RR-032-PTC-12-104960-2-A

"This report cancels and replaces the test report N°RR-032-PTC-12-104960-2-A Edition 0"

E.M.C Test Report

According to the standard:
FCC PART 15 : 2012

Equipment under test:
Well Head Interface (WHI)

Company:
SRETT

FCC listed: 910 701

DISTRIBUTION: Mr. ROUGEUX **(Company:** SRETT)

Number of pages: 26 with 4 annexes

Ed.	Date	Modified page(s)	Written by Name / Visa	Technical Verification and Quality Approval Name / Visa
1	26/04/13	1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 13, 14, 15, 16, 23, 24, 25, 26	C. FOURCADE CF	B. Pellerin

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TEST CERTIFICATION FOR:	FCC Certification
NAME OF THE EQUIPMENT UNDER TEST:	Well Head Interface (WHI)
Serial number:	0E006 for the WHI 1701 for DHG (Probe)
NAME OF THE MANUFACTURER:	SRETT
ADDRESS OF THE APPLICANT:	
Company:	SRETT
Address:	85-87 Avenue Pierre Grenier 92100 BOULOGNE BILLANCOURT FRANCE
Person in charge:	Mr ROUGEUX
DATES OF TESTS:	15 and 16/11/2012 04/04/2013
TESTS LOCATIONS:	Open area test site in Aunainville (28) - FRANCE EMITECH Laboratory in Montigny – le- Bretonneux (78) - France
TESTS OPERATORS:	C. FOURCADE / F. LHEUREUX

TABLE OF CONTENTS

1. *INTRODUCTION*

This document presents the results of Electromagnetic Compatibility tests performed on the equipment «Well Head Interface» according to reference document listed below.

2. *REFERENCE DOCUMENT*

FCC Part 15: 2012
Code of Federal Regulations
Title 47- Telecommunication
Chapter 1- Federal Communication Commission
Part 15- Radio frequency devices

ANSI C63.4: 2003
Methods of Measurement of Radio-Noise Emissions from Low-voltage Electrical and Electronics Equipment in the range of 9 kHz to 40 GHz.

3. *PRODUCT DESCRIPTION*

Operating frequency range:	From 902 MHz to 928 MHz
Number of channels:	2
Channel spacing:	1 MHz
Power source:	3.6 Vdc

Power level, frequency range and channels characteristics are not user adjustable.

Firmware application: ICIS-APPLI-canaux-1-2.hex

4. *EQUIPMENT UNDER TEST (EUT) CONFIGURATION*

- See antenna factors, insertion losses and amplifier values in annex 1.
- See internal photographs in annex 2.
- See setup photographs in annex 3.

Modification of the equipment during the tests: No.

5. *TESTS AND CONCLUSION*

The following table summarizes test results of the EUT.

Test procedure	Designation of test	Test results				Comments
		Pass	Fail	N.A.	N.P.	
15.207	Measurement of conducted emission on AC mains ports			X		
15.249	Intentional radiated emissions	X				
15.209 and 15.249	Harmonics and Unintentional radiated emissions (transmitter mode)	X				
15.215	Additional provisions to the general radiated emission limitations					See annex 4
	(a) Alternative to general radiated emission limits	X				
	(b) Unwanted emissions outside of § 15.249 frequency bands	X				

N.A.: Not Applicable
N.P.: Not Performed

Conclusion:

The tested sample "Well Head Interface (WHI)" submitted to the tests complies with the requirements of the standard:

- FCC PART 15: 2012

According to the limits specified in this report.

6. *INTENTIONAL RADIATED EMISSIONS*

Standard: FCC PART 15 : 2012

Section: 15.249

Test configuration:

The system is tested in an open area test site (OATS).

The test unit is placed on a rotating table, 0.8 m from a ground plane. Zero degree azimuth corresponds to the front of the equipment under test.

The level was maximised in antenna height, azimuth and polarization. The maximum level measured on the spectrum analyser was recorded.

Distance of antenna: 3 meters

Instrumentation test list:

CATEGORY	BRAND	TYPE	Nr EMITECH	Calibration Interval (months)	Calibration Last date
Antenna	Schwarzbeck	UHALP 9108	3106	24	27/04/12
Antenna mast	Maturo	AM 4.0-O	7625	-	-
Antenna mast	Maturo	MCU	7626	-	-
Cable	Câbles & Connectiques	N-13m	2452	24	24/10/12
Cable	-	N-2m	2805	24	17/05/12
Cable	-	N-8m	8019	24	26/11/12
Cable	-	N-8m	8020	24	26/11/12
Open area test site	Emitech	Aunainville	0187	36	28/11/10
Receiver	Rohde & Schwarz	ESVS10	1216	24	12/12/11

Equipment under test operating condition:

EUT is in continuous transmission mode. Amplifier EUT Gain is adjusted to 0 dBm.

Measure conditions:

Ambient temperature (°C): 18
Relative humidity (%): 70
Power source: 3.6 Vd.c.

Resolution bandwidth: 100 kHz

Results:

Polarization of test antenna: Vertical (height: 190 cm)
Position of equipment: Az: 160°

Sample n°1 Channel 1 (903.97 MHz)

		Electro-magnetic field (dBµV/m)	Limit dBµV/m	µV/m
Normal test conditions	Nominal power source (V): 3.6	87.5	94.0	50

Sample n°2 Channel 2 (905.09 MHz)

		Electro-magnetic field (dBµV/m)	Limit dBµV/m	µV/m
Normal test conditions	Nominal power source (V): 3.6	87.2	94.0	50

Test conclusion: Complies with the requirements of the standard.

7. *HARMONICS AND UNINTENTIONAL RADIATED EMISSIONS IN THE BAND 9 kHz – 9.5 GHz*

Standard: FCC PART 15 : 2012

Sections: 15.205; 15.209 and 15.249

Equipment under test arrangement:

The equipment under test (EUT) is placed on a non-conductive test table at 0.8 m above the horizontal metal ground plane.

For maximum meter reading at each frequency, the antenna height is adjusted between 1 m and 4 m above the ground plane. A 360 degrees rotation of the EUT is performed in vertical and horizontal polarization. The frequency azimuth and antenna height are presented in the table on the next pages.

The equipment is in continuous transmission.

Amplifier EUT Gain is adjusted to 0 dBm

Frequency range:	9 kHz – 30 MHz 30 MHz - 1 GHz 1 GHz – 9.5 GHz
Detection mode:	Quasi-peak for 9 kHz – 30 MHz Quasi-peak for 30 MHz - 1 GHz Average for 1 GHz – 9.5 GHz
Resolution bandwidth:	200 Hz for 9 kHz – 150 kHz 9 kHz for 150 kHz – 30 MHz 120 kHz for 30 MHz - 1 GHz 1 MHz for 1 GHz – 9.5 GHz
Measurement distance:	30 meters from 9 kHz to 30 MHz 3 meters from 30 MHz to 9.5 GHz

- Limit for emission radiated outside the frequency band, except the harmonics, shall be attenuated by at least 50 dB below the level of fundamental of the general radiated emission limits in § 15.249 (see table).

From 9 kHz to 30 MHz

Frequency range	Limit µV/m
9 – 490 kHz	2400/F (F in kHz) *
490 – 1705 kHz	24000/F (F in kHz)
1.705 – 30 MHz	30

* Limits in µV/m can be extrapolated to 30 m using 20 dB / decade.

From 30 MHz to 9.5 GHz

Frequency range (MHz)	Limit (dBµV/m)	µV/m
30 to 88	40.0	100
88 to 216	43.5	150
216 to 960	46.0	200
Above 960	54.0	960

- Limit for field strength of harmonic: 54 dBµV/m (500 µV/m)

Instrumentation test list:

CATEGORY	BRAND	TYPE	Nr EMITECH	Calibration interval (months)	Calibration last date
Antenna	Schwarzbeck	UHALP 9108	3106	24	27/04/12
Antenna	Emco	3115	0941	48	15/03/10
Antenna	Emco	3115	3374	48	08/02/12
Antenna	Schwarzbeck	VHA 9103	0317	48	19/08/10
Antenna	Emco	6507	4211	24	22/03/13
Antenna mast	Maturo	AM 4.0-O	7625	-	-
Antenna mast	Maturo	MCU	7626	-	-
Cable	Câbles & Connectiques	N-13m	2452	24	24/10/12
Cable	-	N-2m	2805	24	17/05/11
Cable	-	N-8m	8019	24	26/11/12
Cable	-	N-8m	8020	24	26/11/12
Cable	Câbles & Connectiques	N-SMA	2864	24	14/12/11
Cable	Micro-Coax	N-13m	8063	24	06/08/12
Filter	Trilithic	6HC1300-2.5-KK	1097	24	12/04/11
Filter	Trilithic	5EHLX500-3-KK	1529	24	12/04/11
Filtre	Micro-tronics	HPM 14758	4691	24	12/04/11
Open area test site	Emitech	Aunainville	0187	36	28/11/10
Spectrum analyzer	Rohde & Schwarz	FSP40	5175	24	19/01/11
Voltmeter	Rohde & Schwarz	ESVS10	1216	24	12/12/11

Results:

For channel 1:

Frequency (MHz)	Polarization	Azimut (degrees)	Antenna height (cm)	Measure (dBµV/m)	Standard limit (dBµV/m)	Δ (dB)
1808.0	Vertical	90	200	51.1	54	3.9
5424.6	Vertical	90	190	47.8	54	6.2

For channel 2:

Frequency (MHz)	Polarization	Azimut (degrees)	Antenna height (cm)	Measure (dBµV/m)	Standard limit (dBµV/m)	Δ (dB)
1809.9	Vertical	90	200	51.9	54	2.1
5430.2	Vertical	90	190	41.84	54	12.2

Test conclusion:

The equipment complies with the requirements of the standard FCC.

« □□□ *End of report, 4 annexes to be forwarded* □□□ »

ANNEX 1

Antenna factors, insertion losses and amplifier values

BILL OF MATERIAL

The test antenna used for the radiated emission between 9 kHz and 30 MHz is the active loop antenna n°4211. Antenna factors are given in table 1.

The test antenna used for the radiated emission between 30 MHz and 200 MHz is the biconical antenna n°317. Antenna factors are given in table 2.

The test antenna used for the radiated emission between 200 MHz and 1 GHz is the log-periodic antenna n°3106. Antenna factors are given in table 3.

The measuring receiver n°1216 used in the frequency range 30 MHz to 1 GHz has an integrated preamplifier.

The spectrum analyzer n°5175 is used in the frequency range 9 kHz to 30 MHz and 1 GHz to 9.5 GHz.

The test cable used between 9 kHz and 30 MHz to connect the antennas to the receiver for measurements at a distance of 30 meters has losses given in table 4.

The test cable used between 30 MHz and 1 GHz to connect the antennas to the receiver for measurements at a distance of 3 meters has losses given in table 5.

The test antenna used for the radiated emission between 1 GHz and 9.5 GHz is the horn antenna n°3374. Factors are given in table 6.

The amplifier n°3229 used to connect the spectrum analyzer to the test cable has gain values given in the table 7.

The test cable used between 1 GHz and 9.5 GHz to connect the horn antenna to the amplifier for measurements at a distance of 3 meters has losses given in table 8.

Frequency (MHz)	Antenna factor (dB/m)	Frequency (MHz)	Antenna factor (dB/m)
0.009	-21.8	0.8	-35.2
0.01	-22.7	1	-35.2
0.015	-25.7	1.5	-35.3
0.02	-28.4	2	-35.4
0.03	-31.2	3	-35.4
0.05	-33.6	5	-35.4
0.08	-34.7	8	-35.4
0.1	-35.0	10	-35.4
0.15	-35.4	15	-35.4
0.2	-35.5	20	-35.7
0.3	-35.5	25	-36.1
0.5	-35.4	30	-36.9

TABLE 1 : ACTIVE LOOP ANTENNA

Frequency (MHz)	Antenna factor (dB/m)	Frequency (MHz)	Antenna factor (dB/m)
30	18.9	90	8.5
35	17.1	100	10.1
40	15.1	120	13.0
45	13.3	140	14.5
50	11.5	160	15.5
60	8.0	180	15.7
70	6.4	200	16.1
80	6.9	-	-

TABLE 2 : BICONICAL ANTENNA

Frequency (MHz)	Antenna factor (dB/m)	Frequency (MHz)	Antenna factor (dB/m)
200	24.0	700	20.6
300	14.5	800	21.1
400	16.8	900	22.2
500	17.9	1000	23.2
600	19.5	-	-

TABLE 3 : LOG-PERIODIC ANTENNA

Frequency (MHz)	loss (dB)	Frequency (MHz)	loss (dB)
0.009	0.0	6.000	0.5
0.020	0.0	7.000	0.5
0.050	0.0	8.000	0.5
0.100	0.0	9.000	0.6
0.500	0.1	10.00	0.6
1.000	0.2	15.00	0.7
2.000	0.2	20.00	0.8
3.000	0.3	25.00	1.0
4.000	0.4	30.00	1.1
5.000	0.4	-	-

TABLE 4 : TEST CABLE FOR 30M MEASUREMENT INTO 9 kHz AND 30 MHz

Frequency (MHz)	loss (dB)	Frequency (MHz)	loss (dB)
30	0.7	250	1.8
40	0.7	300	2.1
50	0.9	400	2.3
60	0.9	500	2.5
70	0.9	600	3.0
80	0.9	700	3.4
90	1.1	800	3.6
100	1.1	900	3.9
150	1.4	1000	4.1
200	1.6	-	-

TABLE 5 : TEST CABLE FOR 3M MEASUREMENT INTO 30 MHz AND 1 GHz

Frequency (GHz)	Antenna factor (dB/m)	Frequency (GHz)	Antenna factor (dB/m)
1.0	23.7	5.5	34.1
1.5	24.6	6.0	34.1
2.0	27.5	6.5	34.4
2.5	28.8	7.0	35.4
3.0	29.8	7.5	36.6
3.5	31.2	8.0	36.6
4.0	32.5	8.5	37.0
4.5	32.5	9.0	37.1
5.0	33.5	9.5	37.2

TABLE 6 : HORN ANTENNA

Frequency (GHz)	Gain value (dB)	Frequency (GHz)	Gain value (dB)
1.0	34.9	5.0	36.0
1.5	34.8	6.0	36.2
2.0	35.1	7.0	35.5
2.5	35.1	8.0	34.8
3.0	35.3	9.0	33.2
4.0	35.7	9.5	31.9

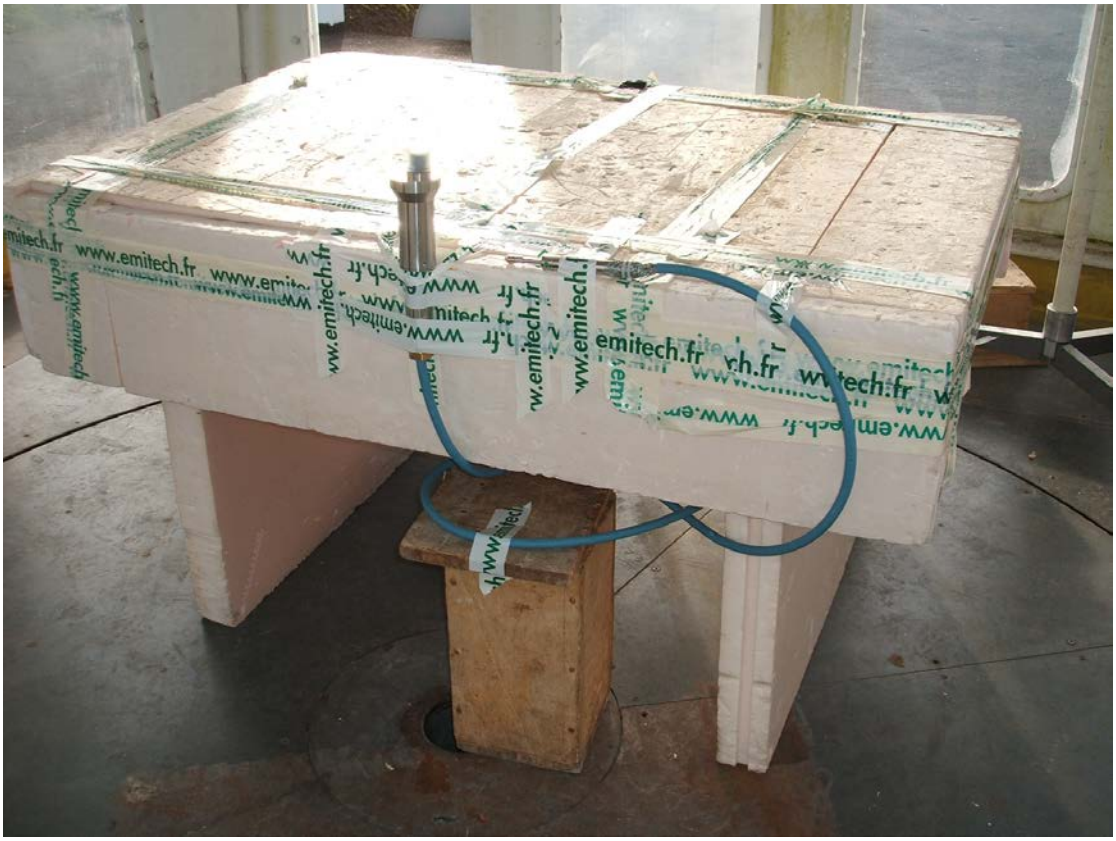
TABLE 7 : AMPLIFIER GAIN VALUE

Frequency (GHz)	loss (dB)	Frequency (GHz)	loss (dB)
1.0	3.4	4.5	7.5
1.5	4.2	5	8.2
2.0	4.8	6	9.1
2.5	5.3	8	9.9
3.0	6.1	10	11.6
3.5	6.6	-	-

TABLE 8: TEST CABLE FOR 3M MEASUREMENT INTO 1 TO 9.5 GHz

ANNEX 2

External photography


www.emitech.fr
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ANNEX 3

Test setup photographies


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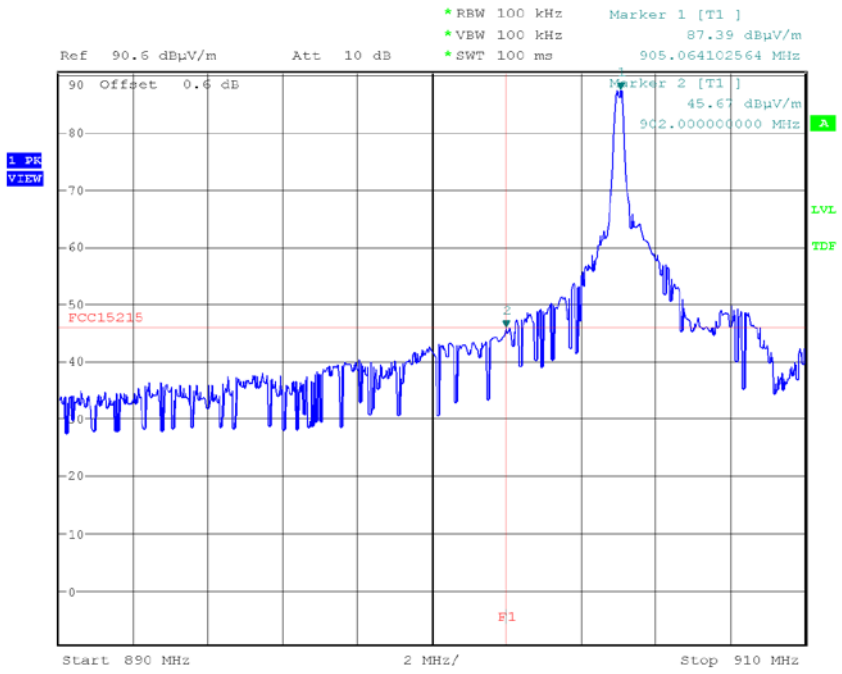
ANNEX 4

Band Edge

For channel 2 in peak detection:



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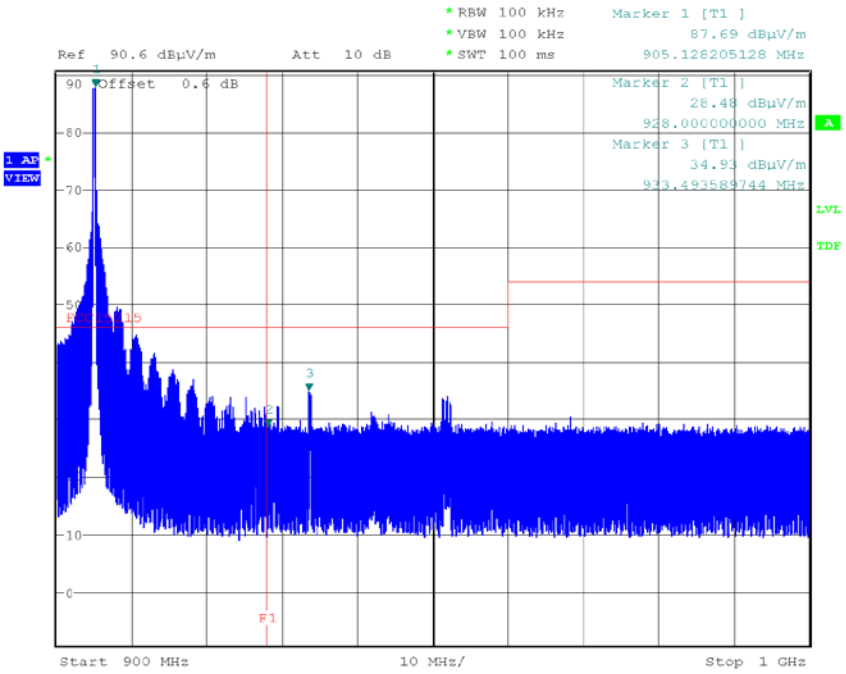

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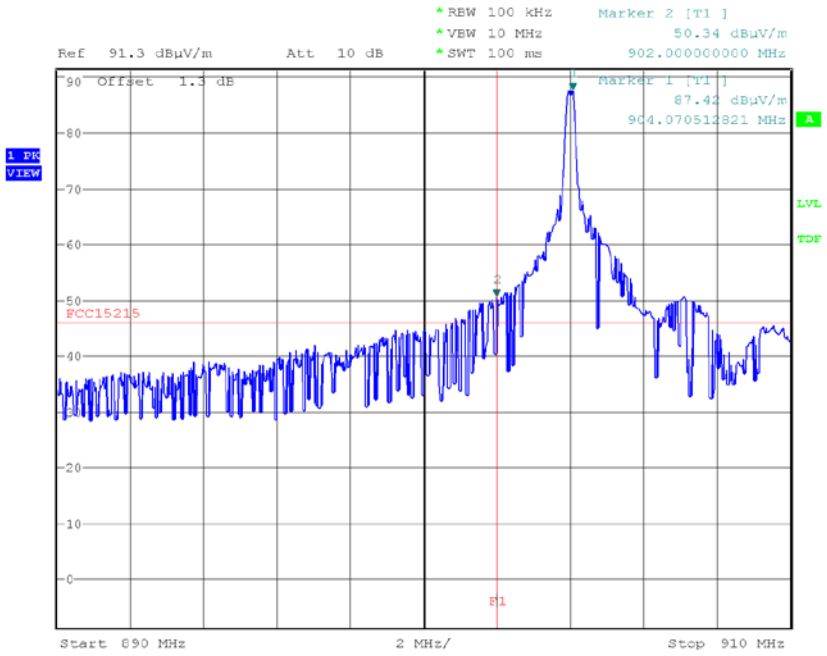
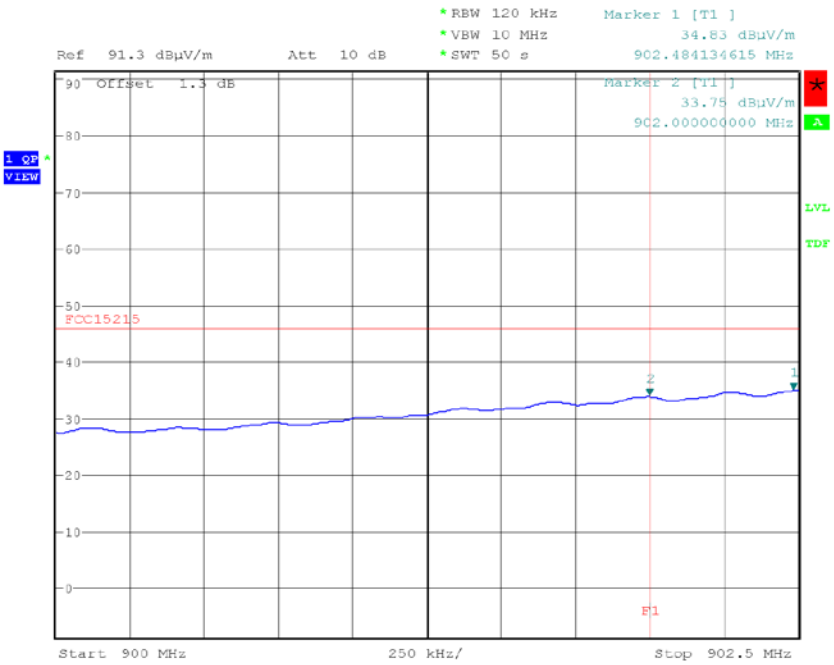
For channel 1 in peak detection:



Date: 4.APR.2013 17:16:26

In quasi-peak detection



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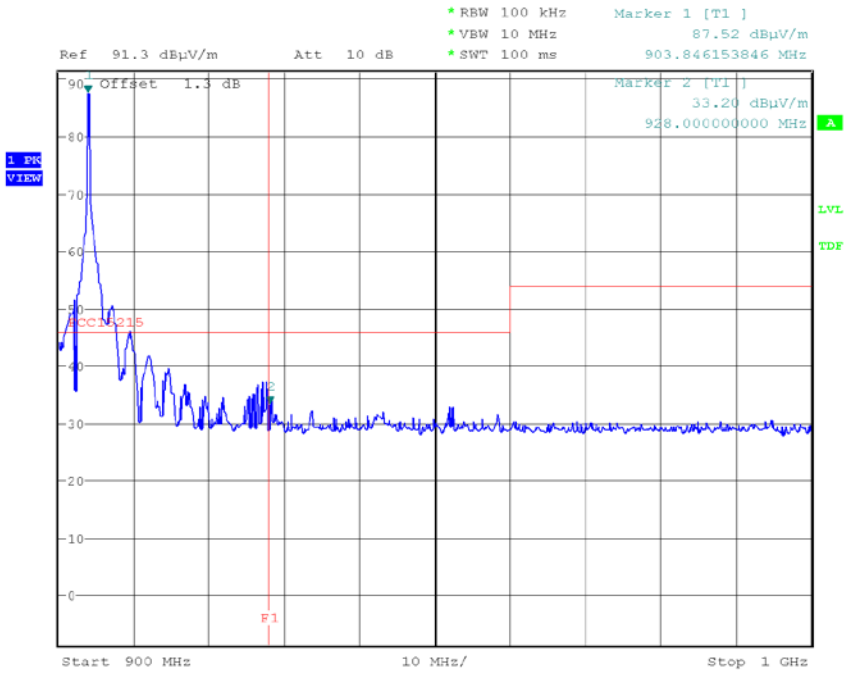
Inpeak detection



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