

EMC TEST REPORT

Report No. : EME-050016

Model No. : AV-R101

Issued Date : Jan. 17. 2005

Applicant : ELANSAT TECHNOLOGIES INC.
5F, No. 12, Innovation Rd., 1 Science-Based Industrial Park,
Hsinchu, 300, Taiwan

Test By : Intertek Testing Services Taiwan Ltd.
No. 11, Ko-Tze-Nan Chia-Tung Li, Shiang-Shan District,
Hsinchu, Taiwan

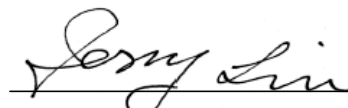
This test report consists of 22 pages in total. It may be duplicated completely for legal use with the allowance of the applicant. It shall not be reproduced except in full, without the written approval of Intertek Laboratory. The test result(s) in this report only applies to the tested sample(s).

Project Engineer



Marx Yan

Reviewed By



Jerry Liu

Table of Contents

Summary of Tests	3
1. General information.....	4
1.1 Identification of the EUT	4
1.2 Additional information about the EUT	4
1.3 Antenna description.....	5
1.4 Peripherals equipment	5
2. Test specifications.....	6
2.1 Test standard	6
2.2 Operation mode.....	6
2.3 Test equipment	7
3. Conducted emission test FCC 15.207.....	8
3.1 Operating environment.....	8
3.2 Test setup & procedure	8
3.3 Emission limit	8
3.4 Conducted emission data FCC 15.207	9
4. Radiated emission test FCC 15.231 (b)	11
4.1 Operating environment.....	11
4.2 Test setup & procedure	11
4.3 Radiated emission limit	12
4.3.1 Fundamental and harmonics emission limits.....	12
4.3.2 General radiated emission limit	13
4.4 Calculation of Average Factor.....	14
4.5 Radiated emission test data FCC 15.231	19
4.5.1 Measurement results: Fundamental Radiated Emission Data.....	19
4.5.2 Measurement results: frequencies equal to or less than 1 GHz	20
4.5.3 Measurement results: frequencies above 1GHz.....	21
4.6 Measured bandwidth FCC 15.231(C)	22

Summary of Tests**2.4GHz Wireless A/V System -Model: AV-R101**
FCC ID: PNKAV-R101

Test	Reference	Results
Conducted Emission of AC Power	15.207	Complies
Radiated Emission test	15.231(b), 15.209	Complies
Measured bandwidth	15.231(c)	Complies

1. General information

1.1 Identification of the EUT

Manufacturer	: ELANSAT TECHNOLOGIES INC.
Product	: 2.4GHz Wireless A/V System
Model No.	: AV-R101
FCC ID.	: PNKAV-101R
Frequency Range	: 433.92MHz
Channel Number	: Single channel
Frequency of each channel	: 433.92MHz
Type of Modulation	: ASK
Power Supply	: 120Vac, 60Hz with adapter (YAD-090030C)
Power Cord	: N/A
Sample Received	: Jan. 5, 2005
Test Date(s)	: Jan. 11, 2005 ~ Jan. 12, 2005

1.2 Additional information about the EUT

The main function of the transmitting unit is sending the video and audio signals to the receiving unit by 2.4GHz RF signal with FM modulation. The receiving unit will pick up the 2.4GHz RF signal and does the FM demodulation; then put the video and audio signals to TV, or other AV devices.

For more detail features, please refer to User's manual as file name "Installation guide.pdf"

1.3 Antenna description

The EUT uses a permanently connected antenna.

Antenna Gain : 0dBi max

Antenna Type : Monopole antenna

Connector Type : N/A

1.4 Peripherals equipment

Peripherals	Manufacturer	Product No.	Serial No.	FCC ID
DVD Player	Royal Tek	RDP-702	P13C193100769	FCC DoC Approved
Color Video Monitor	HITACHI	CPM1404	U7C005888	FCC DoC Approved

2. Test specifications

2.1 Test standard

The EUT was performed according to the procedures in FCC Part 15 Subpart C Section 15.231.

2.2 Operation mode

During all of the tests, the EUT was operated in transmitting continuously.

Once the button releasing, the transmission will be stopped within 1 second.

2.3 Test equipment

Equipment	Brand	Frequency range	Model No.	Intertek ID No.	Next Cal. Date
EMI Test Receiver	Rohde & Schwarz	9kHz~2.75GHz	ESCS 30	EC303	04/13/2005
EMI Test Receiver	Rohde & Schwarz	20Hz~26.5GHz	ESMI	EC317	07/14/2005
Spectrum Analyzer	Rohde & Schwarz	9kHz~30GHz	FSP 30	EC353	07/13/2005
Spectrum Analyzer	Rohde & Schwarz	20Hz~40GHz	FSEK 30	EC365	10/18/2005
Horn Antenna	EMCO	1GHz~18GHz	3115	EC338	08/16/2005
Horn Antenna	SCHWARZBECK	14GHz~40GHz	BBHA 9170	EC351	07/08/2005
Bilog Antenna	SCHWARZBECK	25MHz~1.7GHz	VULB 9160	EC368	05/20/2005
Pre-Amplifier	MITEQ	100MHz~26.5GHz	919981	EC373	4/13/2005
Pre-Amplifier	MITEQ	26GHz~40GHz	828825	EC374	1/28/2005
Controller	HDGmbH	N/A	HD 100	EP317-1	N/A
Antenna Tower	HDGmbH	N/A	MA 240	EP317-2	N/A
Turn Table	HDGmbH	N/A	DS 420S	EP317-3	N/A
LISN	Rohde & Schwarz	9KHz~30MHz	ESH3-Z5	EC344	01/14/2005

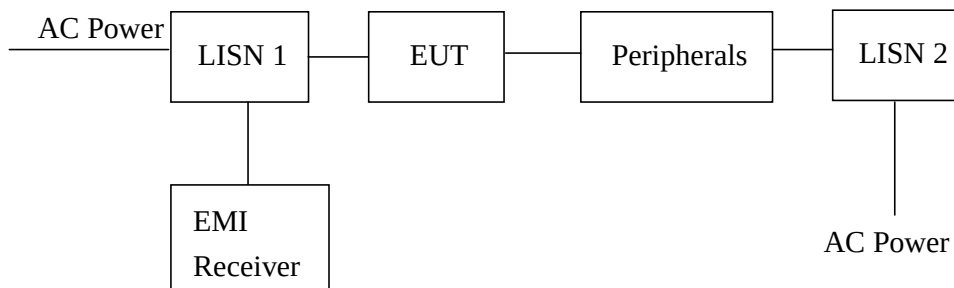
Note: The above equipments are within the valid calibration period.

3. Conducted emission test FCC 15.207

3.1 Operating environment

Temperature:	25	°C	(10-40°C)
Relative Humidity:	58	%	(10-90%)
Atmospheric Pressure:	1023	hPa	(860-1061hPa)

3.2 Test setup & procedure



The EUT are connected to the main power through a line impedance stabilization network (LISN). This provides a 50 ohm/50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination.

Both sides (Line and Neutral) of AC line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4/1992 on conducted measurement.

The bandwidth of the field strength meter (R & S Test Receiver ESCS 30) is set at 9kHz.

3.3 Emission limit

Freq. (MHz)	Maximum RF Line Voltage			
	Class A (dB μ V)		Class B (dB μ V)	
	Q.P.	Ave.	Q.P.	Ave.
0.15~0.50	79	66	66~56	56~46
0.50~5.00	73	60	56	46
5.00~30.0	73	60	60	50

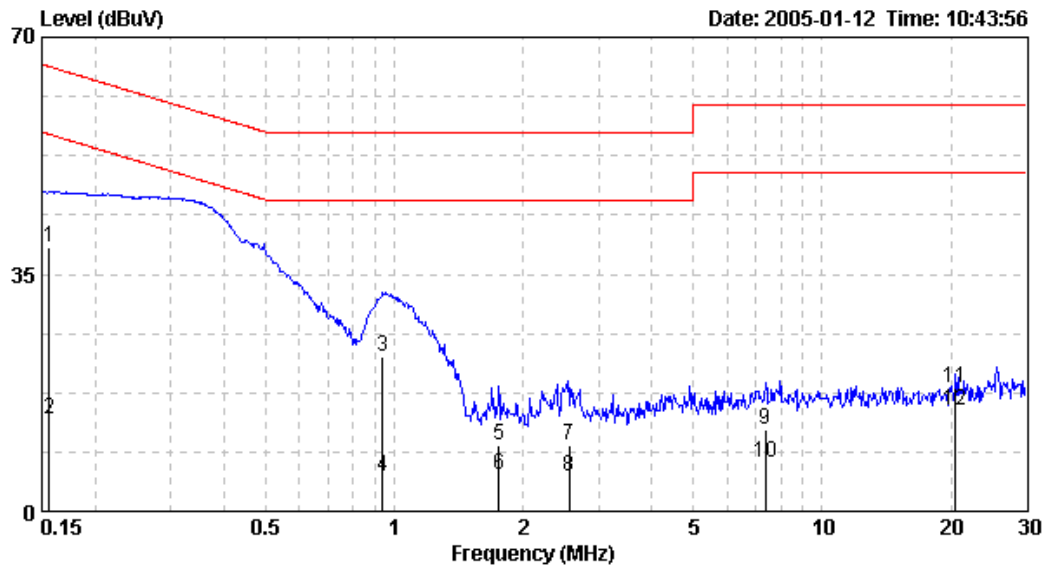
3.4 Conducted emission data FCC 15.207

Phase : Line
 EUT : AV-R101
 Test Condition : Tx at 433.92MHz

Frequency (MHz)	Corr. Factor (dB)	Level	Limit	Level	Limit	Margin	
		Qp (dBuV)	Qp (dBuV)	AV (dBuV)	Av (dBuV)	Qp (dB)	Av
0.16	0.10	38.90	65.67	13.55	55.67	-26.77	-42.12
0.94	0.10	22.90	56.00	5.18	46.00	-33.10	-40.82
1.76	0.11	9.76	56.00	5.28	46.00	-46.24	-40.72
2.56	0.15	9.77	56.00	5.09	46.00	-46.23	-40.91
7.38	0.39	12.01	60.00	7.13	50.00	-47.99	-42.87
20.48	0.96	18.18	60.00	14.82	50.00	-41.82	-35.18

Remark:

1. Correction Factor (dB)= LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)

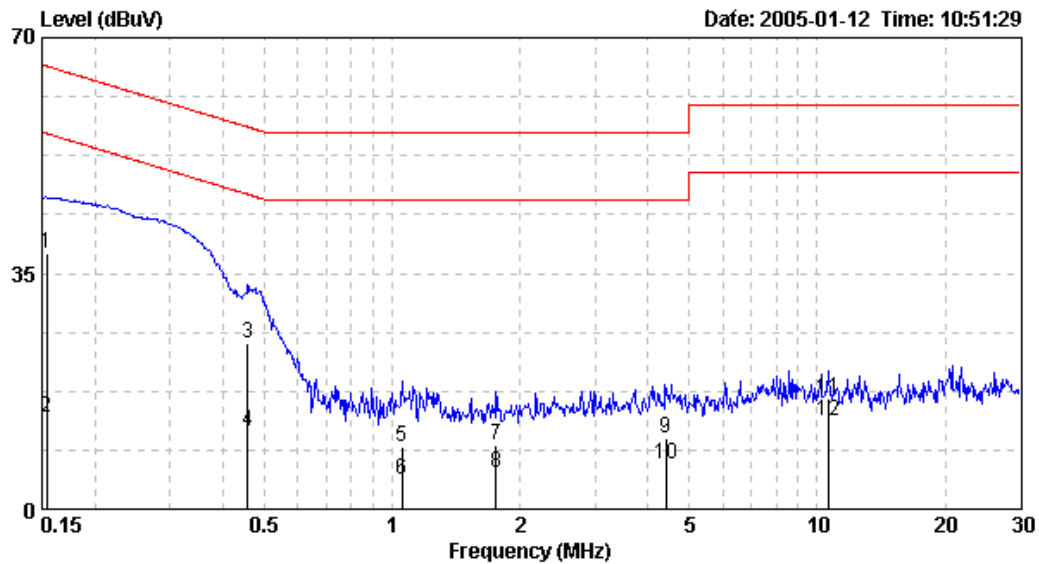


Phase : Neutral
 EUT : AV-R101
 Test Condition : Tx at 433.92MHz

Frequency (MHz)	Corr. Factor (dB)	Level	Limit	Level	Limit	Margin	
		Qp (dBuV)	Qp (dBuV)	AV (dBuV)	Av (dBuV)	Qp	Av
0.15	0.10	37.96	65.80	13.62	55.80	-27.84	-42.18
0.46	0.10	24.68	56.73	11.48	46.73	-32.05	-35.25
1.06	0.10	9.20	56.00	4.44	46.00	-46.80	-41.56
1.76	0.11	9.52	56.00	5.42	46.00	-46.48	-40.58
4.40	0.24	10.60	56.00	6.72	46.00	-45.40	-39.28
10.65	0.33	16.52	60.00	12.95	50.00	-43.48	-37.05

Remark:

1. Correction Factor (dB)= LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)



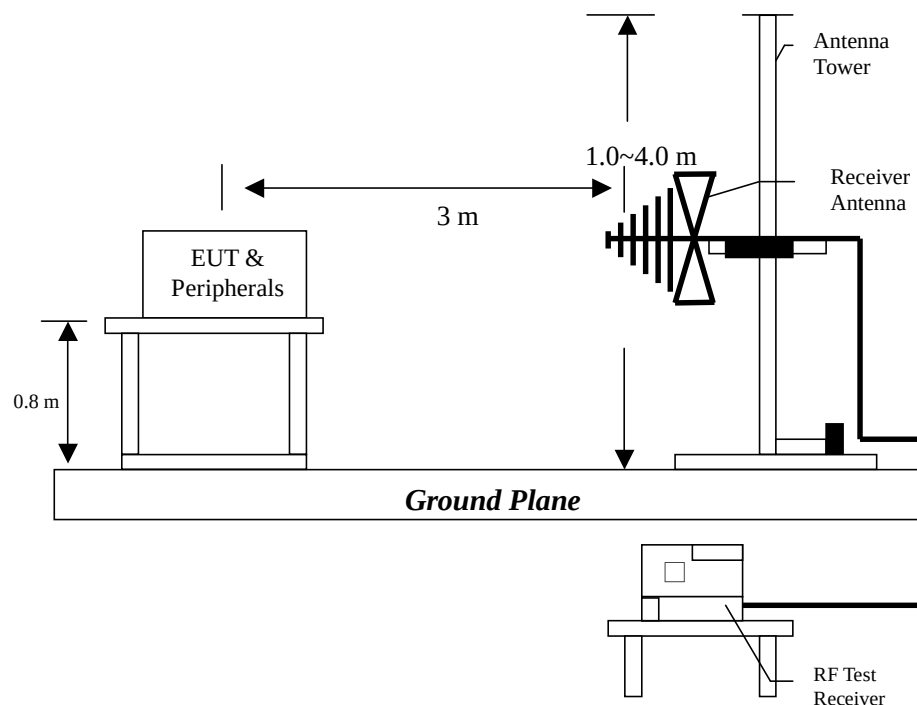
4. Radiated emission test FCC 15.231 (b)

4.1 Operating environment

Temperature:	24	°C	(10-40°C)
Relative Humidity:	50	%	(10-90%)
Atmospheric Pressure	1023	hPa	(860-1060hPa)

4.2 Test setup & procedure

The Diagram below shows the test setup, which is utilized to make these measurements.



Radiated emission measurements were performed from 30MHz to 25GHz. Spectrum Analyzer Resolution Bandwidth is 100kHz or greater for frequencies 30MHz to 1GHz, 1MHz – for frequencies above 1GHz.

The EUT for testing is arranged on a wooden turntable. If some peripherals apply to the EUT, the peripherals will be connected to EUT and the whole system. During the test, all cables were arranged to produce worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meters and down to 1 meter.

The measurement for radiated emission will be done at the distance of three meters unless the signal level is too low to measure at that distance. In the case of the reading under noise floor, a pre-amplifier is used and/or the test is conducted at a closer distance. And then all readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance.

The EUT configuration please refer to the “Spurious set-up photo.pdf”.

4.3 Radiated emission limit

4.3.1 Fundamental and harmonics emission limits

Frequency (MHz)	Field Strength of Fundamental		Field Strength of Harmonics	
	(uV/m@3m)	(dBuV/m@3m)	(uV/m@3m)	(dBuV/m@3m)
433.92	10958	80.8	1096.5	60.8

4.3.2 General radiated emission limit

The spurious Emission shall test through the 10th harmonic. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

Frequency MHz	15.209 Limits (dB μ V/m@3m)
30-88	40
88-216	43.5
216-960	46
Above 960	54

Remark:

1. In the above table, the tighter limit applies at the band edges.
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system

Uncertainty was calculated in accordance with NAMAS NIS 81. Expanded uncertainty (k=2) of radiated emission measurement is ± 3.078 dB.

4.4 Calculation of Average Factor

The specification for output field strengths in accordance with the FCC rules specify measurements with an average detector. During testing, a spectrum analyzer incorporating a peak detector was used. Therefore, a reduction factor can be applied to the resultant peak signal level and compared to the limit for measurement instrumentation incorporating an average detector.

The time period over which the duty cycle is measured in 90 ms or the repetition cycle, whichever is a shorter time frame. The duty cycle is measured by placing the spectrum analyzer in zero span mode at 100KHz resolution bandwidth.

Averaging factor in dB = $20\log(\text{duty cycle})$

The duty cycle is simply the on-time divided by the period:

The duration of one cycle = 70.882 ms

The number of short pulses in each period (18) multiplied by the duration of each short pulses (0.36ms) = 6.48ms

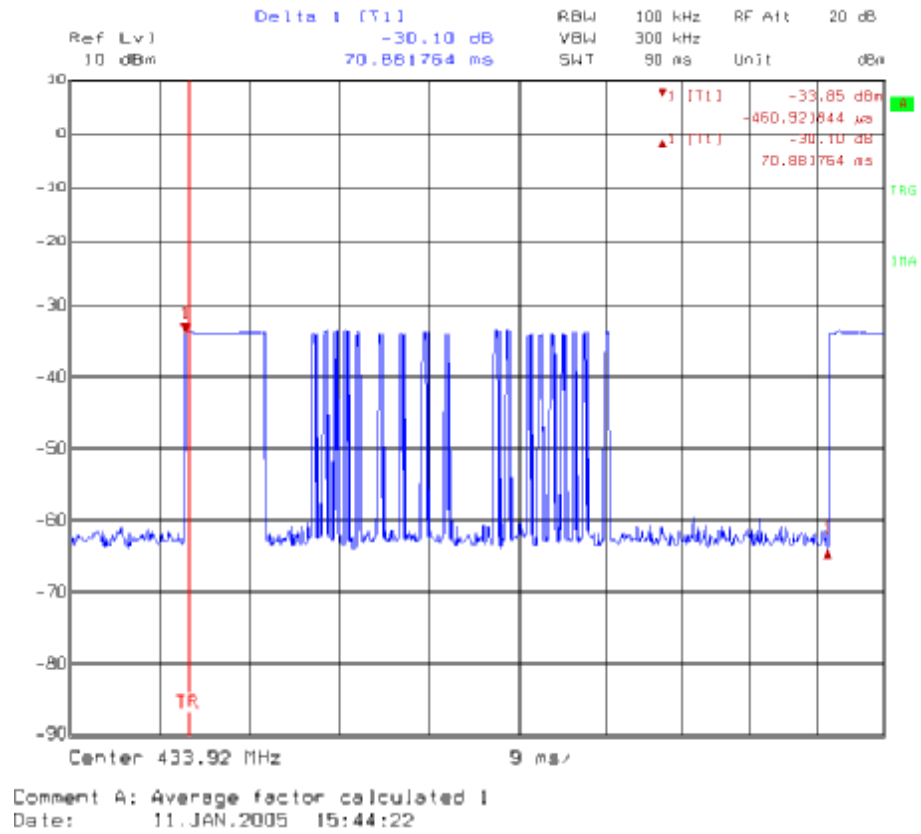
The number of long pulses in each period (1) multiplied by the duration of each long pulses (8.15ms) = 8.15ms

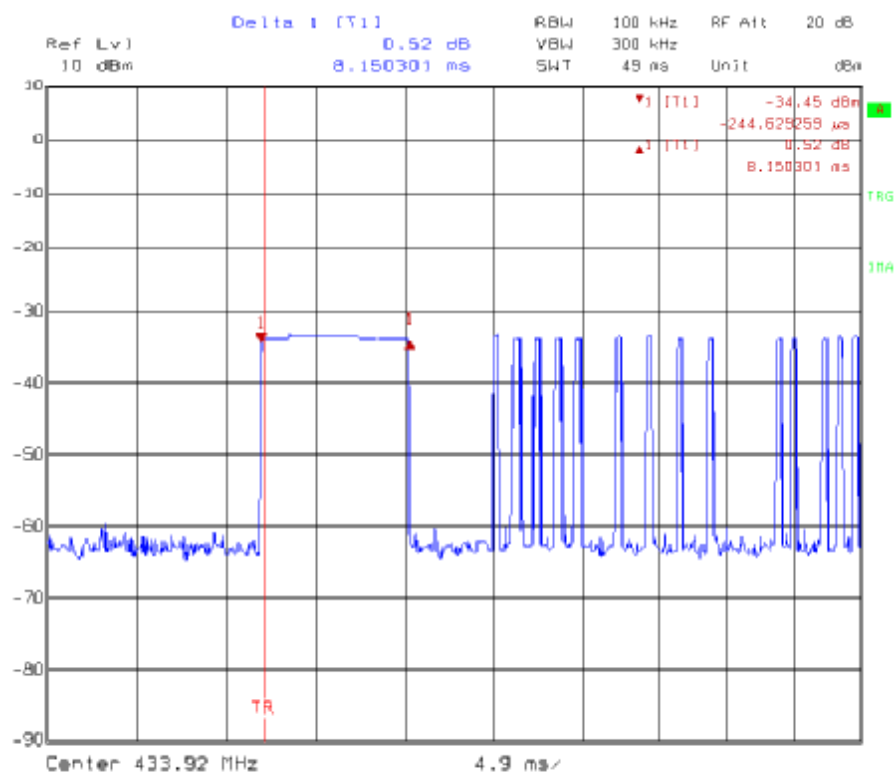
Effective period of the cycle = $6.48 + 8.15 = 14.63$ ms

DC = $14.63 \text{ ms} / 70.882 \text{ ms} = 0.206$

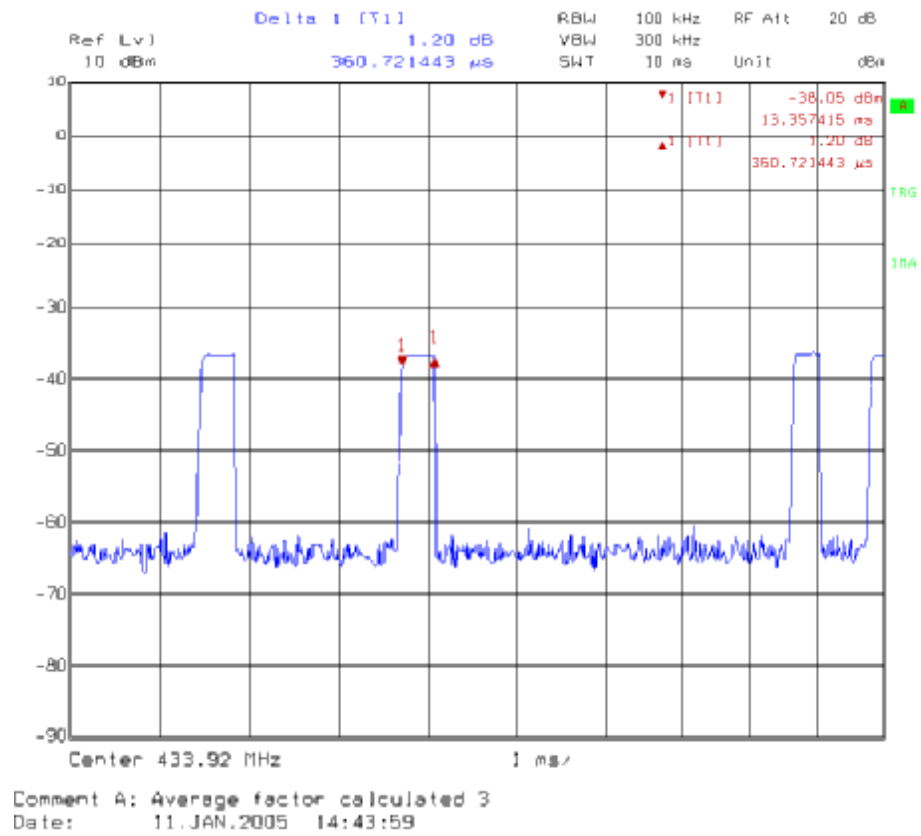
Therefore, the averaging factor is found by $20 \log_{10} 0.26 = -13.7$ dB

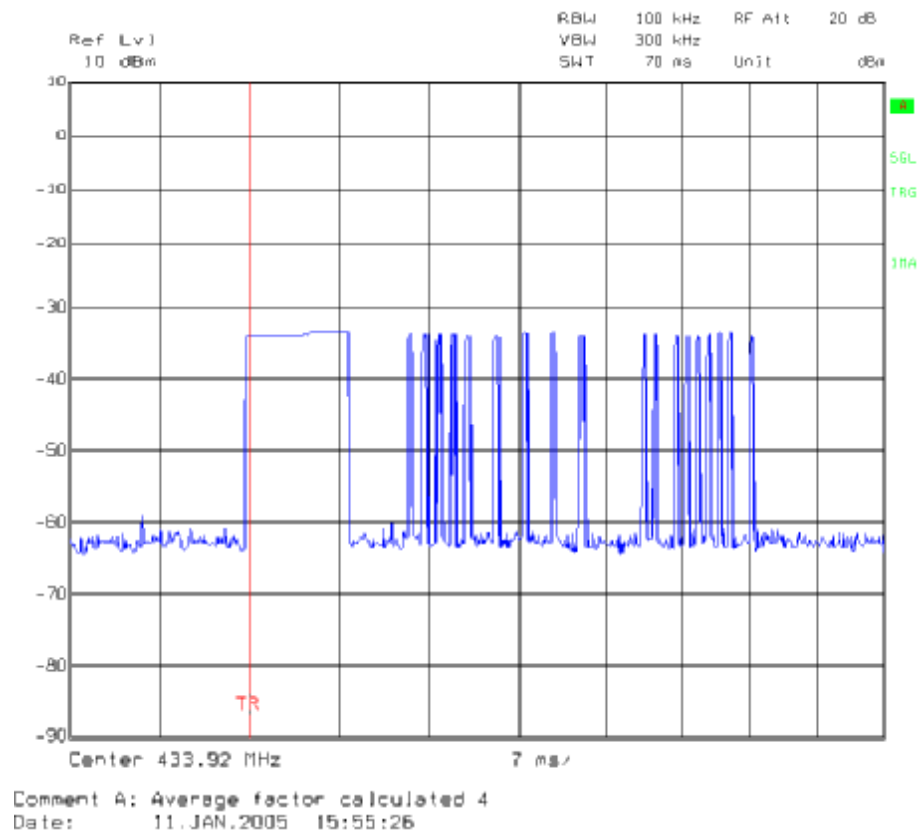
Please see the plot below.





Comment A: Average factor calculated 2
Date: 11.JAN.2005 14:51:20





4.5 Radiated emission test data FCC 15.231

4.5.1 Measurement results: Fundamental Radiated Emission Data

EUT : AV-R101

Test Condition : Tx at 433.92MHz

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Average Factor (dB)	Corrected Level (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)	Antenna high (cm)	Turn Table angle (degree)
433.500	PK	V	17.70	48.62	-13.70	52.62	80.80	-28.18	100.00	212.00
433.500	PK	H	17.70	49.17	-13.70	53.17	80.80	-27.63	100.00	60.00

Remark:

1. Corrected Level = Reading + Correction Factor + Average Factor

2. Correction Factor = Antenna Factor + Cable Loss

4.5.2 Measurement results: frequencies equal to or less than 1 GHz

EUT : AV-R101
Test Condition : Tx at 433.92MHz

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Average Factor (dB)	Corrected Level (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)	Antenna high (cm)	Turn Table angle (degree)
154.250	PK	V	14.76	3.72	-13.70	4.78	60.80	-56.02	283.08	40.81
282.510	PK	V	14.07	5.14	-13.70	5.51	46.00	-40.49	143.58	207.93
530.510	PK	V	19.36	3.31	-13.70	8.97	60.80	-51.83	112.73	263.71
672.180	PK	V	21.36	2.51	-13.70	10.17	60.80	-50.63	207.57	136.54
784.740	PK	V	23.61	3.88	-13.70	13.79	60.80	-47.01	144.90	5.93
906.870	PK	V	25.09	4.12	-13.70	15.51	60.80	-45.29	136.37	359.56
156.170	PK	H	14.76	3.31	-13.70	4.37	60.80	-56.43	159.02	14.53
315.270	PK	H	14.74	2.22	-13.70	3.26	60.80	-57.54	211.99	107.18
515.810	PK	H	18.80	5.17	-13.70	10.27	60.80	-50.53	167.41	277.34
594.710	PK	H	20.86	4.28	-13.70	11.44	60.80	-49.36	169.14	342.21
740.810	PK	H	23.39	3.31	-13.70	13.00	60.80	-47.80	273.94	200.98
866.420	PK	H	24.42	2.85	-13.70	13.57	60.80	-47.23	213.59	218.52

Remark:

1. Corrected Level = Reading + Correction Factor + Average Factor
2. Correction Factor = Antenna Factor + Cable Loss

4.5.3 Measurement results: frequencies above 1GHz

EUT : AV-R101

Test Condition : Tx at 433.92MHz

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp (dB)	Correction Factor (dB/m)	Reading (dBuV)	Average Factor (dB)	Corrected Level (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)	Antenna high (cm)	Turn Table angle (degree)
3772.500	PK	V	39.60	34.54	62.16	-13.70	43.40	54.00	-10.60	108.00	200.00
3772.900	PK	H	39.60	34.54	47.67	-13.70	28.91	54.00	-25.09	111.00	217.00

Remark:

1. Corrected Level = Reading + Correction Factor + Average Factor – Preamp
2. Correction Factor = Antenna Factor + Cable Loss
3. “*” means the emission within the restricted band meets the requirement of part 15.205. The corresponding limit as per 15.209.

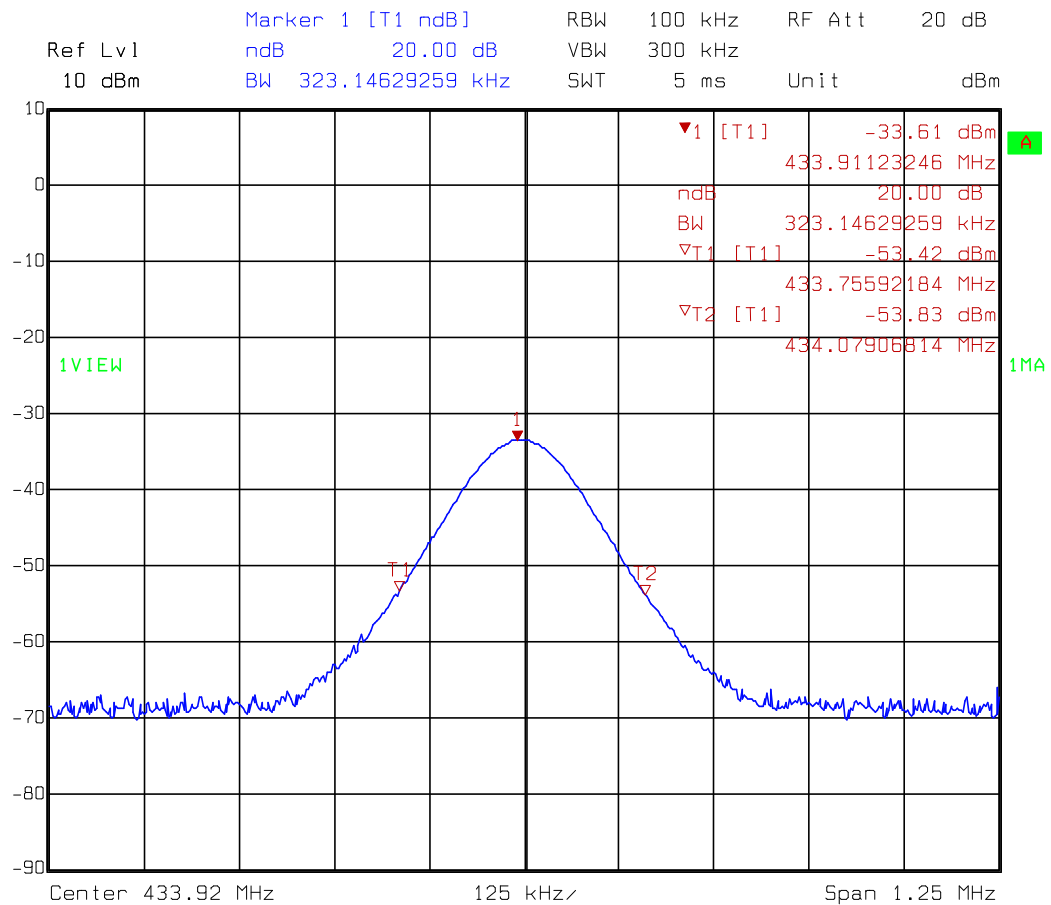
4.6 Measured bandwidth FCC 15.231(C)

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70MHz and below 900MHz. Bandwidth is determined at the points 20dB down from the modulated carrier.

$$B.W(20dBc) \text{ Limit} = 0.25\% \times f(\text{MHz}) = 0.25\% \times 433.92\text{MHz} = 1.0848\text{MHz}$$

From the plot, the bandwidth is observed to be 323kHz, at 20dBc where the bandwidth limit is 1.0848MHz.

Please see the plot below.



Comment A: 20dB Bandwidth

Date: 11.JAN.2005 16:12:19