



Test Report for Japanese Radio Equipment Regulations (2008) article 49.22

Product name : V2X reference design for 760 MHz band
Applicant : NXP Semiconductors Netherlands B.V.

Test report No. : 180900208 01 Ver 2.00

Laboratory information

Accreditation

Telefication complies with the accreditation criteria for test laboratories as laid down in ISO/IEC 17025:2005. The accreditation covers the quality system of the laboratory as well as the specific activities as described in the authorized annex bearing the accreditation number L021 and is granted on 30 November 1990 by the Dutch Council For Accreditation (RvA: Raad voor Accreditatie).

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Documentation

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Testing Location

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Test Site location	Edisonstraat 12a 6902 PK Zevenaar The Netherlands Tel. +31889983600 Fax. +31316583189

Report number: 180900208 01 Ver 2.00

Revision History

Version	Date	Remarks	By
v0.50	11-12-2018	First draft version	PS
v1.00	16-04-2019	Initial release	PS
v2.00	20-05-2019	2 nd release; carrier sense section updated	PS

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Summary of Test results

Radio Reg. article Ref.	Description	Section in report	Verdict
15	Frequency Stability	3.1	Pass
5	Frequency Tolerance	3.1	Pass
6	Occupied Bandwidth	3.2	Pass
7	Unwanted Emission Intensity	3.3	Pass
14	Antenna Power/Tolerance	3.4	Pass
24	Secondary Radiated Emission Strength	3.5	Pass
49.22-2	Absolute gain of transmitting antenna	2.5	Pass
9-4-11, 6-2-2	Interference Prevention Function	3.6	Pass
49.22-2	Construction Protection Confirmation	3.7	Pass
49.22-2	Carrier sense	3.8	Pass
49.22-2	Transmission time restriction	1.5	Pass
49.22-2	Transmission rate	1.5	Pass

1 General Description

1.1 Applicant

Client name: NXP Semiconductors Netherlands B.V.
Address: Gerstweg 2
Zip code: 6534 AE Nijmegen
Telephone: 0243538381
E-mail: ralf.vandenboogaart@nxp.com
Contact name: Ralf van den Boogaart

1.2 Manufacturer

Manufacturer name: NXP Semiconductors Netherlands B.V.
Address: Gerstweg 2
Zip code: 6534 AE Nijmegen
Telephone: 0243538381
E-mail: ralf.vandenboogaart@nxp.com
Contact name: Ralf van den Boogaart

1.3 Equipment Under Test (EUT)

Product name: V2X reference design for 760 MHz band
Brand name: --
Product type: V2I/V2X module
Model(s): Sharkfin 1.5
Software version: --
Hardware version: rev.B
Date of receipt: 13-11-2018
Tests started: 13-11-2018
Testing ended: 10-12-2018

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1.4 Applicability

Radio Reg. article reference	Report reference	Parameter	Status (note 1)
General provisions			
5	3.1	Frequency Tolerance	A
6	3.2	Occupied bandwidth	A
7	3.3	Spurious emissions	A
Transmitting equipment			
14	3.4	Antenna power tolerance	A
14.2	--	SAR	NA
15	3.1	Frequency stabilization	A
Transmitting antenna			
20	2.5	Type, configuration, etc. of transmitting antenna	A
Receiving equipment			
24	3.5	Spurious emission of receiver	A
Operating frequency 755.5 – 764 MHz			
49.22-2	1.5	Communication method	A
49.22-2	3.7	Construction Protection Confirmation	A
49.22-2	3.8	Carrier sense	A
49.22-2	1.5	Transmission time restriction	A
49.22-2	1.5	Transmission rate	A
49.22-2	2.5	Absolute gain of transmitting antenna	A
9-4-11, 6-2-2	3.6	Interference Prevention Function	A
49.22-2	1.5	Modulation method	A
Note 1: A = Conform NT = Not Tested NA = Not Applicable			

1.5 Product specifications of Equipment under test

TX Frequency:	760 MHz
RX frequency:	760 MHz
Maximum output power to antenna:	7 dBm/MHz
Antenna gain	5.8 dBi
Data rate	54 Mbps
Communication method	Simplex
Duty cycle	10 Hz
Transmission on-time	256 μ sec
Type of modulation:	64 QAM (OFDM)
Power source	Vehicle battery

1.6 Modification of the Equipment Under Test (EUT)

The tested sample was modified to include a temporary antenna connector.

1.7 Environmental conditions

Test date	10 -11-2018
Ambient temperature	19.7 °C
Humidity	38.3 %RH

1.8 Measurement Standards

- TELEC T257

1.9 Applicable standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standard:

- Japanese Radio Equipment Regulations (2008), article 49.22-2

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1.10 Conclusions

The sample of the product showed NO NON-COMPLIANCES to the specifications stated in paragraph 1.9 of this report.

The results of the test as stated in this report, are exclusively applicable to the product items as identified in this report. Telefication accepts no responsibility for any properties of product items in this test report, which are not supported by the tests as specified in paragraph 1.9 "*Applicable standards*".

All conducted tests are performed by:

Name : ing. P.A. Suringa

Review of test methods and report by:

Name : ing. R. van Barneveld

The above conclusions have been verified by the following signatory:

Date : 21-05-2019

Name : ing. K.A. Roes

Function : Coordinator Wireless & EMC

Signature :



2 Test configuration of the Equipment Under Test

2.1 Test mode

The applicant provided test mode firmware for the EUT, in which it was possible to configure the EUT into Tx and Rx test modes.

2.2 Tested channels and data rates

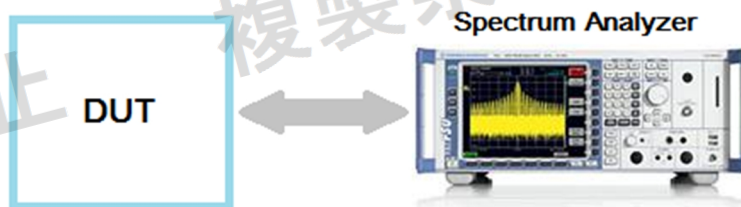
Technology	Channels	Data rate	Frequency (MHz)
IEEE 802.11p	--	--	--
	1	54 Mbps	760
	--	--	--

2.3 Test Conditions

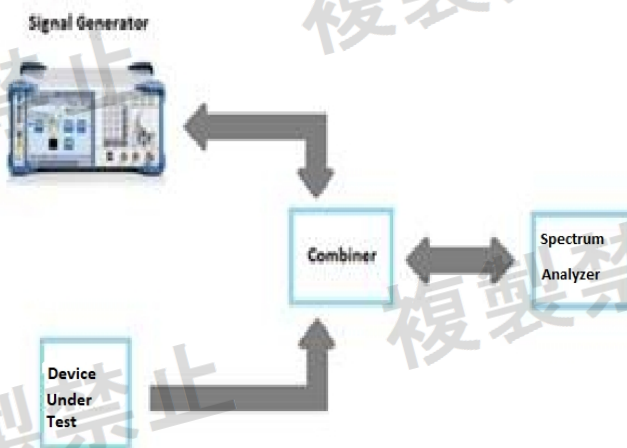
Minimum Voltage (V_{dc})	Nominal Voltage (V_{dc})	Maximum Voltage (V_{dc})
--*)	12	--*)

*) A buck converter and a LDO regulator are used to convert the onboard 12V power supply to a 1.6 V power supply delivered to the RF transceiver. The line regulation of the LDO regulator is within the limits. Therefore tests are carried out at normal voltage.

2.4 Conducted Test Setup



2.5 Carrier sense test setup

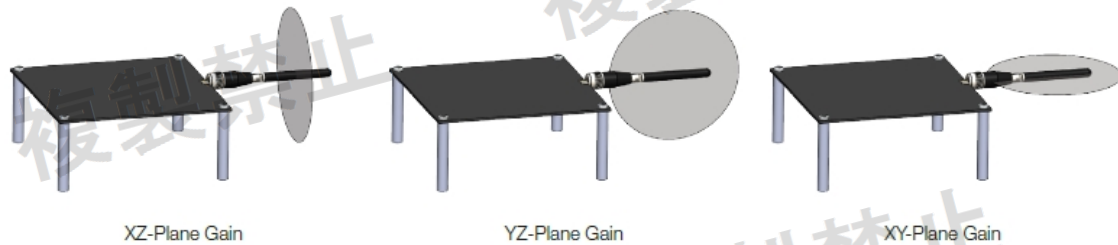


2.6 Antenna Specifications

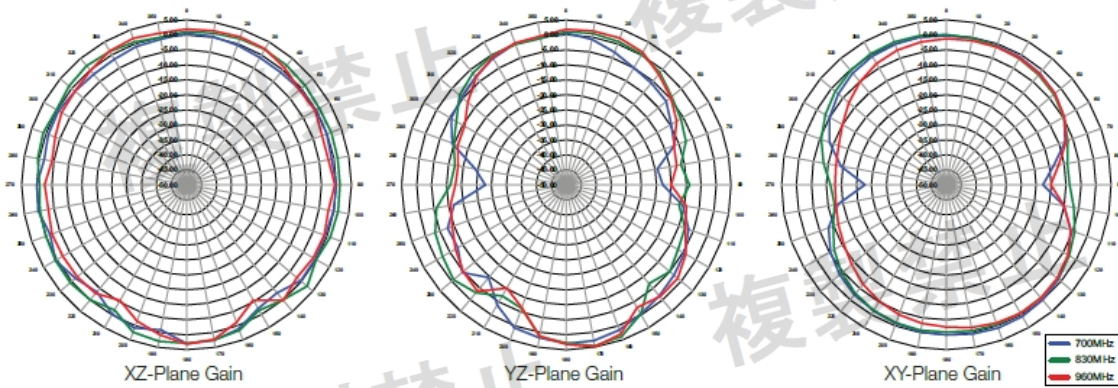
Antenna Type: whip

Antenna Gain: 5.8 dBi

Antenna Radiation Patterns:



700 - 960MHz



2.7 Equipment used in the test configuration

Description	Manufacturer	Model	ID	Used at Par.
Directional coupler	Hewlett Packard	87300C	TE 00503	3.8
Spectrum analyzer	Rohde & Schwarz	ESR 7	TE 01221	3.1, 3.2, 3.3, 3.4, 3.5, 3.8
Signal generator	Rohde & Schwarz	SMBV 100A	TE 01280	3.8

3 Test results

3.1 Frequency Tolerance Measurement

3.1.1 Limit

Item	Limit
Frequency Tolerance	≤ 20 ppm

3.1.2 Measurement instruments

The measurement instruments are listed in chapter 2.6 of this report.

3.1.3 Test setup

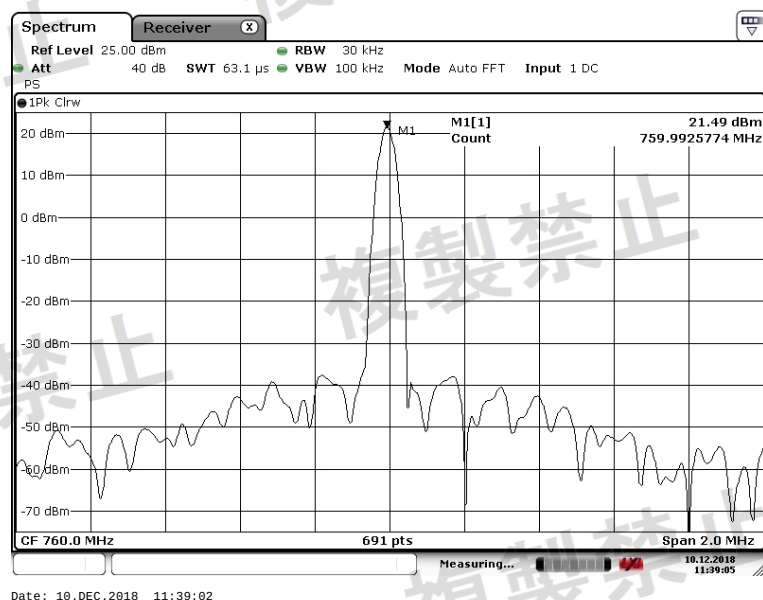
The test setup is as shown in chapter 2.4 of this report.

3.1.4 Test rocedure

IRN 005_11 Frequency (Hz) – method 2.

3.1.5 Test Results of the Frequency Tolerance Measurement

Voltage: U _{low} = --		U _{nom} = 12 Vdc		U _{high} = --			
Channel	Nominal Frequency (MHz)	Frequency (MHz) @ U _{nom}	Frequency tolerance (ppm)	Frequency (MHz) @ -- Vdc	Frequency tolerance (ppm)	Frequency (MHz) @ -- Vdc	Frequency tolerance (ppm)
1	760	759.9925	-0.5	--	--	--	--
Uncertainty:		+/- 1.1 ppm					



3.2 Occupied Bandwidth

3.2.1 Limit

Item	Limit
Occupied Bandwidth	9 MHz

3.2.2 Measurement instruments

The measurement instruments are listed in chapter 2.6 of this report.

3.2.3 Test setup

The test setup is as shown in chapter 2.4 of this report.

3.2.4 Test procedure

IRN 017_10 Occupied bandwidth (Hz) – method 1.

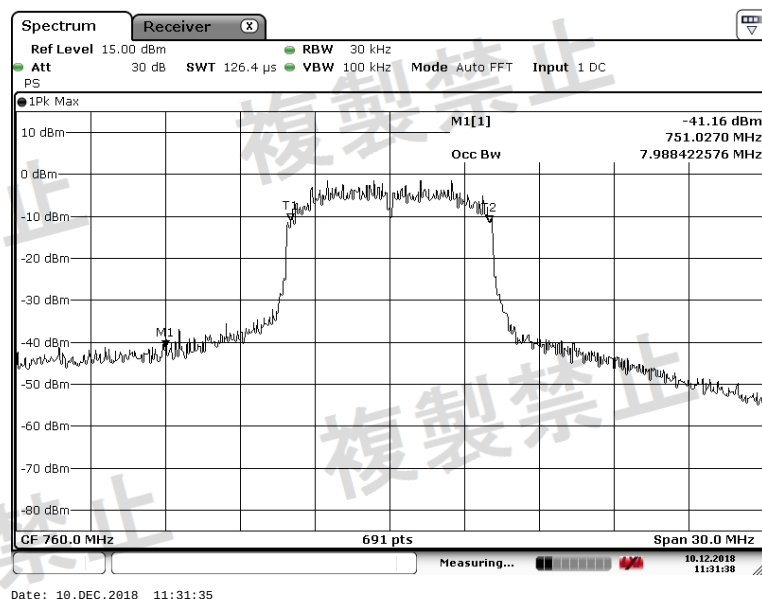
3.2.5 Measurement uncertainty

+/- 346 kHz.

3.2.6 Test results of the Occupied Bandwidth

Voltage	Unom= 12 Vdc
Frequency (MHz)	760
Occupied bandwidth(MHz)	7.99

3.2.7 Plot of the Occupied Bandwidth Measurement



3.3 Unwanted Emission Intensity Measurement

3.3.1 Limit

Item	Frequency range	Limits	Limits
Transmitter Spurious Emission	Below 710 MHz	$\leq 2.5 \mu\text{W}/100 \text{ kHz}$	-26 dBm
	710 – 750 MHz	$\leq 20 \text{ nW}/100 \text{ kHz}$	-47 dBm
	750 – 755 MHz	$\leq 100 \mu\text{W}/100 \text{ kHz}$	-10 dBm
	765 – 770 MHz	$\leq 100 \mu\text{W}/100 \text{ kHz}$	-10 dBm
	770 – 810 MHz	$\leq 10 \text{ nW}/100 \text{ kHz}$	-50 dBm
	810 – 1000 MHz	$\leq 2.5 \mu\text{W}/100 \text{ kHz}$	-26 dBm
	> 1000 MHz	$\leq 2.5 \mu\text{W}/1 \text{ MHz}$	-26 dBm

3.3.2 Measurement instruments

The measurement instruments are listed in chapter 2.6 of this report.

3.3.3 Test setup

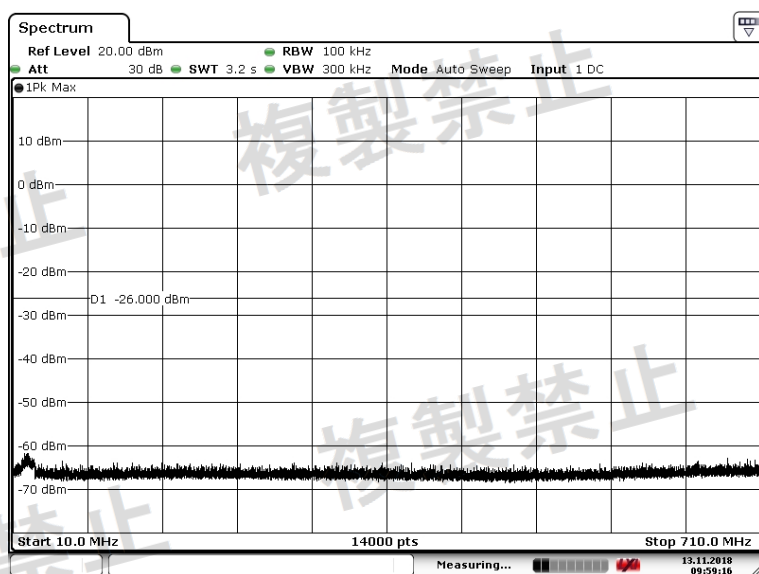
The test setup is as shown in chapter 2.4 of this report.

3.3.4 Test procedure

IRN 016_11 Spurious emission (W) – method 1.

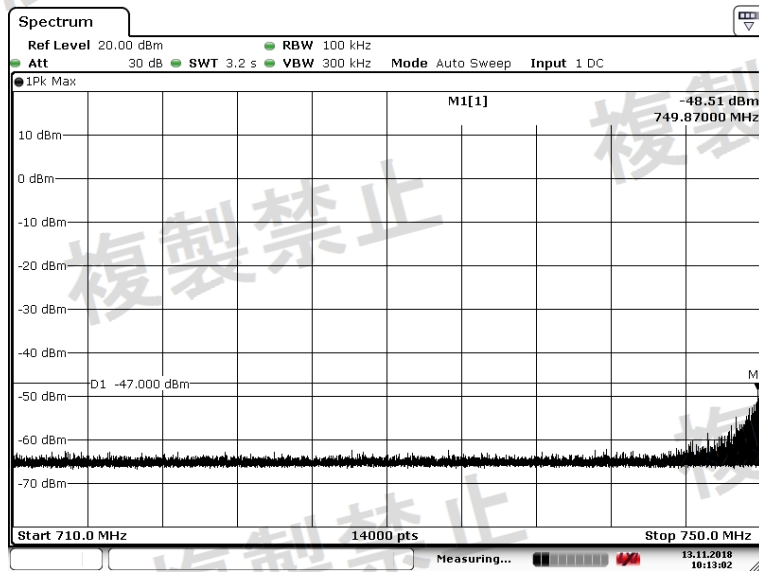
3.3.5 Test results of Unwanted Emission Intensity Measurement

Below 710 MHz.



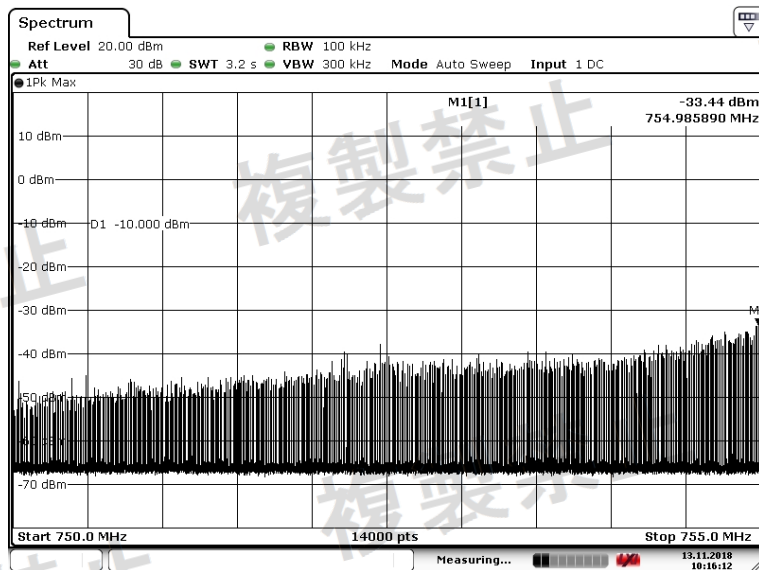
Date: 13.NOV.2018 09:59:17

710 – 750 MHz



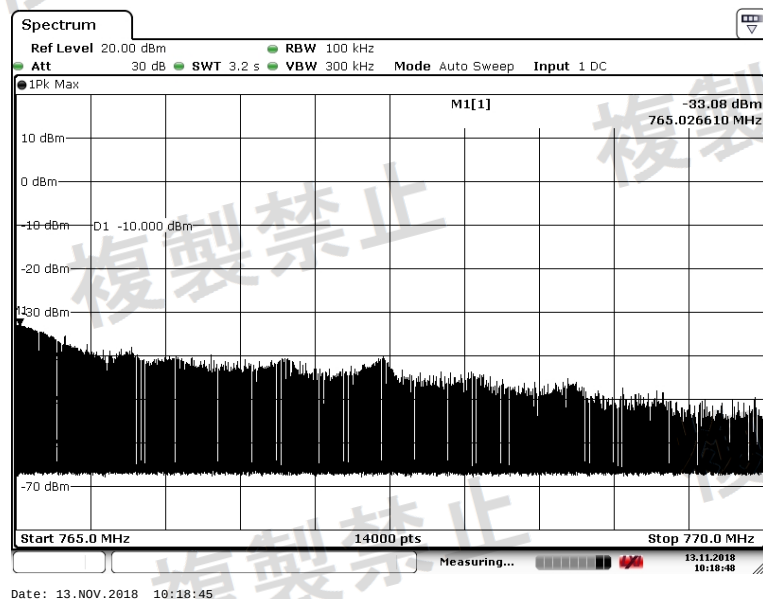
Date: 13. NOV. 2018 10:12:58

750 – 755 MHz

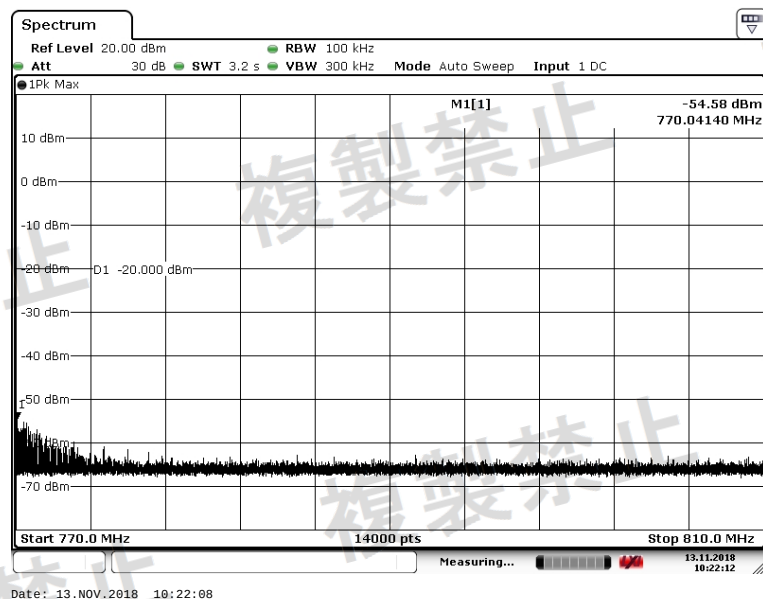


Date: 13. NOV. 2018 10:16:08

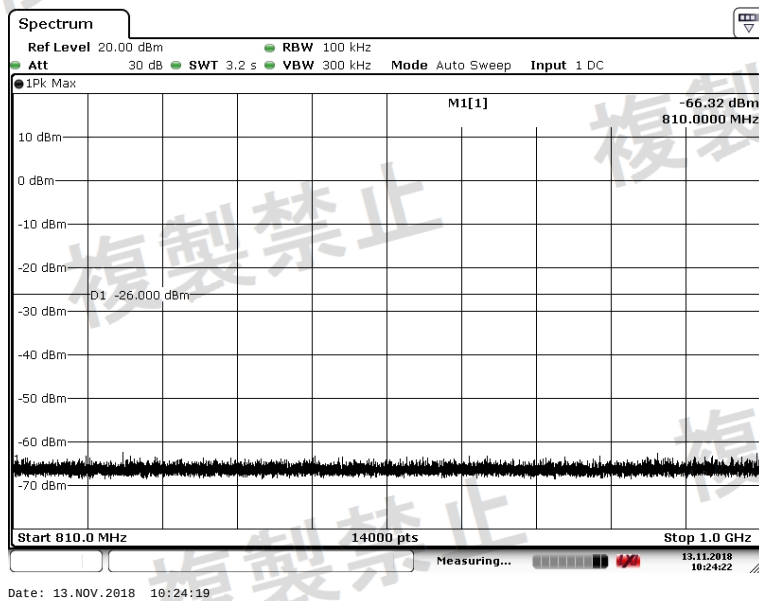
765 – 770 MHz



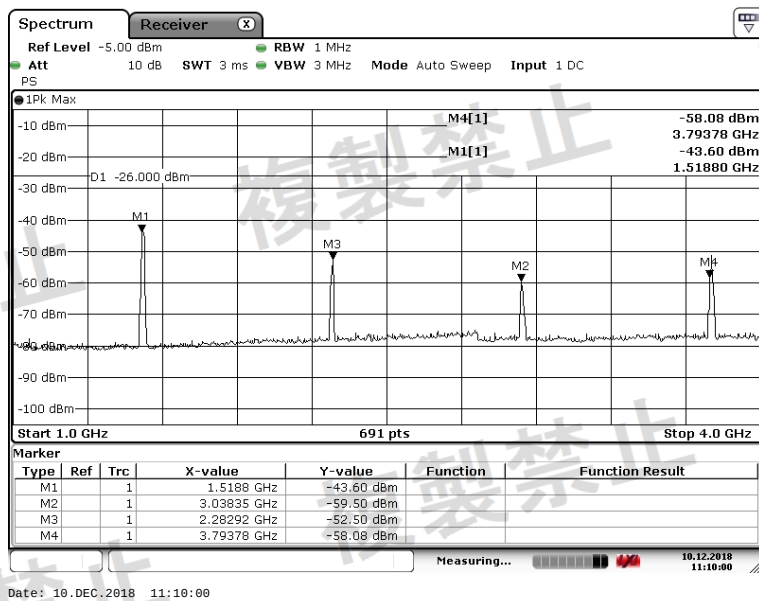
770 - 810 MHz



810 – 1000 MHz



1 – 4 GHz



3.4 Antenna Power/Tolerance Measurement

3.4.1 Limit

Item	limits
Antenna power	10 dBm/MHz
Antenna power Tolerance (%)	-50 % - +50
Antenna power Tolerance (dB)	-3/+ 1.8 (w.r.t. rated power)

Note: rated antenna power: 7 dBm/MHz

3.4.2 Measurement instruments

The measurement instruments are listed in chapter 2.6 of this report.

3.4.3 Test setup

The test setup is as shown in chapter 2.4 of this report.

3.4.4 Test procedure

IRN 014_14 RF Power (W) – method 7 (with modification).

3.4.5 Measurement uncertainty

+/- 0.47 dB.

3.4.6 Test results of Antenna Power/Tolerance Measurement

Voltage	U = 12 Vdc
Frequency (MHz)	760
Antenna power(dBm/MHz)	4.04 (Note)
Tolerance (dB)	-3

Note: See plots on next page