

Prüfbericht-Nr.: <i>Test report no.:</i>	IN23HNHD 001 & IN23HH4B 001	Auftrags-Nr.: <i>Order no.:</i>	146741372 0010	Seite 1 von 5 Page 1 of 5
Kunden-Referenz-Nr.: <i>Client reference no.:</i>	2390953	Auftragsdatum: <i>Order date:</i>	2022-12-01	
Auftraggeber: <i>Client:</i>	Proxim Wireless Corporation 2114 Ringwood Avenue, San Jose, California 95131			
Prüfgegenstand: <i>Test item:</i>	Stratum™ X5			
Bezeichnung <i>Identification</i>	SX5-1040A-US & SX5-1042A-US SX5-1040A-WD & SX5-1042A-WD			
Auftrags-Inhalt: <i>Order content:</i>	Maximum Permissible Exposure			
Prüfgrundlage: <i>Test specification:</i>	FCC 1.1310, and RSS 102 Issue 5 KDB 447498 D01			
Wareneingangsdatum: <i>Date of sample receipt:</i>	2023-04-11			
Prüfmuster-Nr.: <i>Test sample no:</i>	A003453731-003			
Serien -Nr.: <i>Serial no.:</i>	001			
Prüfzeitraum: <i>Testing period:</i>	2023-04-24 - 2023-06-30			
Ort der Prüfung: <i>Place of testing:</i>	Wireless laboratory, Bangalore			
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland (India) Pvt. Ltd. 27/B, 2nd cross road, Electronic city Phase 1, Bangalore-560100, India FCC Test Site Registration No: 496599 IC Test Site Registration No: 27711 HVIN: Gigabit 5 quad			
Prüfergebnis*: <i>Test result*:</i>	Pass			
geprüft von: <i>tested by:</i>	genehmigt von: <i>authorized by:</i>			
Datum: <i>Date:</i>	2023-07-03	Ausstellatum: <i>Issue date:</i>	2023-09-19	
Stellung / Position:	M.V.Naveen Kumar Senior Engineer	Stellung / Position:	Madhu K.N Assistant Manager	
Sonstiges / Other:	FCC ID: HZB-GIGA5 IC : 1856A-GIGA5			
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>	Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>			
* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	3 = befriedigend N/A = nicht anwendbar	4 = ausreichend N/T = nicht getestet
* Legend:	1 = very good P(ass) = passed a.m. test specification(s)	2 = good F(ail) = failed a.m. test specification(s)	3 = satisfactory N/A = not applicable	4 = sufficient N/T = not tested
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>				

1 Maximum Permissible Exposure

1.1 RF Exposure Compliance Requirement

The limit for Maximum Permissible Exposure (MPE) specified in FCC 1.1310 is followed. The gain of the antennas used in the product is extracted from the Antenna data sheets provided and also the maximum total power input to the antenna is measured. Through the Friis transmission formula and the maximum gain of the antenna, we can calculate the distance, away from the product, where the limit of MPE is reached.

Although the Friis Transmission formula is far field assumption, the calculated result of that is an over-prediction for near field power density. It is taken as worst case to specify the safety range.

1.2 RF Exposure Limits:

1.2.1 For FCC

1. According to FCC Part 1 Subpart I 1.1310: The criteria listed in the following table shall be used to evaluate the environmental impact of the human exposure to radio-frequency (RF) radiation as specified in 1.1307 (b) showed in Table 1.

Table 1: Limits for Maximum Permissible Exposure (MPE) as per FCC			
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)
Limits for Occupational / controlled Exposures			
300 - 1500	--	--	F/300
1500 - 100000	--	--	5.0
Limits for General population / Uncontrolled Exposure			
300 - 1500	--	--	F/1500
1500 - 100000	--	--	1.0

F or f = Frequency in MHz

Friss Formula

Friss Transmission 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 the center of radiator in cm

If we know the maximum gain of the antenna and the total output power to the antenna, through calculation.

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Test Results:

Manufacturer has declared the tune-up value as 0 dB is considered in MPE calculation.

Antenna details:

Manufacturer	Antenna Name	Antenna Model	Antenna Gain/used Frequency range
Telimart India	Omni Directional Antenna	TM55D-HVOMNI-12	2 X 12±0.5/ 5.15 to 5.850GHz
Telimart India	Dual Polarization Sector Antenna	TM55D-HVSCCTR-21	2 X 21±0.5/ 5.15 to 5.850GHz
Telimart India	Dual Polarization Directional Antenna	MT-466010/NVH	2 X 28±1.0/ 5.15 to 5.850GHz
Telimart India	Dish Antenna 4.9 - 5.9 GHz, Dual Polarized,	TM55L-DPDISH-35	2 x 35±0.5/ 5.15-5.25GHz & 5.15- 5.85GHz
MARS Antennas & RF Systems LTD	4.9-6.425 GHz Quad Polarization	MA-WA57-QP4MIMO19	4.9-5.15 @ 4x18 dBi 5.15-6.425 @ 4x19 dBi

For BLE uses PCB Antenna with Antenna Gain 2dBi

Note:

The Conducted output power including Tune-up Tolerance for each antenna/bands as below, which was declared by manufacturer.

Antenna Model	Frequency Range (MHz)	Conducted Output Power including tune-up Tolerance (dBm)
TM55D-HVOMNI-12	5150MHz to 5250MHz	22.0
	5725MHz to 5850MHz	23.0
TM55D-HVSCCTR-21	5150MHz to 5250MHz	16.0
	5725MHz to 5850MHz	18.0
MT-466010/NVH	5150MHz to 5250MHz	14.0
	5725MHz to 5850MHz	18.0
TM55L-DPDISH-35	5150MHz to 5250MHz	5.0
	5725MHz to 5850MHz	18.0
MA-WA57-QP4MIMO19	5150MHz to 5250MHz	19.0
	5725MHz to 5850MHz	20.0
PCB Antenna	2402MHz to 2480MHz	3.0

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Radio Protocol	Antenna Model	Frequency (MHz)	Maximum measured RF output power with tune-up procedure (dBm)	Max power Including tune-up tolerance * (mW)	Antenna Gain in linear	Min Separation distance (CM)	Power Density (Pd)(mW/cm²)	FCC Limit (mW/cm2)
Wi-Fi 5GHz	TM55D-HVOMNI-12	5150 to 5250	22.0	158.4893	63.3957	33	0.7342	1
		5725 to 5850	23.0	199.5262	63.3957	37	0.7353	1
	TM55D-HVSCTR-21	5150 to 5250	16.0	39.8107	503.5702	47	0.7222	1
		5725 to 5850	18.0	63.0957	503.5702	59	0.7263	1
	MT-466010/NVH	5150 to 5250	14.0	25.1188	2523.8294	83	0.7323	1
		5725 to 5850	18.0	63.0957	2523.8294	131	0.7384	1
	TM55L-DPDISH-35	5150 to 5250	5.0	3.1622	12649.1106	66	0.7307	1
		5725 to 5850	18.0	63.0957	12649.1106	292	0.7449	1
	MA-WA57-QP4MIMO19	5150 to 5250	19.0	79.4328	317.7313	52	0.7427	1
		5725 to 5850	20.0	100.000	317.7313	59	0.7263	1
BLE	PCB Antenna	2402 to 2480	3.0	1.9952	1.5849	1	0.2516	1

Exemption calculation for simultaneous Operation:

RF Protocol	Calculated MPE	Final MPE	Limit
Wi-Fi 5GHz + BLE	(0.7449) + (0.2516)	0.9965	<1

Note:

1. For above table, to calculate MPE following formula is used

$MPE_{RF1} / Limit_{RF1} + MPE_{RF2} / Limit_{RF2} + \dots + MPE_{RFn} / Limit_{RFn} < 1$

2. Maximum conducted output power taken from test Reports: **IN23HNHD 001 & IN23HH4B 001**

Result: The minimum distance should be more than above distance

1.2.2 For IC

According to IC RSS 102 Issue 5: The criteria listed in the following table shall be used to evaluate the environmental impact of the human exposure to radiofrequency (RF) radiation as specified in section 4 showed in Table 4.

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Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m ²)	Reference Period (minutes)
0.003-10 ²¹	83	90	-	Instantaneous*
0.1-10	-	0.73/ <i>f</i>	-	6**
1.1-10	87/ <i>f</i> ^{0.5}	-	-	6**
10-20	27.46	0.0728	2	6
20-48	58.07/ <i>f</i> ^{0.25}	0.1540/ <i>f</i> ^{0.25}	8.944/ <i>f</i> ^{0.5}	6
48-300	22.06	0.05852	1.291	6
300-6000	3.142 <i>f</i> ^{0.3417}	0.008335 <i>f</i> ^{0.3417}	0.02619 <i>f</i> ^{0.6834}	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	616000/ <i>f</i> ^{1.2}
150000-300000	0.158 <i>f</i> ^{0.5}	4.21 x 10 ⁻⁴ <i>f</i> ^{0.5}	6.67 x 10 ⁻⁵ <i>f</i>	616000/ <i>f</i> ^{1.2}
Note: <i>f</i> is frequency in MHz. *Based on nerve stimulation (NS). ** Based on specific absorption rate (SAR).				

Radio Protocol	Antenna Model	Frequency (MHz)	Maximum measured RF output power with tune-up procedure (dBm)	Max power Including tune-up tolerance * (mW)	Antenna Gain in linear	Min Separation distance (CM)	Power Density (Pd)(mW/cm ²)	RSS Limit (mW/cm ²)
Wi-Fi 5GHz	TM55D-HVOMNI-12	5725 to 5850	23.0	199.5262	63.3957	33	0.9243	0.9831
	TM55D-HVSCTR-21	5725 to 5850	18.0	63.0957	503.5702	51	0.9721	0.9831
	MT-466010/NVH	5725 to 5850	18.0	63.0957	2523.8294	114	0.9751	0.9831
	TM55L-DPDISH-35	5725 to 5850	18.0	63.0957	12649.1106	255	0.9767	0.9831
	MA-WA57-QP4MIMO19	5725 to 5850	20.0	100.000	317.7313	51	0.9720	0.9831
BLE	PCB Antenna	2402 to 2480	3.0	1.9952	1.5849	1	0.2516	0.5469

Result: The minimum distance should be more than above distance

1.3 Conclusion

The Power density of the EUT is less than defined limit as shown above, hence EUT is exempted from routine SAR.