RF EXPOSURE

EXEMPT REPORT

APPLICANT	:	**Hornby Hobbies Limited**
PRODUCT NAME	:	**BLE model train controller**
MODEL NAME	:	**HM6000**
BRAND NAME	:	**Hornby**
FCC ID	:	**2ACUF-HM6000**
STANDARD(S)	:	**FCC §15.247 (i), §2.1091**
RECEIPT DATE	:	**2020-07-14**
TEST DATE	:	**2020-07-14**
ISSUE DATE	:	**2020-09-11**

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Equipment Under Test (EUT) Description

EUT Type:	BLE model train controller
Hardware Version:	N/A
Software Version:	N/A
Frequency Bands:	2402MHz ~ 2480MHz
Modulation Mode:	GFSK
Antenna Type:	PCB Antenna
Antenna Gain:	-3.0 dBi

RF Exposure Measurement

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.

RF Exposure Limit

According to FCC 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)

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm_2)	Averaging Time $\|E\|_2$,$\|H\|_2$ or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500			F/1500	30
1500-100000			1.0	30

Note: f = frequency in MHz
*= Plane-wave equivalent power density

Predication of MPE limit at a given distance, Equation from OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where: S = power density
P = power input to antenna
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna, R=0.2m

Tune up produce power

Mode	BLE
Detector	Peak
BLE	3±1dBm

Protocol	ANT Gain(gain of antenna in linear scale)	Channel Frequency (MHz)	Max Output Power to Antenna (dBm)	Max Tune up Power to Antenna (dBm)	Max Output Power to Antenna (mW)	Max Tune up Power to Antenna (mW)	Max Power Density (mW/cm²)	Max Tune up Power Density (mW/cm²)	Limit (mW/cm²)
BLE	0.5	2480	3.52	4	2.25	2.51	0.0022	0.0025	1

Antenna gain: -3 dBi (gain of antenna in linear scale=0.5)