Certificate No.T-0464

S-CEM/EMCD/TR/2008-2009/157-2

EMI/EMC TEST REPORT FOR TORQUE MEASUREMENT SYSTEM MANUFACTURED BY M/s. HONEYWELL TECHNOLOGY SOLUTIONS (P) LTD., BANGALORE

SAMEER - CENTRE FOR ELECTROMAGNETICS
(An Institution Set-up by Ministry of Communications and Information Technology, Government of India),
2nd Cross Road, CIT Campus, Taramani, Chennai - 600 113.

July 2009

EMI/EMC TEST REPORT FOR TORQUE MEASUREMENT SYSTEM MANUFACTURED BY M/s. HONEYWELL TECHNOLOGY SOLUTIONS (P) LTD., BANGALORE

Test Request Particulars

01. Test request from	: M/s. Honeywell Technology solutions (P) Ltd., Bangalore
02. Equipment under test (EUT)	: Torque Measurement System
03. Number of test sample(s)	: One
04. Types of tests requested	: 1. Conducted Emission Test as per FCC part-15.207; 2004 2. Radiated Emission Test as per FCC part-15.209,223; 2004
05. Manufacturer	: M/s. Honeywell Technology solutions (P) Ltd., Bangalore
06. Model number of EUT	: TMS 9000-92011
07. Serial number of EUT	: Prototype
08. Test plan concurred by	: Mr. Vijay.Tippanna.Talikoti, Senior Engineer Honeywell Technology solutions (P) Ltd., Bangalore
09. EUT Arrived on	: July 16, 2009
10. Test date(s)	: July 16, 2009
11. Test Venue	: SAMEER-CEM, Chennai
12. Status of the EUT on receipt	: Functional

Certified that the data reported in this report are valid only for the test sample(s) mentioned above at the time of and under the stated conditions of measurement. Particulars on Manufacturer / Supplier, given in this report, are based on the information given by the customer, along with test request and SAMEER-CEM does not assume any responsibility for the correctness of that information for the above mentioned equipment under test.

Test Plan & Reviewed By:

(Sanjay Baisakhiya)
Scientist-D

Approved By:

(Dr. B. Subbarao)
Head, EMC Division

Office Seal

EMI/EMC TEST RESULTS AND SUMMARY FOR TORQUE MEASUREMENT SYSTEM

EMC EMISSION TESTS AND RESULTS

Name of the Test	Basic Standard	AC/DC/ Signal Port	Specification	Notes
Conducted Emission Test	FCC part-15.207	110V/ 60Hz Power Port	**Quasipeak Limit** **150kHz -500kHz :** 66 – 56 dBµV **500kHz -5MHz :** 56 – 60 dBµV **5MHz-30MHz :** 60 dBµV **Average limit** **150kHz -500kHz :** 59 – 46 dBµV **500kHz -5MHz :** 46 – 50 dBµV **5MHz-30MHz :** 50 dBµV	Within the limit
Radiated Emission Test	FCC part-15.209	Enclosure port	**Quasipeak Limit** **30 MHz -88MHz :** 40 dBµV/m **88 MHz -216 MHz :** 43.5 dBµV/m **216 MHz -960 MHz:** 46 dBµV/m **960 MHz- 1GHz :** 54 dBµV/m	Within the limit
Radiated Emission Test	FCC part-15.209	Enclosure port	**Average Limit** **1 MHz -30MHz :** 69.52dBµV/m	Within the limit
Radiated Emission Test	FCC part-15.223	Enclosure port	**Average Limit** **6.78MHz:** 63.52 dBµV/m	Within the limit

1. CONDUCTED EMISSION TEST

1.1 Applicable Standard: As per FCC part-15.207

1.2 Test Instrumentation:

Description	Make	Model Number	Serial Number	Calibration Due Date
EMI Receiver	R&S	ESIB 7	100319	14/02/2010
Line Impedance Stabilization Network (LISN)	R&S	ESH2 Z5	893606 / 023	19/11/2009
Transient Limiter	HP	11947A	3107A03845	31/10/2009

1.3 EUT Configuration:

The EUT is Torque Measurement System (Torque Measurement System) which is intended to be used in industrial applications. The EUT is a torque measurement system used to measure torque in Dynamo Meters and other applications. The measurement is based on strain gauge sensor and data transmission is wireless. During the test, the communication lines were not monitored (inactive). The EUT was energized by 110V/ 60Hz and made operational .

1.4 Test Frequency Range and Limits (Class B): As per FCC part-15.207

Frequency	Quasipeak Limits (dBµV)	Average Limits (dBµV)
150 kHz - 5 MHz	66-56	56-46
500 KHz - 5 MHz	56-60	46-50
5.0 MHz - 30 MHz	60	50

1.5 Test Procedure:

The RF Conducted Emissions from the EUT sent back to the mains input were coupled using a Line Impedance Stabilization Network and measured using an Electromagnetic Interference (EMI) receiver. The measurement was done initially in Peak & Average Detection Modes and wherever the emission was closer to the limit line in peak detection mode, Quasi Peak Detection Mode was employed. The measurement was carried out in the frequency range of 150 kHz to 30 MHz.

1.6 Test Observation:

The RF conducted emissions from the EUT was found to be within the limit in the above specified frequency range in both Line and Neutral.

1.7 Enclosed Documents:

Plots 1 – 2: Conducted Emissions from the EUT
Annexure – 1: Block Diagram of EUT & Photograph of EUT.
Annexure – 2: Conducted Emission Test Setup.

Test Conducted by:

(A.Albin)
Scientific Assistant-A

(A. Saravanan)
Project Assistant

2. RADIATED EMISSION TEST

2.1. Applicable Standards: As per FCC part-15.209, 223 Class B: 2004

2.2. Test Instrumentation:

Description	Make	Model Number	Serial Number	Calibration Due Date
EMI Receiver	R&S	ESIB 7	100319	14/02/2010
Biconilog Antenna	ETS	3142B	00026416	18/04/2010
Shielded Semi Anechoic Chamber	Siepel-Hyfral	---	F276	30/11/2009
Active loop antenna	EMCO	6507	1484	17/10/2009

2.3. Test Frequency Range & Limits(3m Distance):

FCC part-15.209:2004(Class B)

Frequency (MHz)	Limit (dBµV/m)
1-30	69.52
30 - 88	40.0
88 - 216	43.5
216-960	46.0
960 - 1000	54.0

FCC part-15.223:2004(Class B)

Frequency (MHz)	Limit (dBµV/m)
6.78	63.52

2.4. EUT Configuration:

The EUT is Torque Measurement System (Torque Measurement System) which is intended to be used in industrial applications. The EUT is a torque measurement system used to measure torque in Dynamo Meters and other applications. The measurement is based on strain gauge sensor and data transmission is wireless. During the test, the communication lines were not monitored (inactive). The EUT was energized by 110V/60Hz AC and made operational.

2.5. Test Procedure:

The Radiated Emission from the EUT in the frequency range of 1 MHz – 30 MHz and 30 MHz – 1000 MHz was picked up at a distance of 3 m using Active Loop antenna and Biconilog Antenna respectively. The measurement was carried out inside the shielded semi anechoic chamber. The EUT was rotated 0 to 360 degrees and the antenna height was varied from 1 to 4 meters to maximize the picked up emission in the frequency range 30 MHz – 1000 MHz The measurement was done in peak detection mode, in both vertical and horizontal polarization in the frequency range 30 MHz – 1000MHz The worst case emission and corresponding frequencies were noted and analyzed thoroughly in quasi-peak detection mode. The EUT was rotated 0 to 360 degrees to maximize the picked up emission in the frequency range 1 MHz – 30MHz The measurement was done in average detection mode, in both parallel and perpendicular position of the loop antenna in the frequency range 1 MHz – 30MHz

2.6. Test Observation:

FCC Part-15.209:2004(Class B)

Table -1: 30 MHz - 1000 MHz

Freq. (MHz)	Table Position (°)	Ant. Ht. (m)	Measured level in (dBµV) A	Antenna Factor (dB/m) B	Cable loss (dB) C	Total Emission (dBµV/m) E=A+B+C	Quasi-peak limit (dBµV/m) L	Delta Level (dB) D=L-E	Test Result
VERTICAL POLARIZATION									
150	105	1	20.84	9.52	1.05	31.41	43.50	12.09	Within the Limit
60.88	35	1.4	15.63	8.21	0.67	24.51	40.00	15.49	Within the Limit
350	175	1.4	21.54	16.00	1.58	39.12	46.00	6.88	Within the Limit
650	250	1	15.85	21.10	2.08	39.03	46.00	6.97	Within the Limit
400.04	260	1	14.18	17.28	1.66	33.12	46.00	12.88	Within the Limit
HORIZONTAL POLARIZATION									
350	85	1	28.27	16.00	1.58	45.85	46.00	0.15	Within the Limit
150	180	1.4	24.62	9.52	1.05	35.19	43.50	8.31	Within the Limit
311.88	100	1	22	14.85	1.51	38.35	46.00	7.65	Within the Limit
325.44	70	1	22.29	15.22	1.51	39.02	46.00	6.98	Within the Limit
339.04	80	1.05	20.46	15.48	1.55	37.49	46.00	8.51	Within the Limit
300	105	1	20.07	14.27	1.51	35.85	46.00	10.16	Within the Limit

FCC part-15.209:2004(Class B)

Table -2: 1 MHz - 30 MHz

Freq. (MHz)	Table Position (°)	Ant. Height (m)	Measured level in (dBµV) A	Antenna Factor (dB/m) B	Cable loss (dB) C	Total Emission (dBµV/m) E=A+B+C	Average limit (dBµV/m) L	Delta Level (dB) D=L-E	Test Result
PARALLEL POSITION									
6.78	240	1	36	17.22	0.23	53.44	69.52	16.08	Within the Limit
PERPENDICULAR POSITION									
6.78	195	1	30.52	17.22	0.23	47.96	69.52	21.56	Within the Limit
13.56	150	1	11.32	16.56	0.32	28.20	69.52	41.32	Within the Limit
27.12	80	1	10.67	15.76	0.46	26.89	69.52	42.63	Within the Limit

FCC part-15.223:2004(Class B)

Table-3: 6.78MHz

Freq. (MHz)	Table Post. (°)	Ant. Ht. (m)	Measured level in (dBµV) A	Ant. Factor (dB/m) B	Cable loss (dB) C	Total Emission (dBµV/m) E=A+B+C	Limit (dBµV/m) L	Delta Level (dB) D=L-E	Test Result
PARALLEL POSITION									
6.78	240	1	36	17.22	0.23	53.44	63.52	10.08	Within the Limit
PERPENDICULAR POSITION									
6.78	185	1	30.53	17.22	0.23	47.97	63.52	15.55	Within the Limit

7. Enclosed Documents:

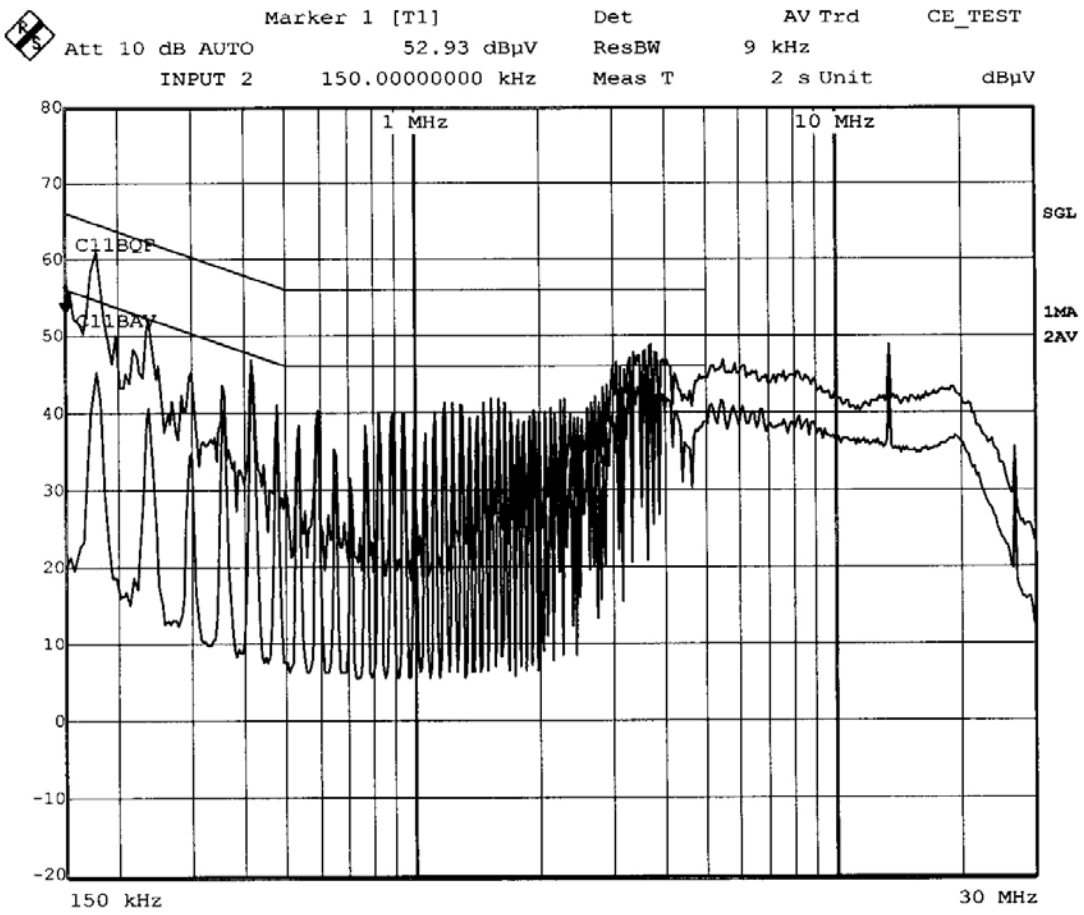
Plots 3- 6 show the Radiated Emission spectrum from EUT.
Annexure – 3 shows the Photograph of Radiated Emission Test Setup.

Test Conducted by:

(A.Albin)
Scientific Assistant-A

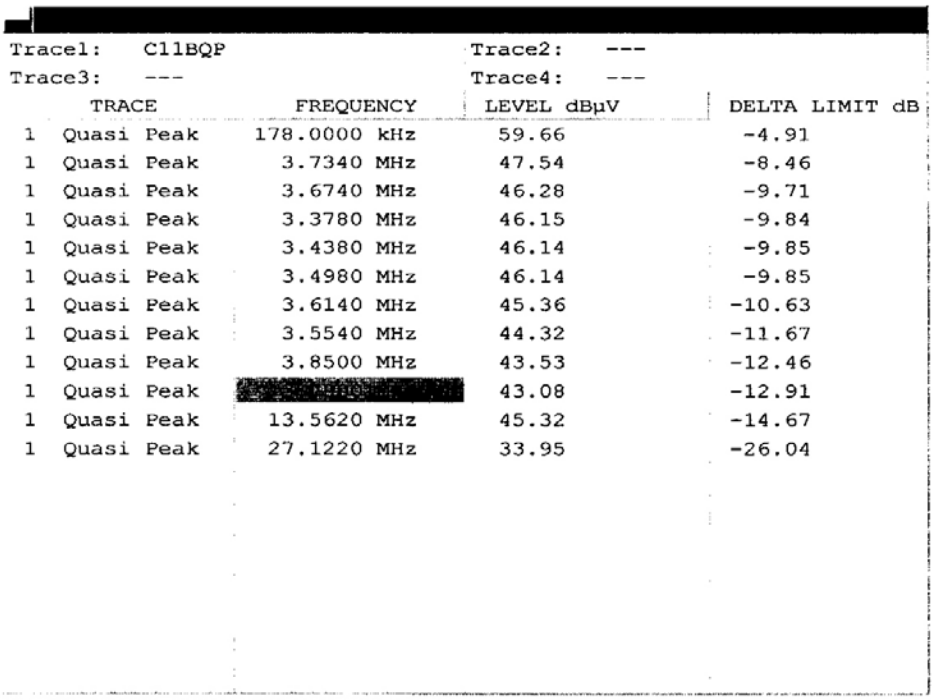
(A. Saravanan)
Project Assistant

PLOT-1



Title: CONDUCTED EMISSION TEST AS PER FCC PART 15 CLASS-B
Comment B: EUT:TORQUE MEASUREMENT SYSTEM,MODEL:TMS 9000(92011),MAKE:HONEYWELL,MEAS:LINE(SHIELDED CORD)
Date: 16.JUL.2009 11:47:02

PLOT-1A

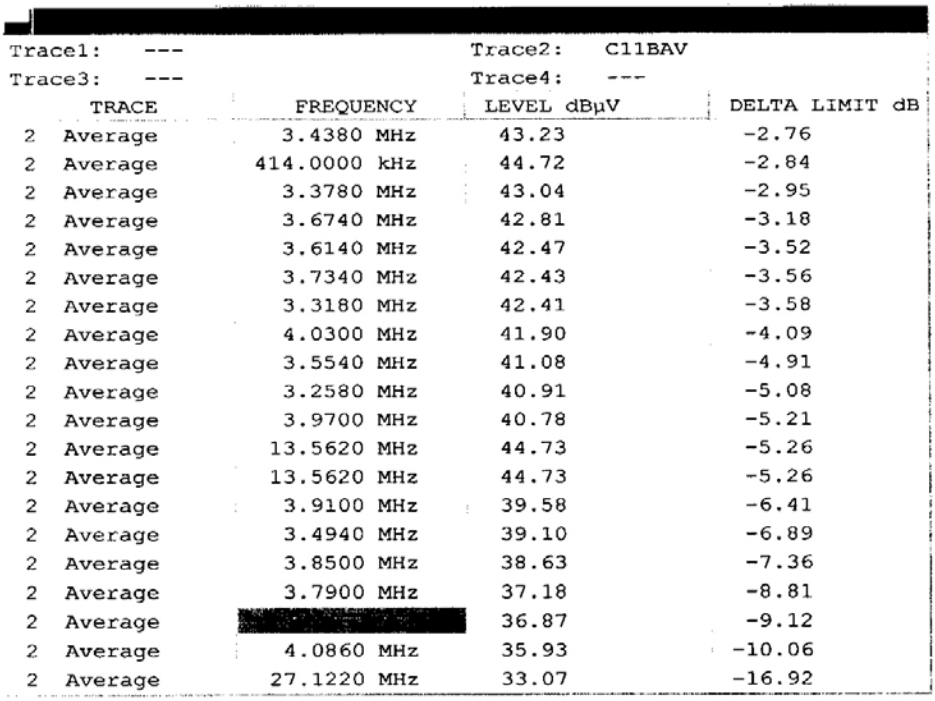


Trace1: C11BQP Trace2: ---
Trace3: --- Trace4: ---

TRACE		FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
1	Quasi Peak	178.0000 kHz	59.66	-4.91
1	Quasi Peak	3.7340 MHz	47.54	-8.46
1	Quasi Peak	3.6740 MHz	46.28	-9.71
1	Quasi Peak	3.3780 MHz	46.15	-9.84
1	Quasi Peak	3.4380 MHz	46.14	-9.85
1	Quasi Peak	3.4980 MHz	46.14	-9.85
1	Quasi Peak	3.6140 MHz	45.36	-10.63
1	Quasi Peak	3.5540 MHz	44.32	-11.67
1	Quasi Peak	3.8500 MHz	43.53	-12.46
1	Quasi Peak	[redacted]	43.08	-12.91
1	Quasi Peak	13.5620 MHz	45.32	-14.67
1	Quasi Peak	27.1220 MHz	33.95	-26.04

Title: CONDUCTED EMISSION TEST AS PER FCC PART 15 CLASS-B
Comment A: RE02 TEST AS PER MIL STD 461_C
Comment B: EUT:TORQUE MEASUREMENT SYSTEM,MODEL:TMS 9000(92011),MAKE:HONEYWELL,MEAS:LINE(SHIELDED CORD)
Date: 16.JUL.2009 11:49:07

PLOT-1B

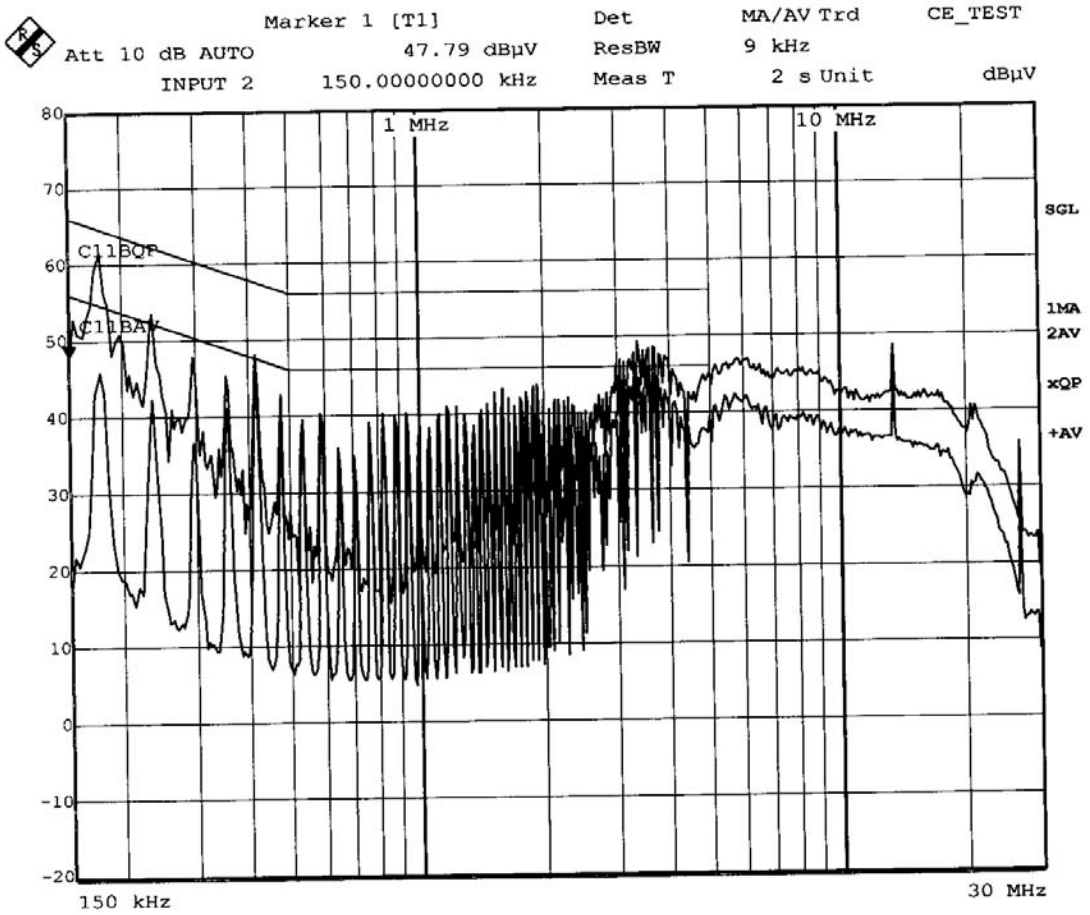


Trace1: --- Trace2: C11BAV
Trace3: --- Trace4: ---

TRACE		FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
2	Average	3.4380 MHz	43.23	-2.76
2	Average	414.0000 kHz	44.72	-2.84
2	Average	3.3780 MHz	43.04	-2.95
2	Average	3.6740 MHz	42.81	-3.18
2	Average	3.6140 MHz	42.47	-3.52
2	Average	3.7340 MHz	42.43	-3.56
2	Average	3.3180 MHz	42.41	-3.58
2	Average	4.0300 MHz	41.90	-4.09
2	Average	3.5540 MHz	41.08	-4.91
2	Average	3.2580 MHz	40.91	-5.08
2	Average	3.9700 MHz	40.78	-5.21
2	Average	13.5620 MHz	44.73	-5.26
2	Average	13.5620 MHz	44.73	-5.26
2	Average	3.9100 MHz	39.58	-6.41
2	Average	3.4940 MHz	39.10	-6.89
2	Average	3.8500 MHz	38.63	-7.36
2	Average	3.7900 MHz	37.18	-8.81
2	Average	[redacted]	36.87	-9.12
2	Average	4.0860 MHz	35.93	-10.06
2	Average	27.1220 MHz	33.07	-16.92

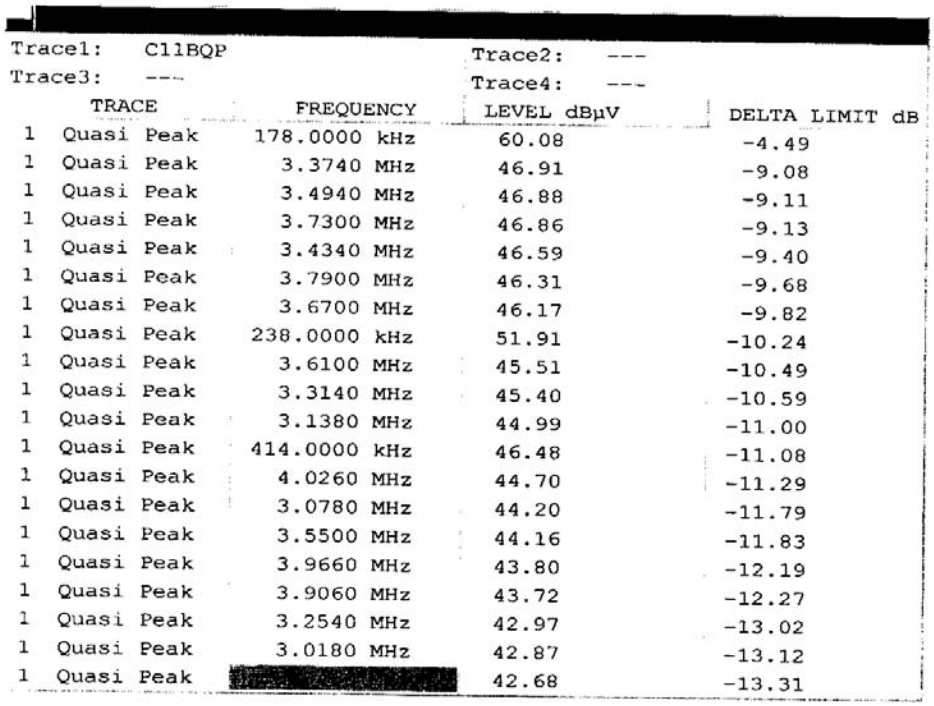
Title: CONDUCTED EMISSION TEST AS PER FCC PART 15 CLASS-B
Comment A: RE02 TEST AS PER MIL STD 461_C
Comment B: EUT:TORQUE MEASUREMENT SYSTEM,MODEL:TMS 9000(92011),MAKE:HONEYWELL,MEAS:LINE(SHIELDED CORD)
Date: 16.JUL.2009 11:50:01

PLOT-2



Title: CONDUCTED EMISSION TEST AS PER FCC PART 15 CLASS-B
Comment B: EUT:TORQUE MEASUREMENT SYSTEM,MODEL:TMS 9000(92011),MAKE:HONEYWELL,MEAS:NEUTRAL(SHIELDED CORD)
Date: 16.JUL.2009 11:40:12

PLOT-2A

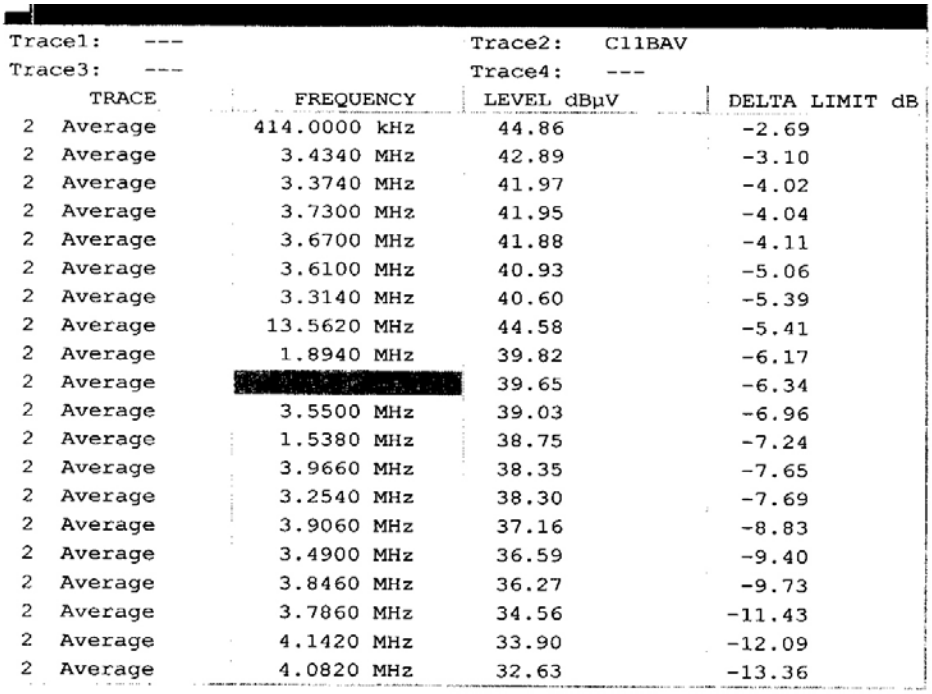


Trace1: C11BQP Trace2: ---
Trace3: --- Trace4: ---

	TRACE	FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
1	Quasi Peak	178.0000 kHz	60.08	-4.49
1	Quasi Peak	3.3740 MHz	46.91	-9.08
1	Quasi Peak	3.4940 MHz	46.88	-9.11
1	Quasi Peak	3.7300 MHz	46.86	-9.13
1	Quasi Peak	3.4340 MHz	46.59	-9.40
1	Quasi Peak	3.7900 MHz	46.31	-9.68
1	Quasi Peak	3.6700 MHz	46.17	-9.82
1	Quasi Peak	238.0000 kHz	51.91	-10.24
1	Quasi Peak	3.6100 MHz	45.51	-10.49
1	Quasi Peak	3.3140 MHz	45.40	-10.59
1	Quasi Peak	3.1380 MHz	44.99	-11.00
1	Quasi Peak	414.0000 kHz	46.48	-11.08
1	Quasi Peak	4.0260 MHz	44.70	-11.29
1	Quasi Peak	3.0780 MHz	44.20	-11.79
1	Quasi Peak	3.5500 MHz	44.16	-11.83
1	Quasi Peak	3.9660 MHz	43.80	-12.19
1	Quasi Peak	3.9060 MHz	43.72	-12.27
1	Quasi Peak	3.2540 MHz	42.97	-13.02
1	Quasi Peak	3.0180 MHz	42.87	-13.12
1	Quasi Peak	[redacted]	42.68	-13.31

Title: CONDUCTED EMISSION TEST AS PER FCC PART 15 CLASS-B
Comment A: RE02 TEST AS PER MIL STD 461_C
Comment B: EUT:TORQUE MEASUREMENT SYSTEM,MODEL:TMS 9000(92011),MAKE:HONEYWELL,MEAS:NEUTRAL(SHIELDED CORD)
Date: 16.JUL.2009 11:41:44

PLOT-2B

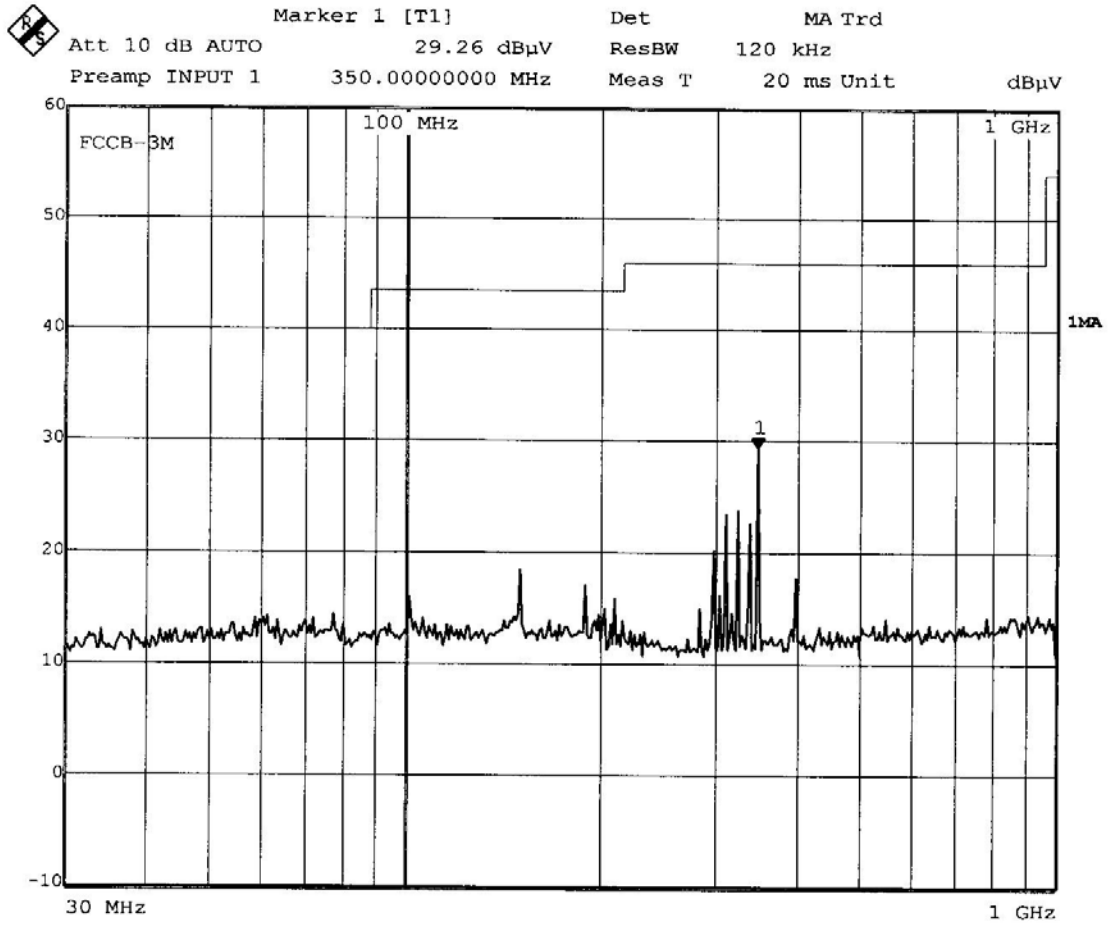


Trace1: --- Trace2: C11BAV
Trace3: --- Trace4: ---

TRACE		FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
2	Average	414.0000 kHz	44.86	-2.69
2	Average	3.4340 MHz	42.89	-3.10
2	Average	3.3740 MHz	41.97	-4.02
2	Average	3.7300 MHz	41.95	-4.04
2	Average	3.6700 MHz	41.88	-4.11
2	Average	3.6100 MHz	40.93	-5.06
2	Average	3.3140 MHz	40.60	-5.39
2	Average	13.5620 MHz	44.58	-5.41
2	Average	1.8940 MHz	39.82	-6.17
2	Average	[redacted]	39.65	-6.34
2	Average	3.5500 MHz	39.03	-6.96
2	Average	1.5380 MHz	38.75	-7.24
2	Average	3.9660 MHz	38.35	-7.65
2	Average	3.2540 MHz	38.30	-7.69
2	Average	3.9060 MHz	37.16	-8.83
2	Average	3.4900 MHz	36.59	-9.40
2	Average	3.8460 MHz	36.27	-9.73
2	Average	3.7860 MHz	34.56	-11.43
2	Average	4.1420 MHz	33.90	-12.09
2	Average	4.0820 MHz	32.63	-13.36

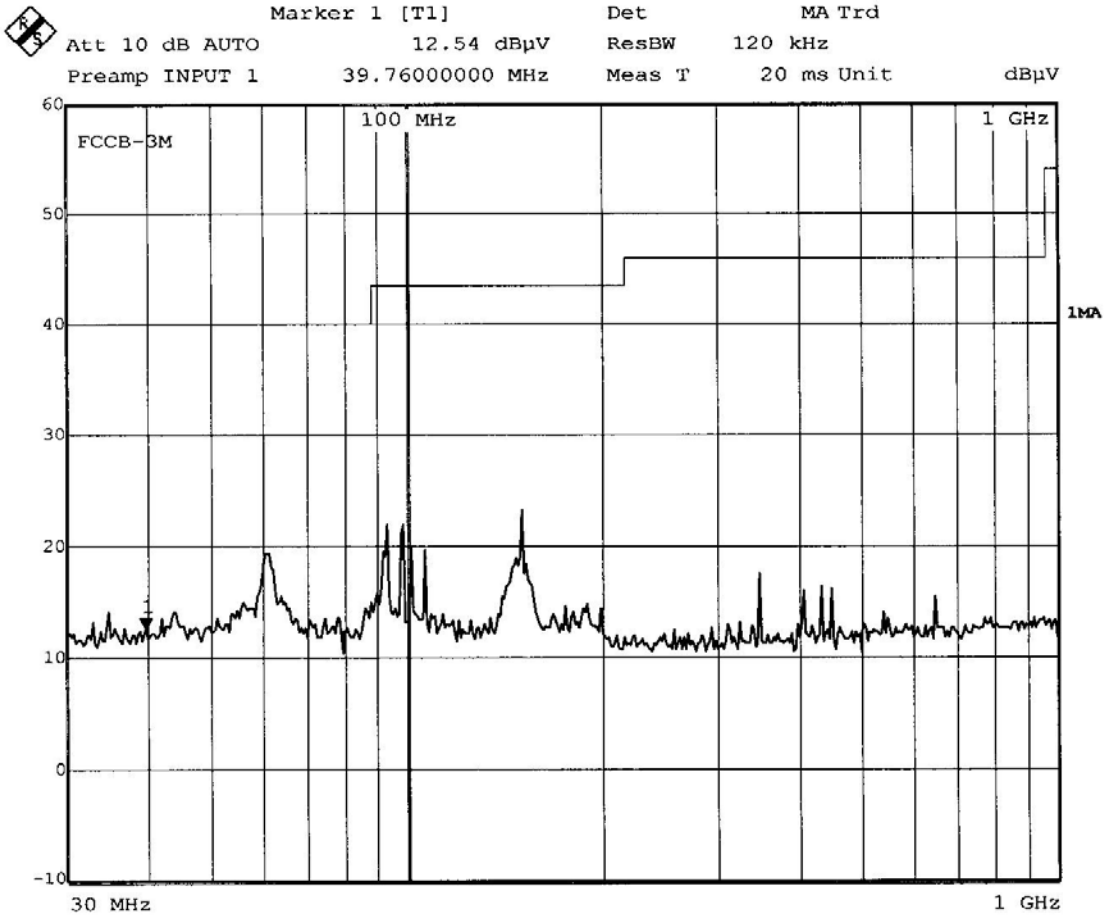
Title: CONDUCTED EMISSION TEST AS PER FCC PART 15 CLASS-B
Comment A: RE02 TEST AS PER MIL STD 461_C
Comment B: EUT:TORQUE MEASUREMENT SYSTEM,MODEL:TMS 9000(92011),MAKE:HONEYWELL,MEAS:NEUTRAL(SHIELDED CORD)
Date: 16.JUL.2009 11:43:00

PLOT-3



Note: The plot shows only the emission pattern from the EUT with peak detector and the values in the plot are not maximized emission as required by standard. For maximized emission please refer table

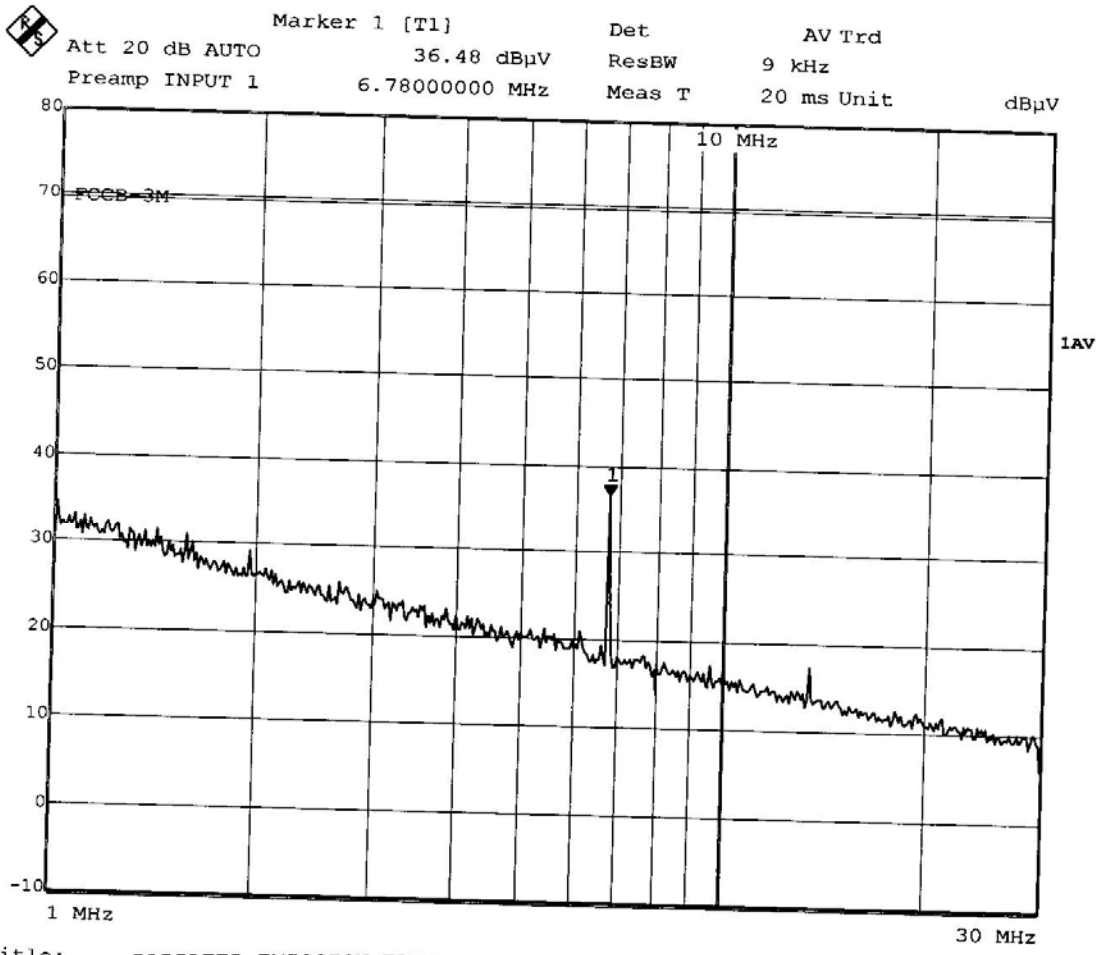
PLOT-4



Title: RADIATED EMISSION TEST AS PER FCC PART 15 CLASS-B
Comment B: EUT:TORQUE MEASUREMENT SYSTEM,MODEL:TMS 9000(92011),MAKE:HONEYWELL,POS:105°,ANT Ht:1m,POL:VER(SHIELDED CORD)
Date: 16.JUL.2009 13:49:52

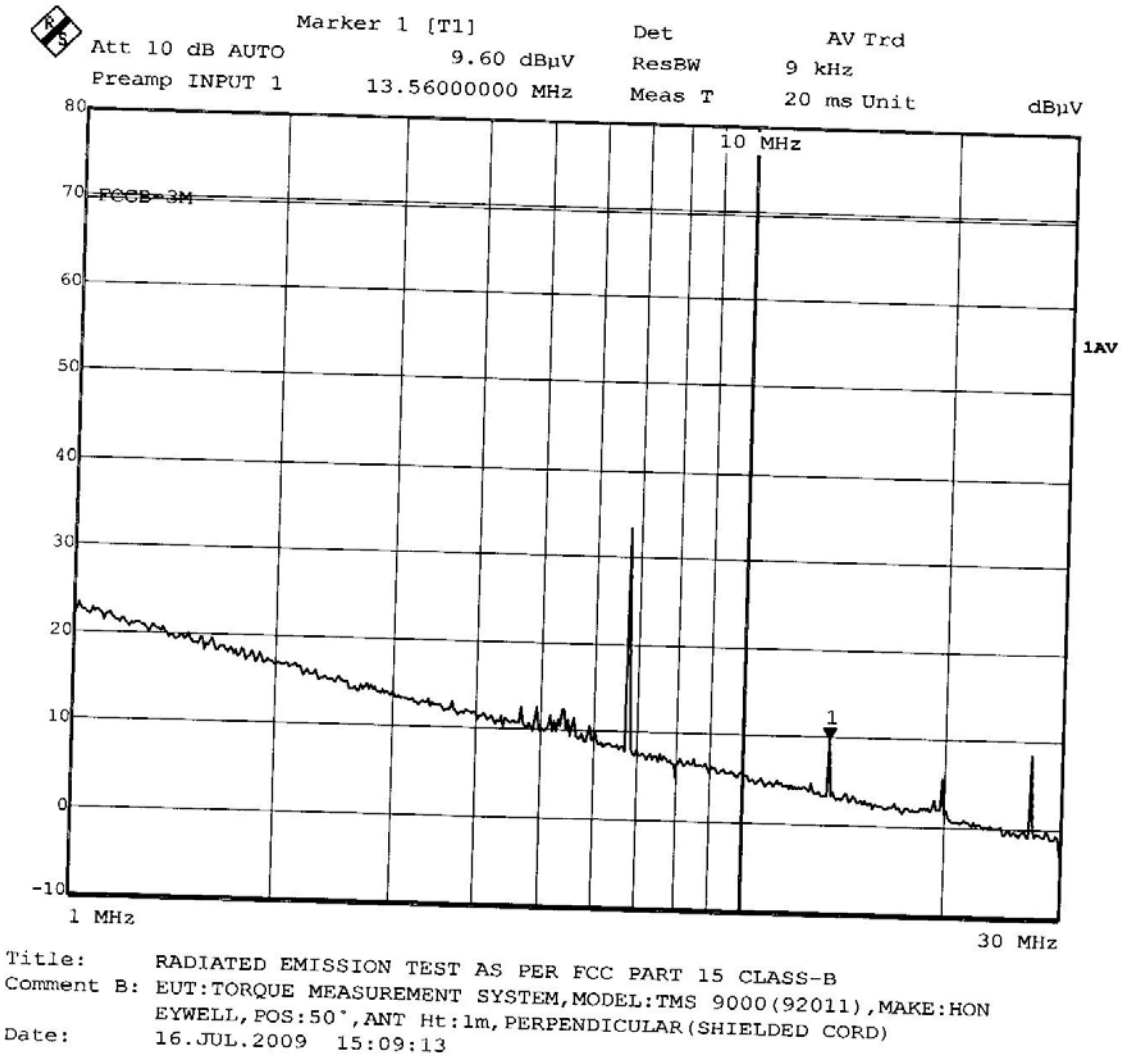
Note: The plot shows only the emission pattern from the EUT with peak detector and the values in the plot are not maximized emission as required by standard. For maximized emission please refer table

PLOT-5



Note: The plot shows only the emission pattern from the EUT with peak detector and the values in the plot are not maximized emission as required by standard. For maximized emission please refer table

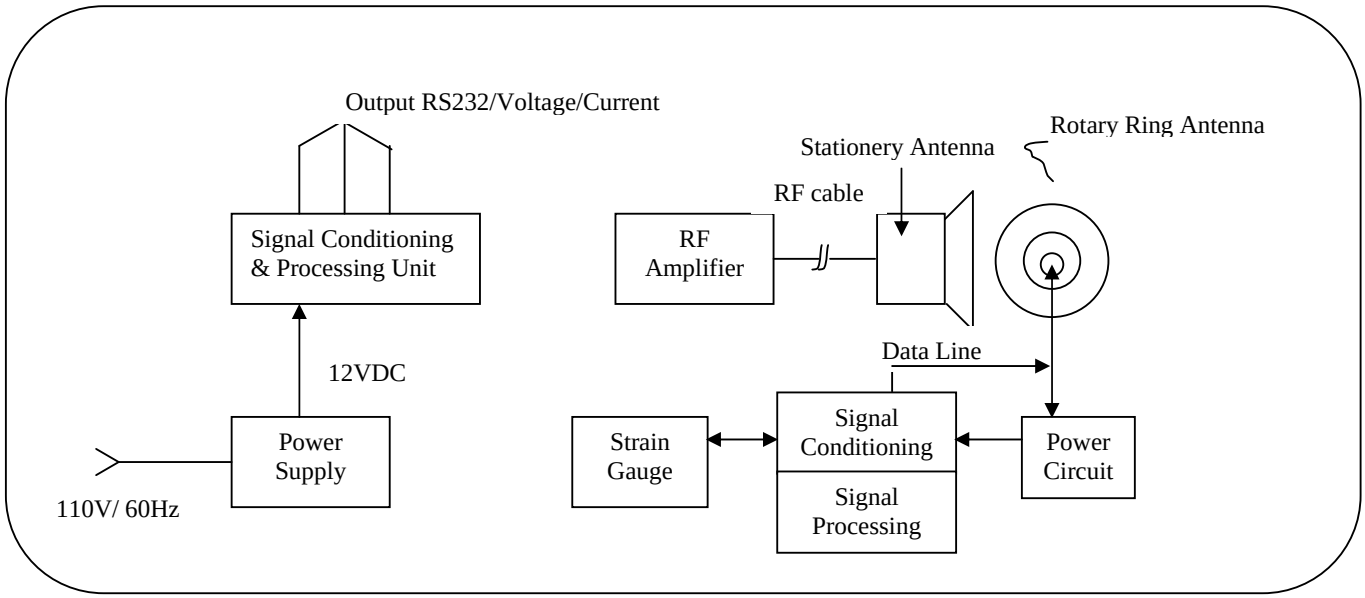
PLOT-6

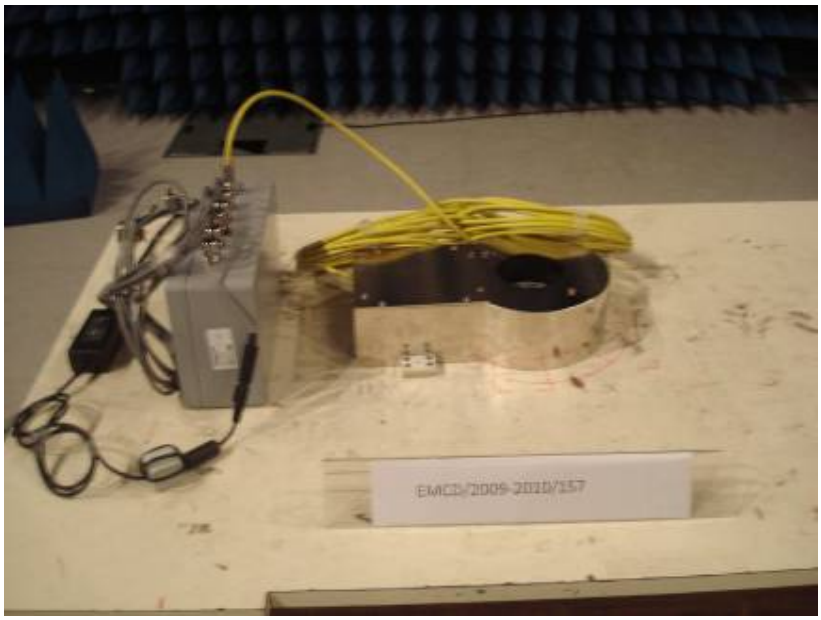


Note: The plot shows only the emission pattern from the EUT with peak detector and the values in the plot are not maximized emission as required by standard. For maximized emission please refer table

Annexure - 1

EUT Configuration





Photograph of EUT

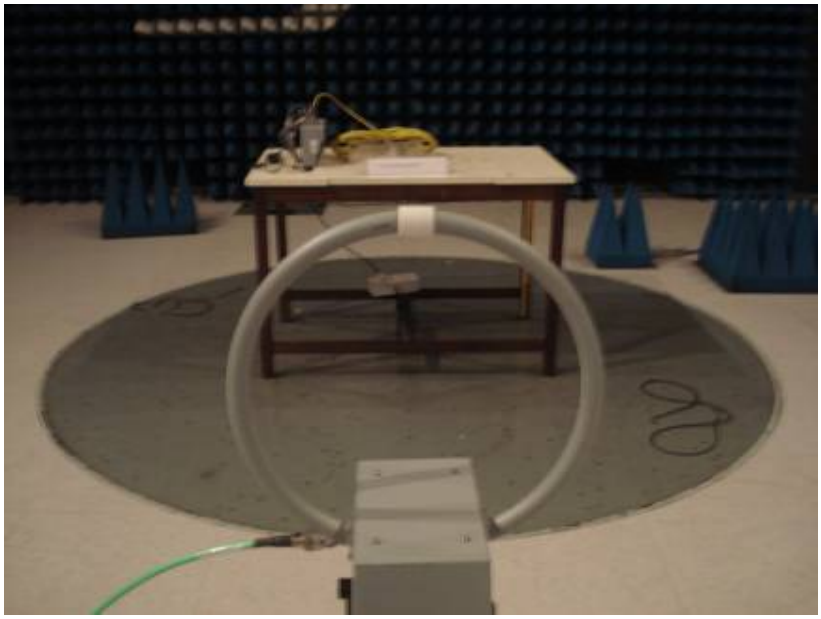
Annexure – 2

Conducted Emission Test Setup

Annexure – 3

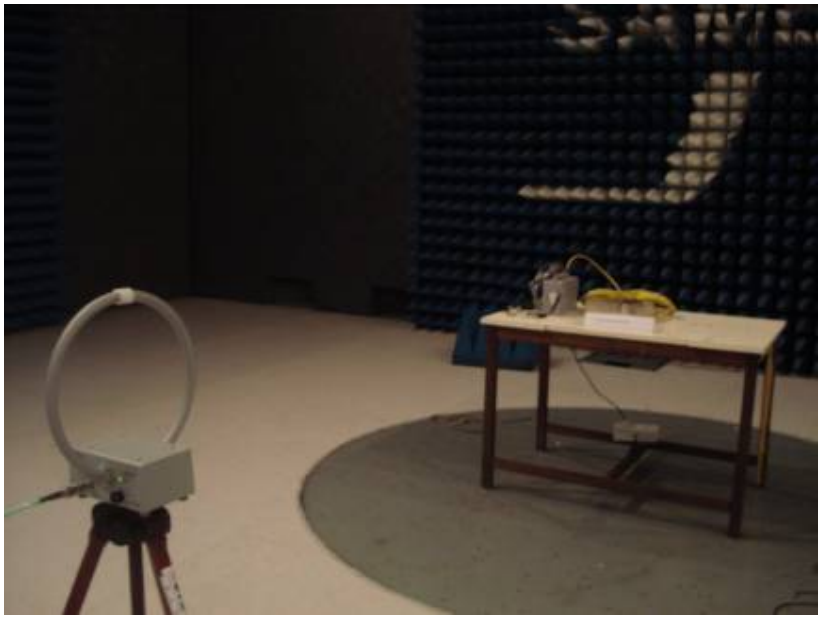
Radiated Emission Test Setup

Annexure -3A



Radiated Emission Test Setup (Parallel)

Annexure – 3B



Radiated Emission Test Setup (Perpendicular)