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FCC PART 90

TEST REPORT

APPLICANT	KANEMATSU USA INC.
	543 WEST ALGONQUIN ROAD
	ARLINGTON HEIGHTS ILLINOIS 60005 USA
FCC ID	IV9FNCV-70
MODEL NUMBER	Fennec VHF70
PRODUCT DESCRIPTION	VHF TRANSCEIVER
DATE SAMPLE RECEIVED	7/28/2006
DATE TESTED	8/15/2006
TESTED BY	Nam Nguyen
APPROVED BY	Mario de Aranzeta
TIMCO REPORT NO.	2235AUT6TestReport
TEST RESULTS	☒ PASS ☐ FAIL

**THE ATTACHED REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL
WITHOUT THE WRITTEN APPROVAL OF TIMCO ENGINEERING, INC.**



Certificate # 0955-01

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STATEMENT OF COMPLIANCE

This equipment has been tested in accordance with the standards identified in the referenced test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report and demonstrate that the equipment complies with the appropriate standards. No modifications were made to the equipment during testing in order to demonstrate compliance with these standards.

I attest that the necessary measurements were made by me or under my supervision, at Timco Engineering, Inc. located at 849 N.W. State Road 45, Newberry, Florida 32669 USA.

Authorized by: Mario de Aranzeta

Signature: On File

Function: Engineer

Date: September 26, 2006

Tested by: Nam Nguyen

Signature: on file

Date: August 15, 2006

GENERAL INFORMATION

Test System Information

Disclaimer : The test results relate only to the items tested.

Purpose of Test : To show the DUT in compliance with FCC CFR 47, Part 90 requirements for VHF radios.

Test Standards : TIA 603, FCC CFR 47 Part 90, ANSI C63.4: 2003,

Related Report : 2235BUT6TestReport for digital interface portion

Test Facility : RF output power and radiated emission were conducted by Timco Engineering Inc. located at 849 NW State Road 45, Newberry, FL 32669 USA

Laboratory Test Condition : The temperature was 26°C with a relative humidity of 50%.

Modification to the DUT : No modification was made to ensure the DUT compliance with requirements.

Test Exercise : The DUT was placed in continuous transmit mode of operation.

System Setup : Stand alone device.

Product Specification

DUT : VHF TRANSCEIVER

FCC ID : IV9FNCV-70

M/N : Fennec VHF70

S/N : N/A

Operating Freq : 150 ~ 174 MHz

Max. Output Pwr : High: 72W, Low: 10W

Channel Spacing : 12.5 kHz, 25 kHz

No. of Channels : Single

Emission : 10K8F3E

Designator(s)

Calculation of Designator(s) : $B_n = 2M + 2DK$, $M = 3000$, $D = 2440$ $K=1$
 $B_n = 2(3000) + 2(2440) = 10.88$

Modulation : FM

Power Source : Battery Operated Exclusively

Test Item : Pre-production

Type of DUT : Mobile

Antenna Spec : OMNI, 5 dBi

TEST EQUIPMENT

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
Analyzer Tan Tower Spectrum Analyzer	HP	8566B Opt 462	3138A07786 3144A20661	CAL 12/7/05	12/7/07
Analyzer Tan Tower RF Preselector	HP	85685A	3221A01400	CAL 12/7/05	12/7/07
Analyzer Tan Tower Quasi-Peak Adapter	HP	85650A	3303A01690	CAL 12/8/05	12/8/07
Analyzer Tan Tower Preamplifier	HP	8449B-H02	3008A00372	CAL 12/8/05	12/8/07
Antenna: Biconnical	Electro-Metrics	BIA-25	1171	CAL 4/29/05	4/29/07
Antenna: Double-Ridged Horn	Electro-Metrics	RGA-180	2319	CAL 12/29/04	12/29/06
Termaline Wattmeter	Bird Electronic Corporation	611	16405	CAL 7/16/06	7/16/08

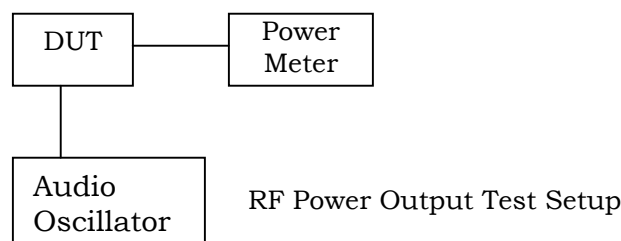
TEST PROCEDURE

Power Line Conducted Interference

The procedure used was ANSI 63.4-2003 using a 50uH LISN. Both lines were observed with the UUT transmitting. The bandwidth of the spectrum analyzer was 10 kHz with an appropriate sweep speed.

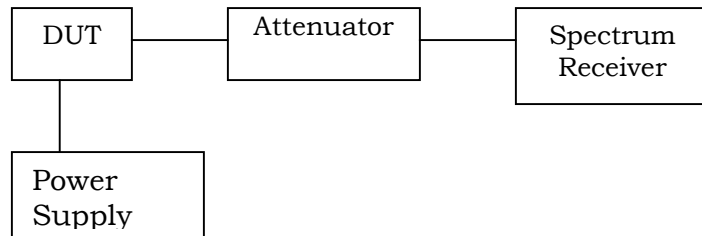
RF Power Output

The RF power output was measured at the antenna feed point using a peak power meter. A 50-ohm, resistive wattmeter was connected to the RF output connector. With a nominal battery voltage, and the transmitter properly adjusted the RF output measures:



Spurious Emissions At Antenna Terminals (Conducted)

The carrier was modulated 100% using a 2500 Hz tone. The spectrum was scanned from 0.4 to at least the 10th harmonic of the fundamental. Above 1 GHz the resolution bandwidth was 1 MHz and the VBW = 3 MHz and the span to 50 MHz. The measurements were made in accordance with standard EIA/TIA-603.



Radiation Interference

The test procedure used was TIA-603-C and ANSI STANDARD C63.4-2003 using an Agilent spectrum receiver with pre-selector. The bandwidth (RBW) of the spectrum receiver was 100 kHz up to 1 GHz and 1 MHz above 1 GHz with an appropriate sweep speed. The VBW above 1 GHz was 3 MHz. The analyzer was calibrated in dB above a microvolt at the output of the antenna.

Modulation Characteristic

Audio frequency response

The audio frequency response was measured in accordance with TIA/EIA Specification 603 with no exception.

Audio Low Pass Filter

The audio low pass filter for voice-modulated equipment was measured in accordance with TIA/EIA Specification 603.

Audio Input versus modulation

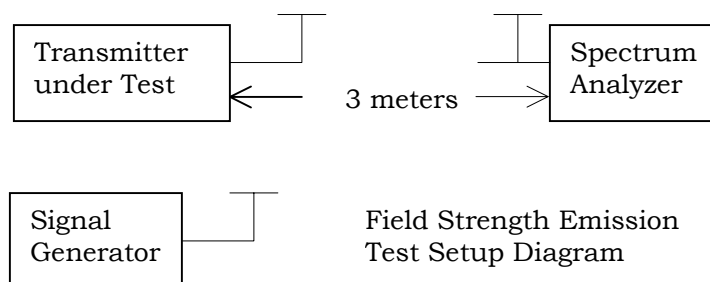
The audio input level needed for a particular percentage of modulation was measured in accordance with TIA/EIA Specification 603. Curves are provided for audio input frequencies of 300, 1000, and 3000 Hz.

Frequency Stability

The frequency stability was measured per TIA/EIA 603.

Field Strength of Spurious Emissions

The spectrum was scanned from 30 MHz to at least the tenth harmonic of the fundamental. This test was conducted per TIA/EIA STANDARD 603 using the substitution method.

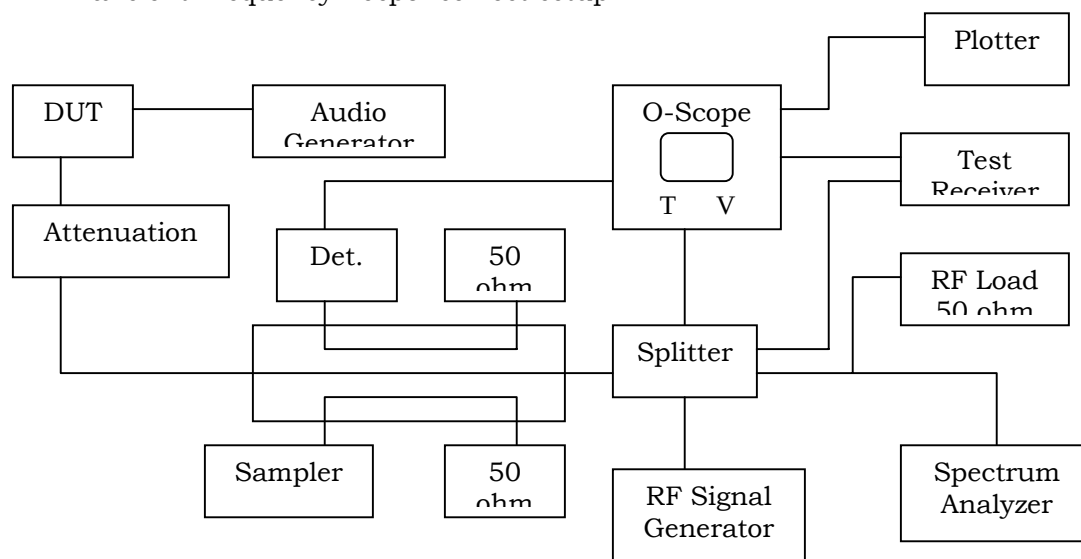


Transient Frequency Behavior

The test procedure was TIA/EIA 603 Para 2.2.19.

- Using the variable attenuator. The transmitter level was set to 40 dB below the test receivers maximum input level,
- Then the transmitter was turned off.
- With the transmitter off the signal generator was set 20dB below the level of the transmitter in the above step, this level will be maintained with the signal generator through-out the test.
- Reduce the attenuation between the transmitter and the RF detector by 30 dB.
- With the levels set as above the transient frequency behavior was observed & recorded.

Transient Frequency Response Test setup



TEST RESULT

RF POWER OUTPUT

Rule Part No.: Part 2.1046(a), Part 90

Requirements: Part 2.1046

Test Data: HIGH – 72.4 Watts
 LOW - 10.5 Watts

MODULATION CHARACTERISTICS

Rule Parts No.: Part 2.1047(a)(b), Part 90

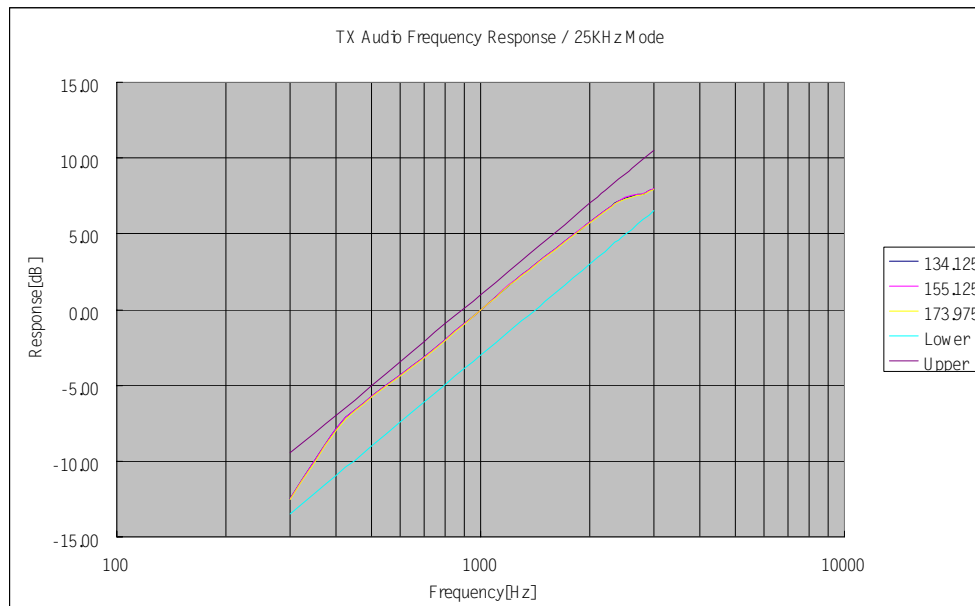
Requirements: A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 – 5000Hz shall be submitted.

For voice modulated communication equipment, a curve or equivalent data showing audio low pass filter shall be submitted.

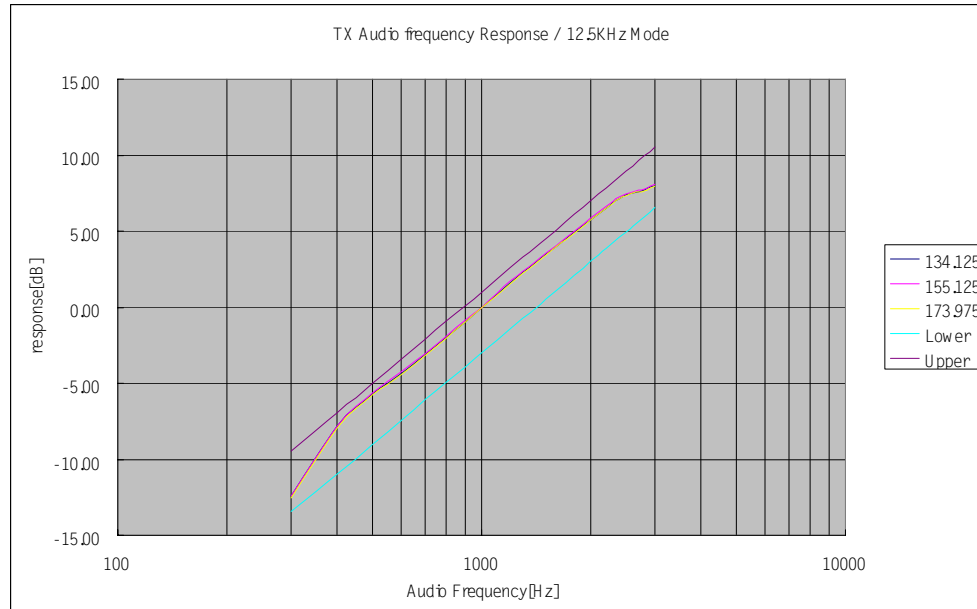
Audio input versus modulation cannot exceed 100%.

Test Data: The curve(s) is/are shown below.

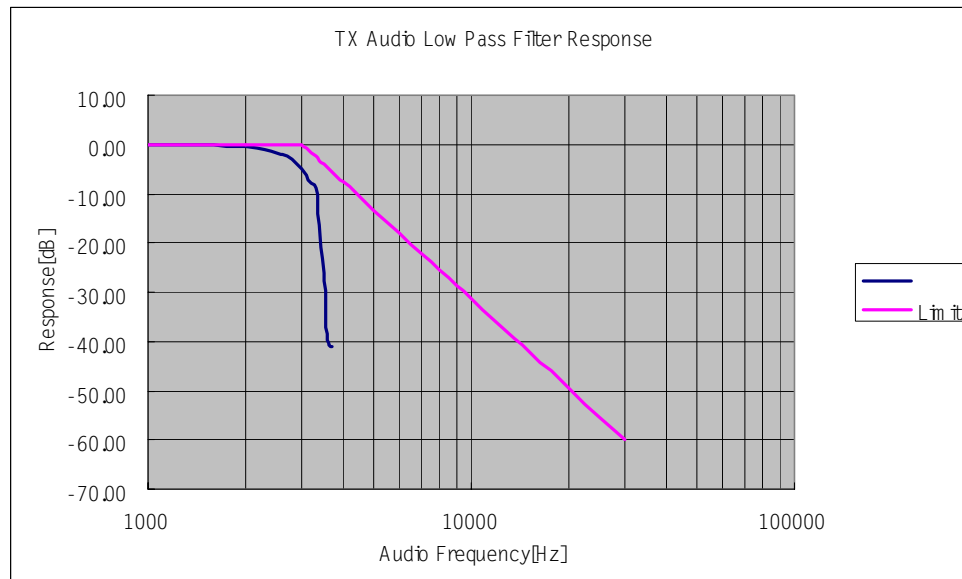
Plot - Audio Frequency Response – 25 kHz



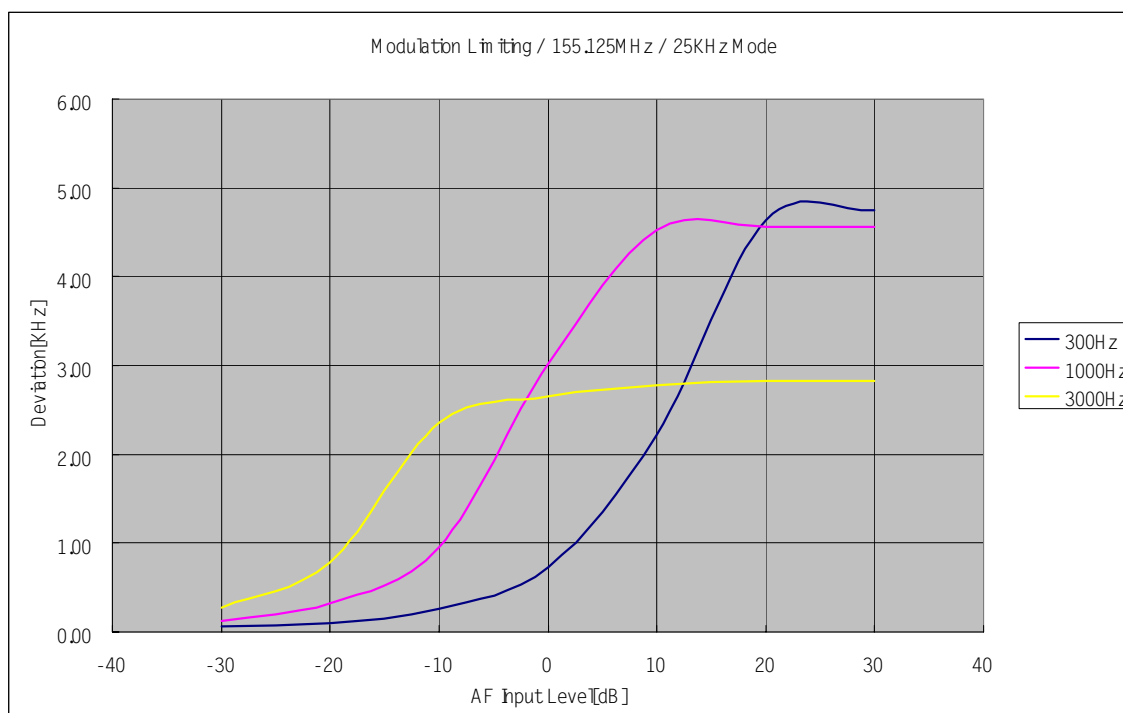
Plot - Audio Frequency Response – 12.5 kHz



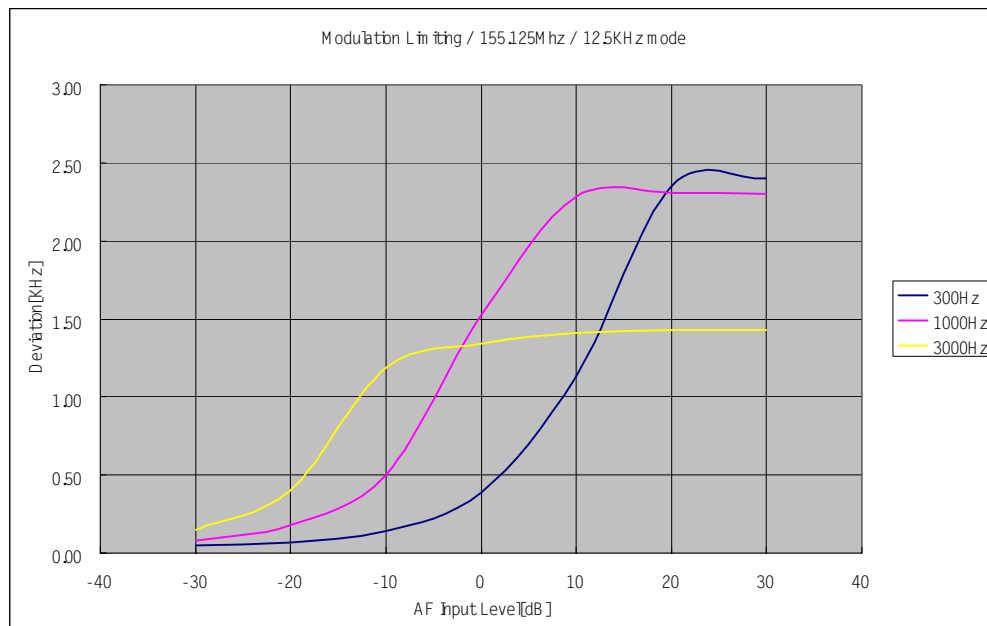
Audio Low Pass Filter Plot



Plot - Audio Input Curves Versus Modulation – 25 kHz – Middle Frequency



Plot - Audio Input Curves Versus Modulation – 12.5 kHz – Middle Frequency



OCCUPIED BANDWIDTH

Rule Parts No: 2.1049, Pt 90.210(b)

Test Requirement:

Part 90.210(b) 25kHz Channel Spacing

Data in the plots show that on any frequency removed from the assigned frequency by more than 50%, but not more than 100%: At least 25dB. On any frequency removed from the assigned frequency by more than 100%, but not more than 250%: At least 35 dB. On any frequency removed from the assigned frequency by more than 250%, of the authorized bandwidth: At least $43 + 10\log(P)$ dB.

Part 90.210(c) 12.5kHz Channel Spacing Not Equipped with a Low Pass Filter

For transmitters that are not equipped with an audio low pass filter pursuant to S90.211 (b), the power of any emission must be attenuated below the un-modulated carrier output power as follows; (1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5 kHz but not more than 10 kHz: At least $83 \log(f_d/5)$ dB; (2) ON any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 10 kHz, but not more than 250% of the authorized bandwidth: At least $29 \log(f_d/11)$ dB or 50 dB, whichever is the lesser attenuation; (3) On any frequency removed from the center of the authorized bandwidth by more than 250% of the authorized bandwidth: At least $43 + 10 \log(P_o)$ dB.

Part 90.210(d) Emission Mask D - 12.5 kHz channel BW equipment.

For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

- (1) On any frequency from the center of the authorized bandwidth f_0 to 5.625 kHz removed from f_0 : Zero dB.
- (2) On any frequency from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5.625 kHz but no more than 12.5 kHz: At least $7.27 (f_d - 2.88 \text{ kHz})$ dB.
- (3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz: At least $50 + 10\log(P)$ dB or 70 dB, whichever is the lesser attenuation.

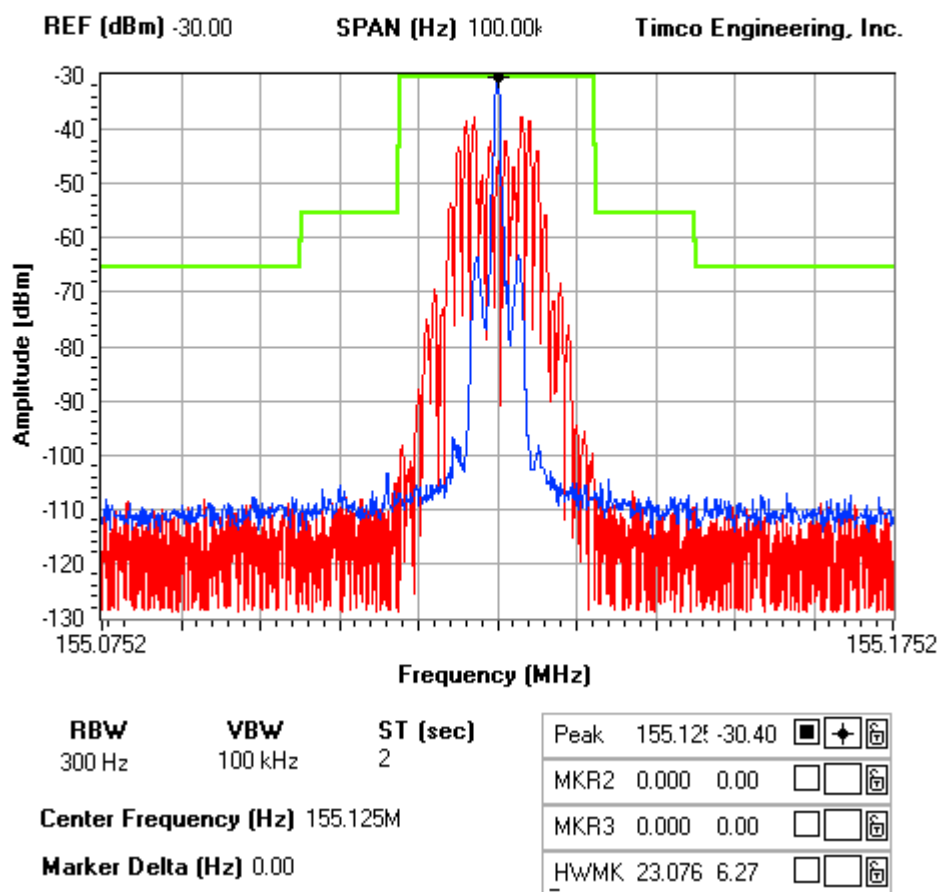
Test Data:

Plot - Part 90.210(b) – 25.0 kHz Channel Spacing

NOTES:

KANEMATSU USA INC. - FCC ID: IV9FNCV-70
Occupied bandwidth plot - 25.0 kHz channel spacing.

FCC 90.210 Mask B

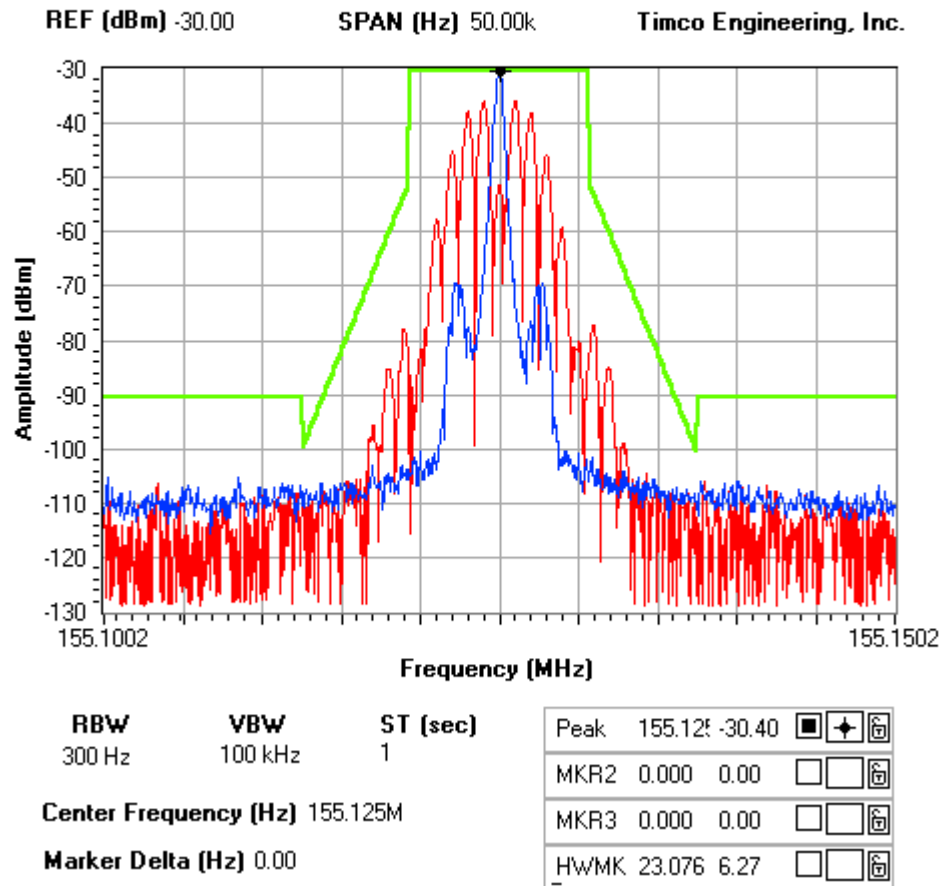


Plot - Part 90.210(d) Emission Mask D - 12.5 kHz channel spacing.

NOTES:

KANEMATSU USA INC. - FCC ID: IV9FNCV-70
Occupied bandwidth plot - 12.5 kHz channel spacing.

FCC 90.210 Mask D



SPURIOUS EMISSIONS AT ANTENNA TERMINALS (CONDUCTED)

Rule Part No.: Part 2.1051(a)

Requirements: 12.5 kHz Spacing = $50 + 10 \log(P_o) = 68.6$ dB

25 kHz Spacing = $43 + 10 \log(P_o) = 61.6$ dB

Test Data: 25 kHz spacing

Low Power

Emission Frequency MHz	dB Below Carrier (dBc)	Emission Frequency MHz	dB Below Carrier (dBc)	Emission Frequency MHz	dB Below Carrier (dBc)
134.13		155.13		173.98	
268.25	65.3	310.25	92.1	347.95	103.5
402.38	95.1	465.38	104.3	521.93	104.2
536.50	111.6	620.50	107.8	695.90	
670.63	112.2	775.63	108.3	869.88	
804.75	112.6	930.75	ne	1043.85	
938.88	110.6	1085.88	102.1	1217.83	
1073.00		1241.00	ne	1391.80	
1207.13		1396.13	98.7	1565.78	
1341.25		1551.25		1739.75	

High Power

Emission Frequency MHz	dB Below Carrier (dBc)	Emission Frequency MHz	dB Below Carrier (dBc)	Emission Frequency MHz	dB Below Carrier (dBc)
134.13		155.13		173.98	
268.25	69.4	310.25	92.1	347.95	101.5
402.38	89.8	465.38	88	521.93	85.9
536.50	98.9	620.50	111.7	695.90	100.5
670.63	100.8	775.63	113.1	869.88	102.8
804.75	105.2	930.75	117.5	1043.85	108.1
938.88	111.7	1085.88	109.1	1217.83	111.5
1073.00	101.7	1241.00	110.9	1391.80	
1207.13	111.5	1396.13	99.5	1565.78	
1341.25		1551.25	110.6	1739.75	

FIELD STRENGTH OF SPURIOUS EMISSIONS

Rule Parts. No.: Part 2.1053

Requirements: Same as conducted emissions

Test Data: 12.5 kHz Spacing

High Power

Emission Frequency MHz	Ant. Polarity V/H	dB Below Carrier (dBc)
134.13		0
268.25	H	84.53
402.38	H	102.84
536.50	H	86.1
670.63	H	92.97
804.75	H	98.01
938.88	H	107.92
1073.00	H	97.58
1207.13	H	100.96
1341.25	H	102.75

Emission Frequency MHz	Ant. Polarity V/H	dB Below Carrier (dBc)
155.13		0
310.25	H	81.05
465.38	H	87.21
620.50	H	99.47
775.63	H	103.06
930.75	H	95.72
1085.88	H	100.43
1241.00	H	100.84
1396.13	H	106.15
1551.25	H	98.82

Emission Frequency MHz	Ant. Polarity V/H	dB Below Carrier (dBc)
173.98		0
347.95	H	78.87
521.93	H	82.25
695.90	H	99.17
869.88	H	89.59
1043.85	H	107.48
1217.83	H	104.22
1391.80	H	101.06
1565.78	H	99.61
1739.75	H	98.21

[Continued]

Low power

Emission Frequency MHz	Ant. Polarity V/H	dB Below Carrier (dBc)
134.13		0
268.25	H	77.53
402.38	H	92.44
536.50	H	91.3
670.63	H	103.77
804.75	H	95.91
938.88	H	101.22
1073.00	H	93.58
1207.13	H	92.56
1341.25	H	95.05

Emission Frequency MHz	Ant. Polarity V/H	dB Below Carrier (dBc)
155.13		0
310.25	H	73.35
465.38	H	80.81
620.50	H	95.97
775.63	H	103.86
930.75	H	98.52
1085.88	H	92.53
1241.00	H	91.94
1396.13	H	97.65
1551.25	H	94.32

Emission Frequency MHz	Ant. Polarity V/H	dB Below Carrier (dBc)
173.98		0
347.95	H	71.67
521.93	H	73.75
695.90	H	95.27
869.88	H	99.39
1043.85	H	101.58
1217.83	H	96.82
1391.80	H	94.36
1565.78	H	94.11
1739.75	H	91.81

FREQUENCY STABILITY

Rule Parts. No.: Part 2.1055, Part 90.213

Requirements: Temperature range requirements: -30 to +50° C.
Voltage Variation +, -15%
±2.5 PPM

Test Data:

Test Temperature [°C]	Frequency [MHz]	Frequency [MHz]	Frequency [MHz]	Unit
	134.125	155.125	173.975	
-30	0.25	0.50	0.33	[ppm]
-20	0.17	0.14	0.11	[ppm]
-10	0.16	0.14	0.10	[ppm]
0	0.18	0.17	0.15	[ppm]
10	0.02	0.01	0.01	[ppm]
20	0.03	0.03	0.02	[ppm]
30	0.02	0.03	0.00	[ppm]
40	0.08	0.08	0.07	[ppm]
50	0.13	0.07	0.09	[ppm]
60	0.79	0.12	0.15	[ppm]

Test Voltage[Vdc]	Frequency [MHz]	Frequency [MHz]	Frequency [MHz]	Unit
	134.125	155.125	173.975	
0 (13.8)	0.10	0.10	0.10	[ppm]
-15%(11.7)	0.10	0.10	0.10	[ppm]
+15%(15.9)	0.10	0.10	0.10	[ppm]

TRANSIENT FREQUENCY BEHAVIOR

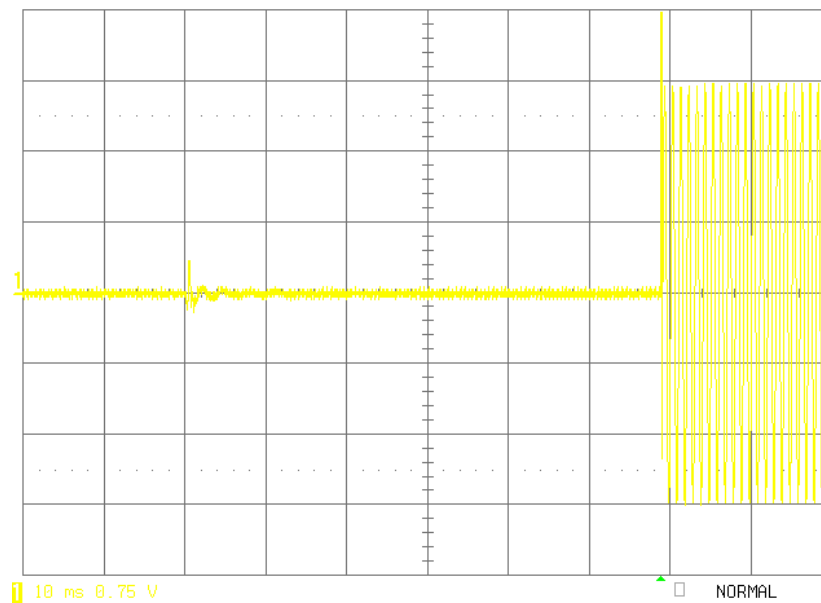
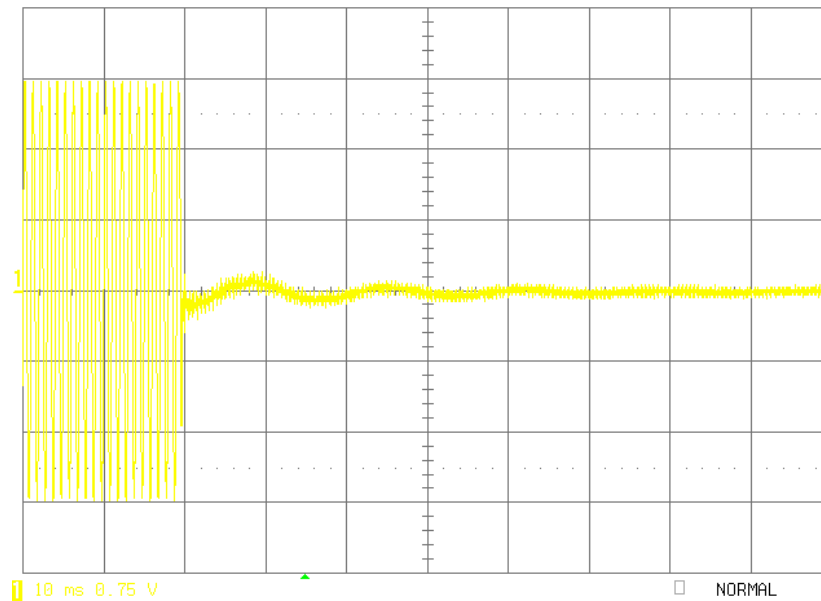
Rule Parts: Part 90.214

Requirements: Transmitters designed to operate in the 150-174 MHz and 421-512 MHz frequency bands must maintain transient frequencies within the maximum transient frequencies within the maximum frequency difference limits during the time intervals indicated:

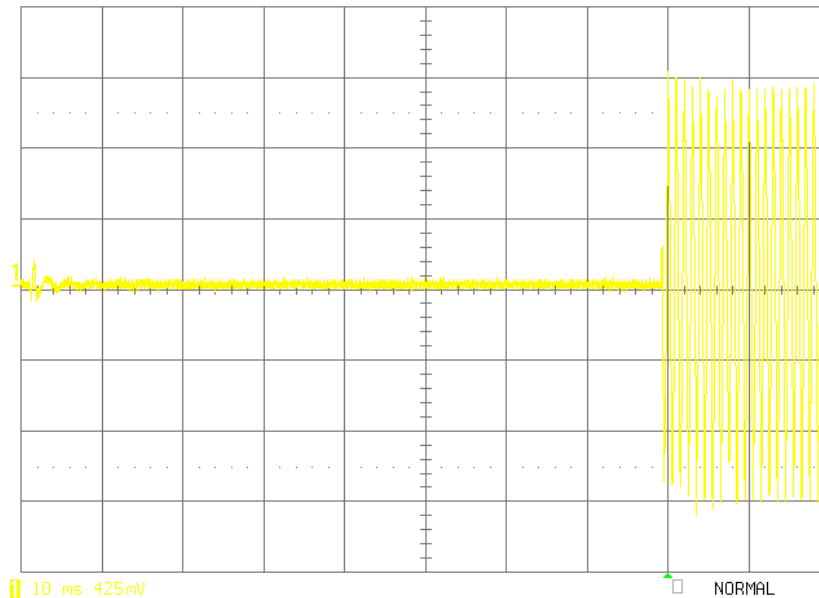
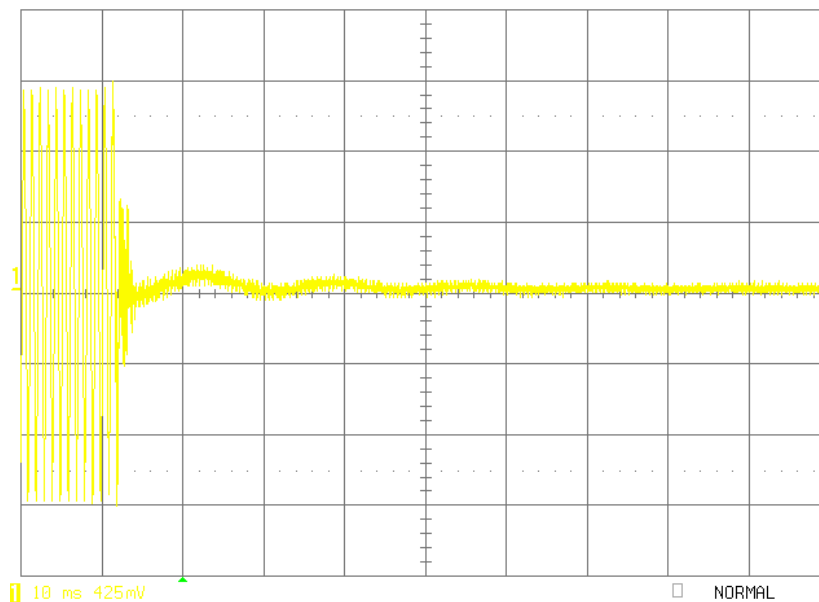
Time Intervals	Maximum frequency difference	All Equipment	
		150-174 MHz	421-512 MHz
Equipment Designed to Operate on 25 kHz Channels			
t ₁ ⁴	±25.0 kHz	5.0 mS	10.0 mS
t ₂	±12.5 kHz	20.0 mS	25.0 mS
t ₃ ⁴	±25.0 kHz	5.0 mS	10.0 mS
Equipment Designed to Operate on 12.5 kHz Channels			
t ₁ ⁴	±12.5 kHz	5.0 mS	10.0 mS
t ₂	±6.25 kHz	20.0 mS	25.0 mS
t ₃ ⁴	±12.5 kHz	5.0 mS	10.0 mS
Equipment Designed to Operate on 6.25 kHz Channels			
t ₁ ⁴	±6.25 kHz	5.0 mS	10.0 mS
t ₂	±3.125 kHz	20.0 mS	25.0 mS
t ₃ ⁴	±6.25 kHz	5.0 mS	10.0 mS

Test Data:

EUT operates on 25 kHz channels spacing:



EUT operates on 12.5 kHz channels spacing:



POWER LINE CONDUCTED INTERFERENCE**Rules Part No.:** Part 15.207**Requirements:**

Frequency (MHz)	Quasi Peak Limits (dBuV)	Average Limits (dBuV)
0.15 – 0.5	66 – 56	56 – 46
0.5 – 5.0	56	46
5.0 – 30	60	50

Test Data: Not applicable DUT is battery operated exclusively.