

EMI-TEST REPORT

- FCC Part 15.407, 5470-5725 MHz, RSS247 -

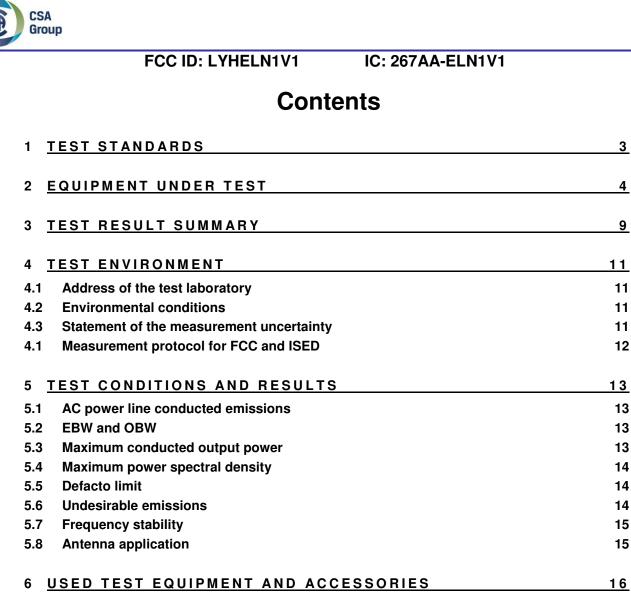
Type / Model Name	: SCALANCE W700 / ELN							
Product Description	: Industrial WLAN access point							
Applicant	: Siemens AG, Industrial Automation Division							
Address	: Gleiwitzer Strasse 555							
	90475 NUERNBERG, GERMANY							
Manufacturer	: Siemens AG, Sensors & Communication							
Address	: Oestliche Rheinbrueckenstrasse 50							
	76187 KARLSRUHE, GERMANY							
Licence holder	: Siemens AG, Industrial Automation Division							
Address	: Gleiwitzer Strasse 555							
	90475 NUERNBERG, GERMANY							
Test Result according to the state listed in clause 1 test standards:	andards POSITIVE							

Test Report No. : T40580-03-03HS 17. May 2016 Date of issue Date of issue	
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The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

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ATTACHMENT A as separate supplement



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1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15, Subpart Part 15, Subpart A, Section 15.31	a A - General (September 2015) Measurement standards
Part 15, Subpart A, Section 15.33	Frequency range of radiated measurements
Part 15, Subpart A, Section 15.35	Measurement detector functions and bandwidths
FCC Rules and Regulations Part 15, Subpart Part 15, Subpart C, Section 15.203	t C - Intentional Radiators (September 2015) Antenna requirement
Part 15, Subpart C, Section 15.204	External radio frequency power amplifiers and antenna modifications
Part 15, Subpart C, Section 15.205	Restricted bands of operation
Part 15, Subpart C, Section 15.207	Conducted limits
Part 15, Subpart C, Section 15.209	Radiated emission limits, general requirements
Part 15, Subpart C, Section 15.212	Modular transmitters
FCC Rules and Regulations Part 15, Subpart	E – Unlicensed National Information Infrastructure Devices (December 2015)
Part 15, Subpart E, Section 15.407	Operation within the bands 5.15 - 5.25 GHz, 5.25 - 5.35 GHz, 5.47 - 5.725 GHz and 5.725 - 5.85 GHz
ANSI C63.10: 2013	Testing Unlicensed Wireless Devices
ETSI TR 100 028 V1.3.1: 2001-03	Electromagnetic Compatibility and Radio Spectrum Matters (ERM); Uncertainties in the Measurement of Mobile Radio Equipment Characteristics—Part 1 and Part 2
KDB 789033 D02 v01r02	Guidance for compliance Testing of U-NII devices, April 8, 2016.



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2 EQUIPMENT UNDER TEST

2.1 Photo documentation of the EUT – Detailed photos see ATTACHMENT A

2.2 General remarks:

The EUT is fully tested and approved according the "old Rules". This test report shall show the further compliance to the "new Rules" under the premise that no operating parameter of the EUT are changed (No change in output power). The measurement values stay the same as under the "old Rules" and are already documented with the test report T36325-00-05HS by mikes testing partners. Therefore, no additional remeasurement under the "new rules".

2.3 Equipment category

WLAN - AP

2.4 Short description of the equipment under test (EUT)

The EUT is a 1-Port WLAN-access point for cap rail applications. The EUT provides a menu to choose the channel for data transmission, the connected antenna and the length of the antenna cable. The AP is compatible with 802.11a/b/g, 802.11n Standard. It supports the 2.4 GHz and 5 GHz frequency band.

Number of tested samples:	1
Serial number:	VPH1126493
Firmware version:	V5.2.0

EUT configuration:

(The CDF filled by the applicant can be viewed at the test laboratory.)

2.5 Variants of the EUT

Vari	ant	Device-Name	WLAN-Interfaces	LAN connector	Antenna Ports	Order numbers
VO	1	ELN-W1-RJ-E1	1	RJ45	1	6GK5721-1FC00-xxxx 6GK5722-1FC00-xxxx 6GK5761-1FC00-xxxx

2.6 Operation frequency and channel plan

The operating frequency is 5470 MHz to 5725 MHz.



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Channel plan WLAN Standard 802.11h/n, HT20:

Channel	Frequency (MHz)				
100	5500				
104	5520				
108	5540				
112	5560				
116	5580				
120	5600				
124	5620				
128	5640				
132	5660				
136	5680				
140	5700				

Note: The red marked channels are not supported by the firmware. Note: The blue marked frequencies are determined for final testing.

HT40 mode:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
100up	5510	104down	5510
108up	5550	112down	5550
116up	5590	120down	5590
124up	5630	128down	5630
132up	5670	136down	5670

Note: The red marked channels are not supported by the firmware.

Note: The blue marked frequencies are determined for final testing.

2.7 Transmit operating modes

The module use OFDM modulation and is capable to provide following data rates:

- 802.11h		54, 48, 36, 24, 18, 12, 9, 6 Mbps
- 802.11n	HT20,	MCS 0 - 15
- 802.11n	HT40.	MCS 0 - 15

HT20

MCS parameters for mandatory 20 MHz, NSS = 1, NES = 1

MCS Index Modulation							Data rate (Mb/s)		
	Modulation	R	N _{BPSCS} (i _{SS})	N _{SD}	N _{SP}	N _{CBPS}	N _{DBPS}	800 ns GI	400 ns GI (see NOTE)
0	BPSK	1/2	1	52	4	52	26	6.5	7.2
1	QPSK	1/2	2	52	4	104	52	13.0	14.4
2	QPSK	3/4	2	52	4	104	78	19.5	21.7
3	16-QAM	1/2	4	52	4	208	104	26.0	28.9
4	16-QAM	3/4	4	52	4	208	156	39.0	43.3
5	64-QAM	2/3	б	52	4	312	208	52.0	57.8
б	64-QAM	3/4	б	52	4	312	234	58.5	65.0
7	64-QAM	5/6	б	52	4	312	260	65.0	72.2
NOTE-S	support of 400 ns (GI is op	tional on transm	it and re	eceive.				

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MCS parameters for optional 20 MHz, NSS = 2, NES = 1, EQM

MCS		R						Data rate (Mb/s)	
MCS Index	Modulation		N _{BPSCS} (iss)	N _{SD}	NSP	NCBPS	N _{DBPS}	800 ns GI	400 ns GI (see NOTE)
8	BPSK	1/2	1	52	4	104	52	13.0	14.4
9	QPSK	1/2	2	52	4	208	104	26.0	28.9
10	QPSK	3/4	2	52	4	208	156	39.0	43.3
11	16-QAM	1/2	4	52	4	416	208	52.0	57.8
12	16-QAM	3/4	4	52	4	416	312	78.0	86.7
13	64-QAM	2/3	6	52	4	624	416	104.0	115.6
14	64-QAM	3/4	6	52	4	624	468	117.0	130.0
15	64-QAM	5/6	6	52	4	624	520	130.0	144.4
NOTE-T	he 400 ns GI rate	values	are rounded to 1	decima	l place.				

HT40

MCS parameters for optional 40 MHz, NSS = 1, NES = 1

MCS Index Modulation		N G	N	N	N	N	Data rate (Mb/s)		
	R	N _{BPSCS} (i _{SS})	N _{SD}	N _{SP}	N _{CBPS}	N _{DBPS}	800 ns GI	400 ns GI	
0	BPSK	1/2	1	108	б	108	54	13.5	15.0
1	QPSK	1/2	2	108	б	216	108	27.0	30.0
2	QPSK	3/4	2	108	б	216	162	40.5	45.0
3	16-QAM	1/2	4	108	б	432	216	54.0	60.0
4	16-QAM	3/4	4	108	6	432	324	81.0	90.0
5	64-QAM	2/3	6	108	6	648	432	108.0	120.0
б	64-QAM	3/4	6	108	б	648	486	121.5	135.0
7	64-QAM	5/6	6	108	6	648	540	135.0	150.0

MCS parameters for optional 40 MHz, NSS = 2, NES = 1, EQM

MCS Index Modulation	D	N G)	N	N	N	N	Data rate (Mb/s)		
	R	N _{BPSCS} (i _{SS})	N _{SD}	N _{SP}	N _{CBPS}	N _{DBPS}	800 ns GI	400 ns GI	
8	BPSK	1/2	1	108	б	216	108	27.0	30.0
9	QPSK	1/2	2	108	б	432	216	54.0	60.0
10	QPSK	3/4	2	108	б	432	324	81.0	90.0
11	16-QAM	1/2	4	108	б	864	432	108.0	120.0
12	16-QAM	3/4	4	108	6	864	648	162.0	180.0
13	64-QAM	2/3	6	108	б	1296	864	216.0	240.0
14	64-QAM	3/4	6	108	б	1296	972	243.0	270.0
15	64-QAM	5/6	6	108	6	1296	1080	270.0	300.0

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Symbol	Explanation
N_{SS}	Number of spatial streams
R	Coding rate
NBPSC	Number of coded bits per single carrier (total across spatial streams)
$N_{BPSCS}(i_{SS})$	Number of coded bits per single carrier for each spatial stream, $i_{SS} = 1,,N_{SS}$
N _{SD}	Number of complex data numbers per spatial stream per OFDM symbol
N_{SP}	Number of pilot values per OFDM symbol
N _{CBPS}	Number of coded bits per OFDM symbol
N _{DBPS}	Number of data bits per OFDM symbol
N_{ES}	Number of BCC encoders for the DATA field
NTBPS	Total bits per subcarrier

2.8 Antenna

Antennas intended for use are classified into 3 gain groups:

- Antenna gain group 1:
- Antenna gain group 2:
- Antenna gain group 3:
- Antennas 0 to 6 dBi Antennas 6 to 9 dBi Antennas 9 to 14 dBi
- Gain Cable effective Gain Frequency Group Number Manufacturer Number Characteristic Model number Connector (GHz) 5GHz loss (dB) 5 GHz (dBi) 6GK5793-8DK00-0AA0 Directed ANT 793-8DK 2x N-female 5 GHz 23 14.2 9-14 1 8.8 2 6GK5793-8DJ00-0AA0 Directed ANT 793-8DJ 2x N-female 5 GHz 18 4.4 13.6 9-14 3 6GK5793-8DL00-0AA0 Directed ANT793-8DL 2x N-female 2.4 + 5 14 0 14 9-14 4 6GK5793-8DP00-0AA0 ANT793-8DP 13.5 13.5 Directed N-female 5 GHz 0 9-14 6GK5795-6DC00-0AA0 ANT 795-6DC 2.4 + 5 GHz 6-9 dBi 5 Wide angle N-female 0 9 9 6 6GK5793-6DG00-0AA0 Wide angle ANT793-6DG 2x N-female 5 GHz 9 0 9 6-9 dBi 7 6GK5795-6MN10-0AA6 Omni ANT 795-6MN N-female 2.4 + 5 GHz 8 0 8 6-9 dBi 7 6GK5795-6MP00-0AA0 ANT795-6MP 2.4 + 5 GHz 0 7 8 Omni N-female 6-9 dBi 6-9 dBi 9 6GK5896-6MM00-0AA0 Omni ANT896-6MM QMA-female 2.4 + 5 GHz 7 0 7 6GK5 793-4MN00-0AA6 ANT 793-4MN N-female 10 Omni 5 GHz 6 0 6 0-6 dBi 11 6GK5795-4MD00-0AA3 Omni ANT795-4MD N-male 2.4 + 5 GHz 5 0 5 0-6 dBi 12 6GK5795-4MC00-0AA3 Omni ANT795-4MC N-male 2.4 + 5 GHz 5 0 5 0-6 dBi 6GK5795-4MA00-0AA3 Omni ANT 795-4MA R-SMA male 2.4 + 5 GHz 13 5 0 5 0-6 dBi 14 6GK5793-6MN00-0AA6 Omni ANT 793-6MN N-female 5 GHz 5 0 5 0-6 dBi 6GK5795-4MX00-0AA0 15 Omni ANT795-4MX N-male 2.4 + 5 GHz 2 0 2 0-6 dBi 0-6 dBi 6XV1875-2D Omni IWLAN Rcoax 1/2" N-female 5 GHz 0 0 0 16

Note: The directed antenna number 2 may be used only with minimum 5 m antenna cable,

Type 6XV 1875-5CH50 with cable loss 4.4 dB at 5.7 GHz.

The directed antenna number 1 may be used only with minimum 10 m antenna cable,

Type 6XV 1875-5CN10 with cable loss 8.8 dB at 5.7 GHz.

2.9 Power supply system utilised

Power supply voltage, V_{nom} 100 - 120 VAC

2.10 Peripheral devices and interface cables

The following peripheral devices and interface cables are connected during the measurements:

- LAN cable, 3m	Model : _CAT5
- Power supply cable, 1m	Model : Self-made
	Model :
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2.11 Determination of worst case conditions for final measurement

Measurements are made in all three orthogonal axes and the settings of the EUT are changed to locate at which position and at what setting of the EUT produce the maximum of the emissions. The tests are carried out in the following frequency band:

5470 - 5725 MHz

Preliminary tests are performed to find the worst-case mode from all possible combinations between available modulations and data rates. The maximum output power depends on used data rate. The EUT is controlled for several tests with special test software used for testing only where continuous signals are needed. For the tests a max possible duty cycle (x) is set.

Following channels and test modes are selected for the final test as listed below:

WLAN	Available channel	Tested channels	Power setting	Modulation	Modulation type	Data rate
802.11h	100 to 140	100, 116, 140	P20, P17, P14	OFDM	BPSK	6 Mbps
802.11n; HT20	52 to 64	100, 116, 140	P20, P17, P14	OFDM	BPSK	MCS0 (BW=20 MHz)
802.11n; HT40	100up to 132up	100up, 108up, 132up	P20, P17, P14	OFDM	BPSK	MCS8 (BW=40 MHz)

- TX continuous mode, 802.11h

TX continuous mode, 802.11n

2.11.1 Test jig

No test jig is used.

2.11.2 Test software

Test software is used to set TX continuous in device service mode. Power, channel and modulation (data rate) setting is done via network interface which is available for professional settings.



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3 TEST RESULT SUMMARY

UNII device using the operating band 5470 MHz - 5725 MHz:

FCC Rule Part (new rules)	FCC Rule Part (old rules)	Description	Result
15.407(b)(6)	15.207(a)	AC power line conducted emissions	Not tested
15.407(a)(5)	15.407(a)	EBW 26 dB	Not tested
15.407(a)(2)	15.407(a)	Maximum conducted output power	Not tested
15.407(a)(2)	15.407(a)	Maximum conducted PSD	Not tested
15.407(b)(2)	15.407(b)	Undesirable emissions	Not tested
15.407(b)(7)	15.205(a)	Emissions in restricted bands	Not tested
15.407(a)	15.407(a)	Antenna requirement	Not tested
15.407(g)	15.407(g)	Frequency stability	Not tested

RSS Rule Part (new rules)	RSS Rule Part (old rules)	Description	Result
RSS-Gen, 8.8	RSS Gen, 7.2.4.	AC power line conducted emissions	Not tested
RSS247, 6.2.3(1)	RSS210, A9.2	Maximum conducted output power	Not tested
RSS247, 6.2.3(2)	RSS210, A9.2	Unwanted emission, radiated	Not tested
RSS-Gen, 8.9	RSS-Gen, 7.2.2	Unwanted emissions in restricted bands	Not tested
RSS247, 6.2.3(1)	RSS210, A9.2	Maximum power spectral density	Not tested
RSS-Gen, 6.10	RSS-Gen, 4.5	Pulsed operation	Not tested
RSS-Gen, 6.6	RSS-Gen, 7.1.2	Antenna requirement	Not tested
RSS-Gen, 6.11	RSS-Gen, 7.2.6	Transmitter frequency stability	Not tested
RSS-Gen, 6.6	RSS210, A9.2	99 % Bandwidth	Not tested
RSS 102, 2.5.2	RSS 102, 2.5.2	MPE	Not tested

The mentioned new RSS Rule Parts in the above table are related to: RSS Gen, Issue 4, November 2014 RSS 247, Issue 1, May 2015 RSS 102, Issue 4, March 2015

The mentioned old RSS Rule Parts in the above table are related to: RSS Gen, Issue 3, December 2010 RSS 210, Issue 8, December 2010 RSS 102, Issue 4, March 2010



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3.1 Final assessment

The equipment under test fulfills the EMI requirements cited in clause 1 test standards.

Date of receipt of test sample

: acc. to storage records

Testing commenced on

: 02 May 2016

Testing concluded on

: 02 May 2016

Checked by:

K. Gegez

Klaus Gegenfurtner I confirm the correctness and Integrity of this document 2016.05.18 11:39:19 +02'00'

Klaus Gegenfurtner Teamleader Radio Tested by:

Um/1

Hermann Smetana I am the author of this document 2016.05.17 20:36:09 +02'00'

Hermann Smetana Radio Team



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4 TEST ENVIRONMENT

4.1 Address of the test laboratory

CSA Group Bayern GmbH Ohmstrasse 1-4 94342 STRASSKIRCHEN GERMANY

4.2 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

 Temperature:
 15-35 °C

 Humidity:
 30-60 %

Atmospheric pressure: 86-106 kPa

4.3 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. It is noted that the expanded measurement uncertainty corresponds to the measurement results from the standard measurement uncertainty multiplied by the coverage factor k = 2. The true value is located in the corresponding interval with a probability of 95 % The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16-4-2 / 11.2003 "Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements" and is documented in the quality system acc. to DIN EN ISO/IEC 17025. For all measurements shown in this report, the measurement uncertainty of the test laboratory, CSA Group Bayern GmbH, is below the measurement uncertainty as defined by CISPR. Therefore, no special measures must be taken into consideration with regard to the limits according to CISPR. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Measurement uncertainty table	
Measurement output power, conducted	±1.5 dB
Measurement PSD, conducted	±1.5 dB
Measurement spurious emissions, conducted	±3.0 dB
Measurement spurious emissions, radiated	±6.0 dB
Measurement frequency	±1 x 10 ⁻⁶



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4.1 Measurement protocol for FCC and ISED

4.1.1 General information

4.1.1.1 <u>Test methodology</u>

Conducted and radiated disturbance testing is performed according to the procedures set out by the International Special Committee on Radio Interference (CISPR) Publication 22, European Standard EN 55022 as shown under section 1 of this report.

The open area test site is a listed under the Canadian Test-Sites File-No:

IC 3009A-1

In compliance with RSS 247 testing for RSS compliance may be achieved by following the procedures set out in ANSI C63.10 and applying the CISPR 22 limits.

4.1.1.2 Justification

The equipment under test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral using the appropriate impedance characteristic or left without termination. Where appropriate, cables are manually manipulated with respect to each other thus obtaining maximum disturbances from the unit.

4.1.1.3 Details of test procedures

The test methods used comply with CISPR Publication 22, EN 55022 - "Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement" and with ANSI C63.10 - "American national standard of procedures for compliance testing of unlicensed wireless devices". In compliance with 47 CFR Part 15 Subpart A, Section 15.38 testing for FCC compliance may be achieved by following the procedures set out in ANSI C63.10 and applying the CISPR 22 limits.



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5 TEST CONDITIONS AND RESULTS

5.1 AC power line conducted emissions

For test instruments and accessories used, see section 6 Part A 4.

5.1.1 Description of the test location

Test location: NONE

Remarks: This measurement is already documented in the test report T35625-00-05HS.

5.2 EBW and OBW

For test instruments and accessories used, see section 6 Part MB.

5.2.1 Description of the test location

Test location: NONE

Remarks: This measurement is already documented in the test report T35625-00-05HS.

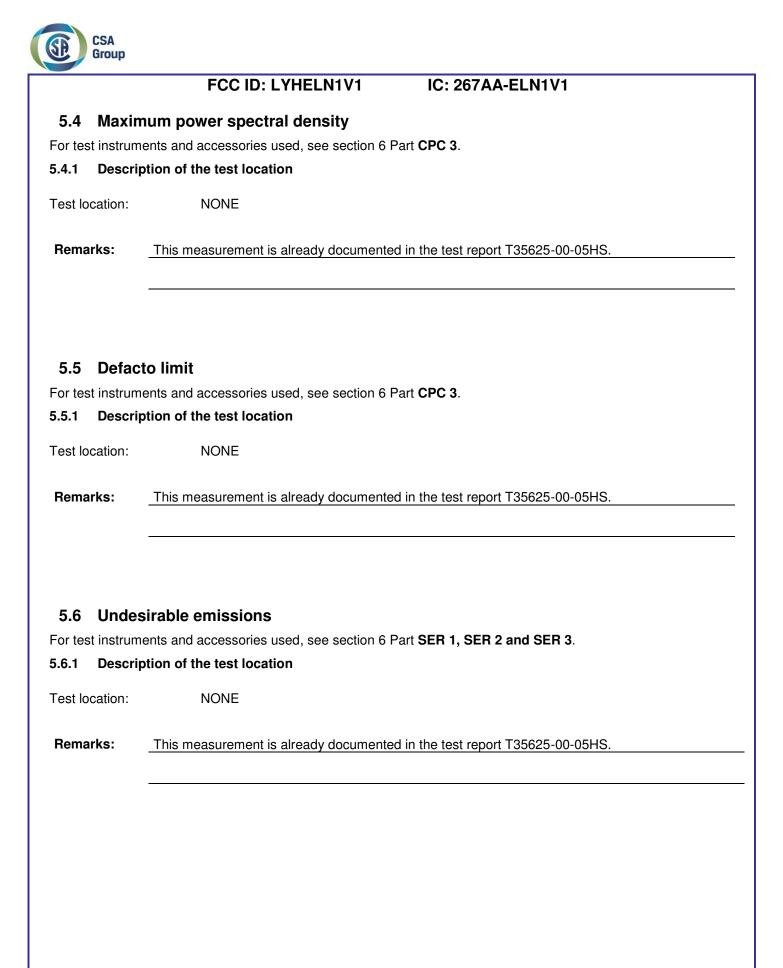
5.3 Maximum conducted output power

For test instruments and accessories used, see section 6 Part CPC 3.

5.3.1 Description of the test location

Test location: NONE

Remarks: This measurement is already documented in the test report T35625-00-05HS.





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5.7 Frequency stability

For test instruments and accessories used, see section 6 Part MB.

5.7.1 Description of the test location

Test location: NONE

Remarks: This measurement is already documented in the test report T35625-00-05HS.

5.8 Antenna application

5.8.1 Applicable standard

According to FCC Part 15C, Section 15.203:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit that broken antennas can be replaced by the user, but the use of a standard antenna jack is prohibited.

The EUT use the listed antennas. The equipment connector is SMA-R.

Remarks: This measurement is already documented in the test report T35625-00-05HS.



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6 USED TEST EQUIPMENT AND ACCESSORIES

All test instruments used are calibrated and verified regularly. The calibration history is available on request.

Fest ID -	Model Type	Equipment No. -	Next Calib. -	Last Calib. -	Next Verif. -	Last Verif -