Radio Frequency Exposure

Graupner GmbH & Co. KG

FCC ID:	ZKZ-MX-16-20A Computer System Graupner HoTT mx-16 mx-20	
Product Description:		
Model No.:		
Supplementary No.:		
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Test by:	Reviewed By:	
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LIMIT

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See EN62311and §1.1307(b)(1) of this chapter.

EUT Specification

Frequency band (Operating) FHSS: 2.400GHz ~ 2.483GHz WLAN: 2.400GHz ~ 5.32GHz / 5.50GHz ~ 5.70GH WLAN: 5.18GHz ~ 5.32GHz / 5.50GHz ~ 5.70GH WLAN: 5.745GHz ~ 5825GHz Others Portable (<20cm separation) Mobile (>20cm separation) Others Coccupational/Controlled exposure (S = 5mW/cm²) General Population/Uncontrolled exposure (S=1mW/cm²) Single antenna Multiple antennas Multiple antennas Tx diversity Rx diversity Rx diversity Tx/Rx diversity Max. output power Antenna gain (Max) I dBi (Numeric gain:1.0dB) Evaluation applied	DUC	Commission Contains Commission II a TT	
WLAN: 2.400GHz ~ 2.483GHz WLAN: 5.18GHz ~ 5.32GHz / 5.50GHz ~ 5.70GH WLAN: 5.745GHz ~ 5.825GHz Others Others Portable (<20cm separation) Others Occupational/Controlled exposure (S = 5mW/cm²) Single antenna Multiple antennas Tx diversity Rx diversity Rx diversity Tx/Rx diversity Tx/Rx diversity Tx/Rx diversity Tx/Rx diversity Max. output power 20.45dBm (110.92mW) MPE Evaluation SAR Eval	EUT	Computer System Graupner HoTT	
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(Operating) WLAN: 5.18GHZ ~ 5.32GHZ / 5.30GHZ ~ 5./0GH WLAN: 5.745GHz ~ 5825GHz Others	Fraguency hand	☐ WLAN: 2.400GHz ~ 2.483GHz	
Others		☐ WLAN: 5.18GHz ~ 5.32GHz / 5.50GHz ~ 5.70GHz	
Device category ☐ Portable (<20cm separation) Mobile (>20cm separation) ☐ Others Occupational/Controlled exposure (S = 5mW/cm²) ☐ General Population/Uncontrolled exposure (S=1mW/cm²) ☐ Single antenna ☐ Multiple antennas ☐ Tx diversity ☐ Rx diversity ☐ Tx/Rx diversity ☐ Antenna gain (Max) 1 dBi (Numeric gain:1.0dB) Evaluation applied ☐ MPE Evaluation ☐ SAR Evaluation	(Operating)	WLAN: 5.745GHz ~ 5825GHz	
Device category		Others _	
□ Others □ Occupational/Controlled exposure (S = 5mW/cm²) □ Seneral Population/Uncontrolled exposure (S=1mW/cm²) □ Single antenna □ Multiple antennas □ Tx diversity □ Rx diversity □ Tx/Rx diversity □ Atenna gain (Max) 1 dBi (Numeric gain:1.0dB) Evaluation applied □ MPE Evaluation □ SAR Evaluation □ SAR Evaluation			
Exposure classificationOccupational/Controlled exposure $(S = 5mW/cm^2)$ General Population/Uncontrolled exposure $(S=1mW/cm^2)$ Single antennaMultiple antennasTx diversityRx diversityTx/Rx diversityTx/Rx diversityMax. output power $20.45dBm (110.92mW)$ Antenna gain (Max) $1 dBi (Numeric gain: 1.0dB)$ Evaluation applied $MPE Evaluation$ SAR Evaluation	Device category	Mobile (>20cm separation)	
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Antenna diversity ☐ Single antenna ☐ Multiple antennas ☐ Tx diversity ☐ Rx diversity ☐ Tx/Rx diversity ☐ Tx/Rx diversity ☐ Max. output power 20.45dBm (110.92mW) Antenna gain (Max) ☐ 1 dBi (Numeric gain:1.0dB) ☐ MPE Evaluation ☐ SAR Evaluation	Exposure classification		
Antenna diversity ☐ Tx diversity ☐ Rx diversity ☐ Tx/Rx diversity ☐ Tx/Rx diversity ☐ Tx/Rx diversity ☐ Multiple antennas ☐ Tx diversity ☐ Rx diversity ☐ Tx/Rx diversity ☐ Tx/Rx diversity ☐ Max. output power ☐ 10.92mW) ☐ Max diversity ☐ Multiple antennas ☐ Rx diversity ☐ Numeric gain:1.0dB) ☐ MPE Evaluation ☐ SAR Evaluation		$(S=1mW/cm^2)$	
Antenna diversity Rx diversity Tx/Rx diversity Tx/Rx diversity Max. output power 20.45dBm (110.92mW) Antenna gain (Max) 1 dBi (Numeric gain:1.0dB) Evaluation applied MPE Evaluation SAR Evaluation		Single antenna	
Rx diversity Tx/Rx diversity Max. output power 20.45dBm (110.92mW) Antenna gain (Max) 1 dBi (Numeric gain:1.0dB) Evaluation applied		Multiple antennas	
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Max. output power 20.45dBm (110.92mW) Antenna gain (Max) 1 dBi (Numeric gain:1.0dB) Evaluation applied		Rx diversity	
Antenna gain (Max) 1 dBi (Numeric gain:1.0dB) Evaluation applied MPE Evaluation SAR Evaluation		☐ Tx/Rx diversity	
Evaluation applied MPE Evaluation SAR Evaluation	Max. output power	20.45dBm (110.92mW)	
Evaluation applied SAR Evaluation	Antenna gain (Max) 1 dBi (Numeric gain:1.0dB)		
SAR Evaluation	Evaluation applied	MPE Evaluation	
	Evaluation applied	SAR Evaluation	
Note:	Note:		
1. The maximum output power is <u>20.45 dBm (110.921mW)</u> at <u>2404MHz</u> (with <u>1.0 numerio</u>			
antenna gain.)			
2. For mobile or fixed location transmitters, no SAR consideration applied. The minimum			
separation generally be used is at least 20 cm, even if the calculations indicate that the			
MPE distance would be lesser.			

TEST RESULT

No non-compliance noted.

Calculation

$$E = \frac{\sqrt{30 \times P \times G}}{d} \& S = \frac{E^2}{3770}$$

Where E = Field Strength in Volts / meter

P = Power in Watts

G=Numeric antenna gain

d=*Distance in meters*

S=Power Density in milliwatts / square centimeter

Combining equations and re-arranging the terms to express the distance as a function of the remaining variables yields:

$$S = \frac{30 \times P \times G}{3770d^2}$$

Changing to units of mW and cm, using:

$$P(mW) = P(W) / 1000$$
 and $d(cm) = 100 * d(m)$

Yields

$$S = \frac{30 \times (P/1000) \times G}{3770 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2}$$

Equation 1

Where

d = distance in cm

P = Power in mW

G = Numeric antenna gain

 $S = Power Density in mW/cm^2$

Maximum Permissible Exposure

EUT Output Power=110.92mW

Numeric antenna gain=1.0

Substituting the MPE safe distance using d=20 cm into *Equation 1*:

Yields

$$S=0.000199\times P\times G$$

Where

P = Power in mW

G = Numeric antenna gain

 $S = Power Density in mW/cm^2$

The power density $S = 0.000199 \times 110.92 \times 1.0 \ mW/cm^2 = 0.02207308 \ mW/cm^2$

(For mobile or fixed location transmitters, the maximum power density is $1.0 \, mW/cm^2$ even if the calculation indicates that the power density would be larger.)

Evaluation reslut: PASS