FCC Part 15 Subpart C

TEST REPORT

of

E.U.T. : FM BAND TRANSMITTER
FCC ID. : BYG008
MODEL : FMT-IPOD
Working Frequency : 88.1~107.9 MHz

for

APPLICANT : SANGEAN ELECTRONICS INC.
ADDRESS : NO.18, LANE 7, LI-DE STREET, CHUNG HO CITY, TAIPEI HSIEN, TAIWAN, R.O.C.

Test Performed by

ELECTRONICS TESTING CENTER, TAIWAN

NO. 34, LIN 5, DING FU TSUN, LINKOU HSIANG,
TAIPEI HSIEN, TAIWAN, R.O.C.
http://www.etc.org.tw ; e-mail : r00@etc.org.tw
Tel:(02)26023052 Fax:(02)26010910

Report Number : ET94R-04-068

TEST REPORT CERTIFICATION

Applicant : SANGEAN ELECTRONICS INC.
NO.18, LANE 7, LI-DE STREET, CHUNG HO CITY,
TAIPEI HSIEN, TAIWAN, R.O.C.

Manufacture : SANGEAN ELECTRONICS INC.
NO.18, LANE 7, LI-DE STREET, CHUNG HO CITY,
TAIPEI HSIEN, TAIWAN, R.O.C.

Description of EUT :

a) Type of EUT	: FM BAND TRANSMITTER
b) Trade Name	: SANGEAN
c) Model No	: FMT-IPOD
d) Working Frequency	: 88.1~107.9 MHz
e) Power Supply	: DC 3V from Host

Regulation Applied : FCC Rules and Regulations Part 15 Subpart C (2005)

I HEREBY CERTIFY THAT; The data shown in this report were made in accordance with the procedures given in ANSI C63.4 and the energy emitted by the device was founded to be within the limits applicable. I assume full responsibility for accuracy and completeness of these data.

Issued Date : Jun. 03, 2005

Test Engineer : Kevin Lee
(Kevin Lee)

Approve & Authorized Signer : Will Yauo
Will Yauo, Manager
EMC Dept. II of ELECTRONICS
TESTING CENTER, TAIWAN

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1. GENERAL INFORMATION

1.1 Product Description

a) Type of EUT	: FM BAND TRANSMITTER
b) Trade Name	: SANGEAN
c) Model No	: FMT-IPOD
d) Frequency Modulation	: 88.1~107.9 MHz
e) Power Supply	: DC 3V from Host

1.2 Characteristics of Device:

Thise user's guide explains how to use PodFreq mini, the premium FM transmitter for your iPod mini. PodFreq mini broadcasts to any analog or digital FM tuner, and enables you to transmit your iPod mini's music on any frequency from 88.1 to 107.9 MHZ to a FM radio or tuner tuned to the same frequency. PodFreq mini incorporaters standard 6-Pin FireWire and mini-USB 2.0 ports in its design so that you may plug in a FireWire cable (sold separately) or the included USB 2.0 cable to transfer files between your computer and iPod mini, sync your files with iTunes, and even charge your iPod mini without removing it from PodFreq mini.

1.3 Test Methodology

Both conducted and radiated testing was performed according to the procedures in chapter 13 of ANSI C63.4 (2003)

The FM BAND TRANSMITTER under test was operated in its normal operating mode for the purpose of the measurements.

The receiving antenna polarized horizontally was varied from 1 to 4 meters and the wooden turntable was rotated through 360 degrees to obtain the highest reading on the field strength meter or on the display of the spectrum analyzer. And also, each emission was to be maximized by changing the orientation of the FM BAND TRANSMITTER under test.

1.4 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located on the roof top of Building at No.34, Lin 5, Ding Fu Tsun, Linkou Hsiang, Taipei Hsien, Taiwan, R.O.C.

This site has been fully described in a report submitted to your office, and accepted in a letter dated June 30, 2004.

2. DEFINITION AND LIMITS

2.1 Definition

Intentional radiator:
A device that intentionally generates and emits radio frequency energy by radiation or induction.

2.2 Restricted Bands of Operation

Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42-16.423	399.9-410	4.5-5.15
0.495 - 0.505 **	16.69475 - 16.69525	608-614	5.35-5.46
2.1735 - 2.1905	16.80425 - 16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475 - 156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2655-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3360-4400	Above 38.6
13.36-13.41			

Remark "**" : Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz

2.3 Limitation

(1) Conducted Emission Limits :

Except for Class A digital devices, for equpment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

Frequency MHz	**Quasi Peak dB μ V**	**Average dB μ V**
0.15 - 0.5	66-56*	56-46*
0.5 - 5.0	56	46
5.0 - 30.0	60	50

* Decreases with the logarithm of the frequency

(2) Radiated Emission Limits :

According to 15.239 the field strength of emissions from intentional radiators operated under these frequency bands shall not exceed the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental	
	μV/meter	dBμV/meter
88-108	250	48

Field strength limits are at the distance of 3 meters, emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209,as following table:

Other Frequencies (MHz)	Field Strength of Fundamental	
	μV/meter	dBμV/meter
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
Above 960	500	54.0

As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.

(3) Antenna Requirement :

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

(4) Emissions Band Limits :

According to 15.239(a), emissions from the intentional radiator shall be confined within a band 200kHz wide centered on the operating frequency. The 200 kHz band shall lie wholly within the frequency range of 88-108 MHz.

2.4 Labeling Requirement

The device shall bear the following statement in a conspicuous location on the device :

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

2.5 User Information

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

3. SYSTEM TEST CONFIGURATION

3.1 Justification

For both radiated and conducted emissions, the system was configured for testing in a typical fashion as a customer would normally use it. The peripherals other than EUT were connected in normally standing by situation.

All measurement were intentional to maximum the emissions from EUT by varying the connection cables, therefore, the test result is sure to meet the applicable requirement.

3.2 Devices for Tested System

Device	Manufacture	Model / FCC ID.	Description
FM BAND TRANSMITTER*	SANGEAN ELECTRONICS INC.	FMT-IPOD /BYG008	----
Notebook PC	ASUS	L1400	2.5mUnshielded AC Adaptor Power Cord
Mine iPod	Apple	A1051	----

Remark "*" means equipment under test.

4 RADIATED EMISSION MEASUREMENT

4.1 Applicable Standard

For intentional radiators, the radiated emission shall comply with §15.209(a).

4.2 Measurement Procedure

1. Setup the configuration per figure 1 and 2 for frequencies measured below and above 1 GHz respectively.
2. For emission frequencies measured below 1 GHz, a pre-scan is performed in a shielded chamber to determine the accurate frequencies of higher emissions will be checked on a open test site. As the same purpose, for emission frequencies measured above 1 GHz, a pre-scan also be performed with a 1 meter measuring distance before final test.
3. For emission frequencies measured below and above 1 GHz, set the spectrum analyzer on a 100 kHz and 1 MHz resolution bandwidth respectively for each frequency measured in step 2.
4. The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0 ° to 360 ° with a speed as slow as possible, and keep the azimuth that highest emission is indicated on the spectrum analyzer. Vary the antenna position again and record the highest value as a final reading. A RF test receiver is also used to confirm emissions measured.
5. Repeat step 4 until all frequencies need to be measured were complete.
6. Repeat step 5 with search antenna in vertical polarized orientations.
7. Check the three frequencies of highest emission with varying the placement of cables associated with EUT to obtain the worse case and record the result.

Figure 1 : Frequencies measured at 30MHz to 1 GHz configuration

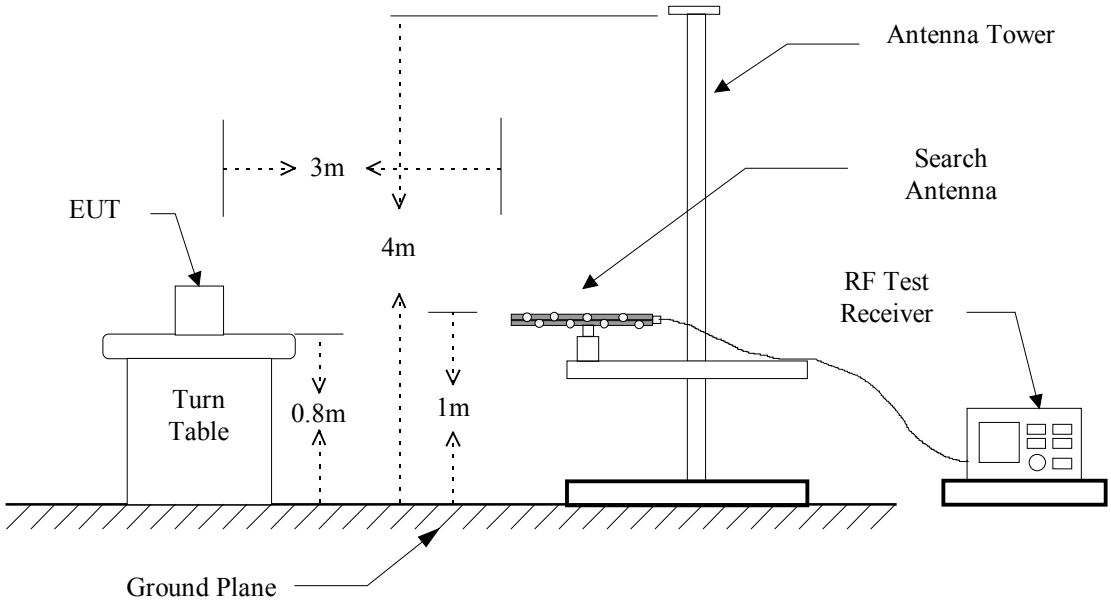
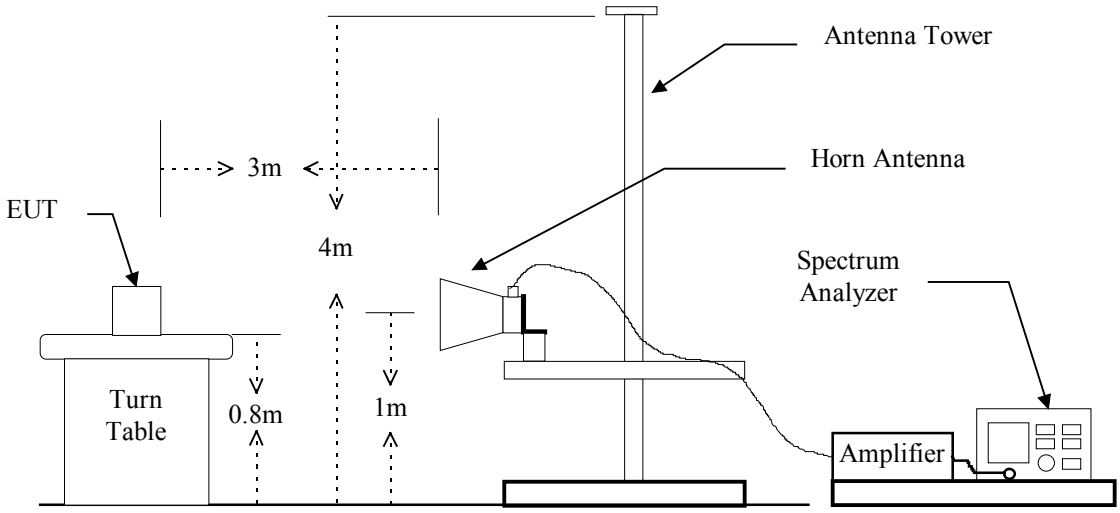


Figure 2 : Frequencies measured above 1 GHz configuration



4.3 Measuring Instrument

The following instrument are used for radiated emissions measurement:

Equipment	Manufacturer	Model No.	Next Cal. Date
Test Receiver	Rohde & Schwarz	ESVS30	09/05/2005
Amplifier	HP	8447D	10/17/2005
Spectrum	Advantest	R3361C	08/10/2005
Log-periodic Antenna	EMCO	3146	10/05/2005
Biconical Antenna	EMCO	3110B	10/05/2005
Double Ridged Antenna	EMCO	3115	08/26/2005
Amplifier	HP	8449B	09/07/2005
Amplifier	HP	83051A	04/18/2006
Spectrum	Rohde & Schwarz	FSP	05/31/2005
Spectrum	HP	8564E	08/11/2005

Measuring instrument setup in measured frequency band when specified detector function is used :

Frequency Band (MHz)	Instrument	Function	Resolution bandwidth	Video Bandwidth
30 to 1000	RF Test Receiver	Quasi-Peak	120 kHz	N/A
	Spectrum Analyzer	Peak	100 kHz	100 kHz
Above 1000	Spectrum Analyzer	Peak	1 MHz	1 MHz
	Spectrum Analyzer	Average	1 MHz	10Hz

4.4 Test Data

4.4.1 Fundamental and Harmonics

A. Fundamental

Fundamental Frequency : 88.1 MHz Audio Modulation : 1 kHz
Test Date : Apr. 22, 2005 Temperature : 25 °C Humidity : 60 %

Frequency	Reading (dBuV)				Factor	Result @3m (dBuV/m)		Limit @3m (dBuV/m)		Margin	Table	Ant.
	H		V		(dB)						Deg.	High
(MHz)	Peak	Ave	Peak	Ave	Corr.	Peak	Ave	Peak	Ave	(dB)	(Deg.)	(m)
88.102	56.0	***	61.2	***	-14.2	47.0	***	68.0	48.0	-21.0	186	1.2

Fundamental Frequency : 98.0 MHz Audio Modulation : 1 kHz
Test Date : Apr. 22, 2005 Temperature : 25 °C Humidity : 60 %

Frequency	Reading (dBuV)				Factor	Result @3m (dBuV/m)		Limit @3m (dBuV/m)		Margin	Table	Ant.
	H		V		(dB)						Deg.	High
(MHz)	Peak	Ave	Peak	Ave	Corr.	Peak	Ave	Peak	Ave	(dB)	(Deg.)	(m)
98.004	60.7	***	58.7	***	-13.9	46.8	***	68.0	48.0	-21.2	186	1.2

Fundamental Frequency : 107.9 MHz Audio Modulation : 1 kHz
Test Date : Apr. 22, 2005 Temperature : 25 °C Humidity : 60 %

Frequency	Reading (dBuV)				Factor	Result @3m (dBuV/m)		Limit @3m (dBuV/m)		Margin	Table	Ant.
	H		V		(dB)						Deg.	High
(MHz)	Peak	Ave	Peak	Ave	Corr.	Peak	Ave	Peak	Ave	(dB)	(Deg.)	(m)
107.896	56.6	***	54.0	***	-12.2	44.4	***	68.0	48.0	-23.6	186	1.2

Note :

1. *Item of margin shown in above table refer to average limit.*
2. *It is considered that the results of average comply with average limit when measuring data with a peak function detector meet the average limit. Mark "***" means that Peak result is meet average limit.*
3. *Remark "---" means that the emissions level is too low to be measured.*
4. *Item "Margin" referred to Average limit while there is only peak result.*
5. *The expanded uncertainty of the radiated emission tests is 3.53 dB.*

4.4.2 Other Emissions

1. Operation Mode : Working with Laptop
Test Date : Apr. 22, 2005 Temperature : 25 °C Humidity : 60 %

Frequency (MHz)	Ant-Pol H/V	Meter Reading (dBuV)	Corrected Factor (dB)	Result @3m (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)	Table Degree (Deg.)	Ant. High (m)
123.690	V	42.1	-11.1	31.0	43.5	-12.5	263	1.3
147.990	V	39.8	-10.2	29.6	43.5	-13.9	28	1.0
172.560	V	40.0	-9.0	31.0	43.5	-12.5	241	1.3
414.100	H	38.1	-5.9	32.2	46.0	-13.8	192	1.0
428.800	H	38.3	-5.5	32.8	46.0	-13.2	77	1.0
701.800	H	32.6	-1.0	31.6	46.0	-14.4	128	1.0

2. Operation Mode : Working with no Laptop
Test Date : Jun. 02, 2005 Temperature : 25 °C Humidity : 60 %

Frequency (MHz)	Ant-Pol H/V	Meter Reading (dBuV)	Corrected Factor (dB)	Result @3m (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)	Table Degree (Deg.)	Ant. High (m)
121.330	V	43.0	-10.9	32.1	43.5	-11.4	150	1.5
143.210	V	41.1	-10.5	30.6	43.5	-12.9	110	1.0
168.420	V	41.5	-9.1	32.4	43.5	-11.1	120	1.1
413.210	H	37.3	-5.9	31.4	46.0	-14.6	140	1.2
424.880	H	35.9	-5.5	32.8	46.0	-15.6	150	1.5
707.560	H	29.2	-0.9	28.3	46.0	-17.7	150	1.3

Note :

1. Remark "---" means that the emissions level is too low to be measured.
2. The expanded uncertainty of the radiated emission tests is 3.53 dB.

4.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. For the limit is employed average value, therefore the peak value can be transferred to average value by subtracting the duty factor. The basic equation with a sample calculation is as follows:

Peak = Reading + Corrected Factor

where

Corr. Factor = Antenna Factor + Cable Factor - Amplifier Gain (if any)

4.6 Radiated Measurement Photos

Mode 1

Mode 2

5 CONDUCTED EMISSION MEASUREMENT

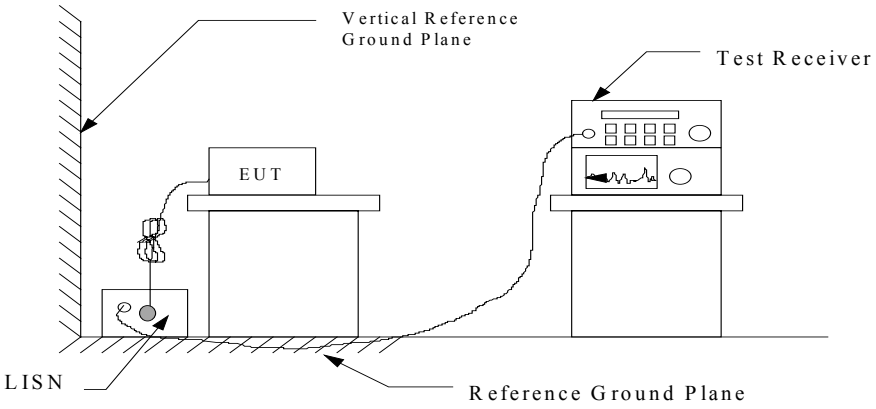
5.1 Standard Applicable

For unintentional and intentional device, Line Conducted Emission Limits are in accordance to 15.107(a) and 15.207(a) respectively.

5.2 Measurement Procedure

1. Setup the configuration per figure 3.
2. A preliminary scan with a spectrum monitor is performed to identify the frequency of emission that has the highest amplitude relative to the limit by operating the EUT in selected modes of operation, typical cable positions, and with a typical system configuration.
3. Record the 6 or 8 highest emissions relative to the limit.
4. Measure each frequency obtained from step 3 by a test receiver set on quasi peak detector function, and then record the accuracy frequency and emission level. If all emissions measured in the specified band are attenuated more than 20 dB from the limit, this step would be ignored, and the peak detector function would be used.
5. Confirm the highest three emissions with variation of the EUT cable configuration and record the final data.
6. Repeat all above procedures on measuring each operation mode of EUT.

Figure 3 : Conducted emissions measurement configuration



5.3 Conducted Emission Data

Operation Mode : Working with Laptop

Test Date : MAY 30, 2005 Temperature : 25 °C Humidity : 60 %

Freq. (MHz)	**Meter Reading** (dB μ V)				**Factor** (dB)	**Result** (dB μ V)				**Limit** (dB μ V)		**Margin** (dB μ V)	
	Q.P Value		AVG. Value			Q.P Value		AVG. alue		QP.	AVG.	QP.	AVG.
	N	L1	N	L1		N	L1	N	L1				
0.267	37.8	41.2	----	----	0.2	38.0	41.4	----	----	61.2	51.2	-19.8	----
0.446	32.3	34.6	----	----	0.3	32.6	34.9	----	----	56.9	46.9	-22.0	----
0.929	31.9	29.6	----	----	0.3	32.2	29.9	----	----	56.0	46.0	-23.8	----
1.261	30.3	29.4	----	----	0.4	30.7	29.8	----	----	56.0	46.0	-25.3	----
13.496	20.4	23.6	----	----	1.0	21.4	24.6	----	----	60.0	50.0	-35.4	----
13.620	21.8	23.7	----	----	1.0	22.8	24.7	----	----	60.0	50.0	-35.3	----

Note :

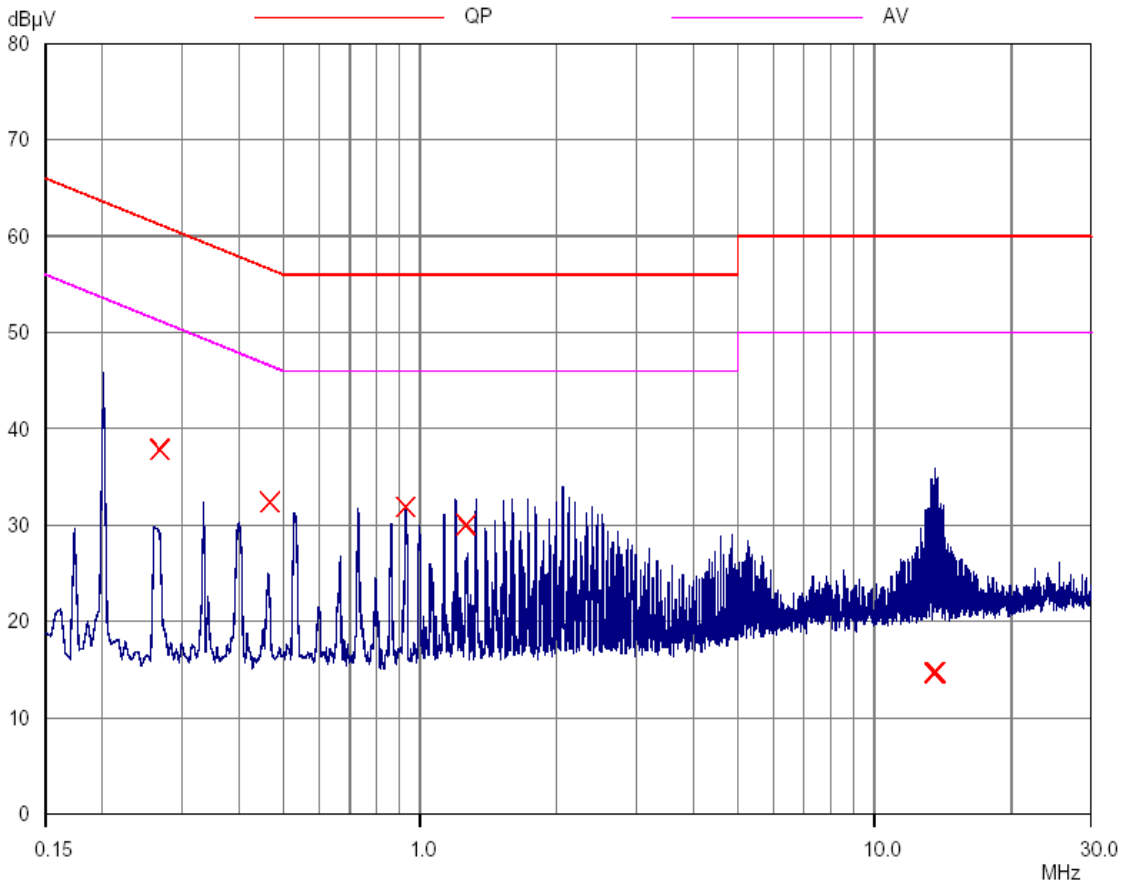
The expanded uncertainty of the conducted emission tests is 2.45 dB.

CONDUCTION EMISSION TEST

Peak Value

EUT: FM band transemitter
Manuf:
Op Cond:
Operator:
Test Spec:
Comment: N

Final Measurement: Detector: X QP
Meas Time: 1sec
Peaks: 8
Acc Margin: 25 dB

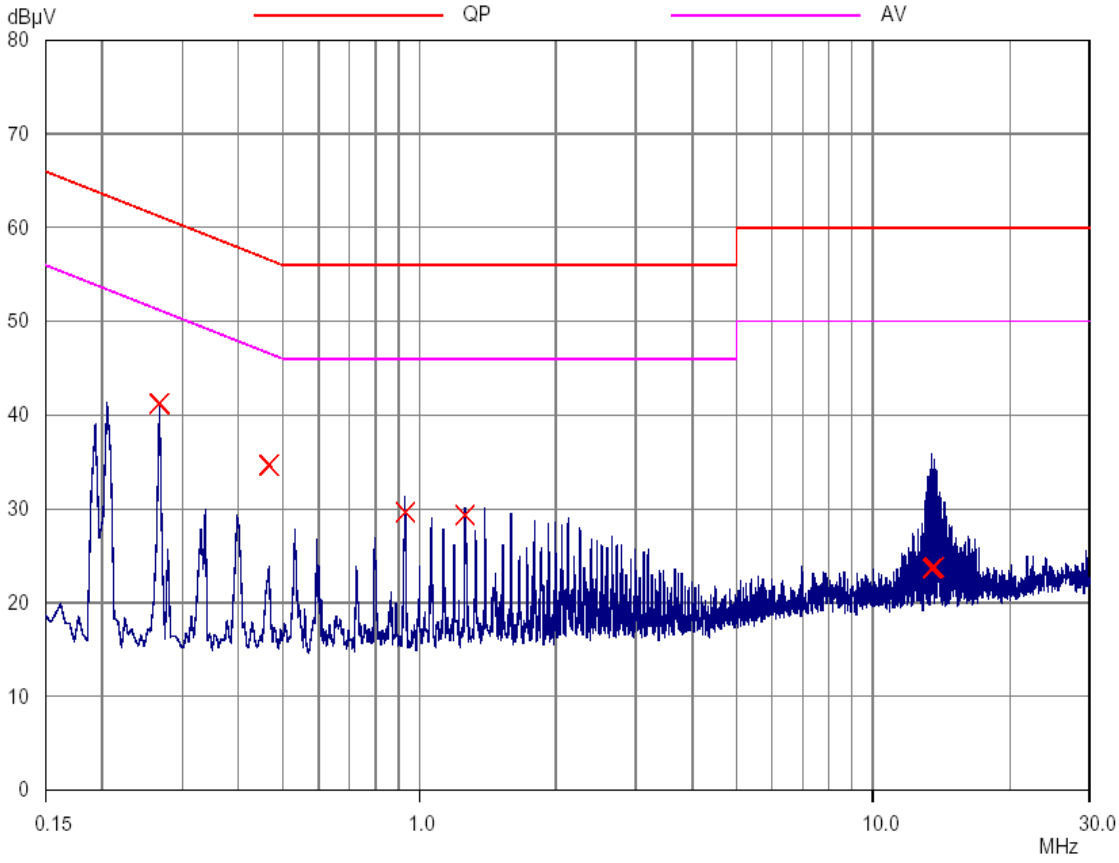


CONDUCTION EMISSION TEST

Peak Value

EUT: FM band transemitter
Manuf:
Op Cond:
Operator:
Test Spec:
Comment: L1

Final Measurement: Detector: X QP
Meas Time: 1sec
Peaks: 8
Acc Margin: 25 dB



5.4 Result Data Calculation

The result data is calculated by adding the LISN Factor to the measured reading. The basic equation with a sample calculation is as follows:

RESULT = READING + LISN FACTOR

Assume a receiver reading of 22.5 dB μ V is obtained, and LISN Factor is 0.1 dB, then the total of field strength is 22.6 dB μ V.

RESULT = 22.5 + 0.1 = 22.6 dB μ V
Level in μ V = Common Antilogarithm[(22.6 dB μ V)/20]
= 13.48 μ V

5.5 Conducted Measurement Equipment

The following test equipment are used during the conducted test .

(Conduction 1)

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
EMI Test Receiver	Rohde & Schware	ESCS 30	2004/12/07	2005/12/06
LISN	Kyoritsu	KNW-407	2004/12/26	2005/12/25
LISN	Rohde & Schwarz	ESH2-Z5	2004/08/11	2005/08/10

Note: The standards used to perform this calibration are traceable to NML/ROC and NIST/USA.

5.6 Photos of Conduction Measuring Setup

6 ANTENNA REQUIREMENT

6.1 Standard Applicable

According to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

6.2 Antenna Construction

The antenna is permanently mounted on EUT, no consideration of replacement.

7 EMISSION BAND MEASUREMENT

7.1 Standard Applicable

According to 15.239(a), emissions from the intentional radiator shall be confined within a band 200kHz wide centered on the operating frequency. The 200 kHz band shall lie wholly within the frequency range of 88-108 MHz.

7.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 1 and measurement the turn on the EUT. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 10 kHz and 100kHz respectively with a convenient frequency span including 200kHz bandwidth of the emission.
4. Mark the bandwidth of 200kHz points and plot the graph on spectrum analyzer.
5. Repeat above procedures until all measured frequencies were complete.

7.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Next Cal. Date
Spectrum Analyzer	Rohde & Schwarz	FSP	05/31/2005

7.4 Measurement Data

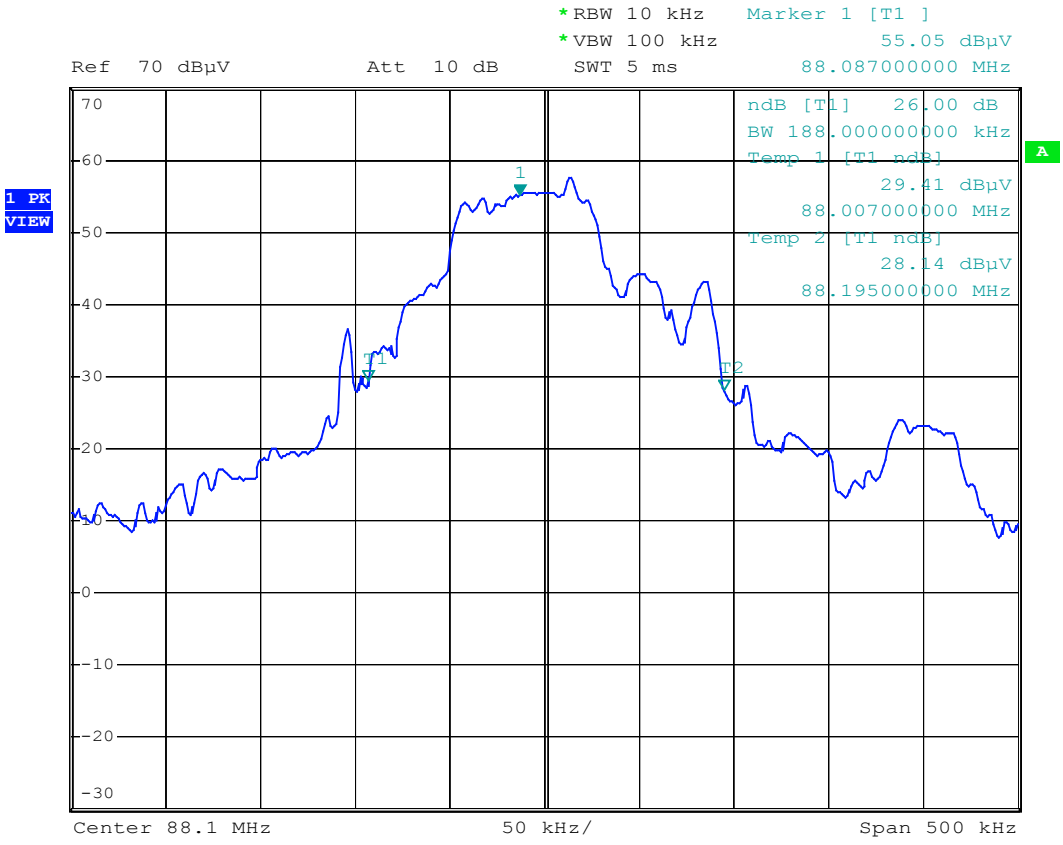
Test Date : Apr. 22, 2005 Temperature : 25 °C Humidity : 60%
Audio Modulation : 1 kHz

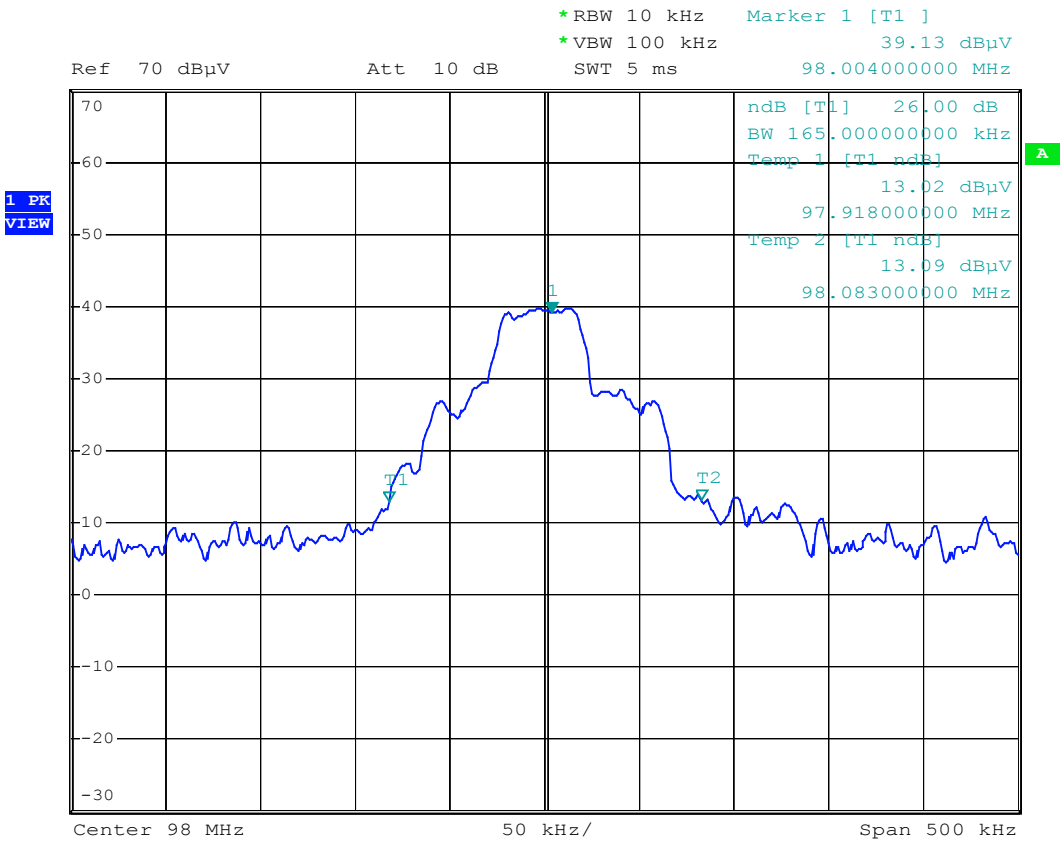
Test result:
The 26 dB bandwidth of 88.087 MHz = 188 kHz < 200 kHz.
The 26 dB bandwidth of 98.004 MHz = 165 kHz < 200 kHz.
The 26 dB bandwidth of 107.899 MHz = 186 kHz < 200 kHz.
The 200 Khz band lie wholly within the frequency range of 88-108 MHz.

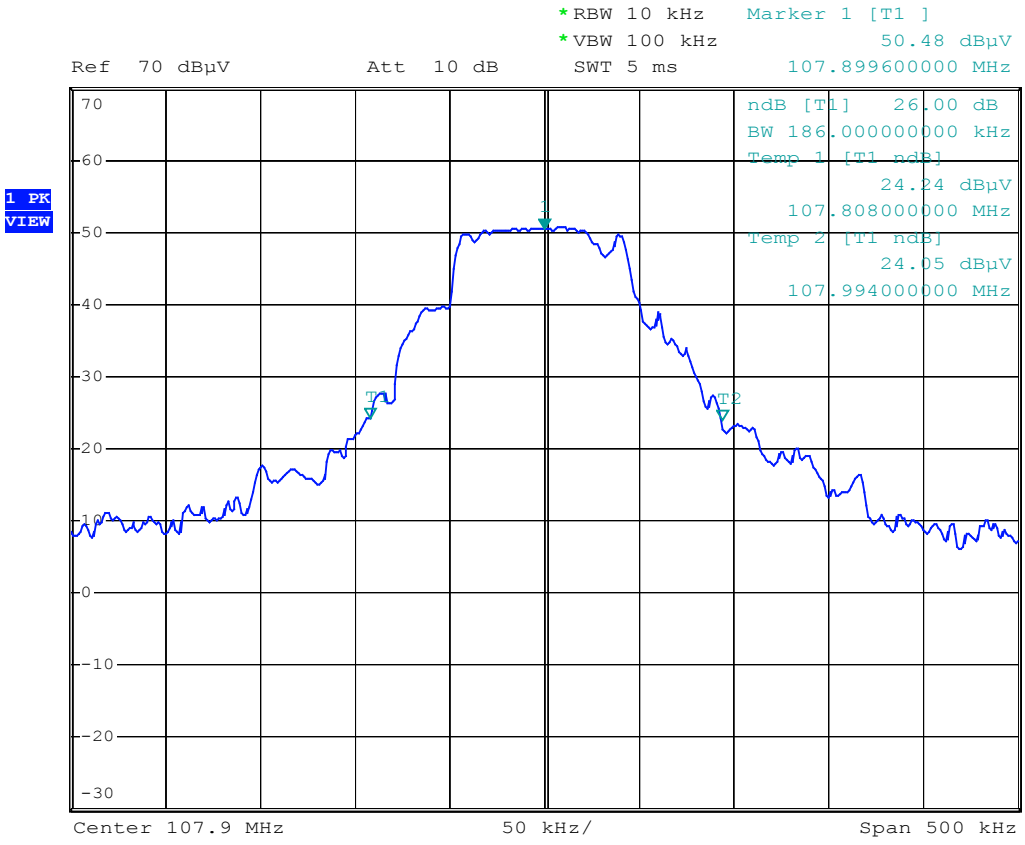
Note :

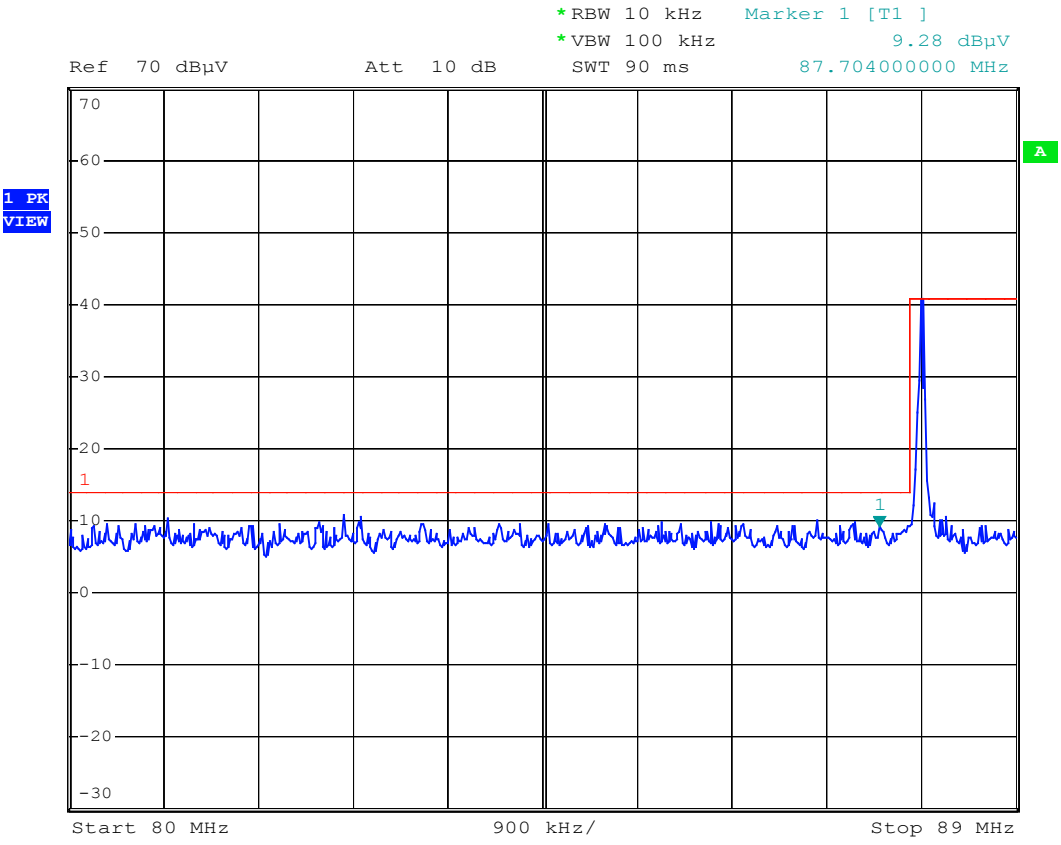
1. **Bandwidth test was done with 1 kHz audio modulation input signal. There is no user controlled function except frequency tuning.**
2. **Please see appendix 1 for Plotted Data.**

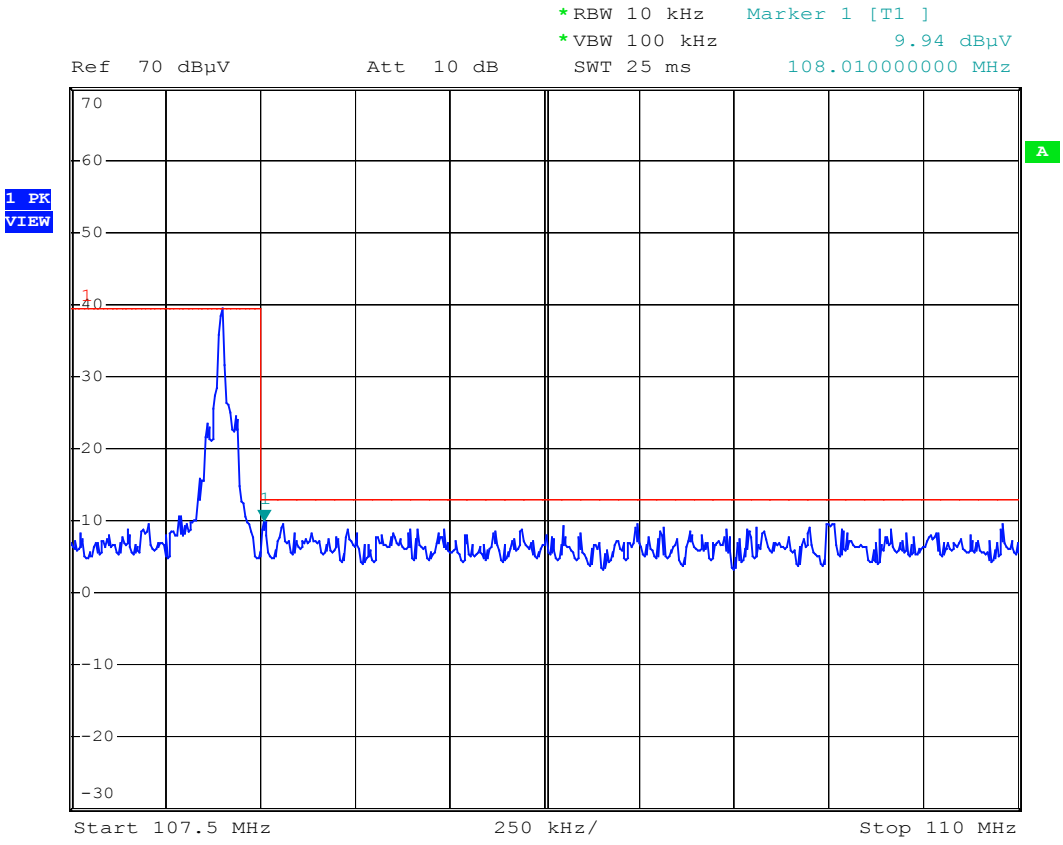
Appendix 1 : Plotted Data For Emission Band Measurement


*RBW 10 kHz
*VBW 100 kHz
SWT 5 ms
Marker 1 [T1]
55.05 dBµV
88.087000000 MHz
Ref 70 dBµV
Att 10 dB
ndB [T1] 26.00 dB
BW 188.000000000 kHz
Temp 1 [T1 ndB]
29.41 dBµV
88.007000000 MHz
Temp 2 [T1 ndB]
28.14 dBµV
88.195000000 MHz
1 PK
VIEW
A
70
60
50
40
30
20
10
0
-10
-20
-30
T1
T2
Center 88.1 MHz
50 kHz/
Span 500 kHz


*RBW 10 kHz
*VBW 100 kHz
SWT 5 ms
Marker 1 [T1]
39.13 dBµV
98.004000000 MHz
Ref 70 dBµV
Att 10 dB
ndB [T1] 26.00 dB
BW 165.000000000 kHz
Temp 1 [T1 ndB]
13.02 dBµV
97.918000000 MHz
Temp 2 [T1 ndB]
13.09 dBµV
98.083000000 MHz
1 PK
VIEW
A
70
60
50
40
30
20
10
0
-10
-20
-30
T1
T2
1
Center 98 MHz
50 kHz/
Span 500 kHz


*RBW 10 kHz
*VBW 100 kHz
Ref 70 dBµV
Att 10 dB
SWT 5 ms
Marker 1 [T1]
50.48 dBµV
107.899600000 MHz
ndB [T1] 26.00 dB
BW 186.000000000 kHz
Temp 1 [T1 ndB]
24.24 dBµV
107.808000000 MHz
Temp 2 [T1 ndB]
24.05 dBµV
107.994000000 MHz
1 PK
VIEW
70
60
50
40
30
20
10
0
-10
-20
-30
T1
T2
Center 107.9 MHz
50 kHz/
Span 500 kHz


*RBW 10 kHz
Marker 1 [T1]
*VBW 100 kHz
9.28 dBµV
Ref 70 dBµV
Att 10 dB
SWT 90 ms
87.704000000 MHz
1 PK
VIEW
A
70
60
50
40
30
20
1
10
0
-10
-20
-30
1
Start 80 MHz
900 kHz/
Stop 89 MHz


*RBW 10 kHz
Marker 1 [T1]
*VBW 100 kHz
9.94 dBµV
Ref 70 dBµV
Att 10 dB
SWT 25 ms
108.010000000 MHz
1 PK
VIEW
A
70
60
50
40
30
20
10
0
-10
-20
-30
Start 107.5 MHz
250 kHz/
Stop 110 MHz