Nemko Test Report:	138966-21TRFWL
Applicant:	DAP Technologies 875 Charest Boulevard West, suite 200, Québec City, QC, Canada G1N 2C9
Apparatus:	Encompass 1d Handheld Reader
FCC ID:	T5M5000B7
In Accordance With:	FCC Part 15 Subpart C, 15.247 FHSS System and Digitally Modulated Radiators 902–928 MHz, 2400–2483.5 MHz, 5725–5850 MHz – Fundamental and spurious emissions
Authorized By:	Andrey Adelberg, Senior Wireless/EMC Specialist
Date:	December 16, 2009
Total Number of Pages:	27

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Section 1 : Report Summary

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, Subpart C. Radiated tests were conducted in accordance with ANSI C63.4-2003.

The assessment summary is as follows:

Apparatus Assessed:	Encompass 1d Handheld Reader
Specification:	FCC Part 15 Subpart C, 15.247
Compliance Status:	Complies
Exclusions:	None
Non-compliances:	None
Report Release History:	Original Release
Test Location:	Nemko Canada Inc. 303 River Road Ottawa, Ontario K1V 1H2
Registration Number:	176392 (3 m Semi-Anechoic Chamber)
Tests Performed By:	Kevin Ma, EMC/Wireless Specialist
Test Dates:	December 2009

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contain in this report are within Nemko Canada's ISO/IEC 17025 accreditation.

Section 2 : Equipment Under Test

2.1 Identification of Equipment Under Test (EUT)

The following information identifies the EUT under test:

Type of Equipment:	Handheld reader CE 5000B with RFID
Brand Name:	DAP
Model Number:	5000B7
FCC ID:	T5M5000B7
Date of Receipt:	November 25, 2009

2.2 Accessories

No accessories were used during this assessment.

2.3 EUT Description

The EUT is a handheld reader with internal RFID and GPRS connectivity. The RFID End Cap Reader was equipped with 2D imager.

2.4 Technical Specifications of the EUT

Operating Band: 902–928 MHz

Operating Frequencies: 902.750–927.250 MHz

Modulation: eGo (Manchester, 35 kBps)
SeGo (Manchester, 80 kBps)
ATA (CW)
Allegro (Manchester, 300 kBps)
Title-21 (Manchester, 300 kBps)
Gen2 (PIE, 40 kBps)

Antenna Data: Microstrip patch antenna 2.7 dBi

Power Supply Requirements: 120 VAC, 60 Hz / 7.4 VDC (Battery powered)

2.5 EUT Setup diagram

2.6 Operation of the EUT during testing

The EUT was operated using test software that would cause the EUT to transmit continuously on selected channels.

2.7 Modifications incorporated in the EUT

There were no modifications performed to the EUT during this assessment.

Section 3 : Test Conditions

3.1 Specifications

The apparatus was assessed against the following specifications:

FCC Part 15 Subpart C, 15.247
FHSS System and Digitally Modulated Radiators
902–928 MHz, 2400–2483.5 MHz and 5725–5850 MHz

3.2 Deviations From Laboratory Test Procedures

No deviations were made from laboratory test procedures.

3.3 Test Environment

All tests were performed under the following environmental conditions:

Temperature range	:	15–30 °C
Humidity range	:	20–75 %
Pressure range	:	86–106 kPa
Power supply range	:	±5 % of rated voltages

3.4 Measurement Uncertainty

Nemko Canada measurement uncertainty has been calculated using guidance of UKAS LAB 34:2003 and TIA-603-B Nov 7, 2002. All calculations have been performed to provide a confidence level of 95 % and can be found in Nemko Canada document MU-003.

3.5 Test Equipment

Equipment	Manufacturer	Model No.	Asset/Serial No.	Cal. Date	Next Cal.
3 m EMI Test Chamber	TDK	SAC-3	FA002047	May 06/09	May 06/10
Receiver/Spectrum Analyzer	Rohde & Schwarz	ESU 26	FA002043	Dec. 16/08	Dec. 16/09
Bilog	Sunol	JB3	FA002108	Jan. 27/09	Jan. 27/10
Horn Antenna #2	EMCO	3115	FA000825	Jan. 21/09	Jan. 21/10
1 – 18 GHz Amplifier	JCA	JCA118-503	FA002091	Oct 7/09	Oct 7/10
Spectrum Analyzer	Rohde & Schwarz	FSU46	FA001877	Sep 29/09	Sep 29/10
Horn 18 – 26.5 GHz	Electro-Metrics	SH-50/60-1	FA000479	COU	COU
18.0 – 26.0 GHz Amplifier	NARDA	BBS-1826N612	FA001550	COU	COU
Highpass Filter	Trilithic Inc.	6HC1000/10000	FA002232	COU	COU
Highpass Filter	Trilithic Inc.	6HC3000/18000	FA002231	COU	COU
Notch Filter	Microwave Circuits	2400-2483MHz	FA001940	COU	COU
Notch Filter	Microwave Circuits	902-928MHz	FA002096	COU	COU

COU – Calibrate on Use
NCR – No Calibration Required

Section 4 : Results Summary

This section contains the following:

FCC Part 15 Subpart C : Test Results

The column headed 'Required' indicates whether the associated clauses were invoked for the apparatus under test. The following abbreviations are used:

N No : not applicable / not relevant.

Y Yes : Mandatory i.e. the apparatus shall conform to these tests.

N/T Not Tested, mandatory but not assessed. (See Report Summary)

4.1 FCC Part 15 Subpart C : Test Results

Part 15	Test Description	Required	Result
15.209(a)	Radiated Emissions within Restricted Bands	Y	PASS
15.247(b)(2)	Maximum peak output power of Frequency hopping systems operating in the 902–928 MHz band	Y	PASS
15.247(b)(4)	Maximum peak output power	Y	PASS
15.247(d)	Radiated Emissions Not in Restricted Bands	Y	PASS

Note: Only partial tests were performed based on the original modular approval certification. The EUT has a custom antenna path and layout therefore fundamental, power spectral density and spurious emissions tests were performed.

Appendix A : Test Results

Clause 15.209(a) Radiated Emissions within Restricted Bands

Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength		Measurement Distance (meters)
	(μV/m)	(dBμV/m)	
0.009–0.490	2400/F	67.6−20log(F)	300
0.490–1.705	24000/F	87.6−20log(F)	30
1.705–30.0	30	29.5	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

Note: F = fundamental frequency in kHz

Test Results: Pass

Additional Observations:

These results apply to emissions found in the restricted bands defined in FCC Part 15 Subpart C, 15.205.

The EUT was measured on three orthogonal axis.

The Emissions measured at a distance of 3 m and the spectrum was searched from 30 MHz to 10 GHz. Measurements were performed using a Peak detector with 1 MHz RBW / 1 MHz VBW for the Peak values.
For the frequency below 1 GHz Quasi-Peak detector with 120 kHz RBW/300 kHz VBW was used.

Fresh batteries were used throughout all tests.

Only the worst-case results were presented.

RFID:

Frequencies above 1 GHz:

Channel	Frequency (MHz)	Pol.	Emission level Peak (dBµV/m)	Limits (dBµV/m)	Margin (dB)
902.750	1050.0000	V	49.91	74.00	24.09
902.750	3600.0000	V	52.12	74.00	21.88
914.750	1008.5000	V	54.34	74.00	19.66
914.750	2697.5200	V	59.30	74.00	14.70
914.750	3659.5200	V	58.80	74.00	15.20
927.250	1033.5000	V	53.93	74.00	20.07
927.250	2772.0000	V	57.94	74.00	16.06

Channel	Frequency (MHz)	Pol.	Emission level Average (dBµV/m)	Limits (dBµV/m)	Margin (dB)
902.750	1050.0000	V	40.20	54.00	13.80
902.750	3600.0000	V	42.41	54.00	11.59
914.750	1008.5000	V	44.63	54.00	9.37
914.750	2697.5200	V	49.59	54.00	4.41
914.750	3659.5200	V	49.09	54.00	4.91
927.250	1033.5000	V	44.22	54.00	9.78
927.250	2772.0000	V	48.23	54.00	5.77

Note: Peak Emission level values include antenna factor, cable losses and amplifier gain. Average Emission Level is calculated from Peak Emission level plus the duty cycle factor (−9.71 dB)

Frequencies below 1 GHz:

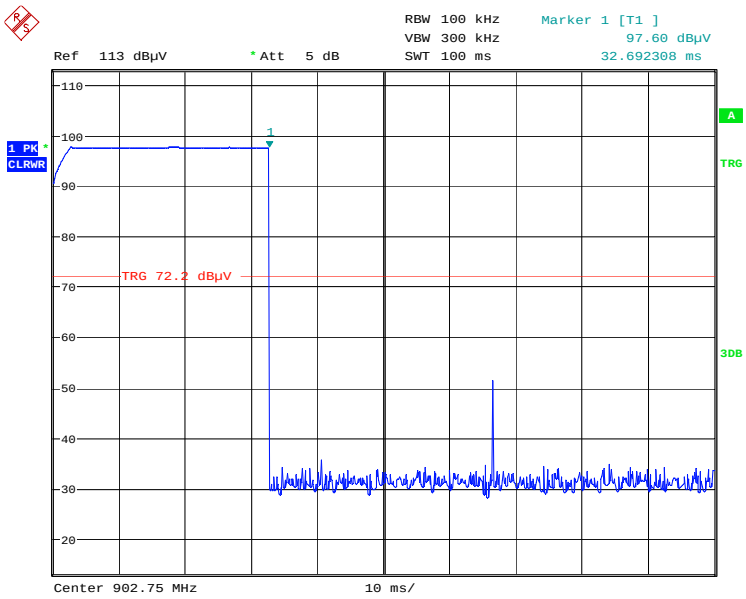
Frequency MHz	Quasi-Peak dBµV/m	Polarity	Corr. dB	Limit dBµV/m	Margin dB
960.000	40.3	H	25.7	43.5	3.2
965.000	38.6	H	26.0	54.0	15.4

Note: Correction factor includes antenna gain and cable loss

There were no additional emissions or change in existing emissions when the RFID was operated simultaneously with the GPRS.

Duty cycle correction factor calculation:

Number of transmissions within 100 ms is 1



Date: 27.NOV.2009 10:49:02

Transmission width is 32.692308 ms.

Duty cycle factor calculation: $20 \times \mathrm{Log}(32.692308 \text{ ms} / 100 \text{ ms}) = -9.71$ dB

Clause 15.247(b)(2) Maximum peak output power of Frequency hopping systems operating in the 902–928 MHz band

For frequency hopping systems operating in the 902–928 MHz band: 1 W for systems employing at least 50 hopping channels; and, 0.25 W for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.

Clause 15.247(b)(4) Maximum peak output power

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Test Results: Pass

Additional Observations:

The EUT was modified to perform the conducted measurements.

Fresh batteries were used throughout all tests.

RFID:

Peak Output Power:

	Channel 902.750 MHz	Channel 914.750 MHz	Channel 927.250 MHz	Limits	Margin (dB)
eGo	29.43 dBm	29.38 dBm	29.42 dBm	30 dBm	0.57
SeGo	29.34 dBm	29.31 dBm	29.36 dBm	30 dBm	0.64
ATA	29.29 dBm	29.37 dBm	29.42 dBm	30 dBm	0.58
Title 21	29.06 dBm	29.02 dBm	29.10 dBm	30 dBm	0.90
Allegro	29.07 dBm	29.08 dBm	29.17 dBm	30 dBm	0.83
Gen2	28.84 dBm	28.82 dBm	28.87 dBm	30 dBm	1.13

Note: all measurements were performed conducted using a peak detector with 1 MHz/3 MHz RBW/VBW.

Maximum antenna is 2.7 dBi
Maximum EIRP = 29.43 + 2.7 = 32.13 dBm
EIRP Limit: 36 dBm
Margin = 3.87 dB

Clause 15.247(d) Radiated Emissions Not in Restricted Bands

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Test Results: Pass

Additional Observations:

The EUT was modified to perform the conducted measurements. Measurements were performed using a Peak detector with 100 kHz RBW / 300 kHz VBW.

Fresh batteries were used throughout all tests.

No emissions were detected higher that 30 dB below the in-band emission measured with 100 kHz IF bandwidth.

RFID:

eGo

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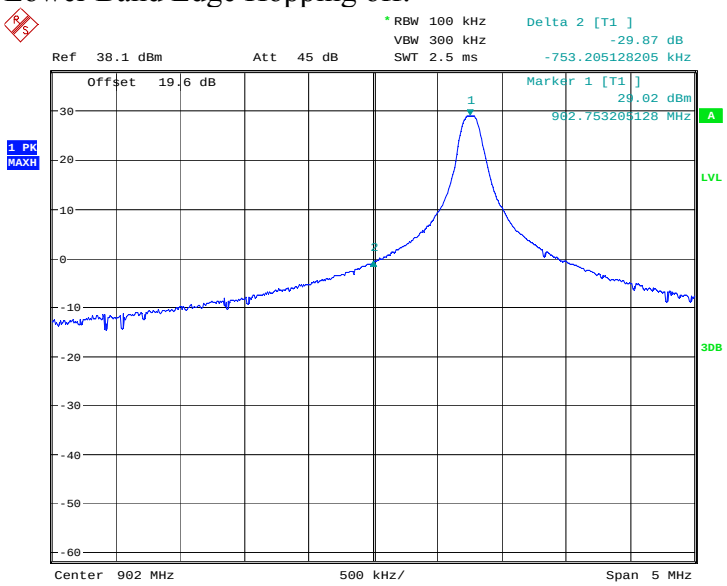

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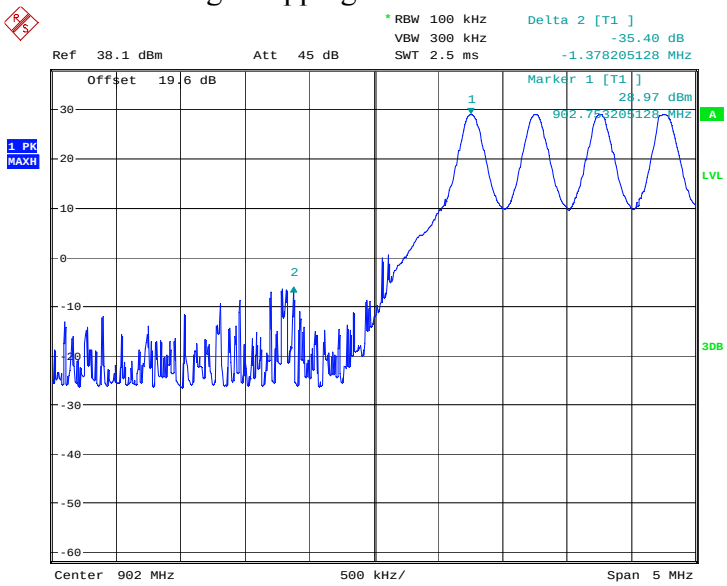

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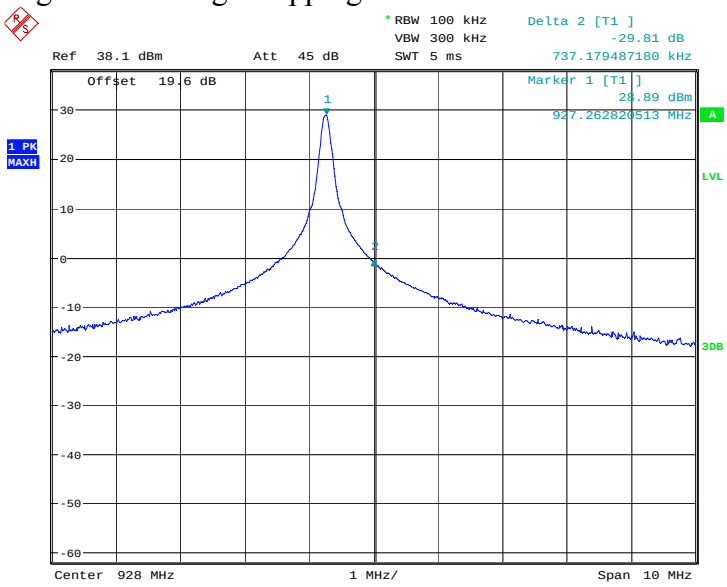

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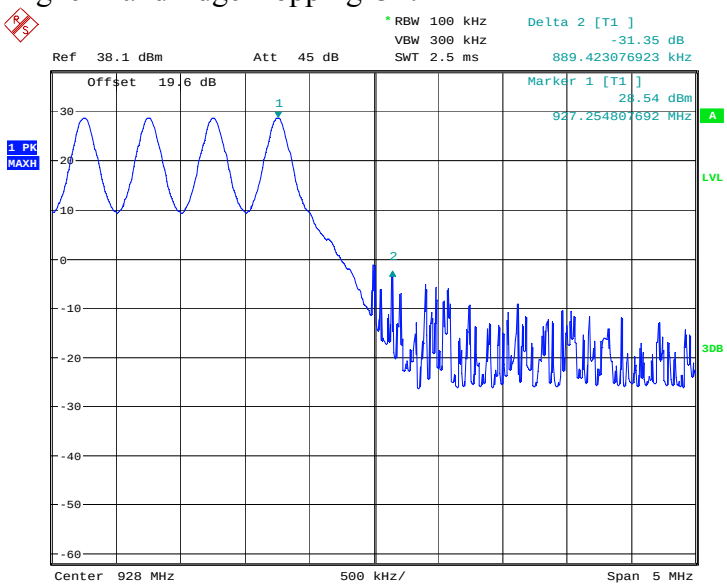

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SeGo

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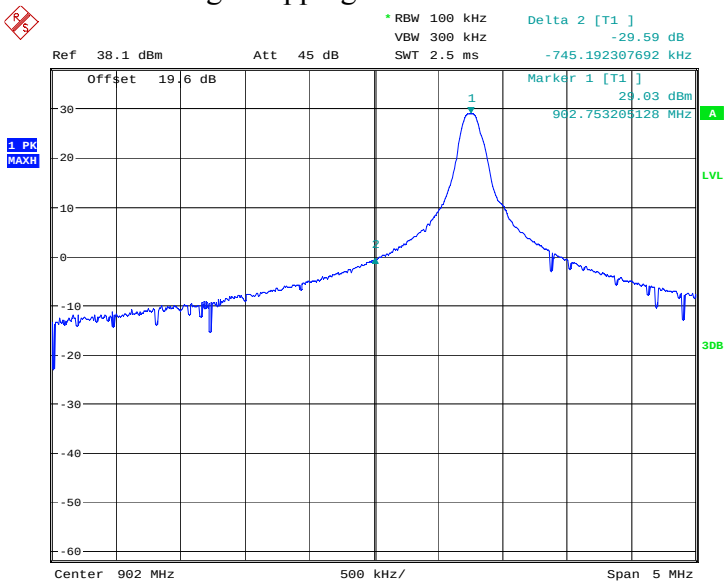

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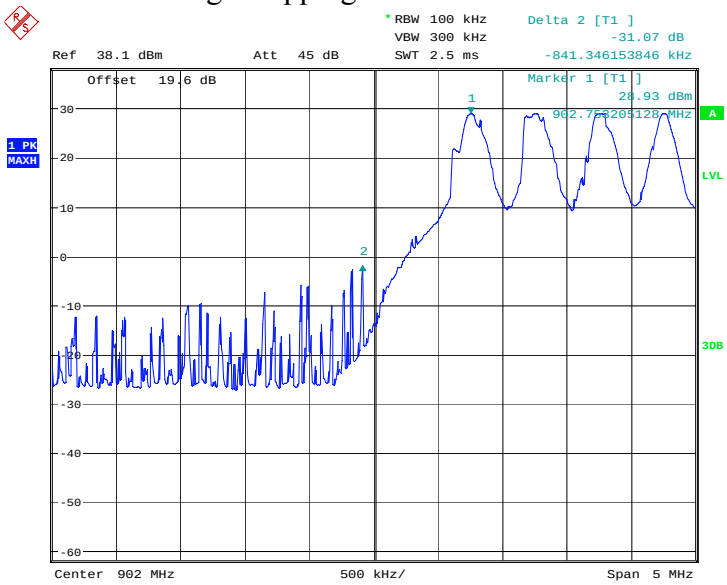

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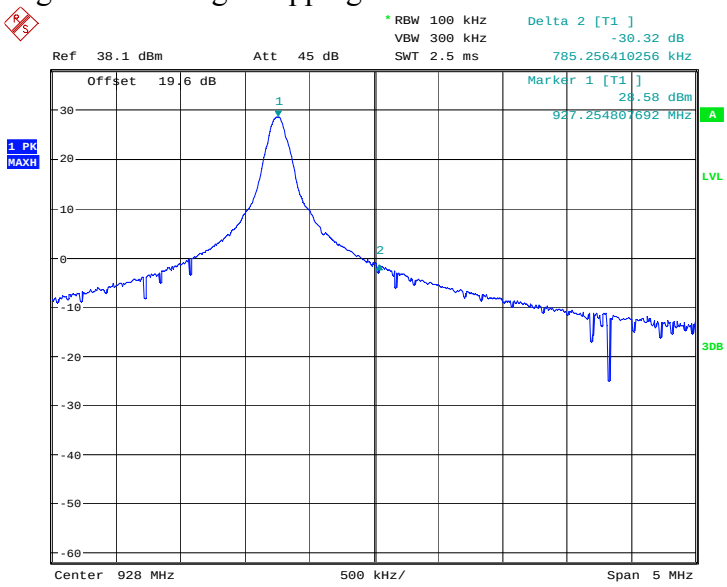

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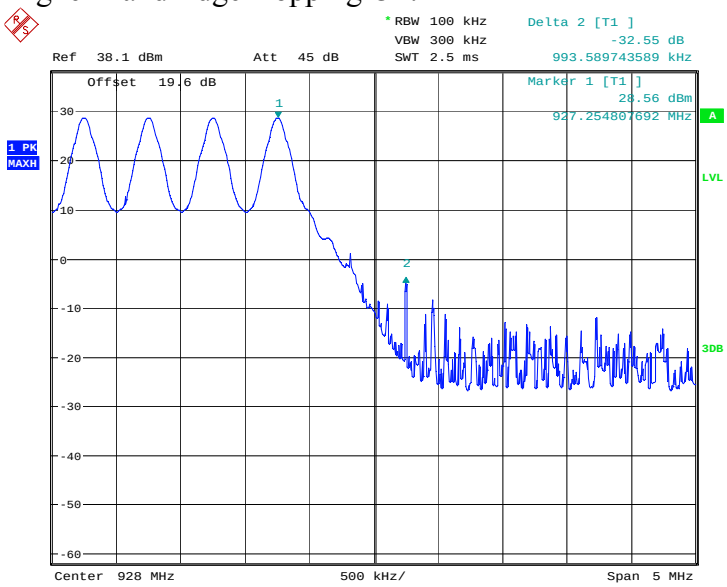

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ATA

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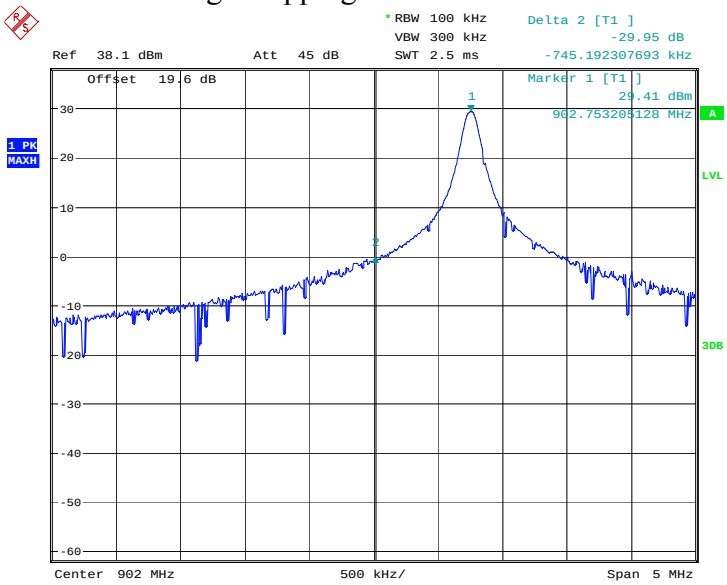

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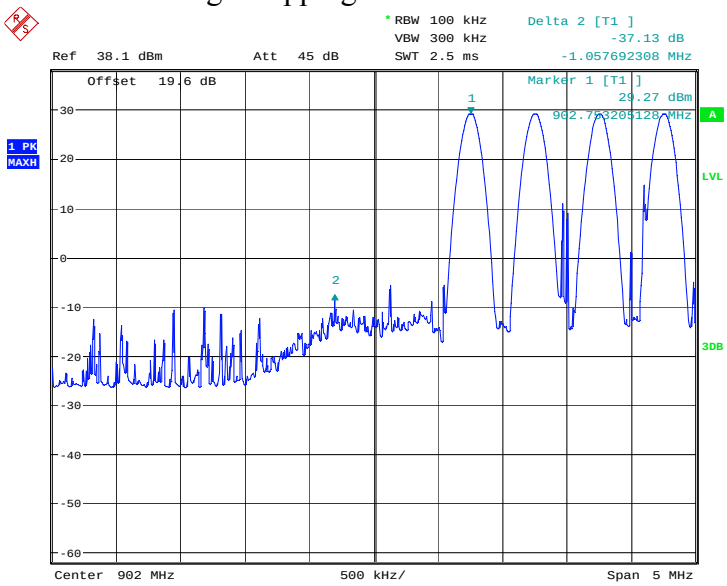

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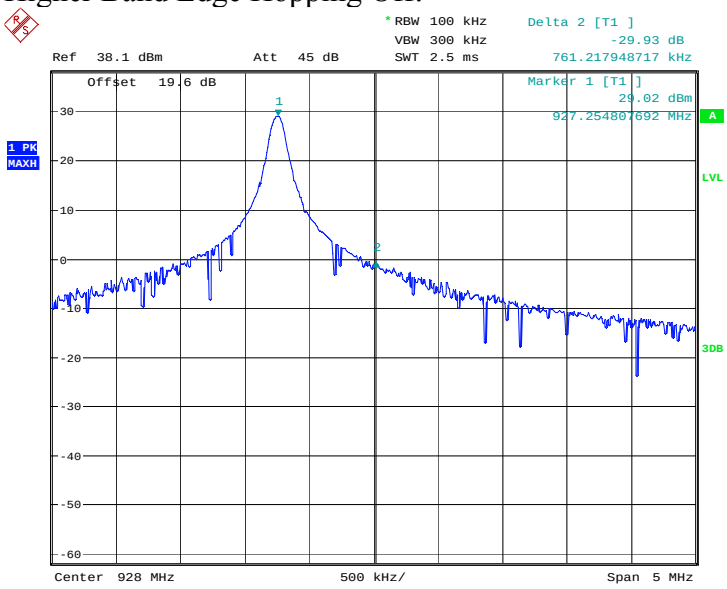

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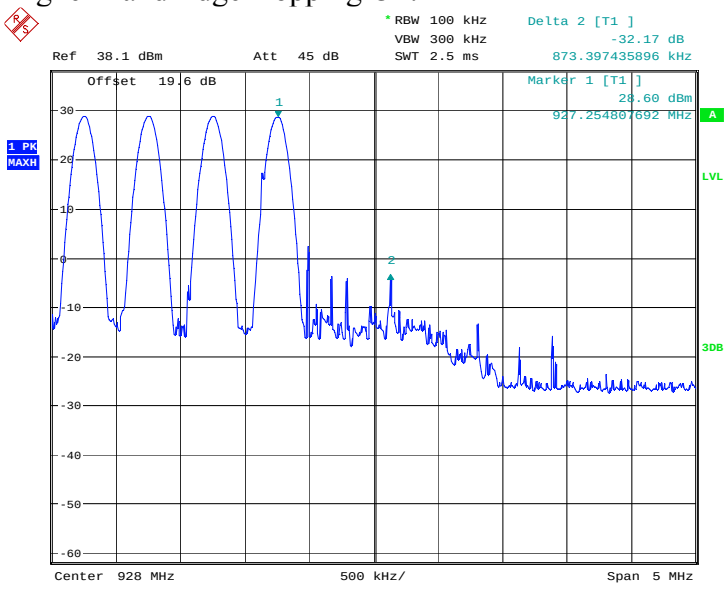

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Title-21

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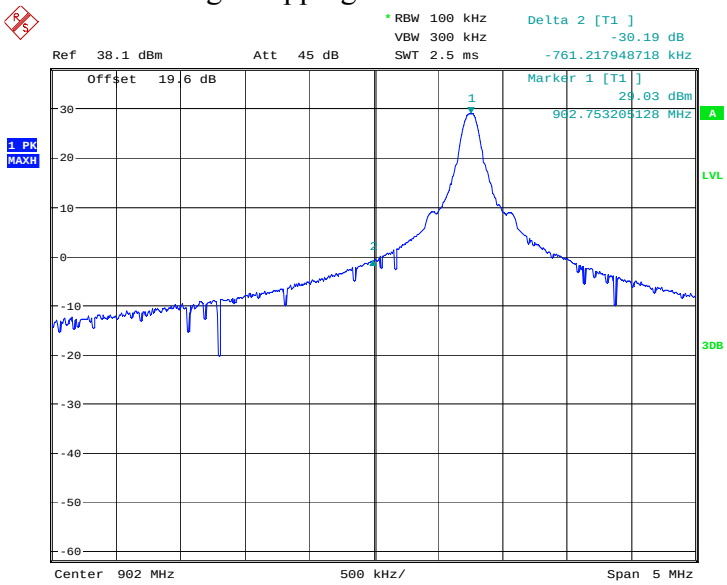

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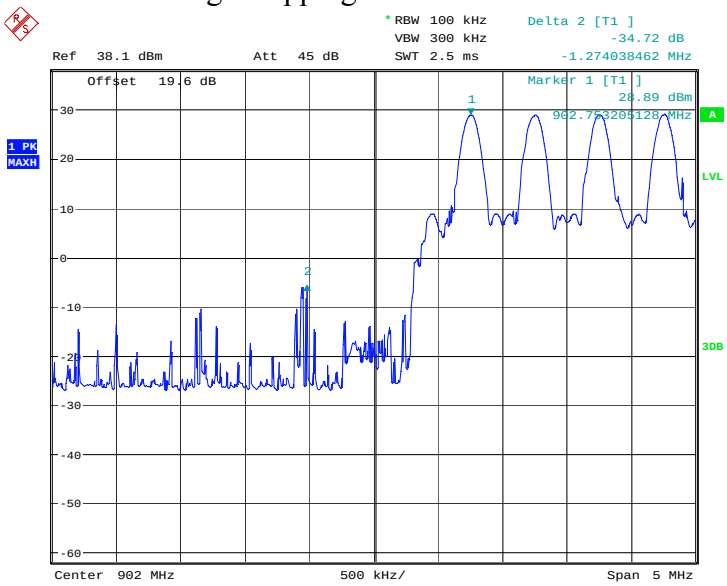

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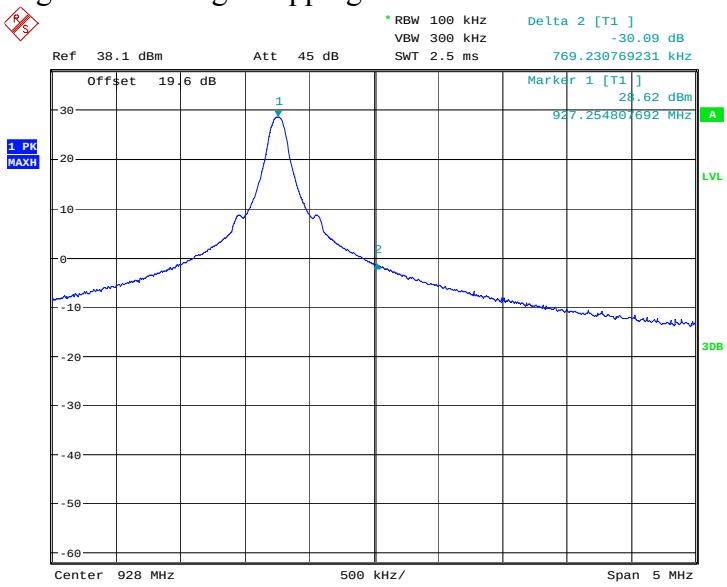

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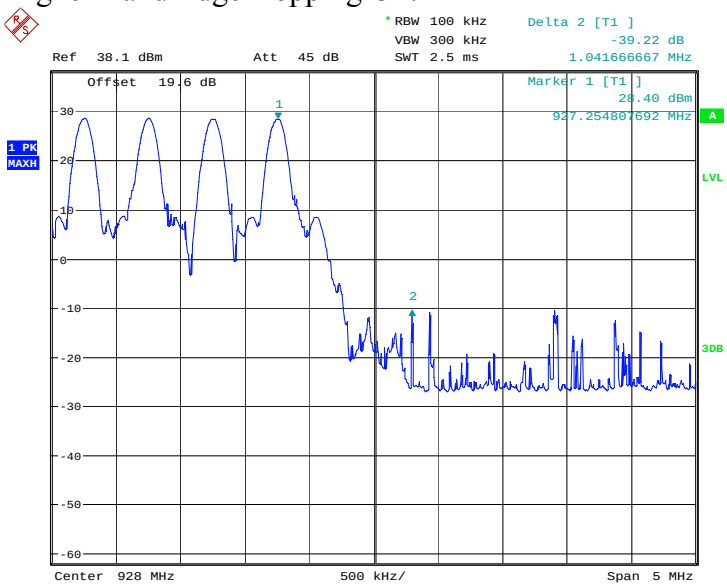

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Allegro

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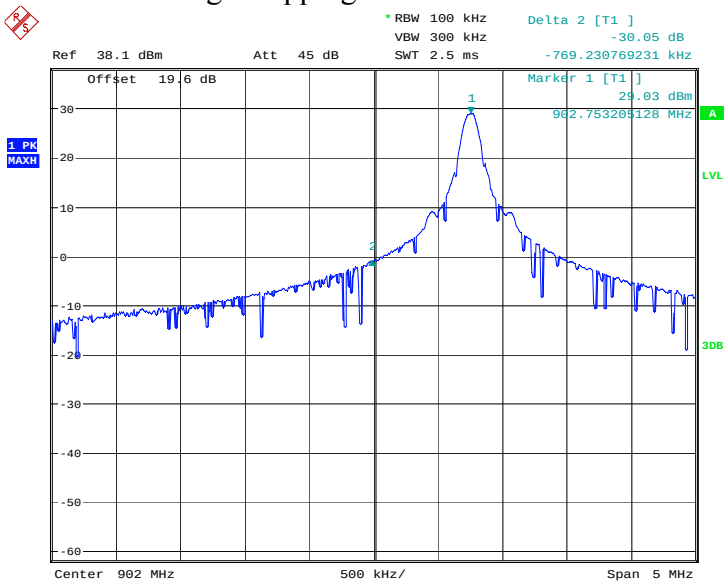

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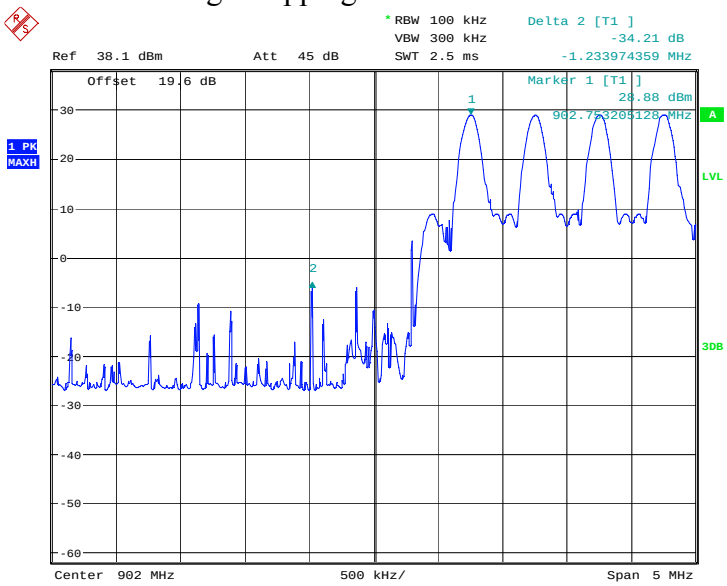

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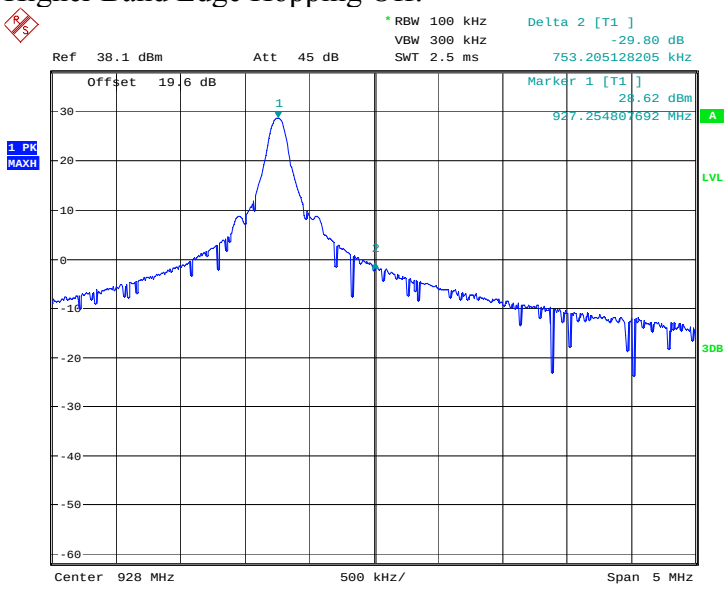

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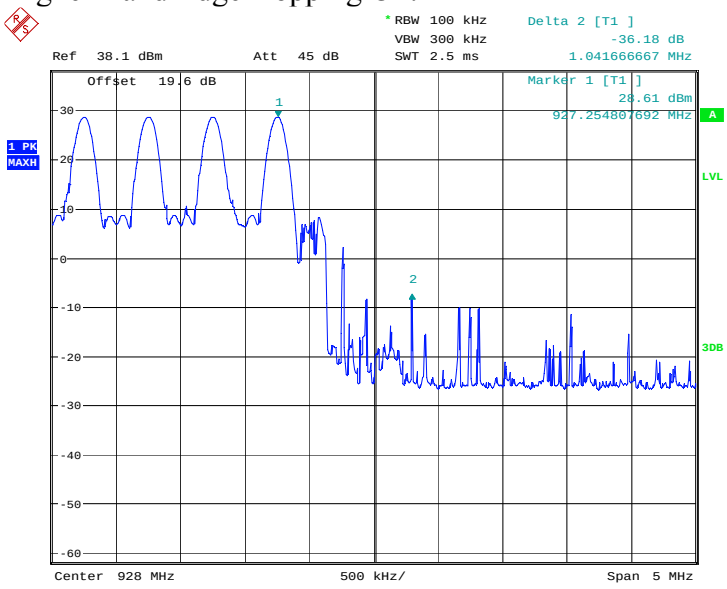

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Gen2

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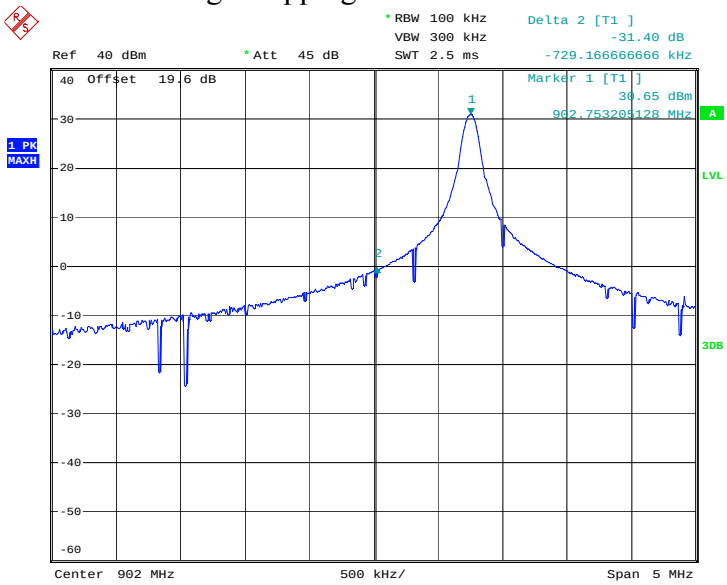

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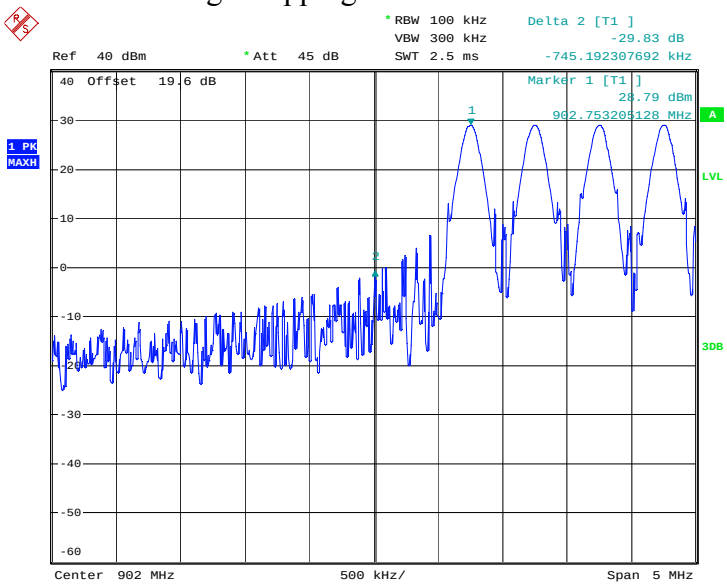

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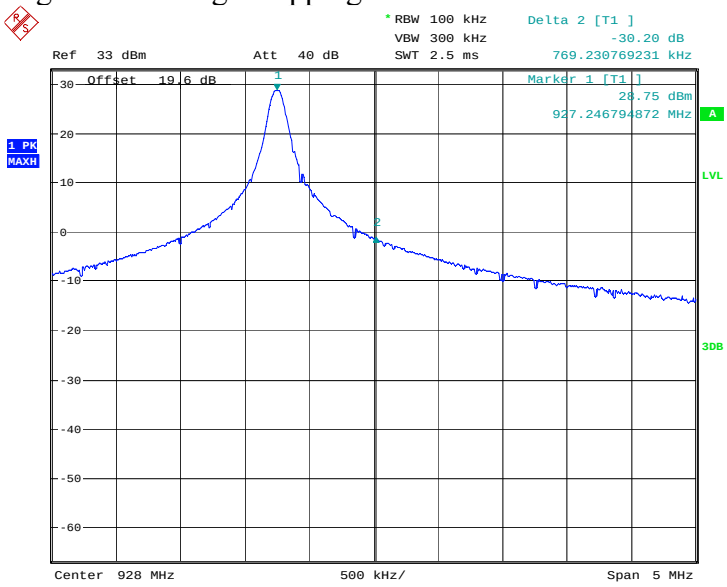

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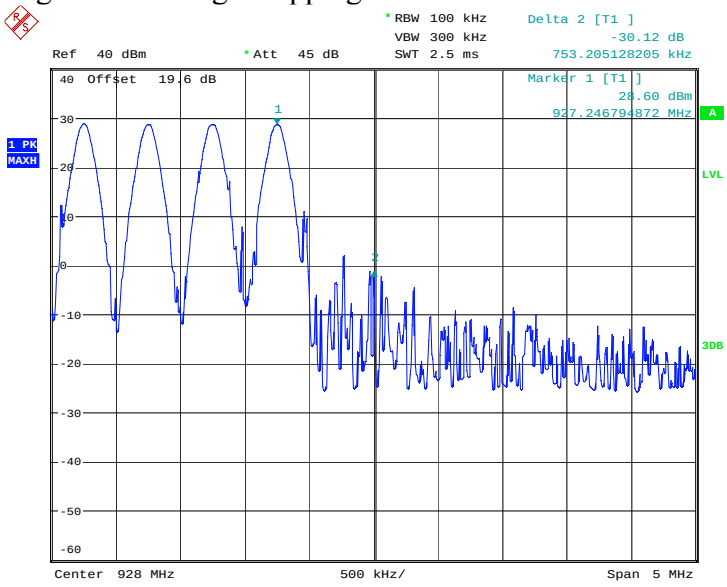

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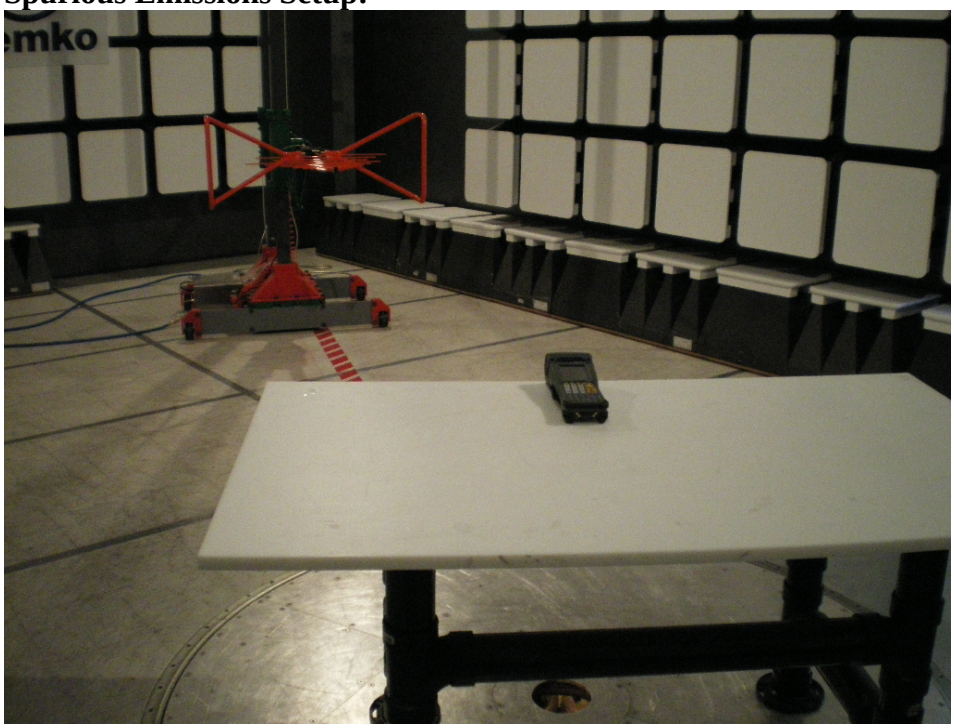
There were no additional emissions or change in existing emissions when the RFID was operated simultaneously with the GPRS.

Appendix B : Setup Photographs

Spurious Emissions Setup:



Appendix C : Block Diagram of Test Setups

Radiated Emissions above 30 MHz Test Site