

Subject: RF exposure analysis for the equipment **NBT HU** (FCC ID: **T8GB140**; IC: **6434A-B140**)

The device **NBT HU** (FCC ID: **T8GB140**; IC: **6434A-B140**) is designed to be installed in and used in mobile exposure conditions.

The antennas used for this device must be installed to provide a separation distance of at least 20 cm from all the persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

MPE exposure limits

The table below is excerpted from Table 1B of 47 CFR 1.1310 titled Limits for Maximum Permissible Exposure (MPE), Limits for General Population/Uncontrolled Exposure:

Frequency Range (MHz)	Power density (mW/cm ²)	Averaging time (minutes)
300 – 1500	f (MHz) /1500	30
1500 – 100.000	1,0	30

The table below is excerpted from RSS-102, Issue 4, 4.2, titled "RF Limits for Devices used by the General Public":

Frequency Range (MHz)	Power density (W/m ²)	Averaging time (minutes)
300 – 1500	f (MHz) /150	6
1500 – 100.000	10	6

As all the operating frequencies of this device are higher than 1500 MHz, the applicable maximum permissive exposure is: 1 mW/cm².

Using the equation $S = \frac{PG}{4\pi R^2}$ to calculate the exposure to electromagnetic fields

where: S = power density (in appropriate units, e.g. mW/cm²)
P = power input to the antenna (in appropriate units, e.g., mW)
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 (appropriate units, e.g., cm)

Compliance with FCC and IC maximum permissive exposure limits is demonstrated based on the following calculations:

Measured conducted output power (please refer to test reports)				Maximum antenna gain calculation			
WLAN: 4,7 dBm Bluetooth: 1,44 dBm				Type of antenna:	External OEM antenna		
				Antenna model:	poor man antenna (for BT and WLAN)		
				Gain (without cable):	-3 dBi		
				Min. cable length in car:	2 m (for BT/WLAN)		
				Cable attenuation:	-2.8 dB (@ 2.4 GHz)		
				Connector loss:	0,15 dB		

Frequency band (MHz)	Mode	Frequency Range (MHz)	Conducted output power (dBm)	Conducted output power (mW)	Antenna gain (dBi)	Antenna gain (numerical)	Duty cycle (%)	Evaluation distance (cm)	Power density (mW/cm ²)	FCC/IC MPE limit (mW/cm ²)	MPE RATIO
2400 – 2483,5	WLAN	2412-2462	4,7	2,951	-3	-4,771	100	20	0,0028	1,000	0,0028
	Bluetooth	2402-2480	1,44	1,393	-3	-4,771	100	20	0,0013	1,000	0,0013

Signed on behalf of **Harman Becker Automotive Systems GmbH** in **Karlsbad** on **October 20th, 2014**.



SIMON VOEGELE
Regulatory Compliance Engineer
Tel: +49 7248 71 3667
Fax: +49 7248 71 3802
Email: simon.voegele@harman.com
Company: Harman Becker Automotive Systems GmbH
Address: Becker-Göring-Straße 16, 76307 Karlsbad, Germany