Nokia Global Product Compliance Laboratory
600-700 Mountain Avenue, Room 5A-107
Murray Hill, NJ 07974, USA
September12, 2019

Federal Communications Commission
Authorization & Evaluation Division
7435 Oakland Mills Road
Columbia, Maryland 21046
Attention: Equipment Authorization Group

SUBJECT: Request for Permissive Change to FCCID-2AD8UAZQCRH1 for the Airscale Micro RRH 3.5 GHz 4T/4R 20W (AZQC).

Dear Examiner,

Nokia Solutions and Networks, OY requests to authorize additional antennas for Part 96 operations with the FCC Hardware Certified Part 96 CBSD radio device.

Attached is the document with the Nokia Antennas and the appropriate power settings of the product to demonstrate the EIRP compliance from the approved Bandwidth.

A duplicate of the 731 Form is attached since there is no change to the Grant.

Should there be any questions or procedural issues please feel free to contact me by email and/or phone.

Sincerely,

Steve Gordon

Steve Gordon
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Reviewed by:

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Attachment

Radio Vendor:	**Nokia**
Radio Product Name:	**AirScale Micro RRH 3.5 GHz 4T/4R 20W**
Radio Model Number:	**AZQC**
Radio FCC ID:	**2AD8UAZQCRH1**

Radio dynamic range:

- Maximum linear conducted power rating at output connector into 50 ohms that meets all OOBE requirements [zero additional attenuation, highest power setting allowed, for use with lowest gain external antennas] (dBm):
  __43 (Total 4xMIMO power)_____
- Minimum linear conducted power rating at output connector into 50 ohms that meets all OOBE requirements [maximum additional linear attenuation, lowest power setting allowed, for use with highest gain external antennas] (dBm):
  __23 (Total 4xMIMO power)_____
- Note: use of an external cable introduces additional losses that may be compensated appropriately by increasing the radio's power level (reducing the attenuator setting). This cable compensation may be achieved during radio setup.

The Original Equipment Manufacturer (OEM) vendor of the radio states that the use of the following listed external antennas meet all requirements for Part 96 operations. The following specific external antennas may be used in conjunction with this model radio at the appropriate listed power settings.

These antennas will allow this radio to meet the appropriate Part 96 requirements for Maximum EIRP, either at or below:

- 30 dBm EIRP (for Category A operations), or
- 47 dBm EIRP (for Category B operations).

As the unit requires an externally mounted antenna assembly, the following table provides a list of various antennas, along with their associated peak antenna gain (ranging from 4.9 to 15.5 dBi). The table further provides the maximum radio conducted power that can be used.

The Radio Conducted Power Setting is the minimum of the unit's maximum conducted power or the conducted power that when added to the antenna gain does not exceed 47dBm/10MHz EIRP for a Category B device or 30dBm/10MHz for a Category A device. The maximum conducted power of the unit is 20W (43dBm) and it can support 10 to 80 MHz of spectrum (utilizing one to four 10 and/or 20 MHz carriers).

RadioConductedPower = MIN [43, 47 – AntennaGain + 10*LOG(Bandwidth/10)]

If Radio Conducted Power Setting is less than the unit's minimum conducted power (23 dBm), then the antenna gain is too high. An antenna with lower gain will be required.

The Maximum Allowed EIRP Rating is equal to the Radio Conducted Power Setting plus the antenna gain, with the result normalized to 10MHz.

MaximumAllowedEirpRating = RadioConductedPower + AntennaGain - 10*LOG(Bandwidth/10)

The unit incorporates SW that checks the supplied configuration information (i.e. Radio Conducted Power, Bandwidth, and Antenna Gain) to ensure the calculated Maximum Alllowed EIRP Rating does not exceed the Part 96 limitation or EIRP and PSD level permitted by the SAS. If the Radio Conducted Power is at the lowest allowable value and Maximum Allowed EIRP is too large, an alarm will be raised to request the operator to check the supplied configuration information. The unit will not transmit until the antenna is changed to one with lower gain.

RF cables and connectors will be required for connecting the external antennas to the unit. The amount of cable loss will vary based on the cable's specification (e.g. attenuation due to length and diameter). In the above equations, the Antenna Gain should be considered as Antenna Gain + cable loss.

Additional antennas with gains within the range shown in the table may become available at a later time. The above equations and table below will provide an indication of the Radio Conducted Power that would be allowed.

Since no antenna is supplied, then per FCC Rules the RF exposure compliance shall be addressed at the time of licensing, as required by the responsible FCC Bureau(s).

CBRS Band 48 External antennas authorized by the Original Equipment Manufacturer for use with this model radio

Antenna Configuration	Antenna Vendor	Antenna Model Number	Antenna Main Beam Peak Gain (dBi)	Bandwidth (MHz)	Radio Conducted Power Setting (dBm)	Maximum Allowed EIRP Rating (dBm/10MHz)	Operational Category (A / B)
1	JMA	CX14OMI236-1C	5	**10**	42.0	47.0	B
2				**20**	43.0	45.0	B
3				**30**	43.0	43.2	B
4				**40**	43.0	42.0	B
5				**50**	43.0	41.0	B
6				**60**	43.0	40.2	B
7				**70**	43.0	39.5	B
8				**80**	43.0	39.0	B
9	JMA	CX16OMI236-1C	5	**10**	42.0	47.0	B
10				**20**	43.0	45.0	B
11				**30**	43.0	43.2	B
12				**40**	43.0	42.0	B
13				**50**	43.0	41.0	B
14				**60**	43.0	40.2	B
15				**70**	43.0	39.5	B
16				**80**	43.0	39.0	B
17	JMA	CX16OMI224-1H	6.1	**10**	40.9	47.0	B
18				**20**	43.0	46.1	B
19				**30**	43.0	44.3	B
20				**40**	43.0	43.1	B
21				**50**	43.0	42.1	B
22				**60**	43.0	41.3	B
23				**70**	43.0	40.6	B
24				**80**	43.0	40.1	B

25	JMA	CX16OMI218-1P	5.3	**10**	41.7	47.0	B
26				**20**	43.0	45.3	B
27				**30**	43.0	43.5	B
28				**40**	43.0	42.3	B
29				**50**	43.0	41.3	B
30				**60**	43.0	40.5	B
31				**70**	43.0	39.8	B
32				**80**	43.0	39.3	B
33	JMA	DX10FRO260-00 or 06	14.8	**10**	32.2	47.0	B
34				**20**	35.2	47.0	B
35				**30**	37.0	47.0	B
36				**40**	38.2	47.0	B
37				**50**	39.2	47.0	B
38				**60**	40.0	47.0	B
39				**70**	40.7	47.0	B
40				**80**	41.2	47.0	B
41	JMA	DX12FRO260-20 or 26	15.5	**10**	31.5	47.0	B
42				**20**	34.5	47.0	B
43				**30**	36.3	47.0	B
44				**40**	37.5	47.0	B
45				**50**	38.5	47.0	B
46				**60**	39.3	47.0	B
47				**70**	40.0	47.0	B
48				**80**	40.5	47.0	B
49	Amphenol	C2U3MT360X06Fxys0	6.6	**10**	40.4	47.0	B
50				**20**	43.0	46.6	B
51				**30**	43.0	44.8	B
52				**40**	43.0	43.6	B
53				**50**	43.0	42.6	B
54				**60**	43.0	41.8	B
55				**70**	43.0	41.1	B
56				**80**	43.0	40.6	B

57	Amphenol	2C2U3MT360X06Fxys0	5.3	**10**	41.7	47.0	B
58				**20**	43.0	45.3	B
59				**30**	43.0	43.5	B
60				**40**	43.0	42.3	B
61				**50**	43.0	41.3	B
62				**60**	43.0	40.5	B
63				**70**	43.0	39.8	B
64				**80**	43.0	39.3	B
65	Amphenol	4U4MT360X06Fxys0	5.7	**10**	41.3	47.0	B
66				**20**	43.0	45.7	B
67				**30**	43.0	43.9	B
68				**40**	43.0	42.7	B
69				**50**	43.0	41.7	B
70				**60**	43.0	40.9	B
71				**70**	43.0	40.2	B
72				**80**	43.0	39.7	B
73	Amphenol	2C4U3MT360X06Fwxys0	5.9	**10**	41.1	47.0	B
74				**20**	43.0	45.9	B
75				**30**	43.0	44.1	B
76				**40**	43.0	42.9	B
77				**50**	43.0	41.9	B
78				**60**	43.0	41.1	B
79				**70**	43.0	40.4	B
80				**80**	43.0	39.9	B
81	Amphenol	2U3MX065X06Fxys0	11.6	**10**	35.4	47.0	B
82				**20**	38.4	47.0	B
83				**30**	40.2	47.0	B
84				**40**	41.4	47.0	B
85				**50**	42.4	47.0	B
86				**60**	43.0	46.8	B
87				**70**	43.0	46.1	B
88				**80**	43.0	45.6	B

89	Amphenol	4U4MX065X06Fxys0	11.3	**10**	35.7	47.0	B
90				**20**	38.7	47.0	B
91				**30**	40.5	47.0	B
92				**40**	41.7	47.0	B
93				**50**	42.7	47.0	B
94				**60**	43.0	46.5	B
95				**70**	43.0	45.8	B
96				**80**	43.0	45.3	B
97	Amphenol	2C4U3MX065X06Fwxys0	8.9	**10**	38.1	47.0	B
98				**20**	41.1	47.0	B
99				**30**	42.9	47.0	B
100				**40**	43.0	45.9	B
101				**50**	43.0	44.9	B
102				**60**	43.0	44.1	B
103				**70**	43.0	43.4	B
104				**80**	43.0	42.9	B
105	Kathrein	84010555 / 84010556	7	**10**	40.0	47.0	B
106				**20**	43.0	47.0	B
107				**30**	43.0	45.2	B
108				**40**	43.0	44.0	B
109				**50**	43.0	43.0	B
110				**60**	43.0	42.2	B
111				**70**	43.0	41.5	B
112				**80**	43.0	41.0	B
113	Kathrein	84010557 / 84010558	5.8	**10**	41.2	47.0	B
114				**20**	43.0	45.8	B
115				**30**	43.0	44.0	B
116				**40**	43.0	42.8	B
117				**50**	43.0	41.8	B
118				**60**	43.0	41.0	B
119				**70**	43.0	40.3	B
120				**80**	43.0	39.8	B

121	Kathrein	84010603 / 84010604	6.5	**10**	40.5	47.0	B
122				**20**	43.0	46.5	B
123				**30**	43.0	44.7	B
124				**40**	43.0	43.5	B
125				**50**	43.0	42.5	B
126				**60**	43.0	41.7	B
127				**70**	43.0	41.0	B
128				**80**	43.0	40.5	B
129	Kathrein	84010564	11	**10**	36.0	47.0	B
130				**20**	39.0	47.0	B
131				**30**	40.8	47.0	B
132				**40**	42.0	47.0	B
133				**50**	43.0	47.0	B
134				**60**	43.0	46.2	B
135				**70**	43.0	45.5	B
136				**80**	43.0	45.0	B
137	CommScope	VVSSP-360S-F	4.9	**10**	42.1	47.0	B
138				**20**	43.0	44.9	B
139				**30**	43.0	43.1	B
140				**40**	43.0	41.9	B
141				**50**	43.0	40.9	B
142				**60**	43.0	40.1	B
143				**70**	43.0	39.4	B
144				**80**	43.0	38.9	B
145	CommScope	NNVVSSP-360S-FM	5.7	**10**	41.3	47.0	B
146				**20**	43.0	45.7	B
147				**30**	43.0	43.9	B
148				**40**	43.0	42.7	B
149				**50**	43.0	41.7	B
150				**60**	43.0	40.9	B
151				**70**	43.0	40.2	B
152				**80**	43.0	39.7	B

153	CommScope	V4SSPP-360S-F	5.4	**10**	41.6	47.0	B
154				**20**	43.0	45.4	B
155				**30**	43.0	43.6	B
156				**40**	43.0	42.4	B
157				**50**	43.0	41.4	B
158				**60**	43.0	40.6	B
159				**70**	43.0	39.9	B
160				**80**	43.0	39.4	B
161	CommScope	VVSSP-65S-R1B (Canister)	9.8	**10**	37.2	47.0	B
162				**20**	40.2	47.0	B
163				**30**	42.0	47.0	B
164				**40**	43.0	46.8	B
165				**50**	43.0	45.8	B
166				**60**	43.0	45.0	B
167				**70**	43.0	44.3	B
168				**80**	43.0	43.8	B
169	CommScope	VVSSP-65S-R1BV2 (Panel)	10.4	**10**	36.6	47.0	B
170				**20**	39.6	47.0	B
171				**30**	41.4	47.0	B
172				**40**	42.6	47.0	B
173				**50**	43.0	46.4	B
174				**60**	43.0	45.6	B
175				**70**	43.0	44.9	B
176				**80**	43.0	44.4	B
177	Alpha Wireless	AW3023-T0-N	18	**10**	29.0	47.0	B
178				**20**	32.0	47.0	B
179				**30**	33.8	47.0	B
180				**40**	35.0	47.0	B
181				**50**	36.0	47.0	B
182				**60**	36.8	47.0	B
183				**70**	37.5	47.0	B
184				**80**	38.0	47.0	B

185	Alpha Wireless	AW3499	6.5	**10**	40.5	47.0	B
186				**20**	43.0	46.5	B
187				**30**	43.0	44.7	B
188				**40**	43.0	43.5	B
189				**50**	43.0	42.5	B
190				**60**	43.0	41.7	B
191				**70**	43.0	41.0	B
192				**80**	43.0	40.5	B
185	Nokia	AAQA	12	**10**	35.0	47.0	B
186				**20**	38.0	47.0	B
187				**30**	39.8	47.0	B
188				**40**	41.0	47.0	B
189				**50**	42.0	47.0	B
190				**60**	42.8	47.0	B
191				**70**	43.0	46.5	B
192				**80**	43.0	46.0	B
193	Nokia	FA2QD	6	**10**	41.0	47.0	B
194				**20**	43.0	46.0	B
195				**30**	43.0	44.2	B
196				**40**	43.0	43.0	B
197				**50**	43.0	42.0	B
198				**60**	43.0	41.2	B
199				**70**	43.0	40.5	B
200				**80**	43.0	40.0	B