



RF Exposure Evaluation Declaration

FCC ID: 2AD8UAWHQS01

Applicant: Nokia Solutions and Networks, OY

Application Type: Certification

Product: AirScale Indoor Radio 4G+5G ASiR-pRRH

Model No.: AWHQS

Brand Name: Nokia

Test Procedure(s): KDB 447498 D01v06

Reviewed By:

Paddy Chen

Approved By:

Chenz Ker



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standards through the calibration of the equipment and evaluated measurement uncertainty herein.

The test report shall not be reproduced except in full without the written approval of MRT Technology (Taiwan) Co., Ltd.

Revision History

Report No.	Version	Description	Issue Date	Note
2107TW0004-U2	Rev. 01	Initial Report	09-07-2021	Valid

General Information

Applicant:	Nokia Solutions and Networks, OY
Applicant Address:	2000 W. Lucent Lane, Naperville, Illinois, United States, 60563
Manufacturer:	Nokia Solutions and Networks, OY
Manufacturer Address:	2000 W. Lucent Lane, Naperville, Illinois, United States, 60563
Test Site:	MRT Technology (Taiwan) Co., Ltd
Test Site Address:	No. 38, Fuxing Second Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C)

Test Facility / Accreditations

Measurements were performed at MRT Laboratory located in Fuxing Rd., Taoyuan, Taiwan (R.O.C)

- MRT facility is a FCC registered (Reg. No. 153292) test facility with the site description report on file and is designated by the FCC as an Accredited Test Film.
- MRT facility is an IC registered (MRT Reg. No. 21723-1) test laboratory with the site description on file at Industry Canada.
- MRT Lab is accredited to ISO 17025 by the American Association for Laboratory Accreditation (TAF) under the American Association for Laboratory Accreditation Program (TAF Cert. No. 3261) in EMC, Telecommunications and Radio testing for FCC, Industry Taiwan, EU and TELEC Rules.

1. PRODUCT INFORMATION

1.1. Equipment Description

Product Name	AirScale Indoor Radio 4G+5G ASiR-pRRH
Model No.	AWHQS
Brand Name	Nokia
Test Device Serial No.	NH212200596
Operating Band (s)	5G NR: n77

1.2. Antenna Information

Band Support	Antenna Type	Nokia Code	Antenna Gain
n77	Omni Antenna (Internal)	092821A	5dBi
Remark: 1. The transmit signals are completely uncorrelated with each other, directional gain = G_{ANT} dBi, G_{ANT} is the antenna gain in dBi; 2. The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer.			

1.3. EIRP Test Result

Test Engineer	Peter Xu	Test Site	SR2
Test Date	2021/07/13 ~ 2021/07/16	Test Configuration	n77 (Single Carrier)
Test Item	EIRP (Reported only)		

Frequency (MHz)	Channel BW (MHz)	Output Power (dBm)				Total Power (dBm)	EIRP (dBm)
		Ant 1	Ant 2	Ant 3	Ant 4		
QPSK							
3710.01	20	24.03	23.84	23.93	23.89	29.94	34.94
3840.00	20	24.18	24.05	24.12	24.05	30.12	35.12
3969.99	20	23.84	23.88	23.77	23.79	29.84	34.84
3720.00	40	24.18	23.97	24.23	24.01	30.12	35.12
3840.00	40	24.10	23.95	24.01	24.11	30.06	35.06
3960.00	40	24.12	24.13	23.99	23.98	30.08	35.08
3730.02	60	24.16	24.10	24.17	24.08	30.15	35.15
3840.00	60	24.09	23.78	23.98	23.88	29.95	34.95
3949.98	60	24.08	24.12	23.75	24.01	30.01	35.01
3740.01	80	24.20	24.01	24.22	23.91	30.11	35.11
3840.00	80	23.90	24.02	23.90	23.89	29.95	34.95
3939.99	80	24.08	24.12	23.86	24.00	30.04	35.04
3750.00	100	24.08	23.96	24.08	23.84	30.01	35.01
3840.00	100	24.01	23.96	23.85	23.79	29.92	34.92
3930.00	100	24.02	24.01	23.84	23.79	29.94	34.94

Frequency (MHz)	Channel BW (MHz)	Output Power (dBm)				Total Power (dBm)	EIRP (dBm)
		Ant 1	Ant 2	Ant 3	Ant 4		
16QAM							
3710.01	20	24.04	23.95	23.91	23.78	29.94	34.94
3840.00	20	24.11	23.96	24.07	23.97	30.05	35.05
3969.99	20	23.93	23.96	23.68	23.93	29.90	34.90
3720.00	40	24.17	24.01	24.15	24.16	30.14	35.14
3840.00	40	24.16	23.98	24.07	24.12	30.10	35.10
3960.00	40	24.19	24.12	23.89	23.98	30.07	35.07
3730.02	60	24.12	24.18	24.08	23.93	30.10	35.10
3840.00	60	24.21	23.99	24.11	23.89	30.07	35.07
3949.98	60	24.16	24.01	23.91	23.93	30.02	35.02
3740.01	80	24.08	24.07	24.12	23.90	30.06	35.06
3840.00	80	23.83	23.88	23.85	23.79	29.86	34.86
3939.99	80	24.01	24.03	23.87	23.98	29.99	34.99
3750.00	100	24.09	24.15	24.06	23.94	30.08	35.08
3840.00	100	24.10	23.99	23.97	23.81	29.99	34.99
3930.00	100	23.99	23.84	23.96	23.81	29.92	34.92
64QAM							
3710.01	20	24.09	23.87	23.98	23.89	29.98	34.98
3840.00	20	24.17	24.04	24.08	23.97	30.09	35.09
3969.99	20	23.97	23.96	23.78	24.01	29.95	34.95
3720.00	40	24.15	23.96	24.12	23.93	30.06	35.06
3840.00	40	24.06	23.84	24.06	23.87	29.98	34.98
3960.00	40	24.02	24.08	23.80	23.97	29.99	34.99
3730.02	60	24.32	23.99	24.28	24.02	30.18	35.18
3840.00	60	24.16	23.71	23.95	23.84	29.94	34.94
3949.98	60	24.10	24.13	23.90	23.87	30.02	35.02
3740.01	80	24.13	24.07	24.22	23.96	30.12	35.12
3840.00	80	23.95	23.89	23.91	23.81	29.91	34.91
3939.99	80	24.12	24.03	23.85	23.86	29.99	34.99
3750.00	100	23.99	23.80	24.02	23.79	29.92	34.92
3840.00	100	23.91	23.88	23.91	23.85	29.91	34.91
3930.00	100	23.97	23.88	23.90	23.75	29.90	34.90

Frequency (MHz)	Channel BW (MHz)	Output Power (dBm)				Total Power (dBm)	EIRP (dBm)
		Ant 1	Ant 2	Ant 3	Ant 4		
256QAM							
3710.01	20	24.12	23.96	23.86	23.84	29.97	34.97
3840.00	20	24.11	23.88	23.98	24.06	30.03	35.03
3969.99	20	23.78	23.86	23.96	23.82	29.88	34.88
3720.00	40	24.13	24.01	24.12	23.95	30.07	35.07
3840.00	40	24.16	23.98	24.09	24.08	30.10	35.10
3960.00	40	24.11	24.19	23.89	23.96	30.06	35.06
3730.02	60	24.14	23.94	24.11	23.98	30.06	35.06
3840.00	60	24.06	23.85	23.95	23.76	29.93	34.93
3949.98	60	24.10	24.10	23.65	23.95	29.97	34.97
3740.01	80	24.23	24.03	24.16	23.95	30.11	35.11
3840.00	80	24.05	23.86	24.00	23.76	29.94	34.94
3939.99	80	24.07	24.11	23.91	23.86	30.01	35.01
3750.00	100	23.92	23.94	24.02	23.81	29.94	34.94
3840.00	100	23.97	23.79	23.86	23.88	29.90	34.90
3930.00	100	23.89	23.81	23.94	23.87	29.90	34.90
Note 1: Total Power (dBm) = 10*log*{10^[ANT 1 Power (dBm) / 10] + 10^[ANT 2 Power (dBm) / 10] + 10^[ANT 3 Power (dBm) / 10] + 10^[ANT 4 Power (dBm) / 10]} (dBm). Note 2: EIRP (dBm) = Total Power (dBm) + Antenna Gain (dBi).							

Test Engineer	Peter Xu	Test Site	SR2
Test Date	2021/07/13 ~ 2021/07/20	Test Configuration	n77 (Multi Carrier)
Test Item	EIRP (Reported only)		

Frequency (MHz)	Channel BW (MHz)	Output Power (dBm)				Total Power (dBm)	EIRP (dBm)
		Ant 1	Ant 2	Ant 3	Ant 4		
QPSK							
3710+3730	20+20	24.05	23.98	24.12	23.98	30.05	35.05
3830+3850	20+20	24.12	24.01	24.10	24.01	30.08	35.08
3950+3970	20+20	24.22	23.99	23.85	24.06	30.05	35.05
3750+3850	100+100	24.11	23.90	24.05	23.85	30.00	35.00
3790+3890	100+100	23.96	23.79	23.89	23.69	29.85	34.85
3830+3930	100+100	23.89	23.82	23.91	23.89	29.90	34.90
16QAM							
3710+3730	20+20	24.12	23.96	24.13	23.97	30.07	35.07
3830+3850	20+20	24.14	24.03	24.10	24.12	30.12	35.12
3950+3970	20+20	24.11	24.18	24.06	24.10	30.13	35.13
3750+3850	100+100	23.96	23.73	23.89	23.81	29.87	34.87
3790+3890	100+100	24.03	23.74	23.84	23.78	29.87	34.87
3830+3930	100+100	23.98	23.95	23.91	23.96	29.97	34.97
64QAM							
3710+3730	20+20	23.95	23.87	24.13	23.94	29.99	34.99
3830+3850	20+20	24.13	23.89	24.01	24.00	30.03	35.03
3950+3970	20+20	24.06	23.99	23.93	24.11	30.04	35.04
3750+3850	100+100	23.93	23.84	23.99	23.80	29.91	34.91
3790+3890	100+100	24.02	23.76	23.86	23.79	29.88	34.88
3830+3930	100+100	23.98	23.86	23.86	23.83	29.90	34.90
256QAM							
3710+3730	20+20	24.04	23.78	24.18	23.85	29.99	34.99
3830+3850	20+20	24.08	23.85	24.07	23.98	30.02	35.02
3950+3970	20+20	24.21	24.11	23.92	24.18	30.13	35.13
3750+3850	100+100	24.11	23.86	24.01	23.91	29.99	34.99
3790+3890	100+100	24.06	23.97	23.98	23.86	29.99	34.99
3830+3930	100+100	24.15	23.98	24.04	24.02	30.07	35.07
Note 1: Total Power (dBm) = 10*log*{10^[ANT 1 Power (dBm) / 10] + 10^[ANT 2 Power (dBm) / 10] + 10^[ANT 3 Power (dBm) / 10] + 10^[ANT 4 Power (dBm) / 10]} (dBm).							
Note 2: EIRP (dBm) = Total Power (dBm) + Antenna Gain (dBi).							

2. RF Exposure Evaluation

2.1. Limits

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in 1.1307(b)

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Average Time (Minutes)
(A) Limits for Occupational/ Control Exposures				
300-1500	--	--	f/300	6
1500-100,000	--	--	5	6
(B) Limits for General Population/ Uncontrolled Exposures				
300-1500	--	--	f/1500	6
1500-100,000	--	--	1	30

f= Frequency in MHz

Calculation Formula: $P_d = (P_{out} * G) / (4 * \pi * r^2)$

Where

P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

r = distance between observation point and center of the radiator in cm

P_d is the limit of MPE, 1mW/cm². If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

2.2. Test Result of RF Exposure Evaluation

Product	AirScale Indoor Radio 4G+5G ASiR-pRRH
Test Item	RF Exposure Evaluation

Test Mode	Frequency Band (MHz)	Maximum EIRP (dBm)	Tune up factor (dB)	Safety Distance (cm)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
Uncontrolled Environment						
n77	3700 ~ 3980	35.18	1.5	20	0.9263	1
Controlled Environment						
n77	3700 ~ 3980	35.18	1.5	20	0.9263	5

2.3. Summary of Test Result

The wireless device described within this report has been shown to be capable of compliance with basic restrictions related to human exposure to electromagnetic fields for both General public and Occupational. The calculations shown in this report were made in accordance the procedures specified in the applied test specifications

Configuration	Required Compliance Boundary (cm)	
	Uncontrolled Environment	Controlled Environment
n77	20	20