



RF Exposure Assessment

Report Reference: 2023-0313-MPE-TR-23-0019-V02

on

Commscope Inc.
ERA CAP M2 34T/37T/37T
Medium Power Carrier Access Point

FCC ID: XS5-CAPM2343737

according to:

OET Bulletin 65 Edition 97-01: August 1997

Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency
Electromagnetic Fields

			Signature:
Date of issue:	08.12.2023	Technical Reviewer:	 Markus Conrad Lab Engineer EMC Digitally signed by Markus Conrad DN: cn=Markus Conrad, gn=Markus Conrad, c=DE, Germany, l=DE, Germany, o=Bureau Veritas Consumer Products Services Germany GmbH, e=Markus.Conrad@bureauveritas.com Reason: I am the author of this document Location: Nuremberg, Germany Date: 2023-12-08 15:21+01:00
Version:	02	Report Reviewer:	 Thomas Hufnagel Test Engineer Digitally signed by Thomas Hufnagel Date: 2023.12.08 15:28:43 +01'00'

The test results relate only to the tested item. The sample has been provided by the client.

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Version History

Version no. of report

01
02

Changes to previous version

Initial version.

- a) Editorial change of considerations regarding maximum output power in chapter 4.1.
- b) Text "Bold marked = worst case band of the radio technology" in table of chapter 4.4.1 removed.
- c) Supplemental of measurements in the last line "5G MIMO 4*4" in chapter 4.4.2.

1 Summary

The RF-exposure assessment according to OET Bulletin 65 Edition 97-01: August 1997 shows, that the worst-case RF exposure values of the assessed radio technologies and bands are below the Limits for General Population/Uncontrolled Exposure:

- Table 1 (B) of OET Bulletin 65
- Table 1 (II) to § 1.1310(E)(1) of 47 CFR Ch. I (10-1-21 Edition).

COMMENTS:

- Assessment limited to supported North American frequency bands
- Prediction Distance R = 169 cm

2 Administrative Data

2.1 Testing Laboratory

Company Name: Bureau Veritas Consumer Products Services
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Address: Thurn-und-Taxis-Straße 18
90411 Nürnberg
Germany

2.2 Applicant Data

Company Name: Andrew Wireless Systems GmbH
Address: Industriering 10
86675 Buchdorf
Germany
Contact Person: Daniel Schwab

2.3 Manufacturer Data

Company Name: Andrew Wireless Systems GmbH
Address: Industriering 10
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Contact Person: Daniel Schwab

3 Test object Data

Declared EUT data by the supplier	
Kind of Device product description	The ERA product is a digital distribution system with focus on flexibility, easy installing, commissioning, and reliable operation. The system is designed in a way to satisfy all of today's needs as well as unknown future standards and requirements. The ERA system comprises of two main parts. A base station interface (Master or Head End Unit) that takes RF signals as well as digital signals from the base stations, conditions the signals for the given application and assigns them to the coverage zones. The coverage side is built of one or more Remote Units. The "Remote Unit" (hereinafter referred to as "RU") is connected via a 10GBASE SFP+ fiber optical link to the ERA Master Unit. This link gives a total RF bandwidth of up to 320 MHz. For higher bandwidth requirements up to 640 MHz, a secondary 10G link can be used in parallel. RF signals between Master Unit and Remote Units are sent digitally over the fiber optical link. At the receiver side these signals are converted back to analog and amplified up to appropriate transmit levels.
Product name	Medium Power Carrier Access Point
Type	ERA CAP M2 34T/37T/37T
Hardware version	7856326-1004 Rev.: 00
Software version	1.6.0.109
Integrated transmitter	Medium Power Carrier Access Point
supported Radio technologies	Band C 5G N77
Antenna	none
Supplied document(s)	-

4 Assessment

4.1 Assessment method and subject of assessment

Calculation of power density and comparison with reference levels for general public exposure.
Applicability area and limitations: Power density can be calculated in far field region.

Applied Standards:

- IEEE Std C95.3-2021, D.4.2 Antennas – Main beam on-axis, general method for determining the power density at points in the radiating near-field and far-field antenna regions.
- IEEE Std C95.1-2019, D.2 Multifrequency exposures (exposures to multiple sources)

Specific information:

- Values used for calculation are based on supplied documents.
- Output power values are based on the supplied test reports and technical data sheet + tolerances.
- Antenna gain values are taken from the supplied data sheets.

Considerations regarding for calculation of maximum output power:

- Main beams of the antennas are directed to the same point in the prediction distance.
- Cable loss of internal antenna cables set to 0.
- Duty factor GSM/GPRS/EDGE = 0.5 (4 of 8 active time slots),
- Duty factor Bluetooth low energy = 0.5 (1 of 2 active time slots),
- Duty factor WLAN 2.4 GHz = 1,
- Duty factor UMTS = 1,
- Duty factor LTE = 1.

- The radio modules can transmit independently from each other:
(1 cellular band + WLAN 2,4 GHz + Bluetooth low energy).

Selected bands for multi frequency exposure calculations:

- The maximum output power is the sum of each cellular technology + WLAN 2.4 GHz + Bluetooth low energy.

4.2 Exposure limits

Extract of

- Table 1 (B) of OET Bulletin 65
- Table 1 (II) to § 1.1310(E)(1) of 47 CFR Ch. I (10–1–21 Edition).

<i>Frequency range</i>	<i>Power density</i>	<i>Power density</i>
<i>MHz</i>	<i>W/m²</i>	<i>mW/cm²</i>
300 – 1500	f/150	f/1500
1500 - 100000	10	1

Note:

f as indicated in the frequency range column

4.3 Formulas used for calculation

4.3.1 Single-frequency exposures (exposures to one source)

Table D.2—Determining power density on antenna main beam axis:

$$S_{FF} = \frac{G_i P_{in}}{4\pi d^2}$$

In this report is the power density S_i at frequency i calculated in mW/cm^2 .

G_i is the (isotropic) far-field antenna gain (power ratio) at frequency i .

P_{in} is the power into the antenna in mW => P_{mW} .

d is the distance to the antenna in cm.

4.3.2 Multi-frequency exposures (exposures to multiple sources)

Summation based on IEEE Std C95.1-2019, D.2

$$\sum_{i=1}^n \frac{exposure_i}{ERL_i} < 1$$

In this report is the power density calculated. In the tables below is “*exposure*” = S_i = power density at frequency i .

ERL_i is the corresponding exposure reference level at frequency i .

IEEE Std C95.1-2019:

exposure reference level (ERL): The maximum exposure level relative to ambient electric and/or magnetic field strength or power density, induced and/or contact current, or contact voltage.

NOTE 1— ERLs provide an adequate margin of safety against established adverse health effects.

NOTE 6— In some documents, ERLs are called reference levels, derived limits, permissible exposure limits, maximum permissible exposure values, action levels, or investigation levels.

4.4 Calculation

4.4.1 Calculation of single-frequency exposures

Limit: FCC OET Bulletin 65 Edition 97-01, Table 1 (B) Limits for General Population/Uncontrolled Exposure

Prediction Distance d in cm =>	169	TX frequ. band	Prediction frequ.	Duty factor (lin.)	Max power (log.)	Average (temporal) power (log.)	Average (temporal) power (lin.)	Gain (log.)	Gain (lin.)	Power density at distance d	Power density limit at frequency f_i	Ratio to exposure reference level	Sum of S_i / ERL_i	Compliance, if Sum of $S_i / ERL_i < 1$	Minimum distance to be ensured
		f_{Band}	f_i	-	P_{dBm}	P_{dBm}	P_{mW}	g_{dBi}	G_i	S_i	ERL_i	S_i / ERL_i	-	-	-
Radio technology	Repeater configuration	MHz	MHz	-	dBm	dBm	mW	dBi	-	mW/cm ²	mW/cm ²	-	-	-	cm
5G n77	34T ANT 1 1 carrier	3400 - 4200	3450	1	32,0	32,00	1584,89	15,00	31,62	0,140	1,000	0,140	0,140	Pass	63,153
5G n77	34T ANT 1 2 carriers	3400 - 4200	3500	1	29,0	32,01	1588,66	15,00	31,62	0,140	1,000	0,140	0,140	Pass	63,228
5G n77	34T ANT 1 4 carriers	3400 - 4200	3550	1	26,0	32,02	1592,43	15,00	31,62	0,140	1,000	0,140	0,140	Pass	63,303
5G n77	34T ANT 3 1 carrier	3400 - 4200	3450	1	32,0	32,00	1584,89	15,00	31,62	0,140	1,000	0,140	0,140	Pass	63,153
5G n77	34T ANT 3 2 carriers	3400 - 4200	3500	1	29,0	32,01	1588,66	15,00	31,62	0,140	1,000	0,140	0,140	Pass	63,228
5G n77	34T ANT 3 4 carriers	3400 - 4200	3550	1	26,0	32,02	1592,43	15,00	31,62	0,140	1,000	0,140	0,140	Pass	63,303
5G n77	37T ANT 1 1 carrier	3400 - 4200	3750	1	34,0	34,00	2511,89	15,00	31,62	0,221	1,000	0,221	0,221	Pass	79,505
5G n77	37T ANT 1 2 carriers	3400 - 4200	3850	1	31,0	34,01	2517,85	15,00	31,62	0,222	1,000	0,222	0,222	Pass	79,599
5G n77	37T ANT 1 4 carriers	3400 - 4200	3950	1	28,0	34,02	2523,83	15,00	31,62	0,222	1,000	0,222	0,222	Pass	79,694
5G n77	37T ANT 3 1 carriers	3400 - 4200	3750	1	34,0	34,00	2511,89	15,00	31,62	0,221	1,000	0,221	0,221	Pass	79,505

5G n77	37T ANT 3 2 carriers	3400 - 4200	3850	1	31,0	34,01	2517,85	15,00	31,62	0,222	1,000	0,222	0,222	Pass	79,599
5G n77	37T ANT 3 4 carriers	3400 - 4200	3950	1	28,0	34,02	2523,83	15,00	31,62	0,222	1,000	0,222	0,222	Pass	79,694
5G n77	37T ANT 2 1 carrier	3400 - 4200	3750	1	35,0	35,00	3162,28	15,00	31,62	0,279	1,000	0,279	0,279	Pass	89,206
5G n77	37T ANT 2 2 carriers	3400 - 4200	3850	1	32,0	35,01	3169,79	15,00	31,62	0,279	1,000	0,279	0,279	Pass	89,312
5G n77	37T ANT 2 4 carriers	3400 - 4200	3950	1	29,0	35,02	3177,31	15,00	31,62	0,280	1,000	0,280	0,280	Pass	89,418
5G n77	37T ANT 4 1 carrier	3400 - 4200	3750	1	35,0	35,00	3162,28	15,00	31,62	0,279	1,000	0,279	0,279	Pass	89,206
5G n77	37T ANT 4 2 carriers	3400 - 4200	3850	1	32,0	35,01	3169,79	15,00	31,62	0,279	1,000	0,279	0,279	Pass	89,312
5G n77	37T ANT 4 4 carriers	3400 - 4200	3950	1	29,0	35,02	3177,31	15,00	31,62	0,280	1,000	0,280	0,280	Pass	89,418

Information: $10 \text{ W m}^{-2} = 1 \text{ mW cm}^{-2}$

4.4.2 Calculation of multi-frequency exposures

Prediction Distance d in cm =>	192	TX frequ. band	Prediction frequ.	Duty factor (lin.)	Max power (log.)	Average (temporal) power (log.)	Average (temporal) power (lin.)	Gain (log.)	Gain (lin.)	Power density at distance d	Power density limit at frequency f _i	Ratio to exposure reference level	Sum of S _i / ERL _i	Compliance, if Sum of S _i / ERL _i < 1	Minimum distance to be ensured
		f _{Band}	f _i	-	P _{dBm}	P _{dBm}	P _{mw}	g _{dB}	G _i	S _i	ERL _i	S _i / ERL _i	-	-	-
Radio technology	Repeater configuration	MHz	MHz	-	dBm	dBm	mW	dB	-	mW/cm ²	mW/cm ²	-	-	-	cm
5G MIMO 2*2	34T ANT 1	3400 - 4200	3450	1	32,0	32,00	1584,89	15,00	31,62	0,108	1,000	0,108	0,216	Pass	89,312
	34T ANT 3	3400 - 4200	3450	1	32,0	32,00	1584,89	15,00	31,62	0,108	1,000	0,108			
5G MIMO 2*2	37T ANT 1	3400 - 4200	3750,0	1	34,0	34,00	2511,89	15,00	31,62	0,171	1,000	0,171	0,343	Pass	112,437
	37T ANT 3	3400 - 4200	3750,0	1	34,0	34,00	2511,89	15,00	31,62	0,171	1,000	0,171			
5G MIMO 2*2	37T ANT 2	3400 - 4200	3900,0	1	35,0	35,00	3162,28	15,00	31,62	0,216	1,000	0,216	0,432	Pass	126,157
	37T ANT 4	3400 - 4200	3900,0	1	35,0	35,00	3162,28	15,00	31,62	0,216	1,000	0,216			
5G MIMO 4*4	37T ANT 1	3400 - 4200	3800,0	1	34,0	34,00	2511,89	15,00	31,62	0,171	1,000	0,171	0,775	Pass	168,990
	37T ANT 2	3400 - 4200	3800,0	1	35,0	35,00	3162,28	15,00	31,62	0,216	1,000	0,216			
	37T ANT 3	3400 - 4200	3800,0	1	34,0	34,00	2511,89	15,00	31,62	0,171	1,000	0,171			
	37T ANT 4	3400 - 4200	3800,0	1	35,0	35,00	3162,28	15,00	31,62	0,216	1,000	0,216			
5G MIMO 4*4 + 5G MIMO 2*2	34T ANT 1	3400 - 4200	3450	1	32,0	32,00	1584,89	15,00	31,62	0,108	1,000	0,108	0,991	Pass	191,139
	34T ANT 3	3400 - 4200	3450	1	32,0	32,00	1584,89	15,00	31,62	0,108	1,000	0,108			
	37T ANT 1	3400 - 4200	3800,0	1	34,0	34,00	2511,89	15,00	31,62	0,171	1,000	0,171			
	37T ANT 2	3400 - 4200	3800,0	1	35,0	35,00	3162,28	15,00	31,62	0,216	1,000	0,216			
	37T ANT 3	3400 - 4200	3800,0	1	34,0	34,00	2511,89	15,00	31,62	0,171	1,000	0,171			
	37T ANT 4	3400 - 4200	3800,0	1	35,0	35,00	3162,28	15,00	31,62	0,216	1,000	0,216			

END OF REPORT