

S-CEM/EMCD/TR/2008-2009/157-1

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

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2nd Cross Road, CIT Campus, Taramani, Chennai - 600 113.

July 2009

**EMI/EMC TEST REPORT FOR TORQUE MEASUREMENT SYSTEM
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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 9000-92016

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	<u>Quasipeak Limit</u> 150kHz -500kHz : 66 – 56 dB μ V 500kHz -5MHz : 56 – 60 dB μ V 5MHz-30MHz : 60 dB μ V <u>Average limit</u> 150kHz -500kHz : 59 – 46 dB μ V 500kHz -5MHz : 46 – 50 dB μ V 5MHz-30MHz : 50 dB μ V	Within the limit
Radiated Emission Test	FCC part-15.209	Enclosure port	<u>Quasipeak Limit</u> 30 MHz -88MHz : 40 dB μ V/m 88 MHz -216 MHz : 43.5 dB μ V/m 216 MHz -960 MHz : 46 dB μ V/m 960 MHz- 1GHz : 54 dB μ V/m	Within the limit
Radiated Emission Test	FCC part-15.209	Enclosure port	<u>Average Limit</u> 1 MHz -30MHz : 69.52dB μ V/m	Within the limit
Radiated Emission Test	FCC part-15.223	Enclosure port	<u>Average Limit</u> 6.78MHz : 63.52 dB μ V/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 AC and made operational.

1.4 Test Frequency Range and Limits: As per FCC part-15.207

Frequency	Quasi-peak Limits (dB μ V)	Average Limits (dB μ V)
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 (dB μ V/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 (dB μ V/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 – 1000 MHz. 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 – 30 MHz. The measurement was done in average detection mode, in both parallel and perpendicular position of the loop antenna in the frequency range 1 MHz – 30 MHz.



Equipment Under Test : Torque Measurement System
 Model Number of EUT : TMS 9000-92016
 Serial Number of EUT : Prototype
 Manufacturer by : M/s. Honeywell Technology solutions (P) Ltd., Bangalore



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 (dB μ V) A	Antenna Factor (dB/m) B	Cable loss (dB) C	Total Emission (dB μ V/m) E=A+B+C	Limit (dB μ V/m) L	Delta Level (dB) D=L-E	Test Result
VERTICAL POLARIZATION									
650	340	1	18.41	21.10	2.08	41.59	46.00	4.41	Within the Limit
150	270	1	18.65	9.52	1.05	29.22	43.50	14.28	Within the Limit
359.36	165	2.7	22.6	16.06	1.60	40.26	46.00	5.74	Within the Limit
350	315	1.3	16.58	16.00	1.58	34.16	46.00	11.84	Within the Limit
372.92	0	2.9	16.26	16.61	1.63	34.51	46.00	11.49	Within the Limit
HORIZONTAL POLARIZATION									
350	110	1	28.21	16.00	1.58	45.79	46.00	0.21	Within the Limit
359.36	105	1	26.43	16.06	1.60	44.09	46.00	1.91	Within the Limit
150	270	1.4	26.23	9.52	1.05	36.80	43.50	6.70	Within the Limit
372.92	100	1	23.48	16.61	1.63	41.73	46.00	4.27	Within the Limit
400	165	1	21.63	17.28	1.66	40.57	46.00	5.43	Within the Limit
300	270	1	19.92	14.27	1.51	35.70	46.00	10.31	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 (dB μ V) A	Antenna Factor (dB/m) B	Cable loss (dB) C	Total Emission (dB μ V/m) E=A+B+C	Average limit (dB μ V/m) L	Delta Level (dB) D=L-E	Test Result
PARALLEL POSITION									
6.78	250	1	43.58	17.22	0.23	61.02	69.52	8.50	Within the Limit
13.56	20	1	20.5	16.56	0.32	37.38	69.52	32.14	Within the Limit
27.12	360	1	10.37	15.76	0.46	26.59	69.52	42.93	Within the Limit
PERPENDICULAR POSITION									
6.78	160	1	40.87	17.22	0.23	58.31	69.52	11.21	Within the Limit
13.56	100	1	25.18	16.56	0.32	42.06	69.52	27.46	Within the Limit
27.12	70	1	15.33	15.76	0.46	31.55	69.52	37.97	Within the Limit



Equipment Under Test : Torque Measurement System
 Model Number of EUT : TMS 9000-92016
 Serial Number of EUT : Prototype
 Manufacturer by : M/s. Honeywell Technology solutions (P) Ltd., Bangalore



FCC part-15.223:2004(Class B)

Table – 3: 6.78MHz

Freq. (MHz)	Table Post. (°)	Ant. Ht. (m)	Measured level in (dB μ V) A	Ant. Factor (dB/m) B	Cable loss (dB) C	Total Emission (dB μ V/m) E=A+B+C	Limit (dB μ V/m) L	Delta Level (dB) D=L-E	Test Result
PARALLEL POSITION									
6.78	260	1	43.54	17.22	0.23	60.98	63.52	2.54	Within the Limit
PERPENDICULAR POSITION									
6.78	170	1	40.82	17.22	0.23	58.26	63.52	5.26	Within the Limit

7. Enclosed Documents:

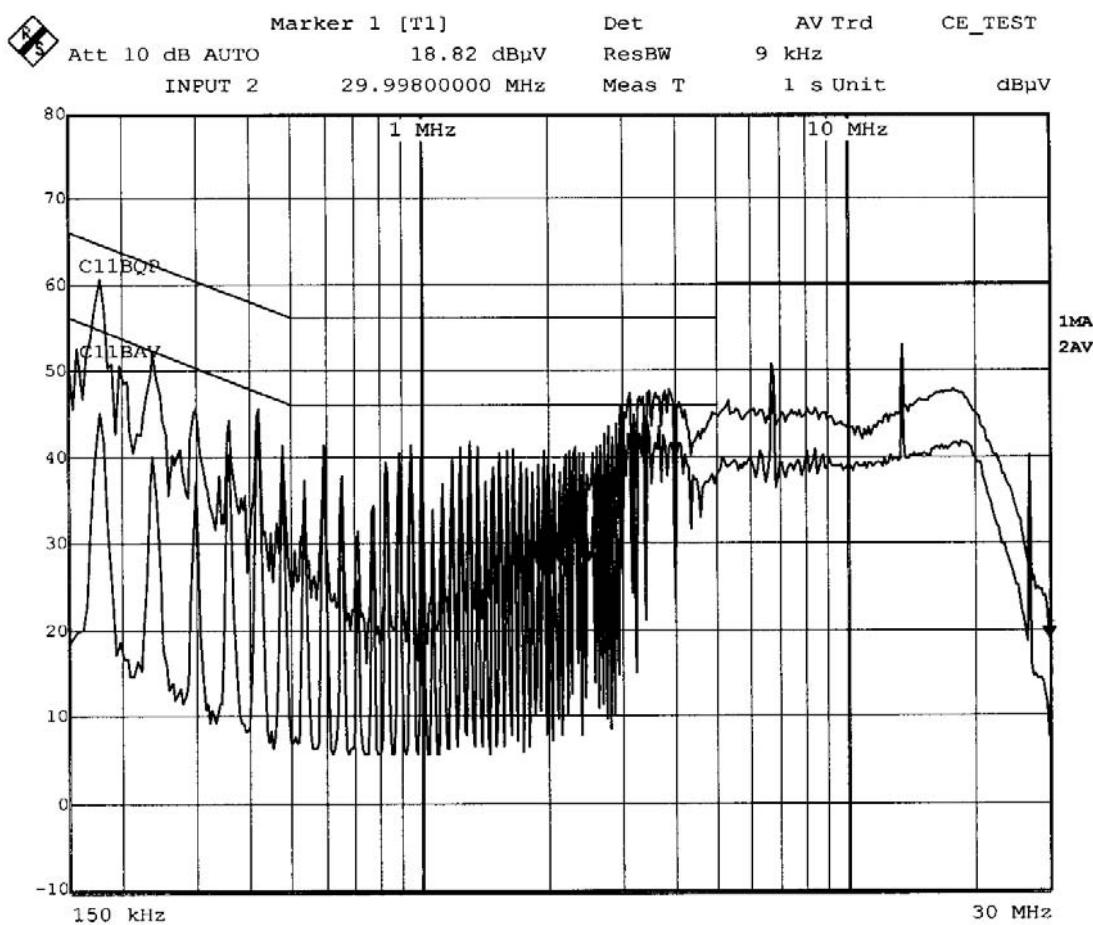
Plots 3- 6 : Radiated Emission spectrum from EUT.
 Annexure – 3 : Photograph of Radiated Emission Test Setup.

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(92016),MAKE:HONEYWELL,MEAS:LINE (SHIELDED CORD)
Date: 16.JUL.2009 18:05:03



Equipment Under Test : Torque Measurement System
Model Number of EUT : TMS 9000-92016
Serial Number of EUT : Prototype
Manufacturer by : M/s. Honeywell Technology solutions (P) Ltd., Bangalore



PLOT-1A

Trace1:	C11BQP	Trace2:	---
Trace3:	---	Trace4:	---
TRACE	FREQUENCY	LEVEL dB _μ V	DELTA LIMIT dB
1	Quasi Peak	59.79	-4.78
1	Quasi Peak	13.5620 MHz	52.92
1	Quasi Peak	3.1500 MHz	42.93
1	Quasi Peak	3.5060 MHz	42.11
1	Quasi Peak	3.4460 MHz	41.51
1	Quasi Peak	3.8620 MHz	41.14
1	Quasi Peak	3.9220 MHz	40.97
1	Quasi Peak	3.8020 MHz	40.04
1	Quasi Peak	3.7420 MHz	38.56
1	Quasi Peak	3.6220 MHz	37.00

Title: CONDUCTED EMISSION TEST AS PER FCC PART 15 CLASS-B
Comment B: EUT:TORQUE MEASUREMENT SYSTEM,MODEL:TMS 9000(92016),MAKE:HONEYWELL,MEAS:LINE(SHIELDED CORD)
Date: 16.JUL.2009 18:05:43



Equipment Under Test : Torque Measurement System
Model Number of EUT : TMS 9000-92016
Serial Number of EUT : Prototype
Manufacturer by : M/s. Honeywell Technology solutions (P) Ltd., Bangalore

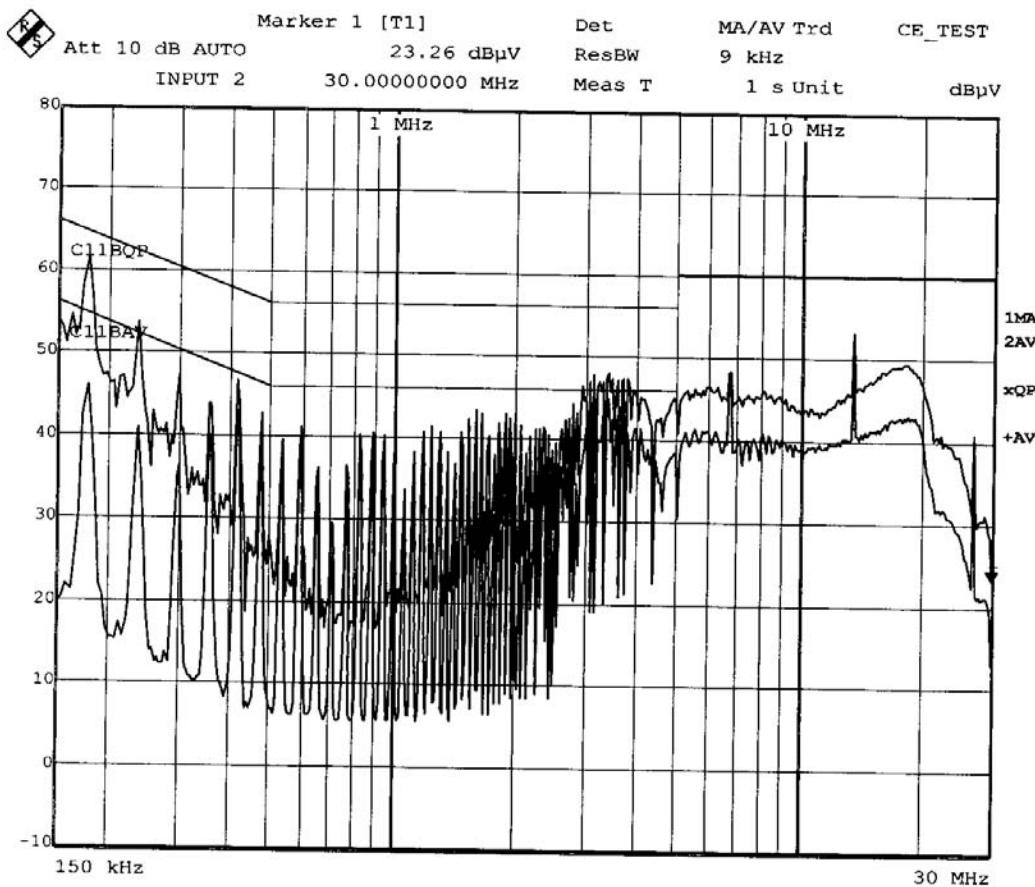


PLOT-1B

Trace1: ---	Trace2: C11BAV		
Trace3: ---	Trace4: ---		
TRACE	FREQUENCY	LEVEL dB _μ V	DELTA LIMIT dB
2 Average		49.50	-0.49
2 Average	6.7820 MHz	47.68	-2.31
2 Average	418.0000 kHz	42.85	-4.63
2 Average	3.0900 MHz	36.08	-9.91
2 Average	3.4460 MHz	35.64	-10.36
2 Average	3.1500 MHz	35.60	-10.39
2 Average	3.5060 MHz	35.07	-10.92
2 Average	3.3860 MHz	35.06	-10.93
2 Average	3.5660 MHz	34.70	-11.29
2 Average	3.0300 MHz	34.36	-11.63
2 Average	3.9820 MHz	32.97	-13.02
2 Average	3.9220 MHz	32.40	-13.59
2 Average	3.3260 MHz	32.33	-13.66
2 Average	3.8620 MHz	30.56	-15.44
2 Average	3.7420 MHz	30.51	-15.48
2 Average	3.6820 MHz	30.30	-15.70
2 Average	3.8020 MHz	29.97	-16.02
2 Average	3.6220 MHz	27.38	-18.61
2 Average	4.0980 MHz	26.88	-19.11
2 Average	4.1580 MHz	26.84	-19.15

Title: CONDUCTED EMISSION TEST AS PER FCC PART 15 CLASS-B
Comment B: EUT:TORQUE MEASUREMENT SYSTEM,MODEL:TMS 9000(92016),MAKE:HONEYWELL,MEAS:LINE(SHIELDED CORD)
Date: 16.JUL.2009 18:06:26

PLOT-2



Title: CONDUCTED EMISSION TEST AS PER FCC PART 15 CLASS-B
Comment B: EUT:TORQUE MEASUREMENT SYSTEM,MODEL:TMS 9000(92016),MAKE:HONEYWELL,MEAS:NEUTRAL(SHIELDED CORD)
Date: 16.JUL.2009 17:59:55

PLOT-2A

Trace1: C11BQP		Trace2: ---	
Trace3: ---		Trace4: ---	
TRACE	FREQUENCY	LEVEL dB _μ V	DELTA LIMIT dB
1	Quasi Peak	60.29	-4.28
1	Quasi Peak	13.5620 MHz	-9.57
1	Quasi Peak	238.0000 kHz	-9.96
1	Quasi Peak	3.4940 MHz	-21.11
1	Quasi Peak	3.4340 MHz	-21.33
1	Quasi Peak	3.1380 MHz	-21.76
1	Quasi Peak	3.3740 MHz	-23.61
1	Quasi Peak	3.7900 MHz	-24.38
1	Quasi Peak	3.7300 MHz	-24.43
1	Quasi Peak	3.6700 MHz	-26.26

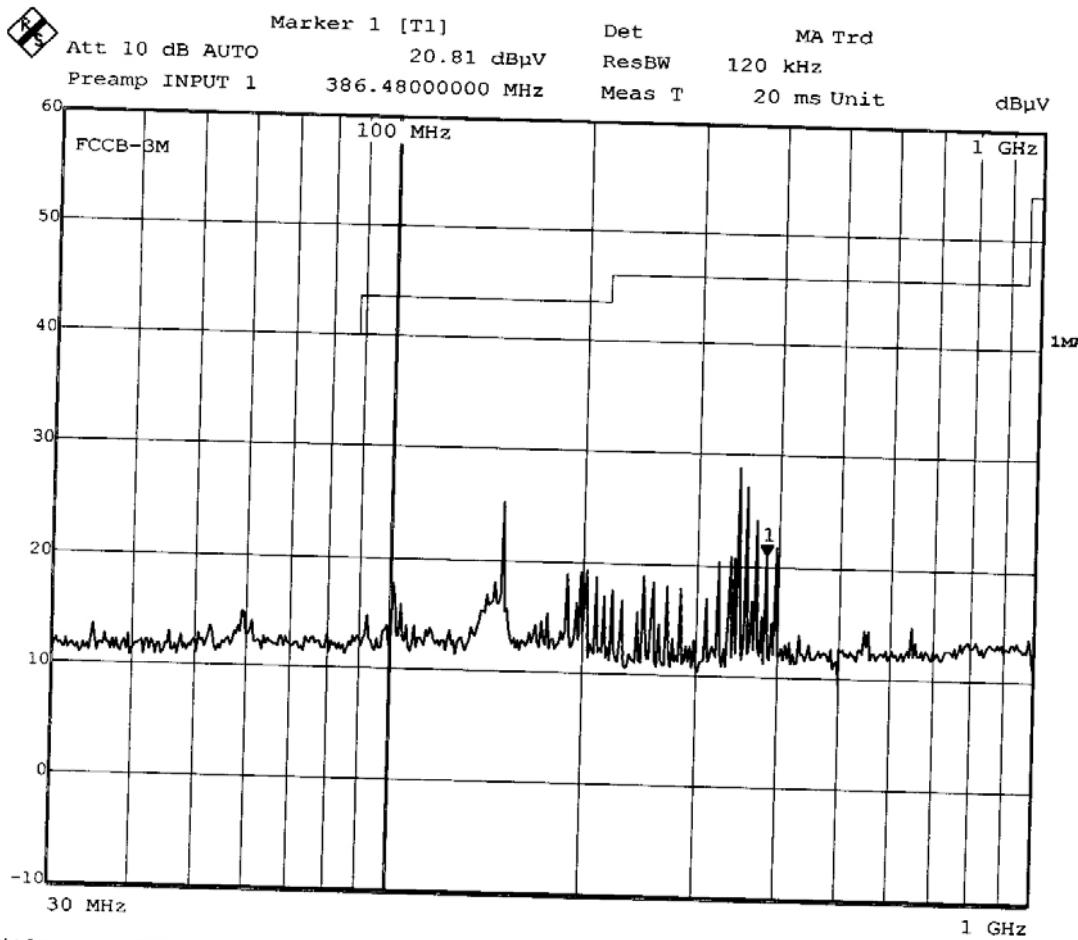
Title: CONDUCTED EMISSION TEST AS PER FCC PART 15 CLASS-B
Comment B: EUT:TORQUE MEASUREMENT SYSTEM,MODEL:TMS 9000(92016),MAKE:HONEYWELL,MEAS:NEUTRAL(SHIELDED CORD)
Date: 16.JUL.2009 18:00:31

PLOT-2B

TRACE	FREQUENCY	LEVEL dB μ V	DELTA LIMIT dB
2 Average		49.78	-0.21
2 Average	6.7820 MHz	47.17	-2.82
2 Average	1.6020 MHz	41.06	-4.93
2 Average	414.0000 kHz	42.37	-5.19
2 Average	1.8940 MHz	31.13	-14.86
2 Average	3.4340 MHz	27.22	-18.77
2 Average	3.4940 MHz	26.88	-19.11
2 Average	3.3740 MHz	26.17	-19.82
2 Average	3.1380 MHz	25.46	-20.53
2 Average	3.0780 MHz	25.02	-20.97
2 Average	3.7300 MHz	24.52	-21.47
2 Average	3.6700 MHz	23.84	-22.15
2 Average	3.3140 MHz	23.18	-22.81
2 Average	3.0180 MHz	22.84	-23.15
2 Average	3.7900 MHz	22.82	-23.17
2 Average	3.6100 MHz	21.33	-24.66
2 Average	4.0860 MHz	21.09	-24.90
2 Average	4.0260 MHz	19.58	-26.41
2 Average	3.5500 MHz	18.90	-27.09
2 Average	3.9660 MHz	18.90	-27.09

Title: CONDUCTED EMISSION TEST AS PER FCC PART 15 CLASS-B
 Comment B: EUT:TORQUE MEASUREMENT SYSTEM,MODEL:TMS 9000(92016),MAKE:HONEYWELL,MEAS:NEUTRAL(SHIELDED CORD)
 Date: 16.JUL.2009 18:01:31

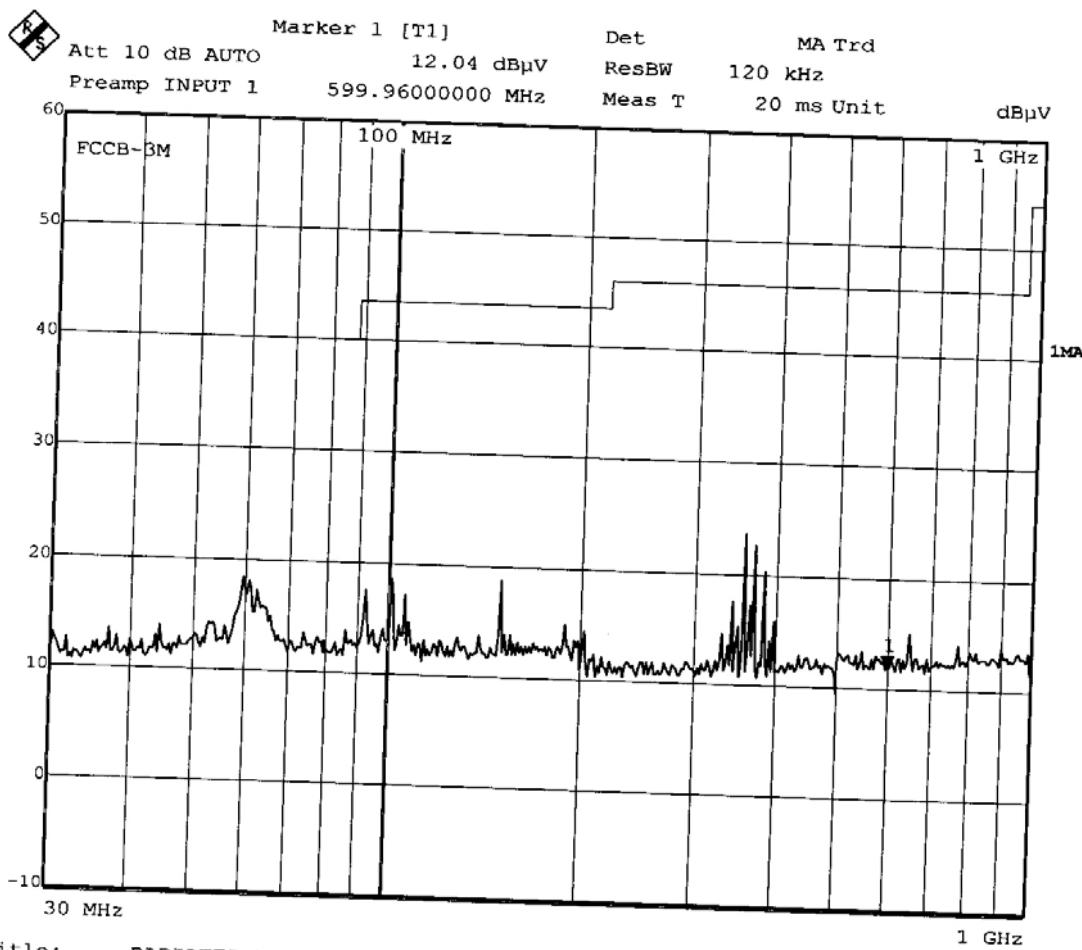
PLOT-3



Title: RADIATED EMISSION TEST AS PER FCC PART 15 CLASS-B
 Comment B: EUT:TORQUE MEASUREMENT SYSTEM,MODEL:TMS 9000(92016),MAKE:HON
 EYWELL, POS:110°, POL:HOR, ANT Ht:1m, (SHIELDED CORD)
 Date: 16.JUL.2009 20:09:23

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

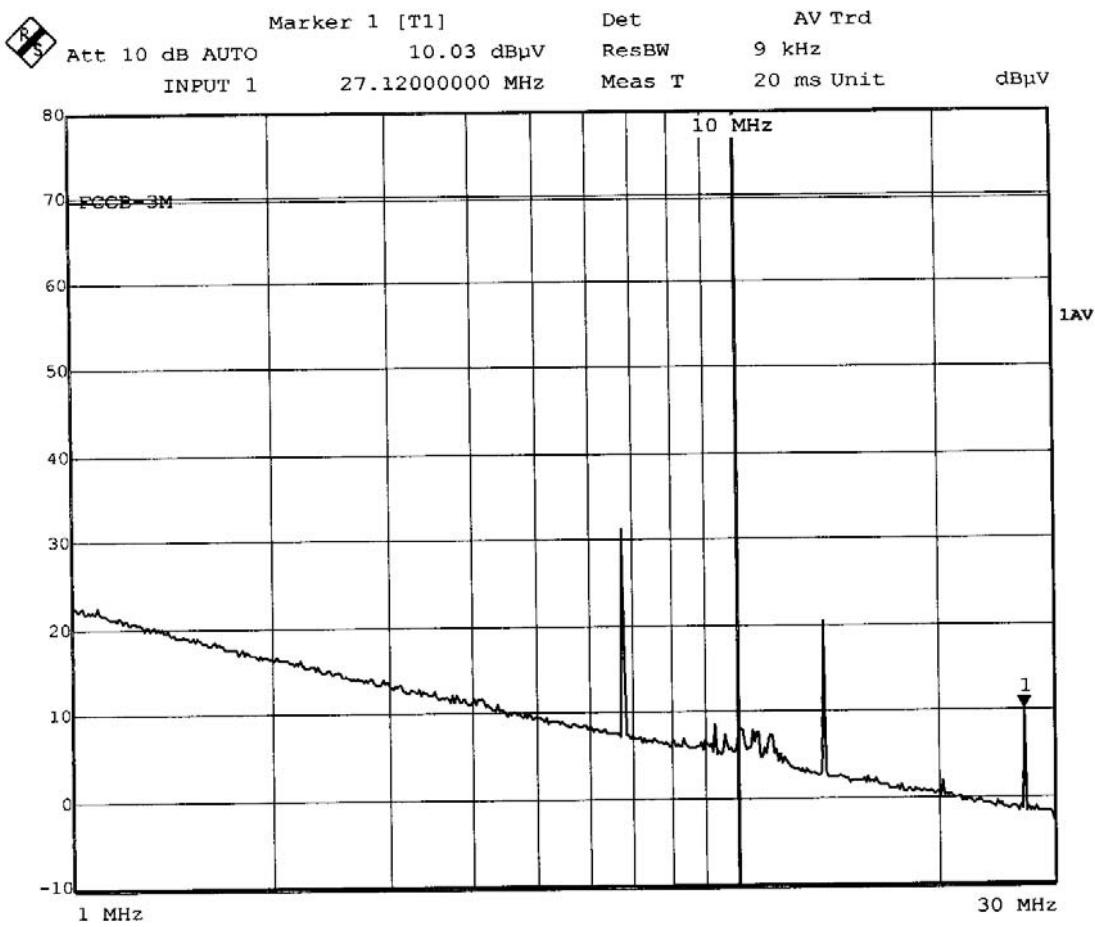
PLOT-4



Title: RADIATED EMISSION TEST AS PER FCC PART 15 CLASS-B
Comment B: EUT:TORQUE MEASUREMENT SYSTEM,MODEL:TMS 9000(92016),MAKE:HON
EYWELL,POS:165°,POL:VER,ANT Ht:2.7m, (SHIELDED CORD)
Date: 16.JUL.2009 19:38:24

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

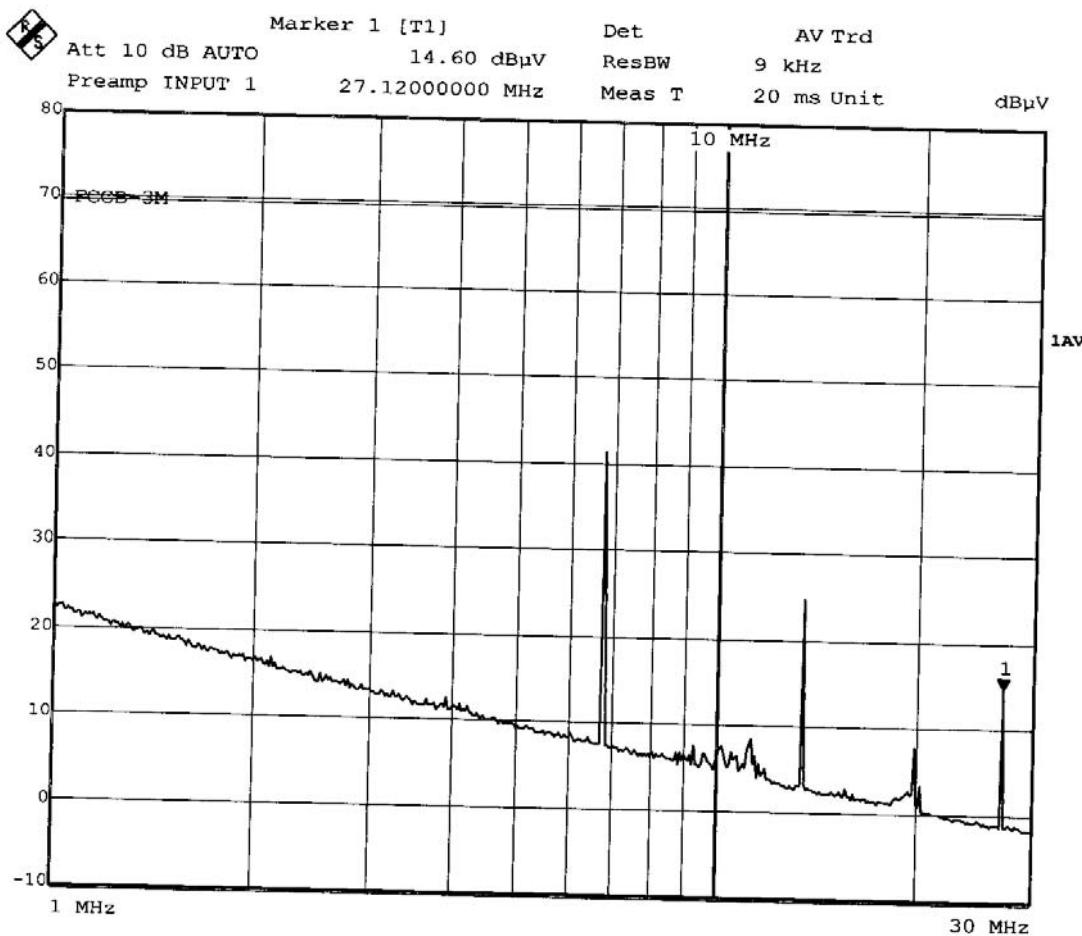
PLOT-5



Title: RADIATED EMISSION TEST AS PER FCC PART 15 CLASS-B
Comment B: EUT:TORQUE MEASUREMENT SYSTEM,MODEL:TMS 9000(92016),MAKE:HONEYWELL,PARALLEL(SHIELDED CORD)
Date: 16.JUL.2009 18:22:30

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

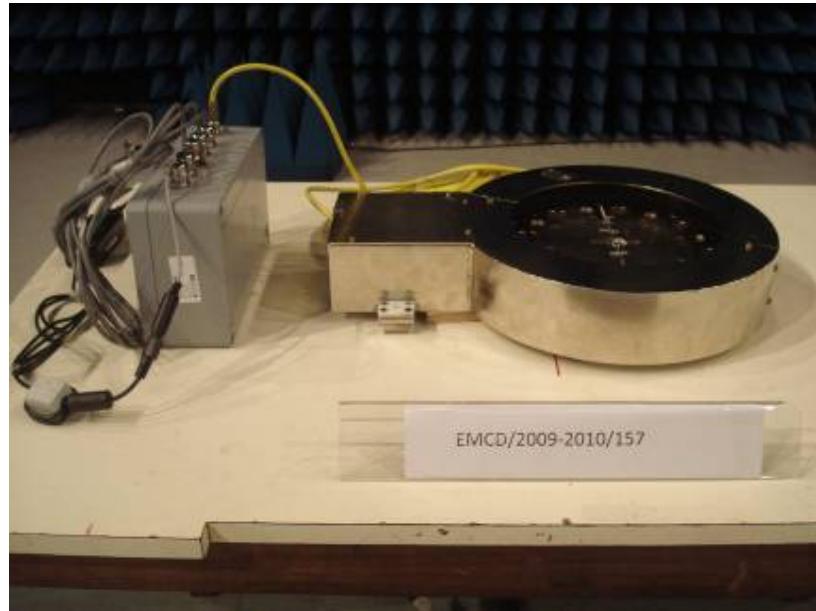
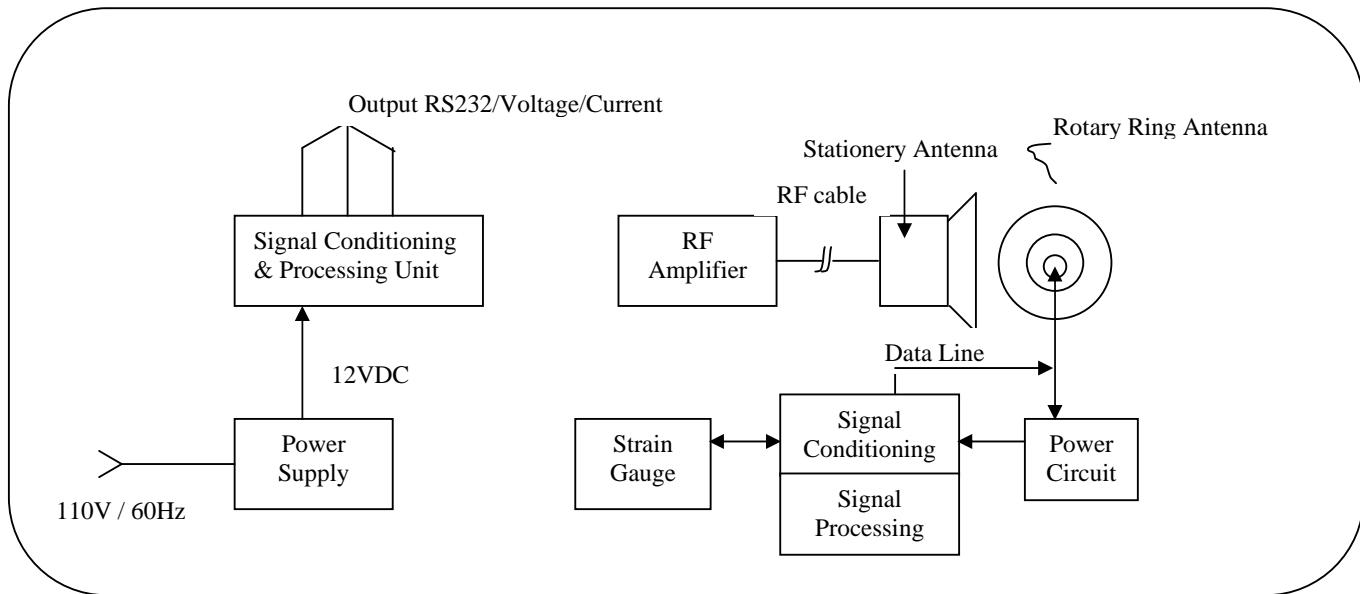


Title: RADIATED EMISSION TEST AS PER FCC PART 15 CLASS-B
Comment B: EUT:TORQUE MEASUREMENT SYSTEM,MODEL:TMS 9000(92016),MAKE:HONEYWELL, PERPENDICULAR(SHIELDED CORD)
Date: 16.JUL.2009 20:23:30

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 (Perpendicular)