



TEST REPORT

EUT Description	WLAN and BT, 2x2 PCIe M.2 1216 SD adapter card, LTE Coexistence
Brand Name	Intel® Wireless-AC 9560
Model Name	9560D2WL
FCC/ISED ID	PD99560D2WL/1000M-9560D2WL
Date of Test Start/End	2018-02-23 / 2018-03-09
Features	802.11 a/b/g/n/ac Wireless LAN + Bluetooth 5 (see section 5)
Applicant	Intel Mobile Communications
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Reference Standards	FCC CFR Title 47 Part 15 B ICES-003 Issue 6 (see section 1)

Test Report identification	180201-02.TR44
Revision Control	Rev. 00 This test report revision replaces any previous test report revision (see section 8)

The test results relate only to the samples tested.

The test report shall not be reproduced in full, without written approval of the laboratory.

Issued by

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FO-033_RF FCC Part 15b Test Report 180302



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1. Standards, reference documents and applicable test methods

- 1. FCC 47 CFR part 15 Subpart B Unintentional Radiators
- 2. FCC 47 CFR part 15 Subpart B §15.109 Radiated emission limits
- 3. FCC 47 CFR part 15 Subpart B §15.107 Conducted limits
- 4. ICES-003 Issue 6 Information Technology Equipment (Including Digital Apparatus) Limits and Methods of Measurement.
- 5. ANSI C63.4-2014 American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz

2. General conditions, competences and guarantees

- ✓ Intel Mobile Communications France SAS Wireless RF Lab (Intel WRF Lab) is an ISO/IEC 17025:2005 testing laboratory accredited by the American Association for Laboratory Accreditation (A2LA) with the certificate number 3478.01.
- ✓ Intel Mobile Communications France SAS Wireless RF Lab (Intel WRF Lab) is an Accredited Test Firm recognized by the FCC, with Designation Number FR0011.
- ✓ Intel Mobile Communications France SAS Wireless RF Lab (Intel WRF Lab) is a Registered Test Site listed by ISED, with ISED Assigned Code 1000Y.
- Intel WRF Lab only provides testing services and is committed to providing reliable, unbiased test results and interpretations.
- ✓ Intel WRF Lab 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.
- ✓ Intel WRF Lab has developed calibration and proficiency programs for its measurement equipment to ensure correlated and reliable results to its customers.
- ✓ This report is only referred to the item that has undergone the test.
- ✓ This report does not imply an approval of the product by the Certification Bodies or competent Authorities.

3. Environmental Conditions

✓ At the site where the measurements were performed the following limits were not exceeded during the tests:

Temperature	20°C ± 3°C
Humidity	41% ± 15%

4. Test samples

Sample	Control #	Description	Model	Serial #	Date of receipt	Note
	180201- 02.S04	Module	9560D2WL	WFM:3413E87ED803	2018-02-14	
#01	170220- 02.S04	Extender Board	PCB00609_01	6092416-493	2017-02-20	N1/A
#01	170000- 01.S16	Laptop	Latitude E5470	C2HTPF2	2017-06-13	IN/A
	170727- 02.S13	Adapter 1216SD to M.2	JfP Adapter M2	N/A	2017-08-09	

NA: Not Applicable

5. EUT features

Brand Name	Intel® Wireless-AC 9560		
Model Name	9560D2WL		
FCC/ISED ID	PD99560D2WL/1000M-95	560D2WL	
Software Version	Proset BT 20.40.0 Proset WLAN 20.30.3		
Driver Version	BT 20.40.0.2 WLAN 20.30.3.1G		
Prototype / Production	Production		
	802.11b/g/n	2.4GHz (2400.0 – 2483.5 MHz)	
Supported Radios	802.11a/n/ac	5.2GHz (5150.0 – 5350.0 MHz) 5.6GHz (5470.0 – 5725.0 MHz) 5.8GHz (5725.0 – 5825.0 MHz)	
Bluetooth		2.4GHz (2400.0 – 2483.5 MHz)	
Antenna Information	CHAIN A: PIFA antenna. WiFi 2.4GHz & 5GHz and BT CHAIN B: PIFA antenna. WiFi 2.4GHz & 5GHz		

6. Remarks and comments

N/A

7. Test Verdicts summary

FCC part	ICES part	Test name	Verdict
15.107 (a)	ICES-003 Clause 6.1	Conducted Limits	Р
15.109 (a)	ICES-003 Clause 6.2	Radiated Emission Limits	Р

P: Pass F: Fail NM: Not Measured NA: Not Applicable

8. Document Revision History

Revision #	Date	Modified by	Revision Details
Rev. 00	2018-03-15	T.Andriamiharivolamena	First Issue



Annex A.Test & System Description

A.1 Measurement system

The measurement site and apparatus were manufactured and installed in conformance with the requirements of ANSI 63.4-2014 and other equivalent standards.

The EUTs are measured for compliance using the procedure and setups described in the Annex B, made in accordance to the general provisions of the standard ANSI 63.4-2014.

Conducted emission Setup 150 kHz - 30 MHz

Measurements were performed using the following setups, the LISN is be grounded to chamber. The bonds used shall each individually have a direct current resistance of less than or equal to $2.5 \text{m}\Omega$.





Radiated Setup 30 MHz - 1GHz



Radiated Setup 1 GHz - 18 GHz



Radiated Setup 18 GHz - 40 GHz





A.2 Test Equipment List

Conducted emission Setup

ID#	Device	Type/Model	Serial #	Manufacturer	Cal. Date	Cal. Due Date
0027	Measurement software	EMC32	1300.7010.02	Rohde & Schwarz	NA	NA
0317	Spectrum Analyzer	FSV30	101318	Rohde & Schwarz	2016-04-27	2018-04-27
0532	LISN	ENV216	101321	Rohde & Schwarz	2016-09-13	2018-09-13
0607	LISN	ENV216	101342	Rohde & Schwarz	2017-09-06	2018-09-06
0538	Transformer	Monophase	TIMM3.15	Montelem	N/A	N/A
095	Millivoltmeter	2000	4009301	KEITHLEY	2017-11-13	2019-11-13
0624	AC power source	61604	SM135546	CHROMA	N/A	N/A
0299	Multimeter	34401A	US36065790	HP	2017-11-14	2019-11-14

Radiated Setup

ID#	Device	Type/Model	Serial Number	Manufactur er	Cal. Date	Cal. Due Date
0133	Spectrum analyzer	FSV40	101358	Rohde & Schwarz	2016-04-14	2018-04-14
0135	Semi Anechoic chamber	FACT 3	5720	ETS Lindgren	2016-04-28	2018-04-28
0530	Measurement Software	EMC32	100623	Rohde & Schwarz	N/A	N/A
0137	Log antenna 30 MHz – 1 GHz	3142E	00156946	ETS Lindgren	2017-12-17	2019-12-17
0325	Double Ridge Horn antenna 1 GHz - 18 GHz	3117	00157734	ETS Lindgren	2017-08-22	2019-08-22
0141	Double Ridged Horn Antenna 1 GHz – 18 GHz	3117	00157736	ETS Lindgren	2016-04-13	2018-04-13
0139	Horn Antenna 18 GHz - 26.5 GHz	114514	00167100	ETS Lindgren	2016-03-16	2018-03-16
0140	Horn Antenna 26.5 GHz - 40 GHz	120722	00169638	ETS Lindgren	2016-07-26	2018-07-26

N/A: Not Applicable



A.3 Measurement Uncertainty Evaluation

The measurement uncertainty evaluation is shown in the table below. The coverage probability is 95% (coverage factor K=2).

Measurement type	Level Uncertainty [±dB]
Conducted emission	±1.45
Radiated emission < 1GHz	±3.8
Radiated emission 1GHz - 40 GHz	±4.7

A.4 Calibration / Correction factor

Conducted emission

The measured level at the spectrum analyzer in dBuV is corrected by a transducer factor taking into account the losses of the RF cable and the LISN as follows:

Conducted Emission level (dBuV) = SALevel + RFCableLosses + LISNLosses

Where:

SA_{Level} is the voltage level displayed on the measurement receiver, in dBuV. RFCable_{Losses} is the value of the cable losses between the LISN and the measurement receiver, in dB. LISN_{Losses} is the value of the insertion losses of the LISN, in dB.

Radiated emission

The spurious received power *Pr* in the spectrum Analyzer is converted to Electric field strength using the transducer factor F corresponding to the Rx path Loss:

F (dB)= Rx Antenna Factor + Free Space Attenuation + Cable losses – Amplifiers Gain (All in dB)

F (dB) is converted to field strength unit at distance D by:

 $F(dBuV/m) = F(dB) + 104.8 - 20 \log (D)$



Annex B.Test Results

B.1 Test Conditions

The EUT is configured to operate, so that all the functions are exercised without enabling the transmission.

The EUT, peripheral and cables are placed in the worst case configuration to maximize the emission during the test.

B.2 Conducted emission

Standard references:

FCC part	ICES part	Limits				
15.107	ICES-003 Clause 6.1	Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.				
		Frequency of emission (MHz)	Conducted li	mit (dBµV)		
		0.15-0.5	66 to 56*	56 to 46*		
		0.5-5	56	46		
		5-30	60	50		
		*Decreases with the logarithm of the frequency.				

Test procedure:

The EUT and peripherals are placed on a wooden table with a nominal size of 1.0 m by 1.5 m, raised 80 cm above the reference ground plane. The EUT is connected to AC-Power line through a Line Impedance Stabilization Network (LISN) to accommodate a 50 Ω /50 μ H coupling impedance for the measurement system. The EUT control PC is considered as a peripheric and therefore is connected to a second LISN which has the measurement port connected to a 50 ohms impedance.

Each measurement is done for each current-carrying conductor (Line and Neutral) at the end plug of the EUT power cord. The EUT is tested in operating mode so that all the functions are exercised.

The exploratory measurement is done over the frequency range from 150 kHz to 30 MHz, while the measurement receiver is recording the Peak and Average signal at 10 kHz steps in Max Hold mode. The cables manipulation is performed within the range of likely configurations to determine the maximum emission. Once the EUT cable configuration, arrangement and mode of operation that produced the emission with the highest amplitude relative to the limit is found the six highest AC power-line conducted emissions relative to 20 dB of the limit are reported as the final measurement. If fewer than six emission frequencies are within 20 dB of the limit, the noise level is reported. For the final measurement, the measurement receiver records the Quasi Peak values with 9 kHz resolution bandwidth and the average values with 10 kHz resolution bandwidth.





EUT arrangement for AC power-line conducted emission tests

Test Results:

150kHz – 30MHz **Conducted Emission – Phase L1** Max Peak Frequency Avg Limit Margin MHz dBµV dBµV dBµV dB 0.2 54.9 ---65.7 10.9 0.2 --31.7 55.7 24.0 59.5 0.4 45.9 ---13.7 0.4 32.5 49.5 17.0 --3.8 56.0 18.6 37.4 ---46.0 3.8 17.8 --28.2 7.6 44.0 60.0 16.0 --7.8 50.0 17.9 --32.1 13.5 50.8 60.0 9.2 --13.6 --42.6 50.0 7.4 23.9 33.9 60.0 26.1 --24.0 ---23 50.0 27.0



Frequency	Max Peak	Avg	Limit	Margir
MHz	dBµV	dBµV	dBµV	dB
0.2	55.2		65.7	10.4
0.2		30.8	55.7	24.8
0.4	44.2		59.6	15.4
0.4		31.0	49.5	18.5
3.2	32.8		56.0	23.2
3.2		22.1	46.0	23.9
8.1	43.1		60.0	16.9
8.0		30.4	50.0	19.6
11.0	44.0		60.0	16.0
11.0		32.0	50.0	18.0
13.5	47.1		60.0	13.1
13.6		39.5	50.0	10.5



B.3 Radiated emissions

Standard references:

FCC part	ICES part	Limits		
15.109 (a)	ICES-003 clause 6.2	Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:		
		30-88 88-216	100 150	
		216-960 Above 960	200 500	

Test procedure:

The EUT and peripheral are placed on a non-conductive platform, of a nominal size 1m by 1.5 m, raised 80 cm above the reference ground plane. The radiated emission measurements are made over the frequency range from 30 MHz to the 5th harmonic of the highest frequency or 40 GHz, whichever is lower.

In the frequency range of 30 MHz to 18 GHz, the measurement antennas are set at 3 m distance from the EUT. While from 18 GHz to 40 GHz the antennas are set at a 1.5 m distance.

For each spurious emission identified, the cables manipulation is performed within the range of likely configurations to determine the maximum emission.

From 30 MHz to 1 GHz:

The exploratory measurement is recording the maximum field strength generated from the EUT and peripheral, through the use of a Peak and Average detector with the RBW of the receiver set at 100 kHz, in Max Hold mode. The antenna height is varied between 1 m and 4 m in both vertical and horizontal polarization, while the turn table is rotated continuously from 0 to 360 degrees.

The final measurement is recording the value for each frequency whose maximum is above or close to the limit, through the use of a Quasi-Peak and Average detector with the RBW of the receiver set at (CISPR) 120 kHz, in Max Hold mode. The antenna height is varied and the turn table rotated to find the height and degree of the EUT's maximum radiated emission.

From 1 GHz to 40 GHz:

The exploratory measurement is recording the maximum field strength generated from the EUT and peripheral, through the use of a Peak and Average detector with the RBW of the receiver set at 1 MHz, in Max Hold mode. The antenna height is varied between 1m and 4m in both vertical and horizontal polarization, while the turn table is rotated continuously from 0 to 360 degrees.

The final measurement is recording the value for each frequency whose maximum is above or close to the limit, through the use of a Max-Peak and Average detector with the RBW of the receiver set at 3 MHz, in Max Hold mode. The antenna height is varied and the turn table rotated to find the height and degree of the EUT's maximum radiated emission.



Radiated Setup < 1GHz



Radiated Setup 1 GHz - 18 GHz



Radiated Setup 18 GHz - 40 GHz





Test Results:

30MHz – 40GHz **Radiated Emission** MaxPeak Limit Frequency Avg Margin MHz dBµV/m dBµV/m dBµV/m dB 115.2 24.5 ---43.5 19.1 132.4 29.4 14.1 ---43.5 226.2 36.2 46.0 9.8 ----576.0 36.4 46.0 9.7 ----640.0 33.1 ---46.0 12.9 42.2 1113.5 74.0 31.7 ---1113.5 ---54.0 17.7 36.2 1190.5 ---35.9 54.0 18.1 1190.5 42.1 74.0 31.8 -------1758.0 35.1 54.0 18.8 42.8 74.0 31.2 1758.0 ----1992.5 45.6 ---74.0 28.4 15518.1 53.1 74.0 20.9 ----15540.8 ---40.6 54.0 13.4 20297.8 ---54.0 22.4 31.6 20367.7 74.0 30.4 43.6 -------20855.5 31.1 54.0 22.9 20872.1 43.5 ---74.0 30.5 30241.9 ----54.0 15.2 38.8 30332.6 49.8 ---74.0 24.1 37374.3 ---42.1 54.0 11.9 37394.0 53.0 ----74.0 21.0 ---38032.9 41.5 54.0 12.5 38157.3 52.5 ----74.0 21.5