

S-CEM/EMCD/TR/2009-2010/350

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

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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.

November 2009

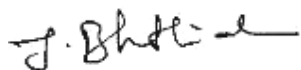
**EMI/EMC TEST REPORT FOR TORQUE MEASUREMENT SYSTEM
MANUFACTURED BY
M/s. HONEYWELL TECHNOLOGY SOLUTIONS (P) LTD., BANGALORE**

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; 2005 2. Radiated Emission Test as per FCC Part-15.209,223; 2005
05. Manufacturer	: M/s. Honeywell Technology Solutions (P) Ltd., Bangalore
06. Model number of EUT	: 94016-8K
07. Serial number of EUT	: 1181467
08. Test plan concurred by	: Mr. Vijay.Tippanna.Talikoti, Senior Engineer Honeywell Technology Solutions (P) Ltd., Bangalore
09. EUT Arrived on	: November 12, 2009
10. Test date(s)	: November 12, 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:



(J. Bharathidasan)
Scientist-B

Approved By:



(Dr. B. Subbarao)
Head, EMC Division

Office Seal





Equipment Under Test : Torque Measurement System
Model Number of EUT : 94016-8K
Serial Number of EUT : 1181467
Manufacturer by : M/s. Honeywell Technology Solutions (P) Ltd., Bangalore



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/ Enclosure	Specification	Notes
Conducted Emission Test	FCC Part-15.207	230V/ 50Hz 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



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1. CONDUCTED EMISSION TEST

1.1 Applicable Standard: As per FCC Part-15.207, 2005

1.2 Test Instrumentation:

Description	Make	Model Number	Serial Number	Calibration Due Date
EMI Receiver	R&S	ESIB7	100319	14/02/2010
Line Impedance Stabilization Network (LISN)	R&S	ESH2-Z5	893606 / 023	7/11/2011
Transient Limiter	HP	11947A	3107A01053	24/09/2011

1.3 EUT Configuration:

The EUT is Torque Measurement System which is intended to be used in industrial applications. The torque measurement system is 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 230V/50Hz AC and made operational. Annexure -1 shows the block diagram of EUT.

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 - 500 kHz	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 to 2 shows the Conducted Emissions from the EUT

Annexure – 1: Block Diagram of EUT

Annexure – 2: Photograph of EUT.

Annexure – 3: Photograph of Conducted Emission Test Setup.

Test Conducted by:

T. Bhavani

(T. Bhavani)
Project Assistant

2. RADIATED EMISSION TEST

2.1. Applicable Standards: As per FCC part-15.209, 223 Class B: 2005

2.2. Test Instrumentation:

Description	Make	Model Number	Serial Number	Calibration Due Date
EMI Receiver	R&S	ESI26	100319	30/07/2010
Ultra log Antenna	R&S	HL562	100100	18/04/2010
Shielded Semi Anechoic Chamber	Siepel-Hyfral	---	F276	22/09/2011
Active Loop Antenna	EMCO	6507	1484	17/10/2010

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 which is intended to be used in industrial applications. The torque measurement system is 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 230V/50Hz AC and made operational. Annexure-1 shows the block diagram of EUT.

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 Ultra log 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 initially in Peak Mode and wherever the emission was closer to the limit line in peak detection mode, Quasi Peak Detection Mode was employed. The measurement was done, in both parallel and perpendicular position of the loop antenna in the frequency range 1 MHz – 30MHz. The 6.78MHz was measured using a average detector.



Equipment Under Test : Torque Measurement System
 Model Number of EUT : 94016-8K
 Serial Number of EUT : 1181467
 Manufacturer by : M/s. Honeywell Technology Solutions (P) Ltd., Bangalore



2.6. Test Observation:

FCC Part-15.209 (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	Limit (dBμV/m) L	Delta Level (dB) D=L-E	Test Result
VERTICAL POLARIZATION									
352.56	360	1	28.25	14.41	1.59	44.25	46.00	1.75	Within the Limit
339	150	1	27.16	14.11	1.55	42.82	46.00	3.18	Within the Limit
366.12	130	1	25.76	14.75	1.62	42.13	46.00	3.87	Within the Limit
189.84	160	1.3	26.48	9.13	1.17	36.78	43.50	6.72	Within the Limit
359.36	0	1	21.22	14.61	1.60	37.44	46.00	8.56	Within the Limit
203.4	360	1	21.85	9.62	1.22	32.69	43.50	10.81	Within the Limit
122.04	150	3	19.58	10.15	0.96	30.69	43.50	12.81	Within the Limit
176.28	180	3	17.81	9.56	1.12	28.49	43.50	15.01	Within the Limit
HORIZONTAL POLARIZATION									
350	40	1	24.65	14.34	1.58	40.57	46.00	5.43	Within the Limit
450	300	1	19.67	16.21	1.77	37.65	46.00	8.35	Within the Limit
366.12	280	1.7	20.04	14.75	1.62	36.41	46.00	9.59	Within the Limit
60.16	200	2	20.83	6.29	0.67	27.78	40.00	12.22	Within the Limit
339	360	1.7	18.04	14.11	1.55	33.70	46.00	12.30	Within the Limit
189.84	150	1	20.1	9.13	1.17	30.40	43.50	13.10	Within the Limit
56.24	300	1	13.25	6.36	0.64	20.25	40.00	19.75	Within the Limit

FCC Part-15.209 (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	limit (dBμV/m) L	Delta Level (dB) D=L-E	Test Result
PARALLEL									
6.78	230	1	42.48	16.70	0.38	59.56	69.52	9.96	Within the Limit
13.56	360	1	23.19	15.88	0.52	39.59	69.52	29.93	Within the Limit
27.12	190	1	14.94	14.70	0.76	30.40	69.52	39.12	Within the Limit
PERPENDICULAR									
6.78	170	1	42.41	16.70	0.38	59.49	69.52	10.03	Within the Limit
13.56	360	1	23.65	15.88	0.52	40.05	69.52	29.47	Within the Limit
27.12	60	1	27.12	14.70	0.76	42.58	69.52	26.94	Within the Limit



Equipment Under Test : Torque Measurement System
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FCC Part-15.223 (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									
6.78	230	1	42.30	16.70	0.38	59.38	63.52	4.14	Within the Limit
PERPENDICULAR									
6.78	170	1	42.23	16.70	0.38	59.31	63.52	4.21	Within the Limit

2.7. Enclosed Documents:

Plots 3 to 4 shows the Radiated Emission spectrum from EUT (30 MHz - 1000 MHz)
 Plots 5 show the Bandwidth Measurement
 Plots 6 to 7 shows the Radiated Emission spectrum from EUT (1 MHz - 30 MHz)
 Annexure – 4: Photograph of Radiated Emission Test Setup.

Test Conducted by:

T. Bhavani

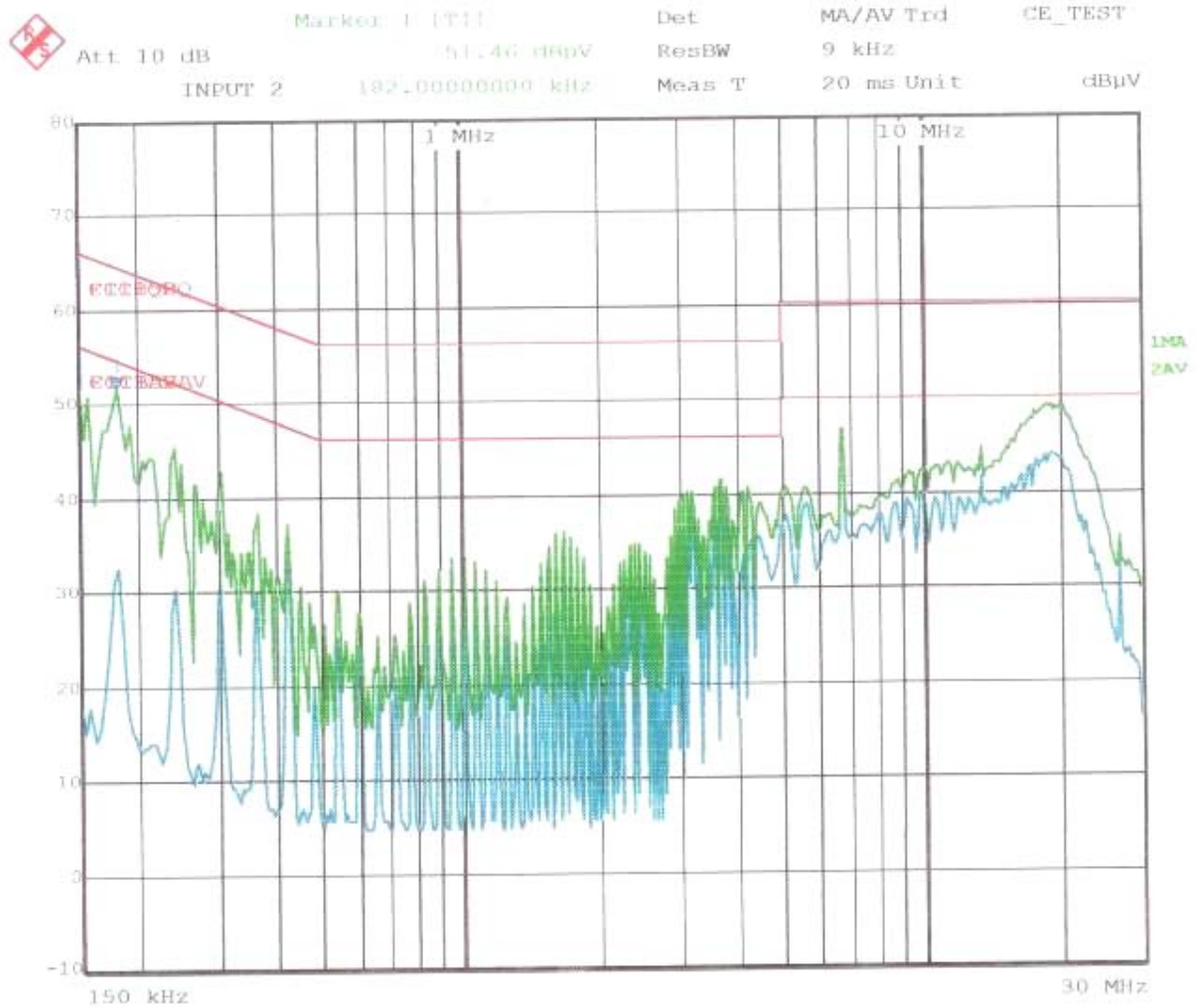
(T. Bhavani)
 Project Assistant



Equipment Under Test : Torque Measurement System
Model Number of EUT : 94016-8K
Serial Number of EUT : 1181467
Manufacturer by : M/s. Honeywell Technology Solutions (P) Ltd., Bangalore



PLOT-1



Title: CONDUCTED EMISSION TEST AS PER FCC15 CLASS B
Comment B: EUT:TORQUE MEASUREMENT SYSTEM,MAKE:HONEYWELL,MODEL:94016-8K,
S1.NO:1181467,MEASUREMENT ON NEUTRAL
Date: 12.NOV.2009 18:28:15



Equipment Under Test : Torque Measurement System
Model Number of EUT : 94016-8K
Serial Number of EUT : 1181467
Manufacturer by : M/s. Honeywell Technology Solutions (P) Ltd., Bangalore



PLOT-1A

EDIT PEAK LIST (Final Measurement Results)			
Trace1: C11BQP		Trace2: C11BAV	
Trace3: ---		Trace4: ---	
TRACE	FREQUENCY	LEVEL dBμV	DELTA LIMIT dB
2 Average	6.7820 MHz	46.14	-3.85
2 Average	17.8820 MHz	42.93	-7.06
1 Quasi Peak	18.4860 MHz	47.11	-12.88
2 Average	18.5420 MHz	43.42	-6.57
2 Average	18.6020 MHz	43.26	-6.73
1 Quasi Peak	18.6060 MHz	47.22	-12.77
1 Quasi Peak	18.6620 MHz	47.15	-12.84
2 Average	18.6620 MHz	43.13	-6.86
1 Quasi Peak	18.6660 MHz	47.12	-12.87
1 Quasi Peak	18.8420 MHz	46.63	-13.36
1 Quasi Peak	18.9060 MHz	46.60	-13.39
1 Quasi Peak	18.9660 MHz	46.91	-13.08
1 Quasi Peak	19.0260 MHz	47.12	-12.87
1 Quasi Peak	19.0820 MHz	47.12	-12.87
1 Quasi Peak	19.0860 MHz	47.35	-12.64
2 Average	19.0860 MHz	43.37	-6.62
2 Average	19.1460 MHz	43.67	-6.32
1 Quasi Peak	19.2060 MHz	47.45	-12.54
2 Average	19.2060 MHz	43.83	-6.16
2 Average	19.2660 MHz	43.83	-6.16

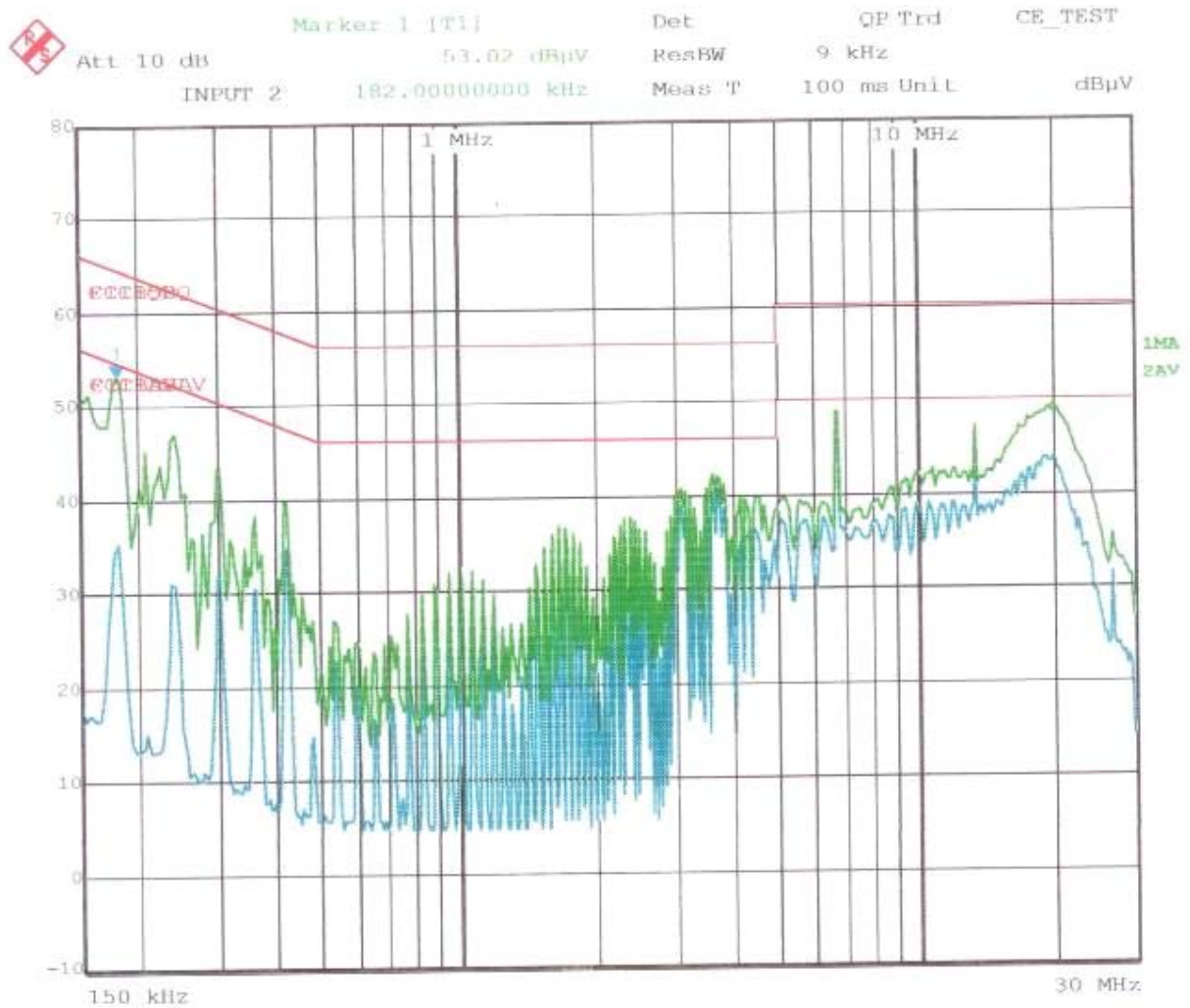
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Comment B: EUT:TORQUE MEASUREMENT SYSTEM,MAKE:HONEYWELL,MODEL:94016-8K,
SI.NO:1181467,MEASUREMENT ON NEUTRAL
Date: 12.NOV.2009 18:31:13



Equipment Under Test : Torque Measurement System
Model Number of EUT : 94016-8K
Serial Number of EUT : 1181467
Manufacturer by : M/s. Honeywell Technology Solutions (P) Ltd., Bangalore



PLOT-2



Title: CONDUCTED EMISSION TEST AS PER FCC15 CLASS B
Comment B: EUT:TORQUE MEASUREMENT SYSTEM,MAKE:HONEYWELL,MODEL:94016-8K,
SI.NO:1181467,MEASUREMENT ON LINE
Date: 12.NOV.2009 18:18:27



Equipment Under Test : Torque Measurement System
Model Number of EUT : 94016-8K
Serial Number of EUT : 1181467
Manufacturer by : M/s. Honeywell Technology Solutions (P) Ltd., Bangalore



PLOT-2A

EDIT PEAK LIST (Final Measurement Results)				
Trace1: C11BQP		Trace2: C11BAV		
Trace3: ---		Trace4: ---		
TRACE	FREQUENCY	LEVEL dBμV	DELTA LIMIT dB	
1 Quasi Peak	182.0000 kHz	50.73	-13.65	
2 Average	3.5980 MHz	22.00	-23.99	
2 Average	3.6580 MHz	22.64	-23.35	
2 Average	3.7180 MHz	22.31	-23.68	
2 Average	3.7780 MHz	21.14	-24.85	
1 Quasi Peak	6.7780 MHz	46.05	-13.94	
2 Average	6.7820 MHz	45.94	-4.05	
2 Average	18.6060 MHz	28.94	-21.05	
2 Average	19.0300 MHz	29.22	-20.77	
2 Average	19.0900 MHz	29.42	-20.58	
1 Quasi Peak	19.1460 MHz	35.85	-24.14	
2 Average	19.1500 MHz	29.60	-20.39	
2 Average	19.2700 MHz	29.79	-20.20	
2 Average	19.3300 MHz	29.82	-20.17	
1 Quasi Peak	19.3900 MHz	36.25	-23.74	
2 Average	19.3900 MHz	29.86	-20.13	
2 Average	19.4500 MHz	29.90	-20.09	
2 Average	19.5100 MHz	29.89	-20.10	
1 Quasi Peak	19.5660 MHz	36.78	-23.21	
1 Quasi Peak	19.5700 MHz	36.18	-23.81	

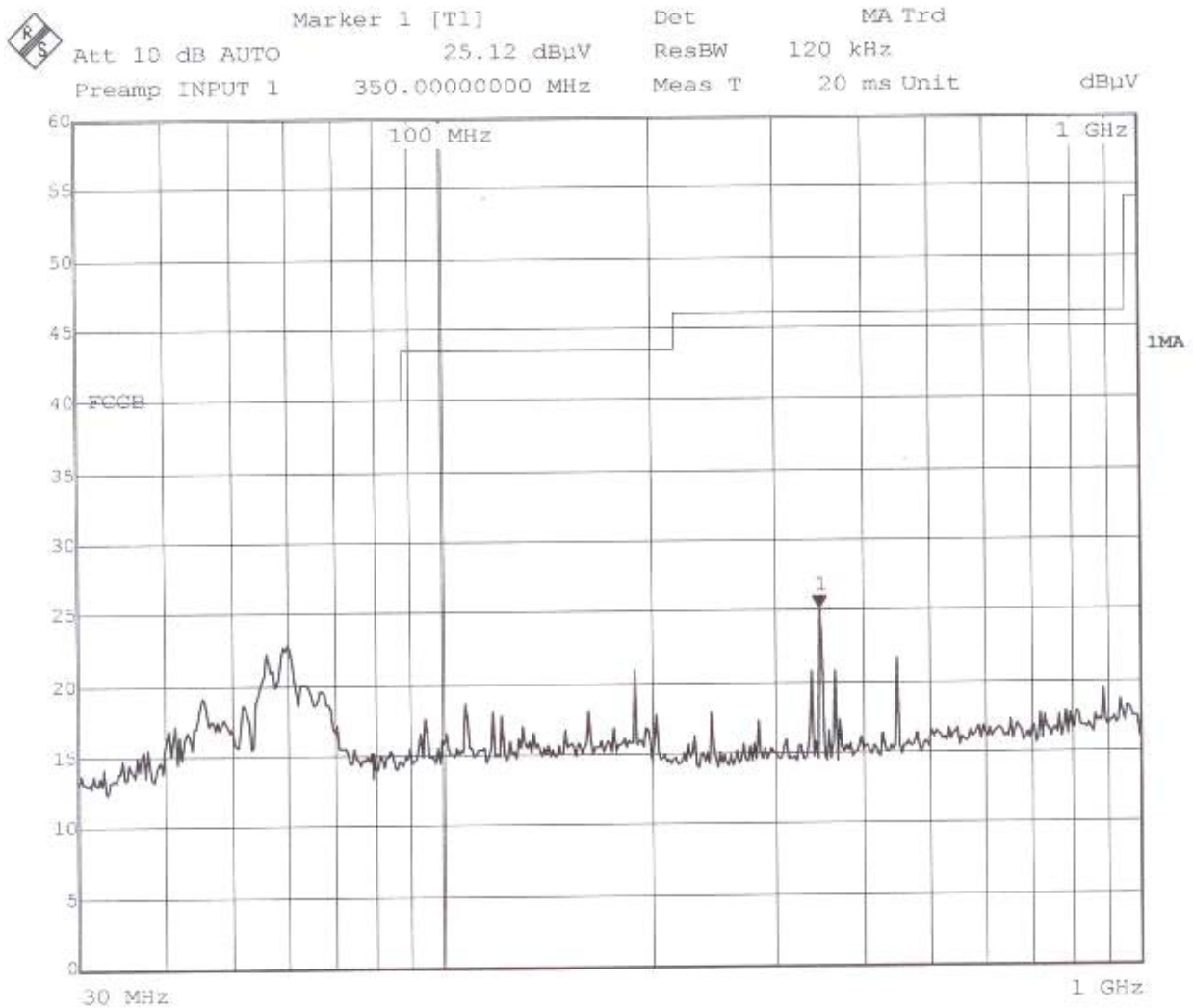
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Comment B: EUT:TORQUE MEASUREMENT SYSTEM,MAKE:HONEYWELL,MODEL:94016-8K,
SI.NO:1181467,MEASUREMENT ON LINE
Date: 12.NOV.2009 18:15:38



Equipment Under Test : Torque Measurement System
Model Number of EUT : 94016-8K
Serial Number of EUT : 1181467
Manufacturer by : M/s. Honeywell Technology Solutions (P) Ltd., Bangalore



PLOT-3



Title: RADIATED EMISSION TEST AS PER FCC15 CLASS B
Comment B: EUT:TORQUE MEASUREMENT SYSTEM,MAKE:HONEYWELL,MODEL:94016-8K,
SI.NO:1181467,POL:VER,POS:40°,ANT HT:1m
Date: 12.NOV.2009 12:03:39

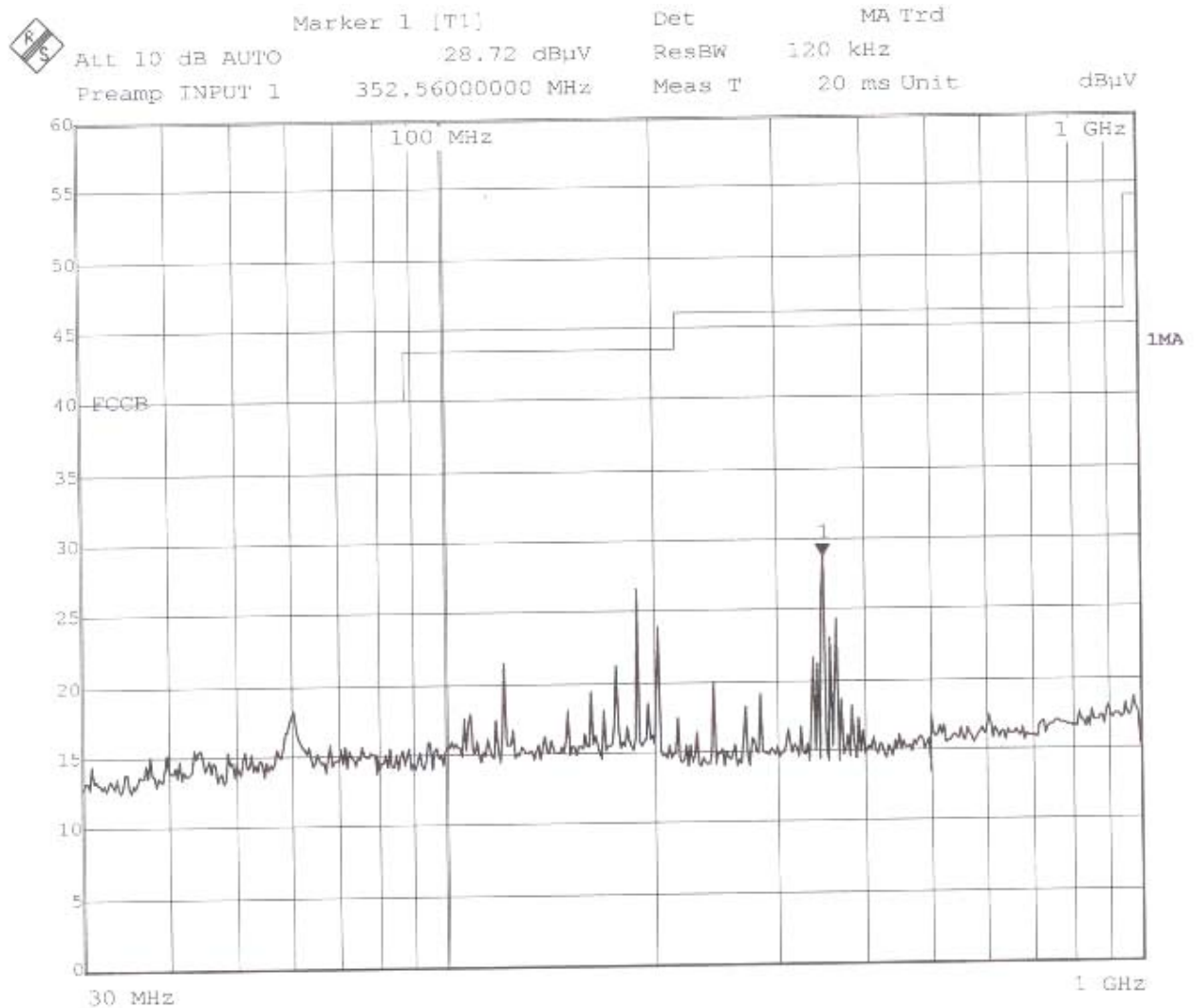
Note: The plot shows only the emission pattern from the EUT with peak detector and the values in the plot are not maximized emission as required by standard. For maximized emission please refer table



Equipment Under Test : Torque Measurement System
Model Number of EUT : 94016-8K
Serial Number of EUT : 1181467
Manufacturer by : M/s. Honeywell Technology Solutions (P) Ltd., Bangalore



PLOT-4



Title: RADIATED EMISSION TEST AS PER FCC15 CLASS B
Comment B: EUT:TORQUE MEASUREMENT SYSTEM, MAKE:HONEYWELL, MODEL:94016-8K,
ST.NO:1181467, POL:HOR, POS:360°, ANT HT:1m
Date: 12.NOV.2009 12:40:55

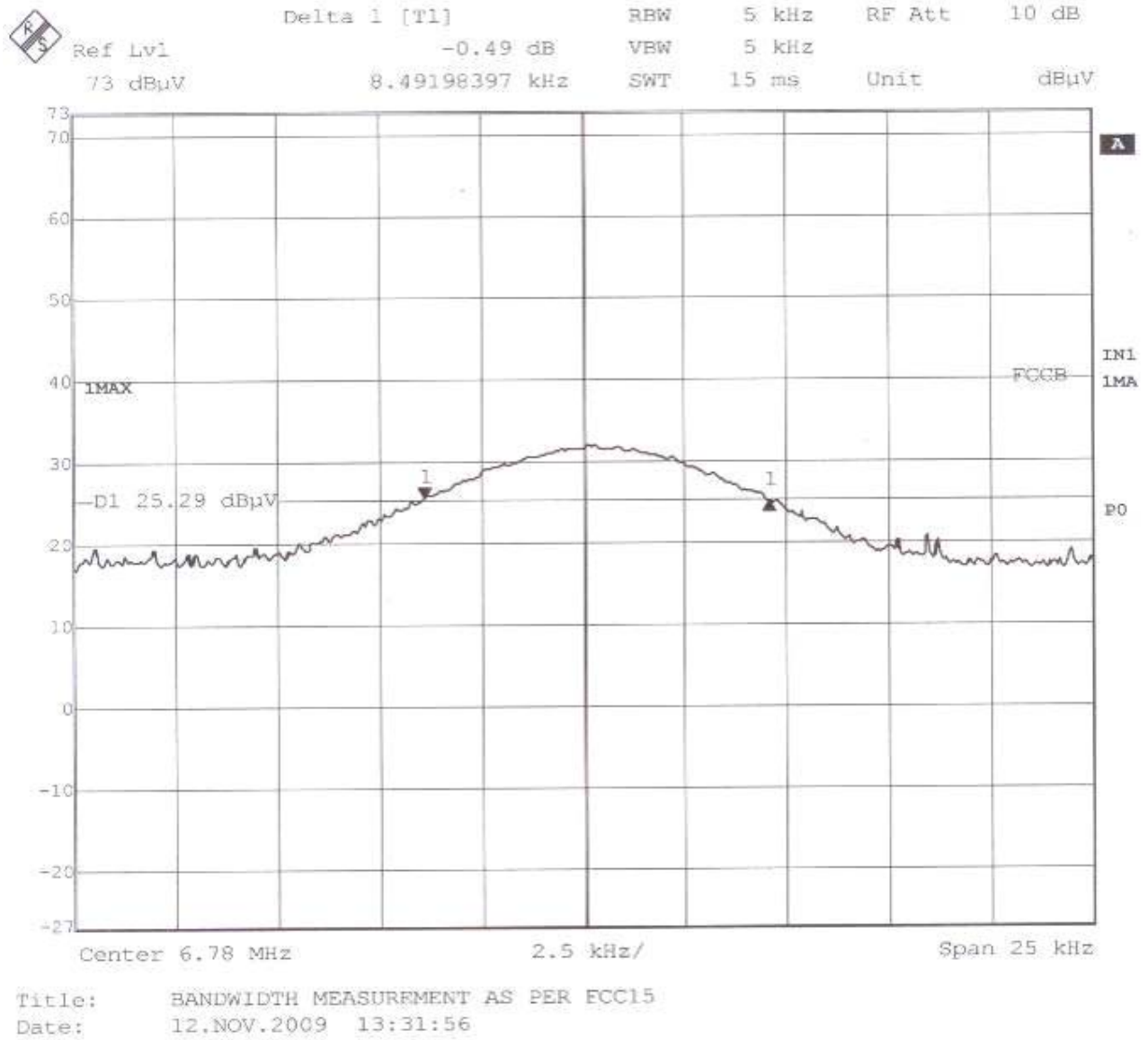
Note: The plot shows only the emission pattern from the EUT with peak detector and the values in the plot are not maximized emission as required by standard. For maximized emission please refer table



Equipment Under Test : Torque Measurement System
Model Number of EUT : 94016-8K
Serial Number of EUT : 1181467
Manufacturer by : M/s. Honeywell Technology Solutions (P) Ltd., Bangalore



PLOT-5

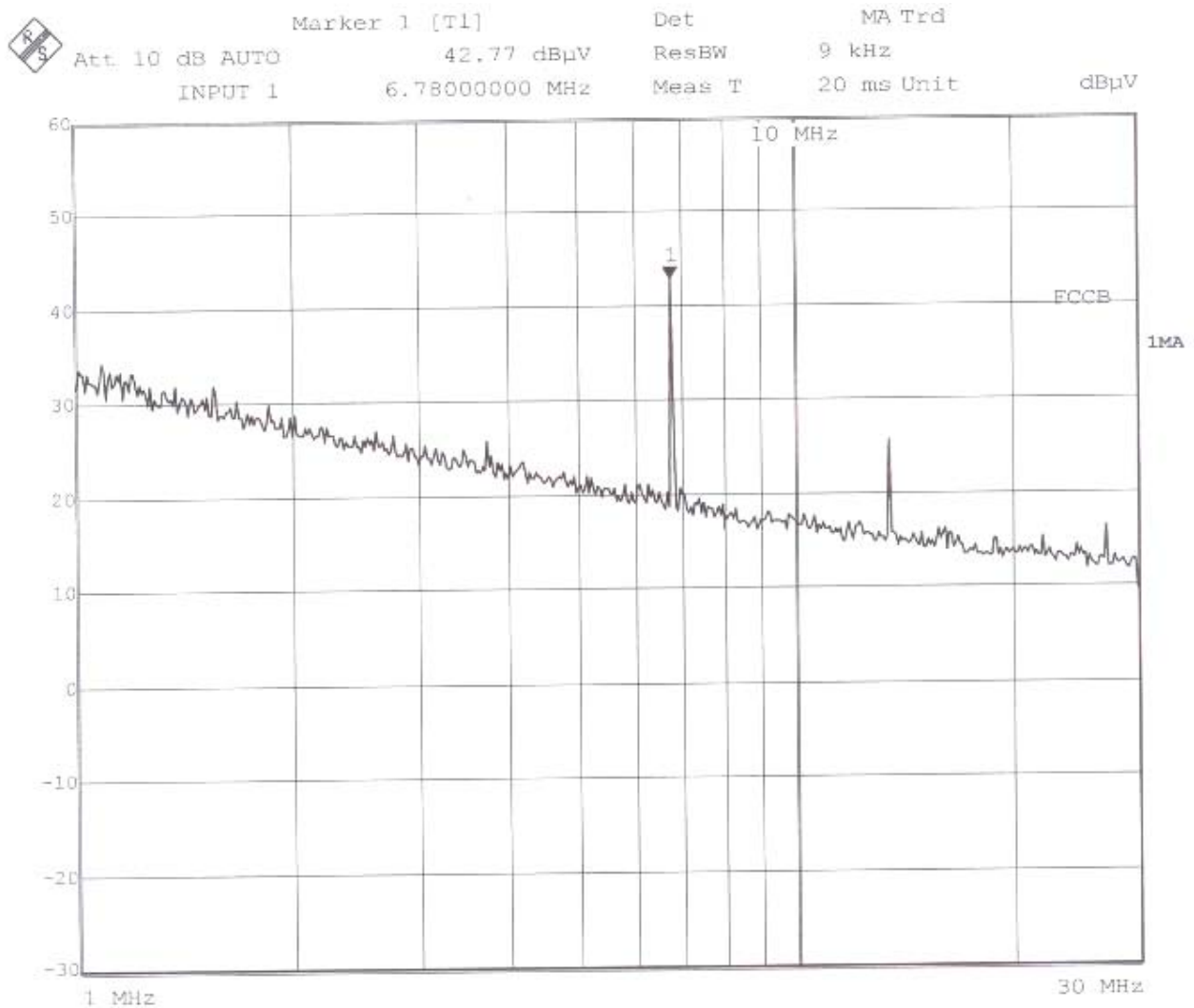




Equipment Under Test : Torque Measurement System
Model Number of EUT : 94016-8K
Serial Number of EUT : 1181467
Manufacturer by : M/s. Honeywell Technology Solutions (P) Ltd., Bangalore



PLOT-6



Title: RADIATED EMISSION MEASUREMENT TEST AS PER FCC 15 CLASS B
Comment B: EUT:TORQUE MEASUREMENT SYSTEM, MAKE:HONEYWELL, MODEL:94016-8K,
SI.NO:1181467, POS:230°, ORIENTATION:PARALLEL
Date: 12.NOV.2009 14:39:51

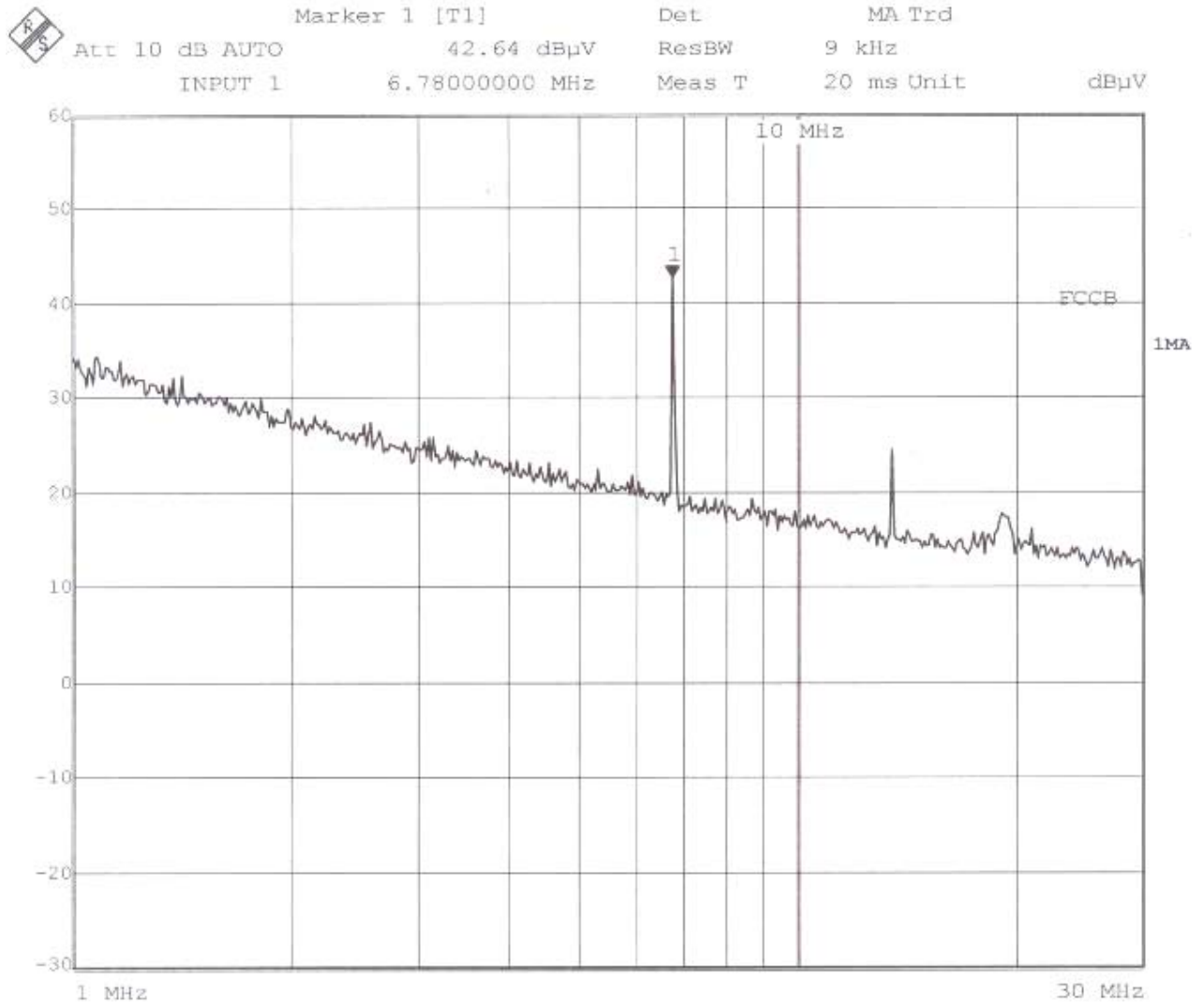
Note: The plot shows only the emission pattern from the EUT with peak detector and the values in the plot are not maximized emission as required by standard. For maximized emission please refer table



Equipment Under Test : Torque Measurement System
Model Number of EUT : 94016-8K
Serial Number of EUT : 1181467
Manufacturer by : M/s. Honeywell Technology Solutions (P) Ltd., Bangalore



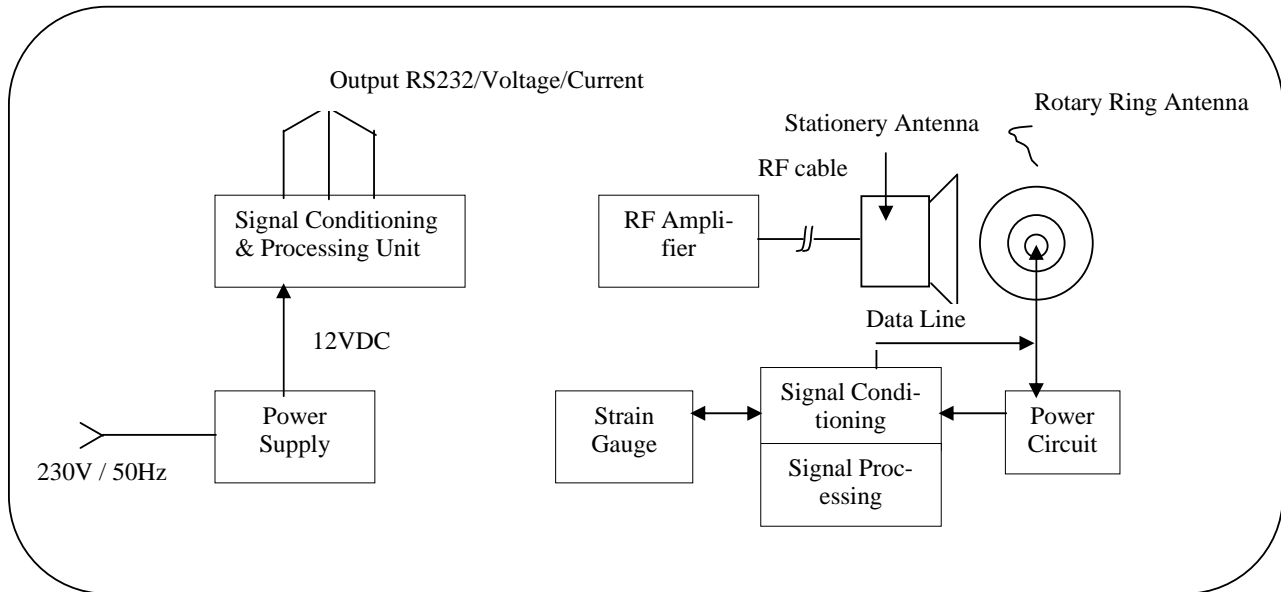
PLOT-7



Title: RADIATED EMISSION MEASUREMENT TEST AS PER FCC 15 CLASS B
Comment B: EUT:TORQUE MEASUREMENT SYSTEM,MAKE:HONEYWELL,MODEL:94016-8K,
SI.NO:1181467,PCS:170°,ORIENTATION:PERPENDICULAR
Date: 12.NOV.2009 14:27:41

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



Block Diagram of EUT Configuration

Annexure – 2



Photograph of EUT

Annexure – 3



Conducted Emission Test Setup

Annexure -4



Radiated Emission Test Setup (Loop Antenna)

Annexure – 4A



Radiated Emission Test Setup (Ultra Log Antenna)