



FCC LISTED, REGISTRATION
NUMBER: 2764.01

ISED LISTED REGISTRATION
NUMBER: 23595-1

Test report No:

2416ERM.001

Test report

**FCC Rules and Regulations CFR 47, Part 15, Subpart B (10-1-18 Edition)
&
ICES-003 ISSUE 6 – Update April (2017)**

Identification of item tested	Cat1 Module Supporting B2/B5/B12/B25/B26
Trademark	Sequans Communications
Model and /or type reference	SP150Q
Other identification of the product	FCC ID: 2AAGMSP150Q IMEI TAC:35199610
Features	<p>Sequans SP150Q module includes Calliope Category 1 baseband, a complete triple band RF front end, memory and required circuitry to meet 3GPP E-UTRA (Long Term Evolution - LTE, Release 10 set of specifications).</p> <ul style="list-style-type: none"> - Operates on LTE bands 25, 26, 2, 5, 12 - Ultra small 22.5 x 22.5 x 1.5 mm LGA module - Single or dual antenna - Based on Sequans' Calliope LTE Cat 1 platform 3GPP Release 10; software-upgradable to Release 11 - PTCRB compliant - Category 1 throughput (10Mbps DL/ 5 Mbps UL) - Multi-band FDD and TDD capable - Embedded IMS clients
Manufacturer	Sequans Communications S.A. 15-55 Boulevard Charles de Gaulle, Colombes, 92700, France
Test method requested, standard	FCC Rules and Regulations CFR 47, Part 15, Subpart B (10-1-18 Edition) ICES-003 ISSUE 6 – Update April (2017)
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Domingo Galvez EMC&RF Lab Manager
Date of issue	2019-03-05
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Competences and guarantees

DEKRA Certification Inc. is a testing laboratory accredited by A2LA (The American Association for Laboratory Accreditation), to perform the tests indicated in the Certificate 2764.01

DEKRA Certification Inc. is a testing laboratory competent to carry out the tests described in this report.

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

DEKRA Certification Inc. 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 Certification at the time of performance of the test.

DEKRA Certification Inc. 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.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA Certification Inc.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA Certification Inc. and the Accreditation Bodies.

Uncertainty

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

	Frequency (MHz)	U(k=2)	Units
Conducted emission	0,009 - 30	2.69	dB
Radiated emission	30-180	3.82	dB
	180-1000	2.61	dB
	1000-18000	2.92	dB
	18000-40000	2.15	dB

Data provided by the client

The SP150Q is a complete LTE module including base-band, RF and memory, for the design of connected consumer electronics devices, tablet and laptop computers, machine-to-machine devices, and other devices with embedded LTE connectivity. SP150Q is based on Sequans' Calliope platform.

DEKRA declines any responsibility with respect to the information provided by the client and that may affect the validity of results.

Usage of samples

Samples undergoing test have been selected by: The client.

Sample S/01 is composed of the following elements:

Control N°	Description	Model	Serial N°	Date of reception
2416.01	Sequans SP150Q	SP150Q	IMEI:351996100000615	02/19/2019
2416.04	Radial isotropic Antenna	OmniLogo 90200	62785	02/19/2019
2416.05	Radial isotropic Antenna	OmniLogo 90200	62775	02/19/2019
2416.08	USB cable	C15332	-	02/19/2019

Sample S/01 was used in following testing: Radiated Emission

Test sample description

Ports..... :	Port name and description		Cable						
			Specified length [m]	Attached during test	Shielded				
	USB		2	<input checked="" type="checkbox"/>	<input type="checkbox"/>				
	UART0			<input type="checkbox"/>	<input type="checkbox"/>				
	UART2			<input type="checkbox"/>	<input type="checkbox"/>				
	UART3			<input type="checkbox"/>	<input type="checkbox"/>				
	PWR			<input type="checkbox"/>	<input type="checkbox"/>				
	SIM			<input type="checkbox"/>	<input type="checkbox"/>				
Supplementary information to the ports..... :	Insert 1 SIM card in one of SIM -2FF or SIM-3FF holder. Do not insert SIM in both SIM-2FF and SIM-3FF at the same time								
Rated power supply	Voltage and Frequency		Reference poles						
			L1	L2	L3	N	PE		
	<input type="checkbox"/>	AC: 230Vac / 50Hz.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
	<input type="checkbox"/>	AC:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
	<input type="checkbox"/>	DC:							
	<input checked="" type="checkbox"/>	5V from USB 2.0 port							
Rated Power	5V from USB 2.0 port								
Clock frequencies	USB 2.0								
Other parameters.....	No Data provided								
Software version	4.3.4.3								
Hardware version.....	SP150 EVT1								
Dimensions in cm (L x W x D)	17 x 24 mm								
Mounting position.....	<input checked="" type="checkbox"/>	Table top equipment							
	<input type="checkbox"/>	Wall/Ceiling mounted equipment							
	<input type="checkbox"/>	Floor standing equipment							
	<input type="checkbox"/>	Hand-held equipment							
	<input type="checkbox"/>	Other:							
Modules/parts	Module/parts of test item			Type		Manufacturer			
	HWPT-003-B			interface board		Sequans			
Accessories (not part of the test item)	Description		Type			Manufacturer			
	USB wire		cable						
	OmniLOG 90200		antenna			Omnilog			
Documents as provided by the applicant.....	Description		File name			Issue date			
	Equipment declaration data		FDT30_14 Declaration Equipment Data			2018/12/28			

Copy of marking plate:



Identification of the client

Sequans Communications S.A.
15-55 Boulevard Charles de Gaulle, Colombes, 92700, France

Testing period and place

Test Location	DEKRA Certification, Inc
Date (start)	2019-02-26
Date (finish)	2019-02-26

Document history

Report number	Date	Description
2416ERM.001	2019-03-055	First release

Environmental conditions

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

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 30 % Max. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

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

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 30 % Max. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

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

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 30 % Max. = 60 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

Remarks and comments

The tests have been performed by the technical personnel: Poojita Bhattu and Koji Nishimoto.

Testing verdicts

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

Summary

Emission Test			
Report Section	Requirement – Test case	Verdict	Remark
A.1.	Radiated emission electromagnetic field test (30 MHz – 1000 MHz)	P	N/A
A.1.	Radiated emission electromagnetic field test (1 GHz – 18 GHz)	P	Refer 1
-.	Conducted emission test (150 kHz to 30 MHz)	N/A	Refer 2
<u>Supplementary information and remarks:</u> <ol style="list-style-type: none"> As per standard 47 CFR §15.33 due to the highest frequency generated or used in the device is above 1000MHz the upper frequency of measurement range is up to 5th harmonic of the highest frequency or 40GHz, whichever is lower. DUT is a module and not the final product. 			

List of equipment used during the test

CONTROL NUMBER	DESCRIPTION	MANUFACTURER	MODEL	LAST CALIBRATION	NEXT CALIBRATION
0980	Preamplifier	BONN ELEKTRONIK	BLNA 0360-01N	2017/05	2019/05
0981	Preamplifier	BONN ELEKTRONIK	BLMA 0118-2A	2018/10	2020/10
0982	Preamplifier	BONN ELEKTRONIK	BLMA1840-1M	2018/10	2020/10
0997	LISN	NARDA	PMM L3-32	2017/03	2019/03
1012	EMI Test Receiver	ROHDE & SCHWARZ	ESR26	2018/09	2020/09
1017	EMC measurement software	ROHDE & SCHWARZ	EMC32 V9.01	---	---
1039	Signal Analyser	ROHDE & SCHWARZ	FSV40	2018/10	2020/10
1055	Horn Antenna	ETS LINDGREN	3116C	2016/12	2019/12
1058	Horn Antenna	ETS LINDGREN	3115	2017/03	2020/03
1065	Biconilog Antenna	ETS LINDGREN	3142E	2017/03	2020/03
1073	Pulse Limiter	NARDA	PMM PL01	2017/06	2019/06

Appendix A: Test results

Appendix A Content

DESCRIPTION OF THE OPERATION MODES 11

A.1.RADIATED EMISSION. ELECTROMAGNETIC FIELD TEST 12

DESCRIPTION OF THE OPERATION MODES

The operation modes described in this paragraph constitute a functionality of the sample under test for itself. Every operation mode takes failure criteria for the immunity test that they were applying to it and a monitoring to guarantee performance of the same ones.

The operation modes used by the samples to which the present report refers, are shown in the following table:

OPERATION MODE	DESCRIPTION
OM#01*	EUT ON. Idle mode. Power supply 5 Vdc

*Worst configurations detected

A.1.RADIATED EMISSION. ELECTROMAGNETIC FIELD TEST

LIMITS:	Product standard:	FCC CFR 47, Part 15, Subpart B (10-1-18 Edition), Secs. 15.109 & ICES-003 Issue 6 – Update April (2017)
	Test standard:	FCC CFR 47, Part 15, Subpart B (10-1-18 Edition), Secs. 15.109 & ICES-003 Issue 6 – Update April (2017); ANSI C63.4 (2014)

Limits of interference Class B

The applied limit for radiated emissions, 3 m distance, according with the requirements of FCC Rules and Regulations 47 CFR Part 15, Subpart B (10-01-18 Edition), Secs. 15.109 & ICES-003 Issue 6 – Update April (2017) in the frequency range 30 MHz to 40 GHz for class B equipment.

Frequency range (MHz)	QP Limit for 3 m	
	(μ V/m)	(dB μ V/m)
30 to 88	100	40
88 to 216	150	43.5
216 to 960	200	46
Above 960	500	54

Frequency range (MHz)	AVG Limit for 3 m		PK Limit for 3 m (1)
	(μ V/m)	(dB μ V/m)	(dB μ V/m)
Above 1000	500	54	74

Frequencies above 1 GHz, the limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test, as per §15.35(b)

TEST SETUP

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 30-1000 MHz (Bilog antenna) and 1-18 GHz (Double ridge horn antennas), and a distance of 1m for the frequency range 18-40 GHz (Double ridge horn antennas).

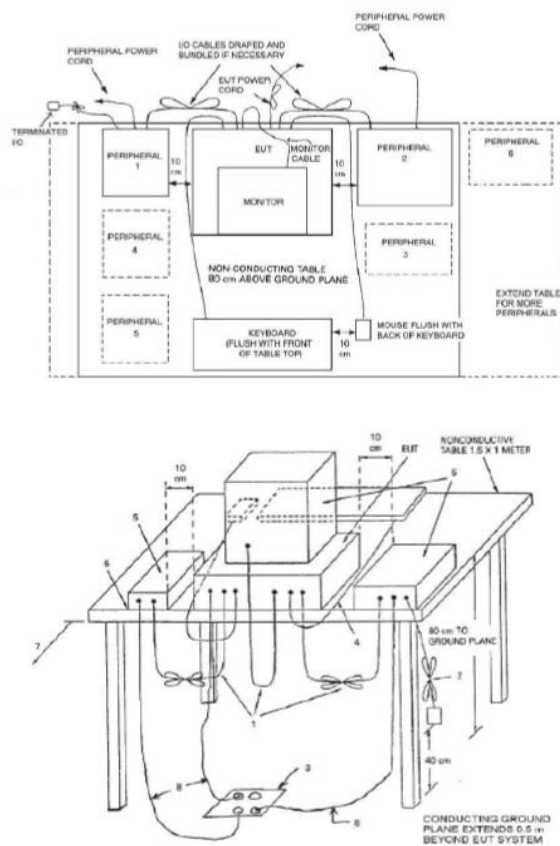
For radiated emissions in the range 18-40 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° 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.

The field strength is calculated by adding correction factor to the measured level from the spectrum analyzer. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.

TEST SETUP (Cont.)



TESTED SAMPLES:

S/01

TESTED OPERATION MODES:

OM#01

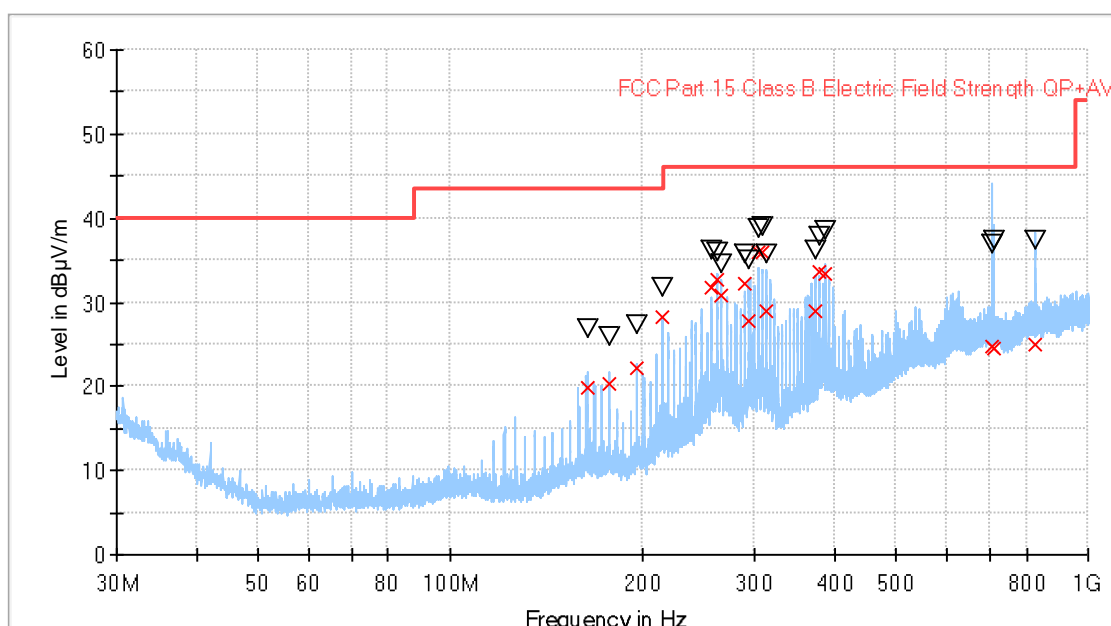
TEST RESULTS:

CRmmnnxx: CR, Radiation Condition; mm: Sample number; nn: Operation mode.,xx:Range,

CRmmnnxx	Description	Result
CR0101LR	Range: 30 MHz - 1000 MHz Horizontal Polarization	P
CR0101LR	Range: 30 MHz - 1000 MHz Vertical Polarization	P
CR0101HR1	Range: 1-18 GHz Horizontal Polarization	P
CR0101HR1	Range: 1-18 GHz Vertical Polarization	P

Radiated Emission. CR0101LR

Project: 02416ERM001
Company: Sequans
Sample: S/01
Operation mode: OM#01
Description: EUT ON. IDLE. Power Supply 5 Vdc. Both polarizations.



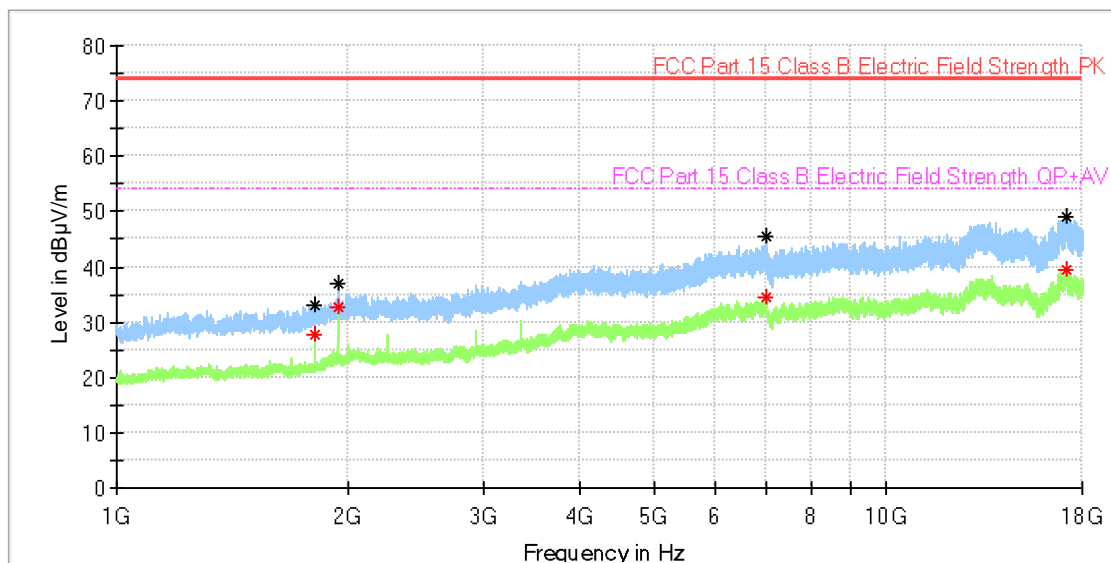
— Preview Result 1-PK+
— FCC Part 15 Class B Electric Field Strength QP+AV
x Final_Result QPK
v Final_Result PK+

Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
163.700000	19.74	26.79	43.50	23.76	122.0	V	106.0
177.680000	20.31	25.80	43.50	23.19	114.0	V	31.0
196.380000	22.27	27.29	43.50	21.23	118.0	V	46.0
215.080000	28.31	31.72	43.50	15.19	100.0	V	-57.0
257.190000	31.78	36.21	46.00	14.22	118.0	H	-31.0
261.940000	32.70	35.98	46.00	13.30	126.0	H	-8.0
266.400000	30.86	34.53	46.00	15.14	100.0	H	-85.0
289.940000	32.28	35.73	46.00	13.72	125.0	H	-142.0
294.500000	27.81	35.06	46.00	18.19	118.0	H	116.0
303.810000	35.87	38.70	46.00	10.13	151.0	V	-130.0
308.490000	36.07	38.99	46.00	9.93	115.0	V	-118.0
313.190000	28.89	35.63	46.00	17.11	125.0	V	-109.0
374.110000	29.02	36.20	46.00	16.98	136.0	V	-133.0
378.500000	33.51	37.82	46.00	12.49	119.0	V	151.0
387.960000	33.36	38.57	46.00	12.64	129.0	V	180.0
705.950000	24.80	36.96	46.00	21.20	100.0	V	-164.0
709.870000	24.60	37.27	46.00	21.40	317.0	V	-40.0
826.230000	25.04	37.45	46.00	20.96	136.0	V	-20.0

Radiated Emission. CR0101HR1

Project: 02416ERM001
Company: Sequans
Sample: S/01
Operation mode: OM#01
Description: EUT ON. IDLE. Power Supply 5 Vdc. Both polarizations.



- Preview Result 2-AVG
- Preview Result 1-PK+
- * Critical_Freqs AVG
- * Critical_Freqs PK+
- FCC Part 15 Class B Electric Field Strength PK
- FCC Part 15 Class B Electric Field Strength QP+AV
- × Final_Result PK+
- ▽ Final_Result AVG

Final_Result

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1812.281250	33.24	---	73.90	40.66
1812.281250	---	27.71	53.90	26.19
1937.125000	37.02	---	73.90	36.88
1937.125000	---	32.69	53.90	21.21
6987.187500	---	34.62	53.90	19.28
6989.843750	45.64	---	73.90	28.26
17134.593750	---	39.45	53.90	14.45
17191.437500	49.23	---	73.90	24.67