

EMI TEST REPORT

Test report No. : EMC- FCC- 0107

Type of equipment : MP3 MUSIC PLAYER DIGITAL SOUND

Model No. : MR-100 M256

FCC ID. : RL4MR100

Applicant : MURO Co., Ltd.

Test standards : FCC part 15 subpart B, Class B
FCC part 15 subpart C, Class B

Test result : Complied

The above equipment was tested by EMC compliance Testing Laboratory for compliance with the requirements of FCC Rules and Regulations.

The results of testing in this report apply to the product/system which was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Date of test: 2003.11.11~11.17 Issued date: 2003 . 11.17

Tested by : J. S. Kim
Kim, Jung-Soo

Approved by: M. S. Chung
Chung, Min-Seok

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1. Client information

Applicant:

MURO Co., Ltd.

Address:

Hongha B/d 201, 878 Shinkil 7-Dong, Youngdungpo-Ku,
Seoul, Korea 157-057

Telephone number: 82-2-842-8052

Facsimile number: 82-2-843-8051

Contact person:

Manufacture:

MURO Co., Ltd.

Address:

Hongha B/d 201, 878 Shinkil 7-Dong, Youngdungpo-Ku,
Seoul, Korea 157-057

Telephone number: 82-2-842-8052

Facsimile number: 82-2-843-8051

2. Laboratory information

Address

EMC compliance Ltd.

82-1, JEIL-RI, YANGJI-MYUN, YOUNGIN-CITY, KYUNGGI-DO, KOREA

Telephone Number : 82 31 336 9919

Facsimile Number : 82 31 336 4767

FCC Filing No. : 793334

SITE MAP



82-1, JEIL-RI, YANGJI-MYUN, YOUNGIN-CITY, KYUNGGI-DO, KOREA

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3. TEST SYSTEM CONFIGURATION

3.1 Operation Environment

		Temperature	Humidity	Pressure
OATS	:	15°C	46 %	1011 hPa
Shield room	:	24°C	39 %	1011 hPa

Test site

These testing were performed following locations;

OATS (3m) : Radiated emission

Shield room : Conducted emission

3.2 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMI. The factors contributing to uncertainties are test receiver, Cable Loss, antenna factor calibration, Antenna directivity, antenna factor Variation with height, antenna phase center variation, antenna Frequency interpolation, measurement distance variation, Site imperfection, mismatching, and system repeatability.

Based on NIS 80, 81, the measurement uncertainty level with a 95% confidence level was applied.

3.3 Sample calculation

Conducted emission

The field strength is calculated by adding the LISN factor, cable loss to the measured reading.

The sample calculation is as follows :

$$FS = MR + LF + CL$$

MR = Meter Reading

LF = LISN Factor

CL = Cable Loss

If MR is 30dB, LISN Factor 1dB, CL 1dB

The result (FS) is

$$30 + 1 + 1 = 32\text{dBuV}$$

Radiated emission

The field strength is calculated adding the antenna Factor, cable loss and, Antenna pad adding, subtracting the amplifier gain from the measured reading.

The sample calculation is as follows :

$$FS = MR + AF + CL + AP - AG$$

MR = Meter Reading

AF = Antenna Factor

CL = Cable Loss

AP = Antenna Pad

AG=Amplifier Gain

If MR is 30dB, AF 12dB, CL 5dB, AP 10dB, AG 35dB

The result (MR) is

$$30 + 12 + 5 + 10 - 35 = 22\text{dBuV/m}$$

4. Description of EUT

4.1 Product Description

Manufactured by:	MURO Co., Ltd.
Address:	Hongha B/D 201, 878 Shinkil 7-Dong, Seoul, Korea 157-057
Type of equipment:	MP3+FM TRNASMITTER
Model:	MR-100
Serial number:	M1400-000910
Power source:	DC 1.2V (Ni-Mh rechargeable betttery)

4.2 Peripherals

Description	Model / Part #	Serial Number	Manufacture
PC	DIMENSION 4600	MY-0452RV-M0145-364-5258	DELL
Monitor	PN17LT	P225HVCT413264	SEC
Printer	EPSON STYLUS C60	DR5K014977	EPSON
Keyboard	KB-9963	B28AC0NGANB1DI	COMPAQ
PS/2 Mouse	M-S69	F466B0MN3NG1CI2	COMPAQ
Serial Mouse	SWW-23	N/A	A4Tech
Joystick	G-YD1	CCC93508076	DEXXA
Headset	C-322	N/A	LABTEC

4.3 Used cables

EUT Port	Type	Shield (Y/N)	Length (m)	Connection point 1	Connection point 2
VGA Out	D-sun	Y	1.8	PC	Monitor
Parallel	Parallel	Y	2.0		Printer
PS/2	PS/2	Y	1.8		Keyboard
PS/2	PS/2	Y	1.8		PS/2 Mouse
Serial	Serial	Y	1.7		Serial Mouse
Serial	Serial	N	2.0		Joystick
SPK,MIC	P-Jack	N	1.8		Headset
USB	USB	Y	1.35	EUT	PC
Line In	Line	N	0.65		PC
EAR	P-Jack	N	1.15		Earphone

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4.4 Operating conditions

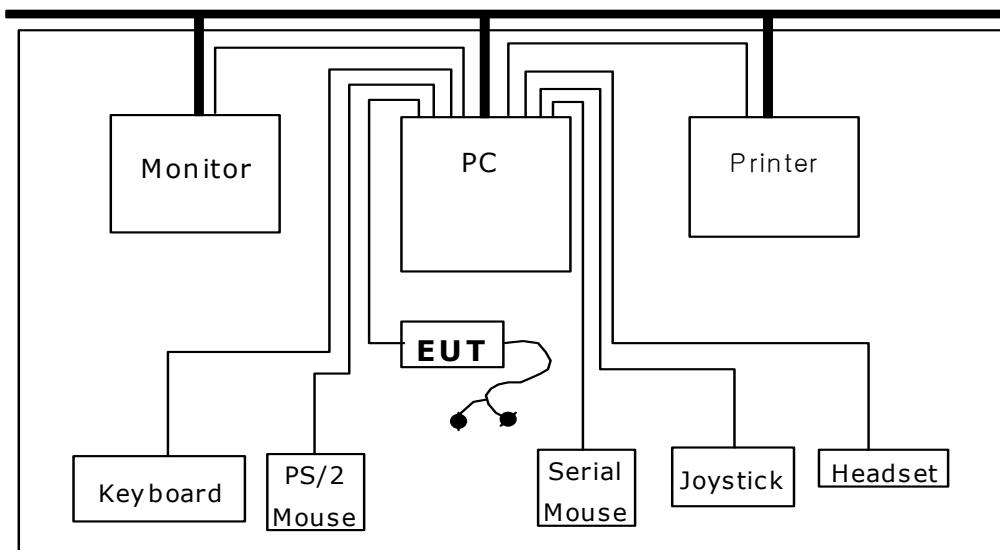
Operating : 1. File up/download mode via USB

2. FM transmitter mode
3. Line in REC (recording mode)
4. FM tuner mode.

- The system was configured in typical fashion (as a customer would normally use it) for testing.

- The test program used during radiated testing was designed to exercise the various system components in a manner similar to typical use.

4.5 EUT test configuration



5. Summary of test results

5.1 Modification to the E.U.T.

None

5.2 Standards & results

FCC Part 15 Subpart B (Class B) - ANSI C63.4 – 1992

FCC Part 15 Subpart C (Class B) - ANSI C63.4 – 1992

Test items	Test methods	Result
Radiated Electric Field emission	ANSI C63.4-1992	Pass
FM tuner	ANSI C63.4-1992	Pass
Intentional radiator 200kHz bandwidth	ANSI C63.4-1992	Pass
Intentional radiator field strength of radiation	ANSI C63.4-1992	Pass
Intentional radiator field strength of spurious	ANSI C63.4-1992	Pass

6. Test results

6.1 Conducted emission

6.1.1 Measurement procedure

The measurements were performed in a shielded room.

EUT was placed on a non-metallic table height of 0.8m above the reference ground plane.

The rear of table was located 0.4m to the vertical conducted plane.

Each EUT power lead, except ground (safety) lead, was individually connected through a LISN to input power source.

The power cord, hot and neutral, were measured.

6.1.2 Used equipments

Equipment	Model	Serial No.	Makers	Next Cal. Date	Used
Test receiver	ESHS 10	843276/003	R&S	04.03.25	<input checked="" type="checkbox"/>
L.I.S.N.	L3-32A	0120J20305	PMM	04.04.03	<input checked="" type="checkbox"/>
	ESH3-Z5	100207	R&S	04.06.17	<input checked="" type="checkbox"/>
Test site	Shield room	-	-	-	<input checked="" type="checkbox"/>

6.1.3 Measurement uncertainty

Conducted emission measurement : ± 2.1 (K=2)

6.1.4 Test data

[Test mode : Line in]

Frequency [MHz]	Correction Factor		Line	Quasi-peak			Average		
	LISN	Cable		Limit [dBuV]	Reading [dBuV]	Result [dBuV]	Limit [dBuV]	Reading [dBuV]	Result [dBuV]
0.150	0.06	0.2	L2	66.00	46.63	46.89	56.00	21.42	21.68
0.177	0.05	0.2	L1	64.63	41.70	41.95	54.63	36.33	36.58
0.234	0.05	0.2	L1	62.31	35.68	35.93	52.31	34.36	34.61
0.294	0.05	0.1	L1	60.41	35.87	36.02	50.41	34.37	34.52
0.474	0.06	0.3	L1	56.44	32.10	32.46	46.44	30.18	30.54
0.708	0.07	0.2	L1	56.00	32.23	32.50	46.00	29.54	29.81
1.299	0.09	0.3	L1		31.43	31.82		28.49	28.88
3.600	0.14	0.5	L2		30.23	30.87		25.34	25.98
15.350	0.45	0.5	L2	60.00	33.57	34.52	50.00	25.17	26.12
16.070	0.48	0.5	L1		37.14	38.12		27.19	28.17

[Test mode : USB(file up/download)]

Frequency [MHz]	Correction Factor		Line	Quasi-peak			Average		
	LISN	Cable		Limit [dBuV]	Reading [dBuV]	Result [dBuV]	Limit [dBuV]	Reading [dBuV]	Result [dBuV]
0.150	0.06	0.2	L2	66.00	46.57	46.83	56.00	21.95	22.21
0.177	0.05	0.2	L1	64.63	42.42	42.67	54.63	37.71	37.96
0.237	0.05	0.2	L1	62.20	36.54	36.79	52.20	34.95	35.20
0.294	0.05	0.1	L1	60.41	35.43	35.58	50.41	34.41	34.56
0.471	0.06	0.3	L1	56.50	30.44	30.80	46.50	29.57	29.93
1.830	0.09	0.4	L2	56.00	29.06	29.55	46.00	28.27	28.76
2.244	0.09	0.4	L2		30.01	30.50		29.07	29.56
3.540	0.14	0.5	L2		32.71	33.35		28.73	29.37
15.470	0.45	0.5	L1	60.	34.56	35.51	50.00	25.24	26.19
16.010	0.48	0.5	L2		37.83	38.81		27.04	28.02

- Note. QP = Quasi-Peak, AV= Average
- Loss = LISN Loss + Cable Loss
- Measurement time : 1 s

6.1.5 Result

Complied

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6.2 Radiated Electric Field Emission

6.2.1 Measurement procedure

The test was done at a 3m open area test site with a quasi-peak detector. EUT was placed on a non-metallic table height of 0.8m above the reference ground plane.

They were folded back and forth forming a bundle 0.3m to 0.4m long and were hanged at a 0.4m height to the ground plane.

Cables connected to EUT were fixed to cause maximum emission.

Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength.

6.2.2 Used equipments

Equipment	Model no.	Serial no.	Makers	Next cal date	Used
Test receiver	ESVS10	827864/006	R&S	04.05.13	<input checked="" type="checkbox"/>
Spectrum	E7401A	US39150191	Agilent	04.07.30	<input checked="" type="checkbox"/>
TRILOG Broadband Ant.	VULB 9160	3138	SCHWARZBECK	04.03.26	<input checked="" type="checkbox"/>
Antenna Mast	A109	N/A	DEAIL	.	<input checked="" type="checkbox"/>
Turn Table	TS14	N/A	DEAIL	.	<input checked="" type="checkbox"/>
10m OATS	-	-	EMC Compliance	-	<input checked="" type="checkbox"/>

6.2.3 Measurement uncertainty

Radiated Emission measurement : (K=2)

30-300 MHz ; 3 m: ±3.67, 10 m: ±4.4

300-1000 MHz ; 3 m: +4.6/-2.92, 10 m: +2.94/-2.88

6.2.4 Test data

[Test mode : EUT ONLY]

AUDIO

Frequency	Reading	Pol.	Height	angle	Correction		Limits	Result	Margin
					Factor				
[MHz]	[dBuV/m]		[m]		Antenna	Cable	[dBuV/m]	[dBuV/m]	[dB]
180.87	14.1	H	1.5	162	11.38	2.40	43.5	27.88	15.62
192.18	24.4	H	1.8	155	10.03	2.40	43.5	36.83	6.67
214.79	20.4	H	1.5	145	9.99	2.70	43.5	33.09	10.41

VOICE REC.

Frequency	Reading	Pol.	Height	angle	Correction		Limits	Result	Margin
					Factor				
[MHz]	[dBuV/m]		[m]		Antenna	Cable	[dBuV/m]	[dBuV/m]	[dB]
204.81	19.8	H	1.5	152	9.64	2.60	43.5	32.04	11.46
212.96	12.6	H	1.6	144	9.86	2.70	43.5	25.16	18.34

[Test mode : Connect PC]

LINE REC.

Frequency	Reading	Pol.	Height	angle	Correction		Limits	Result	Margin
					Factor				
[MHz]	[dBuV/m]		[m]		Antenna	Cable	[dBuV/m]	[dBuV/m]	[dB]
33.93	24.3	V	1.0	51	11.22	1.20	40.0	36.72	3.28
39.57	16.5	V	1.0	73	11.58	1.30	40.0	29.38	10.62
45.12	24.1	V	1.0	243	11.68	1.50	40.0	37.28	2.72
191.96	17.7	H	1.8	63	10.09	2.40	43.5	30.19	13.31
298.68	16.1	H	1.1	296	12.98	3.50	46.0	32.58	13.42
299.82	15.7	H	1.1	296	13.01	3.50	46.0	32.21	13.79
452.17	11.8	H	1.0	267	16.69	4.40	46.0	32.89	13.11
775.30	7.8	V	1.5	153	22.14	6.10	46.0	36.04	9.96

USB

Frequency	Reading	Pol.	Height	angle	Correction		Limits	Result	Margin
					Factor				
[MHz]	[dBuV/m]		[m]		Antenna	Cable	[dBuV/m]	[dBuV/m]	[dB]
36.12	13.5	V	1.0	60	11.30	1.30	40.0	26.10	13.90
48.24	14.9	V	1.0	360	11.58	1.50	40.0	27.98	12.02
196.90	28.2	H	1.7	95	9.78	2.50	43.5	40.48	3.02
206.75	25.4	H	1.7	262	9.97	2.60	43.5	37.97	5.54
474.00	6.0	H	1.0	103	17.12	4.50	46.0	27.62	18.38

[Test mode : FM Tuner]

Tuner Frequency	Local Oscillator	Frequency	Reading	Pol.	Angle	H	Correction		Limits	Result	Margin
							Factor				
[MHz]	[MHz]	[dBuV]				[m]	Ant.	Cable	[dBuV/m]	[dBuV/m]	[dBuV/m]
87.5	Fundamental										
	Harmonics	395.64	9.0	H	1.0	20	15.39	4.00	46.0	28.39	17.62
97.9	Fundamental										
	Harmonics	214.79	21.1	H	1.5	140	9.99	2.70	43.5	33.79	9.71
		327.83	9.8	H	1.0	59	13.75	3.70	46.0	27.25	18.75
107.9	Fundamental										
	Harmonics	474.79	3.0	H	1.0	302	17.12	4.50	46.0	24.62	21.38

* Receiving Antenna Mode : P= Polarization → POL H = Horizontal, POL V = Vertical

* IF Bandwidth : 120kHz

* Note : Reading = Test Receiver meter

* Result = Field Strength (Antenna factor + Cable factor + Reading)

6.2.5 Result

Complied

6.3 Intentional radiator 200kHz Bandwidth

6.3.1 Measurement procedure

The test was done at a 3m open area test site with a quasi-peak detector. EUT was placed on a non-metallic table height of 0.8m above the reference ground plane.

They were folded back and forth forming a bundle 0.3m to 0.4m long and were hanged at a 0.4m height to the ground plane.

Cables connected to EUT were fixed to cause maximum emission.

Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength.

6.3.2 Used equipments

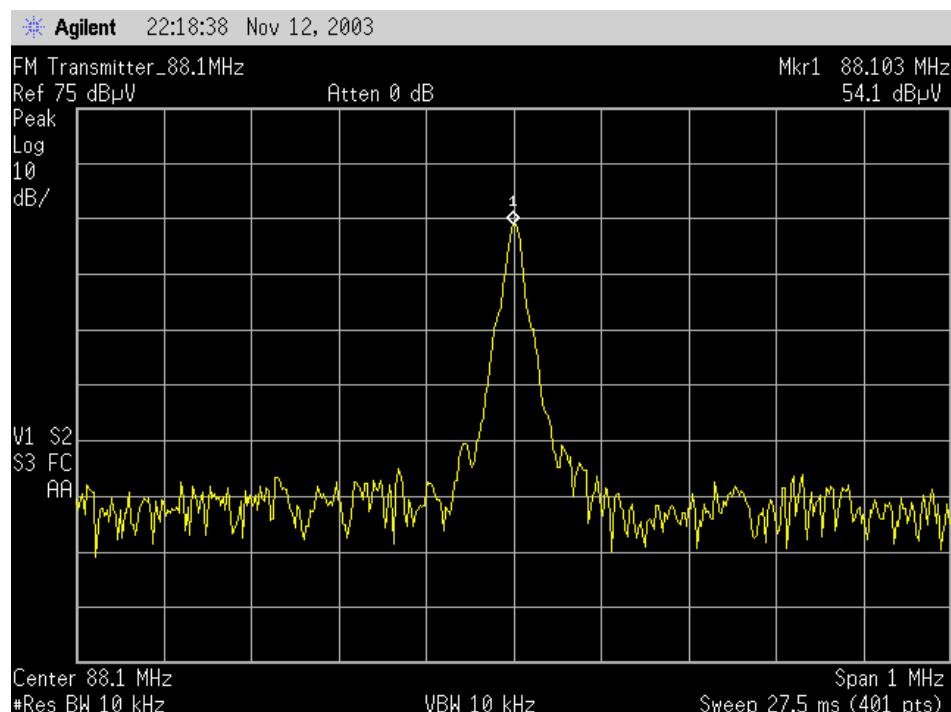
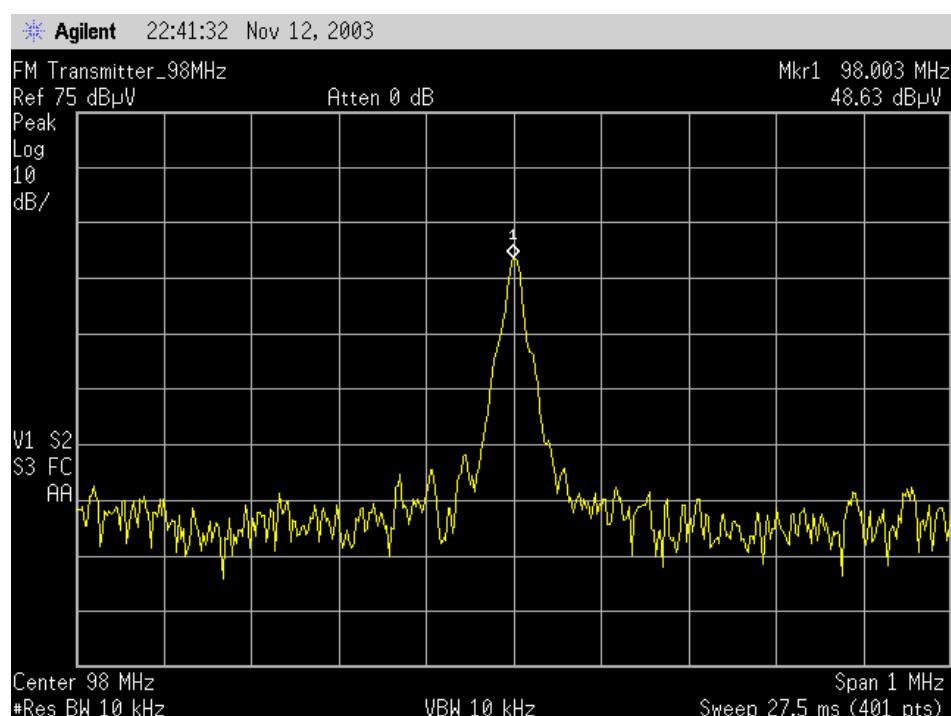
Equipment	Model no.	Serial no.	Makers	Next cal date	Used
Spectrum	E7401A	US39150191	Agilent	04.07.30	<input checked="" type="checkbox"/>
TRILOG Broadband Ant.	VULB 9160	3138	SCHWARZBECK	04.03.26	<input checked="" type="checkbox"/>
Antenna Mast	A109	N/A	DEAIL	.	<input checked="" type="checkbox"/>
Turn Table	TS14	N/A	DEAIL	.	<input checked="" type="checkbox"/>
3m OATS	-	-	EMC Compliance	-	<input checked="" type="checkbox"/>

6.3.3 Instrument Settings

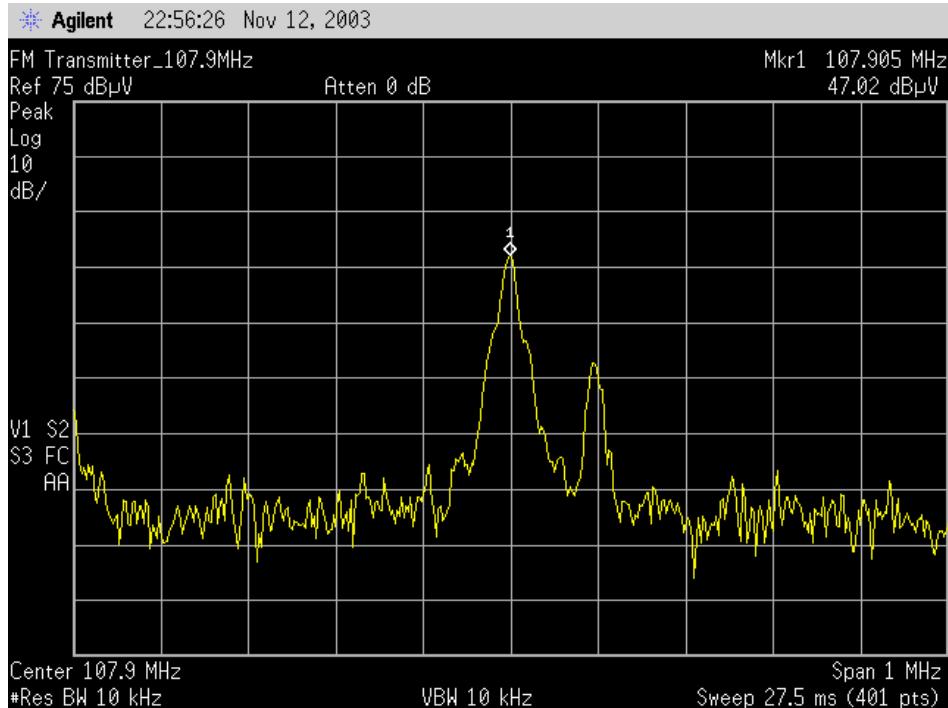
RES BW : 10 kHz

VBW : 10 kHz

6.3.4 Test data

[88.1MHz]**[98MHz]**

[107.9MHz]



6.3.5 Result

Complied

6.4 Intentional radiator Field Strength of Radiation

6.4.1 Measurement procedure

The test was done at a 3m open area test site with average detector.

EUT was placed on a non-metallic table height of 0.8m above the reference ground plane.

They were folded back and forth forming a bundle 0.3m to 0.4m long and were hanged at a 0.4m height to the ground plane.

Cables connected to EUT were fixed to cause maximum emission.

Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength.

6.4.2 Used equipments

Equipment	Model no.	Serial no.	Makers	Next cal date	Used
Test receiver	ESVS10	827864/006	R&S	04.05.13	<input checked="" type="checkbox"/>
Spectrum	E7401A	US39150191	Agilent	04.07.30	<input checked="" type="checkbox"/>
TRILOG Broadband Ant.	VULB 9160	3138	SCHWARZBECK	04.03.26	<input checked="" type="checkbox"/>
Antenna Mast	A109	N/A	DEAIL	.	<input checked="" type="checkbox"/>
Turn Table	TS14	N/A	DEAIL	.	<input checked="" type="checkbox"/>
3m OATS	-	-	EMC Compliance	-	<input checked="" type="checkbox"/>

6.4.3 Measurement uncertainty

Radiated Emission measurement : (K=2)

30-300 MHz ; 3 m: ±3.67, 10 m: ±4.4

300-1000 MHz ; 3 m:+4.6/-2.92, 10 m:+2.94/-2.88

6.4.4 Test data

[Average]

Frequency	Reading	Pol.	Height	angle	Correction		Limits	Result	Margin
					Antenna	Cable			
[MHz]	[dBuV/m]		[m]				[dBuV/m]	[dBuV/m]	[dB]
88.10	36.6	H	3.7	218	7.99	1.80	48.0	46.39	1.61
98.00	35.0	H	3.3	241	8.98	1.80	48.0	45.78	2.22
107.90	30.4	H	2.8	248	9.76	1.80	48.0	41.96	6.04

[Peak]

Frequency	Reading	Pol.	Height	angle	Correction		Limits	Result	Margin
					Antenna	Cable			
[MHz]	[dBuV/m]		[m]				[dBuV/m]	[dBuV/m]	[dB]
88.10	37.0	H	3.7	218	7.99	1.80	68.0	46.79	21.21
98.00	37.0	H	3.3	241	8.98	1.80	68.0	47.78	20.22
107.90	31.3	H	2.8	248	9.76	1.80	68.0	42.86	25.14

* Receiving Antenna Mode : P= Polarization → POL H = Horizontal, POL V = Vertical

* IF Bandwidth : 120kHz

* Result = Field Strength (Antenna factor + Cable factor + Reading)

6.4.5 Result

Complied

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6.5 Intentional radiator Field Strength of Spurious

6.5.1 Measurement procedure

The test was done at a 3m open area test site with a quasi-peak detector. EUT was placed on a non-metallic table height of 0.8m above the reference ground plane.

They were folded back and forth forming a bundle 0.3m to 0.4m long and were hanged at a 0.4m height to the ground plane.

Cables connected to EUT were fixed to cause maximum emission.

Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength.

6.5.2 Used equipments

Equipment	Model no.	Serial no.	Makers	Next cal date	Used
Test receiver	ESVS10	827864/006	R&S	04.05.13	<input checked="" type="checkbox"/>
Spectrum	E7401A	US39150191	Agilent	04.07.30	<input checked="" type="checkbox"/>
TRILOG Broadband Ant.	VULB 9160	3138	SCHWARZBECK	04.03.26	<input checked="" type="checkbox"/>
Antenna Mast	A109	N/A	DEAIL	.	<input checked="" type="checkbox"/>
Turn Table	TS14	N/A	DEAIL	.	<input checked="" type="checkbox"/>
3m OATS	-	-	EMC Compliance	-	<input checked="" type="checkbox"/>

6.5.3 Measurement uncertainty

Radiated Emission measurement : (K=2)

30-300 MHz ; 3 m: ±3.67, 10 m: ±4.4

300-1000 MHz ; 3 m: +4.6/-2.92, 10 m: +2.94/-2.88

6.5.4 Test data

Frequency	Reading	Pol.	Height	angle	Correction		Limits	Result	Margin
					Factor				
[MHz]	[dBuV/m]		[m]		Antenna	Cable	[dBuV/m]	[dBuV/m]	[dB]
176.02	13.6	H	2.1	348	11.73	2.40	43.5	27.73	15.77
192.17	25.1	H	1.8	156	10.03	2.40	43.5	37.53	5.97
305.22	11.7	H	1.0	61	13.17	3.50	46.0	28.37	17.64
531.25	13.0	H	3.0	256	17.99	4.90	46.0	35.89	10.11

* Receiving Antenna Mode : P= Polarization → POL H = Horizontal, POL V = Vertical

* IF Bandwidth : 120kHz

* Note : Reading = Test Receiver meter

* Result = Field Strength (Antenna factor + Cable factor + Reading)

6.5.5 Result

Complied