Prüfbericht – Produkte
Test Report - Products

Prüfbericht-Nr.: *Test report no.:*	**IN23BVW8 001**	**Auftrags-Nr.:** *Order no.*:	146797959 0010	Seite 1 von 3 *Page 1 of 3*
Kunden-Referenz-Nr.: *Client reference no.:*	2133653	**Auftragsdatum**: *Order date:*	2023-06-07	
Auftraggeber: *Client:*	KoreLock, Inc 7100 E. Belleview Ave., Ste. 203, Greenwood Village, CO 80111			
Prüfgegenstand: *Test item:*	KeyInCode 3500 Series Smart Lock			
Bezeichnung *Identification*	3500 Series Deadbolt Lock 3500 Series Lever Lock			
Auftrags-Inhalt: *Order content*:	Maximum Permissible Expsoure			
Prüfgrundlage: *Test specification:*	FCC 1.1310, KDB 447498 D01			
Wareneingangsdatum: *Date of sample receipt:*	2023-06-07			
Prüfmuster-Nr.: *Test sample no:* **Serien -Nr.:** *Serial no.:*	A003491436-001 & A003491436-003 Engineering Sample			
Prüfzeitraum: *Testing period:*	2023-07-03 - 2023-11-03			
Ort der Prüfung: *Place of testing:*	Wireless laboratory, Bangalore			
Prüflaboratorium: *Testing laboratory:*	TÜV Rheinland (India) Pvt. Ltd. 27/B,2nd cross road, Electronic city Phase1, Banglore-560100, India FCC Test Site Registration No: 496599 IC Test Site Registration No: 27711			
Prüfergebnis*: *Test result*:*	Pass			

geprüft von: *tested by:*		**genehmigt von:** *authorized by:*	
Datum: *Date:* **2023-11-05**	M.V. Naveen Kumar	**Ausstellatum:** *Issue date:* **2024-02-02**	Lokesh.K
Stellung / *Position:*	**M.V.Naveen Kumar** **Senior Engineer**	**Stellung** / *Position:*	**Lokesh Ramu** **Senior Manager**
Sonstiges / *Other:*	FCC ID: 2BBNS-KL550		
Zustand des Prüfgegenstandes bei Anlieferung: *Condition of the test item at delivery:*		**Prüfmuster vollständig und unbeschädigt** ***Test item complete and undamaged***	

* Legende:	1 = sehr gut	2 = gut	3 = befriedigend	4 = ausreichend	5 = mangelhaft
	P(ass) = entspricht o.g. Prüfgrundlage(n)		F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
** Legend:*	*1 = very good*	*2 = good*	*3 = satisfactory*	*4 = sufficient*	*5 = poor*
	P(ass) = passed a.m. test specification(s)		*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

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: $Pd = (Pout * G) / (4*pi*r^2)$

Where

Pd = power density in mW/cm^2

Pout = output power to antenna in mW

G = gain of antenna in linear scale

Pi = 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.

Test Results:

Antenna details:

Sl.No	RF Protocols	Antenna Type	Antenna Gain (dBi)
1	Wi-Fi 2.4GHz	Printed PCB monopole antenna – on-board	4.54
2	BLE	Printed PCB trace monopole antenna – on-board	-1.05

Radio Protocol	Antenna Model	Frequency (MHz)	Maximum measured RF output power with tune-up Value (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)
BLE	Printed PCB monopole antenna – on-board	2440	8.00	6.3095	0.7852	20	0.0009	1
Wi-Fi		2462	16.00	39.8107	2.844	20	0.0225	1

Exemption calculation for simultaneous Operation:

RF Protocol	Calculated MPE	Final MPE	Limit
Wi-Fi 2.4GHz + BLE	0.0009+0.0225	0.0234	<1

Note:

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

MPE RF 1 / Limit RF 1 + MPE RF2 / LIMIT RF 2 + ... +MPE RFn / Limit RFn < 1

2. Maximum conducted output power taken from test Reports: **IN23BVW8 001**

1.3 Conclusion

The Power density of the EUT is less than defined limit as shown above, Hence EUT is meeting MPE Calculation.