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TXF-150 150-WATT FM TRANSMITTER TEST REPORT

Technalogix TXF-150 (S/N: 04191155)

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Date: May 27, 2014

Contents

1. Equipment List

Equipment	Manufacturer	Model Number	Serial Number	Last Calibration
Network Analyzer	Agilent	8753ET	MY42000269	19-Sep-2013
Spectrum Analyzer	Tektronix	Tek492	B042695	8-Apr-2014
FM Modulation Analyzer	Innovonics	Model 531	2414	Mar-2013
Modulation Meter	QEI	691	691511	16-Oct-2013
THD Multimeter	Keithley	2015	0893126	15-Jan-2014
HIghpass Filter	MiniCircuits	NHP-200		Note 1
Antenna	Aaronia AG	Bicolog 5070	78477	Jan-2014
RF Wattmeter	Coaxial Dynamics	81060A	1099	5-Mar-2014
RF Load	Termaline	8892D300		Note 1
RF Load (600W)	Bird	8402	1595	Note 1
Directional Coupler	Bird	WBC1-45	122201685	Note 1
Variable Autotransformer	Staco Energy Prod.	3PN1010	122-0003 8645	N/A
Variable Autotransformer	Chuan Hsin	SRV-20		N/A
Digital Camera	Canon	PowerShot A2500	652160000043	N/A

Note 1: Checked in house against Agilent 8753ET in January 2014
N/A: No calibration required

2. Test Temperature

Standard temperature: 20°C +/- 5°C as per BETS-6 [section 3.3]

Actual temperature: _____20_°C_____

3. Carrier Power

Definition

The power output rating of the transmitting equipment is the carrier power at which the transmitting equipment may be operated continuously into the test load.

Requirement (FCC) - 47CFR Part 2, Subpart J, 73.1560 (b)

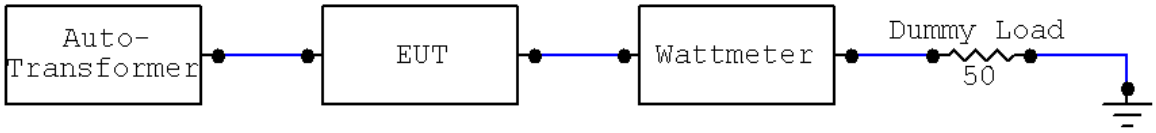
(b) FM stations. Except as provided in paragraph (d) of this section, the transmitter output power of an FM station, with power output as determined by the procedures specified in §73.267, which is authorized for output power more than 10 watts must be maintained as near as practicable to the authorized transmitter output power and may not be less than 90% nor more than 105% of the authorized power. FM stations operating with authorized transmitter output power of 10 watts or less may operate at less than the authorized power, but not more than 105% of the authorized power.

Requirement (Industry Canada) - BETS-6 [section 6.1.3]

The transmitting equipment shall be capable of being adjusted to deliver the rated power output when the AC input voltage varies by 5% from the rated value. Adjustment of the power output of the transmitting equipment shall permit operation over a range of at least from 50% to rated power output.

Method

An average reading RF wattmeter is placed between the transmitter output (directly on the directional coupler's N connector on the back panel) and the 50 Ω dummy load. While observing the external wattmeter, the AC mains voltage and output power is varied to ensure that is adjustable over the proper ranges.



Measurement

Rated AC voltage 110 Vac.
The rated carrier output power is 150 watts at -5% Vac.
The rated carrier output power is 150 watts at rated Vac.
The rated carrier output power is 150 watts at +5% Vac.

Specified RF power out 150 watts.
Range of RF power out 5 watts to 150 watts.

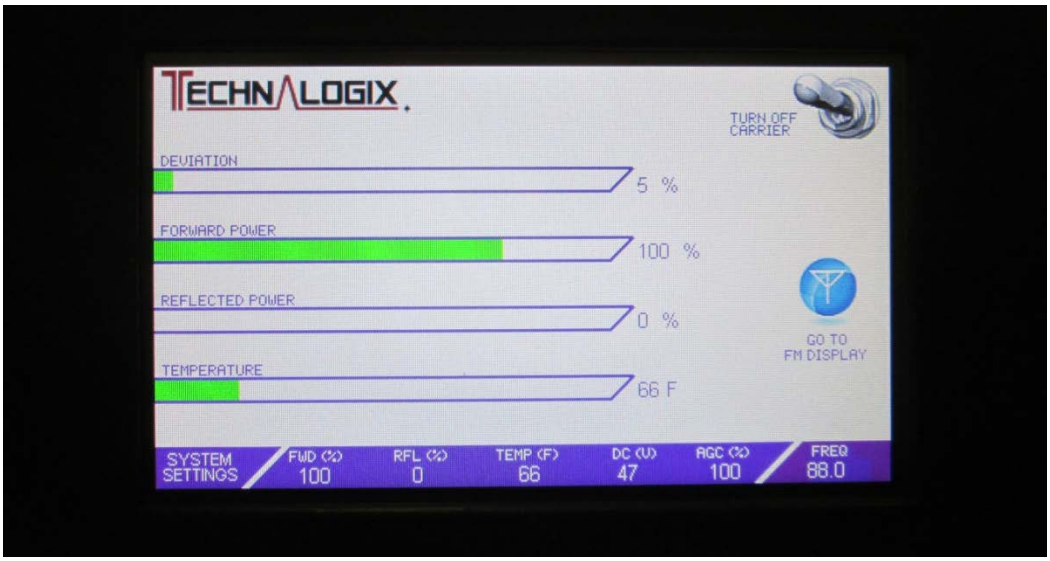


Figure 1: RF Output Level on Wattmeter and Transmitter Readout

4. Audio Frequency Response (Mono)

Definition

A curve or equivalent data showing the frequency response of the audio modulating circuit shall be submitted. For equipment required to have an audio low-pass filter, a curve showing the frequency response of the filter or of all circuitry installed between the modulation limiter and the modulated stage shall be submitted. For the audio input channel, the audio amplitude frequency response of a transmitter is defined as the inverse ratio of the input voltages at specific frequencies, referenced to a 400 Hz test tone of sufficient amplitude to result in 100% modulation required to obtain a constant percentage of modulation. The input voltages at specific frequencies are within the range from 50 Hz to 15 kHz and the ratio is expressed in dB.

Requirement (FCC) - 47CFR Part 2, Subpart J, 73.1570 (b)

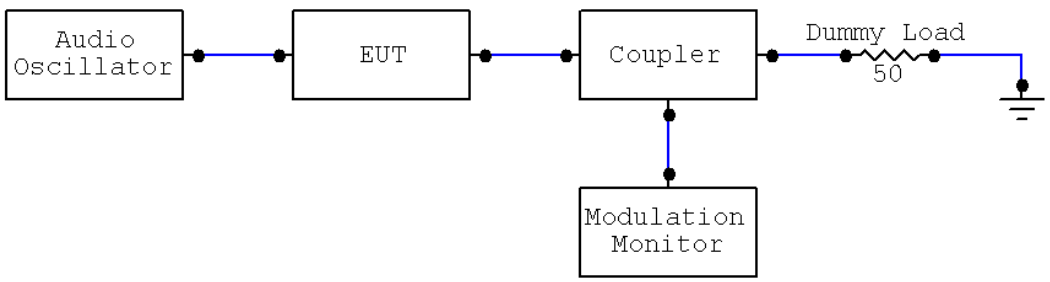
(b) Maximum modulation levels must meet the following limitations:
(2) FM stations. The total modulation must not exceed 100 percent on peaks of frequent reoccurrence referenced to 75 kHz deviation. However, stations providing subsidiary communications services using subcarriers under provisions of § 73.319 concurrently with the broadcasting of stereophonic or monophonic programs may increase the peak modulation deviation as follows:
(i) The total peak modulation may be increased 0.5 percent for each 1.0 percent subcarrier injection modulation.
(ii) In no event may the modulation of the carrier exceed 110 percent (82.5 kHz peak deviation).

Requirement (Industry Canada) - BETS-6 [section A.1.3.3]

The maximum departure of the amplitude response from the standard 75µsec pre-emphasis curve over the range of 50 Hz to 15 kHz shall not exceed ± 0.5 dB up to ± 75 kHz deviation.

Method

A 400 Hz sinusoidal signal from an audio oscillator is applied to the audio input at a level for 100%, 50%, and 25% modulation. With pre-emphasis on, apply sample from the output to the input of a modulation monitor. The audio oscillator's output level at 400 Hz is adjusted to achieve a ± 75 kHz deviation (level is recorded and used as reference). The audio oscillator level is adjusted at 50, 100, 200, 400, 1000, 2500, 5000, 7500, 10000, 12500, and 15000 Hz to retain the ± 75 kHz deviation and the change in audio oscillator level compared to the reference is recorded. Tests completed on two separate frequencies, each near the band edges.



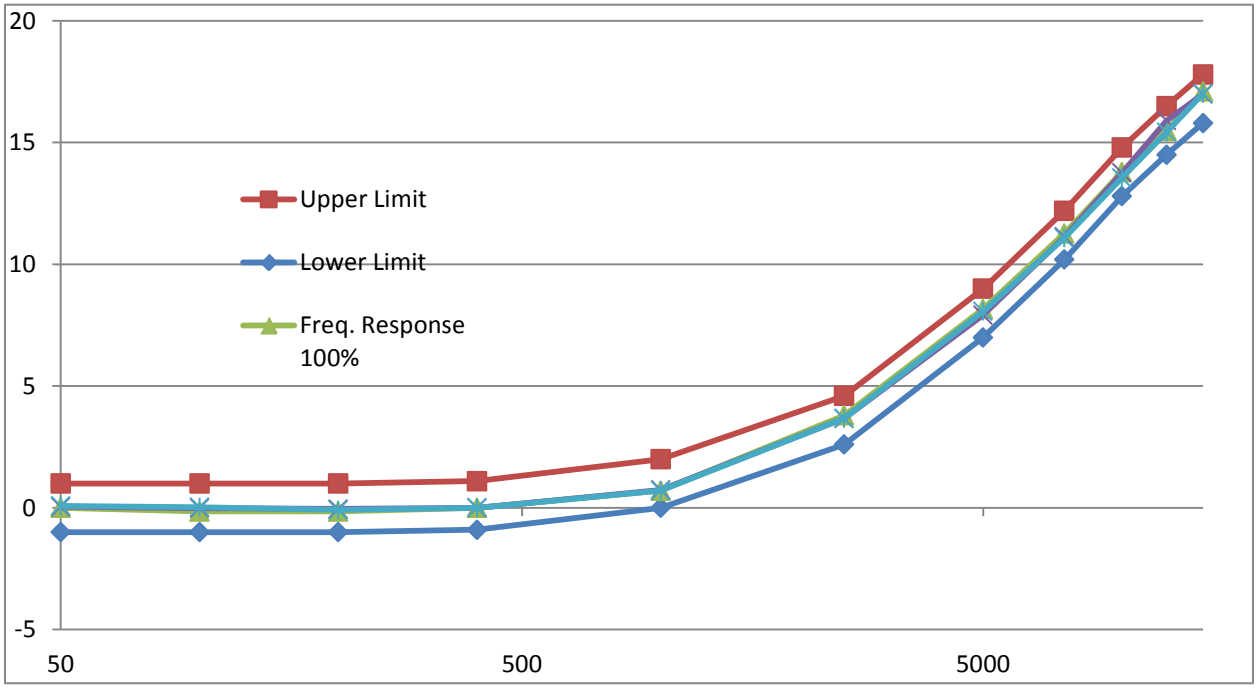


Figure 2: Audio Frequency Response (Mono) with 88.0MHz Carrier (25, 50, 100% Modulation)

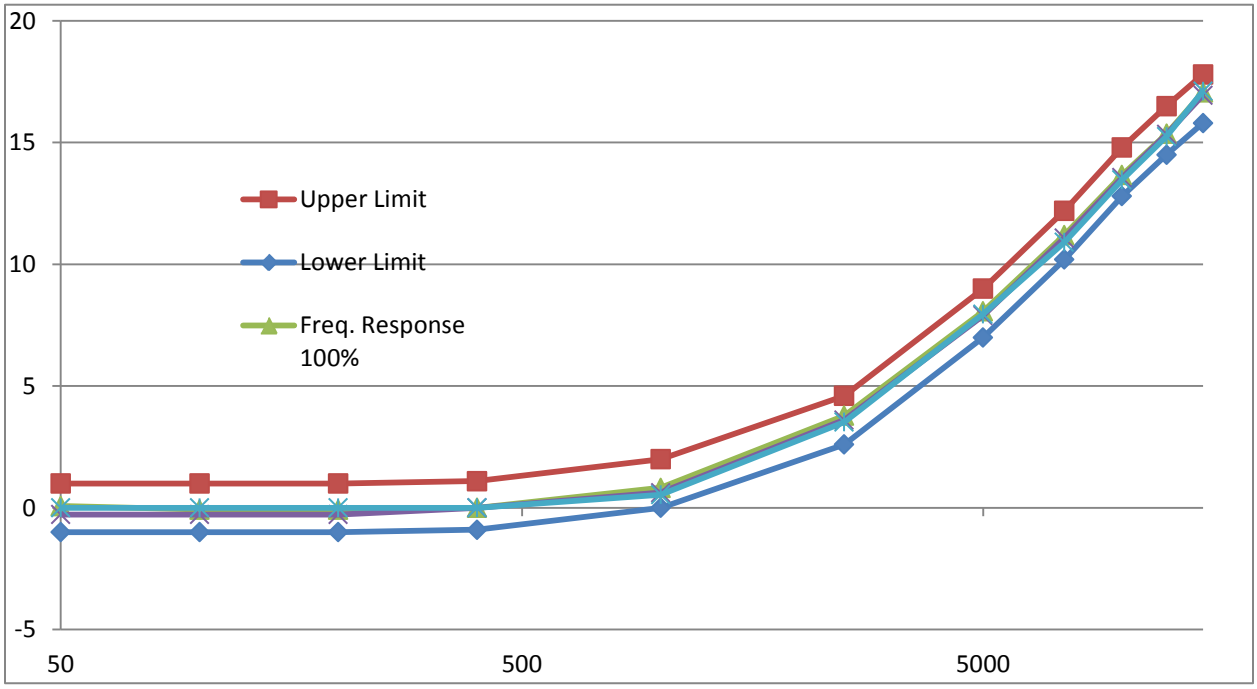


Figure 3: Audio Frequency Response (Mono) with 108.0MHz Carrier (25, 50, 100% Modulation)

5. Occupied Bandwidth

Definition

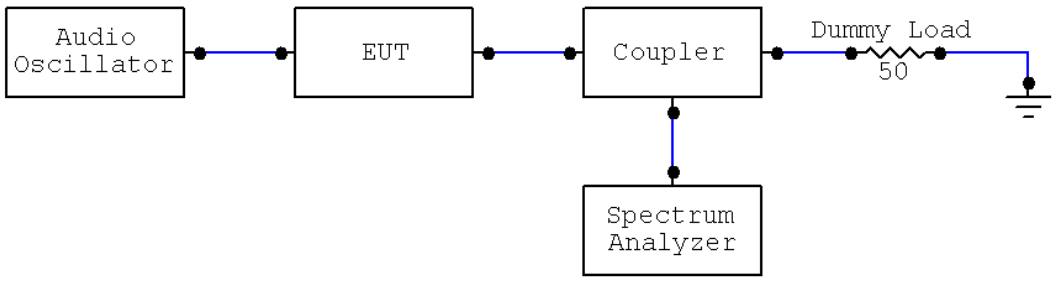
The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the following conditions as applicable:
(e) Transmitters for use in the Radio Broadcast Services:
(3) FM broadcast transmitter not used for multiplex operation—when modulated 85 percent by a 15 kHz input signal.
(4) FM broadcast transmitters for multiplex operation under Subsidiary Communication Authorization (SCA)--when carrier is modulated 70 percent by a 15 kHz main channel input signal, and modulated an additional 15 percent simultaneously by a 67 kHz subcarrier (unmodulated).
(5) FM broadcast transmitter for stereophonic operation--when modulated by a 15 kHz input signal to the main channel, a 15 kHz input signal to the stereophonic subchannel, and the pilot subcarrier simultaneously. The input signals to the main channel and stereophonic subchannel each shall produce 38 percent modulation of the carrier. The pilot subcarrier should produce 9 percent modulation of the carrier.

Requirement (FCC) - 47CFR Part 2, Subpart J, 73.317 (b-d)

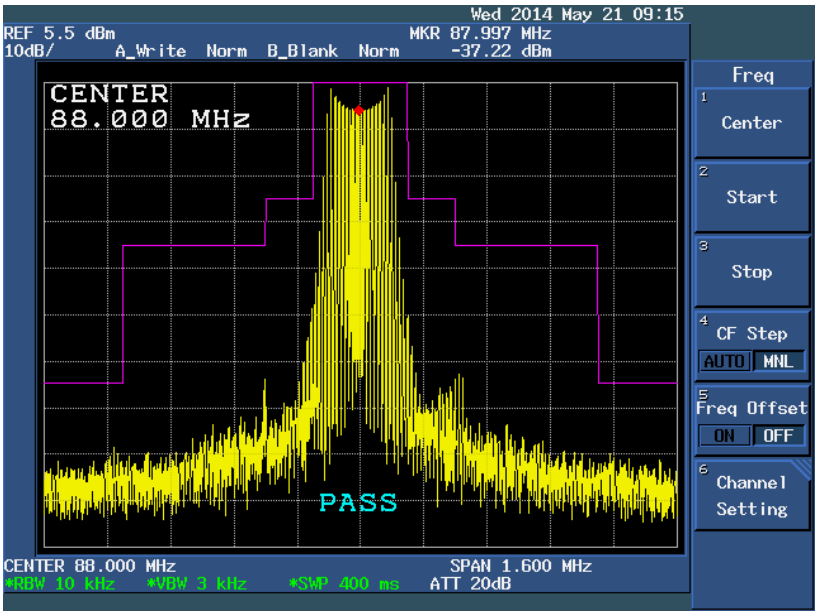
(b) Any emission appearing on a frequency removed from the carrier by between 120 kHz and 240 kHz inclusive must be attenuated at least 25 dB below the level of the unmodulated carrier. Compliance with this requirement will be deemed to show the occupied bandwidth to be 240 kHz or less.
(c) Any emission appearing on a frequency removed from the carrier by more than 240 kHz and up to and including 600 kHz must be attenuated at least 35 dB below the level of the unmodulated carrier.
(d) Any emission appearing on a frequency removed from the carrier by more than 600 kHz must be attenuated at least 43 + 10 Log[10](Power, in watts) dB below the level of the unmodulated carrier, or 80 dB, whichever is the lesser attenuation.

Method

The transmitting equipment is operated into the standard test load at rated power. The carrier is modulated with the standard test input signal at 100% modulation. All emissions found in the above frequency requirements are measured.



88.0 MHz Occupied BW:



108.0 MHz Occupied BW:

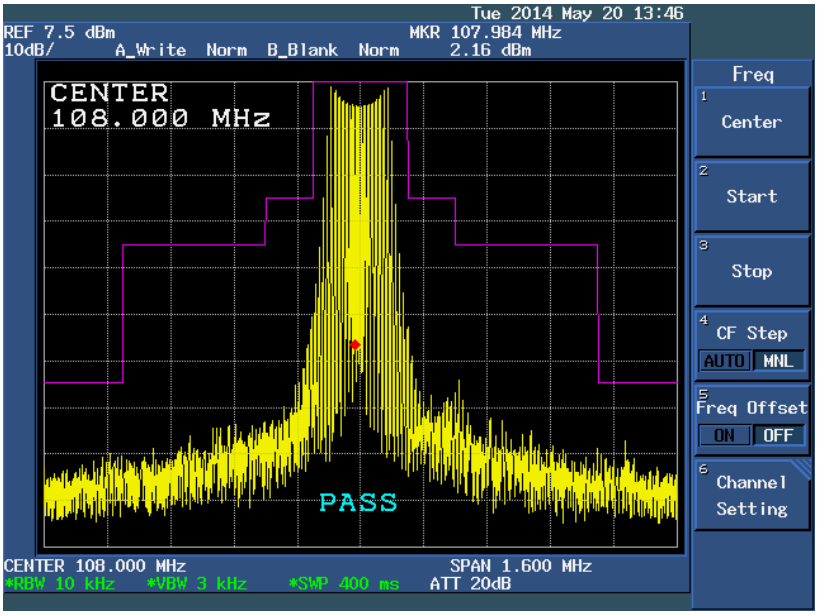


Figure 8: Occupied Bandwidth for Low and High Frequency Carriers

6. Spurious Emissions at Antenna Terminals

Definition

Spurious emissions are unwanted emissions occurring at the output terminals of the transmitting equipment, at frequencies other than those of the IMD products. The RF powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna.

Requirement (FCC) - 47CFR Part 2, Subpart J, 73.317 (d)

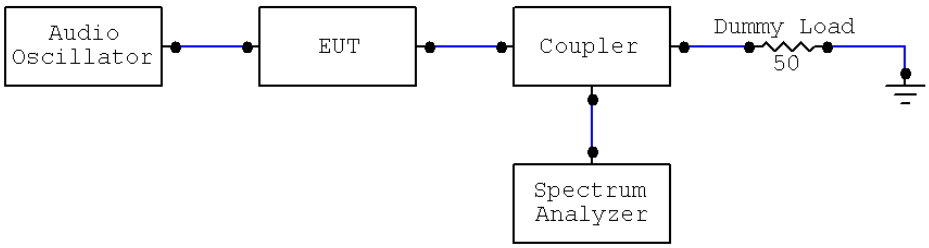
(d) Any emission appearing on a frequency removed from the carrier by more than 600 kHz must be attenuated at least 43 + 10 Log[10](Power, in watts) dB below the level of the modulated carrier, or 80 dB, whichever is the lesser attenuation.

Requirement (Industry Canada) – BETS6 [section 6.3.3]

Frequencies above 600 kHz from the carrier frequency, all spurious emissions must be better than either minus(43 + 10logP) or -80dB, whichever is stronger.

Method

Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

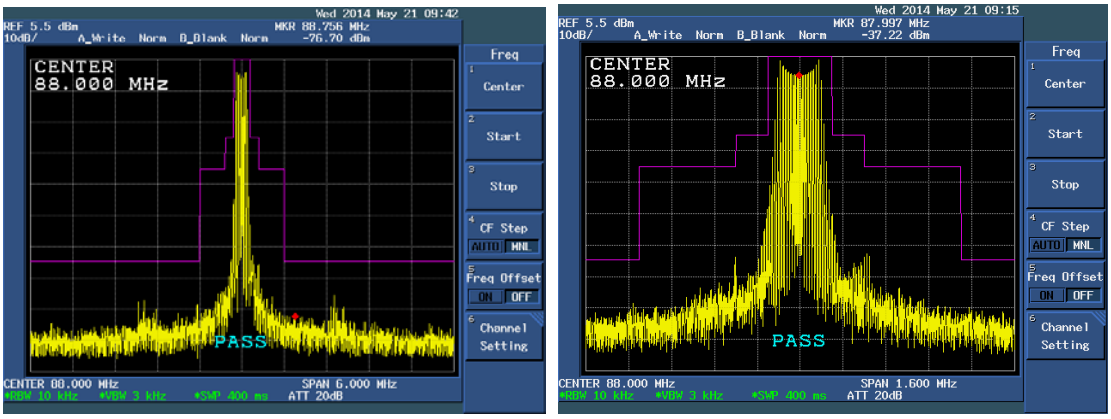


Measurement

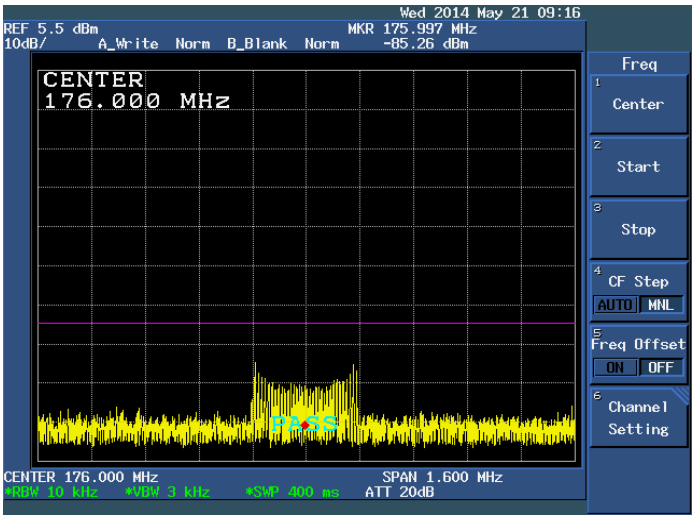
	SPURIOUS (dBc)	
Frequency Range	f = 88.0 MHz	f = 108.0 MHz
f ≥ 600 kHz	-82	-80

	HARMONICS (dBc)	
Frequency Range	f = 88.0 MHz	f = 108.0 MHz
2nd Harmonic	>-85	>-90
3rd Harmonic	>-89	>-92

Fundamental



Second Harmonic



Third Harmonic

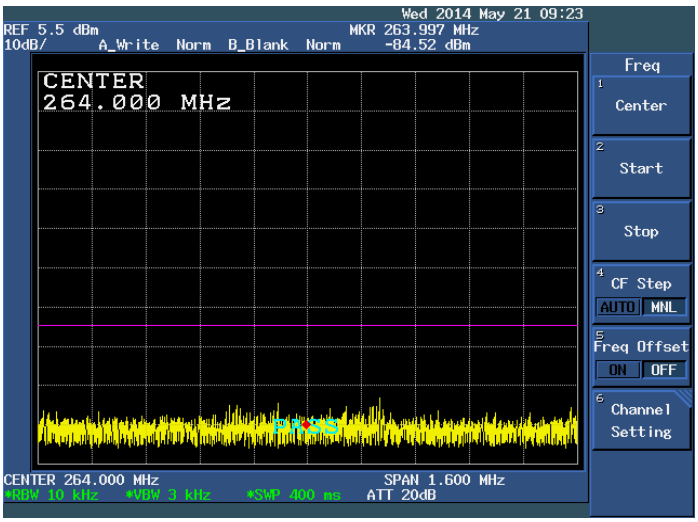
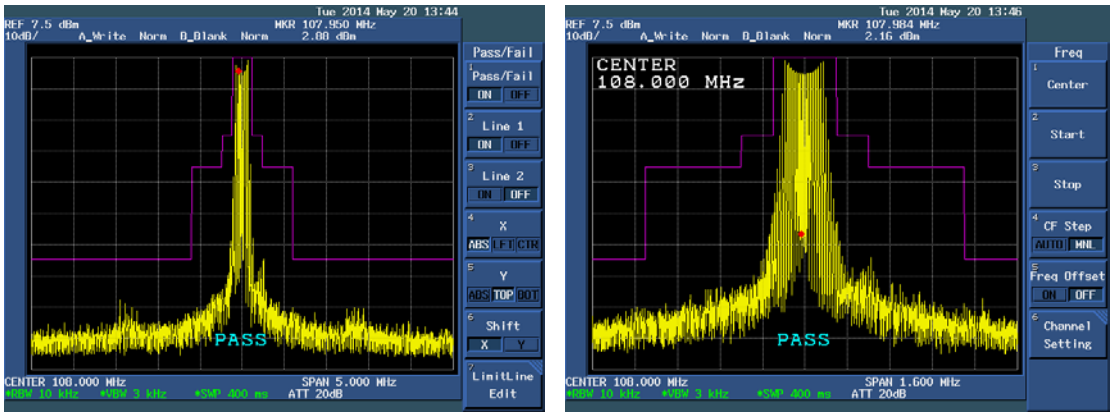
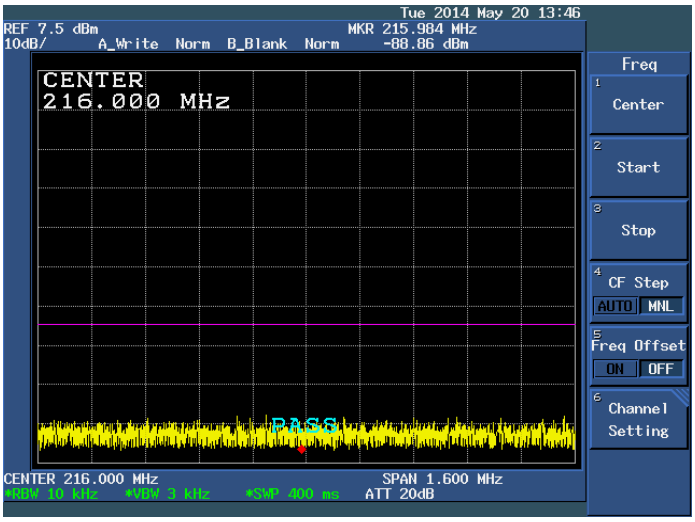


Figure 9: Spurious Emissions with 88.0MHz Carrier

Fundamental



Second Harmonic



Third Harmonic

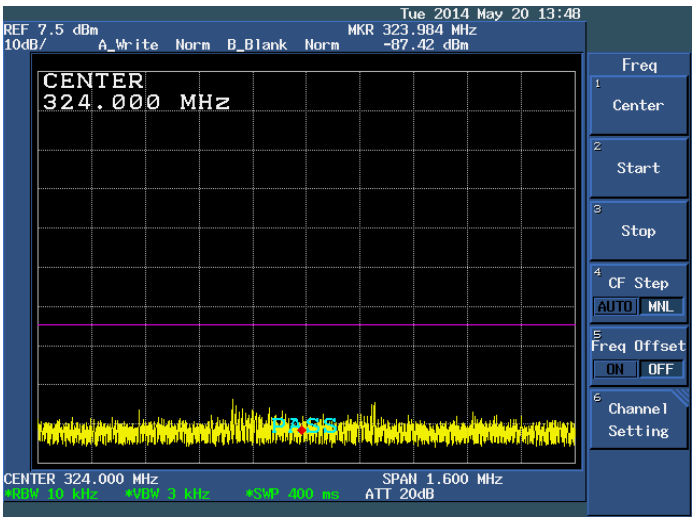


Figure 10: Spurious Emissions with 108.0MHz Carrier

7. Cabinet Radiation

Definition

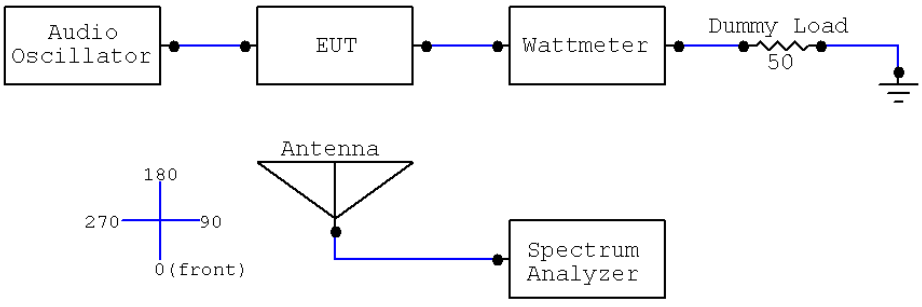
Cabinet radiation is any emission from the transmitting equipment housing or enclosure from sources other than a normal output port.

Requirement (Industry Canada) – BETS-6 [section 6.4.3]

Emissions at any frequency shall be at least 54 dB below the calculated field strength reference level. Any radiation weaker than 70dB below the reference level need not be recorded.

Method

The transmitting equipment shall be operated at rated power and at a suitable frequency. A receiving antenna shall be connected to a calibrated field strength meter or frequency selective voltmeter. The free space path loss, cable loss, and antenna gain characteristics are obtained at the fundamental frequency and at each of the harmonics of the center frequency in order to assess the level of signal radiated from the cabinet. Radiation from the cabinet is measured at a distance of 10 meters in four different physical rotation angles: 0, 90, 180, and 270 degrees (0 degrees being the front of the cabinet). All spectral components above the noise floor referenced to average power radiated from the cabinet are recorded. Alternatively, suitable radiation measurement equipment may be used, providing the noise floor of the equipment is not higher than the signal to be measured. Using the free space formula below, calculate the reference field strength:
E = 7 sqrt(P/r) volts per meter (P is the rated output power in watts and r is distance in meters)



Measurement

88.0 MHz:

Location	Distance	Measured Power (dBm)			E Reference		Measured Field			Antenna Gain (dBi)			Cable Loss (dB)		
		1st	2nd	3rd	V/m	dBu	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
Front	3.0 m	-56.4	-63.0	-58.2	28.6	149.1	79.2	61.2	59.8	-19.39	-7.89	-1.71	0.15	0.19	0.22
Left	3.0 m	-48.5	-68.7	-56	28.6	149.1	87.1	55.5	62.0	-19.39	-7.89	-1.71	0.15	0.19	0.22
Right	3.0 m	-52.2	-60.1	-53.8	28.6	149.1	83.4	64.1	64.2	-19.39	-7.89	-1.71	0.15	0.19	0.22
Back	3.0 m	-41.7	-60.2	-56.4	28.6	149.1	93.9	64.0	61.6	-19.39	-7.89	-1.71	0.15	0.19	0.22

Location	Difference (> 54 dB)		
	1st	2nd	3rd
Front	69.9	88.0	89.3
Left	62.0	93.7	87.1
Right	65.7	85.1	84.9
Back	55.2	85.2	87.5

108.0 MHz:

Location	Distance	Measured Power (dBm)			E Reference		Measured Field			Antenna Gain (dBi)			Cable Loss (dB)		
		1st	2nd	3rd	V/m	dBu	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
Front	3.0 m	-39.7	-58.9	-53.3	28.6	149.1	95.0	66.4	65.0	-16.7	-7.28	-0.22	0.17	0.20	0.24
Left	3.0 m	-45.3	-63.8	-50.9	28.6	149.1	89.4	61.5	67.4	-16.7	-7.28	-0.22	0.17	0.20	0.24
Right	3.0 m	-52.2	-73.5	-70.4	28.6	149.1	82.5	51.8	47.9	-16.7	-7.28	-0.22	0.17	0.20	0.24
Back	3.0 m	-53.3	-61.4	-52.1	28.6	149.1	81.4	63.9	66.2	-16.7	-7.28	-0.22	0.17	0.20	0.24

Location	Difference (> 54 dB)		
	1st	2nd	3rd
Front	54.1	82.7	84.1
Left	59.7	87.6	81.7
Right	66.6	97.3	101.2
Back	67.7	85.2	82.9

8. Carrier Frequency Stability

Definition

Carrier frequency stability is the ability of the transmitting equipment to maintain a mean test frequency.

Requirement (FCC) – 74CFR Part 2, Subpart J, 2.1055 and 73.1545

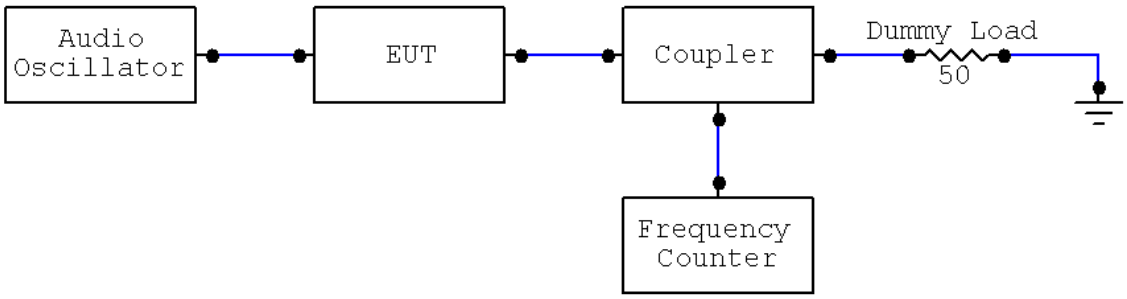
(b) FM stations. (1) The departure of the carrier or center frequency of an FM station with an authorized transmitter output power more than 10 watts may not exceed +/-2,000 Hz from the assigned frequency.
(2) The departure of the carrier or center frequency of an FM station with an authorized transmitter output power of 10 watts or less may not exceed +/-3,000 Hz from the assigned frequency.

Requirement (Industry Canada) – BETS6 [section 6.2.3]

The frequency of the carrier shall remain within +/- 1,000 Hz of the mean test frequency.

Method

After a warm up period of at least one hour at rated AC input voltage, the frequency of the carrier is measured at one-minute intervals during a period of fifteen minutes. From these measurements, the mean test frequency is determined. The operating frequencies are measured at ambient temperatures from +5°C and +45°C at the following three values of power supply voltage for each of these temperatures; 85%, 100%, and 115% of nominal AC supply voltage. Repeat for low, and high frequencies within the FM band.



Measurement

Mean carrier frequency at 88.0 MHz is 87.999 938 MHz

TEMPERATURE (˚C)	AC VOLTAGE	CARRIER FREQUENCY (MHz)	DEVIATION (Hz) FROM MEAN
0	85%	N/A	N/A
	100%	N/A	N/A
	115%	N/A	N/A
5	85%	87.999 979	+41
	100%	87.999 984	+46
	115%	87.999 987	+49
20	85%	87.999 981	+43
	100%	87.999 985	+47
	115%	87.999 988	+50
45	85%	88.000 004	+66
	100%	88.000 006	+68
	115%	88.000 011	+73
50	85%	N/A	N/A
	100%	N/A	N/A
	115%	N/A	N/A

Mean carrier frequency at 108.0 MHz is 107.999 922 MHz

TEMPERATURE (˚C)	AC VOLTAGE	CARRIER FREQUENCY (MHz)	DEVIATION (Hz) FROM MEAN
0	85%	N/A	N/A
	100%	N/A	N/A
	115%	N/A	N/A
5	85%	107.999 982	+60
	100%	107.999 987	+65
	115%	107.999 986	+64
20	85%	107.999 985	+63
	100%	107.999 987	+65
	115%	107.999 992	+70
45	85%	108.000 004	+82
	100%	108.000 007	+85
	115%	108.000 014	+92
50	85%	N/A	N/A
	100%	N/A	N/A
	115%	N/A	N/A

9. Audio Frequency Harmonic Distortion (Mono)

Definition

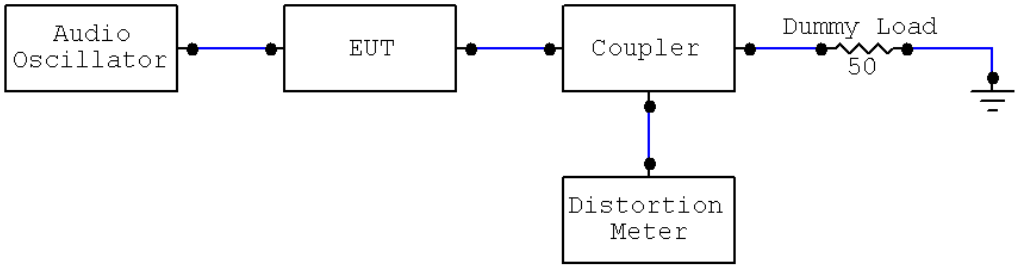
The audio frequency harmonic distortion is the harmonic content of the audio signal contributed by the transmitting equipment.

Requirement (Industry Canada) – BETS-6 [section A.1.4.3]

The audio frequency distortion including all harmonics up to 30 kHz shall not exceed 1% in the range of frequencies from 50 to 15,000 Hz

Method

The demodulated output of the transmitter is fed to a wave or distortion analyzer. The normal 75 microsecond pre-emphasis shall be employed and the demodulator shall include a 75 microsecond de-emphasis. Measurements at 100% modulation are taken at a sufficient number of frequencies in each range of frequencies to plot a distortion versus frequency curve. Alternatively, a VM700 waveform measurement set (or equivalent) may be used. Repeat for low, mid, and high frequencies within the FM band.



Measurement

Carrier Frequency at 88.0 MHz

Frequency (Hz)	THD (%)
50	0.34
100	0.13
200	0.10
400	0.11

Frequency (Hz)	THD (%)
1,000	0.12
2,500	0.13
5,000	0.27
7,500	0.28

Frequency (Hz)	THD (%)
10,000	0.35
12,500	0.42
15,000	0.51

Carrier Frequency at 108.0 MHz

Frequency (Hz)	THD (%)
50	0.14
100	0.09
200	0.10
400	0.15

Frequency (Hz)	THD (%)
1,000	0.24
2,500	0.29
5,000	0.20
7,500	0.17

Frequency (Hz)	THD (%)
10,000	0.22
12,500	0.29
15,000	0.32

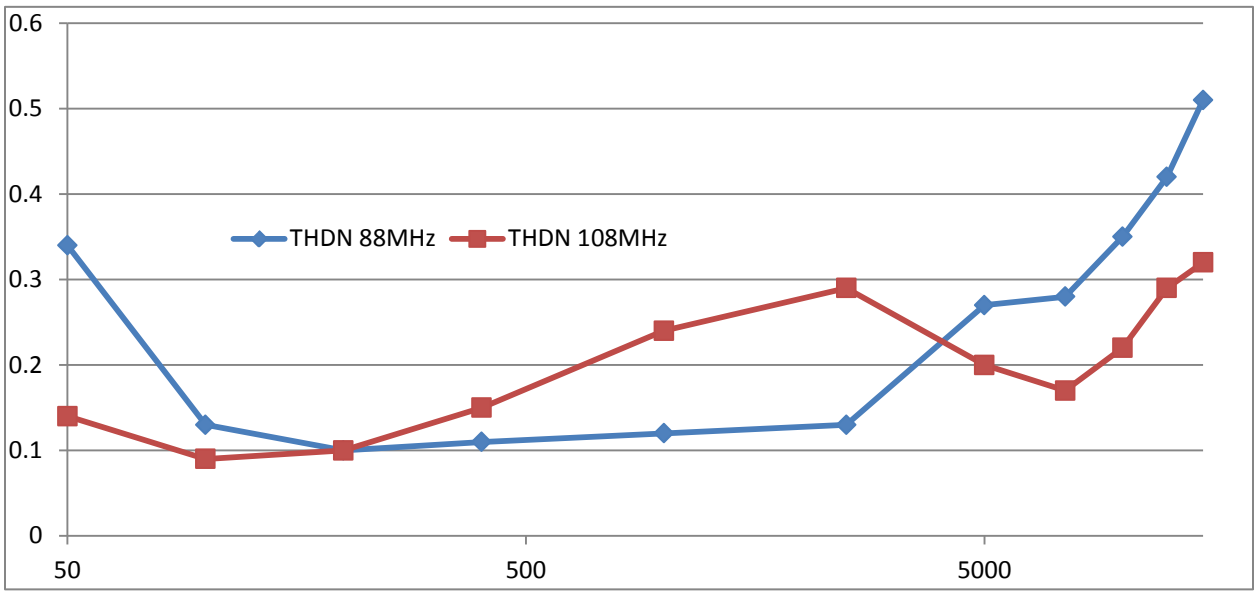


Figure 11: Audio Harmonic Distortion at 88.0 and 108.0MHz Carrier (Mono)

10. Audio Input Level for 100% Modulation and Impedance

Definition

The audio input level for 100% modulation is the audio input, expressed in dBm (0 dBm = 1 mW), necessary to produce a frequency deviation of ±75 kHz.

Requirement (Industry Canada) – BETS-6 [section A.1.2.3]

The standard audio input level for 100% modulation shall be 10 dBm, ±2 dBm.

Method

The standard test signal shall be adjusted to produce 100% modulation and this level shall be recorded.

Measurement

Audio input level: 8.31 dBm

Audio input impedance as per BETS-6 [section A.1.1.1]: 582 ohms

11. Frequency Modulation Noise on Carrier (Mono)

Definition

The frequency modulation noise on the carrier is the residual frequency modulation resulting from disturbances produced in the transmitting equipment itself within the band of 50 to 15,000 Hz.

Requirement (Industry Canada) – BETS-6 [section A.1.5.3]

The ratio shall be at least 60dB below 100% modulation.

Method

The demodulated output of a sample of the transmitting equipment is fed into a distortion and noise meter. The frequency response characteristic of the demodulator shall be within +/- 1dB of the normal 75 microsecond de-emphasis curve from 50 to 15,000 Hz. Readings shall be taken of the output levels with standard test modulation of 100% and without modulation with the input terminated in 600 ohms. Their ratio shall be expressed in dB below 100% modulation (+/- 75 kHz deviation).

Measurement

Carrier Frequency	*Ratio (dB)*
88.0MHz	-71
108.0MHz	-72

12. Amplitude Modulation Noise on Carrier (Mono)

Definition

The amplitude modulation noise on the carrier of an FM carrier is the ratio of the RMS value of the amplitude modulation component (50 to 15,000 Hz) of the carrier envelope to the RMS carrier value during the absence of applied modulating voltage.

Requirement (Industry Canada) – BETS-6 [section A.1.6.3]

The ratio shall be at least 50dB below carrier level within the band of 50 to 15,000 Hz.

Method

Measurement of the carrier amplitude modulation noise level may be accomplished by the use of a linear peak carrier responsive AM detector coupled to the output of the transmitting equipment. Readings are made of the DC voltage and the RMS value of the AC component across the detector load resistor. The DC voltage must be multiplied by 0.707. The measurement shall be made in the absence of modulating voltage with the audio input terminated in 600 ohms.

Measurement

Carrier Frequency	*Ratio (dB)*
88.0MHz	-72
108.0MHz	-73

13. Multiplex L&R Audio Frequency Response

Definition

A curve or equivalent data showing the frequency response of the audio modulating circuit shall be submitted. For equipment required to have an audio low-pass filter, a curve showing the frequency response of the filter or of all circuitry installed between the modulation limiter and the modulated stage shall be submitted. For the audio input channel, the audio amplitude frequency response of a transmitter is defined as the inverse ratio of the input voltages at specific frequencies, referenced to a 400 Hz test tone of sufficient amplitude to result in 100% modulation required to obtain a constant percentage of modulation. The input voltages at specific frequencies are within the range from 50 Hz to 15 kHz and the ratio is expressed in dB.

Requirement (Industry Canada) – BETS-6 [section A.2.3.1]

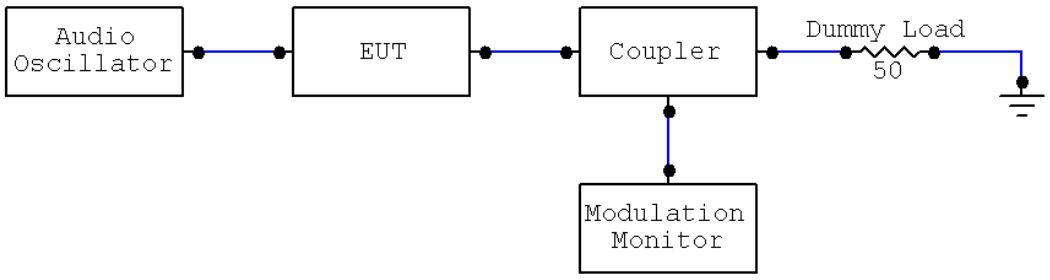
The maximum departure of the amplitude response from the standard 75µsec pre-emphasis curve over the range of 50 Hz to 15 kHz shall not exceed ± 0.5 dB up to ± 75 kHz deviation.

Method

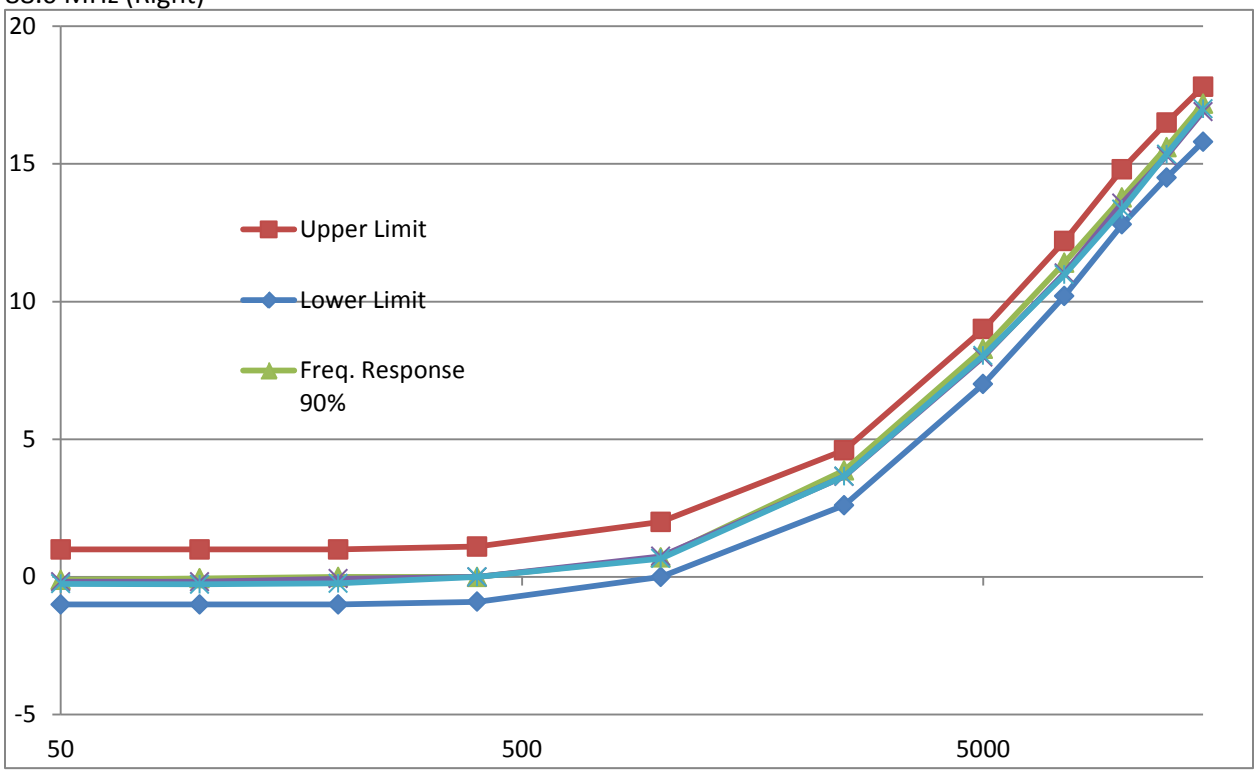
Using the measurement method of A.1.3.2, except that the maximum modulation level shall be 90%, determine the frequency response curves of the L and R channels.

Measurement

A 400 Hz sinusoidal signal from an audio oscillator is applied to the audio input at a level for 90%, 50%, and 25% modulation. With pre-emphasis on, apply sample from the output to the input of a modulation monitor. The audio oscillator's output level at 400 Hz is adjusted to achieve a ± 75 kHz deviation (level is recorded and used as reference). The audio oscillator level is adjusted at 50, 100, 200, 400, 1000, 2500, 5000, 7500, 10000, 12500, and 15000 Hz to retain the ± 75 kHz deviation and the change in audio oscillator level compared to the reference is recorded. Tests completed on two separate frequencies, each near the band edges.



88.0 MHz (Right)



88.0 MHz (Left):

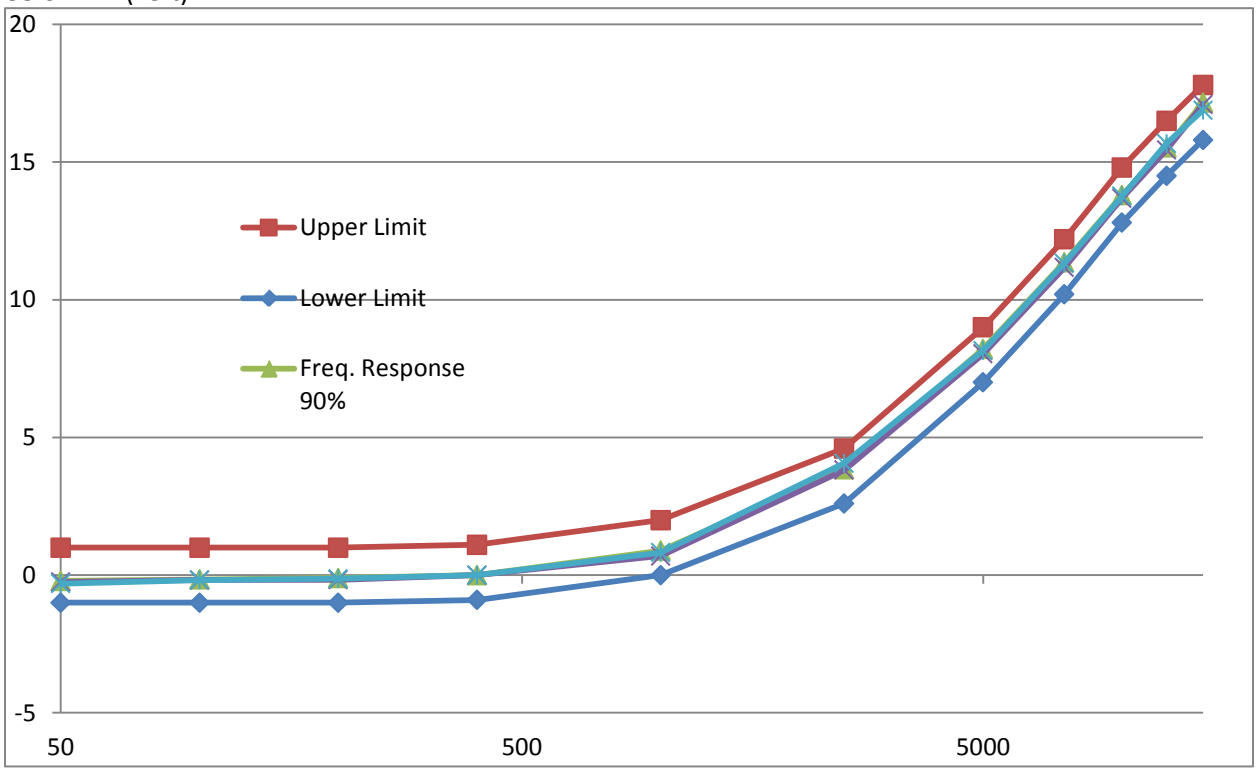
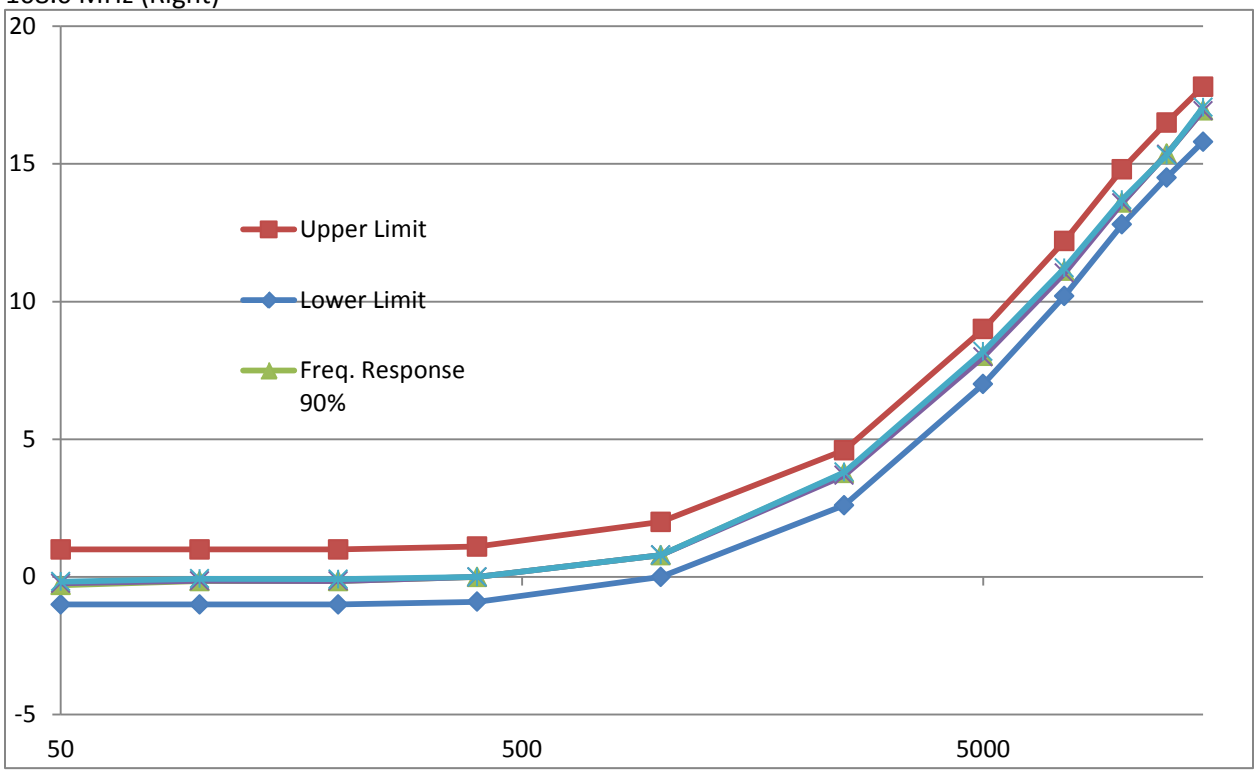


Figure 11: Multiplex L&R Audio Frequency Response with 88.0MHz Carrier (25,50,90% Modulation)

108.0 MHz (Right)



108.0 MHz (Left):

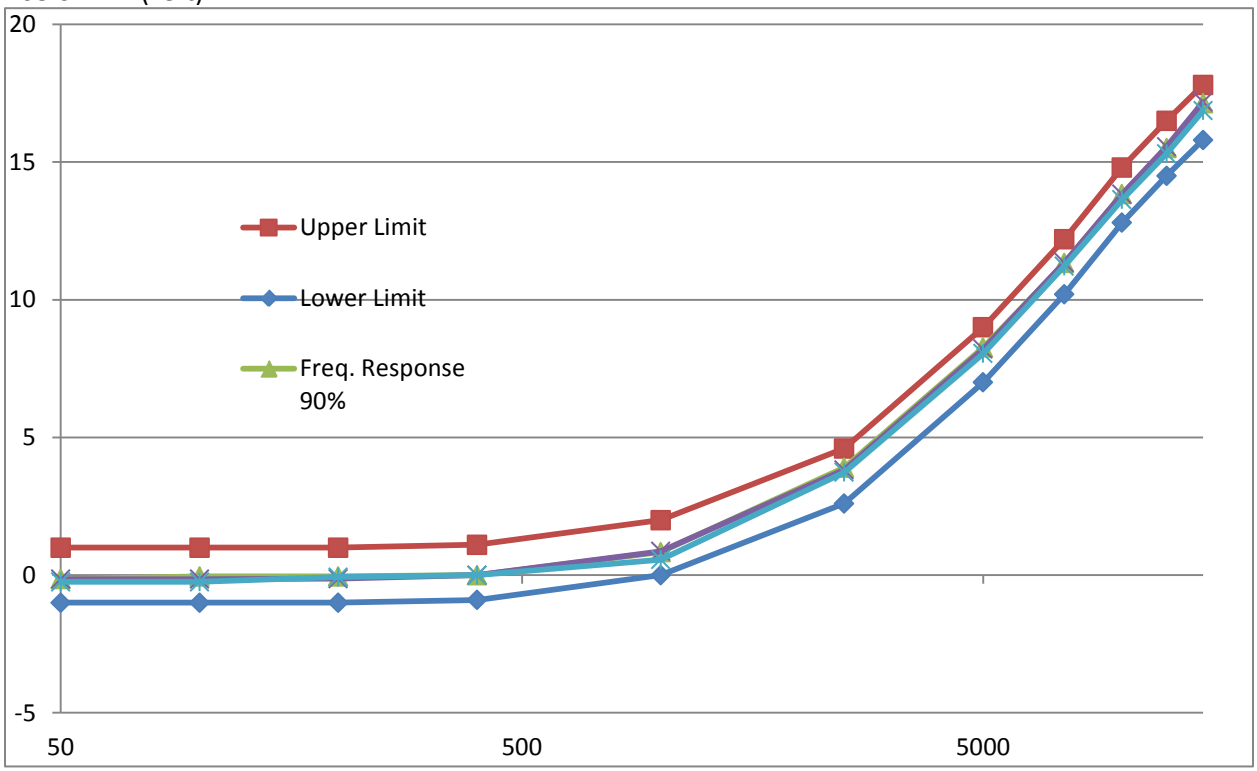


Figure 12: Multiplex L&R Audio Frequency Response with 108.0MHz Carrier (25,50,90% Modulation)

14. Multiplex L&R Audio Frequency Harmonic Distortion

Definition

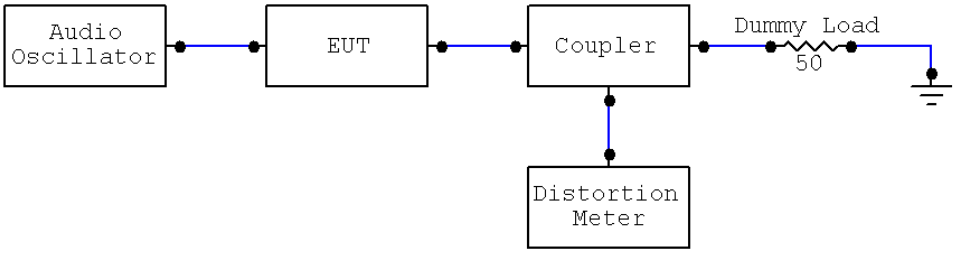
The audio frequency harmonic distortion is the harmonic content of the audio signal contributed by the transmitting equipment. It is measured here for stereo operation.

Requirement (Industry Canada) – BETS-6 [section A.2.3.2]

The audio frequency distortion including all harmonics up to 30 kHz shall not exceed 1% in the range of frequencies from 50 to 15,000 Hz. This measurement references the ratio to 90% for stereo operation.

Method

The demodulated output of the transmitter is fed to a wave or distortion analyzer. The normal 75 microsecond pre-emphasis shall be employed and the demodulator shall include a 75 microsecond de-emphasis. Measurements at 100% modulation are taken at a sufficient number of frequencies in each range of frequencies to plot a distortion versus frequency curve. Alternatively, a VM700 waveform measurement set (or equivalent) may be used. Repeat for low, mid, and high frequencies within the FM band.



Measurement

Carrier Frequency at 88.0 MHz (Right):

Frequency (Hz)	THD (%)
50	0.35
100	0.30
200	0.33
400	0.36

Frequency (Hz)	THD (%)
1,000	0.29
2,500	0.23
5,000	0.24
7,500	0.30

Frequency (Hz)	THD (%)
10,000	0.34
12,500	0.47
15,000	0.76

Carrier Frequency at 88.0 MHz (Left):

Frequency (Hz)	THD (%)
50	0.36
100	0.42
200	0.38
400	0.27

Frequency (Hz)	THD (%)
1,000	0.38
2,500	0.32
5,000	0.28
7,500	0.36

Frequency (Hz)	THD (%)
10,000	0.47
12,500	0.52
15,000	0.94

Carrier Frequency at 108.0 MHz (Right):

Frequency (Hz)	THD (%)
50	0.38
100	0.42
200	0.36
400	0.42

Frequency (Hz)	THD (%)
1,000	0.39
2,500	0.38
5,000	0.29
7,500	0.33

Frequency (Hz)	THD (%)
10,000	0.38
12,500	0.42
15,000	0.84

Carrier Frequency at 108.0MHz (Left):

Frequency (Hz)	THD (%)
50	0.39
100	0.38
200	0.39
400	0.27

Frequency (Hz)	THD (%)
1,000	0.37
2,500	0.32
5,000	0.28
7,500	0.36

Frequency (Hz)	THD (%)
10,000	0.47
12,500	0.51
15,000	0.93

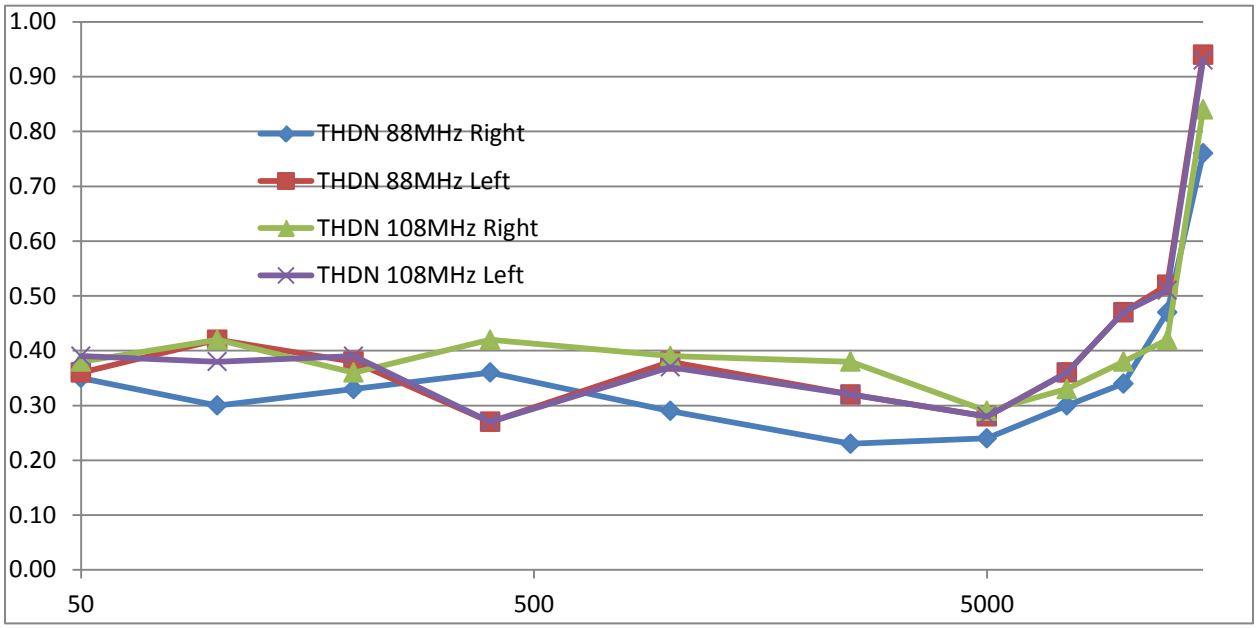


Figure 13: Audio Harmonic Distortion at 88.0 and 108.0MHz Carrier (Stereo)

15. Multiplex L&R Frequency Modulation Noise on Carrier

Definition

The frequency modulation noise on the carrier is the residual frequency modulation resulting from disturbances produced in the transmitting equipment itself within the band of 50 to 15,000 Hz.

Requirement (Industry Canada) – BETS-6 [section A.2.3.3]

The ratio shall be at least 60dB below 90% modulation.

Method

The demodulated output of a sample of the transmitting equipment is fed into a distortion and noise meter. The frequency response characteristic of the demodulator shall be within +/- 1dB of the normal 75 microsecond de-emphasis curve from 50 to 15,000 Hz. Readings shall be taken of the output levels with standard test modulation of 100% and without modulation with the input terminated in 600 ohms. Their ratio shall be expressed in dB below 90% modulation (+/- 75 kHz deviation).

Measurement

Carrier Frequency	*Ratio (dB)*
88.0 MHz	-64
108.0 MHz	-70

16. Multiplex L&R Amplitude Modulation Noise on Carrier

Definition

The amplitude modulation noise on the carrier of an FM carrier is the ratio of the RMS value of the amplitude modulation component (50 to 15,000 Hz) of the carrier envelope to the RMS carrier value during the absence of applied modulating voltage.

Requirement (Industry Canada) – BETS-6 [section A.2.3.4]

The ratio shall be at least 50dB below carrier level within the band of 50 to 15,000 Hz, (90% modulation).

Method

Measurement of the carrier amplitude modulation noise level may be accomplished by the use of a linear peak carrier responsive AM detector coupled to the output of the transmitting equipment. Readings are made of the DC voltage and the RMS value of the AC component across the detector load resistor. The DC voltage must be multiplied by 0.707. The measurement shall be made in the absence of modulating voltage with the audio input terminated in 600 ohms.

Measurement

Carrier Frequency	*Ratio (dB)*
88.0 MHz	-70
108.0 MHz	-69

17. Stereophonic Crosstalk

Definition

Crosstalk is unwanted leakage or bleed of a signal from one audio channel to other channels within a device.

Requirement (Industry Canada) – BETS-6 [section A.2.3.5]

Crosstalk into either channel shall be at least 40 dB below 90% modulation.

Method

Using the standard test input signal to produce 90% modulation of the carrier by the L + R channel, measure the components of the signal appearing in the L - R channel. With 90% modulation of the carrier by the L - R channel, measure the components of the signal appearing in the L + R channel.

Measurement

88.0 MHz:

Crosstalk on L-R referenced to 90% modulation by L+R channel: -46 dB

Crosstalk on L+R referenced to 90% modulation by L-R channel: -40 dB

108.0 MHz:

Crosstalk on L-R referenced to 90% modulation by L+R channel: -45 dB

Crosstalk on L+R referenced to 90% modulation by L-R channel: -40 dB

18. Stereophonic Separation

Definition

Stereo separation is the difference of what is being output from the left and right channels of the transmitter.

Requirement (Industry Canada) – BETS-6 [section A.2.3.6]

The stereophonic separation between channels shall be 30 dB or better.

Method

Modulate the carrier to a level of 90% with a standard test signal applied to the L channel only. Measure the demodulated output of the L and R channels and determine the separation at frequencies of 100, 400, 1000, 2500, 5000, 7500 and 10000 Hz. Repeat the above with a test signal applied to the R channel only.

Measurement

88.0 MHz:

Signal Applied to L Channel		Signal Applied to R Channel	
Frequency (Hz)	Separation (dB)	Frequency (Hz)	Separation (dB)
100	31	100	32
400	41	400	40
1,000	45	1,000	47
2,500	46	2,500	47
5,000	40	5,000	41
7,500	37	7,500	37
10,000	35	10,000	35

108.0 MHz:

Signal Applied to L Channel		Signal Applied to R Channel	
Frequency (Hz)	Separation (dB)	Frequency (Hz)	Separation (dB)
100	33	100	34
400	40	400	40
1,000	41	1,000	45
2,500	43	2,500	46
5,000	40	5,000	41
7,500	37	7,500	37
10,000	34	10,000	35

19. Frequency Stability of Pilot Subcarrier

Definition

The pilot tone at 19 kHz indicates that there is a 38kHz stereophonic subcarrier present. The receiver uses this tone as a reference to demodulate the stereo information and it is important that the pilot subcarrier frequency remains constant.

Requirement (Industry Canada) – BETS-6 [section A.2.3.7]

The pilot subcarrier frequency shall be 19,000 Hz ±2 Hz, and any multiplex subcarrier shall be within 500 Hz of the operating frequency selected by the manufacturer as noted in the test report.

Method

After a warm-up period of one hour at rated AC input voltage, measure the frequency of the pilot subcarrier at one minute intervals during a period of fifteen minutes. From these measurements determine a mean pilot frequency.

Measurement

Mean pilot frequency: 19,000 Hz

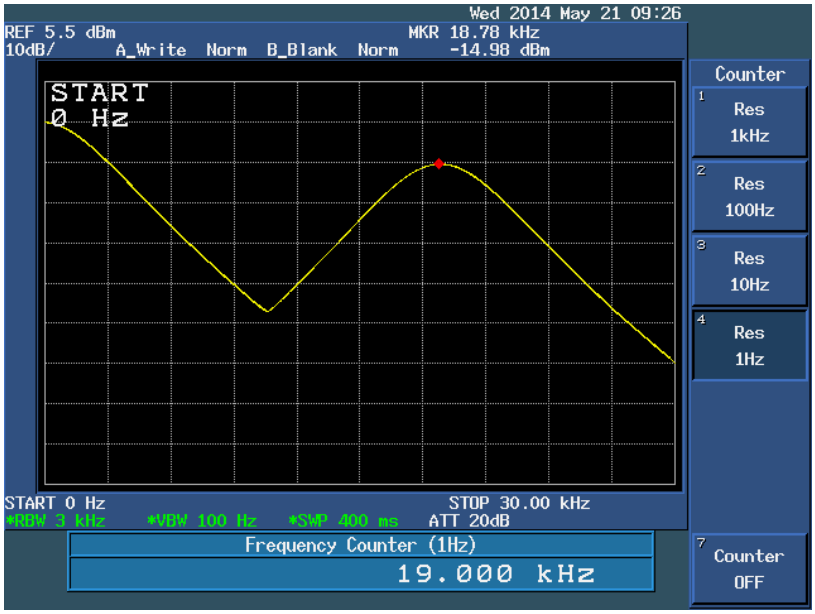


Figure 14: Pilot Subcarrier Frequency

20. Stereophonic Subcarrier Suppression

Definition

The 38kHz subcarrier is suppressed to give a double sideband signal above the normal audio bandwidth.

Requirement (Industry Canada) – BETS-6 [section A.2.4]

The stereo subcarrier shall be at least 40 dB below the total modulation of the carrier.

Method

Using a stereo modulation monitor or other suitable method, determine the level of the stereo subcarrier.

Measurement

88.0 MHz:
Stereo subcarrier level below total modulation of carrier: -64 dB

108.0 MHz:
Stereo subcarrier level below total modulation of carrier: -65 dB