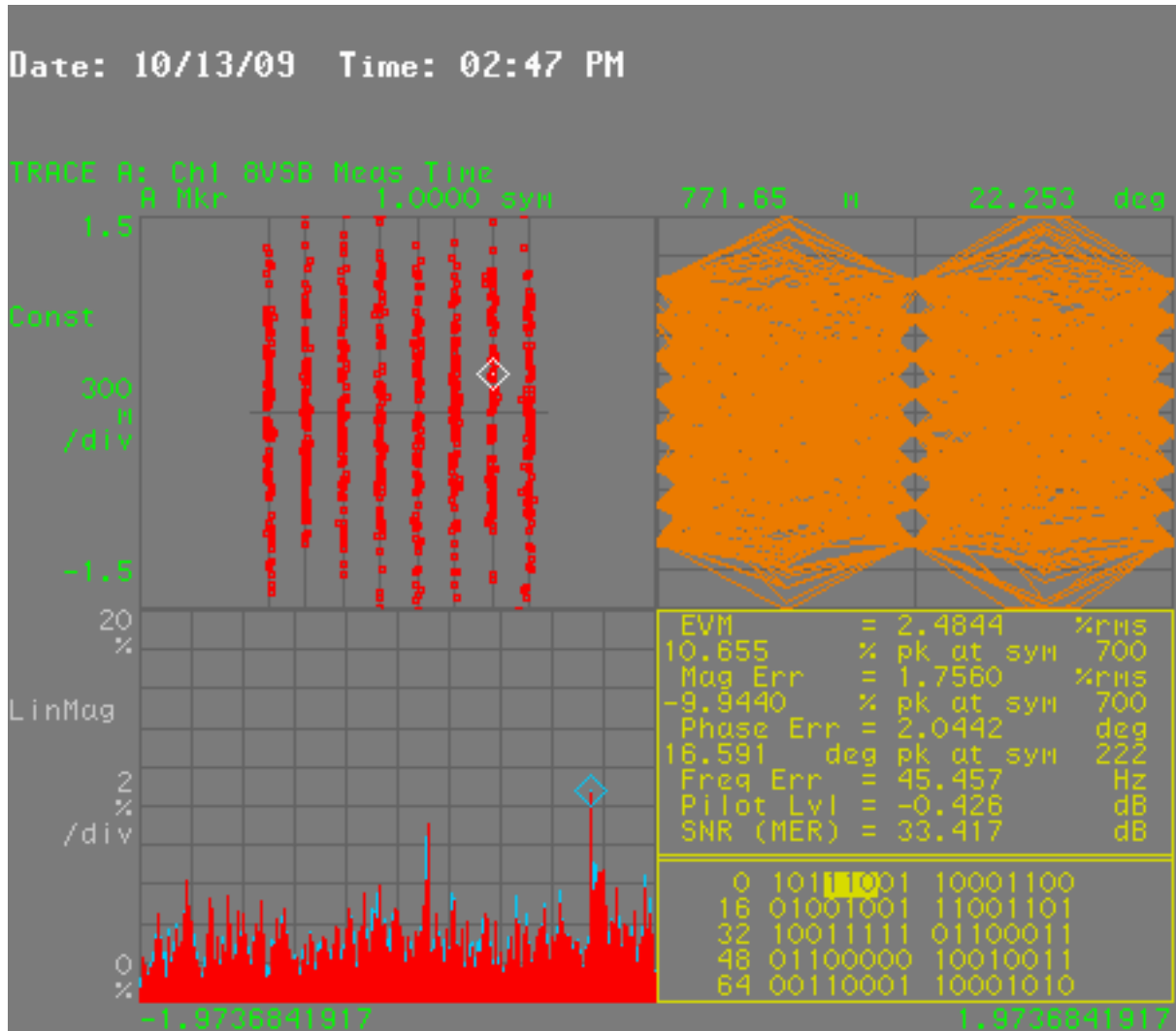
E4404B Agilent readings for the 3rd harmonic, 1,545MHz, first tuned by Telonic Tunable model TTF1000-5-5E, from the after the filter RF Cap Sample [-57dB].

+67dBm -57Db = +10dBm.

+10dBm - 106.4dBm = 116.4 dB - [STD: 110dB] - PASS on FCC FULL POWER MASK requirement.

5. In Channel Signal Characterization.

- EVM** = 2.4844%
- SNR (MER)** = 33.417 dB – [STD: > 27dB] - (ATSC Document A/64B – 5.1.2)

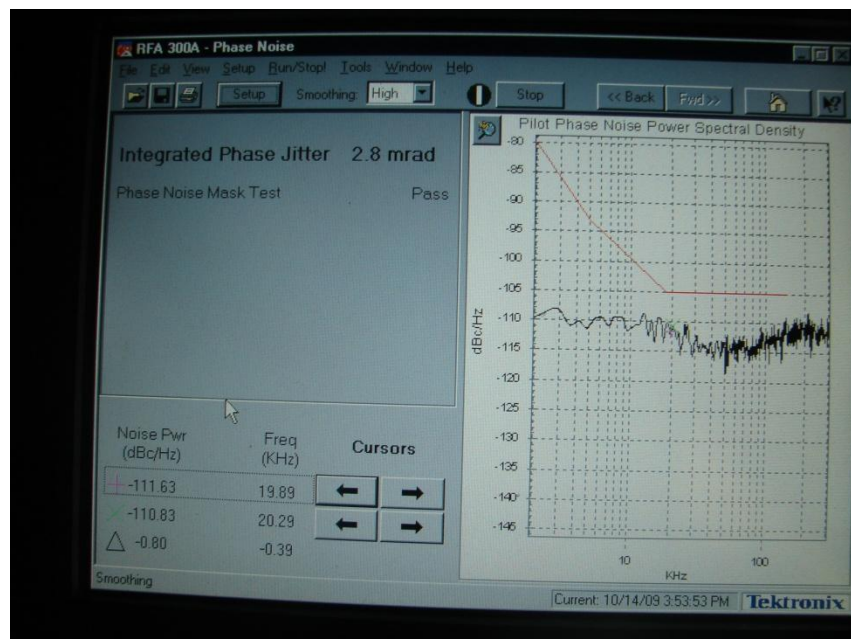
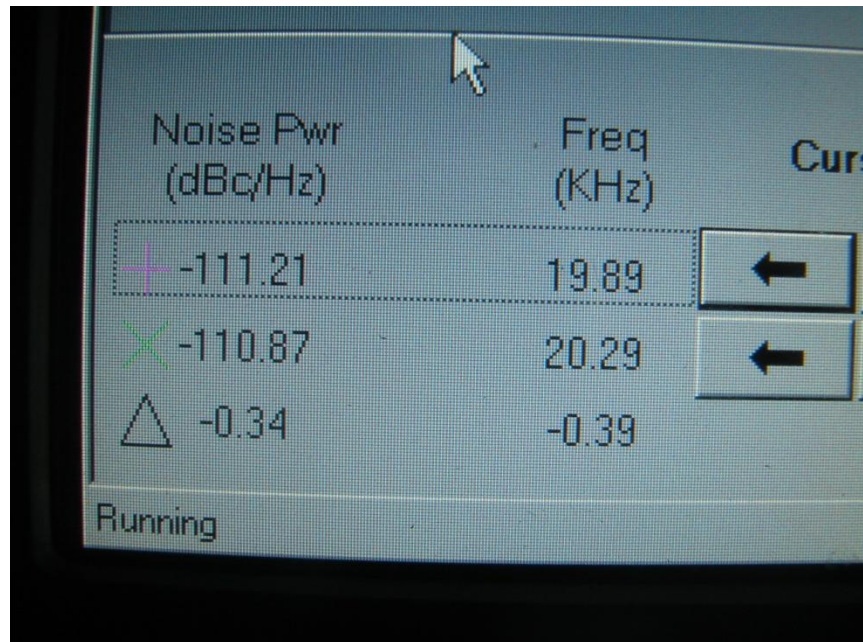


89441A VSA in channel readings

c. **Phase Noise** = -110.87dB/Hz.

STD: [greater than -104dB@20kHz offset from the carrier frequency].

(ATSC Document A/64B – 5.1.4)



RFA300 readings for phase noise

Test Equipment

Model	Manufacturer	Description	Serial #
E4404B	Agilent	Spectrum Analyzer	MY41441110
E4418B	Agilent	Power Meter	US38470909
RFA300A	Tektronix	Signal Analyzer	B020427
8753D	HP	Network Analyzer	3410A09613
5350B	HP	Frequency Counter	3049A05771
89441A	HP	Vector Signal Analyzer	3416A01615
89441V	Agilent	VSB/QAM Signal Ana.	US44310211
TTF1000-5-5E	Telonic	Tunable BP Filter	80403-4