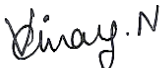


Prüfbericht - Nr.: 19660092 001		Seite 1 von 16	
<i>Test Report No.:</i>		<i>Page 1 of 16</i>	
Auftraggeber: <i>Client</i>	Honeywell Enraf Delftechpark 39 2628 XJ Delft Netherland		
Gegenstand der Prüfung: <i>Test item:</i>	Wireless Field Interface		
Bezeichnung: <i>Identification:</i>	WFI	Serien-Nr.: <i>Serial No.</i>	Engineering Sample
Wareneingangs-Nr.: <i>Receipt No.:</i>	1803014478	Eingangsdatum: <i>Date of receipt:</i>	23.09.2013
Prüfort: <i>Testing location:</i>	Refer Page 4 of 16 for test facilities		
Prüfgrundlage: <i>Test specification:</i>	FCC 15, Subpart C ANSI 63.10:2009		
Prüfergebnis: <i>Test Result:</i>	Der Prüfgegenstand entspricht oben genannter Prüfgrundlage(n). <i>The test item passed the test specification(s).</i>		
Prüflaboratorium: <i>Testing Laboratory:</i>	TÜV Rheinland (India) Pvt. Ltd. 82/A, 3rd Main, West Wing, Electronic City Phase 1 Hosur Road, Bangalore – 560 100. India FCC Registration No.: 176555		
geprüft / tested by:		kontrolliert / reviewed by:	
14.01.2014	Vinay N Engineer	16.01.2014	Raghavendra Kulkarni Senior Manager
			
Datum <i>Date</i>	Name/Stellung <i>Name/Position</i>	Unterschrift <i>Signature</i>	Datum <i>Date</i>
			Name/Stellung <i>Name/Position</i>
			Unterschrift <i>Signature</i>
Sonstiges / Other Aspects: FCC ID: LOM978WFI			
Abkürzungen:		Abbreviations:	
<i>P(ass) = entspricht Prüfgrundlage</i>		<i>P(ass) = passed</i>	
<i>F(ail) = entspricht nicht Prüfgrundlage</i>		<i>F(ail) = failed</i>	
<i>N/A = nicht anwendbar</i>		<i>N/A = not applicable</i>	
<i>N/T = nicht getestet</i>		<i>N/T = not tested</i>	
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any safety mark on this or similar products.</i>			

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Test Result Summary

Clause	Test Item	Result
15.209	Spurious Radiated Emissions	Pass
15.207	Conducted Emissions	Pass

Note:

This Product contains approved module with FCC ID: S5751306799. The module is been certified for Class 2 Permissive Change with this product as new host. Hence module related tests are excluded.

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List of Test and Measurement Instruments

TUV Rheinland (India) Pvt. Ltd. , Bangalore

Equipment	Manufacturer	Model	S/N	Calibration Due Date
EMI Test Receiver	Rohde &Schwarz	ESU 40	100288	04.10.2014
Hybrid Log Periodic antenna	ETS Lindgren	3142D	00081354	26.07.2014
Broadband Horn Antenna	Frankonia	HAX-18	HAX18-802	23.03.2014
Double-Ridged Waveguide Horn Antenna	ETS Lindgren	116794	00133356	01.09.2014
Emission Horn Antenna	ETS Lindgren	116706	00107323	24.08.2014
Active Loop Antenna	Frankonia	LAX-10	LAX-10-800	11.04.2014
Spectrum Analyser	Agilent Technologies	E4407B	US41192772	21.03.2014

Testing Facilities:

- 1) TUV Rheinland (India) Private Limited
No. 108, West Wing
Electronic city Phase I
Bangalore – 560100

General Product Information

Product Function and Intended Use

The Wireless Field Interface (WFI) adds a wireless capability to the existing servo or the radar gauge by supporting the GPU protocol and Flexconn which is compliant with the ISA100 standards. It consists of multiple electronic boards, an antenna cable, and an antenna. The WFI communicates with the servo or the radar gauge through the Honeywell Enraf field bus Bi-Phase Mark, processes the data, and forwards the information wirelessly to the Wireless Device Manager (WDM) which is compliant with the ISA100 standards. The complete network including the WFI is based on the ISA100 wireless field device network.

Ratings and System Details

Operating Frequency	2405-2475 MHz
No. of channel	15
Channel Spacing	5MHz
Transmitted Power	15dBm
Modulation	DSSS
Data Rate	250Kbps
Antenna Type	External
Number of antenna	2
Antenna Gain	As per Table 1
Supply Voltage	65V – 240V AC 50/60Hz 24V – 65V DC
Dimensions	248mm X 173mm X 304mm
Environmental	-40 °C to +65 °C

Test Conditions:

Voltage: 120V AC 60Hz, 24V DC

Environmental conditions:

Temperature: +23 °C

RH: 62%

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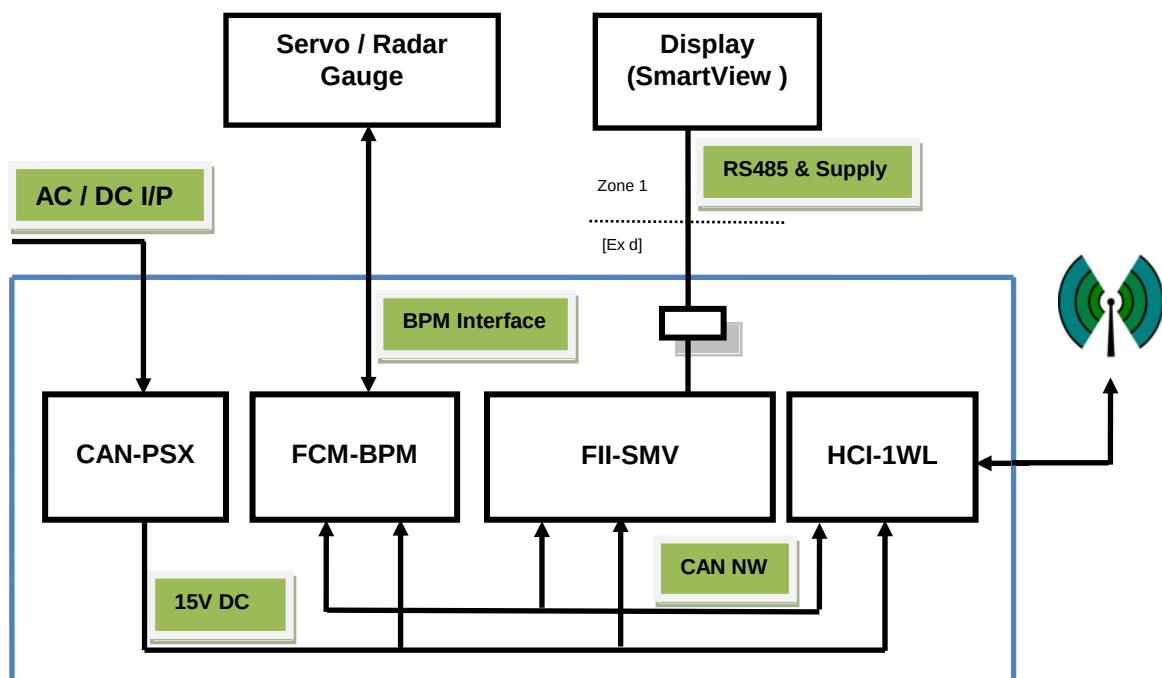
Operation Descriptions

The wireless field interface (WFI) adds wireless capability to the existing Servo/ Radar Gauge. The compact, intelligent and reliable tank gauge is microcontroller based tank level gauge which measures and calculates various parameters like level, temperature, pressure, tank deformation etc., and communicates with WFI over the BPM [Bi-Phase Mark] physical layer overlayed with CAN protocol.

The wireless field interface fetches data from the gauge and transmits it to the control room wirelessly over the ISA100 network. The wireless field interface will support the 4.0dBi and 8.5dBi antennas.

The device WFI will operate at AC & DC inputs.

Block Diagram



Test Set-up and Operation Mode

Principle of Configuration Selection

The test was performed under continuous transmission to obtain the maximum emissions.

Test Operation and Test Software

A keypad embedded on PCB was used to enable the continuous transmission and changing channels (low/mid/high) on the EUT for the tests in this report.

Special Accessories and Auxiliary Equipment

-

Countermeasures to achieve EMC Compliance

- None

Table of carrier frequencies

Frequency Band	Channel No.	Frequency (MHz)
2400-2483.5 MHz	01	2405
	02	2410
	03	2415
	04	2420
	05	2425
	06	2430
	07	2435
	08	2440
	09	2445
	10	2450
	11	2455
	12	2460
	13	2465
	14	2470
	15	2475

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Antennas Used

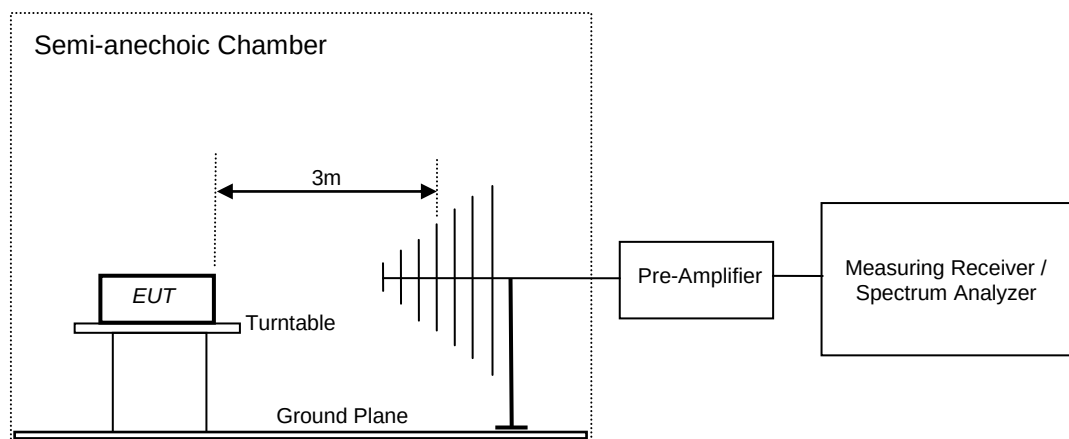
Antenna Number	Make	Model	Antenna Gain (dBi)	Power Level Setting (dBm)
Antenna 1	LCOM	HG2404U	4.0	15
Antenna 2	LCOM	HG2409U	8.5	15

Table 1

Test Methodology

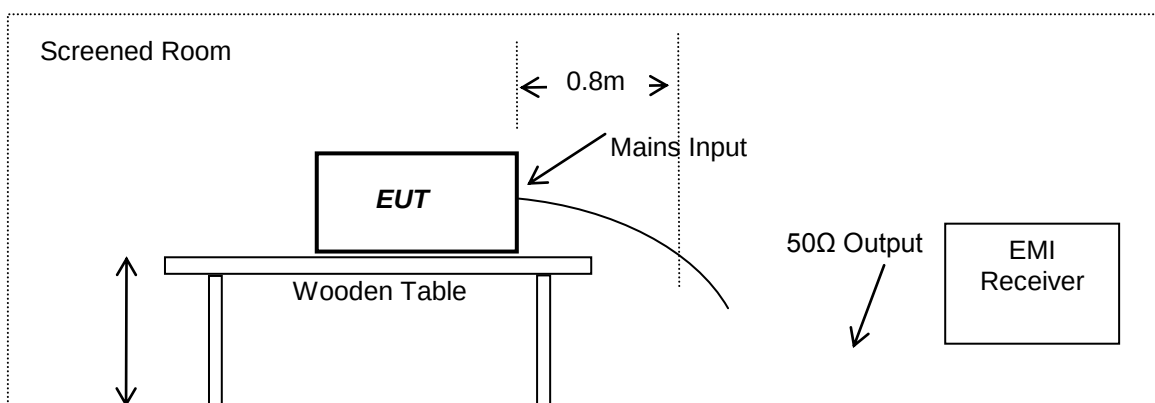
Radiated Emission Test

The radiated emission measurement was performed according to the procedures in ANSI C63.10-2001. The equipment under test (EUT) was placed at the middle of the 80 cm high turntable, and the EUT is 3 meters far from the measuring antenna. The turntable was rotated 360° for obtaining the maximum emission. The height of the measuring antennas was scanned between 1m and 4m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. Repeat the measurement steps until the maximum emissions were obtained. The measurement above 1000MHz was performed by horn antenna. The measurement below 30MHz was performed by loop antenna. The EUT was rotated around the X-, Y-, and Z-Axis and the results from worst case axis are recorded.



Conducted Emission Test on a.c. mains line

The equipment under test (EUT) was placed on a wooden table 80cm above the ground plane, the LISN was placed 80cm away from the EUT. The test was performed in accordance with ANSI C63.4: 2003, with the following: an initial measurement was performed in peak and average detection mode on the live and neutral lines. The pre-scan was performed by peak detection on both live and neutral conductors. Any emissions recorded within 20dB of the relevant limit line were re-measured using quasi-peak and average detections, the 6 worst cases were recorded in the table of results.



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Test Results

Spurious Radiated Emissions

Section 15.209

Result

Pass

Test Specification	FCC 15.207
Test Method	ANSI C63.10-2009
Measurement Location	Semi Anechoic Chamber
Supply Voltage	120V 60Hz AC, 24V DC
Measuring Frequency Range	9kHz – 26GHz(Up to 10 th harmonic of the highest fundamental frequency)
Measuring Distance	3m
Detection	QP for frequency below 1GHz, Average for frequency above 1GHz
Requirement	The emission should not exceed the limits as mentioned in the table below

Limit for Radiated Emission of Section 15.209:

Frequency (MHz)	Field strength (μV/m)	Field strength (dBμV/m)	Distance of Measurement (m)
0.009 – 0.490	2400/F(kHz)	48.50 – 13.80	300*
0.490 – 1.705	24000/F(kHz)	33.80 – 23.00	30*
1.705 -30	30	29.54	30*
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Remark: * the limit shows in the table above of frequency range 0.009 – 0.490, 0.490 – 1.705 MHz and 1.705-30MHz is at 300 meter, 30 meter and 30 meter range respectively, which corresponds to 88,50 – 53.80, 53.80 – 43.00 and 49.5dBμV/m at 3m range by extrapolation calculation and the measurement of loop antenna.

The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz Radiated emission limits in these three bands are based on measurements employing an average detector.

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Test Results

This Product was tested with 120V AC and 24VDC. Only worst case results are reported.

For Frequency below 1GHz

Polarization	Frequency (MHz)	Emission level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
H	31.11	21.92	40.00	-18.08
	56.96	23.62	40.00	-16.38
	78.88	25.44	40.00	-14.56
	82.47	26.34	40.00	-13.66
	105.36	23.44	43.50	-20.06
	105.36	24.00	43.50	-19.50
	359.02	34.64	46.00	-11.36
V	31.41	31.95	40.00	-8.05
	58.03	28.82	40.00	-11.18
	78.88	29.03	40.00	-10.97
	82.76	27.58	40.00	-12.42
	106.24	20.99	43.50	-22.51
	358.92	30.49	46.00	-15.51

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For Frequency above 1GHz
Antenna 1: 4dBi

Channel	Polarization	Frequency (MHz)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)
Low	V	2351	61.89	74	-12.11
		2351	50.15	54	-3.85
		2405	107.4	*	-
		2405	104.7	*	-
		4810	52.74	74	-21.26
		4810	42.93	54	-11.07
		7215	58.57	74	-15.43
		7215	46.95	54	-7.05
	H	2350	46.47	74	-27.53
		2350	36.36	54	-17.64
		2405	97.24	*	-
		2405	93.56	*	-
		4810	52.93	74	-21.07
		4810	43.98	54	-10.02
		7215	57.74	74	-16.26
		7215	45.49	54	-8.51
Mid	V	2440	107.36	*	-
		2440	104.21	*	-
		4880	51.58	74	-22.42
		4880	40.21	54	-13.79
		7320	58.4	74	-15.6
		7320	46.33	54	-7.67
	H	2440	98.04	*	-
		2440	94.27	*	-
		4880	50.78	74	-23.22
		4880	41.73	54	-12.27
		7320	57.06	74	-16.94
		7320	45.46	54	-8.54
High	V	2475	107.44	*	-
		2475	104.2	*	-
		2540	58.59	74	-15.41
		2540	49.73	54	-4.27
		4950	50.67	74	-23.33
		4950	41.17	54	-12.83
		7425	-	74	-
		7425	-	54	-
	H	2475	96.5	*	-
		2475	92.89	*	-
		2540	45.55	74	-28.45
		2540	35.63	54	-18.37
		4950	52.99	74	-21.01
		4950	42.52	54	-11.48
		7425	-	74	-
		7425	-	54	-

Antenna 2 : 8.5dBi

Channel	Polarization	Frequency (MHz)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)
Low	V	2351	64.03	74	-9.97
		2351	53.42	54	-0.58
		2405	107.54	*	-
		2405	104.42	*	-
		4810	52.1	74	-21.9
		4810	43.04	54	-10.96
		7215	58.05	74	-15.95
		7215	47.66	54	-6.34
	H	2351	43.68	74	-30.32
		2351	38.14	54	-15.86
		2405	94.03	*	-
		2405	90.41	*	-
		4810	53.71	74	-20.29
		4810	44.45	54	-9.55
		7215	57.83	74	-16.17
		7215	45.31	54	-8.69
Mid	V	2440	107.49	*	-
		2440	104.34	*	-
		4880	51.63	74	-22.37
		4880	39.3	54	-14.7
		7320	58.15	74	-15.85
		7320	46.55	54	-7.45
	H	2440	92.05	*	-
		2440	88.28	*	-
		4880	51.32	74	-22.68
		4880	42.29	54	-11.71
High	V	7320	57.24	74	-16.76
		7320	45.25	54	-8.75
		2475	107.41	*	-
		2475	104.2	*	-
		2540	59.23	74	-14.77
		2540	48.96	54	-5.04
		4950	52.1	74	-21.9
		4950	41.23	54	-12.77
	H	7425	-	74	-
		7425	-	54	-
		2475	90.86	*	-
		2475	87.2	*	-
		2540	41.59	74	-32.41
		2540	31.08	54	-22.92
		4950	51.64	74	-22.36
		4950	42.51	54	-11.49
		7425	-	74	-
		7425	-	54	-

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Conducted Emission Test on a.c. Power Line

Section 15.207

Result

Pass

Test Specification : FCC Part 15 Section 15.207
Test Method : ANSI C63.4-2003
Testing Location : Screened room
Measurement Bandwidth : 9kHz
Frequency Range : 150kHz – 30MHz
Supply Voltage : 120V AC

Limit of section 15.207

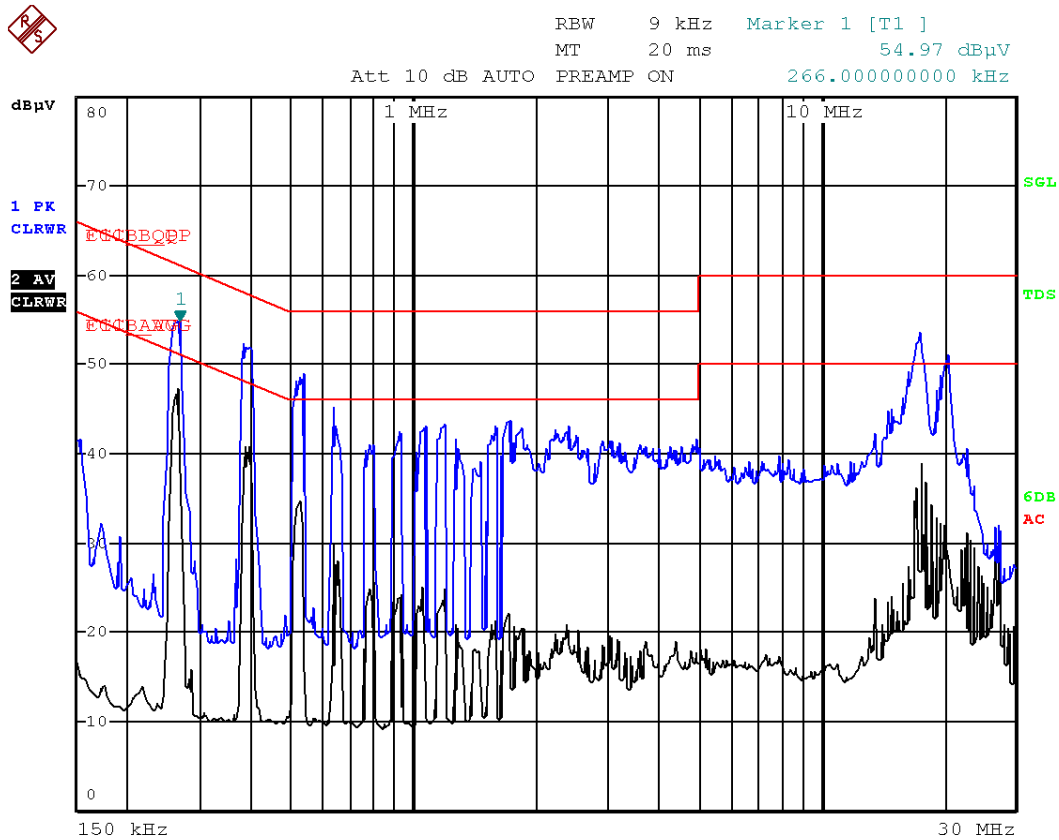
Frequency of emission (MHz)	QP Limit (dB μ V)	AV Limit (dB μ V/m)
0.15 – 0.5	66 – 56*	56 – 46*
0.5 – 5	56	46
5 – 30	60	50

* Decreases with the logarithm of the frequency

Test Result:

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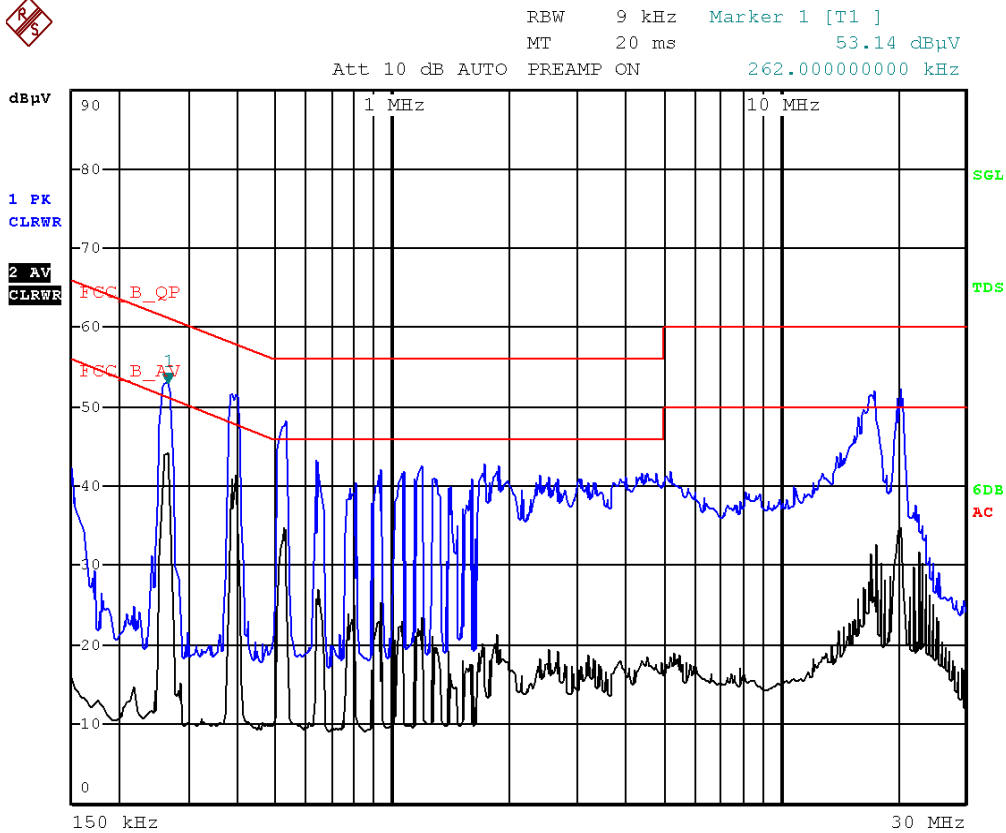
Mode: Line



EDIT PEAK LIST (Final Measurement Results)				
Trace1:	FCC_B_QP			
Trace2:	FCC_AVG			
Trace3:	---			
TRACE	FREQUENCY	LEVEL dBμV	DELTA LIMIT dB	
2 Average	262 kHz	46.76 L1	-4.60	
2 Average	394 kHz	40.92 L1	-7.05	
1 Quasi Peak	382 kHz	50.85 L1	-7.38	
1 Quasi Peak	266 kHz	53.09 L1	-8.14	
1 Quasi Peak	534 kHz	47.12 L1	-8.87	
2 Average	526 kHz	35.04 L1	-10.95	
1 Quasi Peak	634 kHz	42.23 L1	-13.76	
1 Quasi Peak	20.446 MHz	44.74 L1	-15.25	
1 Quasi Peak	17.466 MHz	42.56 L1	-17.43	
2 Average	17.114 MHz	23.29 L1	-26.70	
2 Average	17.618 MHz	23.16 L1	-26.83	
2 Average	19.13 MHz	21.31 L1	-28.69	
2 Average	18.626 MHz	18.37 L1	-31.63	

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Mode: Neutral



EDIT PEAK LIST (Final Measurement Results)				
Trace1:	FCC_B_QP			
Trace2:	FCC_B_AV			
Trace3:	---			
TRACE	FREQUENCY	LEVEL dBμV		DELTA LIMIT dB
2 Average	262 kHz	44.91	N	-6.45
2 Average	394 kHz	40.53	N	-7.44
1 Quasi Peak	382 kHz	50.45	N	-7.78
1 Quasi Peak	530 kHz	46.72	N	-9.27
1 Quasi Peak	262 kHz	51.69	N	-9.66
2 Average	526 kHz	33.76	N	-12.23
1 Quasi Peak	638 kHz	40.74	N	-15.25
2 Average	20.318 MHz	34.53	N	-15.47
1 Quasi Peak	20.562 MHz	43.92	N	-16.07
1 Quasi Peak	17.546 MHz	42.45	N	-17.54
2 Average	22.674 MHz	31.13	N	-18.86
2 Average	17.634 MHz	30.28	N	-19.71