

EVALUATION REPORT

EUT Description	WLAN and BT, 2x2 PCIe M.2 2230 adapter card
Brand Name	Intel® Wi-Fi 6E AX411
Model Name	AX411NGW
FCC ID	PD9AX411NG
Date of Test Start/End	2022-02-02 / 2022-02-02
Features	802.11ax, Tri-Band, 2x2 Wi-Fi + Bluetooth® 5.2 (see section 3)

Applicant	Intel Mobile Communications
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Reference Standards	FCC 47 CFR 1.1310 FCC 47 CFR 2.1091 (see section 1)
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Test Report identification	211130-04.TR03
Revision Control	Rev. 00 This test report revision replaces any previous test report revision (see section 6)

The test results relate only to the samples tested.

Reference to accreditation shall be used only by full reproduction of test report.

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1. Standards, reference documents and applicable test methods

FCC	FCC 47 CFR Part §1.1310 Radiofrequency radiation exposure limits. Edition October 2019 FCC 47 CFR Part §2.1091 Radiofrequency radiation exposure evaluation: mobile devices. Edition October 2019
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2. General conditions, competences and guarantees

- ✓ Intel Corporation SAS Wireless RF Lab (Intel WRF Lab) is an ISO/IEC 17025:2017 laboratory accredited by the American Association for Laboratory Accreditation (A2LA) with the certificate number 3478.01.
- ✓ Intel Corporation SAS Wireless RF Lab (Intel WRF Lab) is an Accredited Test Firm recognized by the FCC, with Designation Number FR0011
- ✓ Intel WRF Lab declines any responsibility with respect to the identified information provided by the customer and that may affect the validity of results.
- ✓ 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. EUT Features

The herein information is provided by the customer

Brand Name	Intel® Wi-Fi 6E AX411		
Model Name	AX411NGW		
Supported Radios	<div> <div>802.11b/g/n/ax</div> <div>2.4GHz (2400.0 – 2483.5 MHz)</div> </div> <div> <div>802.11a/n/ac/ax</div> <div>5.2GHz (5150.0 – 5350.0 MHz)</div> <div>5.6GHz (5470.0 – 5725.0 MHz)</div> <div>5.8GHz (5725.0 – 5895.0 MHz)</div> <div>6.0GHz (5925.0 - 7125.0 MHz)</div> </div> <div> <div>802.11ax</div> <div>2.4GHz (2400.0 – 2483.5 MHz)</div> </div> <div> <div>Bluetooth 5.2</div> </div>		
Antenna Information	Transmitter	Main	Aux
	Manufacturer	WIESON	WIESON
	Antenna type	Dipole antenna	Dipole antenna
	Part number	ARY121-0009-002-H0	ARY121-0009-002-H0
	Frequency Band		Peak gain w/cable loss (dBi)
	Declared Antenna gain (dBi) - 2.4GHz		+3.10
	Declared Antenna gain (dBi) – 5.2 & 5.3GHz		+4.11
	Declared Antenna gain (dBi) – 5.5GHz		+5.17
	Declared Antenna gain (dBi) – 5.8 GHz		+5.17
	6.2 GHz (5925MHz-6425MHz)		+5.06
	6.5GHz (6425MHz-6525MHz)		+4.71
	6.7 GHz (6525MHz-6875MHz)		+4.49
	6.9 GHz (6875MHz-7125MHz)		+5.34
Simultaneous Transmission Configurations	DTS 2.4GHz Main + BT Aux DTS 2.4GHz Main + DTS 2.4GHz Aux UNII Main + BT Aux UNII Main + UNII Aux UNII Main + UNII Aux + BT Aux		

4. Remarks and comments

NA

5. Evaluation Verdicts summary

Power Density Calculations

Mode	Highest Power Density @ 20cm (mW/cm²)	Limit (mW/cm²)	Verdict
DTS	0.05	1.0	P
UNII 5GHz	0.08	1.0	P
UNII 6GHz	0.02	1.0	P
BT	0.006	1.0	P

Collocated Power Density Calculations

Mode	$\sum \frac{Power\ Density}{Limit}$	Ratio Max	Verdict
WLAN + BT	0.166	1	P

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

6. Document Revision History

Revision #	Modified by	Revision Details
Rev. 00	Ines KHARRAT	First Issue

Annex A. Evaluation Description

A.1 RF Exposure Limit

According to the FCC part 1.1310:

- The MPE limits listed in the table below shall be used in all cases to evaluate the environmental impact of human exposure to RF radiation as specified in §1.1307(b) of this part.

Limits for Maximum Permissible Exposure (MPE) (TABLE 1 TO §1.1310(E)(1))

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(ii) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	<30
1.34-30	824/f	2.19/f	*(180/f ²)	<30
30-300	27.5	0.073	0.2	<30
300-1,500	-	-	f/1500	<30
1,500-100,000	-	-	1.0	<30

f = frequency in MHz. * = Plane-wave equivalent power density.

For the purpose of this evaluation, a distance of 20cm was used to calculate the equivalent plan wave power density, to be compared with the limit described in the table above:

$$S_{eq} = \frac{P_{avg} \cdot G}{4 \cdot \pi \cdot R^2}$$

Where:

S_{eq} = Equivalent Plane Wave Power Density

P_{avg} = Average Power at antenna terminals in Watts

G = Gain of the Transmitting Antenna

R = Distance from the Transmitting Antenna in meters

A.2 Exposure from source with Multiple Frequencies

If the device is designed such that more than one antenna can functionally transmit at the same time, the RF exposure evaluation shall be conducted while all antennas are transmitting. The individual exposure level ratios shall be totalled and used for compliance purposes.:

$$\sum \frac{S_{eq_i}}{S_{Limit_i}} < 1$$

Annex B. RF Exposure Evaluation Results

B.1 Declared Maximum Output Power

According to the applicant, the maximum conducted transmit power (including the upper tolerance) for the EUT under evaluation are as follows:

Mode	Max Output Power (incl. Tolerance) dBm
DTS	21.0
UNII 5GHz	21.0
BT	11.5
UNII 6GHz	13.50

B.2 RF Exposure Evaluation Results

B.2.1 DTS

Band	Avg Power [dBm]	Peak antenna Gain (dBi)	ERP/EIRP Avg [dBm]	ERP/EIRP Avg [mW]	Power density @ 20cm [mW/cm ²]	Limit [mW/cm ²]	Ratio (Power density/Limit)
DTS	21.0	3.1	24.1	257.0	0.05	1.0	0.05

B.2.2 UNII 5GHz

Band	Avg Power [dBm]	Peak antenna Gain (dBi)	ERP/EIRP Avg [dBm]	ERP/EIRP Avg [mW]	Power density @ 20cm [mW/cm ²]	Limit [mW/cm ²]	Ratio (Power density/Limit)
UNII 5GHz	21.0	5.17	26.17	414.0	0.08	1.0	0.08

B.2.3 BT

Band	Avg Power [dBm]	Peak antenna Gain (dBi)	ERP/EIRP Avg [dBm]	ERP/EIRP Avg [mW]	Power density @ 20cm [mW/cm ²]	Limit [mW/cm ²]	Ratio (Power density/Limit)
BT	11.5	3.1	14.6	28.8	0.006	1.0	0.006

B.2.4 UNII 6GHz

Band	Avg Power [dBm]	Peak antenna Gain (dBi)	ERP/EIRP Avg [dBm]	ERP/EIRP Avg [mW]	Power density @ 20cm [mW/cm ²]	Limit [mW/cm ²]	Ratio (Power density/Limit)
UNII 6GHz	13.5	5.34	18.84	76.56	0.02	1.0	0.02

The maximum exposure for collocated transmitters is:

Band	Ratio (Power density/Limit)	$\sum \text{Ratio}_i$	Limit
UNII 5GHz	0.08	0.166	1.0
UNII 5GHz	0.08		
Bluetooth	0.006		

End of the Report

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