



January 13, 2014

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Attention: Director of Certification

RE: Analysis of RF Exposure for Portable and Mobile use per KDB 447498 D01 Mobile Portable RF Exposure v05r01

FCC ID: IFU1001008

1. Mobile MPE Calculation Summary using a 20cm separation distance:

Mode	Output Power	Power Density (mW/m ²)
802.11 a	10.18 dBm	0.0035
802.11 a (U NII-1)	11.77 dBm	0.0051
802.11 b	14.85 dBm	0.0119
802.11 g	13.09 dBm	0.0079
802.11 n (HT20) 2.4 GHz	13.13 dBm	0.0080
802.11 n (HT40) 2.4 GHz	12.54 dBm	0.0070
802.11 n (HT20) 5.0 GHz	10.05 dBm	0.0034
802.11 n (HT20) 5.0 GHz (U NII-1)	11.68 dBm	0.0050
802.11 n (HT40) 5.0 GHz	6.530 dBm	0.0015
802.11 n (HT40) 5.0 GHz (U NII-1)	5.800 dBm	0.0013
802.11 n (HT20) 2.4 GHz MIMO	15.66 dBm	0.0260
Bluetooth LE	8.460 dBm	0.0027
Bluetooth 2.0 + EDR	11.97 dBm	0.0061
NFC	51.0 dBμV/m @ 3 meters	0.0000001

2. Co-Located Transmitters transmission table:

Transmitter type	Transmitter type that can transmit at the same time
WiFi (802.11 a,b,g and n)	NFC
Bluetooth	NFC
NFC	WiFi (802.11 a,b,g and n) or Bluetooth



3. Simultaneous Transmission MPE:

Transmitter type	MPE (mW/cm ²)	Limit (mW/cm ²)	MPE ratio (MPE/Limit)
WiFi (802.11)	0.0260	1.0	0.0260
Bluetooth	0.0061	1.0	0.0061
NFC	0.00000001	0.97893	0.0000001021
Sum of the ratios (should be <1.0)			0.0321

Data presented is worst case scenario, WiFi and Bluetooth can't transmit at the same time.

4. Mobile MPE Calculation using a 20cm separation distance (802.11a):

Using Power Density formula:

$$S = \frac{PG}{4\pi R^2}$$

where: S = power density

P = power input to the antenna

G = power gain of the antenna in the direction of interest relative to isotropic

R = distance to the center of radiation of the antenna

Maximum peak output power at antenna input terminal:	10.18	(dBm)
Maximum peak output power at antenna input terminal:	10.42	(mW)
Antenna gain(typical):	2.3	(dBi)
Maximum antenna gain:	1.698	(numeric)
Prediction distance:	20	(cm)
Source Based Time Average Duty Cycle:	100	(%)
Prediction frequency:	5785	(MHz)
MPE limit for uncontrolled exposure at prediction frequency:	1.000	(mW/cm ²)
Power density at prediction frequency:	0.0035	(mW/cm ²)
Power density at prediction frequency:	0.035	(W/m ²)
Margin of Compliance:	-24.53	(dB)

5. Mobile MPE Calculation using a 20cm separation distance (802.11a U NII-1):

Maximum peak output power at antenna input terminal:	11.77	(dBm)
Maximum peak output power at antenna input terminal:	15.03	(mW)
Antenna gain(typical):	2.3	(dBi)
Maximum antenna gain:	1.698	(numeric)
Prediction distance:	20	(cm)
Source Based Time Average Duty Cycle:	100	(%)
Prediction frequency:	5200	(MHz)



MPE limit for uncontrolled exposure at prediction frequency:	1.000	(mW/cm ²)
Power density at prediction frequency:	0.0051	(mW/cm ²)
Power density at prediction frequency:	0.051	(W/m ²)
Margin of Compliance:	-22.94	(dB)

6. Mobile MPE Calculation using a 20cm separation distance (802.11b):

Maximum peak output power at antenna input terminal:	14.85	(dBm)
Maximum peak output power at antenna input terminal:	30.55	(mW)
Antenna gain(typical):	2.9	(dBi)
Maximum antenna gain:	1.950	(numeric)
Prediction distance:	20	(cm)
Source Based Time Average Duty Cycle:	100	(%)
Prediction frequency:	2437	(MHz)
MPE limit for uncontrolled exposure at prediction frequency:	1.000	(mW/cm ²)
Power density at prediction frequency:	0.0119	(mW/cm ²)
Power density at prediction frequency:	0.119	(W/m ²)
Margin of Compliance:	-19.26	(dB)

7. Mobile MPE Calculation using a 20cm separation distance (802.11g):

Maximum peak output power at antenna input terminal:	13.09	(dBm)
Maximum peak output power at antenna input terminal:	20.37	(mW)
Antenna gain(typical):	2.9	(dBi)
Maximum antenna gain:	1.950	(numeric)
Prediction distance:	20	(cm)
Source Based Time Average Duty Cycle:	100	(%)
Prediction frequency:	2437	(MHz)
MPE limit for uncontrolled exposure at prediction frequency:	1.000	(mW/cm ²)
Power density at prediction frequency:	0.0079	(mW/cm ²)
Power density at prediction frequency:	0.079	(W/m ²)
Margin of Compliance:	-21.02	(dB)

8. Mobile MPE Calculation using a 20cm separation distance (802.11 n HT20 2.4 GHz):

Maximum peak output power at antenna input terminal:	13.13	(dBm)
Maximum peak output power at antenna input terminal:	20.56	(mW)
Antenna gain(typical):	2.9	(dBi)
Maximum antenna gain:	1.950	(numeric)
Prediction distance:	20	(cm)



Source Based Time Average Duty Cycle:	100	(%)
Prediction frequency:	2437	(MHz)
MPE limit for uncontrolled exposure at prediction frequency:	1.000	(mW/cm ²)
Power density at prediction frequency:	0.0080	(mW/cm ²)
Power density at prediction frequency:	0.080	(W/m ²)
Margin of Compliance:	-20.98	(dB)

9. Mobile MPE Calculation using a 20cm separation distance (802.11 n HT40 2.4 GHz):

Maximum peak output power at antenna input terminal:	12.54	(dBm)
Maximum peak output power at antenna input terminal:	17.95	(mW)
Antenna gain(typical):	2.9	(dBi)
Maximum antenna gain:	1.950	(numeric)
Prediction distance:	20	(cm)
Source Based Time Average Duty Cycle:	100	(%)
Prediction frequency:	2437	(MHz)
MPE limit for uncontrolled exposure at prediction frequency:	1.000	(mW/cm ²)
Power density at prediction frequency:	0.0070	(mW/cm ²)
Power density at prediction frequency:	0.070	(W/m ²)
Margin of Compliance:	-21.57	(dB)

10. Mobile MPE Calculation using a 20cm separation distance (802.11 n HT20 5.0 GHz):

Maximum peak output power at antenna input terminal:	10.05	(dBm)
Maximum peak output power at antenna input terminal:	10.12	(mW)
Antenna gain(typical):	2.3	(dBi)
Maximum antenna gain:	1.698	(numeric)
Prediction distance:	20	(cm)
Source Based Time Average Duty Cycle:	100	(%)
Prediction frequency:	5825	(MHz)
MPE limit for uncontrolled exposure at prediction frequency:	1.000	(mW/cm ²)
Power density at prediction frequency:	0.0034	(mW/cm ²)
Power density at prediction frequency:	0.034	(W/m ²)
Margin of Compliance:	-24.66	(dB)

11. Mobile MPE Calculation using a 20cm separation distance (802.11 n HT20 5.0 GHz U NII-1):

Maximum peak output power at antenna input terminal:	11.68	(dBm)
Maximum peak output power at antenna input terminal:	14.72	(mW)
Antenna gain(typical):	2.3	(dBi)



Maximum antenna gain:	1.698	(numeric)
Prediction distance:	20	(cm)
Source Based Time Average Duty Cycle:	100	(%)
Prediction frequency:	5200	(MHz)
MPE limit for uncontrolled exposure at prediction frequency:	1.000	(mW/cm ²)
Power density at prediction frequency:	0.0050	(mW/cm ²)
Power density at prediction frequency:	0.050	(W/m ²)
Margin of Compliance:	-23.03	(dB)

12. Mobile MPE Calculation using a 20cm separation distance (802.11 n HT40 5.0 GHz):

Maximum peak output power at antenna input terminal:	6.53	(dBm)
Maximum peak output power at antenna input terminal:	4.50	(mW)
Antenna gain(typical):	2.3	(dBi)
Maximum antenna gain:	1.698	(numeric)
Prediction distance:	20	(cm)
Source Based Time Average Duty Cycle:	100	(%)
Prediction frequency:	5785	(MHz)
MPE limit for uncontrolled exposure at prediction frequency:	1.000	(mW/cm ²)
Power density at prediction frequency:	0.0015	(mW/cm ²)
Power density at prediction frequency:	0.015	(W/m ²)
Margin of Compliance:	-28.18	(dB)

13. Mobile MPE Calculation using a 20cm separation distance (802.11 n HT40 5.0 GHz U NII-1):

Maximum peak output power at antenna input terminal:	5.80	(dBm)
Maximum peak output power at antenna input terminal:	3.80	(mW)
Antenna gain(typical):	2.3	(dBi)
Maximum antenna gain:	1.698	(numeric)
Prediction distance:	20	(cm)
Source Based Time Average Duty Cycle:	100	(%)
Prediction frequency:	5240	(MHz)
MPE limit for uncontrolled exposure at prediction frequency:	1.000	(mW/cm ²)
Power density at prediction frequency:	0.0013	(mW/cm ²)
Power density at prediction frequency:	0.013	(W/m ²)
Margin of Compliance:	-28.91	(dB)

14. Mobile MPE Calculation using a 20cm separation distance (802.11 n HT20 2.4 GHz MIMO):

Maximum peak output power at antenna input terminal:	15.66	(dBm)
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Maximum peak output power at antenna input terminal:	36.81	(mW)
Antenna gain(typical):	5.5	(dBi)
Maximum antenna gain:	3.548	(numeric)
Prediction distance:	20	(cm)
Source Based Time Average Duty Cycle:	100	(%)
Prediction frequency:	2437	(MHz)
MPE limit for uncontrolled exposure at prediction frequency:	1.000	(mW/cm ²)
Power density at prediction frequency:	0.0260	(mW/cm ²)
Power density at prediction frequency:	0.260	(W/m ²)
Margin of Compliance:	-15.85	(dB)

15. Mobile MPE Calculation using a 20cm separation distance (Bluetooth LE):

Maximum peak output power at antenna input terminal:	8.46	(dBm)
Maximum peak output power at antenna input terminal:	7.01	(mW)
Antenna gain(typical):	2.9	(dBi)
Maximum antenna gain:	1.950	(numeric)
Prediction distance:	20	(cm)
Source Based Time Average Duty Cycle:	100	(%)
Prediction frequency:	2440	(MHz)
MPE limit for uncontrolled exposure at prediction frequency:	1.000	(mW/cm ²)
Power density at prediction frequency:	0.0027	(mW/cm ²)
Power density at prediction frequency:	0.027	(W/m ²)
Margin of Compliance:	-25.65	(dB)

16. Mobile MPE Calculation using a 20cm separation distance (Bluetooth 2.0 + EDR):

Maximum peak output power at antenna input terminal:	11.97	(dBm)
Maximum peak output power at antenna input terminal:	15.74	(mW)
Antenna gain(typical):	2.9	(dBi)
Maximum antenna gain:	1.950	(numeric)
Prediction distance:	20	(cm)
Source Based Time Average Duty Cycle:	100	(%)
Prediction frequency:	2440	(MHz)
MPE limit for uncontrolled exposure at prediction frequency:	1.000	(mW/cm ²)
Power density at prediction frequency:	0.0061	(mW/cm ²)
Power density at prediction frequency:	0.061	(W/m ²)
Margin of Compliance:	-22.14	(dB)



17. Mobile MPE Calculation using a 20cm separation distance (NFC):

Measured Field Strength @ 3 meters --Radiated:	51.00	(dB μ V/m)
Maximum peak output power --Radiated:	0.0000000	(W)
Antenna gain(typical):	0.00	(dBi)
Maximum antenna gain:	1.00	(numeric)
Prediction distance:	20.00	(cm)
Prediction frequency:	13.56	(MHz)
Limit from table below:	0.97893	(mW/cm ²)
Power density at prediction frequency:	0.00000001	(mW/cm ²)

Sincerely,

A handwritten signature in black ink, appearing to read 'Ferdie S. Custodio', written over a horizontal line.

Name

Authorized Signatory

Title: Senior EMC/Wireless Test Engineer