FCC / INDUSTRY CANADA MEASUREMENT REPORT

CERTIFICATION OF COMPLIANCE
FCC PART90 CERTIFICATION

PRODUCT	:	Data Radio Land Mobile Service (LMR)
MODEL/TYPE NO	:	SD-174E
FCC ID	:	RXUSD-174E
TRADE NAME	:	maxon cic Maxon CIC Corp.
APPLICANT	:	Chongho Building, #7-61 Yangjae-Dong, Seocho-Gu, Seoul, 137-130, Korea Attn. : Hyun Koo Kang / Senior Manager
CLASSIFICATION	:	JBP Licensed Non-Broadcast Station Transmitter
RULE PART(S)	:	FCC Part 90 Private land mobile radio services
FCC PROCEDURE	:	Certification
DATES OF TEST	:	July 20, 2009 to August 31, 2009
DATES OF ISSUE	:	August 31, 2009
TEST REPORT No.	:	BWS-09-RF-0008
TEST LAB.	:	BWS TECH Inc.(FCC Registration Number : 553281)

This Data Radio SD-174E has been tested in accordance with the measurement procedures specified in ANSI C63.4-2003 and ANSI/TIA-603-C-2004 at the BWS TECH/EMC Test Laboratory and has been shown to be complied with the electromagnetic radiated emission limits specified in FCC Rule Part 90.

I attest to the accuracy of data. All measurement herein was performed by me or were made under my supervision. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them. The results of testing in this report apply to the product/system, which was tested only. Other similar equipment may not necessarily produce the same results due to production tolerance and measurement uncertainties.

August 31, 2009
(Date)

Tested by **Hyunsup, Jin**

August 31, 2009
(Date)

Reviewed by **TaeHyun, Nam**

BWS TECH Inc.
www.bws.co.kr
#611-1 Maesan-Ri, Mohyeon-Myeon, Yongin-Si, Gyeonggi-Do, 449-853 Korea
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TABLE OF CONTENTS

FCC TEST REPORT

Scope – *Measurement and determination of electromagnetic emission(EME) of radio frequency devices including intentional radiators and/or unintentional radiators for compliance with the technical rules and regulations of the U.S Federal Communications Commission(FCC)*

1. General Information

Applicant

Company Name	Maxon CIC Corp.
Company Address	Chongho Building, #7-61 Yangjea-Dong, Seocho-Gu, Seoul, 137-130, Korea
Phone/Fax	Phone : +82-2-3498-3060 Fax : 02-3498-3115

Manufacturer

Company Name	Maxon CIC Thailand Co., Ltd(MCTL)
Company Address	40/23 Moo 5 Rojana Industrial Park Tambol U-Thai, Amphur U-Thai Ayutthaya 13210 Thailand
Phone/Fax	Tel No. : +66-(0)35-719-498~501 Fax No. : +66-(0)35-719-492

● **EUT Type**	Data Radio (LMR)
● **Model Number**	SD-174E
● **FCC Identifier**	RXUSD-174E
● **S/N**	#2
● **FCC Rule Part(s)**	FCC Part 90 Private land mobile radio services
● **FCC Classification**	TNB : Licensed Non-Broadcast Station Transmitter
● **Freq. Range**	450 MHz ~ 490 MHz
● **Channel**	16 Channels
● **Modulation Method**	FM, FFSK, GMSK
● **Emission Designator**	19K6F2D, 11K0F3E, 16K0F3E
● **RF Power Output**	1/5 Watt
● **Test Procedure**	ANSI C63.4-2003 and ANSI/TIA-603-C-2004
● **Dates of Tests**	July 20, 2009 to August 6, 2009
● **Place of Tests**	BWS TECH Inc.(FCC Registration Number : 553281) #611-1 Maesan-Ri, Mohyeon-Myeon, Yongin-Si, Gyeonggi-Do, 449-853 Korea TEL: +82 31 333 5997 FAX: +82 31 333 0017
● **Test Report No.**	BWS-09-RF-0008

2. Description of Test Facility

The measurement for radiated and conducted emission test were conducted at the open area test site of BWS TECH Inc. facility located at #611-1 Maesan-Ri, Mohyeon-Myeon, Yongin-Si, Gyeonggi-Do, 449-853 Korea. The site is constructed in conformance with the requirements of the ANSI C63.4-2000 and CISPR Publication 16. The BWS TECH measurement facility has been filed to the Commission with the FCC for 3 and 10-meter site configurations. Detailed description of test facility was found to be in compliance with the requirements of Section 2.948 FCC Rules according to the ANSI C63.4-2000 and registered to the Federal Communications Commission (Registration Number : 553281).

The measurement procedure described in American National Standard for Method of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz (ANSI C.63.4-2000) was used in determining radiated and conducted emissions from the Maxon C IC Corp. Data Radio Model : SD-174E.

3. Product Information

The Equipment Under Test (EUT) is the MAXON CIC CO LTD Data Radio model: SD-174E (FCC ID: RXUSD-174E).

The Maxon SD-125E Series of RF Link Modules from Maxon utilize the latest technology in their designs and manufacturing.

Both the UHF and VHF models are Phase Lock Loop Synthesizer(PLL) / microprocessor controlled and offer 1/5 Watt(Low/High) programmable output power per channel with 16 channel capability.

Multiple functions including 1200 to 9600 baud rates. AC and/or DC audio coupling, GMSK,FFSK and FSK modulation are standard in these fully programmable wide bandwidth RF Link Module units.

3.1 DC Voltage and Currents

The DC voltages applied to and DC currents into the several elements of the final radio frequency amplifying stage for normal operation over power range were;

Standby: 12 Volts, 0.065 Ampare
Low Power: 12 Volts, 1.00 Ampare
High Power: 12 volts, 2.00 Ampare

3.2 Emission Designator

Type of Emission : F3E

Necessary Bandwidth and Emission Bandwidth:

Data (Wide Band) : Bn = 19K6F2D
12.5 kHz (Narrow Band) : Bn = 11K0F3E
25.0 kHz (Wide Band) : Bn = 16K0F3E

Calculation:

Maximum Modulation(M) in kHz : 3000(Audio), 9600(Data)
Maximum Deviation(D) in kHz : 5(Data), 2.5(NB), 5(WB)
Constant Factor(k) : 1
Bn = 2M + 2DK

Data (Narrow Band) :

Bn = [2 X (9600 / 2)] + (2 X 5000 X 1) = 19.60 kHz

12.5 (Narrow Band) :

Bn = (2 X 3000) + (2 X 2500 X 1) = 11.00 kHz

25.0 (Wide Band) :

Bn = (2 X 3000) + (2 X 5000 X 1) = 16.00 kHz

3.3 General Specification

GENERAL

Equipment Type	:	Data Radio
Performance Specifications		TIA/EIA -603 / IC, RSS212
Band	:	VHF(SD-171E) / UHF(SD-174E)
Channel Spacings	:	12.5 kHz, 25 kHz programmable
RF Output Power	:	5 / 1 watt programmable
Modulation Type	:	F2D, F3E
Intermediate Frequency	:	45.1 MHz & 455 kHz
Number of Channels	:	16
Frequency Source	:	Synthesizer
Operation Rating	:	Intermittent 90 : 5 : 5 (Standby: RX: TX)
Power Supply	:	Ext. Power Supply(12 VDC Nominal) 9.0V – 18.0V DC EXTREME
Temperature Range	:	Storage (- 40° C to + 80° C) Operating (- 30° C to + 60° C)
Current Consumption	:	Standby (Muted) < 65 mA Transmit 5 Watt RF power < 2.0 A Transmit 1 Watt RF power < 1.0 A
Frequency Bands	:	450 – 490 MHz 450 - 490 MHz
Lock Time	:	< 10 mS
TX to RX attack time	:	< 20 mS (No Power Saving)
RX to TX attack time		< 20 mS
Dimensions	:	118 mm (H) x 63 mm (W) x 35 mm (D)
Weight	:	266.5g

TRANSMITTER

Carrier Power		Minimum	Normal	Maximum
Hi	:	4.5W	5.0W	6.0W
Low		0.8W	1.0W	1.5W
Sustained Transmission		Nominal conditions		
Time	:	5	10	30 Sec.
Power		>90%	>85%	>80%
Frequency Error	:	< 0.75 kHz Nominal condition for UHF < ±5.0 ppm Extreme condition for UHF		
Frequency Deviation	:	25.0 kHz Channel Spacing Peak ±5.0, Min. ±3.8 12.5 kHz Channel Spacing Peak ±2.5, Min. ±1.9		
Audio Frequency Response	:	Within +1/-3dB of 6dB octave @ 300 Hz to 2.55 kHz for 12.5 kHz C.S. @ 300 Hz to 3.0 kHz for 25 kHz C.S.		
Adjacent Channel Power	:	25.0 kHz Channel Spacing < 70 dBc @ Nominal Condition < 65 dBc @ Extreme Condition 12.5 kHz Channel Spacing < 60 dBc @ Nominal Condition < 55 dBc @ Extreme Condition		
Conducted Spurious Emission	:	< -36dBm(<1GHz), -30dBm(>1GHz)		
Modulation Sensitivity	:	100mV RMS @ 60 % Peak Dev.		
Hum & Noise	:	25.0 kHz Channel Spacing > 40 dB (with no PSOPH) 12.5 kHz Channel Spacing > 40 dB (with PSOPH)		
Modulation Symmetry	:	< 10 % Peak Dev @ 1 kHz input for nominal dev +20dB		
Load Stability	:	No osc at ≥ 10:1 VSWR all phase angles and suitable antenna No destroy at ≥ 20:1 all phase angle		
Peak Deviation Range Adjustment @ 1 kHz, Nom. Dev +20dB	:	25.0 kHz Channel Spacing Min. 3.5, Max. 6.0 12.5 kHz Channel Spacing Min. 1.5, Max. 4.0		

RECEIVER

Sensitivity (12dB Sinad)	:	(25.0kHz) < -118dBm, (12.5kHz) <-117dBm @ Normal Condition (25.0kHz) < -115dBm, (12.5kHz) <-114dBm @ Extreme Condition
Amplitude Characteristic	:	< ±3 dB
Adjacent Channel Selectivity	:	25.0 kHz Channel Spacing >70 dB @ Normal Condition >60 dB @ Extreme Condition 12.5 kHz Channel Spacing >60 dB @ Normal Condition >50 dB @ Extreme Condition
Spurious Response Rejection	:	> 70 dB (100 kHz - 4 GHz)
Image Response	:	> 70 dB
IF Response	:	> 70 dB
Others.	:	> 70 dB
IMD Response Rejection	:	70 dB
Conducted Spurious Emission	:	@ Normal Conditions: 9 kHz - 1 GHz < -57 dBm 1 GHz - 4 GHz < -47 dBm
RX Spurious Emissions (Radiated)		@ Normal Conditions: 9 kHz - 1 GHz < -57 dBm 1 GHz - 4 GHz < -47 dBm
AF Distortion	:	< 3% @ Normal Condition < 10 % @ Extreme Condition
RX Hum & Noise	:	25.0 kHz Channel Spacing < 40 dB (with No PSOPH) 12.5 kHz Channel Spacing < 40 dB (with PSOPH)
Receiver Response Time	:	< 16 mS
Squelch Opening Range	:	-113dBm±2@ Normal Conditions
Squelch Closing Range (Hysteresis)	:	-116dBm±2@ Normal Conditions
Squelch Attack Time	:	RF Level at Threshold < 40 mS RF Level at Threshold + 20 dB < 30 mS
Squelch Decay Time	:	5 mS Min., 20 mS Max.
Antenna Socket Input Match	:	> 10 dB Return Loss
L.O. Frequency Temperature Stability	:	1st < 5 ppm, 2nd < 15 ppm from -30° to + 60° C
L.O. Frequency Aging Rate	:	±2 ppm/ year

3.4 EUT operating conditions & test configuration

3.4.1 Client Condition

Temperature : -30℃ ~ +60℃
Humidity : 95 %

3.4.2 EUT Operating Condition

Operating Mode : Transmitter was operated in a continues transmission mode with the carrier modulated as specified in the test data.
Special test Software : Not Used.
Special test Hardware : Not Used.
TX Frequency Band : 450 MHz ~ 490 MHz

Test Frequencies :		
	Low	450.0125 MHz
	Middle	470.025 MHz
	High	489.975 MHz

Modulation : FM Modulation
Modulation Signal Source : External Source

4. Summary of Test Results

TEST REQUIREMENTS	FCC Paragraph	Result
RF Power Output (Conducted)	§2.1046	Pass
Audio Frequency Response	§2.1047	Pass
Modulation Limiting	§2.1047	Pass
Occupied Bandwidth	§2.1049	Pass
Spurious Emissions at Antenna Terminals	§2.1051	Pass
Field Strength of Spurious Radiation	§2.1053	Pass
Radiated Emission Test	§15.109	Pass
Frequency Stability / Temperature Variation	§2.1055	Pass
Transient Frequency Behavior	§90.214	Pass
Exposure Requirement	§1.1307 §1.1310 §2.1091 §2.1093	Pass
Power Line Conducted Emission	§15.107	Pass

5. TEST DATA

5.1 RF Power Output (Conducted)

5.1.1 Specification

FCC Rules Part 2, Section 2.1046
FCC Rules Part 90, Section 90.205

5.1.2 Method of Measurement

ANSI/TIA-603-C-2004 Section 2.2.1

5.1.3 Measurement Set-Up

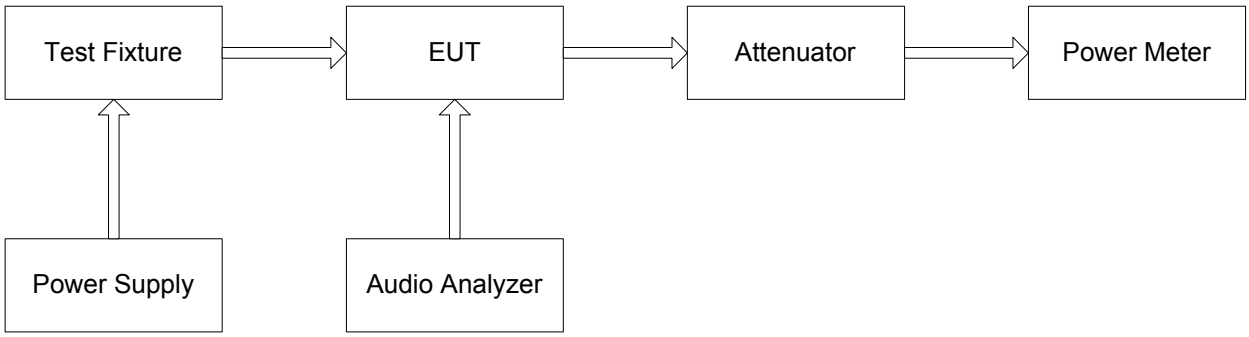


Fig.1

5.1.4 Test Equipment List

Equipment	Model Name	Manufacturer
EUT	SD-174E	Maxon CIC Corp.
Test Fixture	ACC-2001	Maxon CIC Corp.
Power Supply	IPS-30B03DD	Interact
Audio Analyzer	8903B	Agilent
Attenuator	33-30-33	Weinschel
Power Sensor	8481A	Agilent
Power Meter	E4418A	Agilent

5.1.5 Test Procedure

-. The unit was turn-up in accordance with the alignment procedure stated in the Fig.1, and was loaded into a 50 ohm resistive termination.
-. The unit was powered though test fixture that normally accompanied power cable by a DC power supply.
-. Power supply voltage was set to nominal voltage at the power supply terminals with transmitter off.
-. The unit was operated for three consecutive test cycles of 15 minutes standby and 5 minutes in transmitting.
-. The EUT was aligned for transmitter operation on three frequencies(Fo) at full rated power per the tune-up procedure outlined in the Product Specification. This represents frequencies at the 1st, 2nd and 3rd end of the EUT operating frequency band.

5.1.6 Test Result

Frequency (MHz)	Measured Power (dBm)	Rated Power (Watts)
Low Power (Ref. 1 Watt)		
450.0125	30.80	1.20
470.025	30.40	1.10
489.975	30.21	1.05
High Power (Ref. 5 Watts)		
450.0125	37.55	5.69
470.025	37.14	5.18
489.975	37.13	5.16

5.2 Modulation Characteristics – Audio Frequency Response

5.2.1 Specification

FCC Rules Part 2, Section 2.1047(a)
FCC Rules Part 90, Section 90.207

5.2.2 Method of Measurement

ANSI/TIA-603-C-2004 Section 2.2.6

5.2.3 Measurement Set-Up

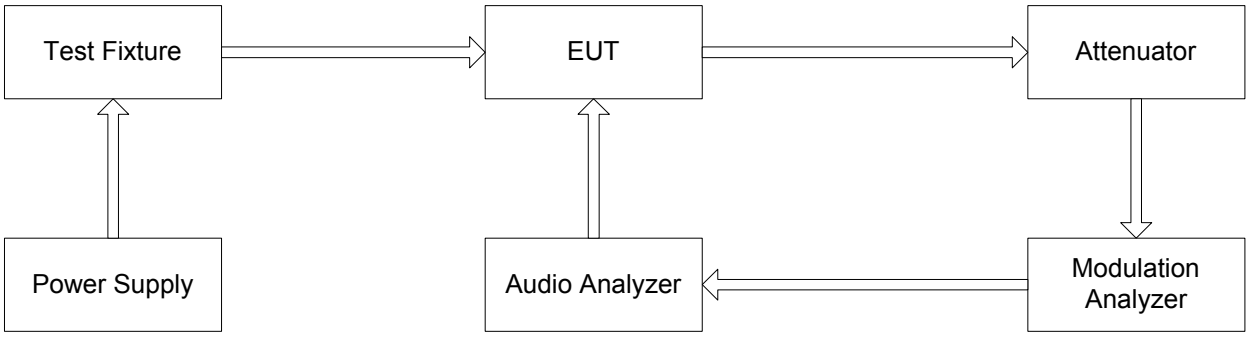


Fig.2

5.2.4 Test Equipment List

Equipment	Model Name	Manufacturer
EUT	SD-174E	Maxon CIC Corp.
Test Fixture	ACC-2001	Maxon CIC Corp.
Power Supply	IPS-30B03DD	Interact
Audio Analyzer	8903B	Agilent
Modulation Analyzer	8901B	Agilent
Attenuator	33-30-33	Weinschel

5.2.5 Test Procedure

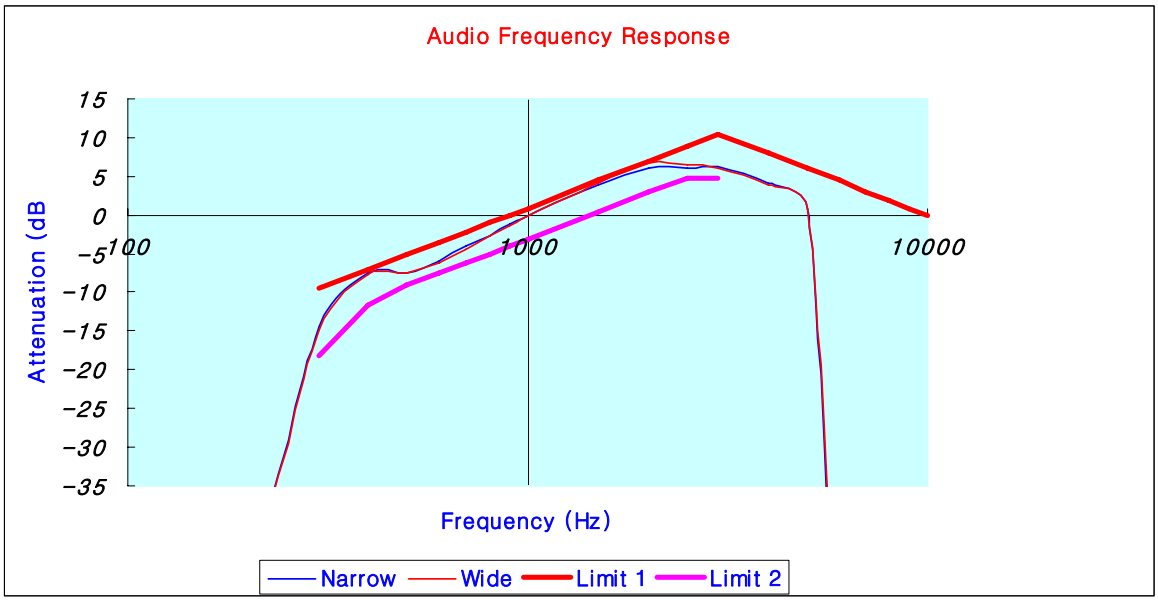
-. The unit was turn-up in accordance with the alignment procedure stated in the Fig.2, and was loaded into a 50 ohm resistive termination.
-. The audio analyzer was connected to the audio input circuit/microphone of the EUT.
-. The audio signal input was adjusted to obtain 20% modulation at 1 kHz, and this point was taken as the 0 dB reference level.
-. With input levels held constant and below limiting at all frequencies, the audio signal generator was varied from 100 Hz to 10 kHz.
-. The response in dB relative to 1 kHz was then measured, using the HP 8901A Modulation Analyzer.
-. No limit is required by the FCC for audio frequency response. The measured audio response data shows the role-off curve at 3 kHz.

5.2.6 Test Data

FCC Rules :	Part 2 §2.1047(a) & §90.207
Operating Frequency :	470.025 MHz
Channel :	Middle Channel
Reference Voltage :	12.0 VDC
Power Output :	5.0 Watts

Audio Input Frequency (Hz)	Attenuation (dB)	
	Channel Spacing : 12.5 kHz	Channel Spacing : 25 kHz
100	-43.8	-44.3
200	-43.1	-43.3
300	-14.5	-14.9
400	-7.5	-7.6
500	-7.4	-7.5
600	-6	-6.1
700	-4.1	-4.4
800	-2.6	-2.7
900	-1.1	-1.3
1000	0	0
1500	3.9	4.1
2000	6.1	6.6
2500	6	6.4
3000	6.2	6.1
4000	4.1	3.9
5000	0.9	0.8
6000	-60.3	-56.3
7000	-60.3	-56.3
8000	-60.3	-56.3
9000	-60.3	-56.3
10000	-60.3	-56.3

5.2.7 Graph



5.3 Modulation Characteristics – Modulation Limiting

5.3.1 Specification

FCC Rules Part 2, Section 2.1047(b)
FCC Rules Part 90, Section 90.207

5.3.2 Method of Measurement

ANSI/TIA-603-C-2004 Section 2.2.3

5.3.3 Measurement Set-Up

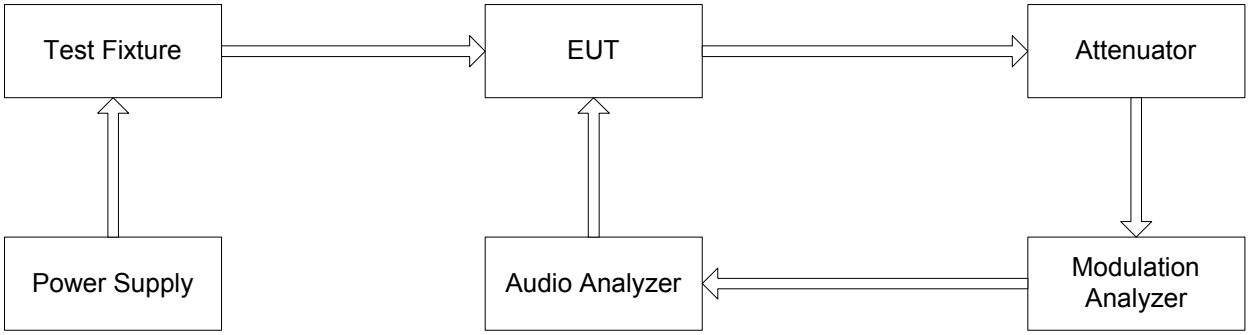


Fig.3

5.3.4 Test Equipment List

Equipment	Model Name	Manufacturer
EUT	SD-174E	Maxon CIC Corp.
Test Fixture	ACC-2001	Maxon CIC Corp.
Power Supply	IPS-30B03DD	Interact
Audio Analyzer	8903B	Agilent
Modulation Analyzer	8901B	Agilent
Attenuator	33-30-33	Weinschel

5.3.5 Test Procedure

-. The unit was turn-up in accordance with the alignment procedure stated in the Fig.3, and was loaded into a 50 ohm resistive termination.
-. Apply an 1kHz modulating signal to EUT from the audio frequency analyzer, and adjust the level to obtain 60% of full rated system deviation.
-. Increase the level from the AF generator by ± 20 dB in one step.
-. Measure the steady-state deviation.
-. With the AF generator level hold constant, vary the audio frequency from 300 Hz to 3000 Hz. Record the maximum deviation.
-. Set the modulation analyzer to measure the peak negative deviation and repeat the test above.

5.3.6 Test Data 1 Narrow Band

FCC Rules :	Part 2 §2.1047(a) & §90.207
Operating Frequency :	470.025 MHz
Channel :	Middle Channel
Reference Voltage :	12.0 VDC
Power Output :	5.0 Watts

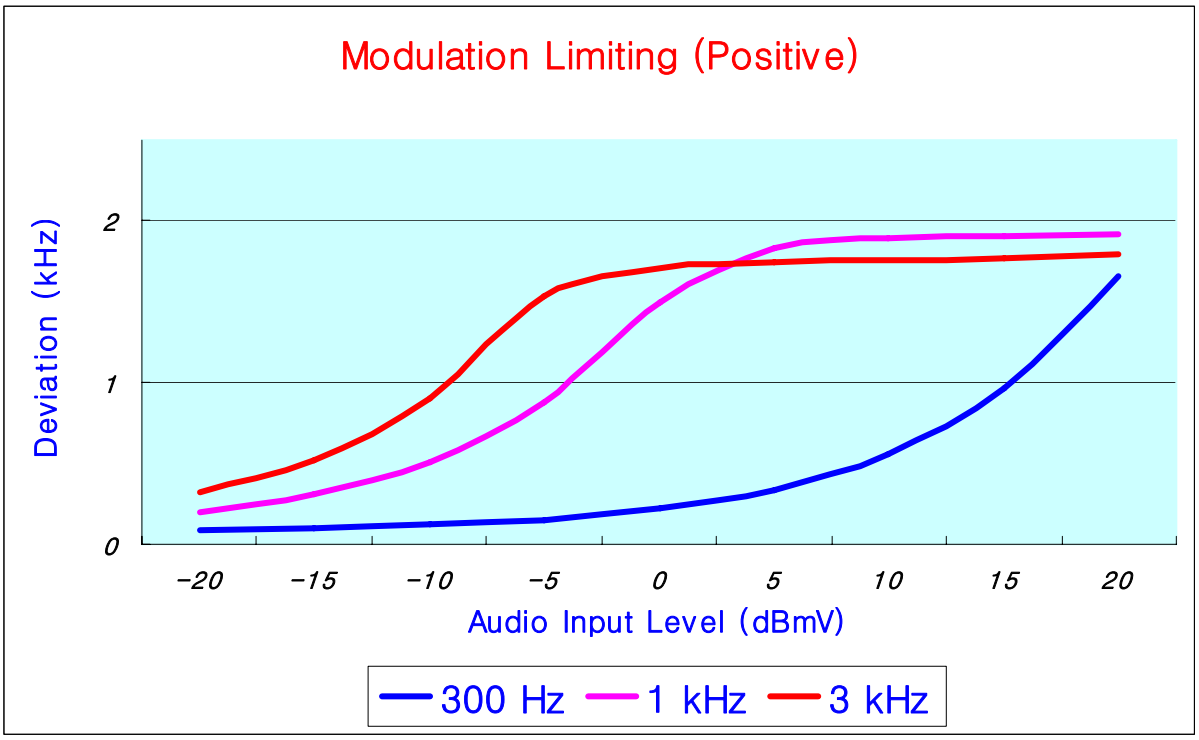
Audio Input Level (dB)	Positive Peak Deviation (kHz)			Negative Peak Deviation (kHz)		
	300 Hz	1 kHz	3 kHz	300 Hz	1 kHz	3 kHz
-20	0.09	0.2	0.32	0.08	0.2	0.33
-15	0.1	0.31	0.52	0.1	0.32	0.51
-10	0.12	0.51	0.9	0.11	0.53	0.91
-5	0.15	0.88	1.53	0.16	0.9	1.55
0	0.22	1.5	1.71	0.2	1.5	1.7
+5	0.34	1.83	1.75	0.33	1.82	1.73
+10	0.56	1.89	1.76	0.56	1.88	1.75
+15	0.96	1.91	1.77	0.95	1.9	1.77
+20	1.66	1.92	1.79	1.65	1.92	1.79

5.3.7 Test Data 2 Wide Band

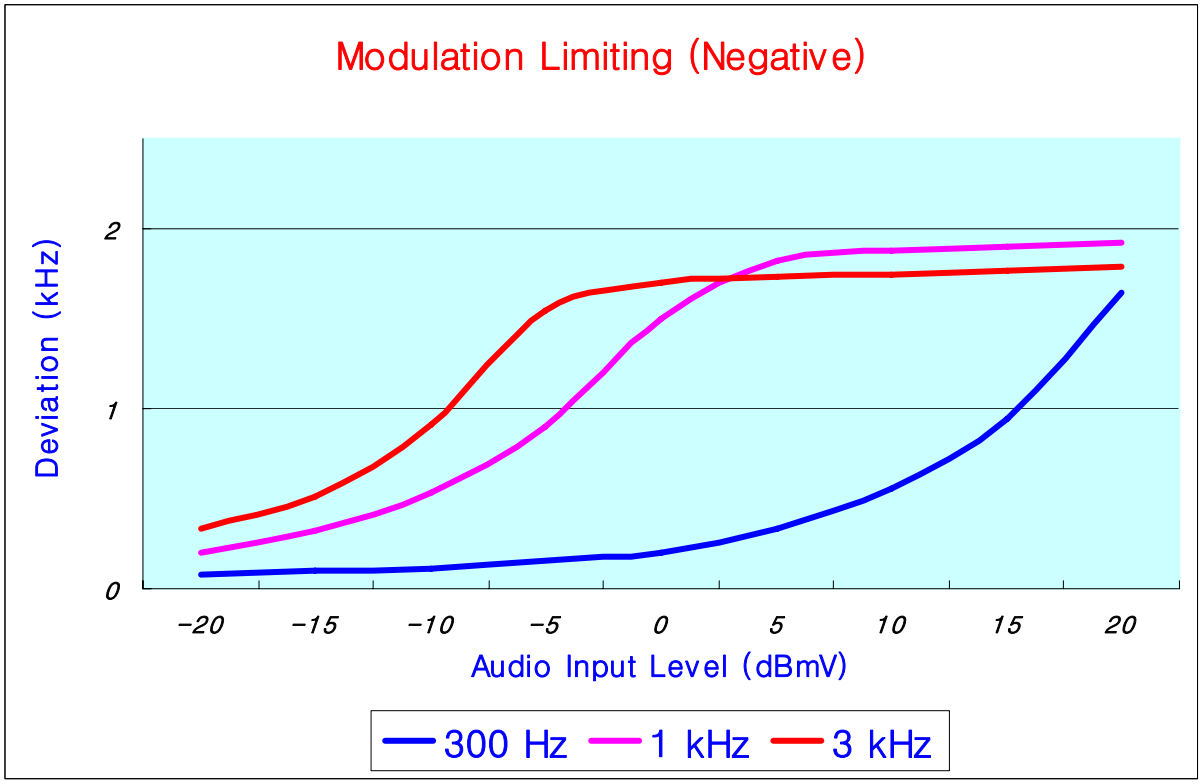
FCC Rules :	Part 2 §2.1047(a) & §90.207
Operating Frequency :	470.025 MHz
Channel :	Middle Channel
Reference Voltage :	12.0 VDC
Power Output :	5.0 Watts

Audio Input Level (dB)	Positive Peak Deviation (kHz)			Negative Peak Deviation (kHz)		
	300 Hz	1 kHz	3 kHz	300 Hz	1 kHz	3 kHz
-20	0.12	0.34	0.66	0.11	0.35	0.65
-15	0.13	0.56	1.15	0.13	0.55	1.16
-10	0.17	0.95	2.01	0.16	0.95	2
-5	0.24	1.7	3.47	0.23	1.8	3.48
0	0.38	3	3.91	0.36	3.21	3.9
+5	0.64	3.94	4.01	0.66	3.99	4.02
+10	1.08	4.15	4.05	1.09	4.16	4.05
+15	1.84	4.19	4.05	1.86	4.18	4.05
+20	3.07	4.23	4.06	3.1	4.22	4.05

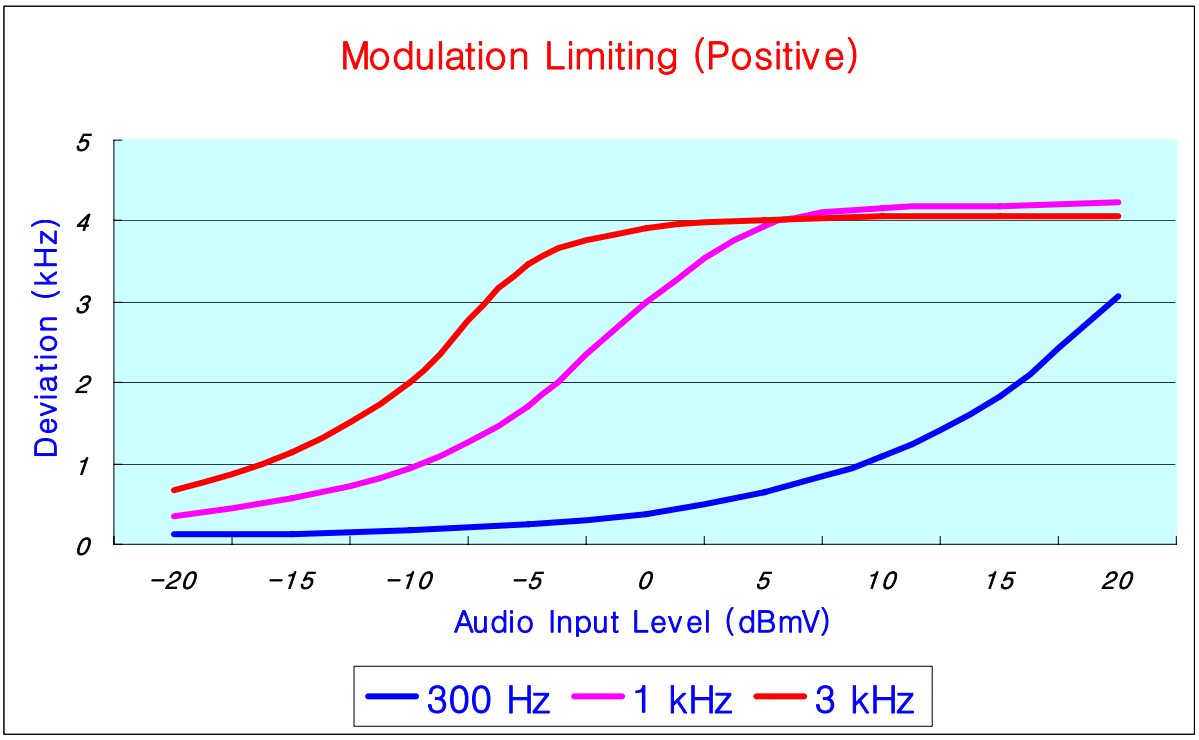
5.3.8 Graph 1 Narrow Band / Positive



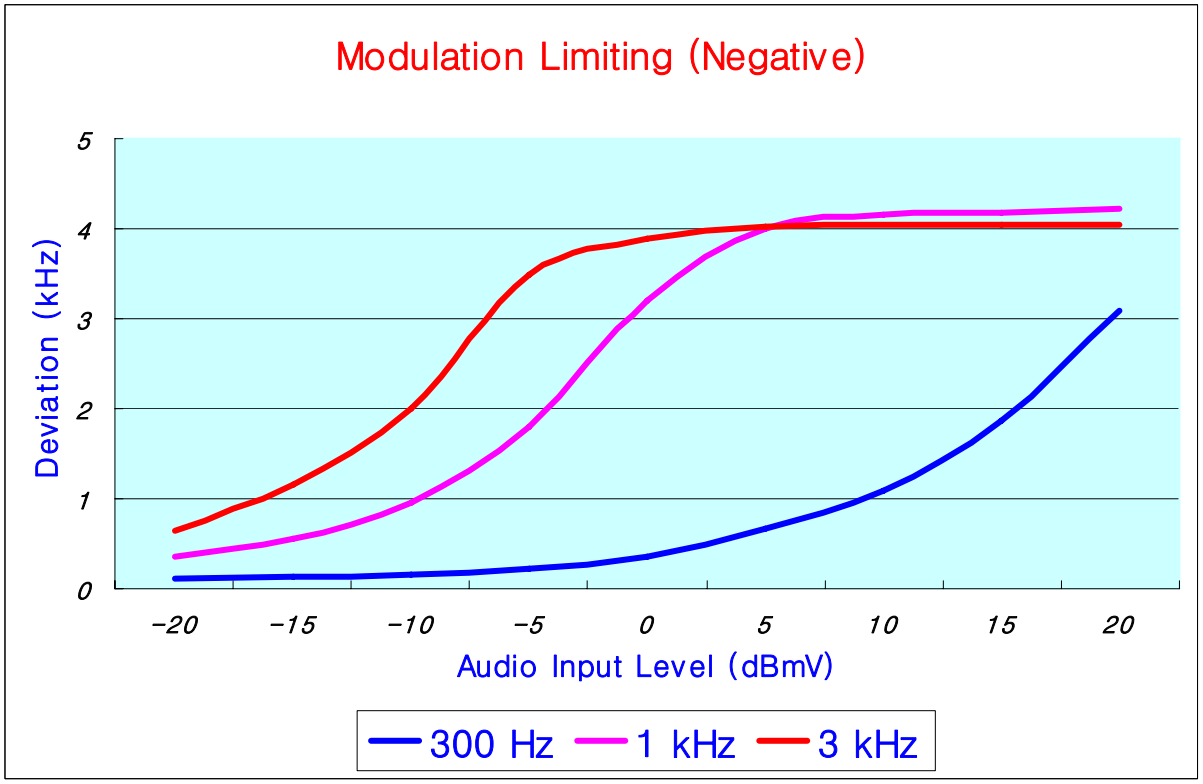
5.3.9 Graph 2 Narrow Band / Negative



5.3.10 Graph 3 Wide Band / Positive



5.3.11 Graph 4 Wide Band / Negative



5.4 Occupied Bandwidth

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. pecified limits according to the emission mask per section 90.210 is as below.

Emission Mask B.
For transmitters that are equipped with an audio low-pass filter, the power of any emission must be below the unmodulated carrier power (P) as follows:

(1) On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth: At least 25 dB.
(2) On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 per-cent of the authorized bandwidth: At least 35 dB.
(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized band-width: At least 43 + 10 log (P) dB.

Emission Mask D.
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 f0 to 5.625 kHz removed from f0: Zero dB.
(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 5.625 kHz but no more than 12.5 kHz: At least 7.27(fd ´2.88 kHz) dB.
(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 12.5 kHz: At least 50 + 10 log (P) dB or 70 dB, whichever is the lesser attenuation.

5.4.1 Specification

FCC Rules Part 2, Section 2.1049
FCC Rules Part 90, Section 90.210

5.4.2 Method of Measurement

ANSI/TIA-603-C-2004 Section 2.2.11

5.4.3 Measurement Set-Up

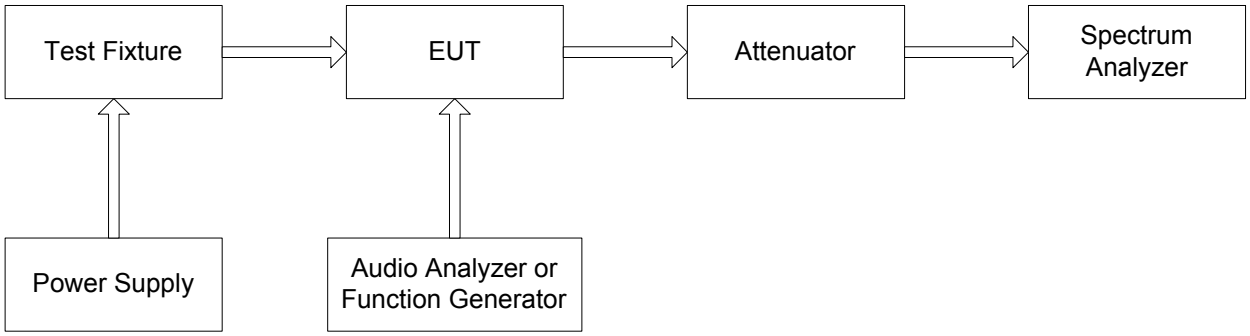


Fig.4

5.4.4 Test Equipment List

Equipment	Model Name	Manufacturer
EUT	SD-174E	Maxon CIC Corp.
Test Fixture	ACC-2001	Maxon CIC Corp.
Power Supply	IPS-30B03DD	Interact
Audio Analyzer	8903B	Agilent
Function Generator	33250A	Agilent
Attenuator	33-30-33	Weinschel
Spectrum Analyzer	FSP7	Rohde & Shwarz

5.4.5 Measurement Procedure

-. The unit was turn-up in accordance with the alignment procedure stated in the Fig.4, and was loaded into a 50 ohm resistive termination.
-. The radio transmitter was modulated by a 2500 Hz tone at an input level 16 dB greater than that necessary to produce 50 percent modulation. The input level shall be established at the frequency of maximum response of the audio modulating circuit.
-. The occupied bandwidth data is obtained for 25 kHz and 12.5 kHz channel bandwidth.

5.4.6 Data

Frequency (MHz)	Channel Spacing	Mask Type	99% Bandwidth (kHz)		Maximum Authorized Bandwidth (KHz)
			Low Power	High Power	
450.0125 MHz	F2D / 25.0 kHz	B	12.6	12.3	20.00
	F3E / 12.5 kHz	D	7.1	7.0	11.25
	F3E / 25.0 kHz	B	13.4	12.6	20.00
470.025 MHz	F2D / 25.0 kHz	B	12.3	12.6	20.00
	F3E / 12.5 kHz	D	7.1	7.1	11.25
	F3E / 25.0 kHz	B	13.6	13.0	20.00
489.975 MHz	F2D / 25.0 kHz	B	12.5	12.5	20.00
	F3E / 12.5 kHz	D	7.2	7.3	11.25
	F3E / 25.0 kHz	B	14.0	13.7	20.00

5.5 Spurious Emissions at Antenna Terminals

Conducted spurious emissions are emissions at the antenna terminals on a frequency or frequencies which are outside of band sufficient to ensure transmission or information of required quality for the class of communication desired.

5.5.1 Specification

FCC Rules Part 2, Section 2.1051
FCC Rules Part 90, Section 90.210

5.5.2 Method of Measurement

ANSI/TIA-603-B-2002 Section 2.2.13

5.5.3 Measurement Set-Up

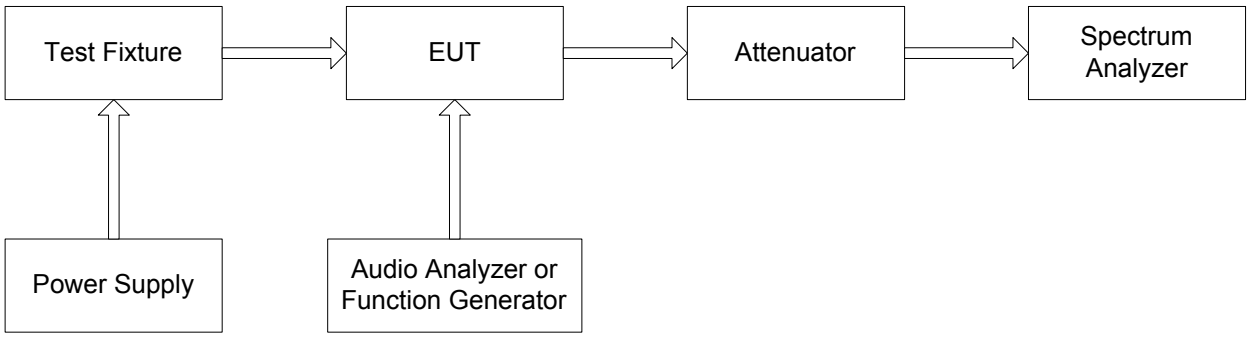


Fig.5

5.5.4 Test Equipment List

Equipment	Model Name	Manufacturer
EUT	SD-174E	Maxon CIC Corp.
Test Fixture	ACC-2001	Maxon CIC Corp.
Power Supply	IPS-30B03DD	Interact
Audio Analyzer	8903B	Agilent
Function Generator	33250A	Agilent
Attenuator	33-30-33	Weinschel
Spectrum Analyzer	FSP7	Rohde & Shwarz

5.5.5 Measurement Procedure

-. The unit was turned-up in accordance with the alignment procedure stated in the Fig.5, and was loaded into a 50 ohm resistive termination.
-. The antenna output terminal of the EUT was connected to the input of a 50 ohm spectrum analyzer through a matched 10 dB attenuator and notch filter.
-. Transmitter was set to the maximum power output condition.
-. The unit was modulated with a 2.5 kHz audio tone at an input level 16dB greater than that required 50% modulation. The spectrum was scanned from the lowest frequency generated in the equipment to the 10^{th} harmonic of the carrier.
-. The test performed at worst case mode. (High power and Narrow Band)
-. The transmitter limit was applied according the $50+10\log_{10}$(P: mean power in Watts) dB.
-. The receiver limit was applied according the $50+10\log_{10}$(P: mean power in Watts) dB.

5.5.6 Data 1

Mode (TX/RX)	Frequency (MHz)	Spurious Emissions		
		Level (dBm)	Limit (dBm)	Margin (dB)
Operating Frequency 450.0125 MHz				
TX	898.22	-40.04	-20	20.04
	1347.32	-41.42		21.42
RX	399.22	-84.1	-57	27.1
	4051.9	-84.02		27.02
	4540.92	-84.41		27.41
Operating Frequency 470.025 MHz				
TX	938.14	-44.16	-20	24.16
	1407.2	-47.52		27.52
	2345.32	-44.64		24.64
RX	419.18	-79.72	-57	22.72
	2544.92	-66.98		9.98
	2974.06	-66.15		9.15
	3822.36	-79.94		22.94
Operating Frequency 489.975 MHz				
TX	978.06	-46.71	-20	26.71
	1467.08	-50.34		30.34
	4956.10	-48.14		28.14
	2455.10	-37.81		17.81
RX	439.14	-74.53	-57	17.53
	2225.56	-83.28		26.28
	2674.66	-62.54		5.54
	4011.98	-73.93		16.93

5.6 Field Strength of Spurious Radiation

Radiated spurious emissions are emissions from the equipment when transmitting load on frequency or frequencies which are outside of band sufficient to ensure transmission or information of required quality for the class of communication desired.

5.6.1 Specification

FCC Rules Part 2, Section 2.1053(a)
FCC Rules Part 90, Section 90.210

5.6.2 Method of Measurement

ANSI/TIA-603-C-2004 Section 2.2.12

5.6.3 Measurement Set-Up

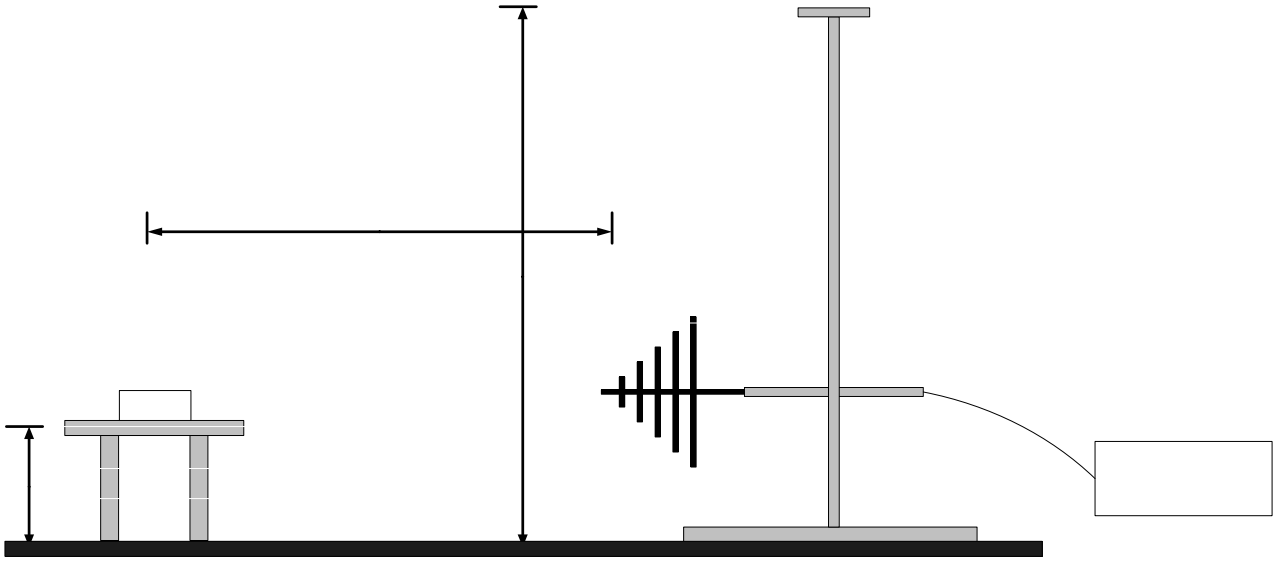


Fig.6

5.6.4 Test Equipment List

Equipment	Model Name	Manufacturer
EUT	SD-174E	Maxon CIC Corp.
Test Fixture	ACC-2001	Maxon CIC Corp.
Power Supply	IPS-30B03DD	Interact
Spectrum Analyzer	E7403A	Agilent
Bilog Antenna	VULB9160	Swalzbeck
Horn Antenna	BBHA 9120 D	Swalzbeck

5.6.5 Test Data

FCC Rules :	Part 2 §2.1053(a) & §90.210
Power Output :	5 Watts
Reference Voltage :	12 Vdc
Channel Spacing :	Narrow Band
Limit :	50 + 10log$_{10}$P (-20dBm)

Frequency [MHz]	Spectrum Reading [dBuV/m]	Ant. Pol. [H/V]	S.G Level [dBm]	Ant. Gain [dBi]	Loss [dB]	Emission Level [dBm]	Limit [dBm]	Margin [dB]
450.0125	38.55	H	-29.8	6.6	1.0	-37.4	-	-
1869.00	42.40	-	-40.3	9.1	1.9	-51.3	-20	31.3
470.025	35.11	H	-24.8	6.6	1.0	-32.4	-	-
1865.00	43.56	-	-41.1	9.1	1.9	-52.1	-20	32.1
489.975	39.69	V	-28.9	5.8	1.0	-35.7	-	-
979.6	38.65	V	-30.5	6.4	1.6	-38.5	-20	18.5

Note :

1. The transmitter was tested while transmitting continuously while attached to a dummy load.
2. Transmitter was set to the high power output (5 watts) condition.
3. The spectrum was checked from 30 MHz up to the 10th harmonic of the carrier frequency.
4. All emission not reported were found to be more than 20dB below the limit.
5. The EUT was positioned through 3 orthogonal axis and worst-case are reported.
6. Transmitter was set to the high power output (5 watts) condition because the high power setting is the worst case emission condition.
7. The measurement has been made both narrow and wide band but the attached plots are for narrowband. There is no difference in the test result for the bandwidth setting.
8. ERP measurements were performed using the standard battery with full charged condition.
9. The test performed at worst case mode. (High power and Narrow Band)
10. The limit was applied according to the section 90.210(d) 50+10logP or –20dBm or 70dBc whichever is less.

5.7 Radiated Emission Test (Stand-by and Receive Mode)

Radiated emissions form 30 MHz to 1000 MHz were measured with a bandwidth of 120 kHz according to the methods defines in FCC Part 15.109. The EUT was placed on a nonmetallic stand in the open-field site, 0.8 meter above the ground plane. The interface cables and equipment positions were varied within limits of reasonable applications to determine the positions producing maximum radiated emissions.

5.7.1 Specification

FCC Rules Part 15, Section 15.109

5.7.2 Method of Measurement

ANSI/TIA-603-C-2004 Section 2.2.12

5.7.3 Measurement Set-Up

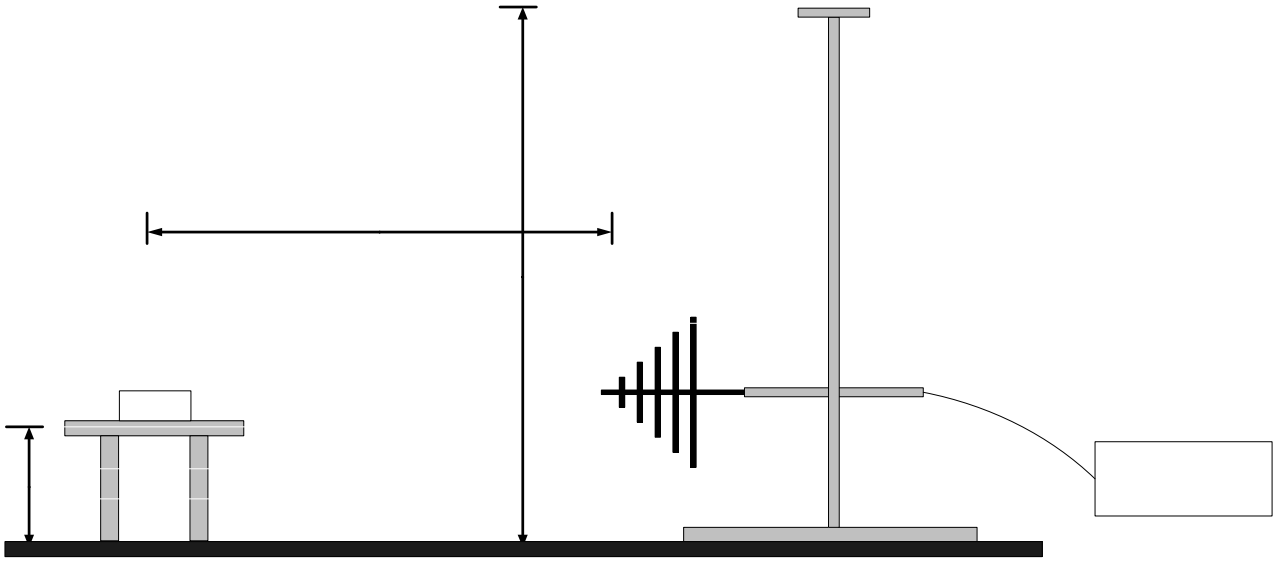


Fig.7

5.7.4 Test Equipment List

Equipment	Model Name	Manufacturer
EUT	SD-174E	Maxon CIC Corp.
Test Fixture	ACC-2001	Maxon CIC Corp.
Power Supply	IPS-30B03DD	Interact
Spectrum Analyzer	E7403A	Agilent
Bilog Antenna	VULB9160	Swalzbeck
Horn Antenna	BBHA 9120 D	Swalzbeck

5.7.5 Limit

Frequency Range (MHz)	Limit (dBuV)	
	Quasi-Peak	Average-Peak
30 ~ 88	40.0	N/A
88 ~ 216	43.5	N/A
216 ~ 960	46.0	N/A
Above 960	54.0	N/A

5.7.6 Test Result of Radiated Emission

EUT : SD-174E

Test distance : 3 m

Radiated Emission Test Result : **PASS**

Test data sheets follow.

Frequency [MHz]	Reading [dBμV]	Polarization [*H/**V]	Ant.Factor [dB/m]	Cable Loss [dB]	Limit [dBμV/m]	Emission Level [dBμV/m]	Margin [dB]
1st Channel : 470.025 MHz							
450.013	20.22	V	16.92	4.77	46.00	41.91	4.09
2nd Channel : 480.025 MHz							
470.025	20.12	V	17.22	4.90	46.00	42.24	3.76
3rd Channel : 489.975 MHz							
489.975	20.26	V	17.53	5.03	46.00	42.82	3.18

Notes:

1. * H : Horizontal polarization , ** V : Vertical polarization
2. Emission Level = Reading + Antenna factor + Cable loss
3. Margin value = Emission Level - Limit
4. All other emissions not reported were more than 25dB below the permitted limit.
5. Measurement uncertainty estimated at ±4.08 dB.
   The measurement uncertainty is given with a confidence of 95.45 % with the coverage factor, k=2.

5.8 Frequency Stability / Temperature Variation

5.8.1 Specification

FCC Rules Part 2, Section 2.1055
FCC Rules Part 90, Section 90.213

5.8.2 Method of Measurement

ANSI/TIA-603-C-2004 Section 2.2.2

5.8.3 Measurement Set-Up

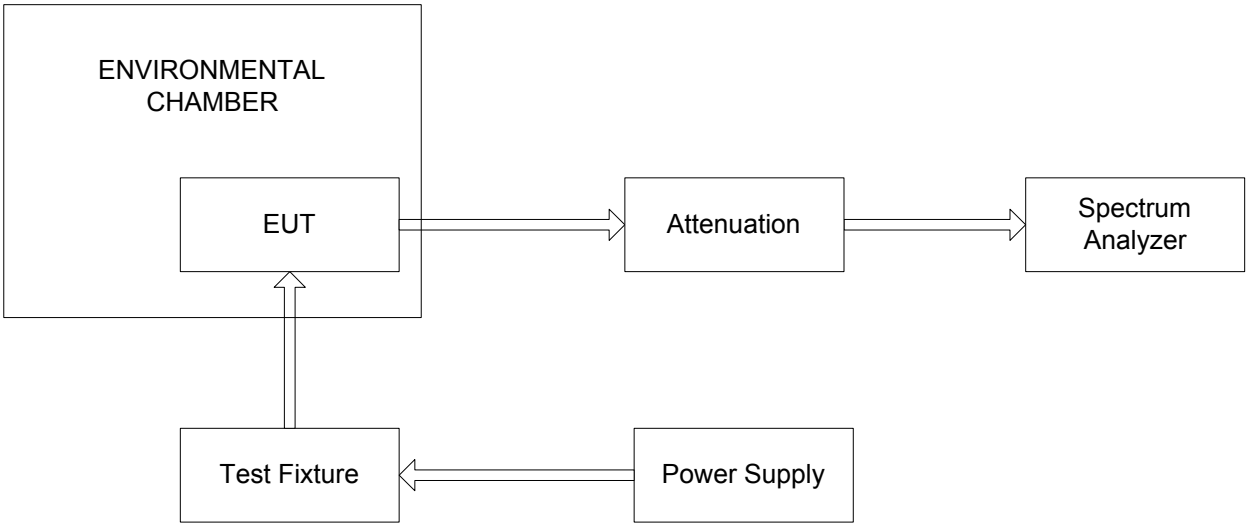


Fig.8

5.8.4 Test Equipment List

Equipment	Model Name	Manufacturer
EUT	SD-174E	Maxon CIC Corp.
Test Fixture	ACC-2001	Maxon CIC Corp.
Power Supply	IPS-30B03DD	Interact
Attenuator	33-30-33	Weinschel
Spectrum Analyzer	FSP7	Rohde & Shwarz
Environmental Chamber	EN-GLMP-54	Enex

5.8.5 Test Procedure

-. The unit was turn-up in accordance with the alignment procedure stated in the Fig.7, and was loaded into a 50 ohm resistive termination.
-. With all power removed, the temperature was decreased to -30°C and permitted to stabilize for three hours. Power was applied and the maximum change in frequency was noted within one minute.
-. With power OFF, the temperature was raised in 10°C steps. The sample was permitted to stabilize at each step for at least one-half hour. Power was applied and the maximum frequency change was noted within one minute.
-. The temperature tests were performed for the worst case.
-. FCC Limits (according to part 90.213) : 2.5 x 10^{-6} x Frequency

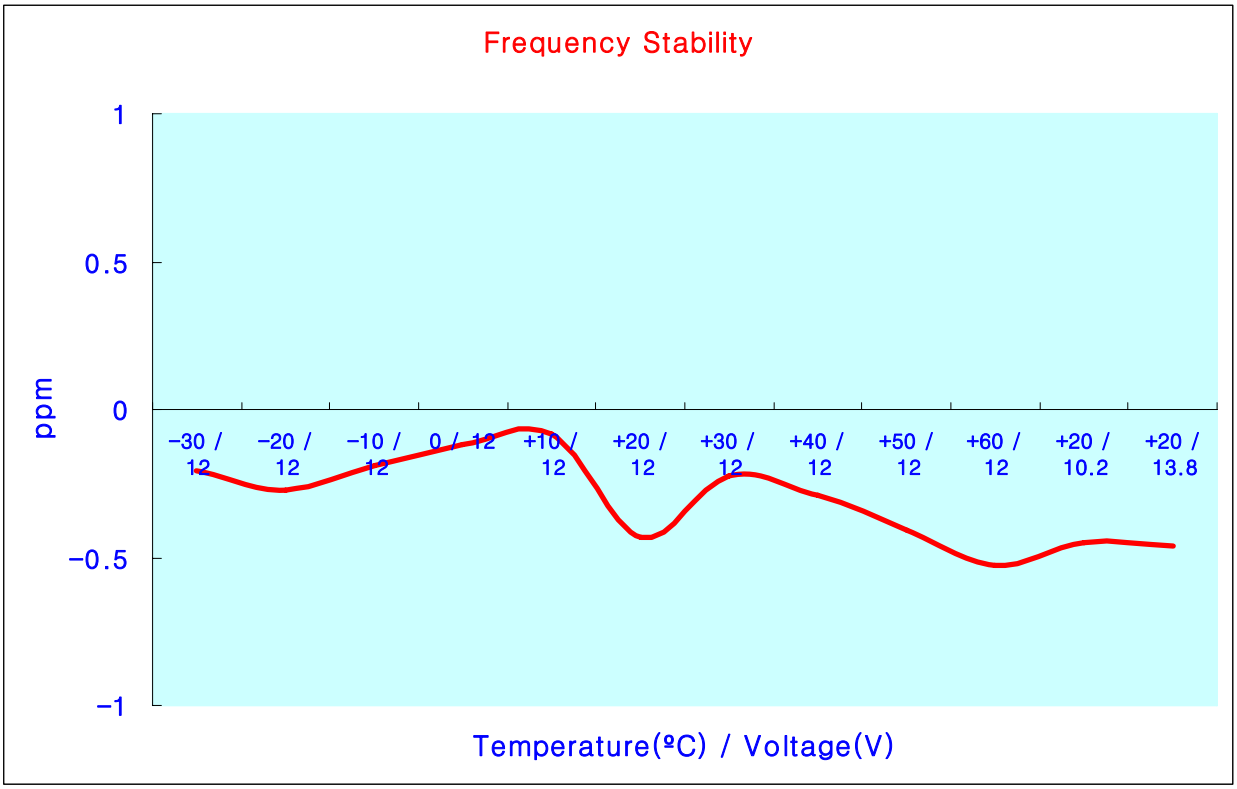
5.8.6 Test Result

FCC Rules :	Part 2 §2.1055 & §90.231
Operating Frequency :	450.0125 MHz
Power Output :	5 Watts
Modulation :	Non-Modulation
Reference Voltage :	12.0 Vdc

5.8.6.1 Data

Voltage (%)	Power Supply (Vdc)	Temperature (ºC)	Frequency (Hz)	Deviation (ppm)	Limit (ppm)
100 %	12.0	-30	470024903	−0.21	2.5
100 %	12.0	-20	470024873	−0.27	2.5
100 %	12.0	-10	470024911	−0.19	2.5
100 %	12.0	0	470024943	−0.12	2.5
100 %	12.0	+10	470024960	−0.09	2.5
100 %	12.0	+20 (ref)	470024798	−0.43	2.5
100 %	12.0	+30	470024894	−0.23	2.5
100 %	12.0	+40	470024864	−0.29	2.5
100 %	12.0	+50	470024808	−0.41	2.5
100 %	12.0	+60	470024752	−0.53	2.5
85 %	10.2	+20	470024790	−0.45	2.5
115 %	13.8	+20	470024784	−0.46	2.5

5.8.6.2 Graph



5.9 Transient Frequency Behavior

5.9.1 Specification

FCC Rules Part 90, Section 90.214

5.9.2 Method of Measurement

ANSI/TIA-603-C-2004 Section 2.2.19

5.9.3 Measurement Set-Up

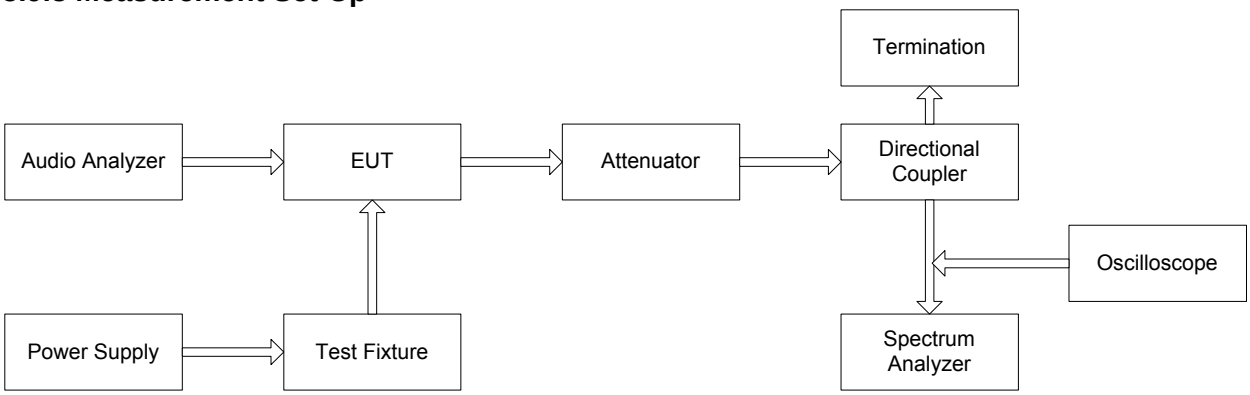


Fig.9

5.9.4 Test Equipment List

Equipment	Model Name	Manufacturer
EUT	SD-174E	Maxon CIC Corp.
Power Supply	IPS-30B03DD	Interact
Audio Analyzer	8903B	Agilent
Attenuator	33-30-33	Weinschel
Directional Coupler	778D	Agilent
Termination	8173	Bird
Oscilloscope	TDS3032	Tektronix
Spectrum Analyzer	FSP7	Rohde & Shwarz

5.9.5 Test Procedure

-. The unit was turn-up in accordance with the alignment procedure stated in the Fig.9, and was loaded into a 50 ohm resistive termination.
-. 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.
-. Requirements

5.9.6 Limit

Transient Frequency Difference Limits

Time Interval	Max. Permitted Frequency Difference for 25 and 30 kHz Channel Spacing (in kHz)	Max. Permitted Frequency Difference for 12.5 and 15 kHz Channel Spacing (in kHz)
t_1 or t_3	25	12.5
t_2	12.5	6.25

Transient Duration Limits

Time Intervals	Frequency Ranges (MHz)		
Frequency	30 to 174	**406 to 512**	806 to 940
t_1	5.0 ms	**10.0 ms**	20.0 ms
t_2	20.0 ms	**25.0 ms**	50.0 ms
t_3	5.0 ms	**10.0 ms**	10.0 ms

The transient frequency behavior of the transmitter is the variation in time of the transmitter frequency difference from the nominal frequency of the transmitter when the RF output power is switched on and off.

t_{on}: according to the method of measurement described the switch-on instant t_{on} of a transmitter is defined by the condition when the output power, measured at the antenna terminal, exceeds 0,1 % of the nominal power.

t_1: period of time starting at t_{on} and finishing.

t_2: period of time starting at the end of t1 and finishing.

t_{off}: switch-off instant defined by the condition when the nominal power falls below 0,1 % of the nominal power.

t_3: period of time that finishing at t_{off} and starting.

5.9.7 Test Data

Transient Period	Transient Frequency Period (ms)
t_1	**« 10.0 ms**
t_2	**« 25.0 ms**
t_3	**« 10.0 ms**
Uncertainty (%)	10

5.10 RF Exposure Requirement

5.10.1 Method of Measurement

These devices are not exempted from compliance does not exceed the Commission's RF exposure guidelines. Unless a device operates at substantially low power levels, with a low gain antenna(s), supporting information is generally needed to establish the various potential operating configurations and exposure conditions of a transmitter and its antenna(s) in order to determine compliance with the RF exposure guidelines.

In order to demonstrate compliance with MPE requirements (see Section 2.1091), the following information is typically needed:

Calculation that estimates the minimum separation distance (20 cm or more) between an antenna and persons required to satisfy power density limits defined for free space.

Antenna installation and device operating instructions for installers (professional/unskilled users), and the parties responsible for ensuring compliance with the RF exposure requirement Any caution statements and/or warning labels that are necessary in order to comply with the exposure limits Any other RF exposure related issues that may affect MPE compliance.

5.10.2 Limits

FCC 1.1310:- The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in 1.1307(b).

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm2)	Average Time (minutes)
(A) Limits for Occupational/Control Exposures				
300 - 1500	-	-	f / 300	6
(B) Limits for General Population/Uncontrolled Exposure				
300 - 1500	**-**	**-**	**f / 1500**	**30**

※ f = frequency in MHz

5.10.3 Result

Frequency [MHz]	Conducted Power [dBm]	Antenna Gain [dBi]	Calculated EIRP [mW]	Duty Cycle [%]	The time averaged power over 30 minutes [mWatt]	Laboratory's Recommended Minimum RF Safety Distance r [Cm]	Power Density in mW/cm2 at Formula When r=20Cm [mW/cm2]	Limit (f/1500) [mW/cm2]
450.013	37.55	6.00	22646.44	100	22646.44	77.50	4.5054	0.3000
470.025	37.14	6.00	20606.30	100	20606.30	72.34	4.0995	0.3134
489.975	37.13	6.00	20558.91	100	20558.91	70.77	4.0901	0.3267

Calculation Method of RF Safety Distance:

$$S = \frac{PG}{4\pi r^2} = \frac{EIRP}{4\pi r^2}$$

P : power input to the antenna in mW
EIRP : Equivalent (effective) isotropic radiated power.
S : power density mW/cm^2
G : numeric gain of antenna relative to isotropic radiator
R : distance to centre of radiation in cm

FCC radio frequency exposure limits may be exceeded at distances closer than r cm from the antenna of this device

$$r = \sqrt{\frac{PG}{4\pi S}} = \sqrt{\frac{EIRP}{4\pi S}}$$

Note :

1. S = (f/1500) mW/cm^2 for Limits for General Population/Uncontrolled Exposures.
2. The time averaged power over 30 minutes will be equaled Output Power.
3. Minimum calculated separation distance between antenna and persons required : 77.50 Cm
4. The power density at a distance of 20Cm calculated from the formula is far above the limit of (f/1500)mW/cm^2.
5. The maximum power density is 4.5054 mW/cm^2 at 450.0125 MHz
6. Complies if the user is advised of the above safe distances in the appropriate documentation.

5.11 Power Line Conducted Emission

Conducted Emissions were measured from 150 kHz to 30 MHz with a bandwidth of 9 kHz on the 230V AC power and return leads of the EUT according to the methods defined in FCC Part 15.207. The EUT was placed on a nonmetallic stand in a shielded room 0.8 meters above the ground plane as shown in section 3.1.5. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position producing maximum conducted emissions.

5.11.1 Test Condition

Frequency Range of Test	:	150 kHz to 30 MHz
Test Standard	:	FCC Part 15.107
Test Date	:	July 28, 2009
Temperature/Humidity	:	25 °C/ 40 %

5.11.2 Test Standard

Item		Frequency Range (MHz)	Limit (dBuV)	
			Quasi-Peak	Average-Peak
☐	Class A	0.15 ~ 0.5	79	66
		0.5 ~ 30	73	60
☒	Class B	0.15 ~ 0.5	66 – 56	56 – 46
		0.5 ~ 5	56	46
		5 ~ 30	60	50

5.11.3 Test Equipment List

Equipment Type	Model	Manufacture	Serial No	Cal Due Date
TEST RECEIVER	ESPI	ROHDE & SCHWARZ	100012	11. 03. 2009
Conducted Cable	N/A	N/A	N/A	N/A
LISN	L1-115	Com-Power	241017	01. 20. 2010

5.11.4 Test Result of Power Line Conducted Emission

EUT : SD-174E

Input Voltage : 230V, 50Hz

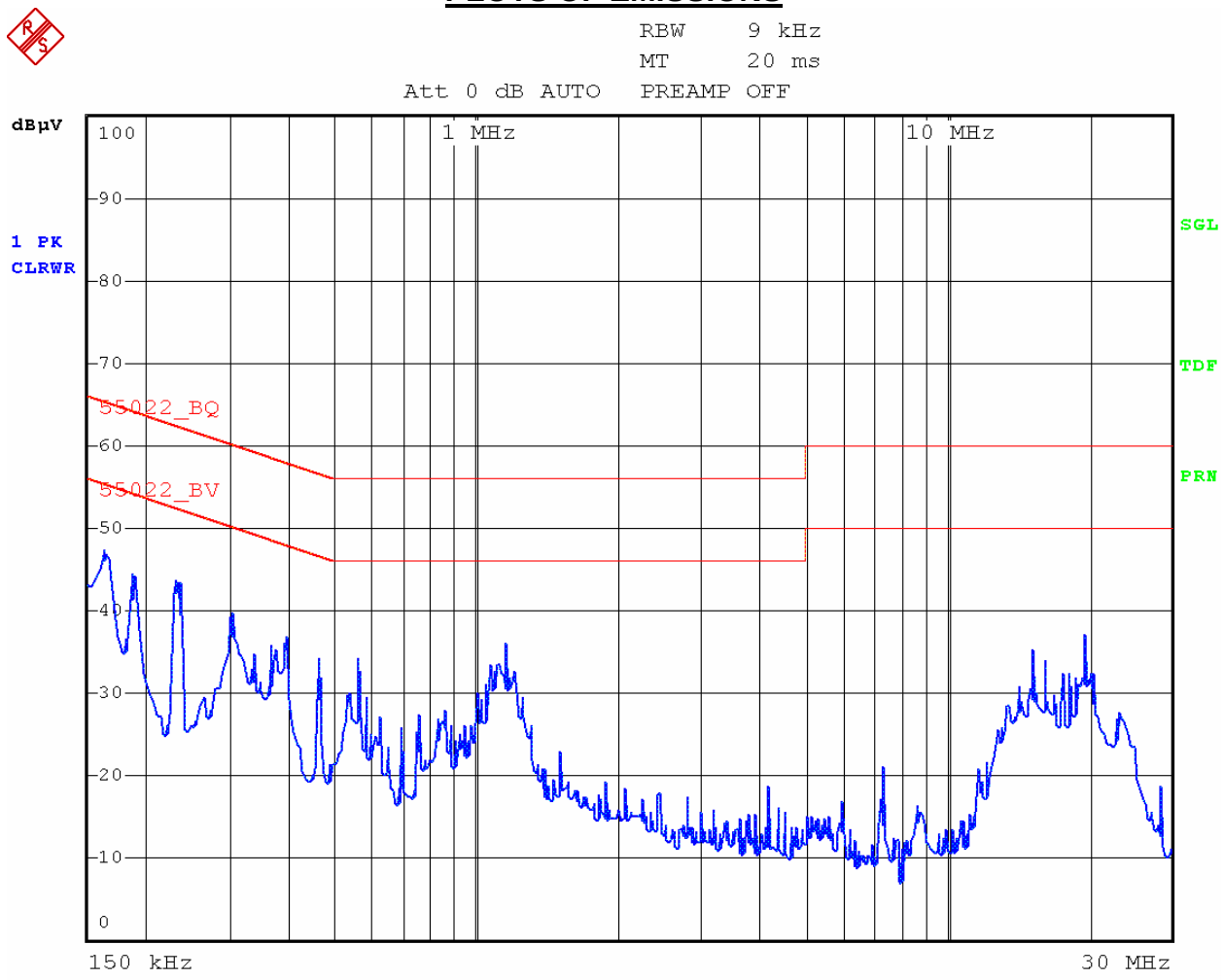
Power Line Conducted Emission Test Results : **PASS**

Test data sheets follow.

Freq [MHz]	Correction		Phase [H/N]	Quasi-Peak Mode				Average Mode			
	AMN	C.L		Limit	Reading	Emission Level	Margin	Limit	Reading	Emission Level	Margin
				[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]
0.154	0.06	0.03	N	66.00	48.32	48.41	17.59	59.00			
0.208	0.07	0.10	N	64.40	44.65	44.82	19.58	56.97			
0.234	0.07	0.10	N	63.70	43.74	43.91	19.79	56.04			
0.562	0.07	0.30	H	56.00	34.16	34.53	21.47	46.00			
1.114	0.04	0.42	N		35.13	35.59	20.41				
1.158	0.04	0.42	N		36.35	36.81	19.19				
15.254	0.06	1.22	H	60.00	35.33	36.61	19.39	50.00			
16.166	0.07	1.22	H		34.08	35.37	24.63				
19.710	0.05	1.35	H		37.15	38.55	21.45				

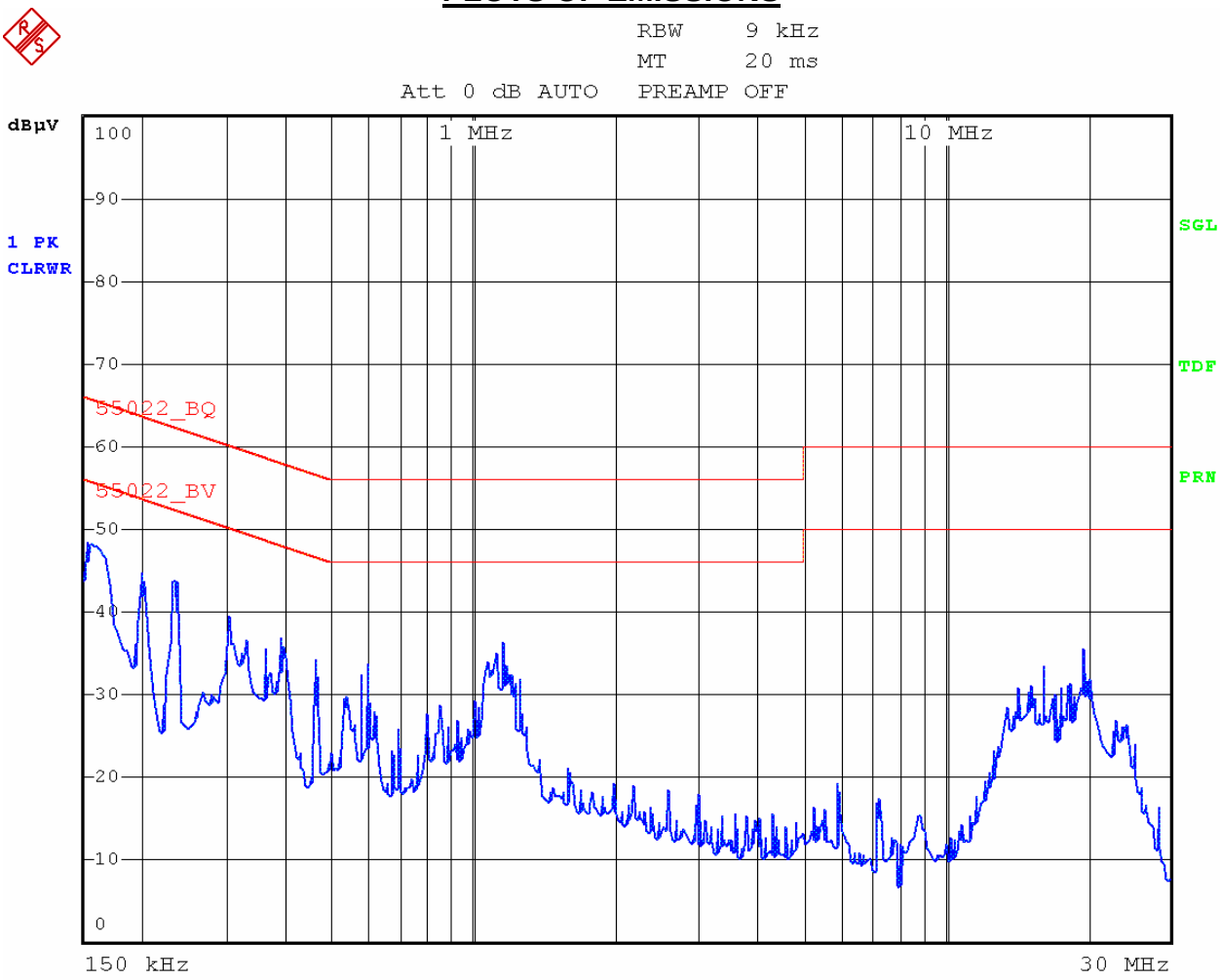
Notes:
1. All modes of operation were investigated and the worst-case emissions are reported.
See the plots in next 2 pages.
2. Line N = (Neutral), Line H = (Hot)
3. Measurement uncertainty estimated at ±1.38 dB.
The measurement uncertainty is given with a confidence of 95.45 % with the coverage factor, k=2

PLOTS OF EMISSIONS



Test Model: SD-174E
Test Mode: HOT
Classification: FCC Part 15.107

PLOTS OF EMISSIONS



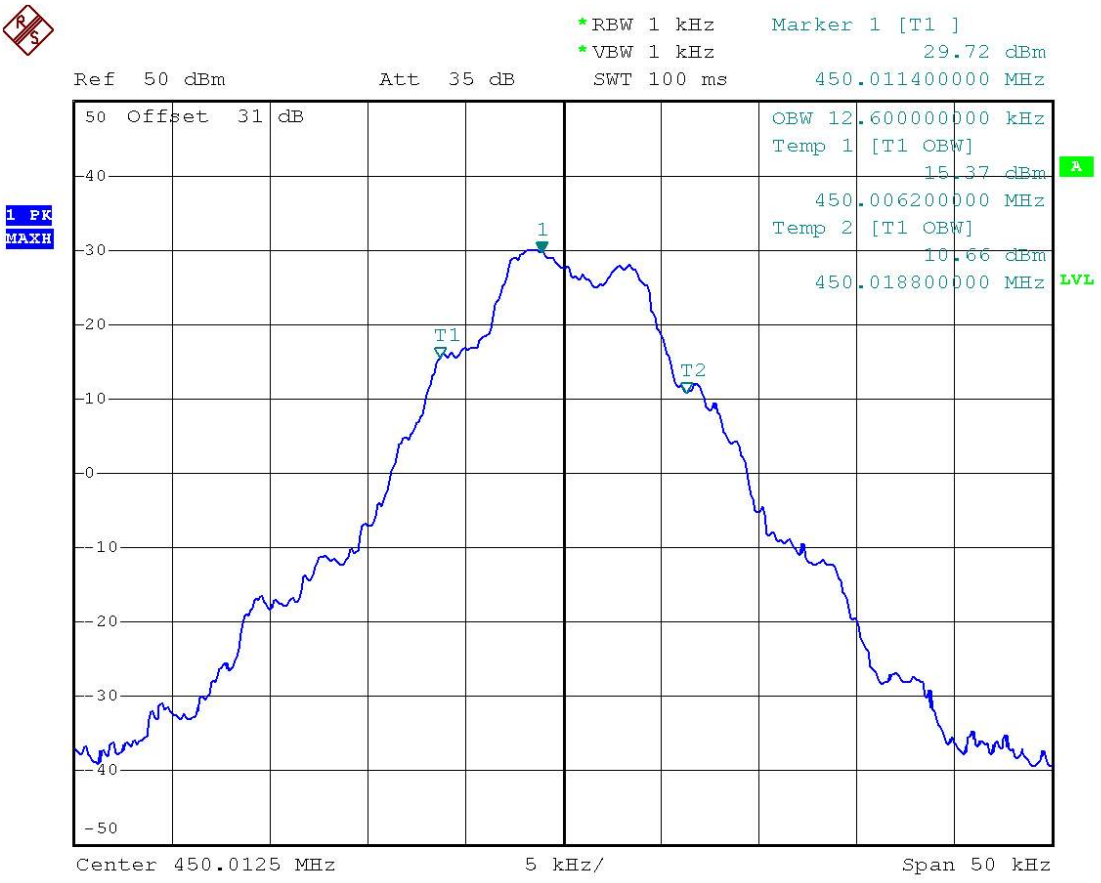
Test Model: SD-174E
Test Mode: NEUTRAL
Classification: FCC Part 15.107

6. TEST PLOT

6.1 99% Bandwidth

6.1.1 Low Channel / Low Power / F2D

FCC Rules :	Part 2 §2.1053(a) & §90.210
Operating Frequency :	450.0125 MHz
Channel :	Low Channel
Power Output :	1 Watt
Channel Spacing :	Wide Band
Modulation Signal :	9600 bps
Emission Mask :	99% Bandwidth
Reference Voltage :	12 Vdc



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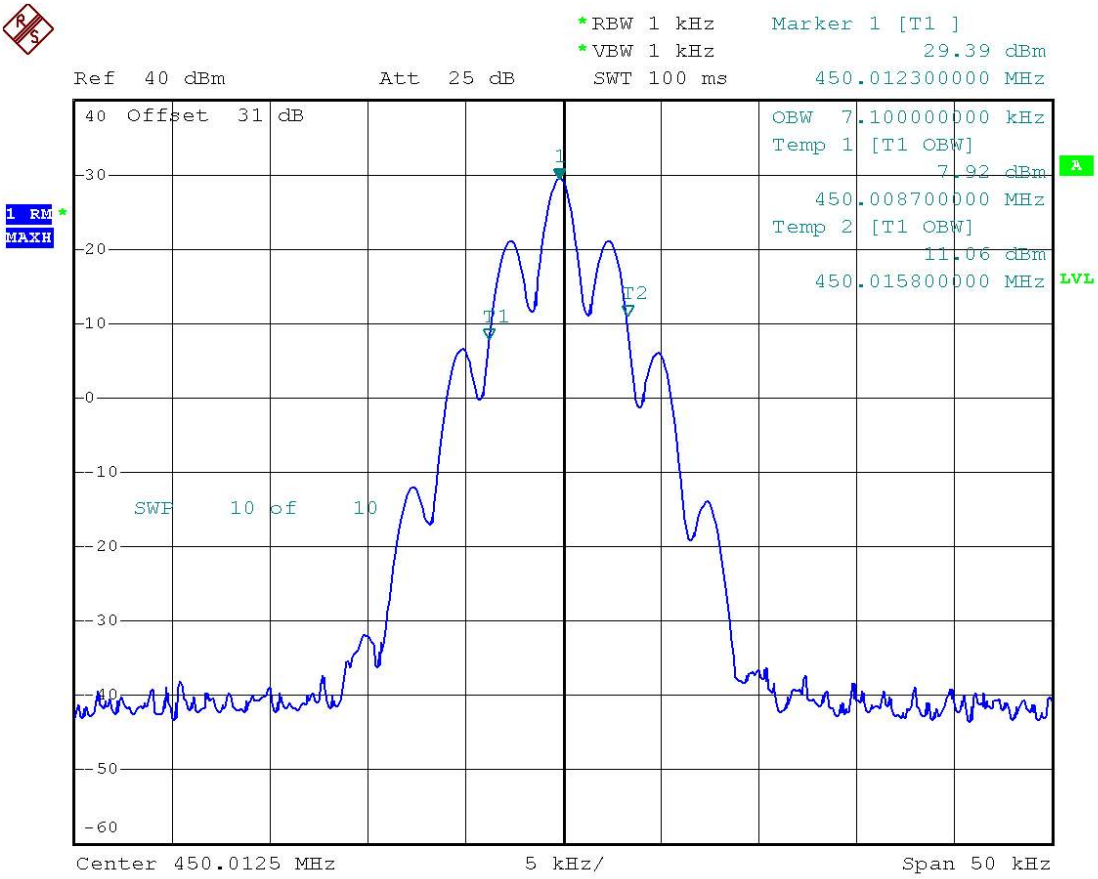
6.1.2 Low Channel / Low Power / F3E / Narrow Band

FCC Rules :	Part 2 §2.1053(a) & §90.210
Operating Frequency :	450.0125 MHz
Channel :	Low Channel
Power Output :	1 Watt
Channel Spacing :	Narrow Band
Modulation Signal :	FM modulation with 2.5kHz sine wave signal
Emission Mask :	99% Bandwidth
Reference Voltage :	12 Vdc



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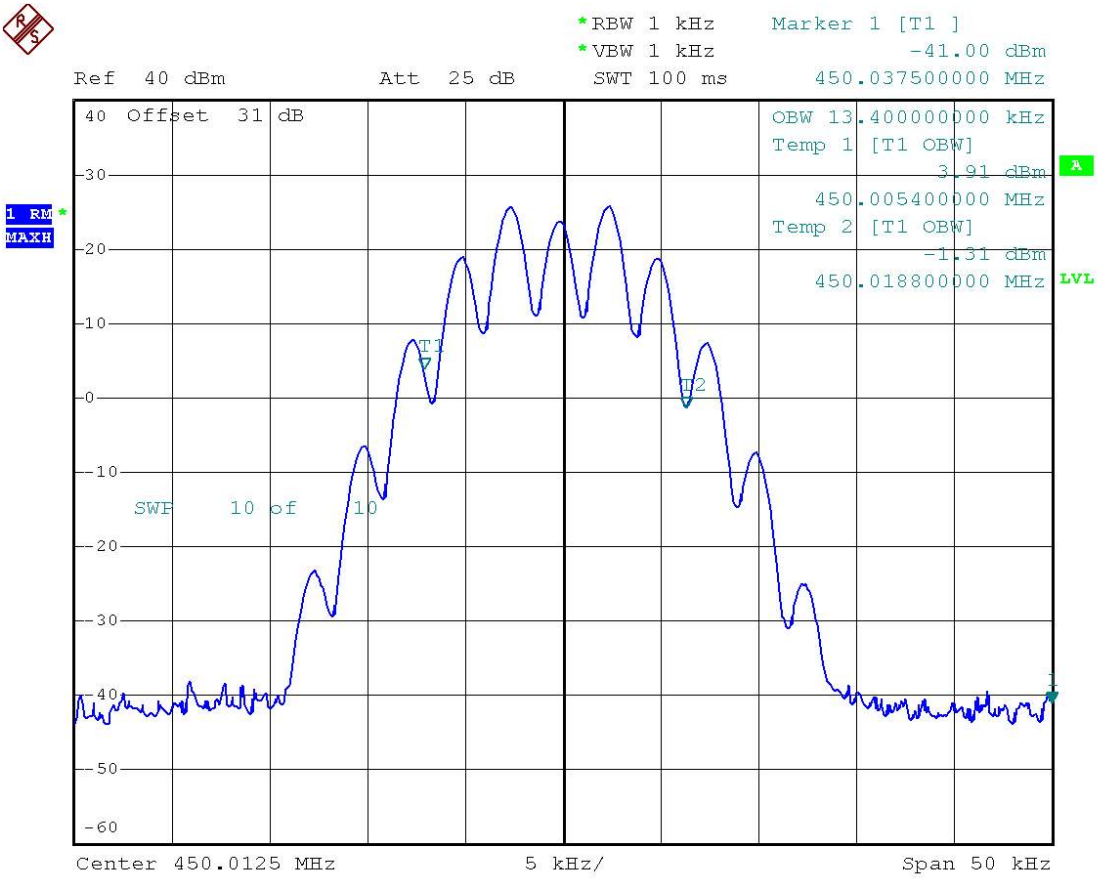
6.1.3 Low Channel / Low Power / F3E / Wide Band

FCC Rules :	Part 2 §2.1053(a) & §90.210
Operating Frequency :	450.0125 MHz
Channel :	Low Channel
Power Output :	1 Watt
Channel Spacing :	Wide Band
Modulation Signal :	FM modulation with 2.5kHz sine wave signal
Emission Mask :	99% Bandwidth
Reference Voltage :	12 Vdc



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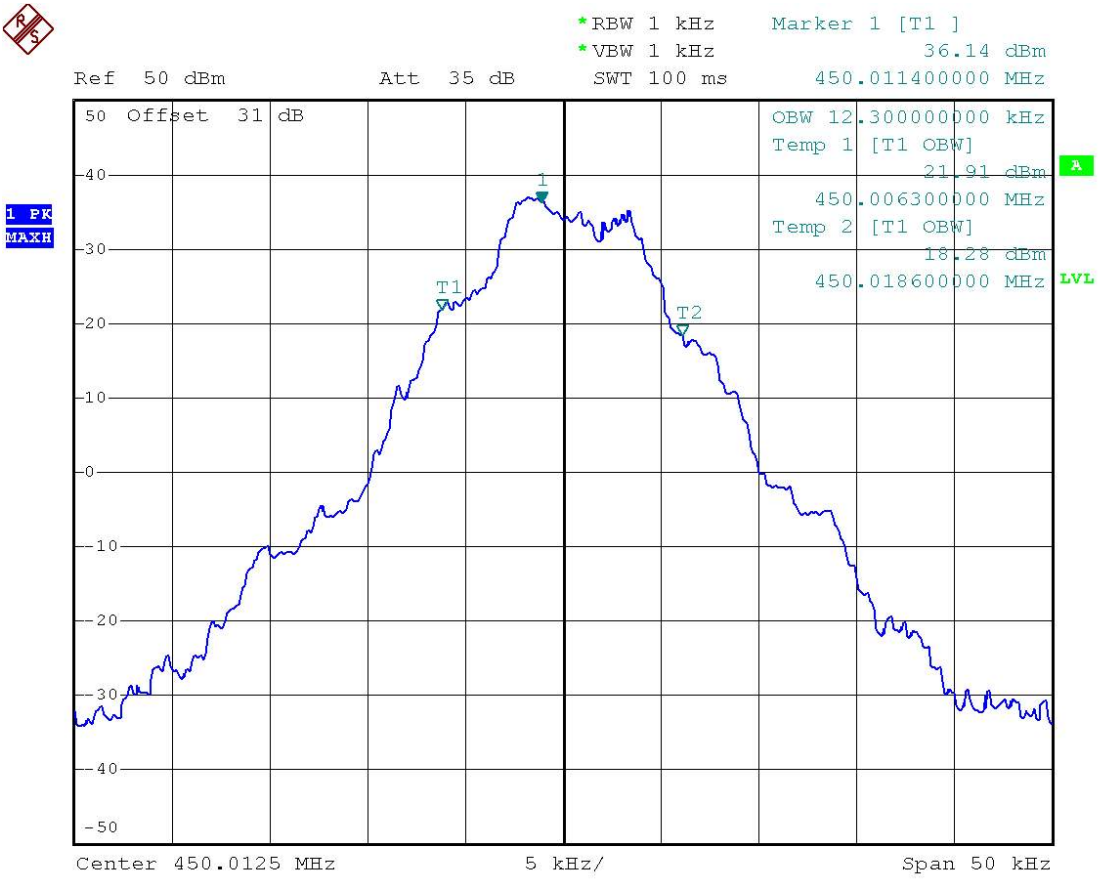
6.1.4 Low Channel / High Power / F2D

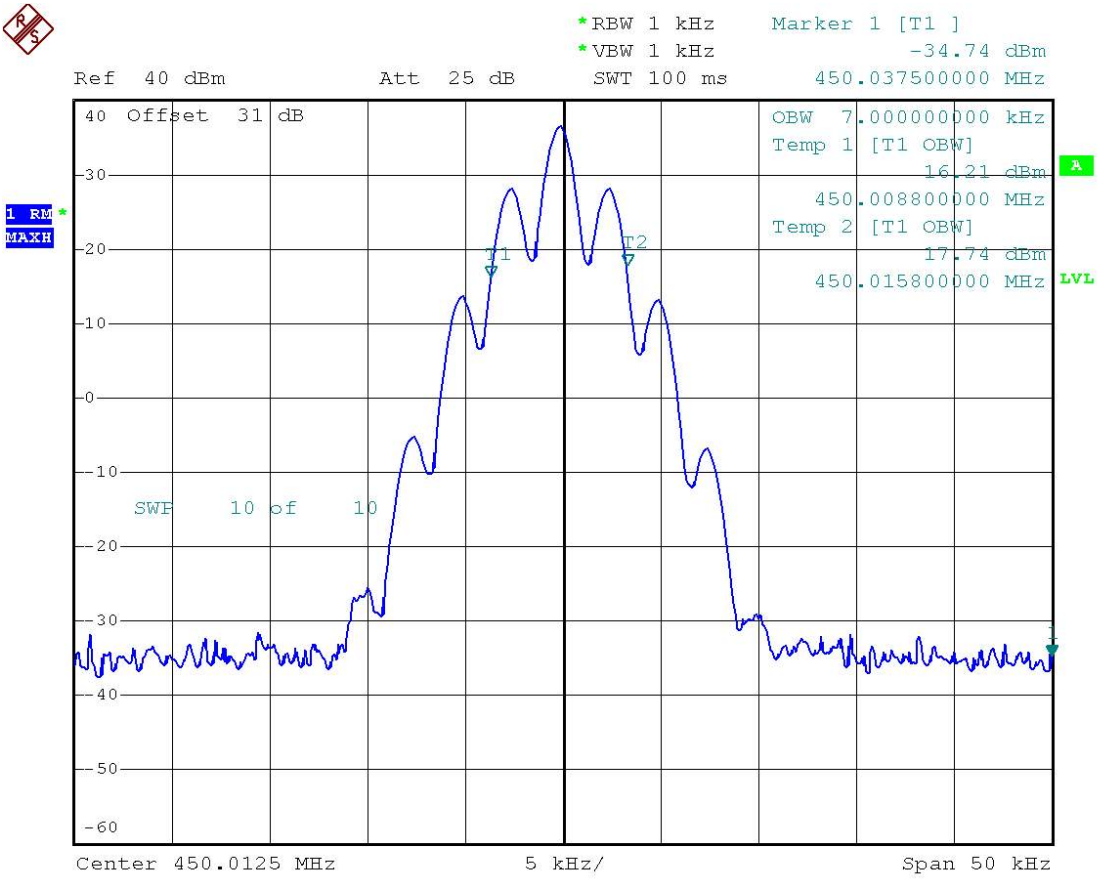
FCC Rules :	Part 2 §2.1053(a) & §90.210
Operating Frequency :	450.0125 MHz
Channel :	Low Channel
Power Output :	5 Watt
Channel Spacing :	Wide Band
Modulation Signal :	9600 bps
Emission Mask :	99% Bandwidth
Reference Voltage :	12 Vdc



Date: 1.SEP.2009 00:05:49

6.1.5 Low Channel / high Power / F3E / Narrow Band

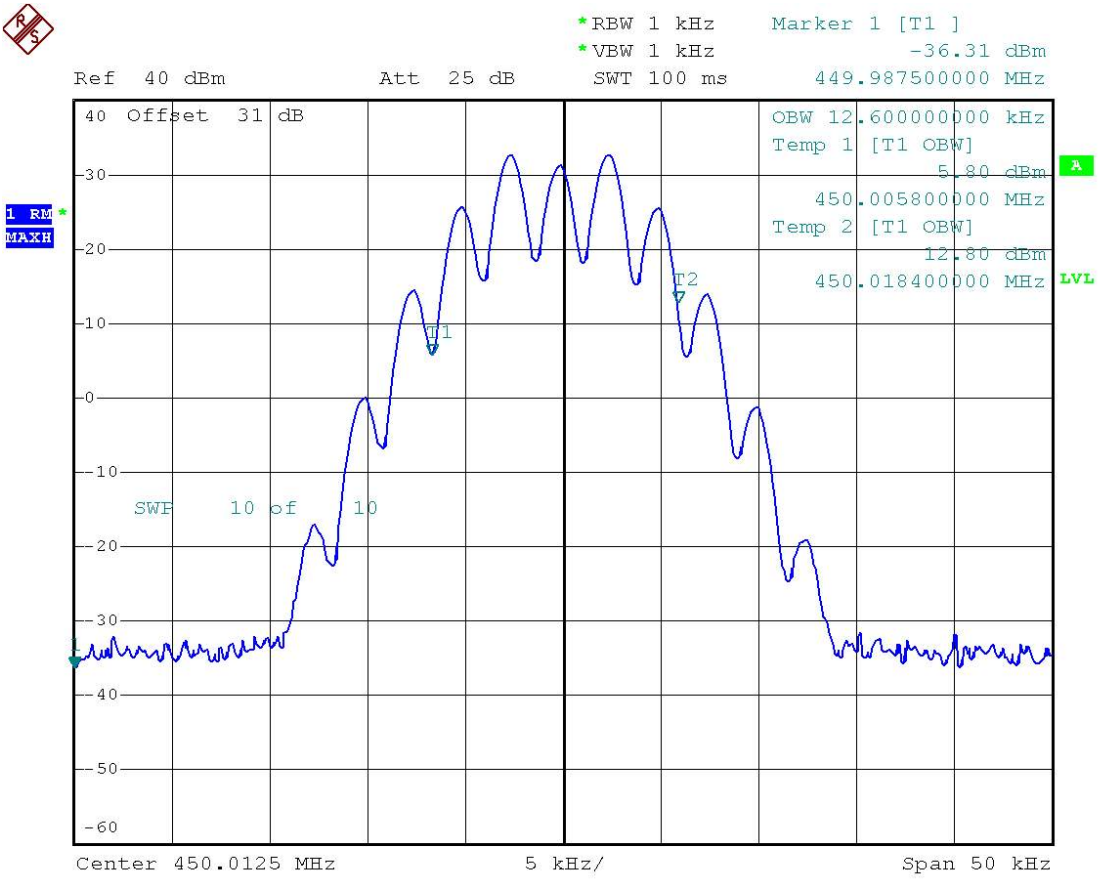
FCC Rules :	Part 2 §2.1053(a) & §90.210
Operating Frequency :	450.0125 MHz
Channel :	Low Channel
Power Output :	5 Watt
Channel Spacing :	Narrow Band
Modulation Signal :	FM modulation with 2.5kHz sine wave signal
Emission Mask :	99% Bandwidth
Reference Voltage :	12 Vdc



Date: 26.AUG.2009 15:13:34

6.1.6 Low Channel / High Power / F3E / Wide Band

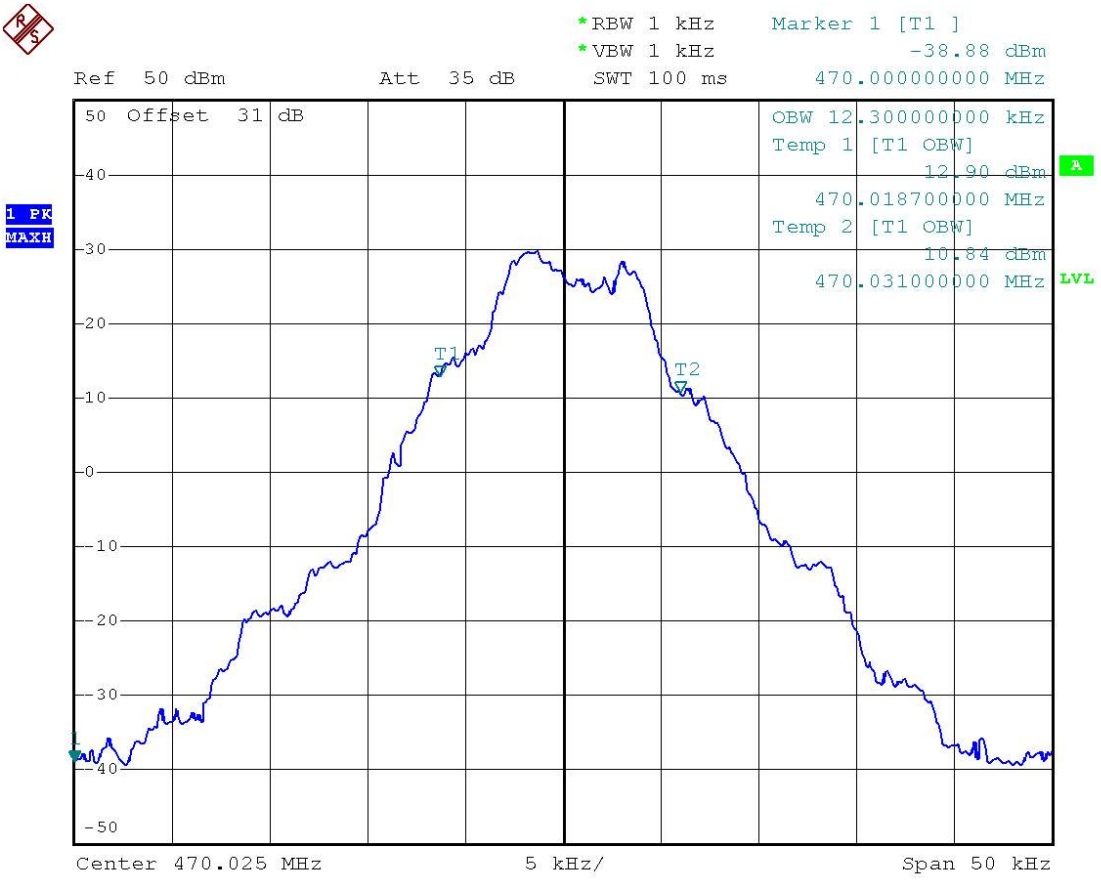
FCC Rules :	Part 2 §2.1053(a) & §90.210
Operating Frequency :	450.0125 MHz
Channel :	Low Channel
Power Output :	5 Watt
Channel Spacing :	Wide Band
Modulation Signal :	FM modulation with 2.5kHz sine wave signal
Emission Mask :	99% Bandwidth
Reference Voltage :	12 Vdc



Date: 26.AUG.2009 15:04:23

6.1.7 Middle Channel / Low Power / F2D

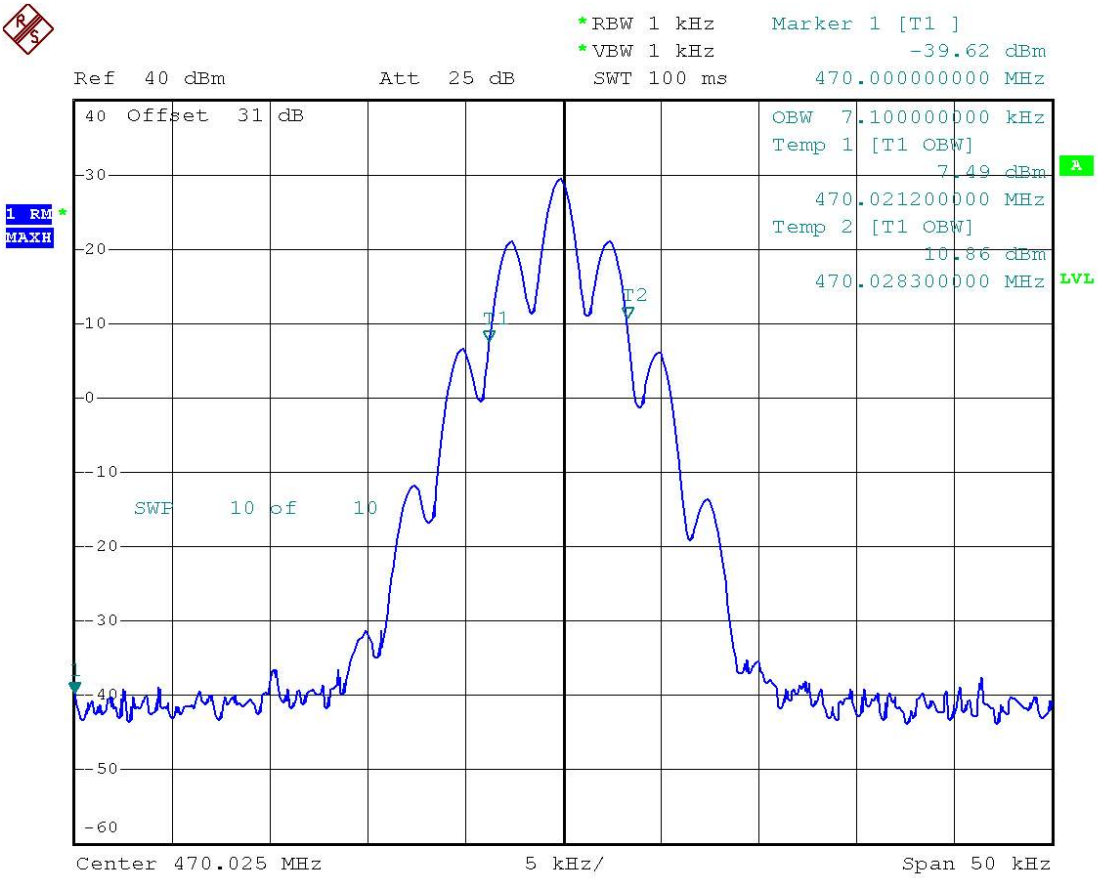
FCC Rules :	Part 2 §2.1053(a) & §90.210
Operating Frequency :	470.025 MHz
Channel :	Middle Channel
Power Output :	1 Watt
Channel Spacing :	Wide Band
Modulation Signal :	9600 bps
Emission Mask :	99% Bandwidth
Reference Voltage :	12 Vdc



Date: 1.SEP.2009 00:08:33

6.1.8 Middle Channel / Low Power / F3E / Narrow Band

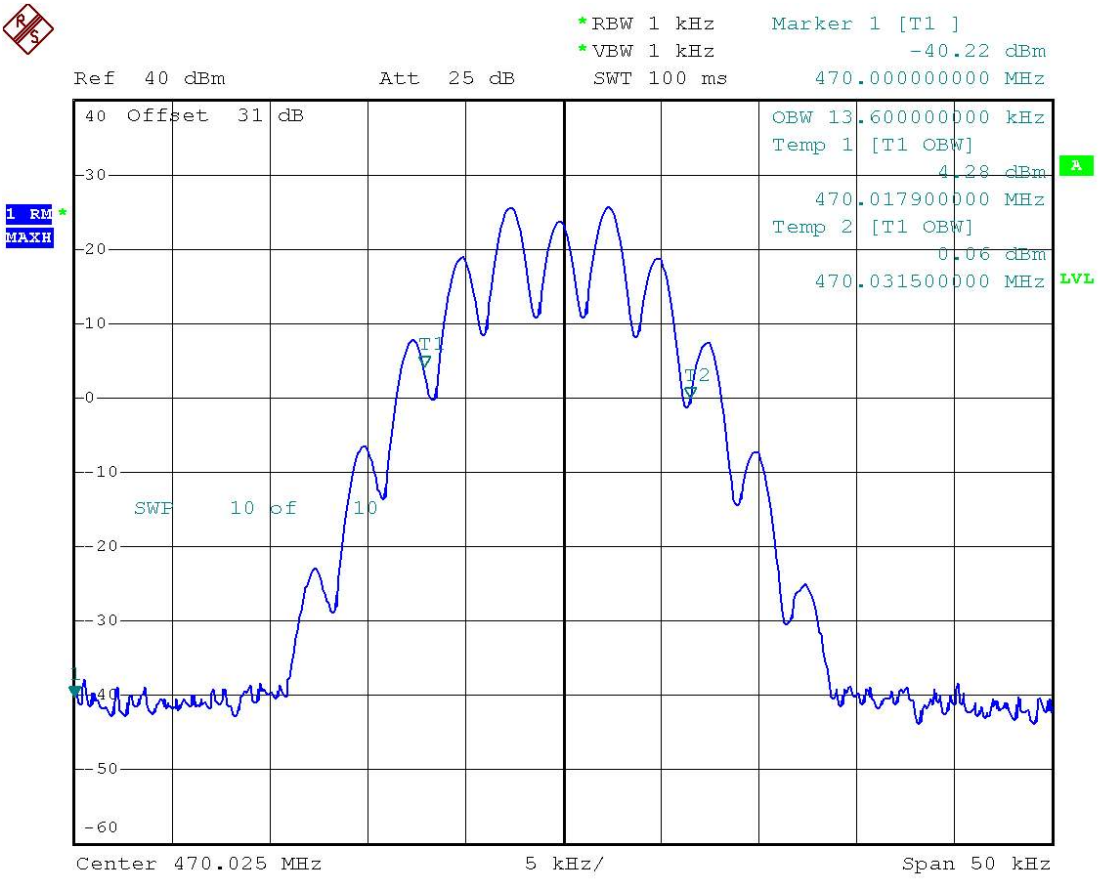
FCC Rules :	Part 2 §2.1053(a) & §90.210
Operating Frequency :	470.025 MHz
Channel :	Middle Channel
Power Output :	1 Watt
Channel Spacing :	Narrow Band
Modulation Signal :	FM modulation with 2.5kHz sine wave signal
Emission Mask :	99% Bandwidth
Reference Voltage :	12 Vdc



Date: 26.AUG.2009 15:05:56

6.1.9 Middle Channel / Low Power / F3E / Wide Band

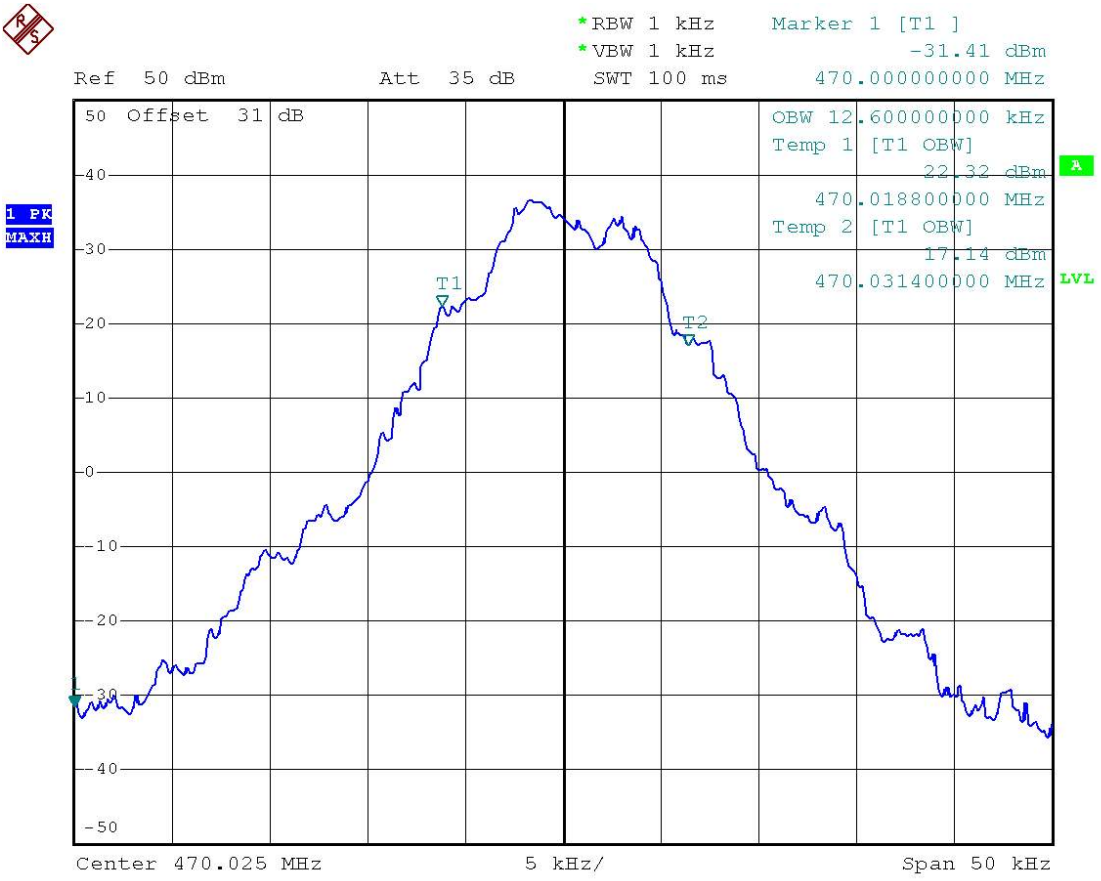
FCC Rules :	Part 2 §2.1053(a) & §90.210
Operating Frequency :	470.025 MHz
Channel :	Middle Channel
Power Output :	1 Watt
Channel Spacing :	Wide Band
Modulation Signal :	FM modulation with 2.5kHz sine wave signal
Emission Mask :	99% Bandwidth
Reference Voltage :	12 Vdc



Date: 26.AUG.2009 15:14:56

6.1.10 Middle Channel / High Power / F2D

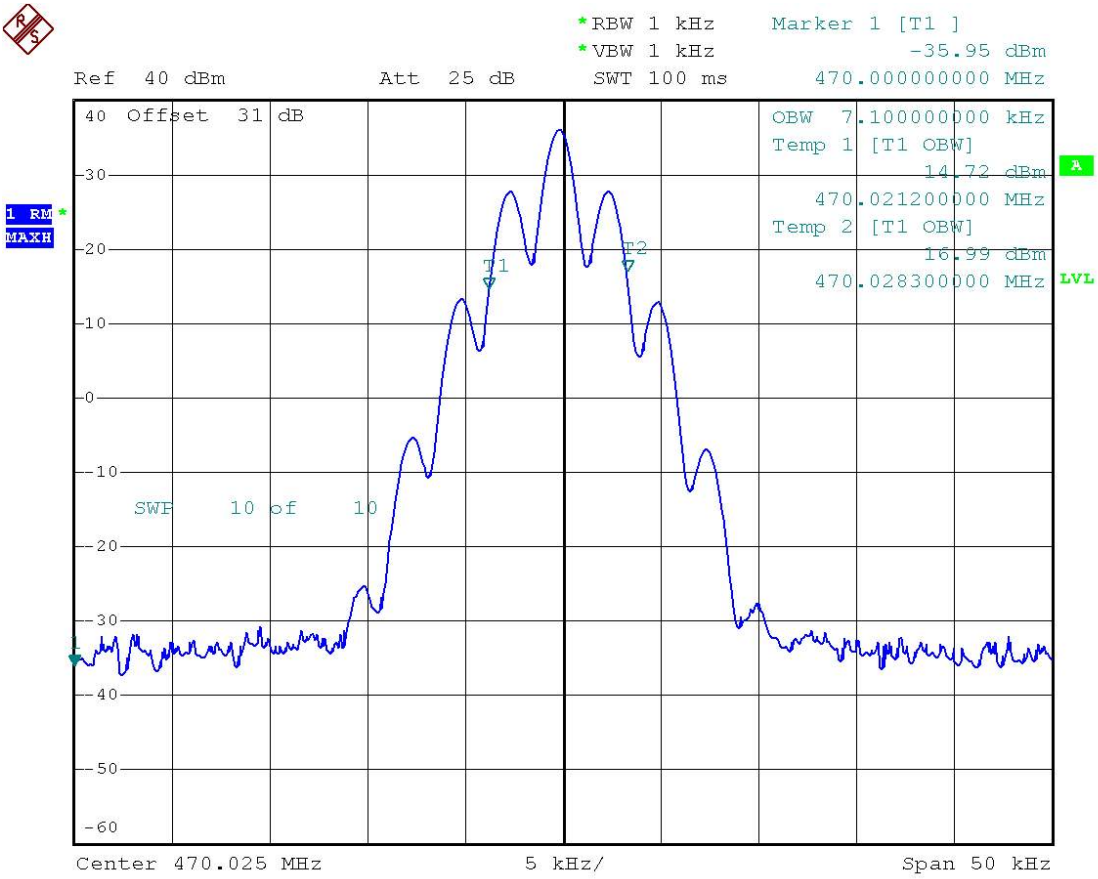
FCC Rules :	Part 2 §2.1053(a) & §90.210
Operating Frequency :	470.025 MHz
Channel :	Middle Channel
Power Output :	5 Watt
Channel Spacing :	Wide Band
Modulation Signal :	9600 bps
Emission Mask :	99% Bandwidth
Reference Voltage :	12 Vdc



Date: 1.SEP.2009 00:07:17

6.1.11 Middle Channel / high Power / F3E / Narrow Band

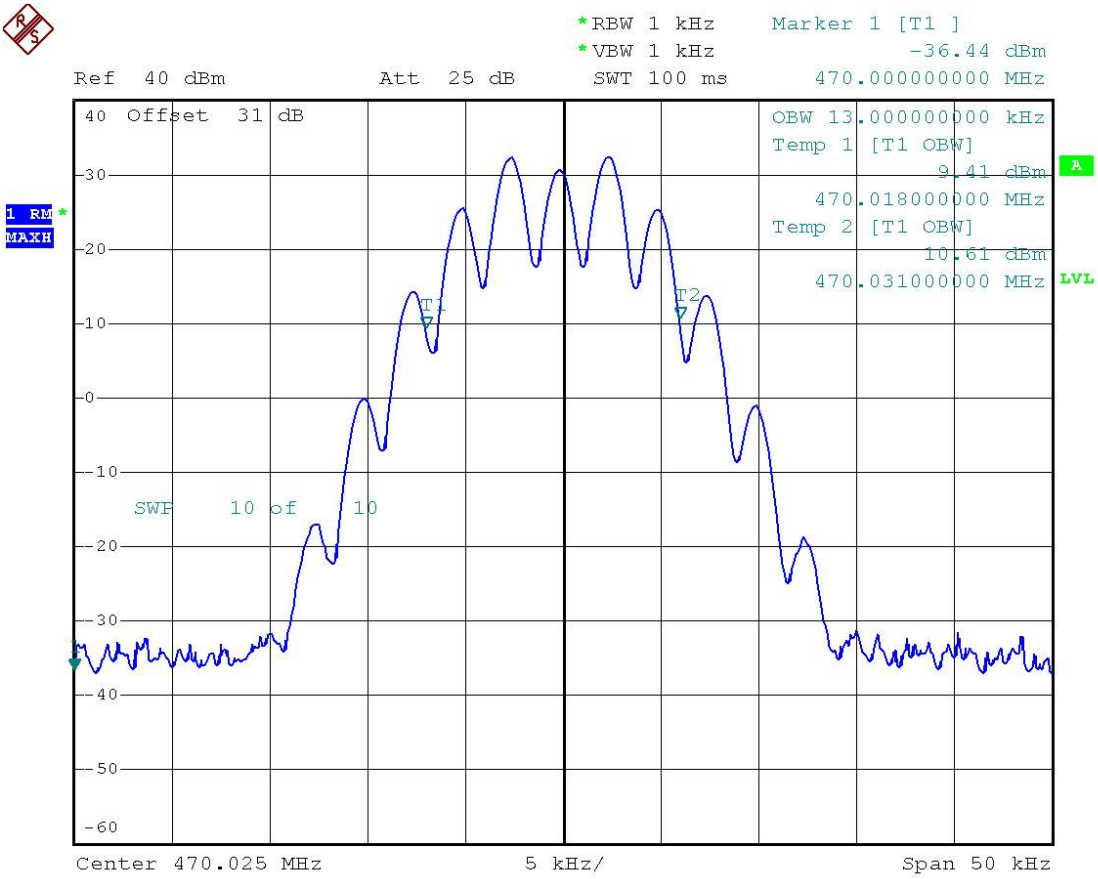
FCC Rules :	Part 2 §2.1053(a) & §90.210
Operating Frequency :	470.025 MHz
Channel :	Middle Channel
Power Output :	5 Watt
Channel Spacing :	Narrow Band
Modulation Signal :	FM modulation with 2.5kHz sine wave signal
Emission Mask :	99% Bandwidth
Reference Voltage :	12 Vdc



Date: 26.AUG.2009 15:14:29

6.1.12 Middle Channel / High Power / F3E / Wide Band

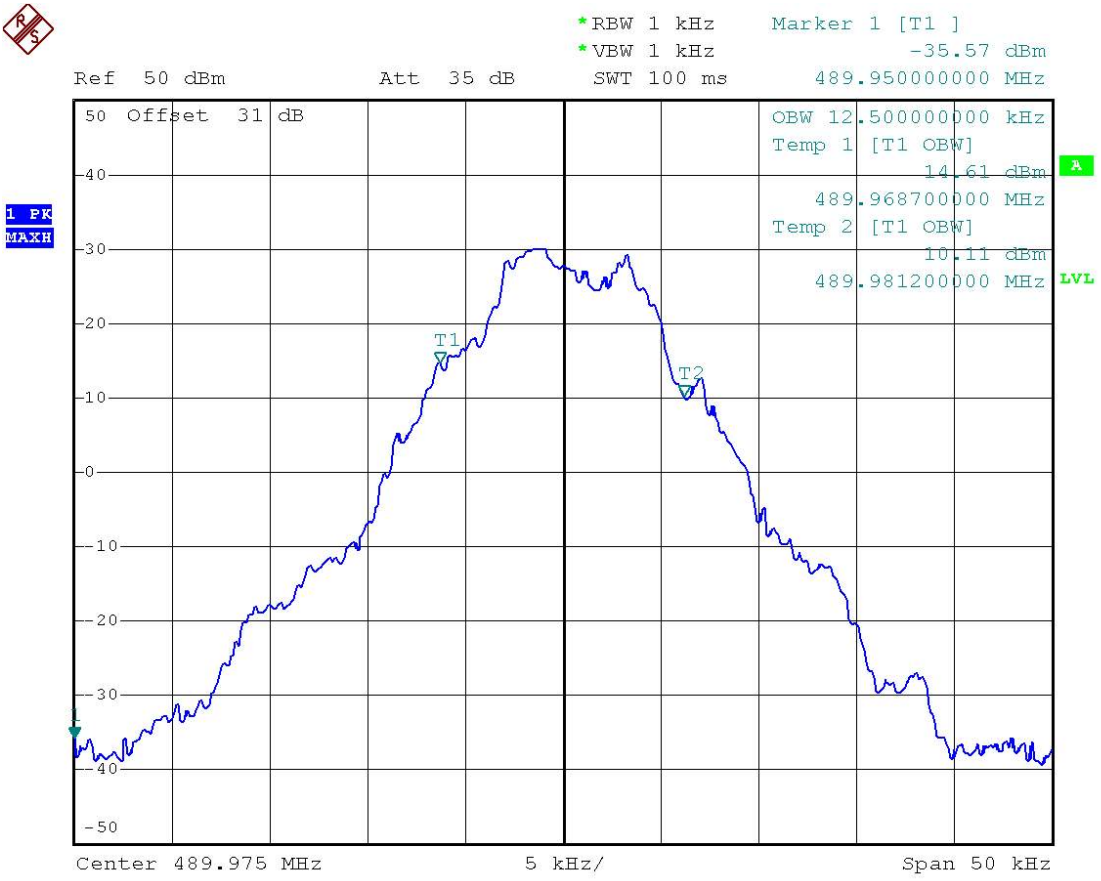
FCC Rules :	Part 2 §2.1053(a) & §90.210
Operating Frequency :	470.025 MHz
Channel :	Middle Channel
Power Output :	5 Watt
Channel Spacing :	Wide Band
Modulation Signal :	FM modulation with 2.5kHz sine wave signal
Emission Mask :	99% Bandwidth
Reference Voltage :	12 Vdc



Date: 26.AUG.2009 15:05:36

6.1.13 High Channel / Low Power / F2D

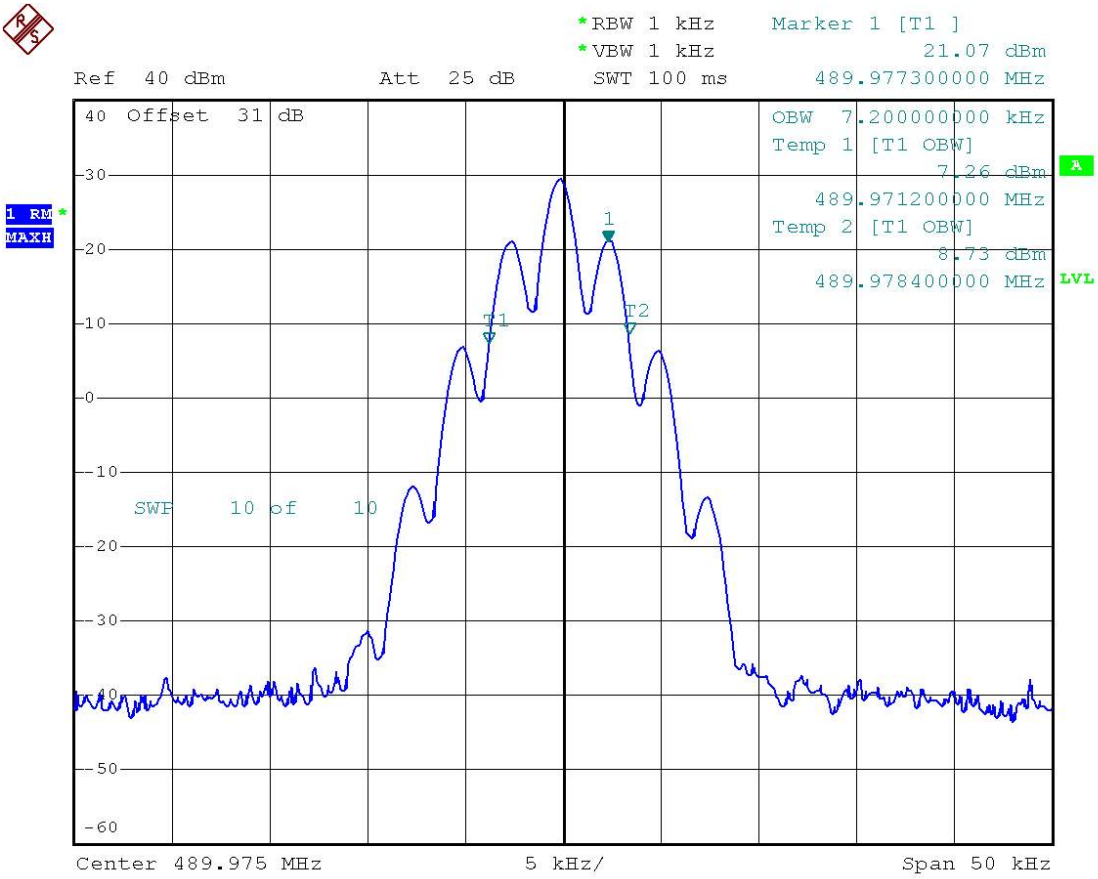
FCC Rules :	Part 2 §2.1053(a) & §90.210
Operating Frequency :	489.975 MHz
Channel :	High Channel
Power Output :	1 Watt
Channel Spacing :	Wide Band
Modulation Signal :	9600 bps
Emission Mask :	99% Bandwidth
Reference Voltage :	12 Vdc



Date: 1.SEP.2009 00:10:46

6.1.14 High Channel / Low Power / F3E / Narrow Band

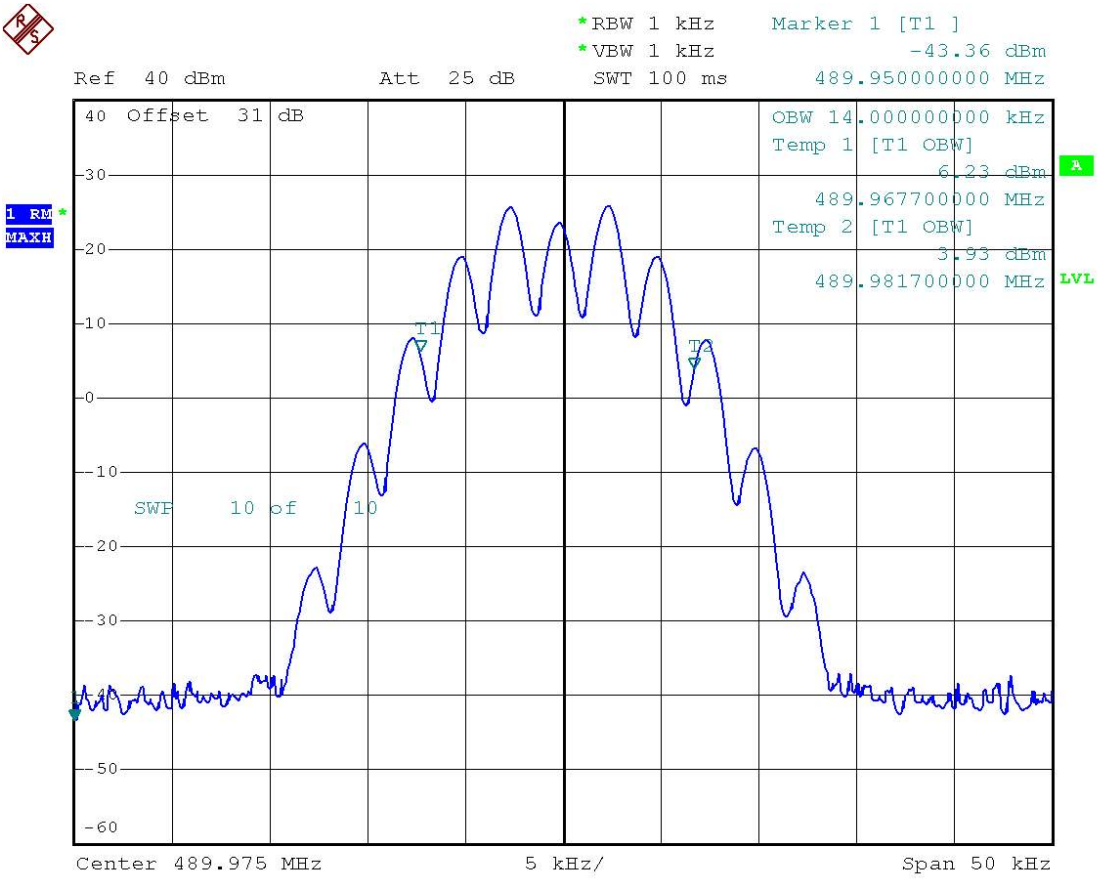
FCC Rules :	Part 2 §2.1053(a) & §90.210
Operating Frequency :	489.975 MHz
Channel :	High Channel
Power Output :	1 Watt
Channel Spacing :	Narrow Band
Modulation Signal :	FM modulation with 2.5kHz sine wave signal
Emission Mask :	99% Bandwidth
Reference Voltage :	12 Vdc



Date: 26.AUG.2009 15:13:03

6.1.15 High Channel / Low Power / F3E / Wide Band

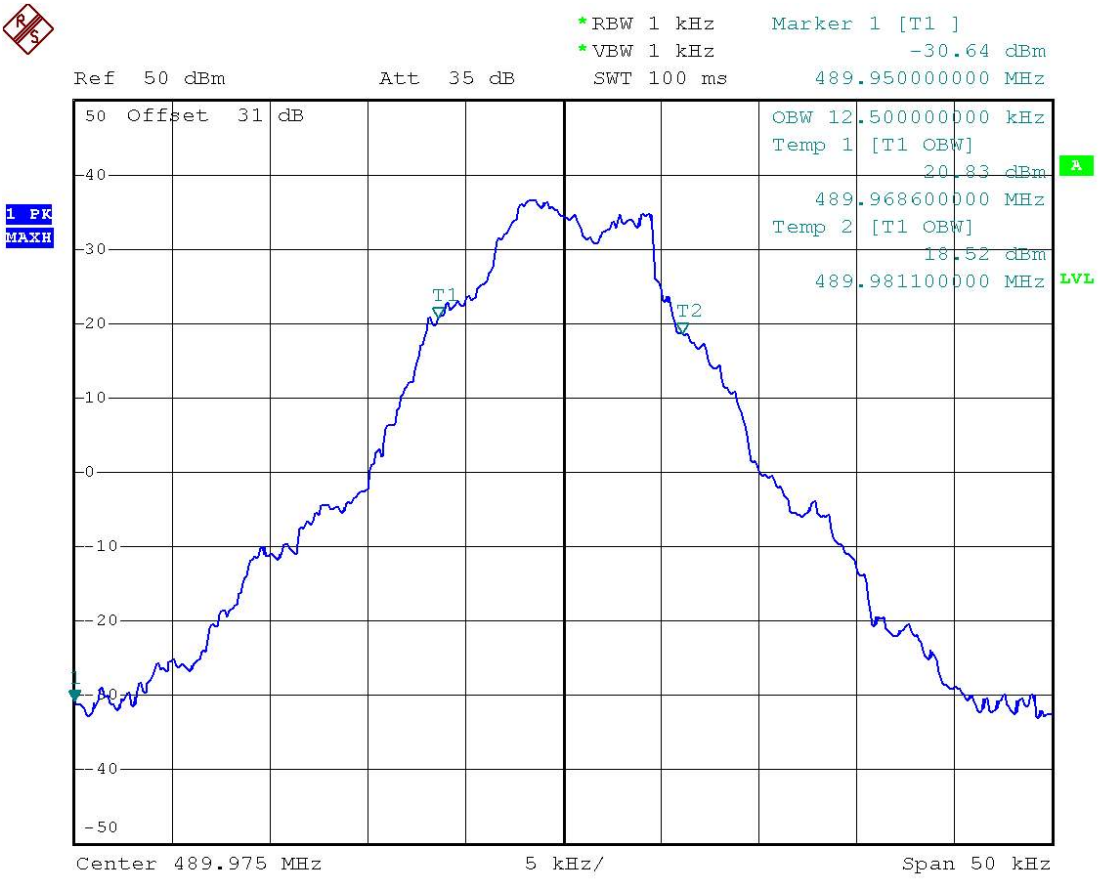
FCC Rules :	Part 2 §2.1053(a) & §90.210
Operating Frequency :	489.975 MHz
Channel :	High Channel
Power Output :	1 Watt
Channel Spacing :	Wide Band
Modulation Signal :	FM modulation with 2.5kHz sine wave signal
Emission Mask :	99% Bandwidth
Reference Voltage :	12 Vdc



Date: 26.AUG.2009 15:15:48

6.1.16 High Channel / High Power / F2D

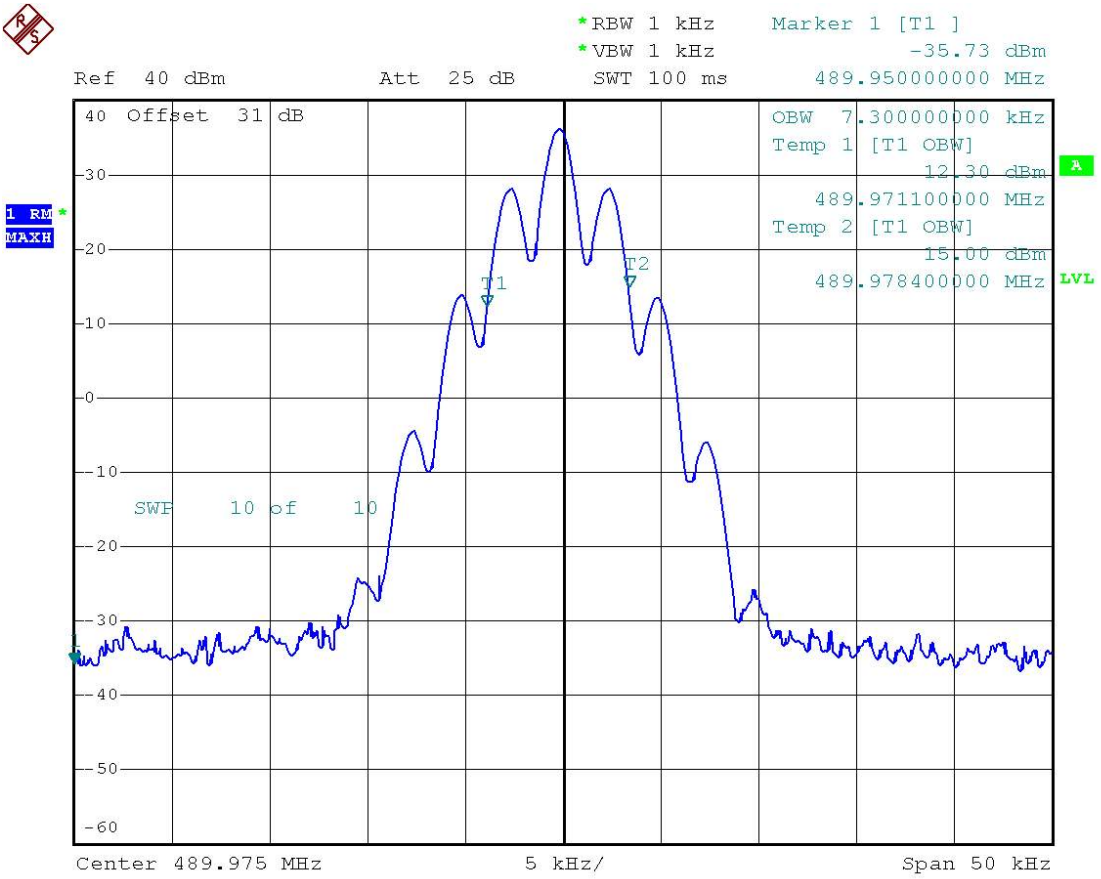
FCC Rules :	Part 2 §2.1053(a) & §90.210
Operating Frequency :	489.975 MHz
Channel :	High Channel
Power Output :	5 Watt
Channel Spacing :	Wide Band
Modulation Signal :	9600 bps
Emission Mask :	99% Bandwidth
Reference Voltage :	12 Vdc



Date: 1.SEP.2009 00:09:42

6.1.17 High Channel / high Power / F3E / Narrow Band

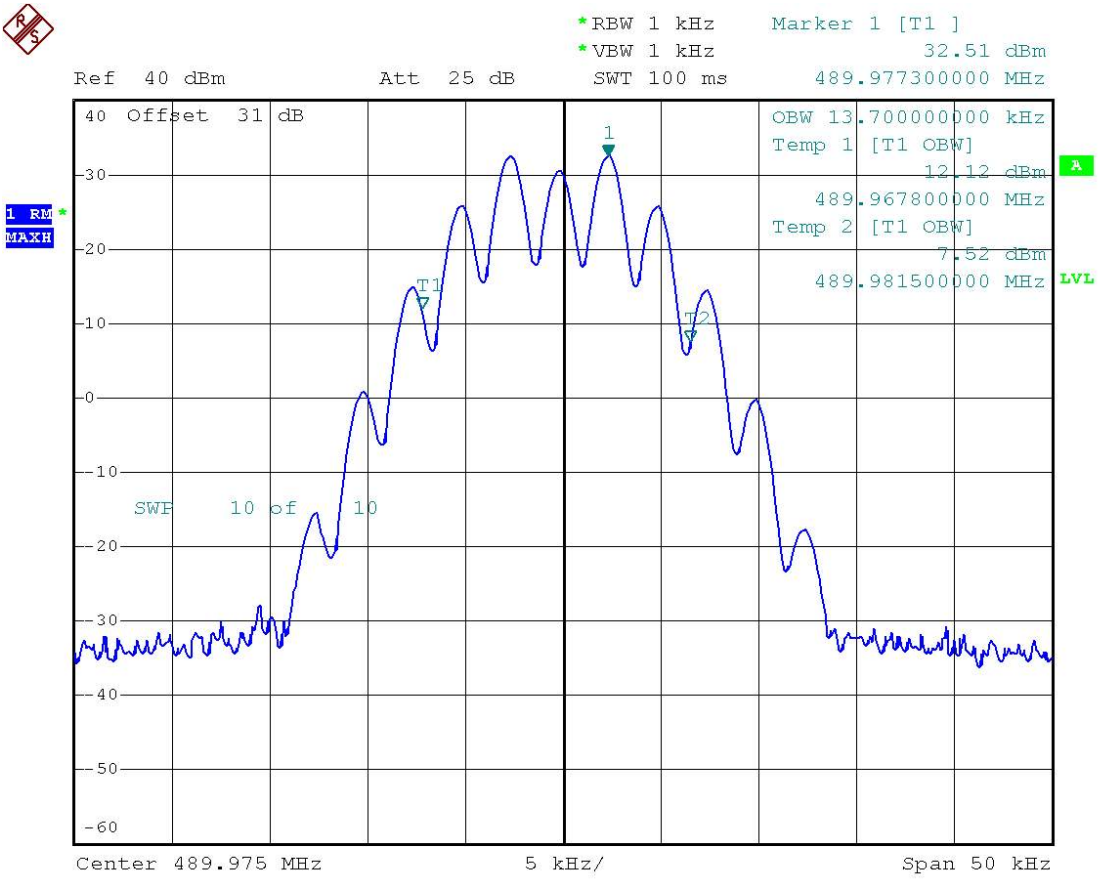
FCC Rules :	Part 2 §2.1053(a) & §90.210
Operating Frequency :	489.975 MHz
Channel :	High Channel
Power Output :	5 Watt
Channel Spacing :	Narrow Band
Modulation Signal :	FM modulation with 2.5kHz sine wave signal
Emission Mask :	99% Bandwidth
Reference Voltage :	12 Vdc



Date: 26.AUG.2009 15:15:24

6.1.18 High Channel / High Power / F3E / Wide Band

FCC Rules :	Part 2 §2.1053(a) & §90.210
Operating Frequency :	489.975 MHz
Channel :	High Channel
Power Output :	5 Watt
Channel Spacing :	Wide Band
Modulation Signal :	FM modulation with 2.5kHz sine wave signal
Emission Mask :	99% Bandwidth
Reference Voltage :	12 Vdc

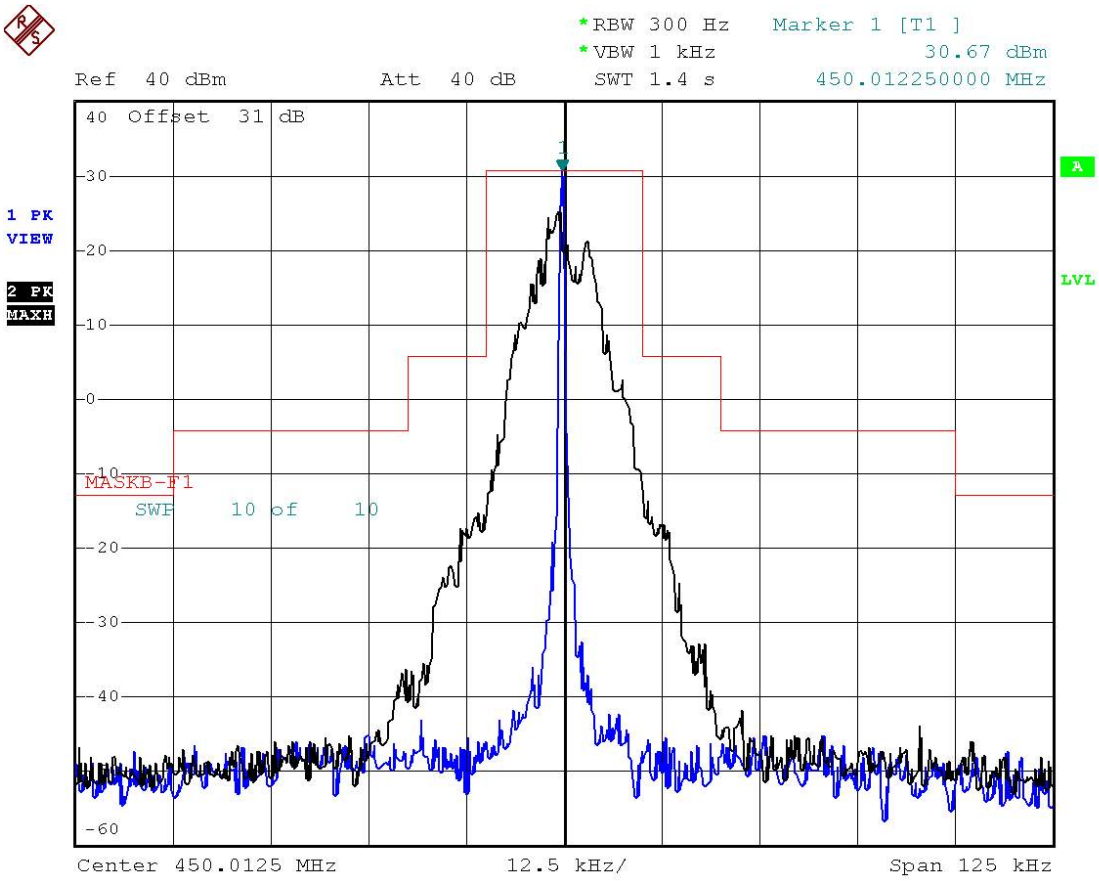


Date: 26.AUG.2009 15:12:47

6.2 Emission Mask

6.2.1 Low Channel / Low Power / F2D

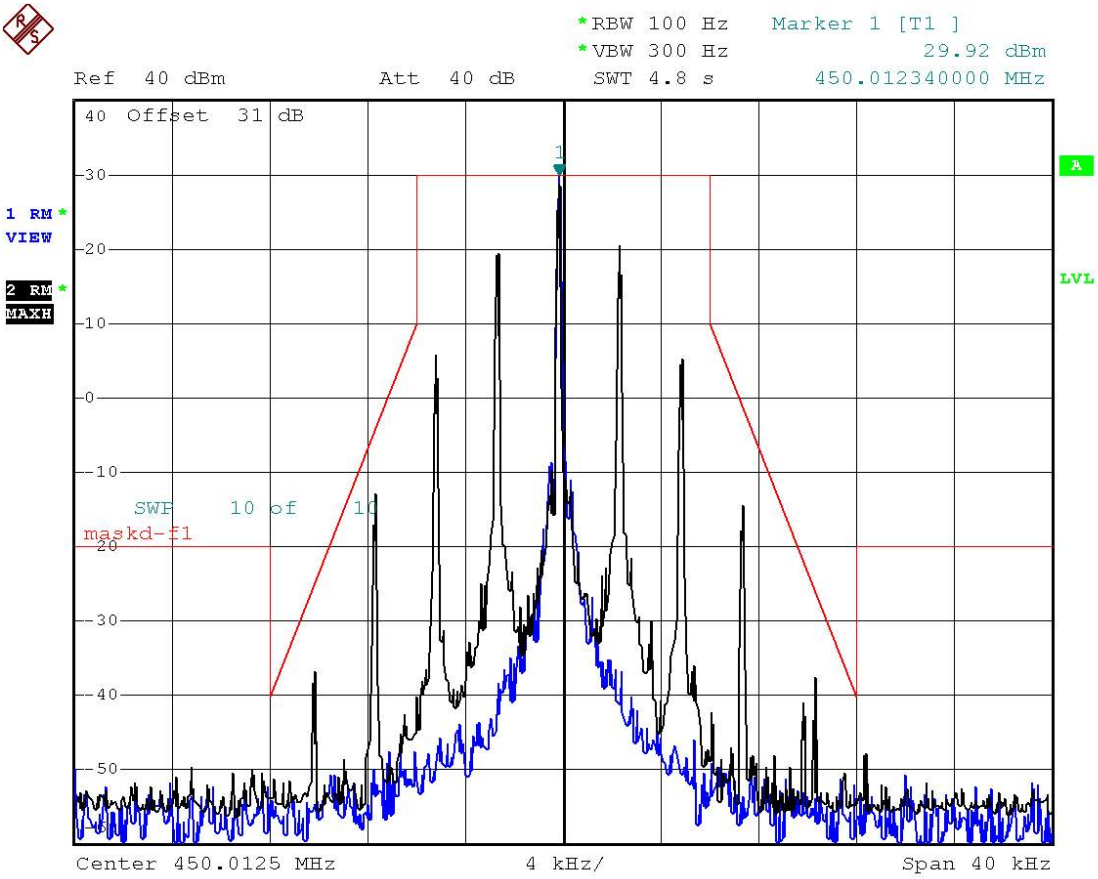
FCC Rules :	Part 2 §2.1053(a) & §90.210
Operating Frequency :	450.0125 MHz
Channel :	Low Channel
Power Output :	1 Watt
Channel Spacing :	Wide Band
Modulation Signal :	9600 bps
Emission Mask :	Mask B
Reference Voltage :	12 Vdc



Date: 1.SEP.2009 00:21:30

6.2.2 Low Channel / Low Power / F3E / Narrow Band

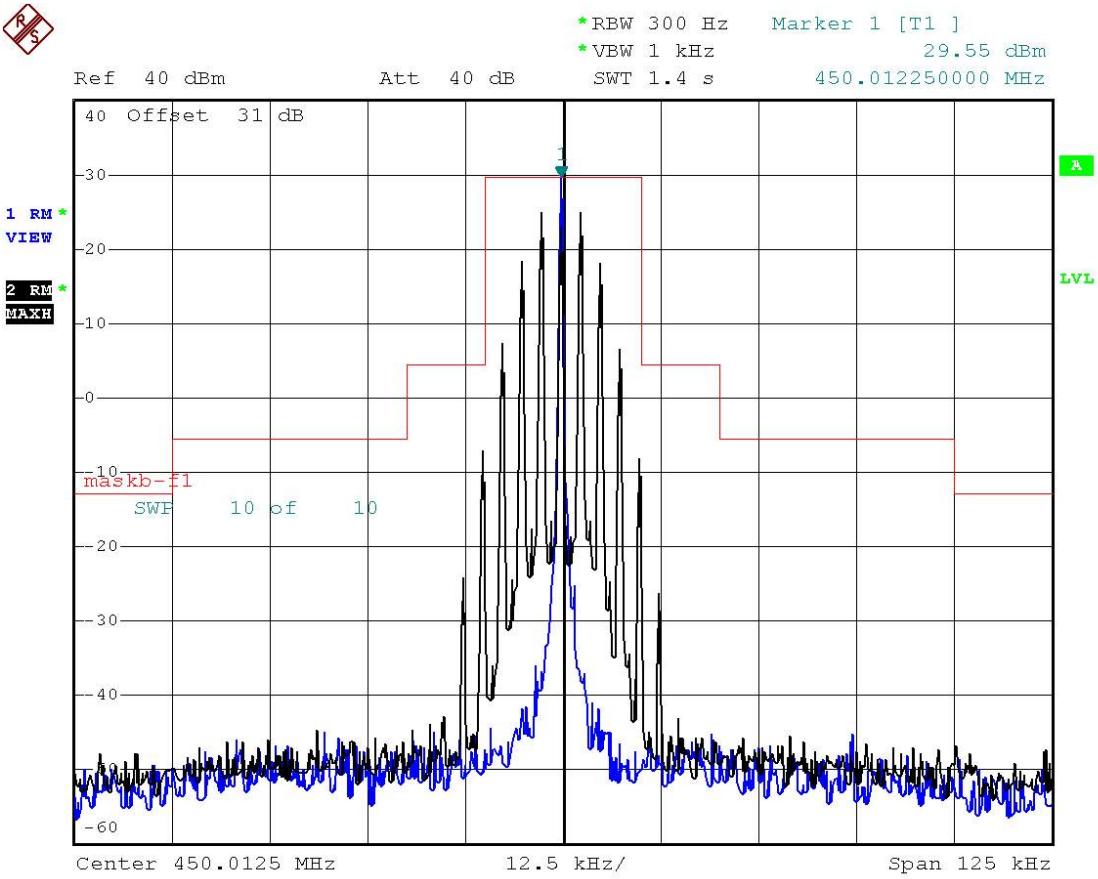
FCC Rules :	Part 2 §2.1053(a) & §90.210
Operating Frequency :	450.0125 MHz
Channel :	Low Channel
Power Output :	1 Watt
Channel Spacing :	Narrow Band
Modulation Signal :	FM modulation with 2.5kHz sine wave signal
Emission Mask :	Mask D
Reference Voltage :	12 Vdc



Date: 26.AUG.2009 15:37:08

6.2.3 Low Channel / Low Power / F3E / Wide Band

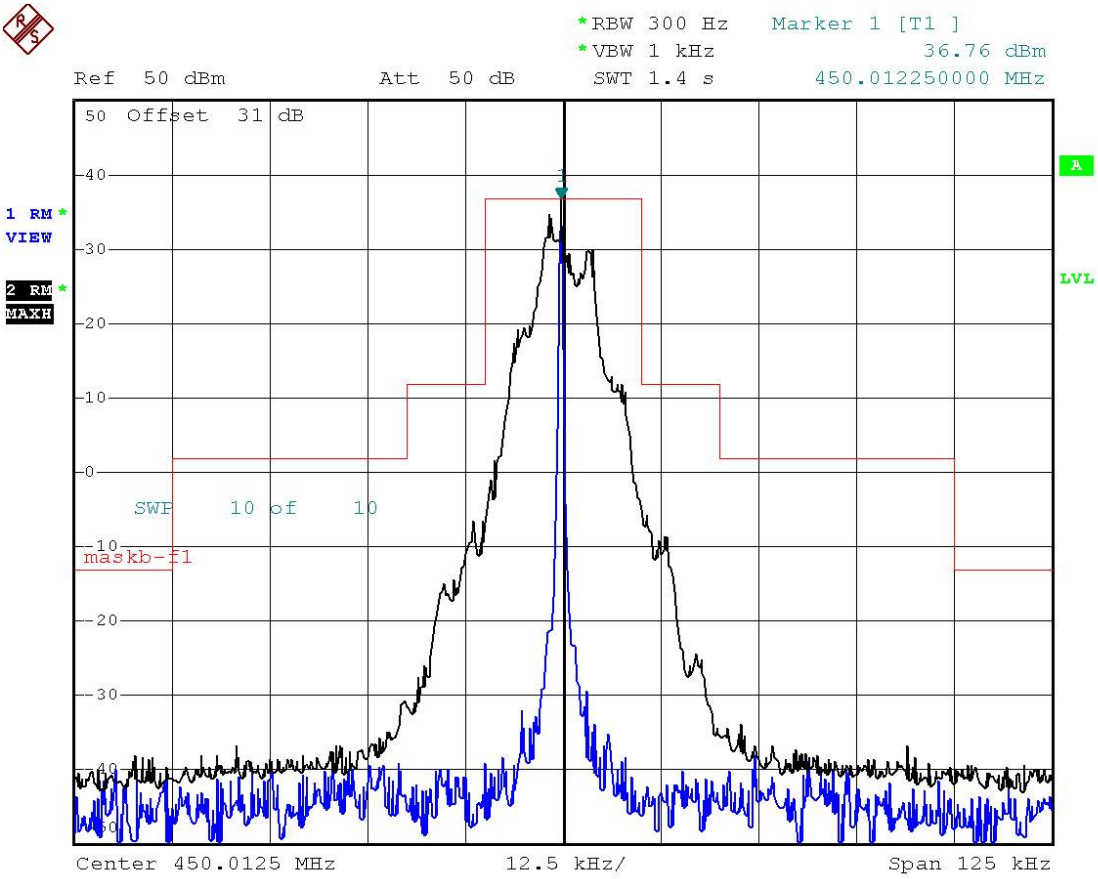
FCC Rules :	Part 2 §2.1053(a) & §90.210
Operating Frequency :	450.0125 MHz
Channel :	Low Channel
Power Output :	1 Watt
Channel Spacing :	Wide Band
Modulation Signal :	FM modulation with 2.5kHz sine wave signal
Emission Mask :	Mask B
Reference Voltage :	12 Vdc



Date: 26.AUG.2009 16:18:43

6.2.4 Low Channel / High Power / F2D

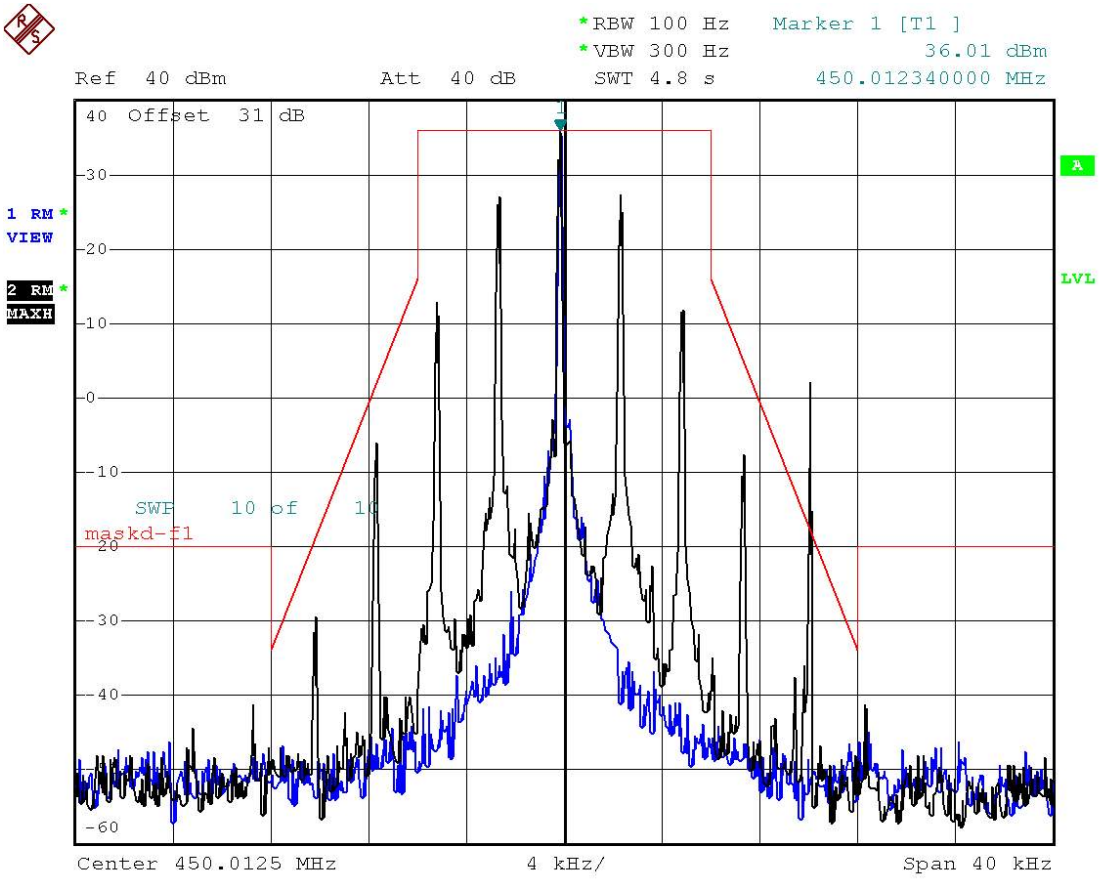
FCC Rules :	Part 2 §2.1053(a) & §90.210
Operating Frequency :	450.0125 MHz
Channel :	Low Channel
Power Output :	5 Watt
Channel Spacing :	Wide Band
Modulation Signal :	9600 bps
Emission Mask :	Mask B
Reference Voltage :	12 Vdc



Date: 28.AUG.2009 09:48:32

6.2.5 Low Channel / high Power / F3E / Narrow Band

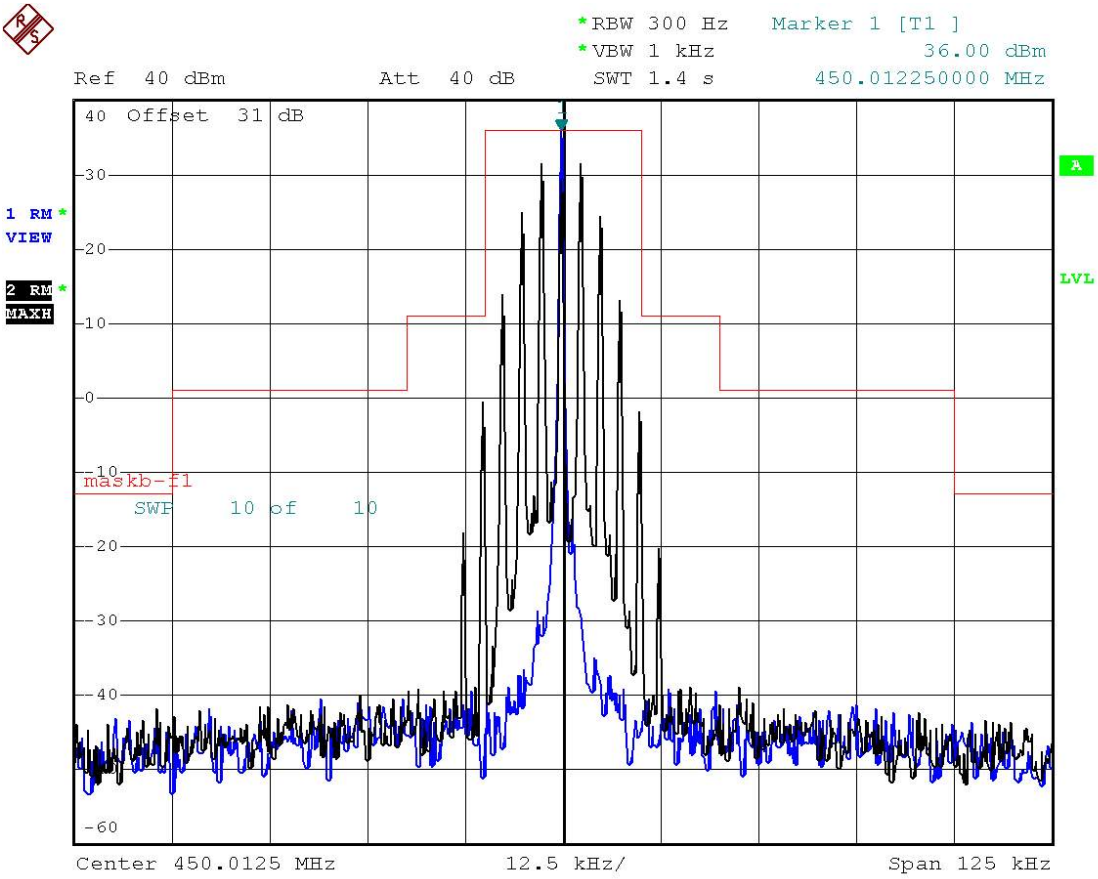
FCC Rules :	Part 2 §2.1053(a) & §90.210
Operating Frequency :	450.0125 MHz
Channel :	Low Channel
Power Output :	5 Watt
Channel Spacing :	Narrow Band
Modulation Signal :	FM modulation with 2.5kHz sine wave signal
Emission Mask :	Mask D
Reference Voltage :	12 Vdc



Date: 26.AUG.2009 16:16:25

6.2.6 Low Channel / High Power / F3E / Wide Band

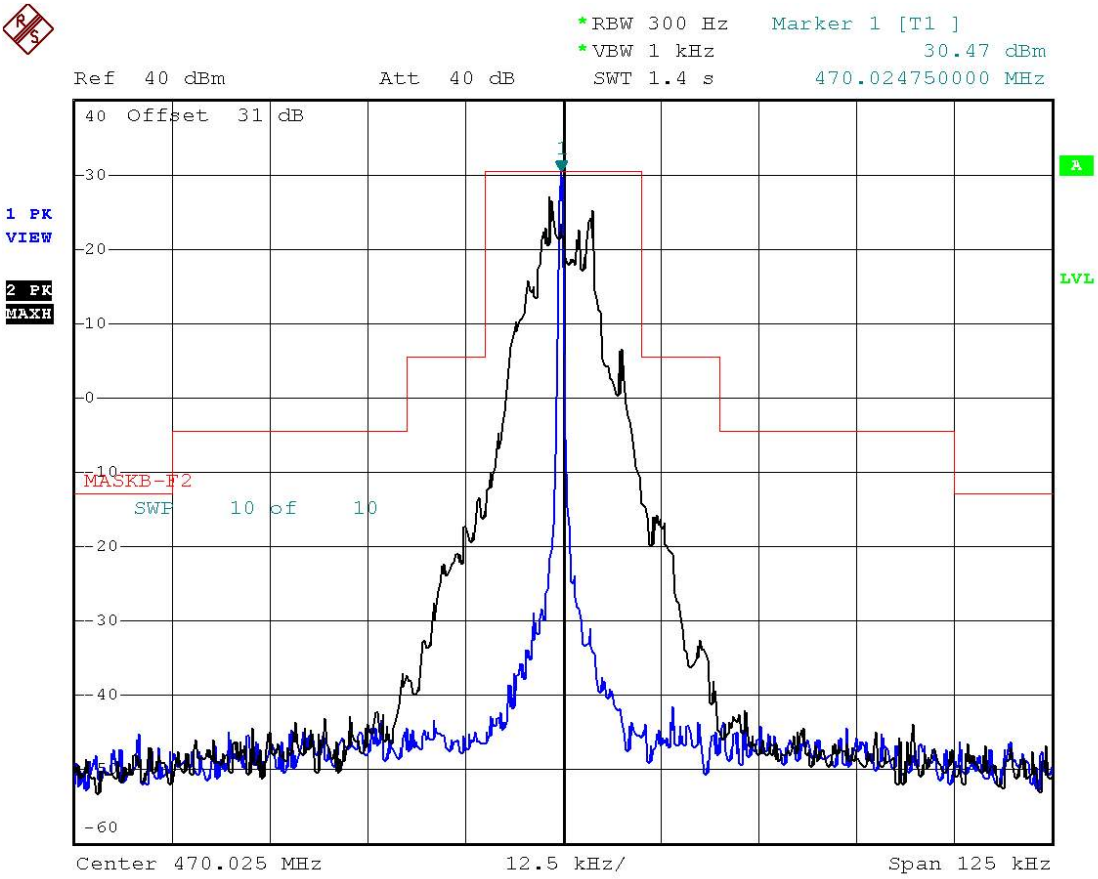
FCC Rules :	Part 2 §2.1053(a) & §90.210
Operating Frequency :	450.0125 MHz
Channel :	Low Channel
Power Output :	5 Watt
Channel Spacing :	Wide Band
Modulation Signal :	FM modulation with 2.5kHz sine wave signal
Emission Mask :	Mask B
Reference Voltage :	12 Vdc



Date: 26.AUG.2009 15:25:10

6.2.7 Middle Channel / Low Power / F2D

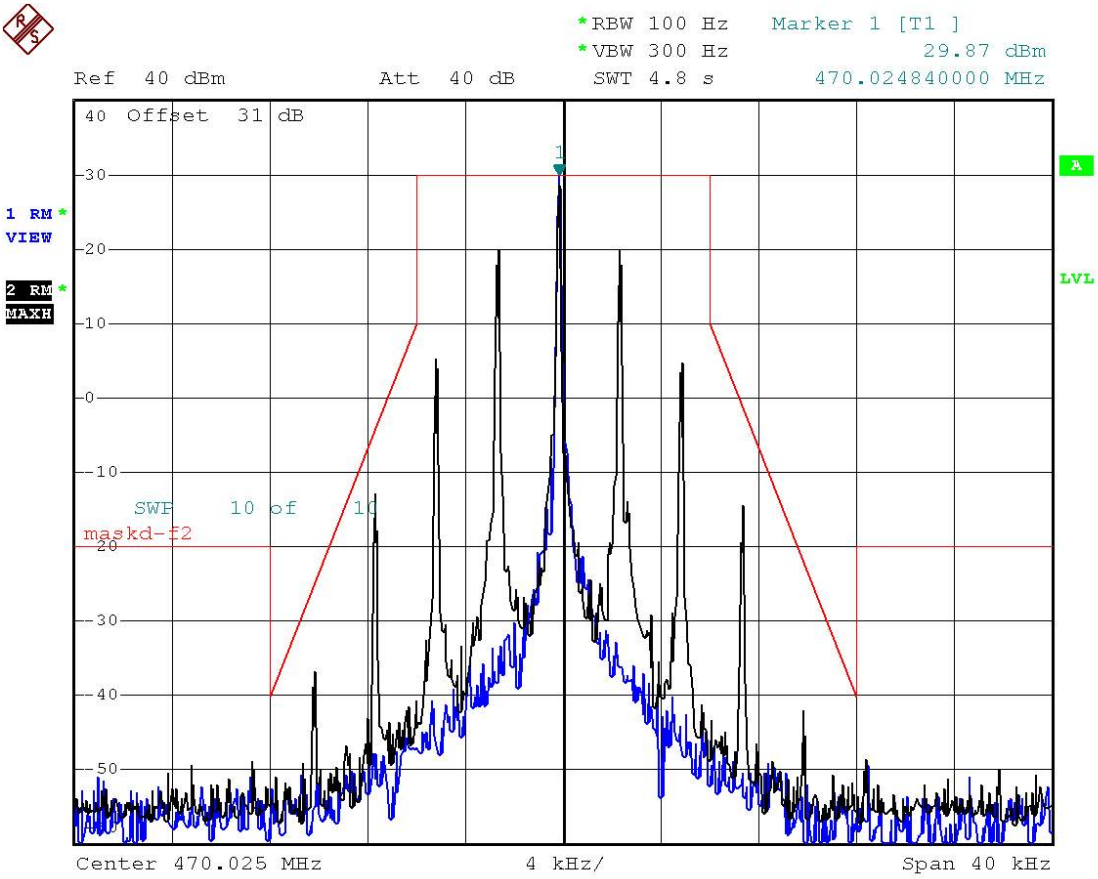
FCC Rules :	Part 2 §2.1053(a) & §90.210
Operating Frequency :	470.025 MHz
Channel :	Middle Channel
Power Output :	1 Watt
Channel Spacing :	Wide Band
Modulation Signal :	9600 bps
Emission Mask :	Mask B
Reference Voltage :	12 Vdc



Date: 1.SEP.2009 00:25:39

6.2.8 Middle Channel / Low Power / F3E / Narrow Band

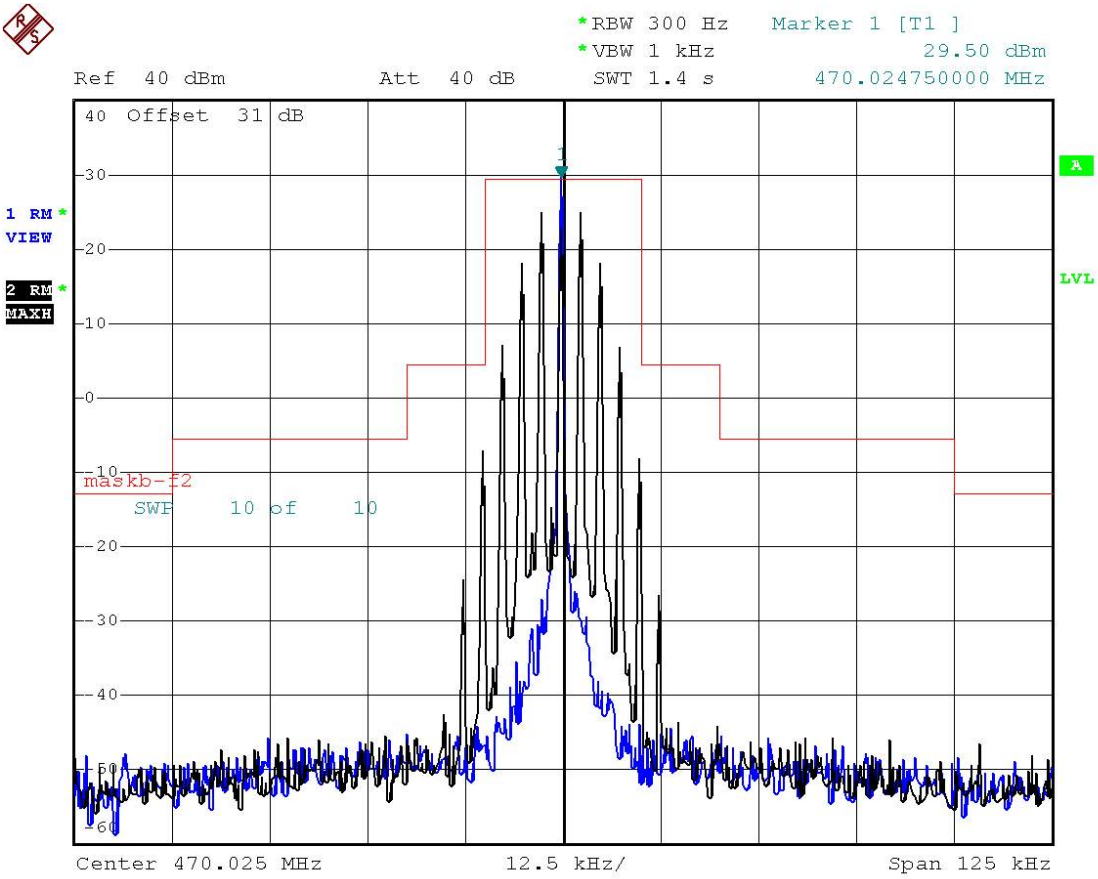
FCC Rules :	Part 2 §2.1053(a) & §90.210
Operating Frequency :	470.025 MHz
Channel :	Middle Channel
Power Output :	1 Watt
Channel Spacing :	Narrow Band
Modulation Signal :	FM modulation with 2.5kHz sine wave signal
Emission Mask :	Mask D
Reference Voltage :	12 Vdc



Date: 26.AUG.2009 15:47:40

6.2.9 Middle Channel / Low Power / F3E / Wide Band

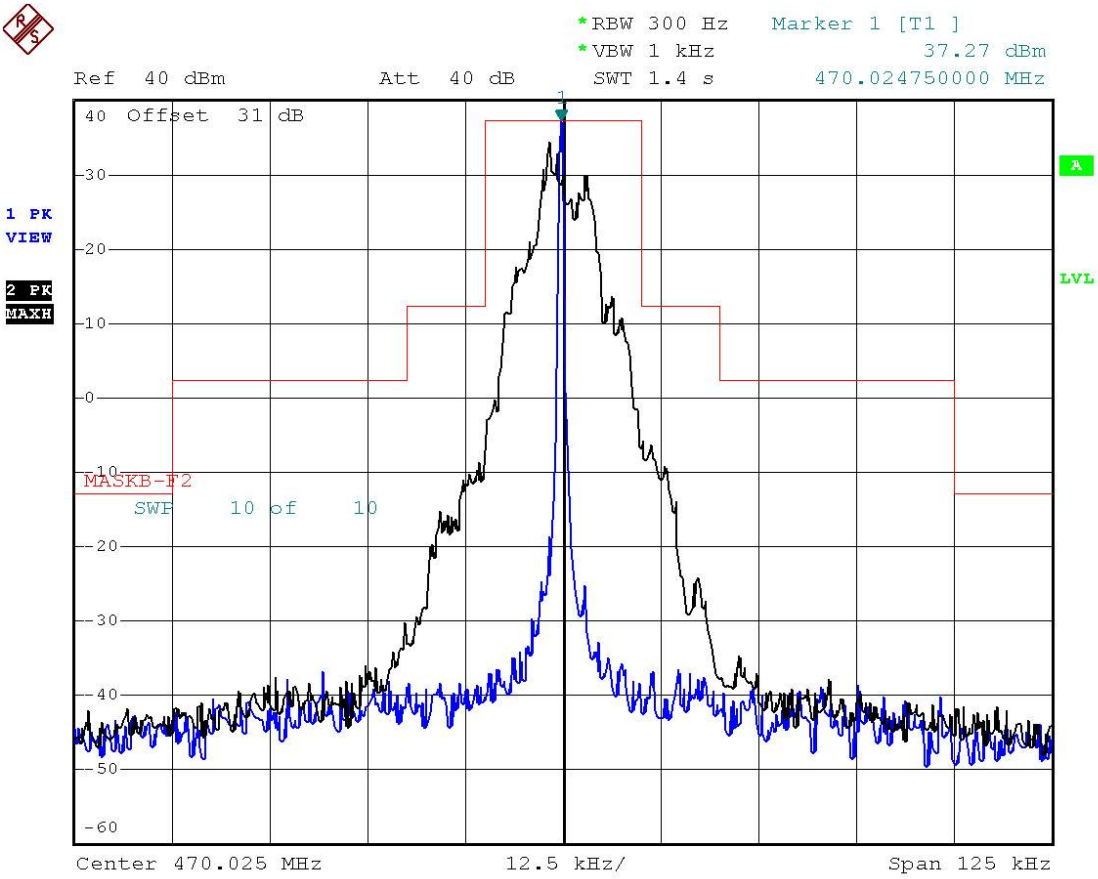
FCC Rules :	Part 2 §2.1053(a) & §90.210
Operating Frequency :	470.025 MHz
Channel :	Middle Channel
Power Output :	1 Watt
Channel Spacing :	Wide Band
Modulation Signal :	FM modulation with 2.5kHz sine wave signal
Emission Mask :	Mask B
Reference Voltage :	12 Vdc



Date: 26.AUG.2009 16:23:46

6.2.10 Middle Channel / High Power / F2D

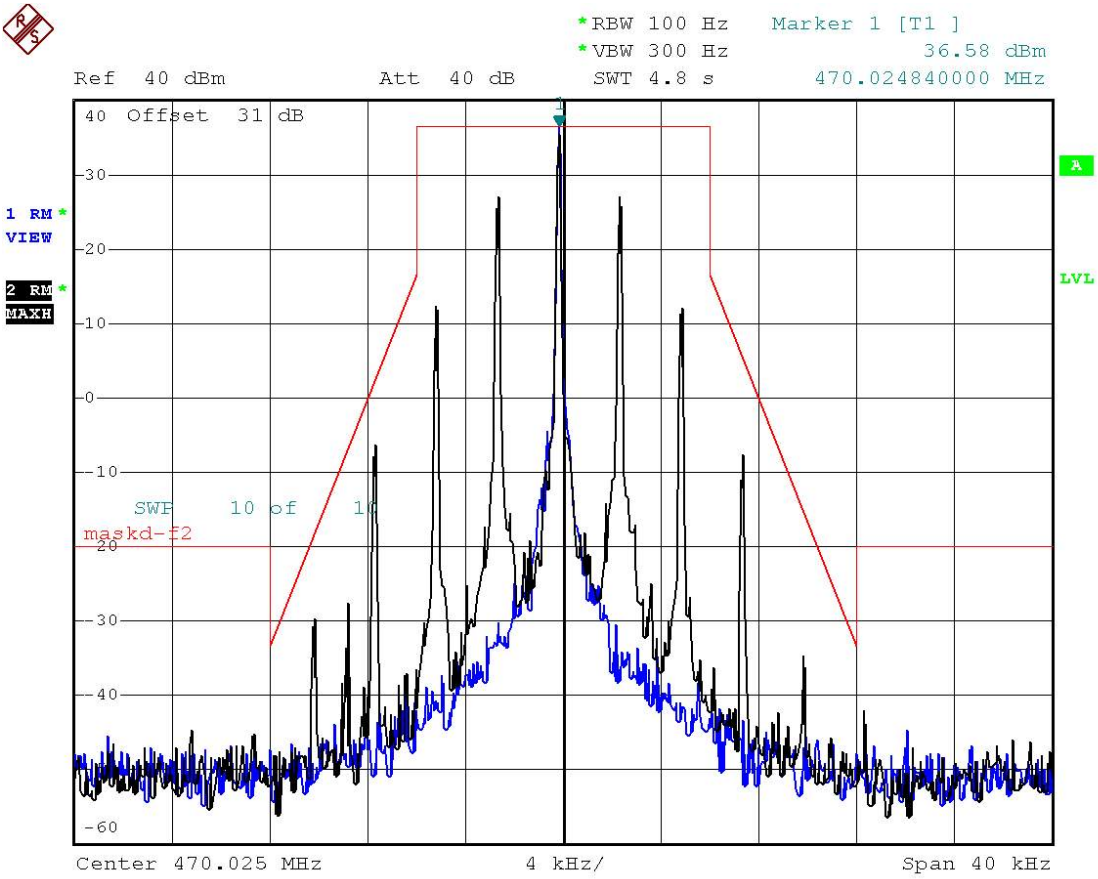
FCC Rules :	Part 2 §2.1053(a) & §90.210
Operating Frequency :	470.025 MHz
Channel :	Middle Channel
Power Output :	5 Watt
Channel Spacing :	Wide Band
Modulation Signal :	9600 bps
Emission Mask :	Mask B
Reference Voltage :	12 Vdc



Date: 1.SEP.2009 00:23:47

6.2.11 Middle Channel / high Power / F3E / Narrow Band

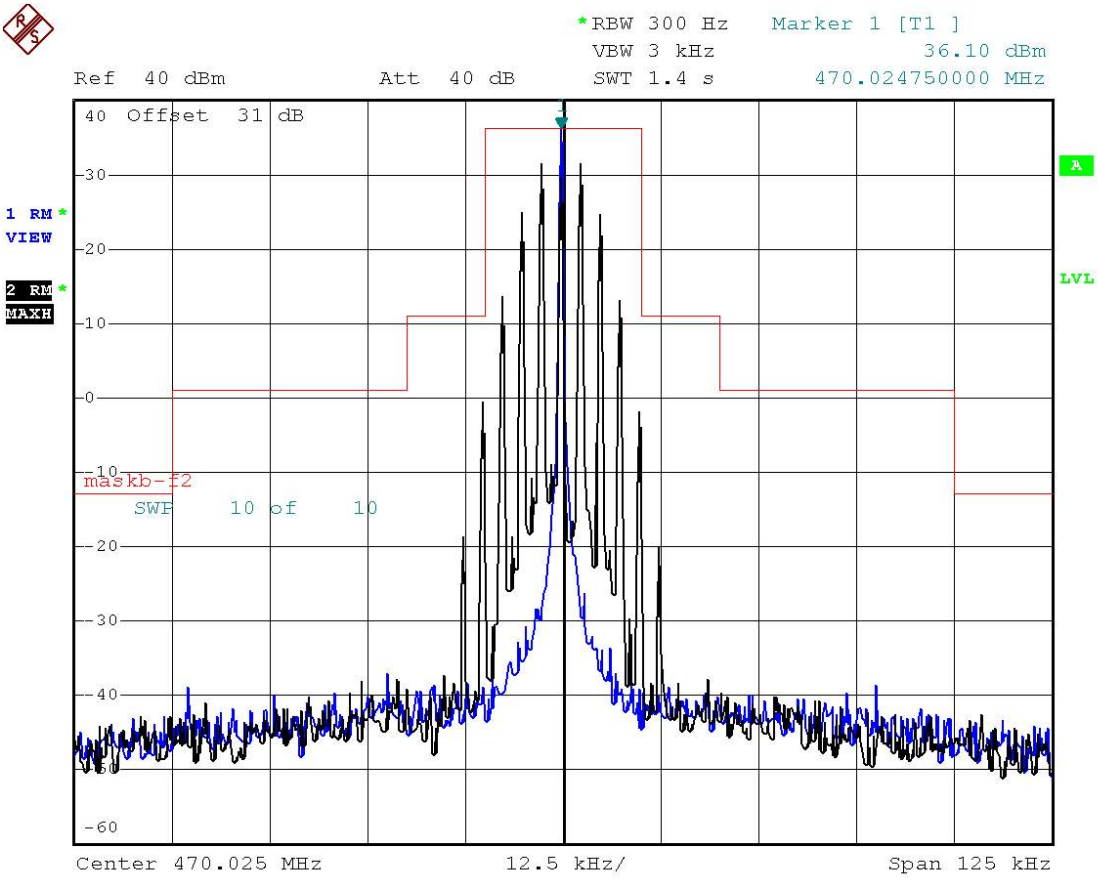
FCC Rules :	Part 2 §2.1053(a) & §90.210
Operating Frequency :	470.025 MHz
Channel :	Middle Channel
Power Output :	5 Watt
Channel Spacing :	Narrow Band
Modulation Signal :	FM modulation with 2.5kHz sine wave signal
Emission Mask :	Mask D
Reference Voltage :	12 Vdc



Date: 26.AUG.2009 16:21:43

6.2.12 Middle Channel / High Power / F3E / Wide Band

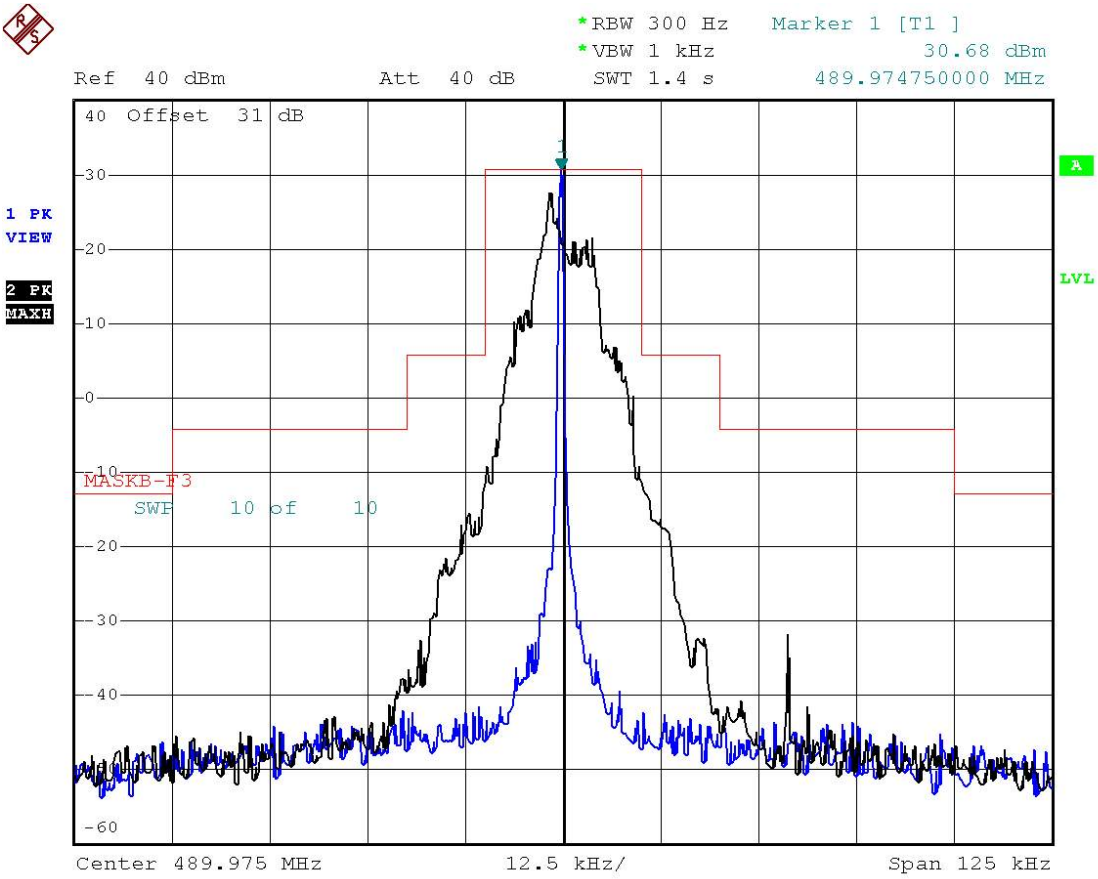
FCC Rules :	Part 2 §2.1053(a) & §90.210
Operating Frequency :	470.025 MHz
Channel :	Middle Channel
Power Output :	5 Watt
Channel Spacing :	Wide Band
Modulation Signal :	FM modulation with 2.5kHz sine wave signal
Emission Mask :	Mask B
Reference Voltage :	12 Vdc



Date: 26.AUG.2009 15:42:54

6.2.13 High Channel / Low Power / F2D

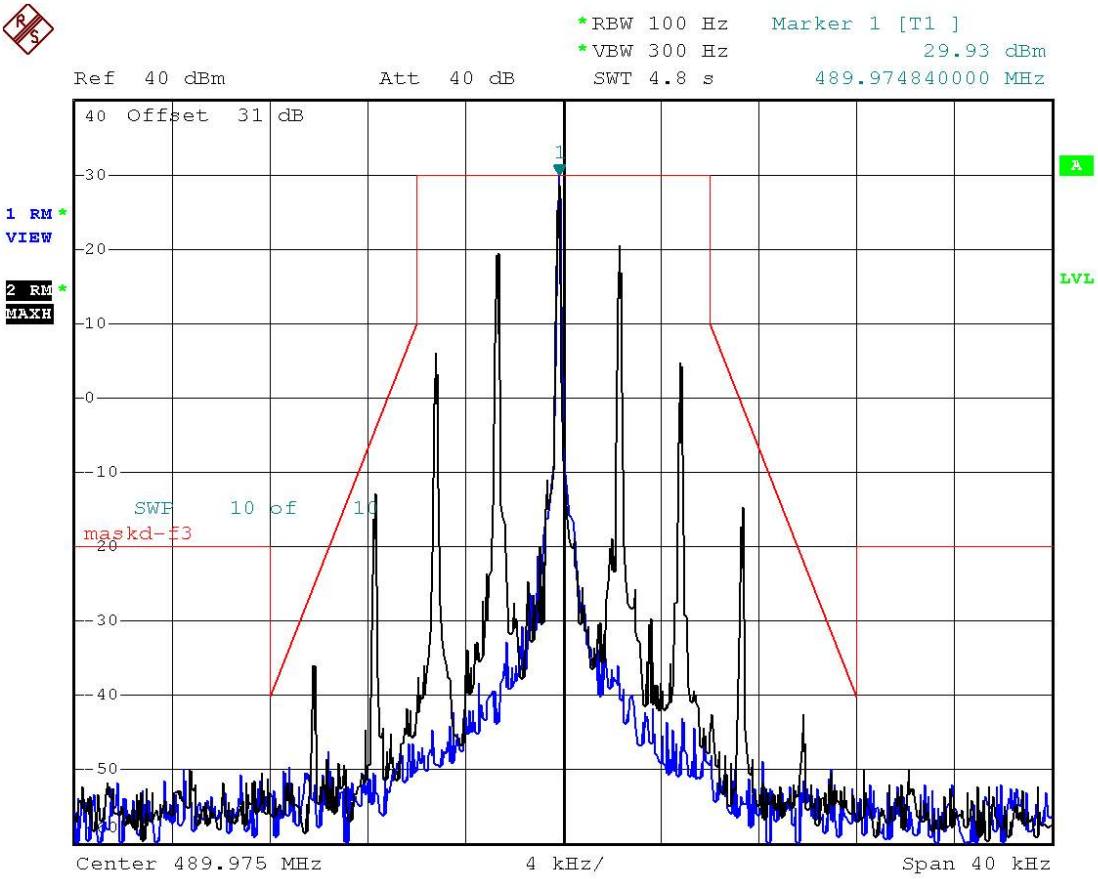
FCC Rules :	Part 2 §2.1053(a) & §90.210
Operating Frequency :	489.975 MHz
Channel :	High Channel
Power Output :	1 Watt
Channel Spacing :	Wide Band
Modulation Signal :	9600 bps
Emission Mask :	Mask B
Reference Voltage :	12 Vdc



Date: 1.SEP.2009 00:14:24

6.2.14 High Channel / Low Power / F3E / Narrow Band

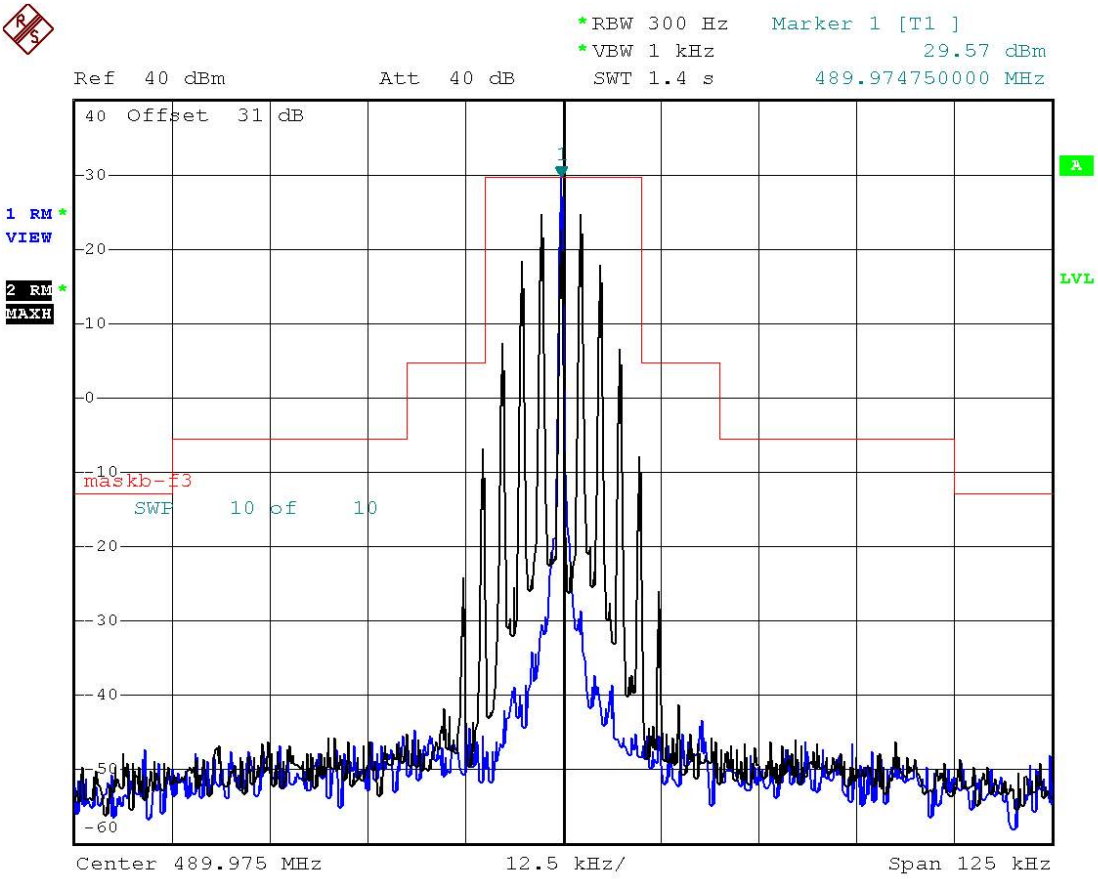
FCC Rules :	Part 2 §2.1053(a) & §90.210
Operating Frequency :	489.975 MHz
Channel :	High Channel
Power Output :	1 Watt
Channel Spacing :	Narrow Band
Modulation Signal :	FM modulation with 2.5kHz sine wave signal
Emission Mask :	Mask D
Reference Voltage :	12 Vdc



Date: 26.AUG.2009 16:14:09

6.2.15 High Channel / Low Power / F3E / Wide Band

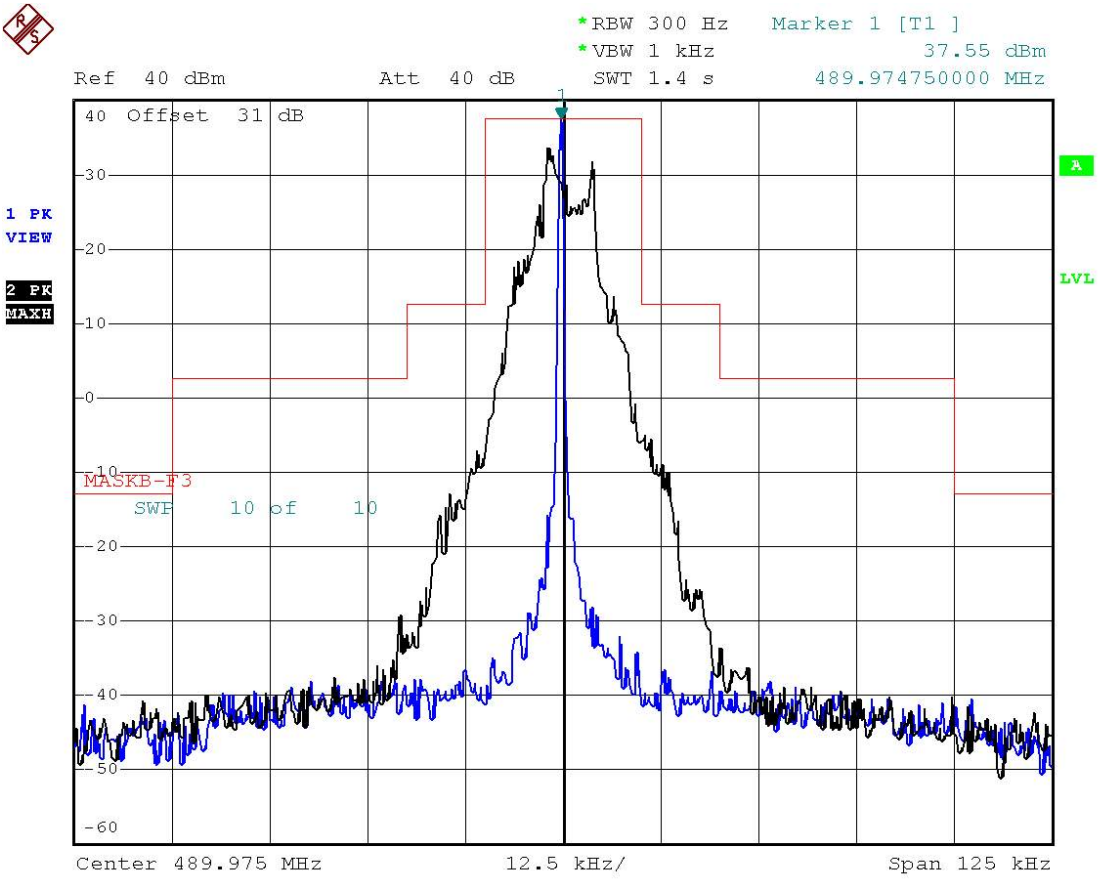
FCC Rules :	Part 2 §2.1053(a) & §90.210
Operating Frequency :	489.975 MHz
Channel :	High Channel
Power Output :	1 Watt
Channel Spacing :	Wide Band
Modulation Signal :	FM modulation with 2.5kHz sine wave signal
Emission Mask :	Mask B
Reference Voltage :	12 Vdc



Date: 26.AUG.2009 16:28:41

6.2.16 High Channel / High Power / F2D

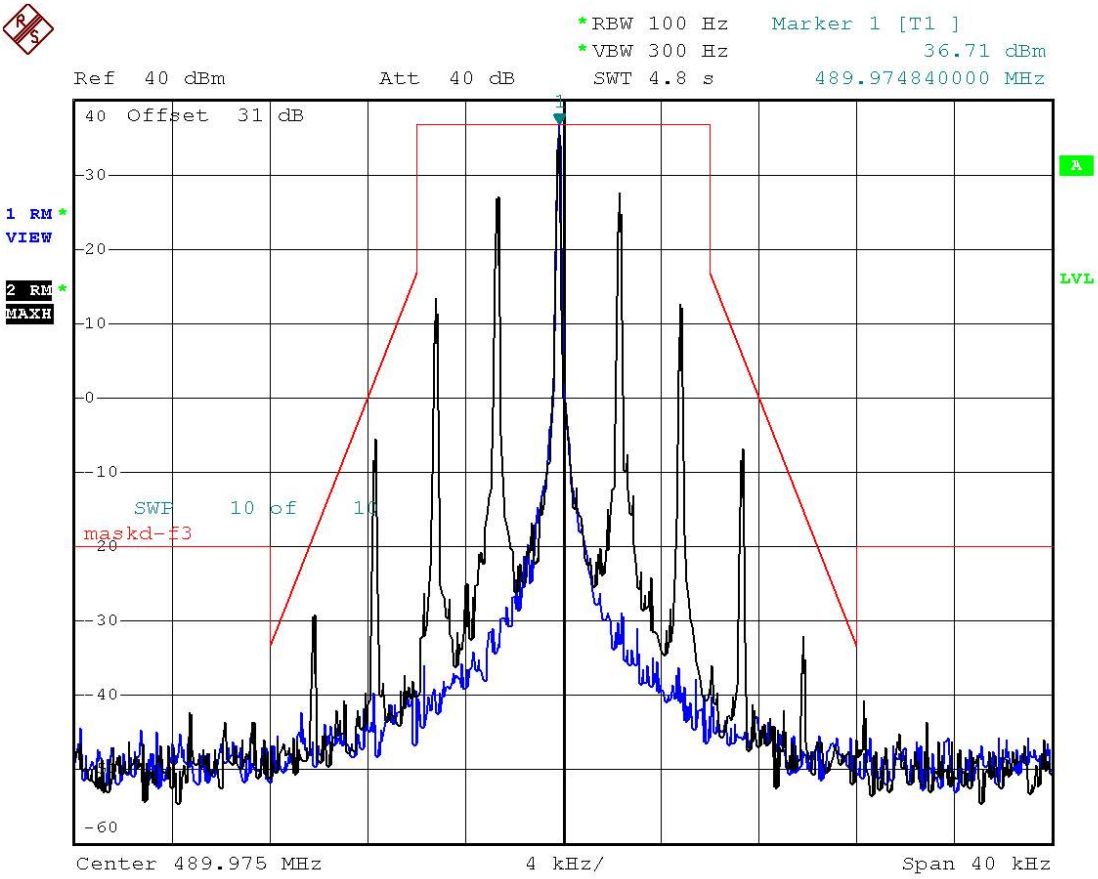
FCC Rules :	Part 2 §2.1053(a) & §90.210
Operating Frequency :	489.975 MHz
Channel :	High Channel
Power Output :	5 Watt
Channel Spacing :	Wide Band
Modulation Signal :	9600 bps
Emission Mask :	Mask B
Reference Voltage :	12 Vdc



Date: 1.SEP.2009 00:16:58

6.2.17 High Channel / high Power / F3E / Narrow Band

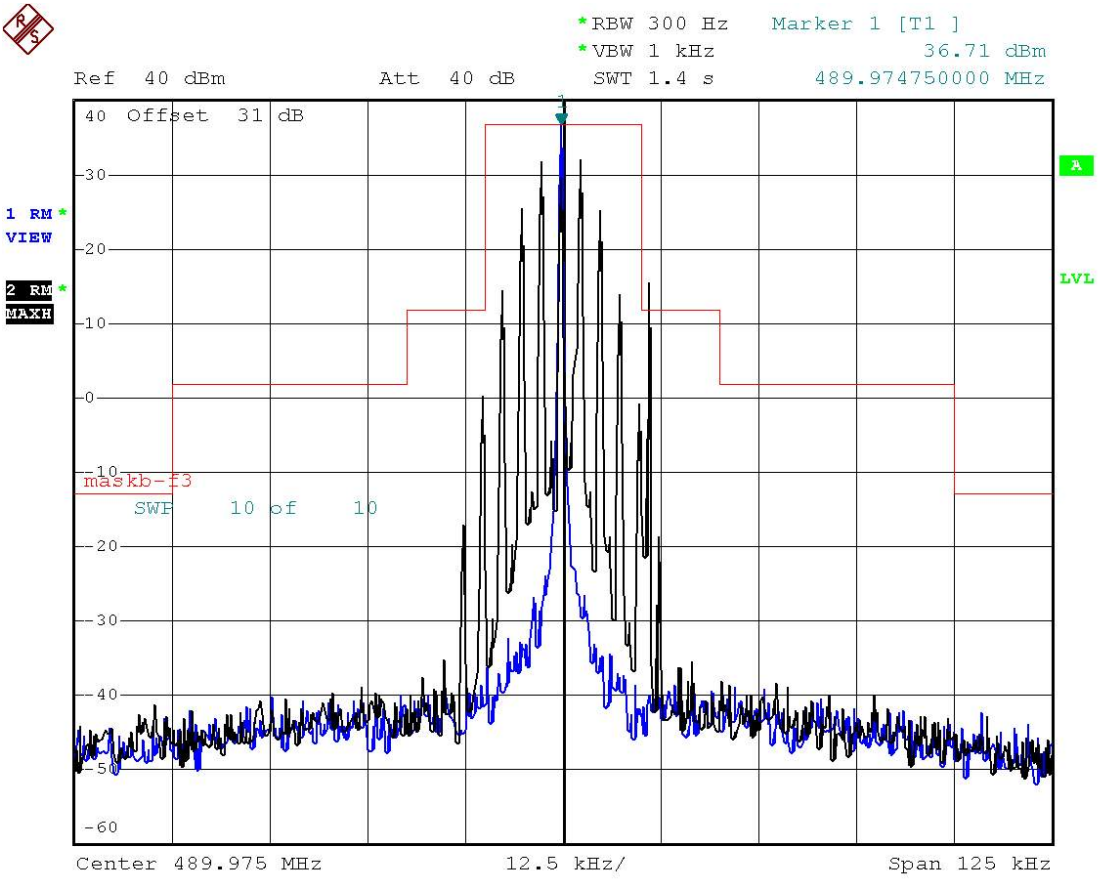
FCC Rules :	Part 2 §2.1053(a) & §90.210
Operating Frequency :	489.975 MHz
Channel :	High Channel
Power Output :	5 Watt
Channel Spacing :	Narrow Band
Modulation Signal :	FM modulation with 2.5kHz sine wave signal
Emission Mask :	Mask D
Reference Voltage :	12 Vdc



Date: 26.AUG.2009 16:26:36

6.2.18 High Channel / High Power / F3E / Wide Band

FCC Rules :	Part 2 §2.1053(a) & §90.210
Operating Frequency :	489.975 MHz
Channel :	High Channel
Power Output :	5 Watt
Channel Spacing :	Wide Band
Modulation Signal :	FM modulation with 2.5kHz sine wave signal
Emission Mask :	Mask B
Reference Voltage :	12 Vdc

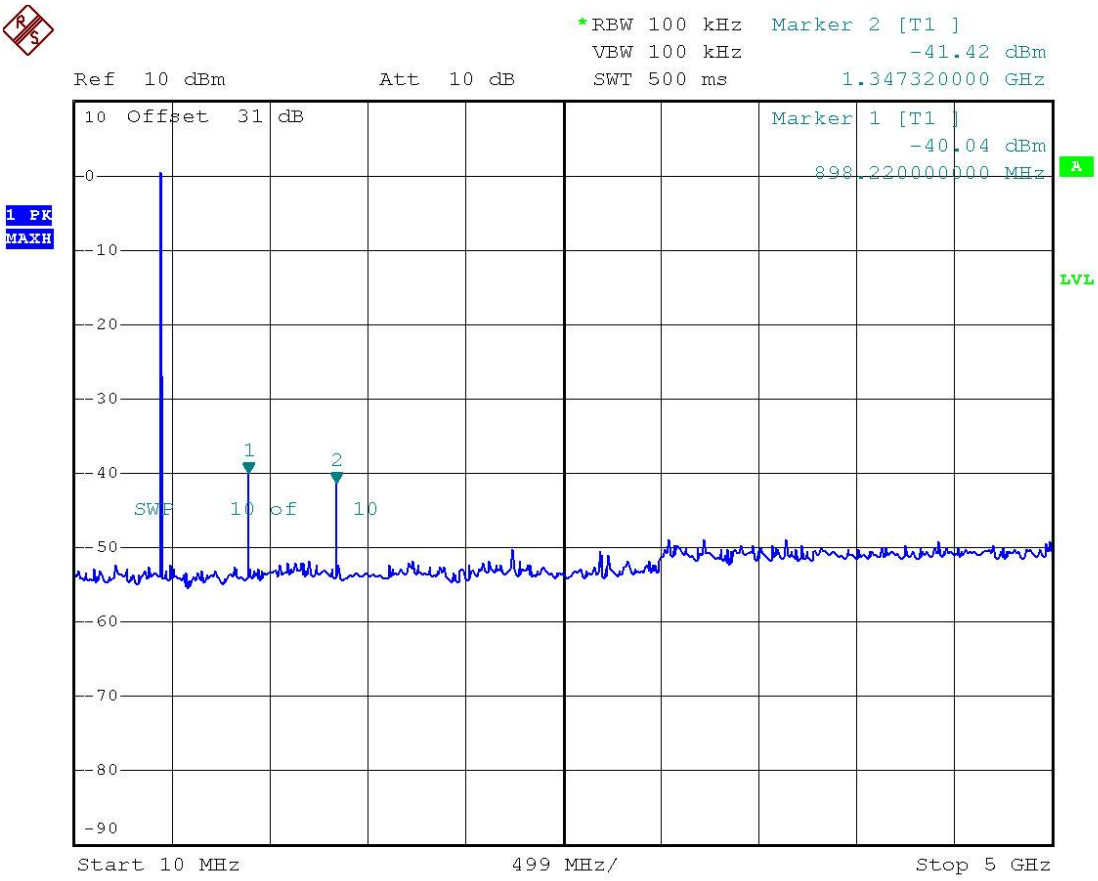


Date: 26.AUG.2009 16:02:26

6.3 Spurious Emissions at Antenna Terminals

6.3.1 Low Channel / High Power / Narrow Band / TX

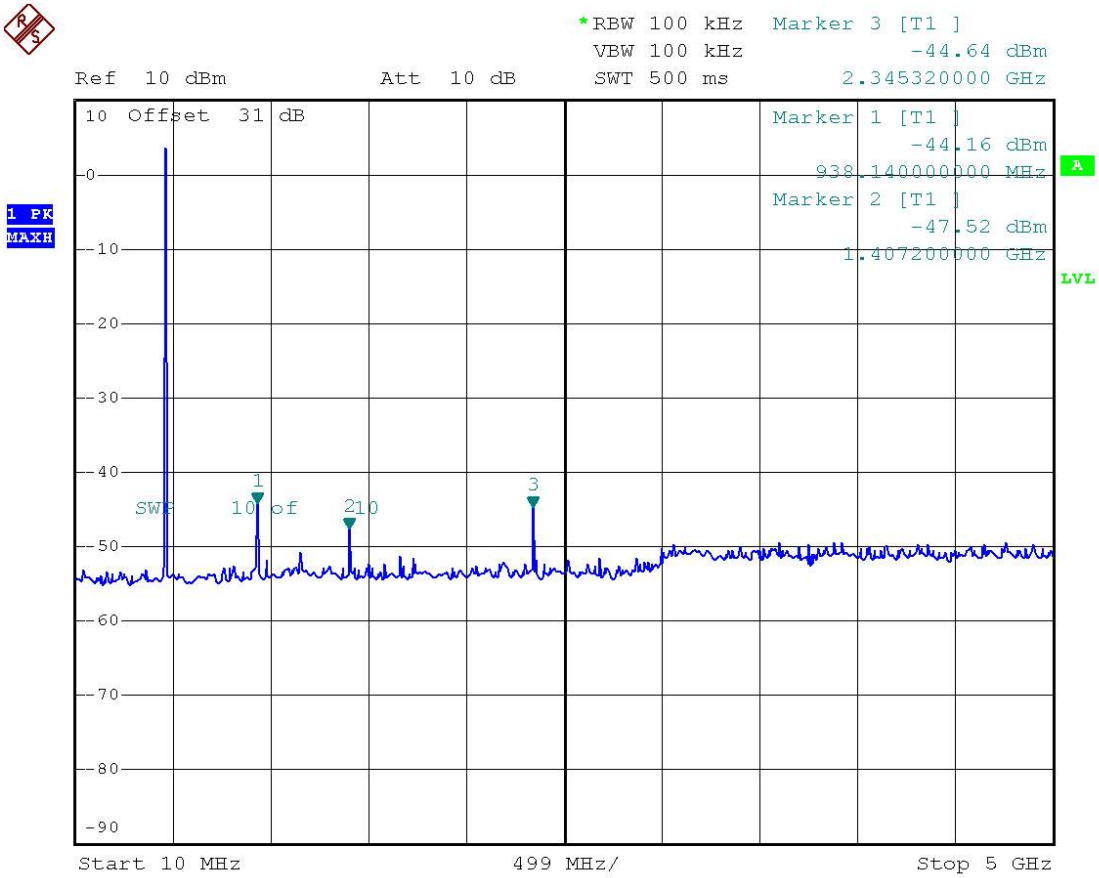
FCC Rules :	Part 2 §2.1051 & §90.210
Operating Frequency :	450.0125 MHz
Channel :	Low Channel
Power Output :	5 Watts
Channel Spacing :	Narrow Band
Reference Voltage :	12 Vdc
Limit :	50 + 10log$_{10}$P (-20dBm)



Date: 5.AUG.2009 09:28:54

6.3.2 Middle Channel / High Power / Narrow Band / TX

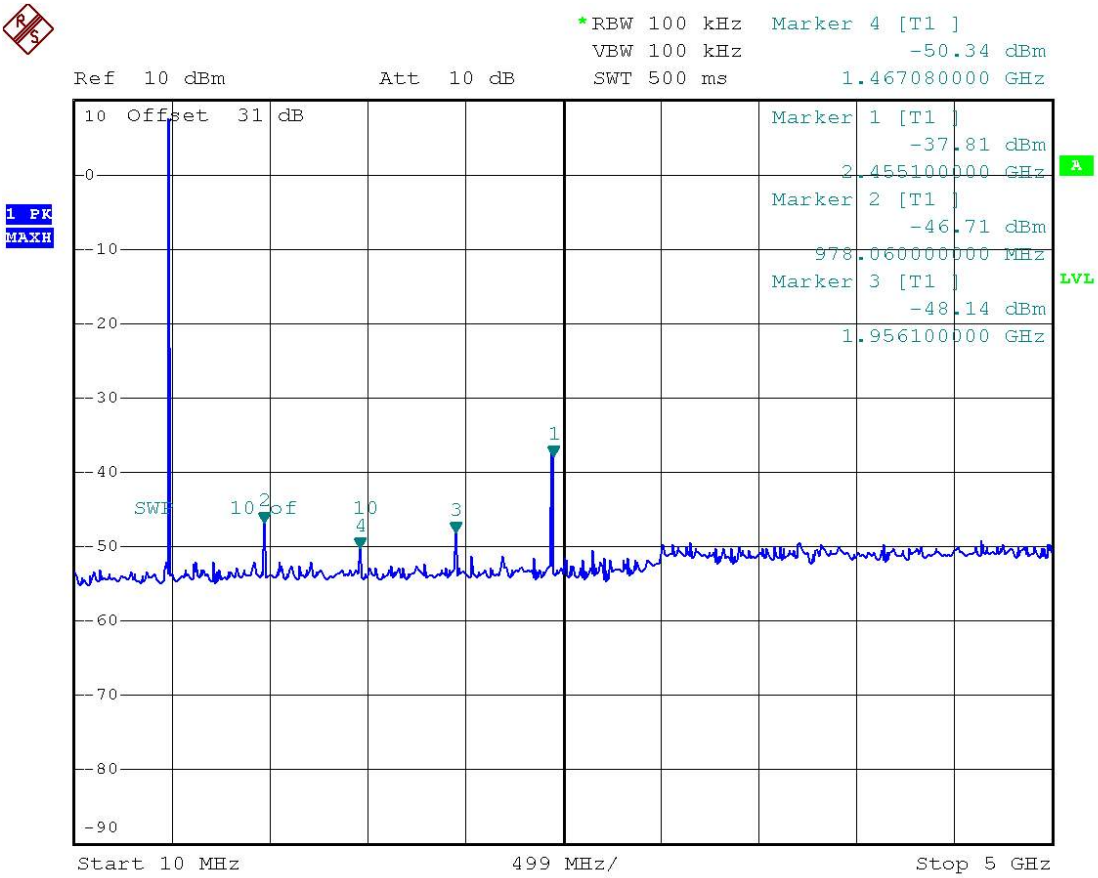
FCC Rules :	Part 2 §2.1051 & §90.210
Operating Frequency :	470.025 MHz
Channel :	Middle Channel
Power Output :	5 Watts
Channel Spacing :	Narrow Band
Reference Voltage :	12 Vdc
Limit :	50 + 10log$_{10}$P (-20dBm)



Date: 5.AUG.2009 09:29:37

6.3.3 High Channel / High Power / Narrow Band / TX

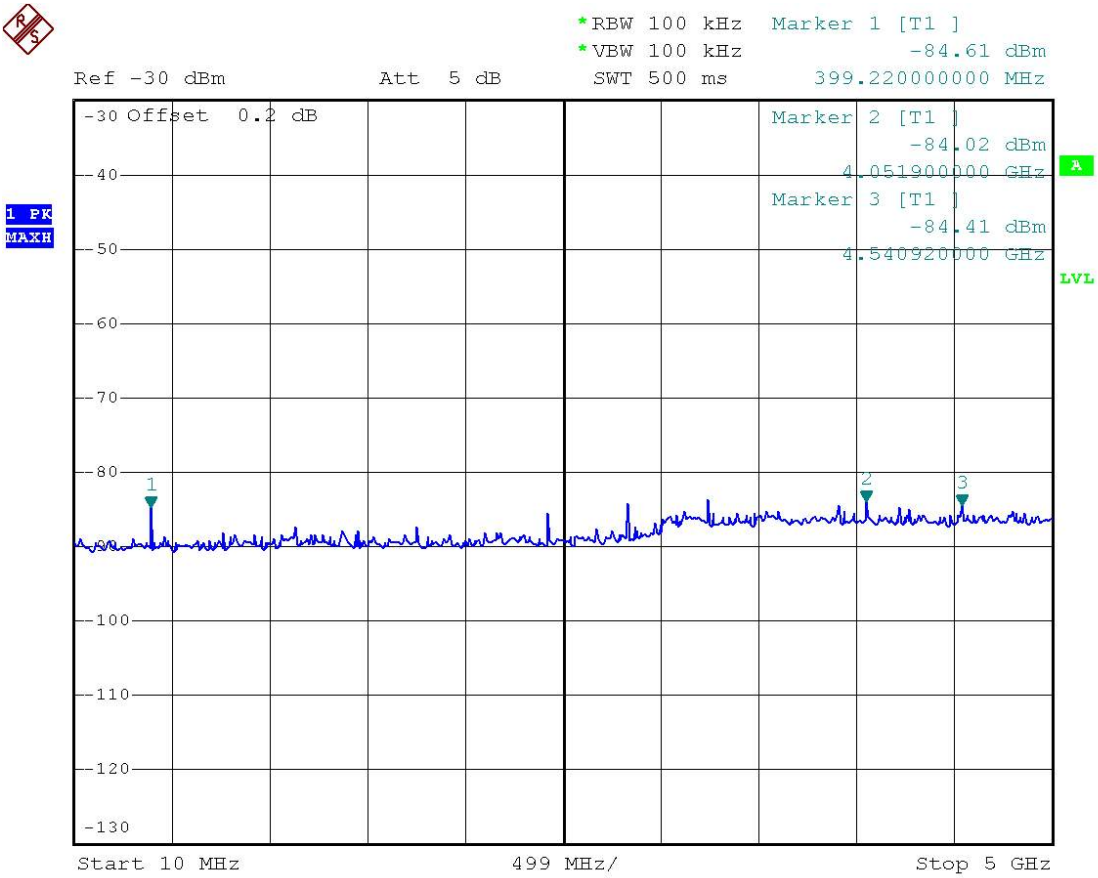
FCC Rules :	Part 2 §2.1051 & §90.210
Operating Frequency :	489.975 MHz
Channel :	High Channel
Power Output :	5 Watts
Channel Spacing :	Narrow Band
Reference Voltage :	12 Vdc
Limit :	50 + 10log$_{10}$P (-20dBm)



Date: 5.AUG.2009 09:30:25

6.3.4 Low Channel / Narrow Band / RX

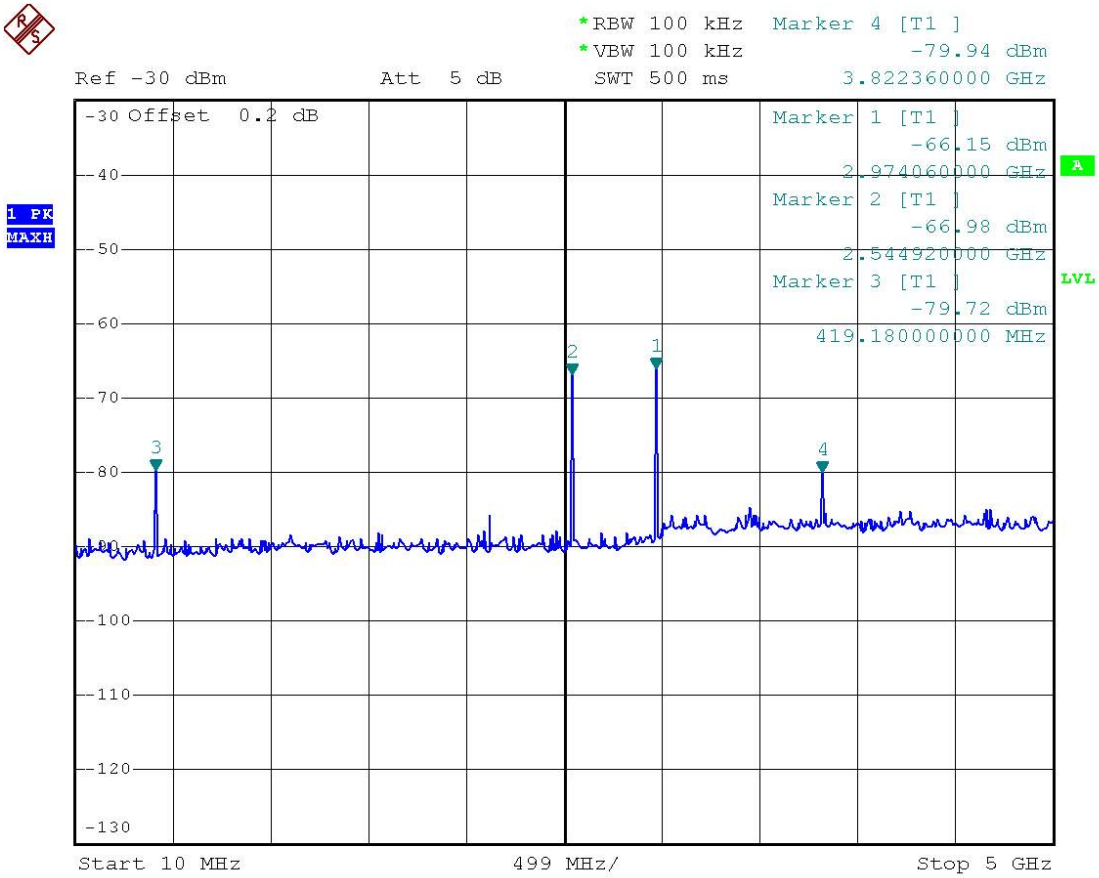
FCC Rules :	Part 2 §2.1051 & §90.210
Operating Frequency :	450.0125 MHz
Channel :	Low Channel
Power Output :	Stand-By
Channel Spacing :	Narrow Band
Reference Voltage :	12 Vdc
Limit :	50 + 10log$_{10}$P (-20dBm)



Date: 5.AUG.2009 17:25:31

6.3.5 Middle Channel / Narrow Band / RX

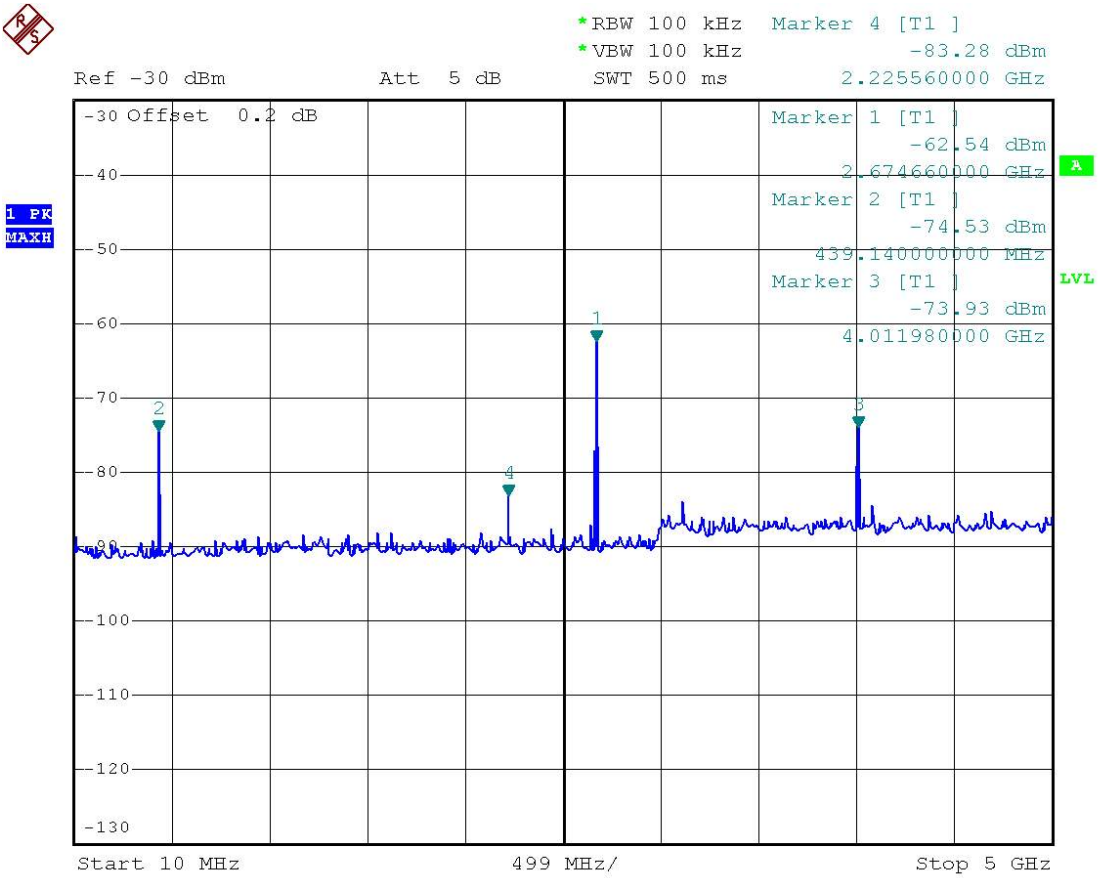
FCC Rules :	Part 2 §2.1051 & §90.210
Operating Frequency :	470.025 MHz
Channel :	Middle Channel
Power Output :	Stand-By
Channel Spacing :	Narrow Band
Reference Voltage :	12 Vdc
Limit :	50 + 10log$_{10}$P (-20dBm)



Date: 5.AUG.2009 17:26:09

6.3.6 High Channel / Narrow Band / RX

FCC Rules :	Part 2 §2.1051 & §90.210
Operating Frequency :	489.975 MHz
Channel :	High Channel
Power Output :	Stand-By
Channel Spacing :	Narrow Band
Reference Voltage :	12 Vdc
Limit :	50 + 10log$_{10}$P (-20dBm)

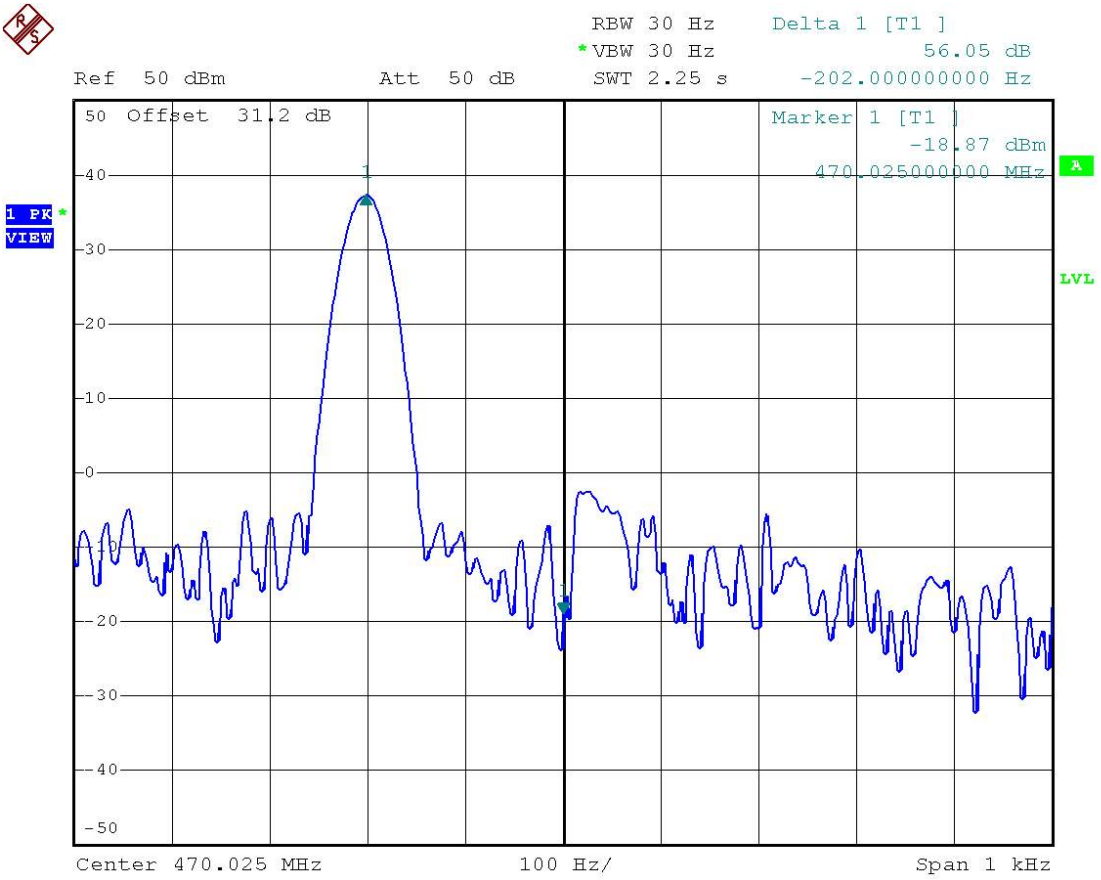


Date: 5.AUG.2009 17:26:53

6.4 Frequency Stability / Temperature Variation

Middle Channel / High Power / Non-Modulation

FCC Rules :	Part 2 §2.1055 & §90.231
Operating Frequency :	470.025 MHz
Channel :	Middle Channel
Power Output :	5 Watt
Limit :	2.5 ppm
Test Voltage :	12 Vdc
Test Temperature :	20 ℃

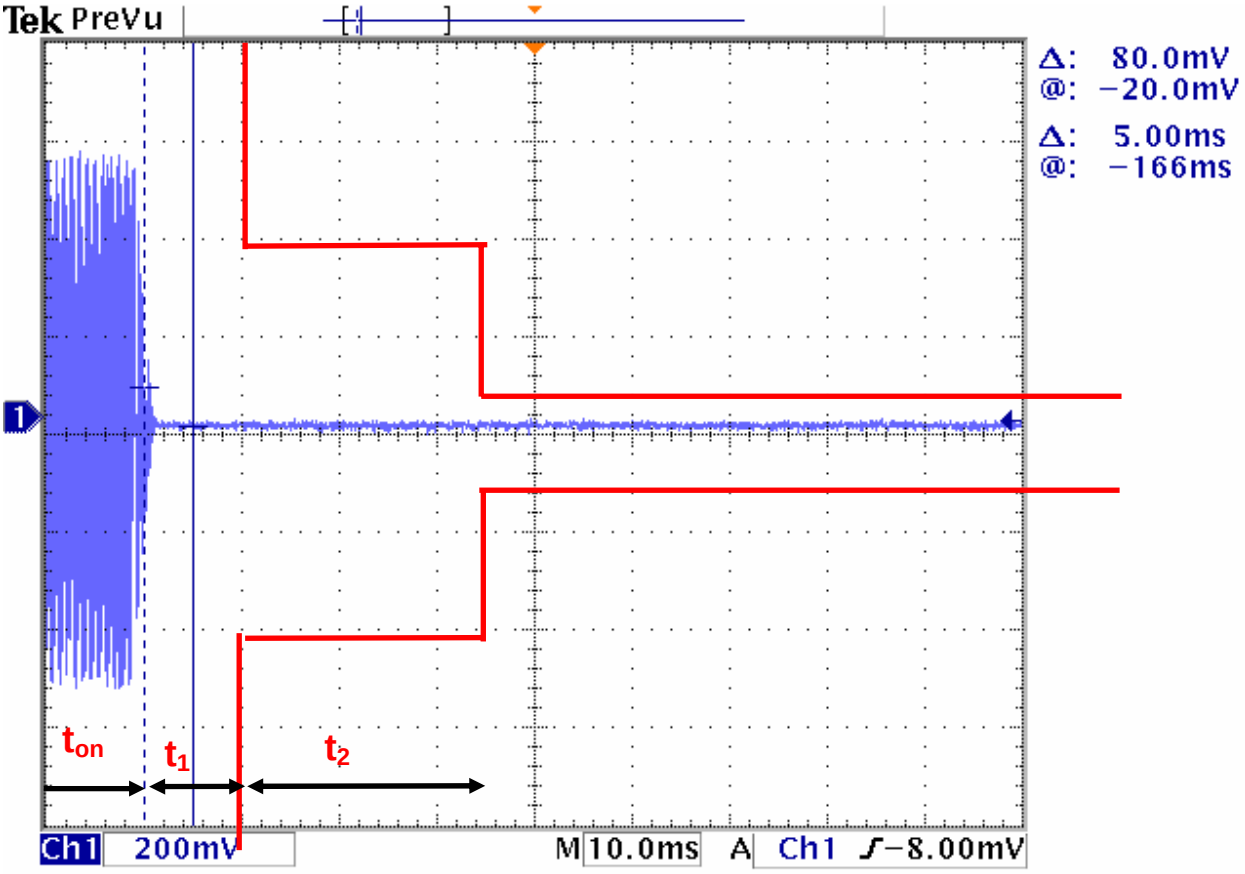


Date: 5.AUG.2009 17:36:27

6.5 Transient Frequency Behavior

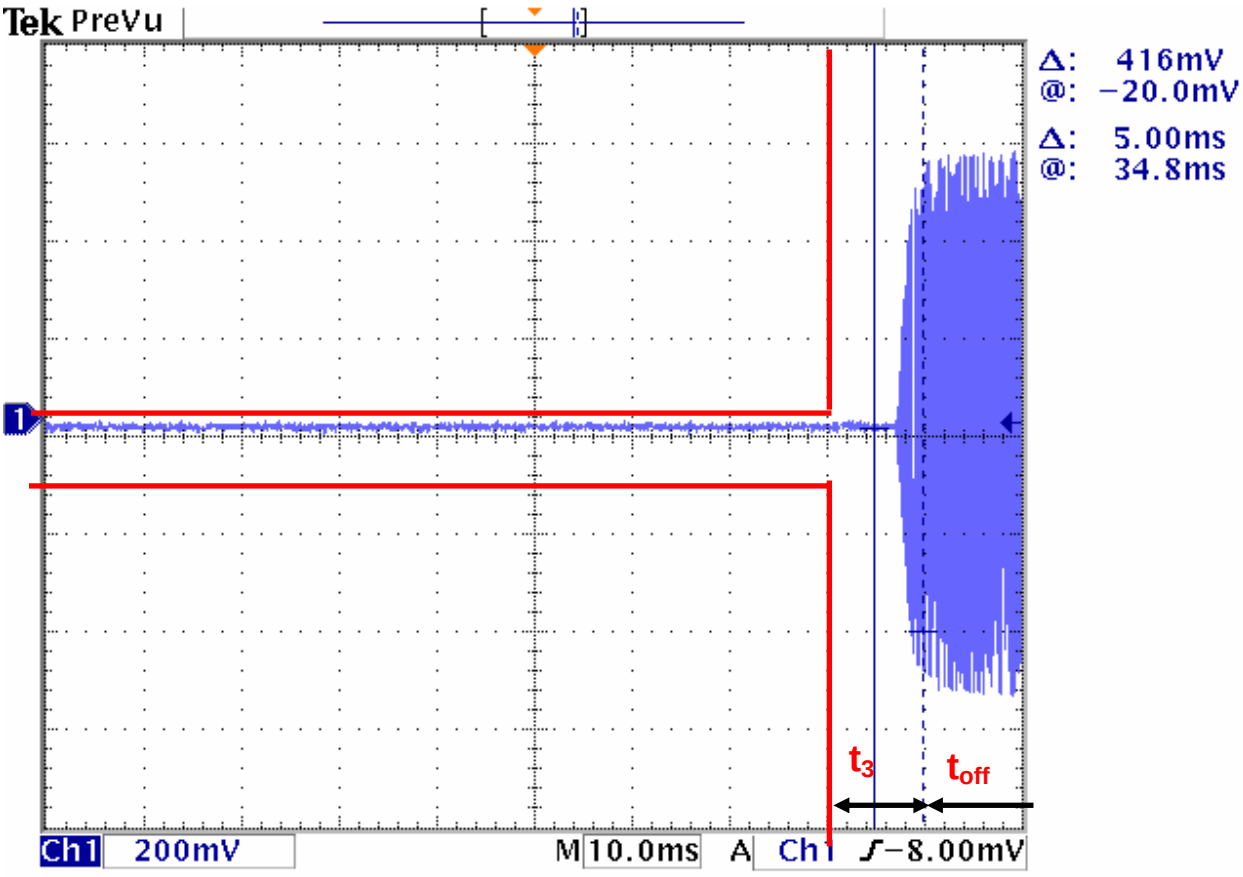
6.5.1 Middle Channel / High Power / Narrow Band / Switch On

FCC Rules :	Part 90 §90.231
Operating Frequency :	470.025 MHz
Channel :	Middle Channel
Power Output :	5 Watt
Mode :	Switch on condition t_{on}, t_1 and t_2
Channel Spacing :	Narrow Band
Test Voltage :	12 Vdc



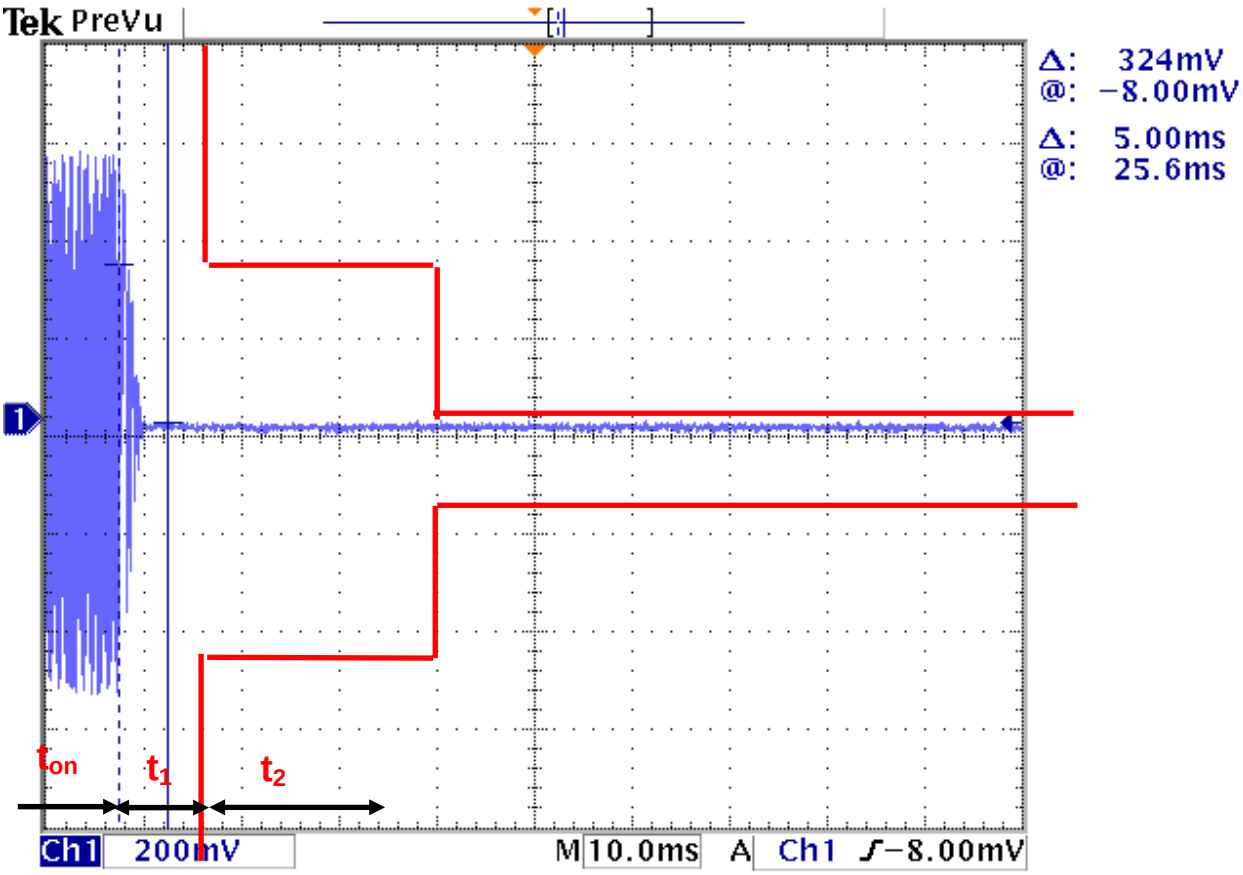
6.5.2 Middle Channel / High Power / Narrow Band / Switch Off

FCC Rules :	Part 90 §90.231
Operating Frequency :	470.025 MHz
Channel :	Middle Channel
Power Output :	5 Watt
Mode :	Switch off condition t3, t_{off}
Channel Spacing :	Narrow Band
Test Voltage :	12 Vdc



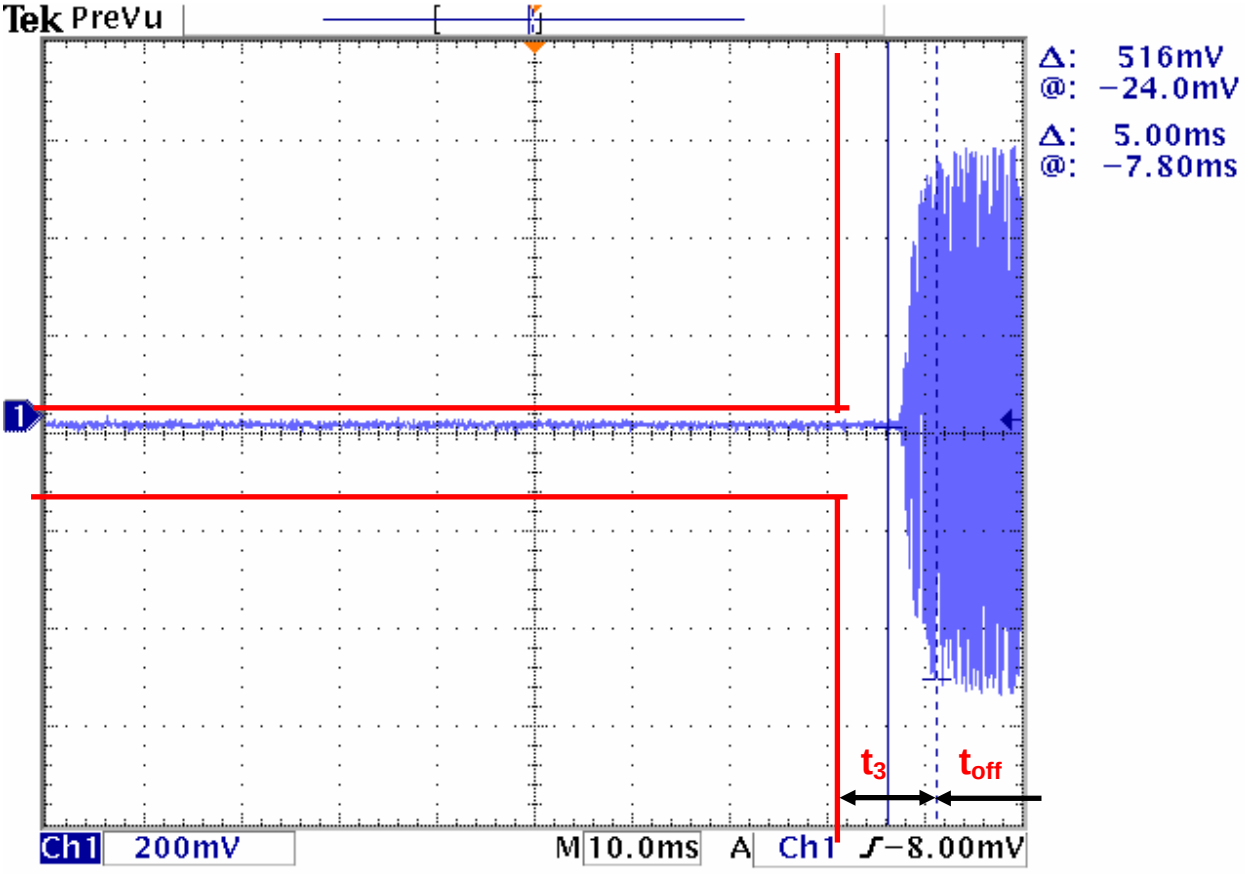
6.5.3 Middle Channel / High Power / Wide Band / Switch On

FCC Rules :	Part 90 §90.231
Operating Frequency :	470.025 MHz
Channel :	Middle Channel
Power Output :	5 Watt
Mode :	Switch on condition t_{on}, t_1 and t_2
Channel Spacing :	Wide Band
Test Voltage :	12 Vdc



6.5.4 Middle Channel / High Power / Wide Band / Switch Off

FCC Rules :	Part 90 §90.231
Operating Frequency :	470.025 MHz
Channel :	Middle Channel
Power Output :	5 Watt
Mode :	Switch off condition t3, t_{off}
Channel Spacing :	Wide Band
Test Voltage :	12 Vdc



7. TEST EQUIPMENTS LIST

EQUIPMENT		MODEL	MANUFACTURE	SERIAL NUMBER	Calibration Due date
1	Receiver	ESVN30	Rohde & Schwarz	832854/010	07/25/2010
2	Spectrum analyzer	FSP7	Rohde & Schwarz	100001	10/30/2009
3	Signal Generator	E4432B	Agilent	US40053157	02/04/2010
5	Signal Generator	GT9000	Gigatronics	9604010	10/30/2009
6	Signal Generator	N5182A	Agilent	MY46240037	10/02/2009
7	Signal Generator	8656B	HP	3050V09844	10/02/2009
8	Modulation Analyzer	8901B	Agilent	3028A03124	10/30/2009
9	Audio Analyzer	8903B	Agilent	3011A09344	10/30/2009
10	Digital Oscilloscope	TDS3032	Tektronix	B019436	10/30/2009
11	Frequency Counter	R5372	Advantest	41855204	10/29/2009
12	Shield Room (7m x 4m x 3m)	N/A	SJEMC	0004	N/A
13	Turn Table	OSC-30	N/A	BWS-01	N/A
14	Antenna Mast	JAC-3	Dail EMC	N/A	N/A
15	Temperature & Humidity chanber	EN-GLMP-54	Enex	N/A	01/30/2010
16	Bilog Antenna	VULB9160	Schwarzbeck	VULB9160-3122	01/24/2010
17	Bilog Antenna	VULB9161	Schwarzbeck	VULB9161-4067	11/19/2009
18	Bilog Antenna	VULB9161	Schwarzbeck	VULB9161-4068	12/11/2009
19	Horn Antenna	BBHA 9120 D	Schwarzbeck	BBHA 9120 D517	12/18/2010
20	Horn Antenna	BBHA 9120 D	Schwarzbeck	BBHA 9120 D 234	03/16/2011
22	Power Meter	E4418A	Agilent	GB38272621	10/29/2009
23	Power Sensor	E9301B	Agilent	US40010238	10/29/2009
24	Power supply	IPS-30B03DD	Interact	42052	10/30/2009
25	Directional Coupler	778D	Agilent	1144A08477	10/29/2009
26	Power Divider/Combiner	11636A	Agilent	05774	02/05/2010
27	Power Divider/Combiner	11636A	Agilent	05870	02/05/2010