FCC LISTED, REGISTRATION NUMBER: 720267

Test report No:

NIE: 56182RRF.002

Test report
REFERENCE STANDARD: USA FCC Part 22

Identificación del objeto ensayado.....: Identification of item tested	RF Transceiver / Base Station Repeater
Marca .....: Trademark	PowerTrunk
Modelo y/o referencia tipo .....: Model and /or type reference	BSR75 -8
Other identification of the product .....:	D138861PT FCC ID: WT7PTBSR75450B
HW version .....:	CCP: 0.03.35.34.36
SW version .....:	CCP: 0.03.35.34.36
Características .....: Features	Power supply: o Nominal voltage: 27.4 VDC o Operational voltage range: [21.6 - 28.0 VDC] Frequency band: TX: 450-470 MHz RX: 450-470 MHz RF output power (nominal): TETRA: 48.75 dBm (75 W) TI D-LMR: 48.75 dBm (75 W) According to the requirements of the standard mentioned below, operation is restricted to an authorized bandwidth of 20 kHz (supported by TI D-LMR modulation only). See full details on page 4
Fabricante .....: Manufacturer	TELTRONIC, S.A.U. Polígono Malpica, Calle C/F-Oeste (50016). Zaragoza (SPAIN).
Método de ensayo solicitado, norma.....: Test method requested, standard	USA FCC Part 22 10-1-17 Edition. ANSI C63.26-2015.
Resultado.....: Summary	IN COMPLIANCE
Aprobado por (nombre / cargo y firma) .....: Approved by (name / position & signature)	A. Llamas RF Lab. Manager Firmado digitalmente por ALEJANDRO LLAMAS RODRIGUEZ Fecha: 2018.02.23 14:05:21 +01'00'
Fecha de realización .....: Date of issue	2018-02-23
Formato de informe No. .....: Report template No	FDT08_20

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Competences and guarantees

DEKRA Testing and Certification is a laboratory with a measurement facility in compliance with the requirements of Section 2.948 of the FCC rules and has been added to the list of facilities whose measurements data will be accepted in conjuction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Registration Number: 720267.

DEKRA Testing and Certification is a laboratory with a measurement site in compliance with the requirements of RSS 212, Issue 1 (Provisional) and has been added to the list of filed sites of the Canadian Certification and Engineering Bureau. Reference File Number: ISED 4621A-2.

In order to assure the traceability to other national and international laboratories, DEKRA Testing and Certification has a calibration and maintenance program for its measurement equipment.

DEKRA Testing and Certification guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at DEKRA Testing and Certification at the time of performance of the test.

DEKRA Testing and Certification is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

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General conditions

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
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4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA Testing and Certification and the Accreditation Bodies.

Uncertainty

Uncertainty (factor k=2) was calculated according to the DEKRA Testing and Certification internal document PODT000.

Usage of samples

Samples undergoing test have been selected by: **the client**.

Sample S/01 is composed of the following elements:

Control Nº	Description	Model	Code	Serial number	Reception date
56182B/001	RF Transceiver / Base Station Repeater	BSR75 -8	D138861PT	840834	2018-01-09

1. Sample S/01 has undergone the test(s).

   All tests indicated in appendix A.

Test sample description

The BSR75 (Base Station Repeater) is a digital RF transceiver aimed at providing the PowerTrunk-T Infrastructure with a TETRA carrier. It has been conceived as a module to be integrated in a PowerTrunk-T Cabinet with an SBS configuration (Site Base Station). The BSR75 -8 operates in the frequency band 450-470 MHz and provides an RF output power of 75 W in the whole band.

Features:

Power Supply:

Nominal voltage: 27.4 VDC

Operational voltage range: [21.6 - 28.0 VDC]

Access scheme:

TDMA with 4 physical channels (time slots) per RF channel.

Modulation scheme:

π/4-DQPSK with a modulation rate of 18 Ksym/s, equivalent to 36 Kbits/s. Based upon it, two digital communication systems are supported:

- TETRA:
  Modulation low-pass filter: Square-root raised cosine filter with a roll-off factor of 0.35.
- TI D-LMR:
  Modulation low-pass filter: Square-root raised cosine filter with a roll-off factor of 0.2.

RF channel bandwidth (channel spacing):

25 KHz

Spectral efficiency:

One voice & data physical channel with a rate of 9 Kbits/s is allocated a 6.25 KHz equivalent channel bandwidth.

Frequency band:
TX: 450-470 MHz
RX: 450-470 MHz

RF output power (nominal):

TETRA: 48.75 dBm (75 W)

TI D-LMR: 48.75 dBm (75 W)

RF authorized bandwidth:

TETRA: 22 KHz

TI D-LMR: 20 KHz

Emission designators:

TETRA: 22K0D7D, 22K0D7E, 22K0D7W

TI D-LMR: 20K0D7D, 20K0D7E, 20K0D7W

Additional features:

Audio low-pass filter (root-raised cosine filter).

Options:
O485002PT: OPTION ENCRYPTION POWERTRUNK-T

Note: According to the requirements of the standard CFR-2017-title47-vol2-part22, operation is restricted to an authorized bandwidth of 20 kHz (supported by TI D-LMR modulation only).

Identification of the client

TELTRONIC, S.A.U.

Polígono Malpica, Calle F-Oeste (50016). Zaragoza. SPAIN.

Testing period

The performed test started on 2018-01-23 and finished on 2018-02-07.

The tests have been performed at DEKRA Testing and Certification.

Environmental conditions

In the control chamber, the following limits were not exceeded during the test:

Temperature	Min. = 15 ºC Max. = 35 ºC
Relative humidity	Min. = 20 % Max. = 75 %
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 1 Ω

In the semianechoic chamber the following limits were not exceeded during the test.

Temperature	Min. = 15 ºC Max. = 35 ºC
Relative humidity	Min. = 20 % Max. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 1 Ω
Normal site attenuation (NSA)	< ±4 dB at 10 m distance between item under test and receiver antenna, (30 MHz to 1000 MHz)
Field homogeneity	More than 75% of illuminated surface is between 0 and 6 dB (26 MHz to 1000 MHz).

In the chamber for conducted measurements the following limits were not exceeded during the test:

Temperature	Min. = 22.7 ºC Max. = 25.2 ºC
Relative humidity	Min. = 49.9 % Max. = 47.3 %
Air pressure	Min. = 1019 mbar Max. = 1019 mbar
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 1 Ω

Remarks and comments

1: The tests have been performed by the technical personnel: Pedro Parada and Carolina Postigo.

2: Used instrumentation.

Conducted Measurements

		Last Cal. date	Cal. due date
1.	Climatic chamber CTS C-70/600	2017/05	2018/05
2.	DC power supply R&S NGPE 40/40	---	---
3.	Digital multimeter FLUKE 113	2017/05	2019/05
4.	Power sensor R&S NRP-Z81	2016/04	2018/04
5.	Spectrum analyser R&S FSV40	2017/07	2019/07
6.	Radiocommunication analyser HP 8920A	2017/04	2019/04

Radiated Measurements

		Last Cal. date	Cal. due date
1.	Semianechoic Absorber Lined Chamber ETS FACT3 200STP	N.A.	N.A.
2.	BiconicalLog antenna ETS LINDGREN 3142E	2015/06	2018/06
3.	Multi Device Controller EMCO 2090	N.A.	N.A.
4.	Double-ridge Guide Horn antenna 1-18 GHz SCHWARZBECK BBHA 9120 D	2016/11	2019/11
5.	Spectrum analyser Rohde & Schwarz FSV40	2017/07	2019/07
6.	EMI Test Receiver R&S ESU 40	2016/03	2018/03
7.	RF pre-amplifier 20 MHz-7 GHz A. H. SYSTEMS PAM-0207	2017/09	2018/09
8.	RF pre-amplifier 1-18 GHz Bonn Elektronik BLMA 0118-1M	2016/02	2018/02
9.	DC power supply KEYSIGHT TECHNOLOGIES	---	---
10.	Digital multimeter FLUKE 113	2017/05	2019/05

3: This information has been provided by the applicant.

Testing verdicts

Not applicable ..... :	N/A
Pass ..... :	P
Fail ..... :	F
Not measured ..... :	N/M

FCC PART 22 PARAGRAPH	VERDICT			
	NA	P	F	NM
Clause 2.1047: Modulation characteristics				NM[3]
Clause 2.1046 and 22.565, 22.727, 22.809: RF output power		P		
Clause 2.1055, 22.355 and 22.863: Frequency stability		P		
Clause 2.1049 and 22.863: Occupied Bandwidth		P		
Clause 22.357, 22.359, 22.731, 22.861: Spurious emissions at antenna terminals		P		
Clause 22.357, 22.359, 22.731, 22.861: Band-edge emissions compliance		P		
Clause 22.357, 22.359, 22.731, 22.861: Radiated emissions		P		

3: see point “Remarks and comments”.

Appendix A – Test result for FCC Part 22

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TEST CONDITIONS

Power supply (V):

V_{nom} = 27.40 Vdc

V_{max} = 31.51 Vdc

V_{min} = 21.60 Vdc

The subscripts nom, min and max indicate voltage test conditions (nominal, minimum and maximum respectively, as declared by the applicant).

Type of power supply = DC Voltage from external power supply.

Type of antenna = external connectable antenna.

Rated RF Output Power:

- Mode TI D-LMR (20 kHz bandwidth): 48.75 dBm (75 W).

TEST FREQUENCIES:

Lowest channel: 454.350 MHz

Middle channel: 454.825 MHz

Highest channel: 459.350 MHz

Additional tested channels for checking compliance with Frequency stability:

454.675 MHz

454.975 MHz

CONDUCTED MEASUREMENTS

The equipment under test (EUT) was set up in a shielded room and it is connected to the spectrum analyzer or power meter through a calibrated attenuator and a low loss RF cable. The reading of the instrument is corrected taking into account the attenuator and cable loss.

RADIATED MEASUREMENTS

The equipment under test was scanned for spurious emissions in the frequency range 30 to 5000 MHz.

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 3 m for the frequency range 30 MHz-1000 MHz (30 MHz-1000 MHz Bilog antenna) and at a distance of 1m for the frequency range 1 GHz-5 GHz (1 GHz-18 GHz Double ridge horn antenna).

For radiated emissions in the range 1 GHz-5 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

The equipment under test was set up on a non-conductive platform and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360º and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

Measurements were made in both horizontal and vertical planes of polarization.

Modulation Characteristics

SPECIFICATION

FCC §2.1047

(a) Voice modulated communication equipment. A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz shall be submitted. For equipment required to have an audio low-pass filter, a curve showing the frequency response of the filter, or of all circuitry installed between the modulation limiter and the modulated stage shall be submitted.

(b) Equipment which employs modulation limiting. A curve or family of curves showing the percentage of modulation versus the modulation input voltage shall be supplied. The information submitted shall be sufficient to show modulation limiting capability throughout the range of modulating frequencies and input modulating signal levels employed.

(c) Single sideband and independent sideband radiotelephone transmitters which employ a device or circuit to limit peak envelope power. A curve showing the peak envelope power output versus the modulation input voltage shall be supplied. The modulating signals shall be the same in frequency as specified in paragraph (c) of § 2.1049 for the occupied bandwidth tests.

(d) Other types of equipment. A curve or equivalent data which shows that the equipment will meet the modulation requirements of the rules under which the equipment is to be licensed.

RESULTS (The following information has been provided by the applicant).

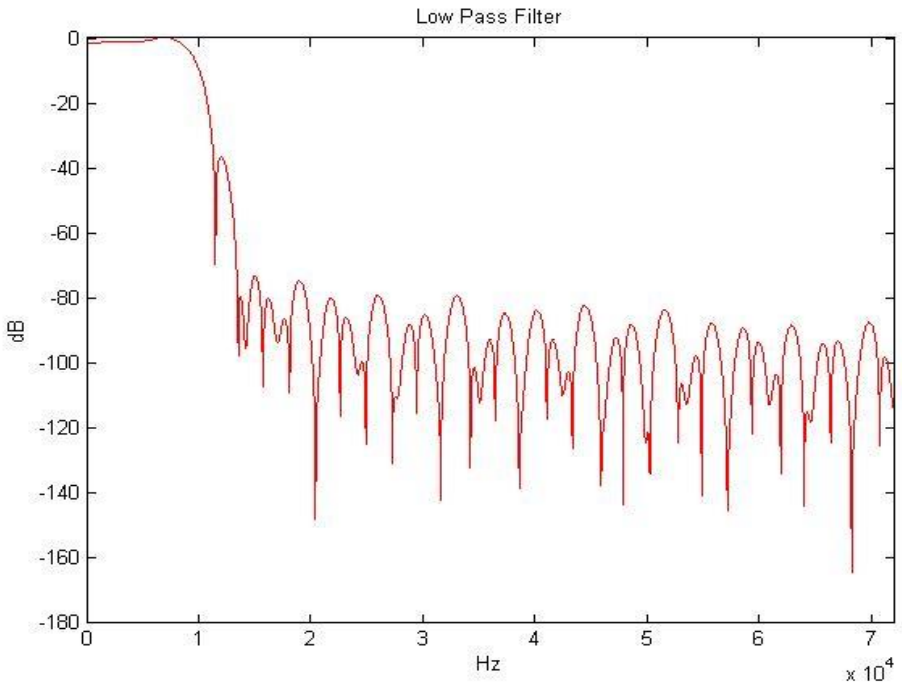
The EUT operates with π/4-shifted Differential Quaternary Phase Shift Keying (π/4-DQPSK) in TI D-LMR, featuring a modulation rate of 18 ksym/s (36 kbits/s).

The access scheme is TDMA with 4 physical channels per carrier.

A root-raised-cosine filter (RRC) is used as a transmitting and receiving filter to perform matched filtering. The combined response of such two filters is that of the raised-cosine filter. The raised-cosine filter is often used for pulse-shaping in digital modulation, known for its ability to minimize intersymbol interference (ISI).

The graph below show the transfer function of the aforementioned filter when the authorized modulation bandwidth is 20 KHz.

BSR75 transmitter low pass filter for TI D-LMR (20 KHz authorized bandwidth):



RF Output Power (conducted)

SPECIFICATION

§2.1046, 22.565, 22.727, 22.809.

FCC 22.565

(a) *Maximum ERP*. The effective radiated power (ERP) of base and fixed transmitters must not exceed the applicable limits in this paragraph under any circumstances.

Frequency range (MHz)	Maximum ERP (watts)
152-153	1400
157-159	150
454-455	3500
459-460	150

(b) *Basic power limit*. Except as provided in paragraph (d) of this section, the ERP of base transmitters must not exceed 500 Watts.

FCC 22.727

(a) The Effective Radiated Power (E.R.P.) of central office and rural subscriber station transmitters must not exceed the applicable limits in this paragraph under any circumstances.

Frequency range (MHz)	Maximum ERP (watts)
152-153	1400
157-159	150
454-455	3500
459-460	150

(b) *Basic power limit*. Except as provided in paragraph (d) of this section, the ERP of central office station transmitters must not exceed 500 Watts.

FCC 22.809

The transmitting power of ground and airborne mobile transmitters operating on the channels listed in §22.805 must not exceed the limits:

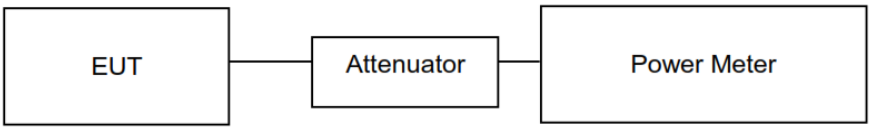
(a) Ground station transmitters. The effective radiated power of ground stations must not exceed 100 Watts and must not be less than 50 Watts, except as provided in §22.811.
(b) Airborne mobile transmitters. The transmitter power output of airborne mobile transmitters must not exceed 25 Watts and must not be less than 4 Watts.

METHOD

The EUT was controlled via a terminal emulator of the PC.

The conducted RF output power measurements were made at the RF output terminals of the EUT using an attenuator and a calibrated wideband power sensor.

TEST SETUP



RESULTS

MAXIMUM OUTPUT POWER (CONDUCTED).

20 kHz Bandwidth Modulation	Frequency (MHz)	Maximum average power (dBm) / W
	454.350	48.05 / 63.83
	454.825	48.09 / 64.42
	459.350	48.03 / 63.53
Measurement uncertainty (dB)	<±0.33	

The sum of the system loss (dB) and antenna gain (dBd) for the worst case of conducted power (48.09 dBm) shall be such that the Effective Radiated Power (E.R.P.) shall not exceed the limit indicated above.

Verdict: PASS

Occupied Bandwidth

SPECIFICATION

FCC §2.1049, §22.863

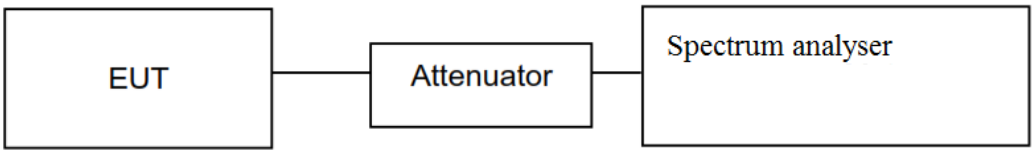
The occupied bandwidth of the fundamental emissions remains within the authorized frequency bands of operation.

METHOD

The EUT was configured to transmit a modulated carrier signal. An IF bandwidth of 300 Hz was used to determine the occupied bandwidth of the modulated emission. The 99% occupied bandwidth and the -26 dBc bandwidth were measured directly using the built-in bandwidth measuring option of spectrum analyzer.

.

TEST SETUP

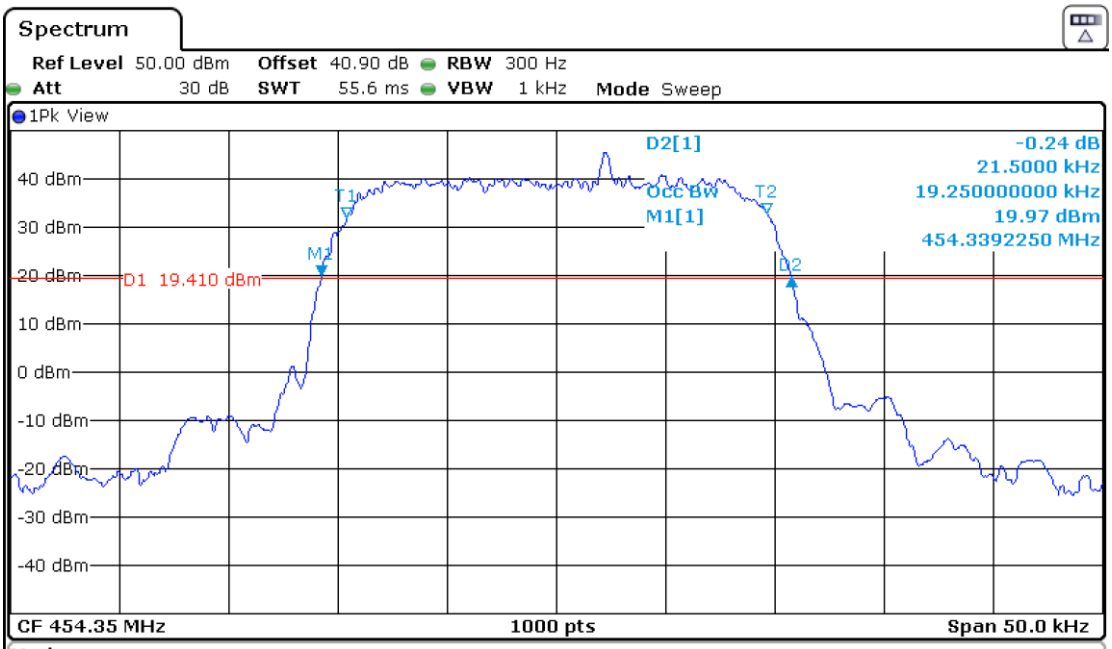


RESULTS (see next plots)

Channel	454.350 MHz	454.675 MHz	454.825 MHz	454.975 MHz	459.350 MHz
99% Occupied bandwidth (kHz)	19.25	19.00	19.20	19.20	19.25
-26 dBc bandwidth (kHz)	21.50	21.50	21.70	21.85	21.55
Measurement uncertainty (kHz)	<±0.03				

Verdict: PASS

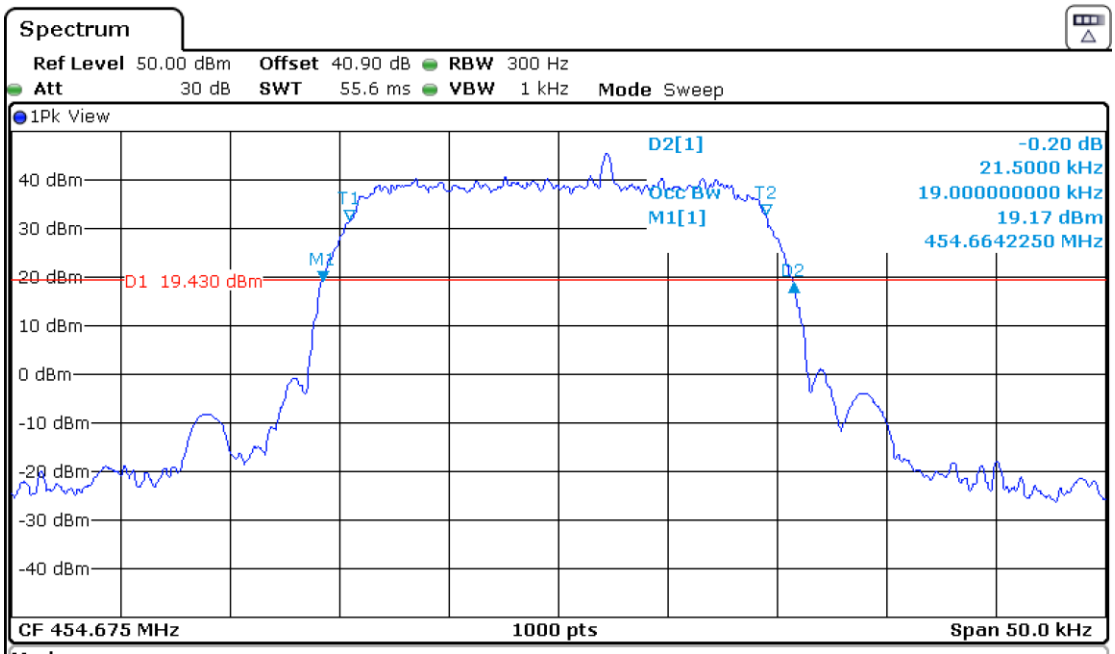
Channel: 454.350 MHz



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	454.339225 MHz	19.97 dBm		
T1		1	454.340375 MHz	32.13 dBm	Occ Bw	19.25 kHz
T2		1	454.359625 MHz	32.95 dBm		
D2	M1	1	21.5 kHz	-0.24 dB		

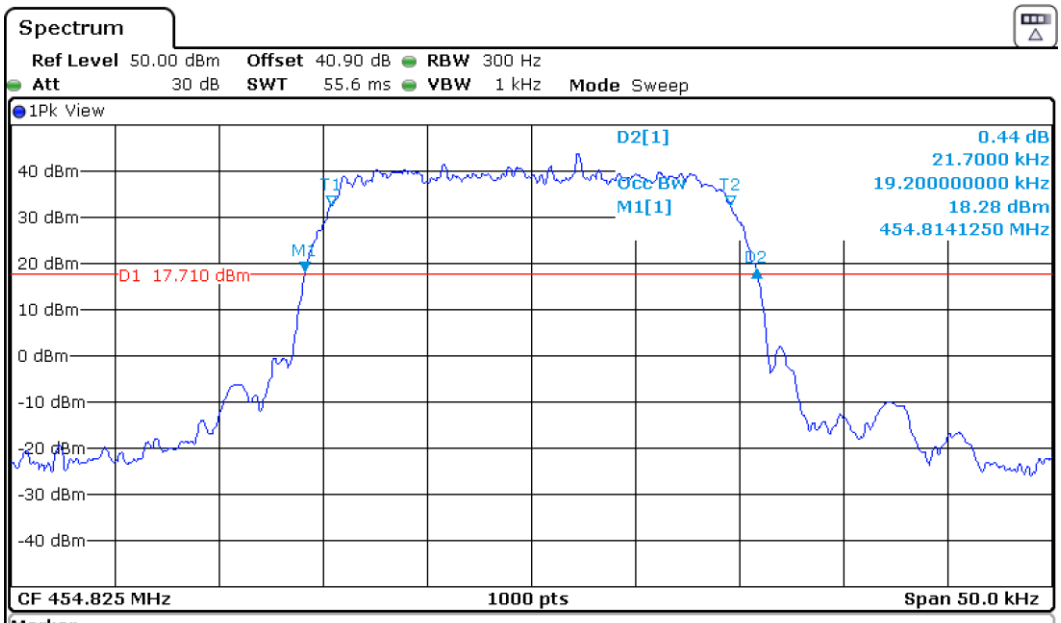
Channel: 454.675 MHz



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	454.664225 MHz	19.17 dBm		
T1		1	454.665475 MHz	31.82 dBm	Occ Bw	19.0 kHz
T2		1	454.684475 MHz	32.72 dBm		
D2	M1	1	21.5 kHz	-0.20 dB		

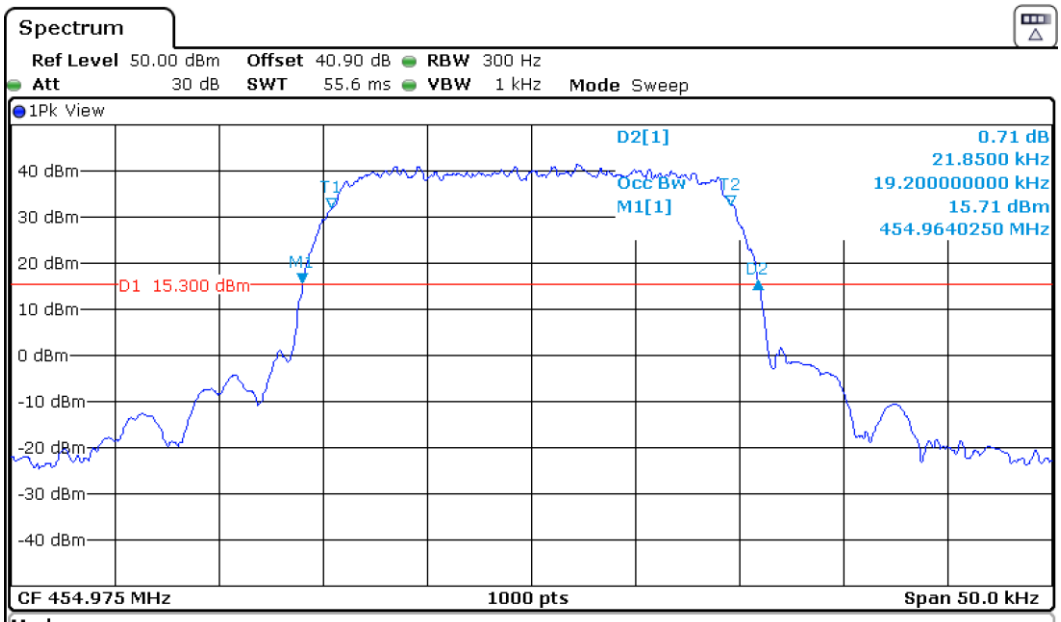
Channel: 454.825 MHz



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	454.814125 MHz	18.28 dBm		
T1		1	454.815375 MHz	32.65 dBm	Occ Bw	19.2 kHz
T2		1	454.834575 MHz	32.59 dBm		
D2	M1	1	21.7 kHz	0.44 dB		

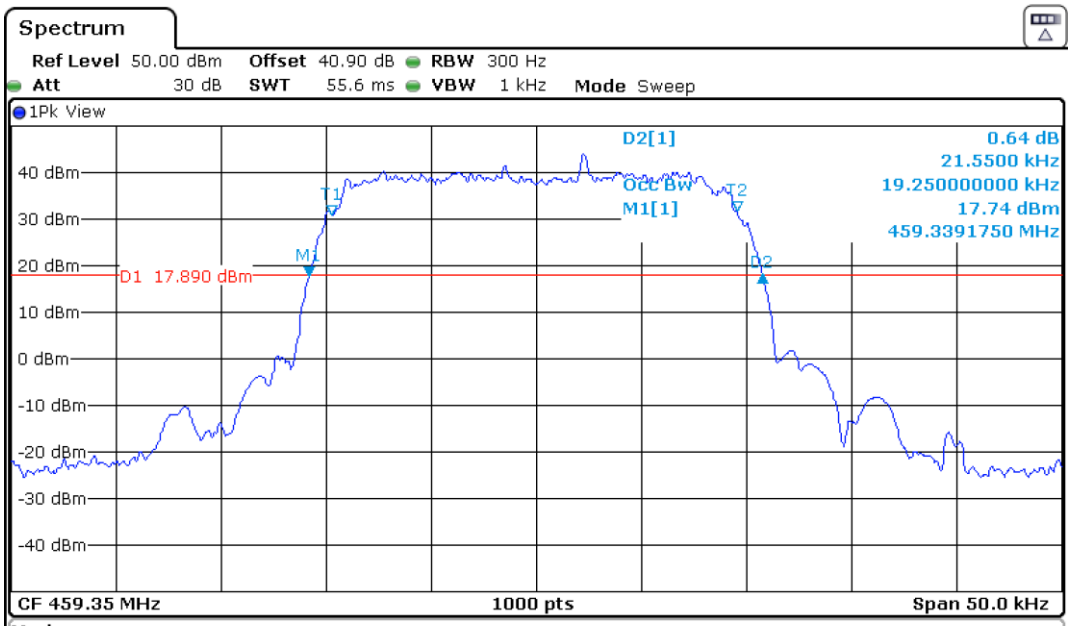
Channel: 454.975 MHz



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	454.964025 MHz	15.71 dBm		
T1		1	454.965375 MHz	32.02 dBm	Occ Bw	19.2 kHz
T2		1	454.984575 MHz	32.53 dBm		
D2	M1	1	21.85 kHz	0.71 dB		

Channel: 459.350 MHz



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	459.339175 MHz	17.74 dBm		
T1		1	459.340275 MHz	30.80 dBm	Occ Bw	19.25 kHz
T2		1	459.359525 MHz	31.75 dBm		
D2	M1	1	21.55 kHz	0.64 dB		

Frequency Stability

SPECIFICATION

FCC §2.1055, §22.355, §22.863:

FCC 22.355
Except as otherwise provided in this part, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table C-1 of this section.

Table C-1—Frequency Tolerance for Transmitters in the Public Mobile Services

Frequency range (MHz)	Base, fixed(ppm)	Mobile >3 watts (ppm)	Mobile ≤3 watts (ppm)
25 to 50	20.0	20.0	50.0
50 to 450	5.0	5.0	50.0
450 to 512	2.5	5.0	5.0
821 to 896	1.5	2.5	2.5
928 to 929	5.0	n/a	n/a
929 to 960	1.5	n/a	n/a
2110 to 2220	10.0	n/a	n/a

FCC 22.863
The frequency stability of equipment used under this subpart shall be sufficient to ensure that, after accounting for Doppler frequency shifts, the occupied bandwidth of the fundamental emissions remains within the authorized frequency bands of operation.

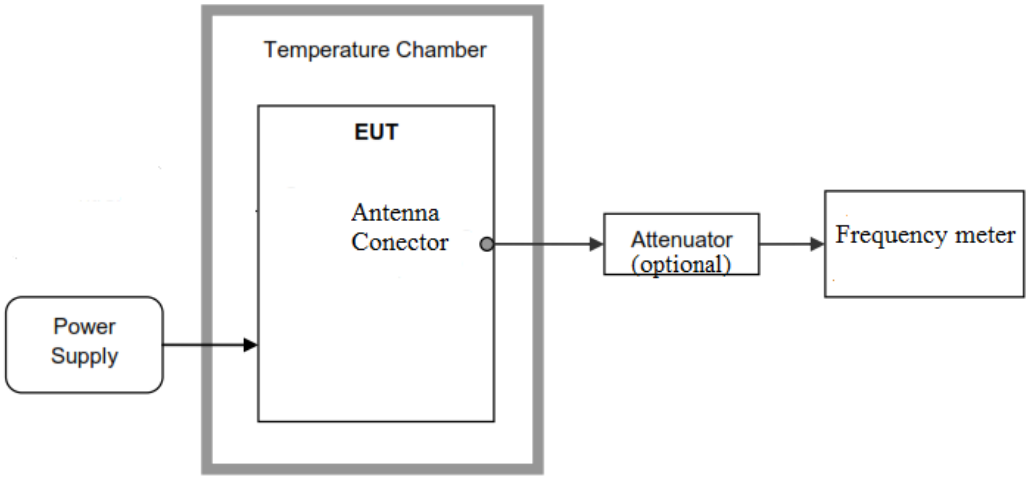
METHOD

The frequency tolerance measurements over temperature variations were made over the temperature range of –30ºC to +50ºC. The EUT was placed inside a climatic chamber and the temperature was raised hourly in 10ºC steps from –30ºC up to +50ºC.

Frequency Stability vs Voltage: Vary primary supply voltage between the extreme voltage values.

The EUT is set in continuous transmission without modulation (only carrier) and the frequency is measured with the frequency meter of Radiocommunication analyzer HP 8920A.

TEST SETUP



RESULTS

Channel: 454.825 MHz.

Voltage (Vdc)	Temperature (ºC)	Frequency Error (Hz)	Frequency Error (ppm)
Frequency stability with Temperature			
27.40	+50	15	0.03298
	+40	14	0.03078
	+30	15	0.03298
	+20	15	0.03298
	+10	15	0.03298
	0	15	0.03298
	-10	15	0.03298
	-20	14	0.03078
	-30	14	0.03078
Frequency stability with Supply Voltage			
21.60	20	15	0.03298
31.51	20	15	0.03298

Measurement uncertainty	$<\pm 1x\ 10^{-6}$

The maximum frequency error was 0.03298 ppm (15 Hz). This error added to the extreme frequency measured in the Occupied Bandwidth is sufficient to ensure that the Occupied Bandwidth of the fundamental emission remains within the authorized frequency band of operation.

Verdict: PASS

Spurious emissions at antenna terminals

SPECIFICATION
FCC §22.357. §22.359. §22.731. §22.861.

Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB.

METHOD

The EUT RF output connector was connected to a spectrum analyser using a 50 ohm attenuator and the resolution bandwidth of the spectrum analyser was set to 100 kHz for frequencies < 1GHz and 1 MHz for frequencies > 1GHz. The spectrum was investigated from 9 kHz to 5 GHz.

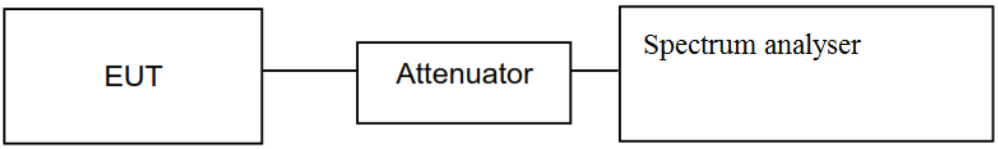
The reading of the spectrum analyser is corrected with the attenuation loss of connection between output terminal of EUT and input of the spectrum analyser.

Measurement Limit**:**

According to specification. the power of emissions shall be attenuated below the transmitter power (P) by a factor of at least 43 + 10 log (P) dB. P in watts.
At Po transmitting power the specified minimum attenuation becomes 43+10log (Po) and the level in dBm relative Po becomes:

Po (dBm) – [43 + 10 log (Po in mwatts) - 30] = - 13 dBm

TEST SETUP



RESULTS (see plots in next pages)

1. CHANNEL: 454.350 MHz

No spurious signals were found at less than 20 dB below the limit in all the range.

1. CHANNEL: 454.825 MHz

No spurious signals were found at less than 20 dB below the limit in all the range.

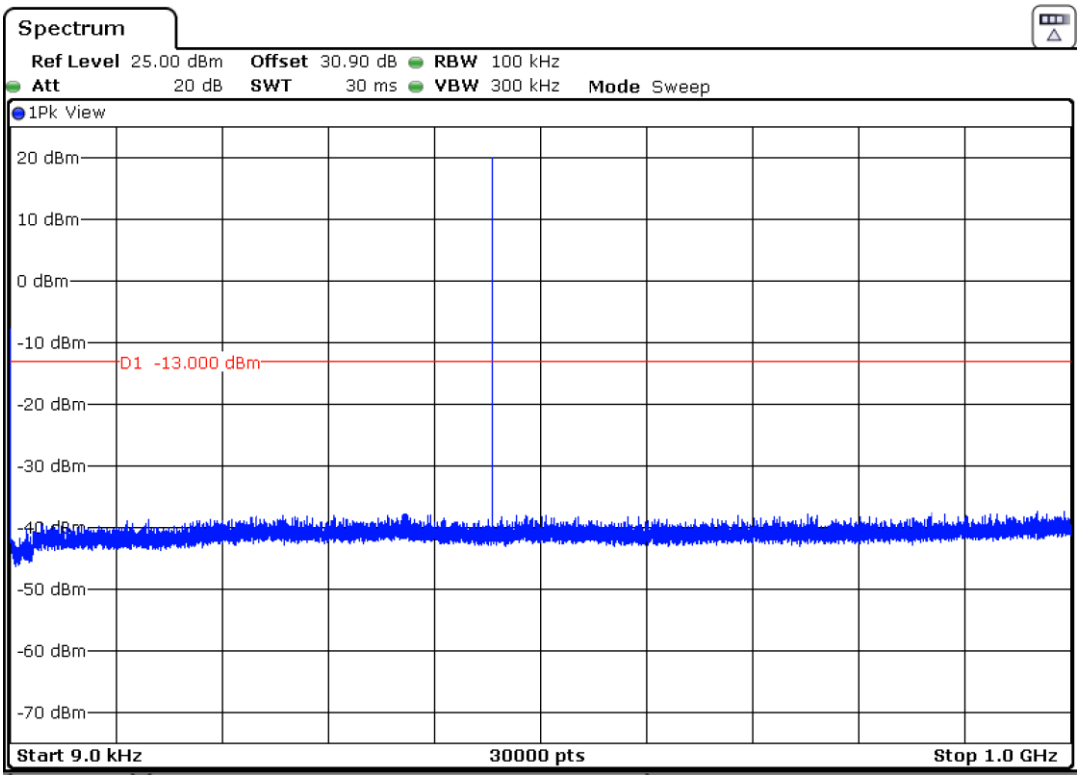
2. CHANNEL: 459.350 MHz

No spurious signals were found at less than 20 dB below the limit in all the range.

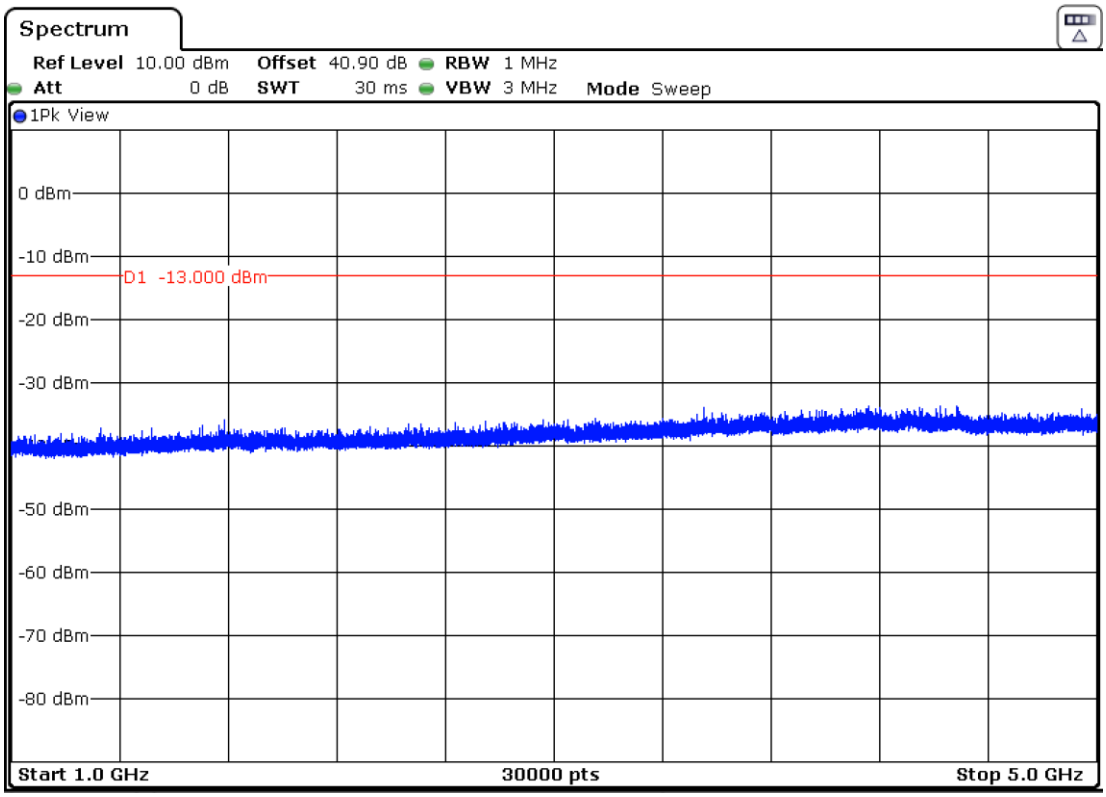
Measurement uncertainty (dB)	<±0.34

Verdict: PASS

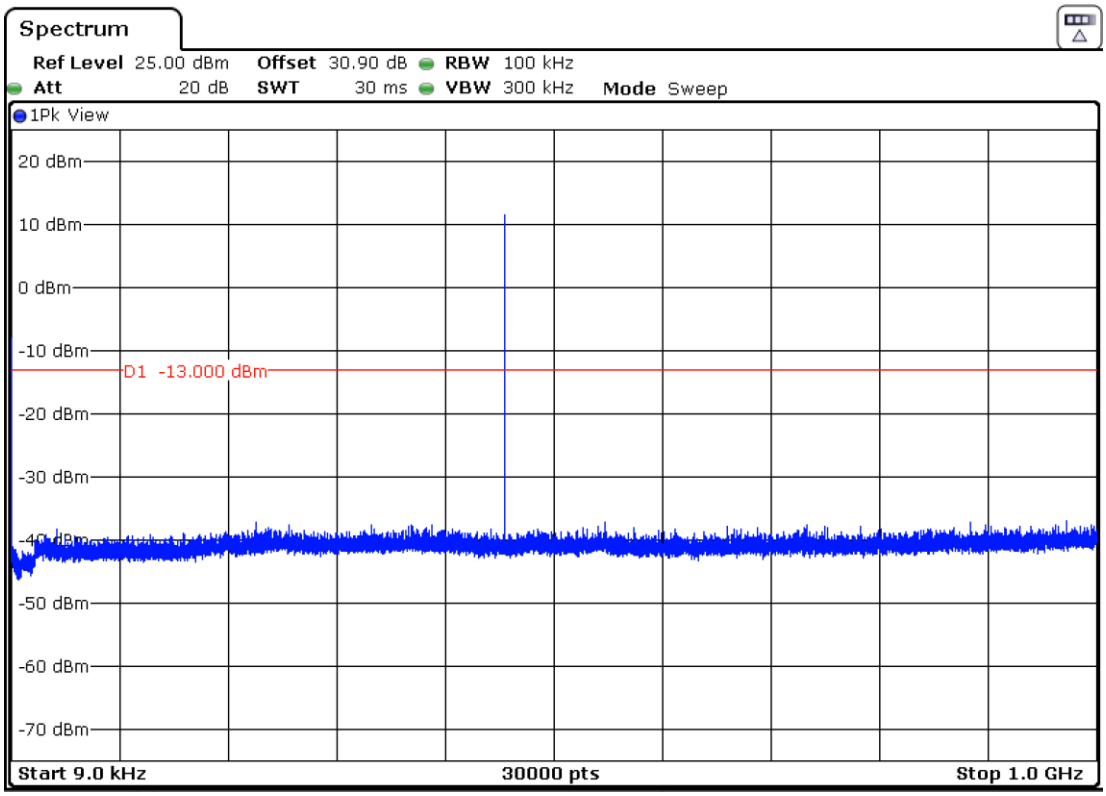
1. CHANNEL: 454.350 MHz.



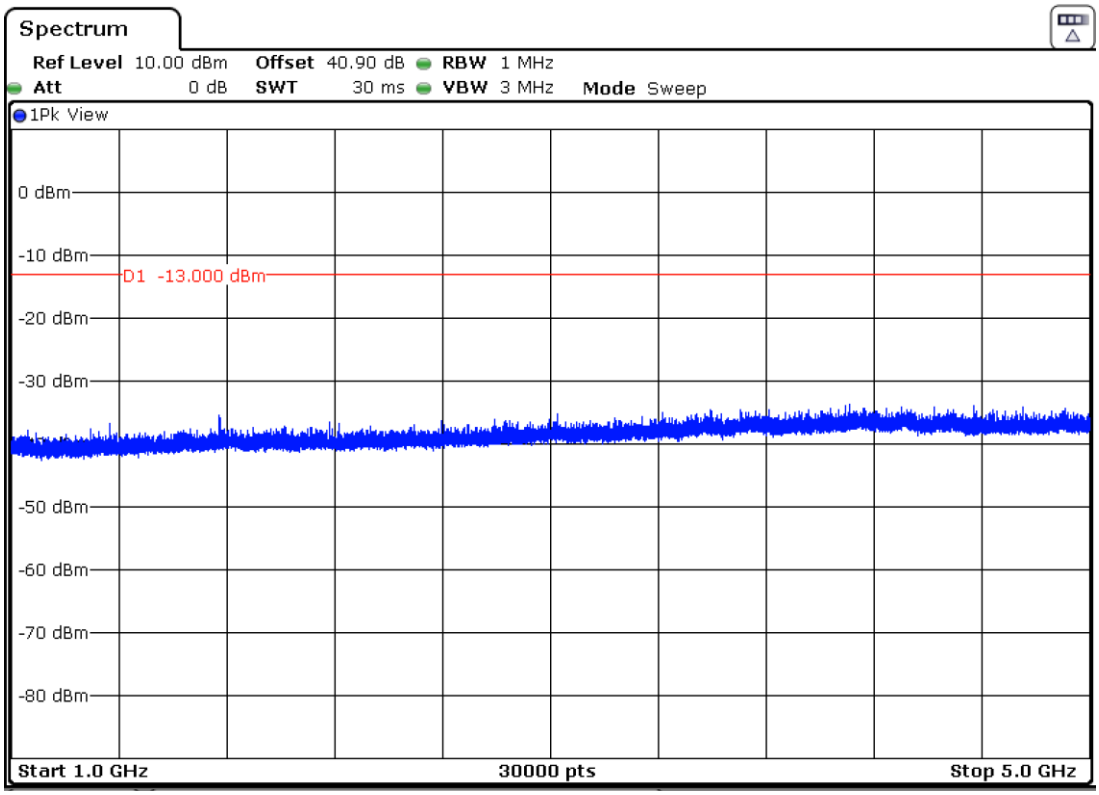
Note: The peak above the limit is the carrier frequency. The carrier was attenuated using a notch filter.



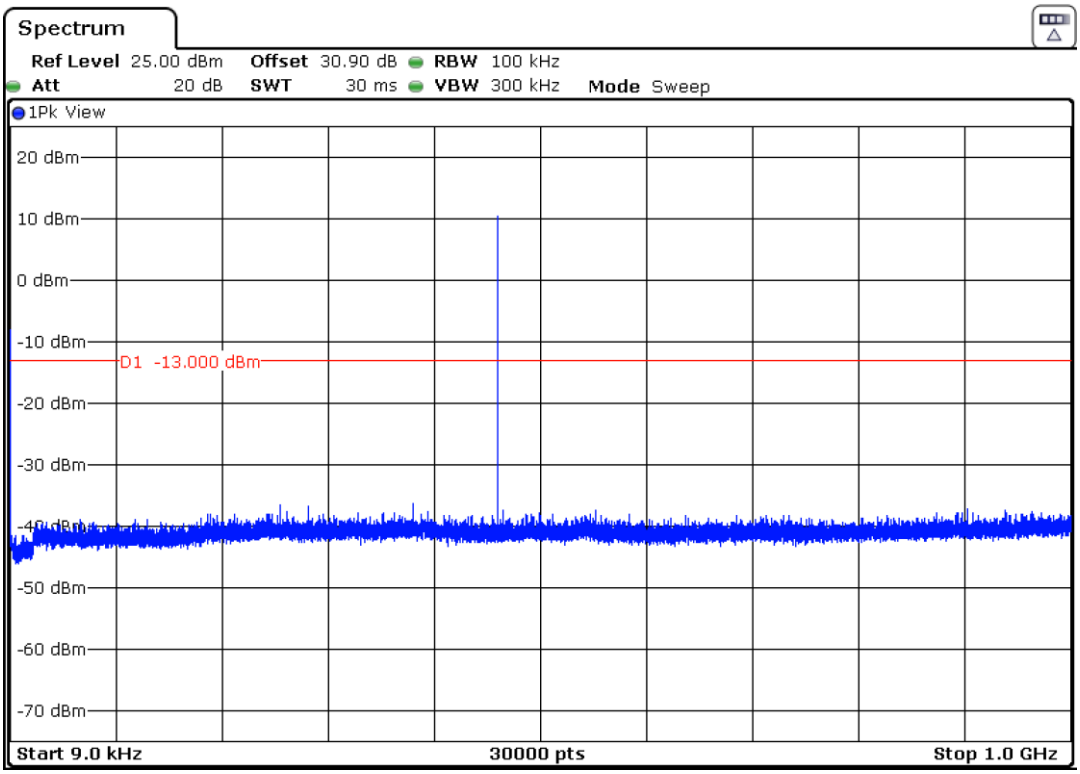
2. CHANNEL: 454.825 MHz.



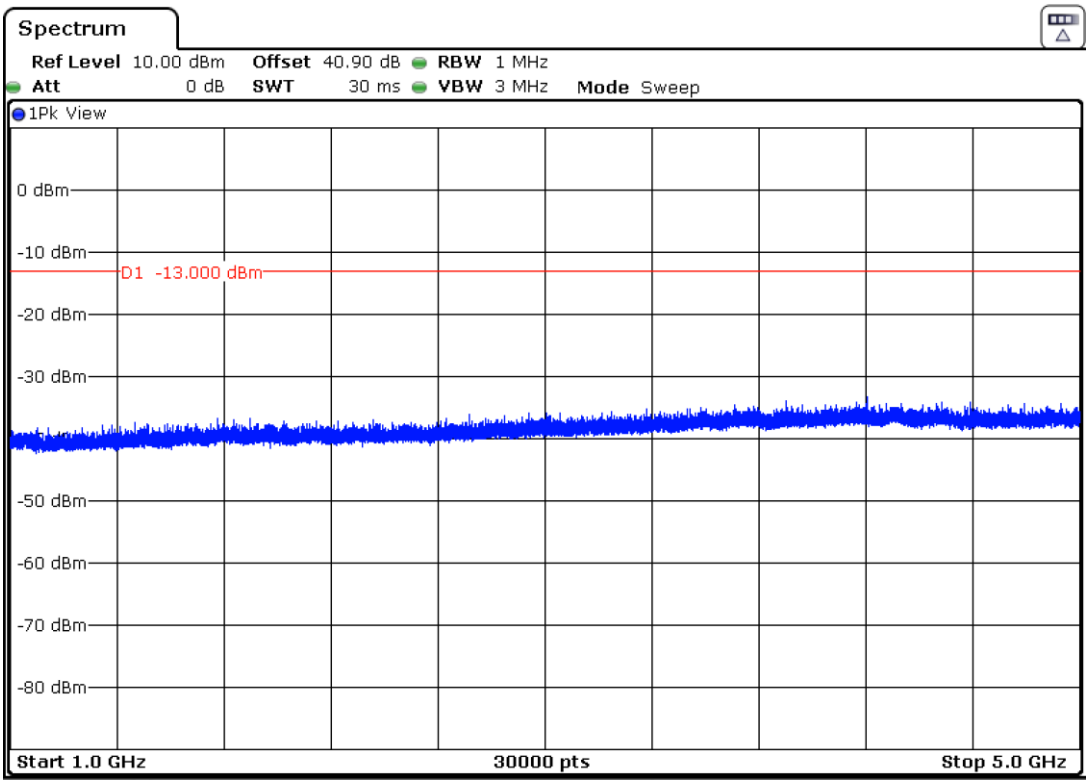
Note: The peak above the limit is the carrier frequency. The carrier was attenuated using a notch filter.



3. CHANNEL: 459.350 MHz.



Note: The peak above the limit is the carrier frequency. The carrier was attenuated using a notch filter.



Band-edge emissions compliance (Transmitter)

SPECIFICATION
FCC §22.357. §22.359. §22.731. §22.861.

Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB.

METHOD

FCC 22.359

As indicated in FCC part 22.359. in the 60 kHz bands immediately outside and adjacent to the authorized frequency range or channel. a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power. A resolution bandwidth of 300 Hz was used.

FCC 22.861

As indicated in FCC part 22.861. in the 1 MHz bands immediately outside and adjacent to the frequency block. a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power. A resolution bandwidth of 300 Hz was used.

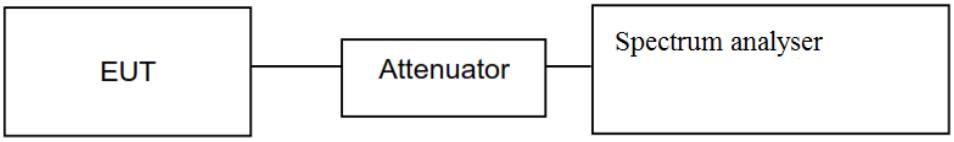
The reading of the spectrum analyser is corrected with the attenuation loss of connection between output terminal of EUT and input of the spectrum analyser.

Measurement Limit**:**

According to specification. the power of emissions shall be attenuated below the transmitter power (P) by a factor of at least 43 + 10 log (P) dB. P in watts.
At Po transmitting power the specified minimum attenuation becomes 43+10log (Po) and the level in dBm relative Po becomes:

Po (dBm) – [43 + 10 log (Po in mwatts) - 30] = - 13 dBm

TEST SETUP

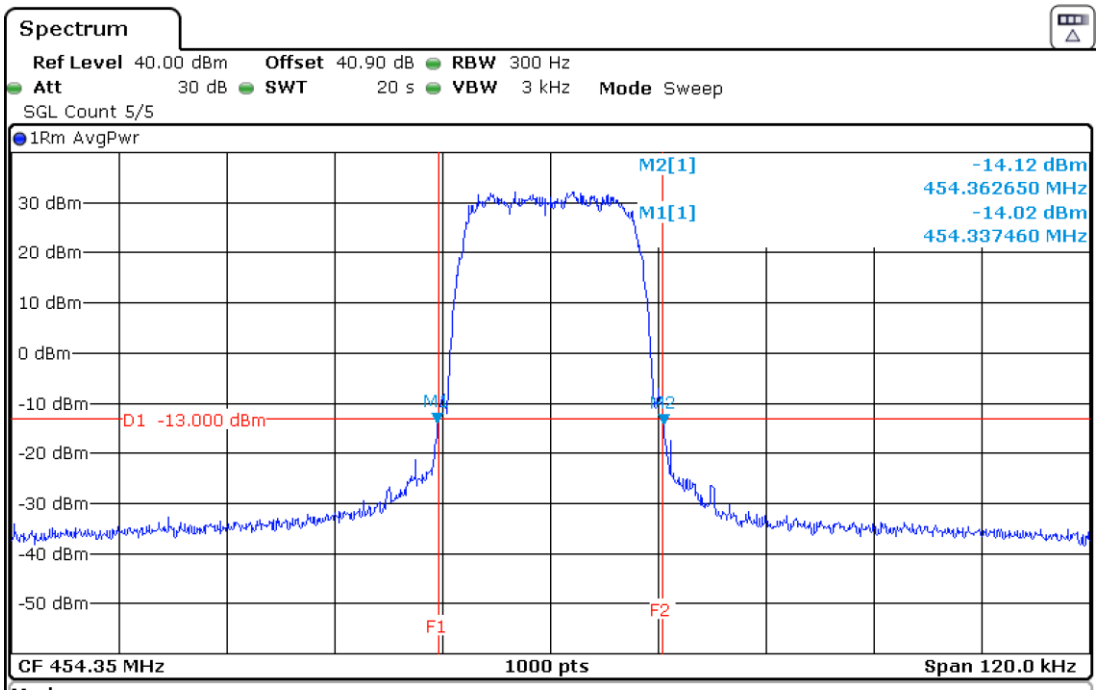


RESULTS (See next plots):

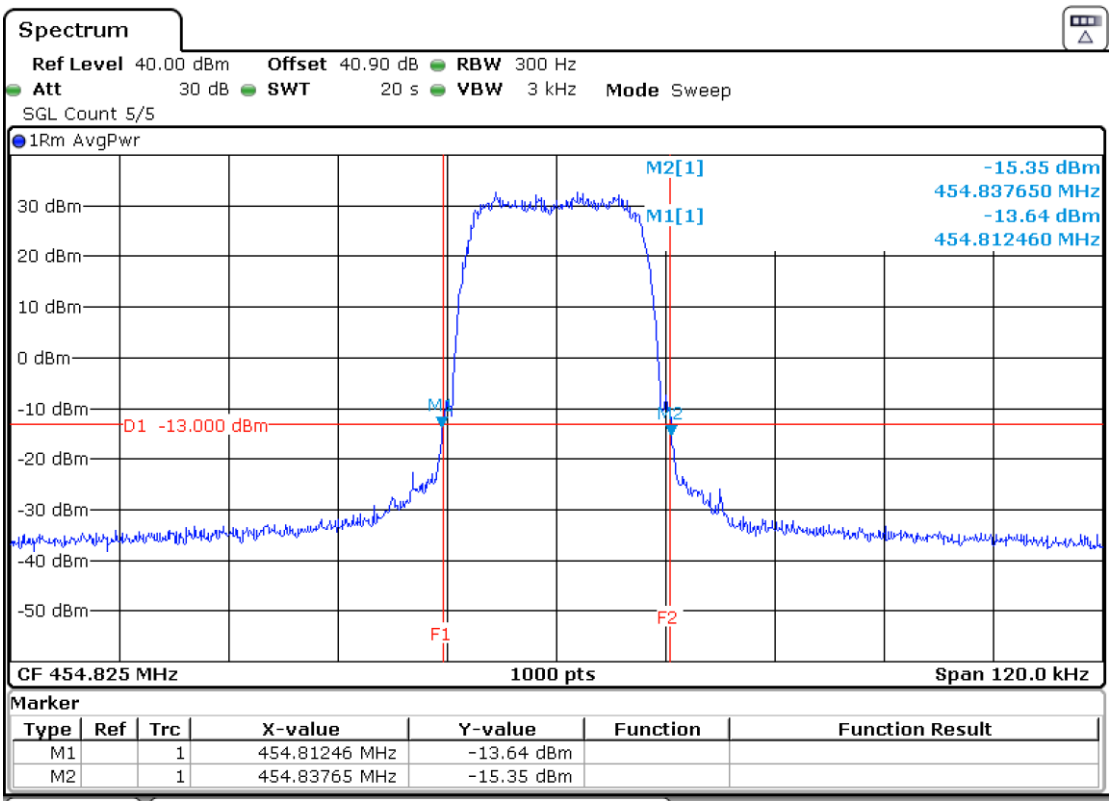
	Lower channel edge	Upper channel edge
Channel 454.350 MHz. Maximum measured level at channel edges at antenna port (dBm)	-14.02	-14.12
Channel 454.825 MHz. Maximum measured level at channel edges at antenna port (dBm)	-13.64	-15.35
Channel 459.350 MHz. Maximum measured level at channel edges at antenna port (dBm)	-13.13	-14.30
Measurement uncertainty (dB):	< ± 0.34	

Verdict: PASS

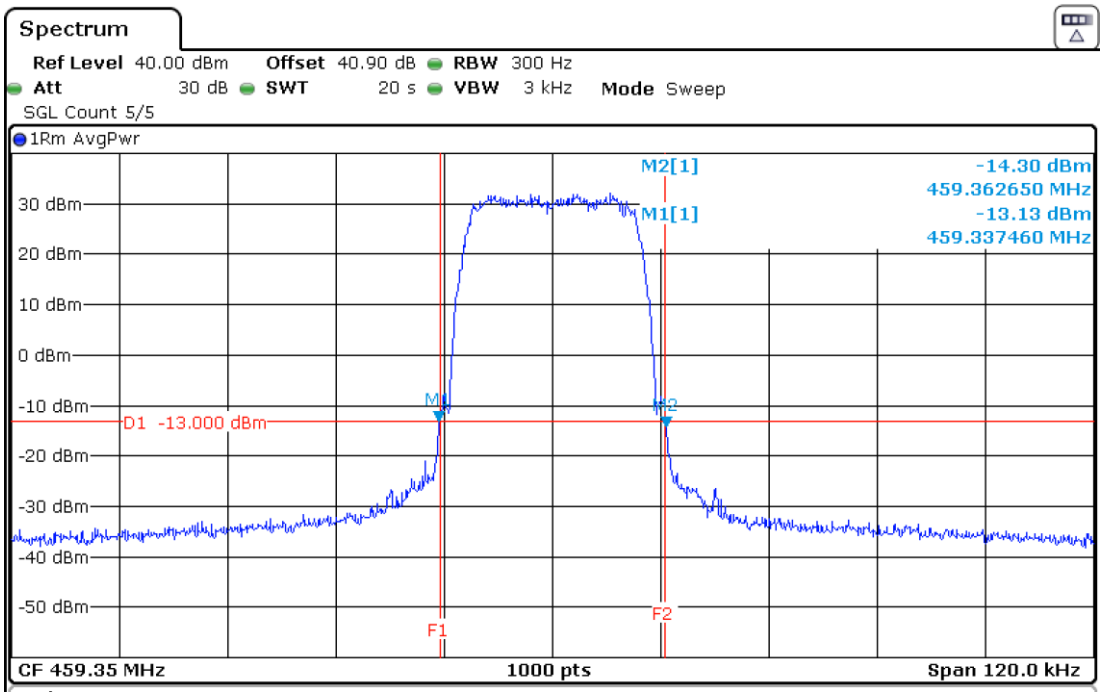
1. Channel: 454.350 MHz.



2. Channel: 454.825 MHz.



3. Channel: 459.350 MHz.



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	459.33746 MHz	-13.13 dBm		
M2		1	459.36265 MHz	-14.30 dBm		

Radiated emissions

SPECIFICATION
FCC §22.357. §22.359. §22.731. §22.861.

Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB.

METHOD

The measurement was performed with the EUT inside an anechoic chamber. The RF output connector of the EUT is terminated with an attenuator and a 50 ohm load.
The spectrum was scanned from 30 MHz to at least the 10th harmonic of the highest frequency generated within the equipment.
The EUT was placed on a 1.5 meter high non-conductive stand at a 3 meter distance from the measuring antenna for measurements below 1 GHz and at 1 m distance for measurements above 1 GHz.
Detected emissions were maximized at each frequency by rotating the EUT and adjusting the measuring antenna height and polarization. The maximum meter reading was recorded.
Each detected emission at less than 20 dB below the limit is substituted by the Substitution method.

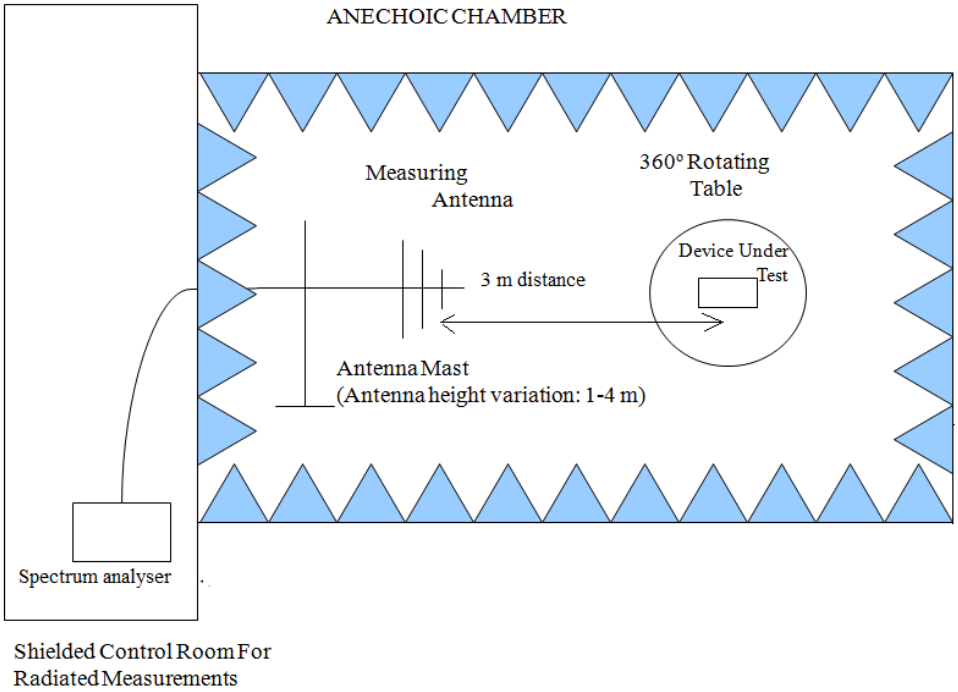
Measurement Limit**:**

According to specification. the power of emissions shall be attenuated below the transmitter power (P) by a factor of at least 43 + 10 log (P) dB. P in watts.
At Po transmitting power the specified minimum attenuation becomes 43+10log (Po) and the level in dBm relative Po becomes:

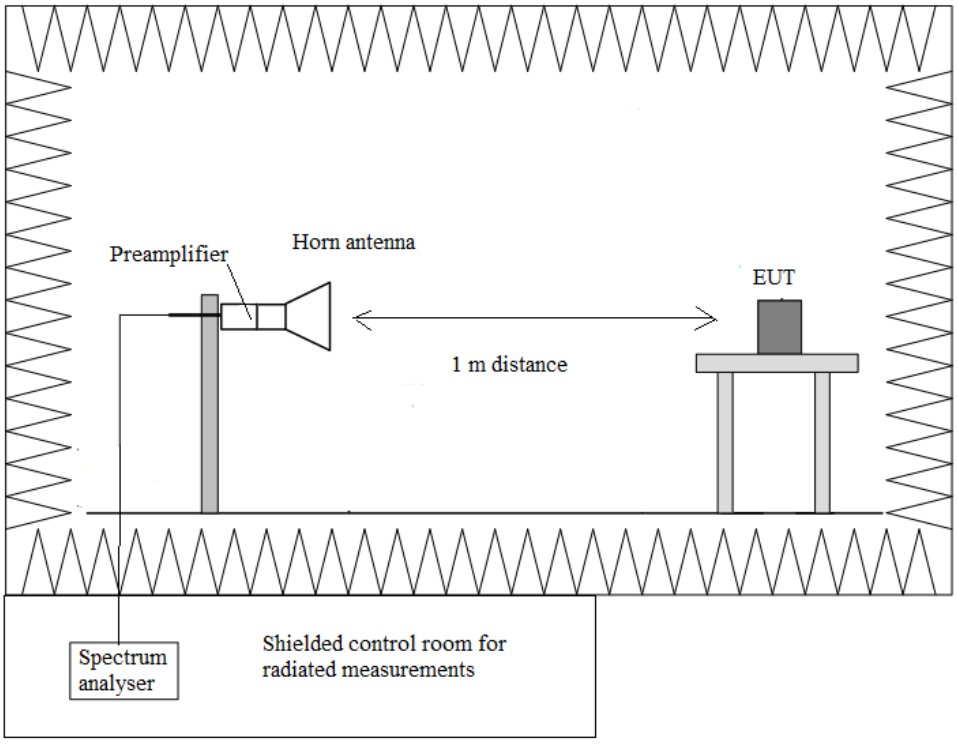
Po (dBm) – [43 + 10 log (Po in mwatts) - 30] = - 13 dBm

TEST SETUP

Radiated measurements below 1 GHz.



Radiated measurements above 1 GHz.



RESULTS

1. CHANNEL: 454.350 MHz.

Highest spurious signals.

Substitution method data

Frequency (MHz)	Instrument reading (dBm)	RBW (kHz)	Detector	Polarization	(1) Generator output (dBm)	(2) Cable loss (dB)	(3) Substitution antenna gain Gi (respect to isotropic radiator) (dB)	E.I.R.P. (dBm) = (1) – (2) + (3)
119.9190	-25.76	100	Peak	Vertical	-51.99	0.40	-1.37	-53.76
167.9825	-24.22	100	Peak	Vertical	-53.54	0.53	3.15	-50.92
1363.000	-47.90	1000	Peak	Vertical	-58.78	1.46	7.36	-52.88
3180.600	-53.04	1000	Peak	Vertical	-60.77	2.40	11.22	-51.95
4089.670	-56.56	1000	Peak	Horizontal	-61.78	2.80	11.95	-52.63
4997.270	-60.63	1000	Peak	Vertical	-61.75	3.20	11.50	-53.45

2. CHANNEL: 454.825 MHz.

Highest spurious signals.

Substitution method data

Frequency (MHz)	Instrument reading (dBm)	RBW (kHz)	Detector	Polarization	(1) Generator output (dBm)	(2) Cable loss (dB)	(3) Substitution antenna gain Gi (respect to isotropic radiator) (dB)	E.I.R.P. (dBm) = (1) – (2) + (3)
95.9600	-27.41	100	Peak	Vertical	-56.19	0.31	1.89	-54.61
103.9625	-25.27	100	Peak	Vertical	-52.61	0.35	-0.41	-53.37
167.9825	-27.23	100	Peak	Vertical	-56.55	0.53	3.15	-53.93
1120.330	-53.26	1000	Peak	Horizontal	-61.30	1.26	6.80	-55.76
3183.800	-54.01	1000	Peak	Vertical	-61.75	2.40	11.23	-52.92
4093.400	-57.11	1000	Peak	Vertical	-62.30	2.80	11.94	-53.16

3. CHANNEL: HIGHEST. 459.350 MHz.

Highest spurious signals.

Substitution method data

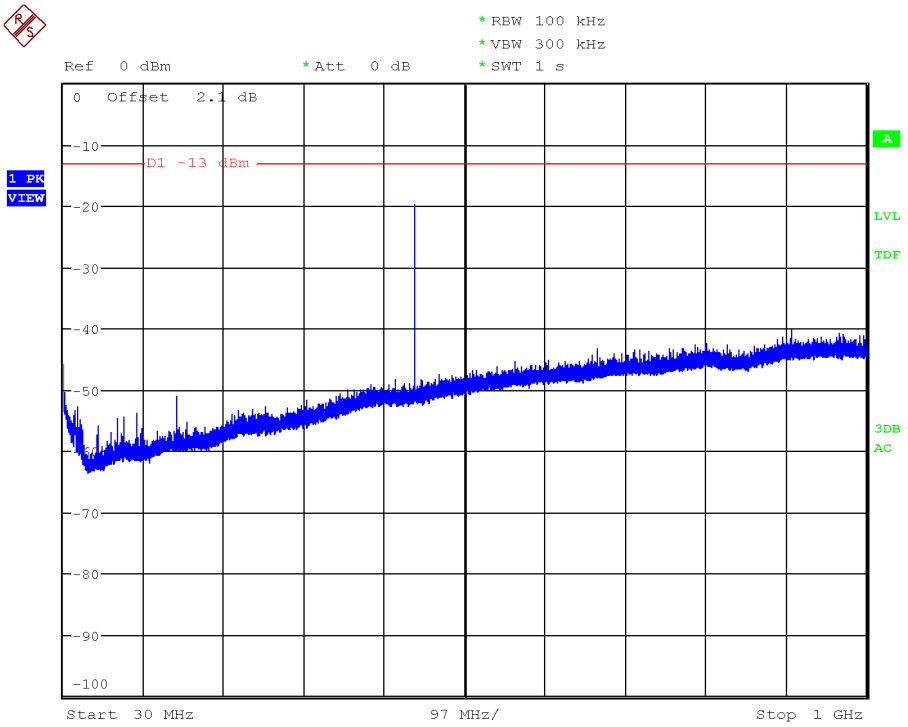
Frequency (MHz)	Instrument reading (dBm)	RBW (kHz)	Detector	Polarization	(1) Generator output (dBm)	(2) Cable loss (dB)	(3) Substitution antenna gain Gi (respect to isotropic radiator) (dB)	E.I.R.P. (dBm) = (1) – (2) + (3)
167.9825	-26.73	100	Peak	Vertical	-56.05	0.53	3.15	-53.43
1377.930	-42.58	1000	Peak	Vertical	-53.48	1.48	7.44	-47.52
1837.800	-47.42	1000	Peak	Vertical	-58.63	1.72	9.31	-51.03
2296.600	-47.47	1000	Peak	Horizontal	-57.75	2.00	10.37	-49.37
3215.670	-49.44	1000	Peak	Vertical	-57.13	2.42	11.29	-48.26
3674.470	-53.65	1000	Peak	Horizontal	-60.36	2.67	11.87	-51.16

Measurement uncertainty (dB)	<±3.88 for f < 1GHz <±4.87 for f ≥ 1 GHz up to 18 GHz

Verdict: PASS

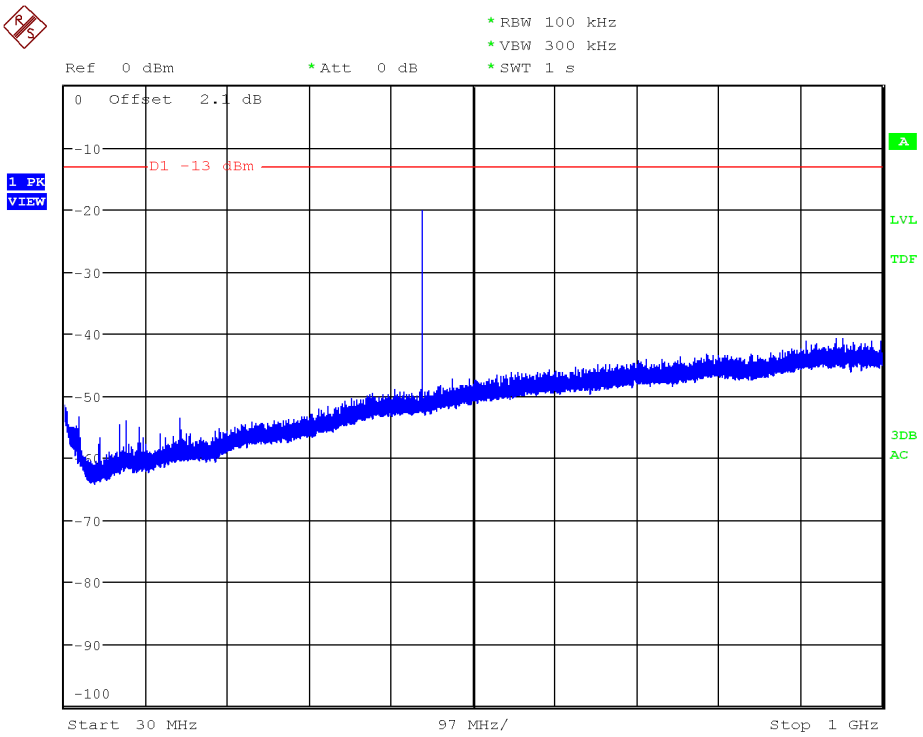
FREQUENCY RANGE 30 MHz-1000 MHz.

1. CHANNEL: 454.350 MHz.



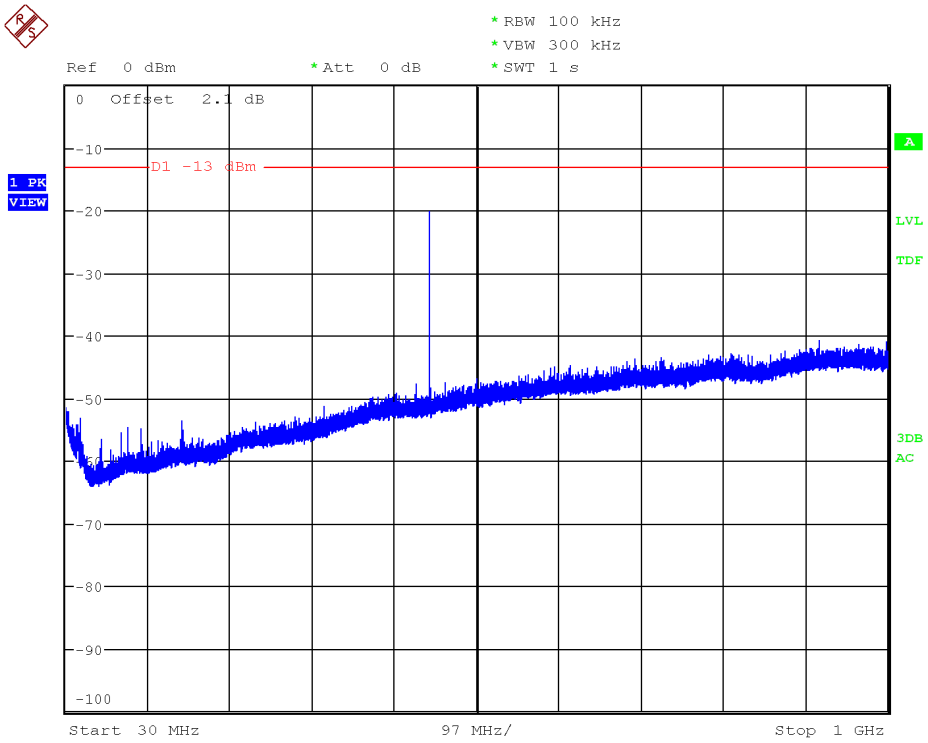
Note: The highest peak shown in the above plot is the carrier frequency.

2. CHANNEL: 454.825 MHz.



Note: The highest peak shown in the above plot is the carrier frequency.

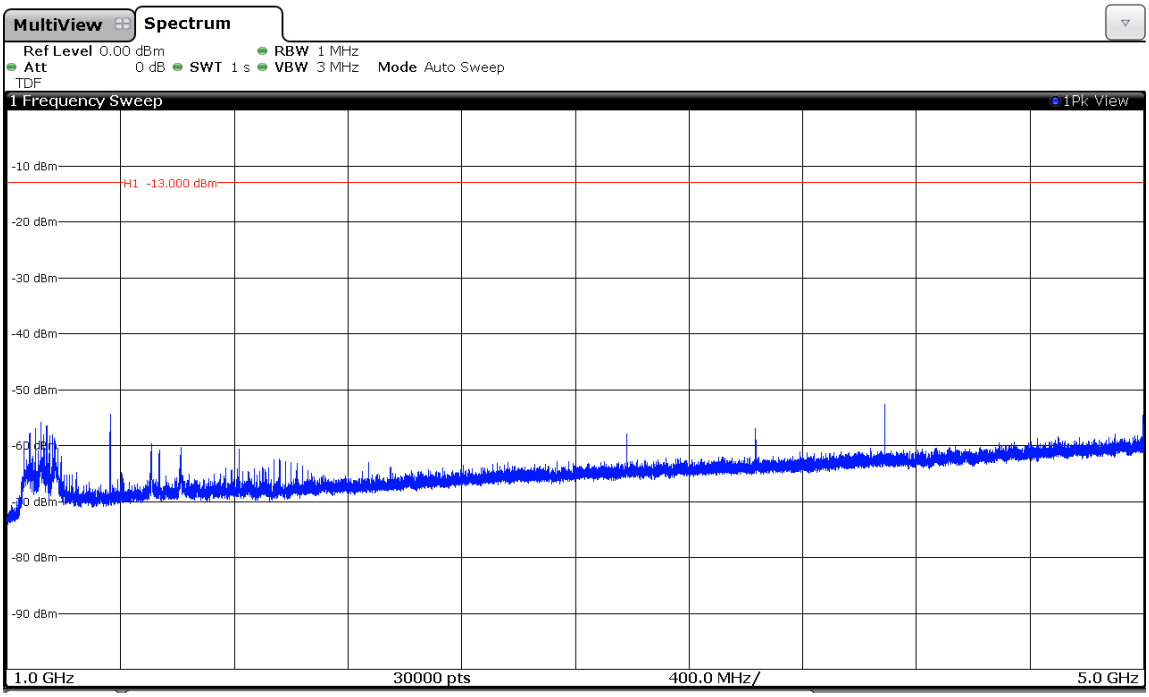
3. CHANNEL: 459.350 MHz.



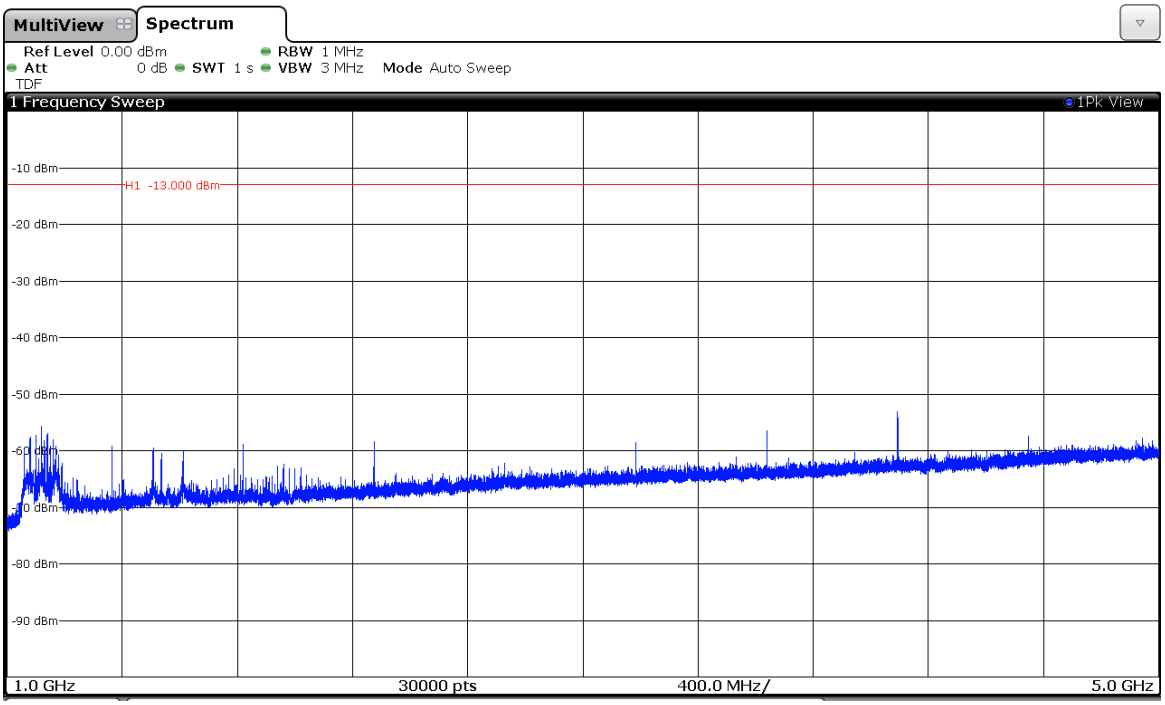
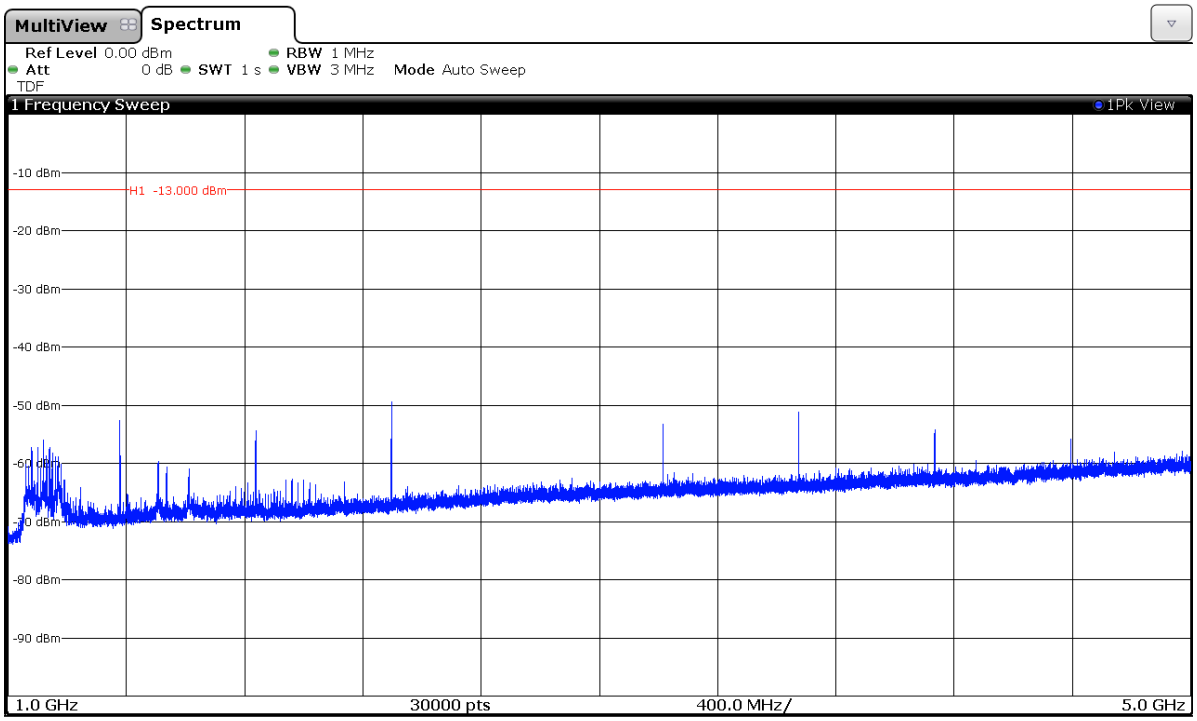
Note: The highest peak shown in the above plot is the carrier frequency.

FREQUENCY RANGE 1 GHz to 5 GHz.

1. CHANNEL: 454.350 MHz.



2. CHANNEL: 454.825 MHz.



3. CHANNEL: 459.350 MHz.