American Certification Body, Inc.
6731 Whittier Avenue
Suite C110
McLean, VA 22101

Date: Mar. 02, 2015

RF exposure analysis for the equipment FCC ID: PD917265NG; IC: 1000M-17265NG

The device (FCC ID: PD917265NG; IC: 1000M-17265NG) is designed as module to be installed in and used in a mixed mobile and portable exposure host platform. Portable exposure conditions are evaluated in a separate exhibit. The analysis provided in this document only covers mobile exposure conditions and for that the antenna(s) used for this transmitter 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 except in the conditions described in this document.

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/cm^2.

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/cm^2)
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.

1. Standalone operations analysis

DSS GRANT (Bluetooth Basic and EDR)

					CONDUCTED OUTPUT POWER										ANTENNA GAIN						
Frequency band (MHz)	Mode	BW (MHz)	Channel / Freq.	Data Rate	SISO Chain A Measured Value (dBm)	SISO Chain A Measured Value (mW)	SISO Chain B Measured Value (dBm)	SISO Chain B Measured Value (mW)	MIMO Chain A Measured Value (dBm)	MIMO Chain A Measured Value (mW)	MIMO Chain B Measured Value (dBm)	MIMO Chain B Measured Value (mW)	MIMO Chain A+B Measured Value (mW)	Worst Case Conducted Output Power (mW)	Antenna gain (dBi)	Antenna gain (numerical)	Duty cycle (%)	Evaluation distance (cm)	Power density (mW/cm²)	FCC/IC MPE limit (mW/cm²)	MPE RATIO
2400-2483,5	Bluetooth BR (Modulation: GFSK)	1	0 / 2402	1 Mbps	n/a	n/a	6,26	4,227	n/a	n/a	n/a	n/a	n/a	4,227	3,24	2,11	100%	20	0,001774	1,000	0,001774
			40 / 2441		n/a	n/a	6,60	4,571	n/a	n/a	n/a	n/a	n/a	4,571	3,24	2,11	100%	20	0,001918	1,000	0,001918
			79 / 2480		n/a	n/a	6,49	4,457	n/a	n/a	n/a	n/a	n/a	4,457	3,24	2,11	100%	20	0,00187	1,000	0,00187
	Bluetooth EDR (Modulation: Π/4-DQPSK)	1,5	0 / 2402	2 Mbps	n/a	n/a	5,30	3,388	n/a	n/a	n/a	n/a	n/a	3,388	3,24	2,11	100%	20	0,001422	1,000	0,001422
			40 / 2441		n/a	n/a	5,46	3,516	n/a	n/a	n/a	n/a	n/a	3,516	3,24	2,11	100%	20	0,001475	1,000	0,001475
			79 / 2480		n/a	n/a	5,57	3,606	n/a	n/a	n/a	n/a	n/a	3,606	3,24	2,11	100%	20	0,001513	1,000	0,001513
	Bluetooth EDR (Modulation: 8-DPSK)	1,5	0 / 2402	3 Mbps	n/a	n/a	4,47	2,799	n/a	n/a	n/a	n/a	n/a	2,799	3,24	2,11	100%	20	0,001175	1,000	0,001175
			40 / 2441		n/a	n/a	4,86	3,062	n/a	n/a	n/a	n/a	n/a	3,062	3,24	2,11	100%	20	0,001285	1,000	0,001285
			79 / 2480		n/a	n/a	4,77	2,999	n/a	n/a	n/a	n/a	n/a	2,999	3,24	2,11	100%	20	0,001259	1,000	0,001259

DTS GRANT (Bluetooth Low Energy operation + WLAN operation in 2400-2483,5 MHz frequency band)

					CONDUCTED OUTPUT POWER										ANTENNA GAIN						
Frequency band (MHz)	Mode	BW (MHz)	Channel / Freq.	Data Rate	SISO Chain A Measured Value (dBm)	SISO Chain A Measured Value (mW)	SISO Chain B Measured Value (dBm)	SISO Chain B Measured Value (mW)	MIMO Chain A Measured Value (dBm)	MIMO Chain A Measured Value (mW)	MIMO Chain B Measured Value (dBm)	MIMO Chain B Measured Value (mW)	MIMO Chain A+B Measured Value (mW)	Worst Case Conducted Output Power (mW)	Antenna gain (dBi)	Antenna gain (numerical)	Duty cycle (%)	Evaluation distance (cm)	Power density (mW/cm²)	FCC/IC MPE limit (mW/cm²)	MPE RATIO
2400-2483,5	Bluetooth Low Energy (Modulation: GFSK)	1	0 / 2402	200 kbps	n/a	n/a	4,97	3,141	n/a	n/a	n/a	n/a	n/a	3,141	3,24	2,11	100%	20	0,001318	1,000	0,001318
			40 / 2441		n/a	n/a	5,14	3,266	n/a	n/a	n/a	n/a	n/a	3,266	3,24	2,11	100%	20	0,001371	1,000	0,001371
			79 / 2480		n/a	n/a	5,42	3,483	n/a	n/a	n/a	n/a	n/a	3,483	3,24	2,11	100%	20	0,001462	1,000	0,001462
2400-2483,5	802.11b	20	1 / 2412	1 Mbps	16,64	0,046	16,88	16,880	n/a	n/a	n/a	n/a	n/a	16,880	3,24	2,11	100%	20	0,007082	1,000	0,007082
			6 / 2437		17,66	0,058	17,62	17,620	n/a	n/a	n/a	n/a	n/a	17,620	3,24	2,11	100%	20	0,007392	1,000	0,007392
			11 / 2462		16,60	0,046	16,85	16,850	n/a	n/a	n/a	n/a	n/a	16,850	3,24	2,11	100%	20	0,007069	1,000	0,007069
	802.11g	20	1 / 2412	6 Mbps	14,03	0,025	14,77	14,770	n/a	n/a	n/a	n/a	n/a	14,770	3,24	2,11	100%	20	0,006196	1,000	0,006196
			6 / 2437		17,22	0,053	17,67	17,670	n/a	n/a	n/a	n/a	n/a	17,670	3,24	2,11	100%	20	0,007413	1,000	0,007413
			11 / 2462		12,37	0,017	12,81	12,810	n/a	n/a	n/a	n/a	n/a	12,810	3,24	2,11	100%	20	0,005374	1,000	0,005374
	802.11n	20	1 / 2412	HT4	14,15	0,026	14,34	14,340	11,89	15,453	12,15	16,406	31,858	31,858	3,24	2,11	100%	20	0,013365	1,000	0,013365
			6 / 2437		17,57	0,057	17,43	17,430	17,67	58,479	17,76	59,704	118,183	118,183	3,24	2,11	100%	20	0,049578	1,000	0,049578
			11 / 2462		12,26	0,017	12,64	12,640	12,29	16,943	12,26	16,827	33,770	33,770	3,24	2,11	100%	20	0,014167	1,000	0,014167
	802.11n	40	3 / 2422	HT4	13,73	0,024	13,43	13,430	9,56	9,036	9,72	9,376	18,412	18,412	3,24	2,11	100%	20	0,007724	1,000	0,007724
			6 / 2437		16,58	0,045	16,36	16,360	13,66	23,227	13,89	24,491	47,718	47,718	3,24	2,11	100%	20	0,020018	1,000	0,020018
			9 / 2452		12,23	0,017	11,35	11,350	9,39	8,690	9,88	9,727	18,417	18,417	3,24	2,11	100%	20	0,007726	1,000	0,007726

U-NII GRANT (WLAN operation in 5150-5250 MHz, 5250-5350 MHz, 5470-5725 and 5725-5850 MHz frequency bands)

					CONDUCTED OUTPUT POWER										ANTENNA GAIN						
Frequency band (MHz)	Mode	BW (MHz)	Channel / Freq.	Data Rate	SISO Chain A Measured Value (dBm)	SISO Chain A Measured Value (mW)	SISO Chain B Measured Value (dBm)	SISO Chain B Measured Value (mW)	MIMO Chain A Measured Value (dBm)	MIMO Chain A Measured Value (mW)	MIMO Chain B Measured Value (dBm)	MIMO Chain B Measured Value (mW)	MIMO Chain A+B Measured Value (mW)	Worst Case Conducted Output Power (mW)	Antenna gain (dBi)	Antenna gain (numerical)	Duty cycle (%)	Evaluation distance (cm)	Power density (mW/cm²)	FCC/IC MPE limit (mW/cm²)	MPE RATIO
5150-5250	802.11a	20	36 / 5180	6 Mbps	13,99	0,025	14,12	25,823	n/a	n/a	n/a	n/a	n/a	25,823	3,64	2,31	100%	20	0,011878	1,000	0,011878
			40 / 5200		14,33	0,027	14,27	26,730	n/a	n/a	n/a	n/a	n/a	26,730	3,64	2,31	100%	20	0,012296	1,000	0,012296
			48 / 5240		14,29	0,027	14,32	27,040	n/a	n/a	n/a	n/a	n/a	27,040	3,64	2,31	100%	20	0,012438	1,000	0,012438
	802.11n	20	36 / 5180	HT4	14,11	0,026	13,98	25,003	10,96	12,474	10,98	12,531	25,005	25,005	3,64	2,31	100%	20	0,011502	1,000	0,011502
			40 / 5200		14,41	0,028	14,45	27,861	11,18	13,122	10,98	12,531	25,653	27,861	3,64	2,31	100%	20	0,012816	1,000	0,012816
			48 / 5240		14,43	0,028	14,41	27,606	10,93	12,388	11,05	12,735	25,123	27,606	3,64	2,31	100%	20	0,012698	1,000	0,012698
	802.11n	40	38 / 5190	HT4	12,16	0,016	13,60	22,909	10,58	11,429	10,37	10,889	22,318	22,909	3,64	2,31	100%	20	0,010538	1,000	0,010538
			46 / 5230		16,67	0,046	13,60	22,909	13,89	24,491	13,96	24,889	49,379	49,379	3,64	2,31	100%	20	0,022713	1,000	0,022713
	802.11ac	80	42 / 5210	VHT6	13,47	0,022	13,60	22,909	11,55	14,289	11,64	14,588	28,877	28,877	3,64	2,31	100%	20	0,013283	1,000	0,013283
5250-5350	802.11a	20	52 / 5260	6 Mbps	15,97	0,040	16,46	44,259	n/a	n/a	n/a	n/a	n/a	44,259	3,73	2,36	100%	20	0,020785	1,000	0,020785
			60 / 5300		16,13	0,041	16,55	45,186	n/a	n/a	n/a	n/a	n/a	45,186	3,73	2,36	100%	20	0,02122	1,000	0,02122
			64 / 5320		13,42	0,022	13,47	22,233	n/a	n/a	n/a	n/a	n/a	22,233	3,73	2,36	100%	20	0,010441	1,000	0,010441
	802.11n	20	52 / 5260	HT4	15,97	0,040	16,45	44,157	13,63	23,067	13,57	22,751	45,818	45,818	3,73	2,36	100%	20	0,021517	1,000	0,021517
			60 / 5300		15,95	0,039	16,63	46,026	13,63	23,067	13,51	22,439	45,506	46,026	3,73	2,36	100%	20	0,021614	1,000	0,021614
			64 / 5320		13,51	0,022	13,41	21,928	11,63	14,555	11,51	14,158	28,713	28,713	3,73	2,36	100%	20	0,013484	1,000	0,013484
	802.11n	40	54 / 5270	HT4	16,68	0,047	16,41	43,752	16,40	43,652	16,48	44,463	88,115	88,115	3,73	2,36	100%	20	0,041379	1,000	0,041379
			62 / 5310		13,62	0,023	13,55	22,646	11,64	14,588	11,47	14,028	28,616	28,616	3,73	2,36	100%	20	0,013439	1,000	0,013439
	802.11ac	80	58 / 5290	VHT6	13,69	0,023	13,70	23,442	11,38	13,740	11,40	13,804	27,544	27,544	3,73	2,36	100%	20	0,012935	1,000	0,012935
5470-5725 5725-5825: Only Channels 138, 142, 144 that straddle 5725 MHz limit of U-NII-2 frequency band	802.11a	20	100 / 5500	6 Mbps	13,63	0,023	13,31	21,429	n/a	n/a	n/a	n/a	n/a	21,429	4,77	3,00	100%	20	0,012786	1,000	0,012786
			120 / 5600		16,18	0,041	16,51	44,771	n/a	n/a	n/a	n/a	n/a	44,771	4,77	3,00	100%	20	0,026714	1,000	0,026714
			140 / 5700		13,18	0,021	12,95	19,724	n/a	n/a	n/a	n/a	n/a	19,724	4,77	3,00	100%	20	0,011769	1,000	0,011769
	802.11n	20	100 / 5500	HT4	13,41	0,022	13,48	22,284	10,40	10,965	10,33	10,789	21,754	22,284	4,77	3,00	100%	20	0,013297	1,000	0,013297
			120 / 5600		16,17	0,041	15,94	39,264	14,43	27,733	14,44	27,797	55,530	55,530	4,77	3,00	100%	20	0,033133	1,000	0,033133
			140 / 5700		13,20	0,021	12,87	19,364	11,20	13,183	10,77	11,940	25,122	25,122	4,77	3,00	100%	20	0,01499	1,000	0,01499
	802.11n	40	102 / 5510	HT4	13,36	0,022	14,21	26,363	11,64	14,588	11,57	14,355	28,943	28,943	4,77	3,00	100%	20	0,01727	1,000	0,01727
			118 / 5590		16,62	0,046	16,45	44,157	16,75	47,315	16,44	44,055	91,371	91,371	4,77	3,00	100%	20	0,054518	1,000	0,054518
			134 / 5670		16,66	0,046	16,41	43,752	16,60	45,709	16,38	43,451	89,160	89,160	4,77	3,00	100%	20	0,053199	1,000	0,053199
	802.11ac	20	144 / 5720 (*)	VHT6	16,14	0,041	15,51	35,538	13,41	21,928	13,30	21,402	43,330	43,330	4,77	3,00	100%	20	0,025854	1,000	0,025854
	802.11ac	40	142 /5710 (*)	VHT6	16,36	0,043	16,41	43,709	16,61	45,826	16,40	43,668	89,494	89,494	4,77	3,00	100%	20	0,053398	1,000	0,053398
	802.11ac	80	106 / 5530	VHT6	13,61	0,023	13,56	22,699	11,50	14,125	11,63	14,555	28,680	28,680	4,77	3,00	100%	20	0,017113	1,000	0,017113
			122 / 5610		16,62	0,046	16,57	45,394	16,77	47,534	16,46	44,259	91,792	91,792	4,77	3,00	100%	20	0,05477	1,000	0,05477
			138 / 5690 (*)		16,51	0,045	16,56	45,306	16,71	46,838	16,59	45,559	92,397	92,397	4,77	3,00	100%	20	0,055131	1,000	0,055131
5725-5850	802.11a	20	149 / 5745	6 Mbps	16,05	0,040	15,37	34,435	n/a	n/a	n/a	n/a	n/a	34,435	4,97	3,14	100%	20	0,021515	1,000	0,021515
			157 / 5785		15,62	0,036	14,92	31,046	n/a	n/a	n/a	n/a	n/a	31,046	4,97	3,14	100%	20	0,019397	1,000	0,019397
			165 / 5825		15,96	0,039	14,76	29,923	n/a	n/a	n/a	n/a	n/a	29,923	4,97	3,14	100%	20	0,018696	1,000	0,018696
	802.11n	20	149 / 5745	HT4	15,93	0,039	15,29	33,806	13,67	23,281	13,33	21,528	44,809	44,809	4,97	3,14	100%	20	0,027996	1,000	0,027996
			157 / 5785		15,60	0,036	15,42	34,834	13,67	23,281	13,47	22,233	45,514	45,514	4,97	3,14	100%	20	0,028437	1,000	0,028437
			165 / 5825		16,14	0,041	14,98	31,477	13,62	23,014	13,53	22,542	45,557	45,557	4,97	3,14	100%	20	0,028464	1,000	0,028464
	802.11n	40	151 / 5755	HT4	16,61	0,046	16,33	42,954	16,65	46,238	16,45	44,157	90,395	90,395	4,97	3,14	100%	20	0,056478	1,000	0,056478
			159 / 5795		16,59	0,046	16,43	43,954	16,62	45,920	16,43	43,954	89,874	89,874	4,97	3,14	100%	20	0,056152	1,000	0,056152
	802.11ac	80	155 / 5775	VHT6	16,57	0,045	16,49	44,566	16,62	45,920	16,49	44,566	90,485	90,485	4,97	3,14	100%	20	0,056534	1,000	0,056534

(*): Total output power of the channel calculated by summing mathematically the power integrated in each sub-band in linear power units

DXT GRANT (WLAN operation in 57-64 GHz frequency band)

				CONDUCTED OUTPUT POWER	ANTENNA GAIN						
Frequency band (GHz)	Mode	BW (GHz)	Channel / Freq.	SISO Measured Value (dBm)	SISO Chain A Measured Value (mW)	Antenna gain (dBi)	Antenna gain (numerical)	Duty cycle (%)	Evaluation distance (cm)	Power density (mW/cm²)	FCC/IC MPE limit (mW/cm²)	MPE RATIO
57-64	802.11ad	2	1 / 58320	7,80	6,026	15,30	33,88	100%	20	0,04062	1,000	0,04062
			2 / 60640	8,85	7,674	15,45	35,08	100%	20	0,053547	1,000	0,053547
			3 / 62640	8,40	6,918	15,00	31,62	100%	20	0,043525	1,000	0,043525

Under all conditions the equipment complies with the FCC/IC MPE limits and the maximum MPE ratio obtained is **0,056534**.

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2. Co-location analysis

2.1. Co-location with other transmitter in mobile exposure conditions

According to KDB 447498 D01 General RF Exposure Guidance v05r01, 7.2:

> *Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on calculated or measured field strengths or power density, is ≤ 1.0.*

As the maximum calculated MPE ratio for the device is **0,056534**, the product can be co-located with other antennas providing that the sum of the MPE ratios for all the other simultaneous transmitting antennas incorporated in a host device, based on calculated or measured field strengths or power density is ≤ 1.0 – **0,056534** = **0,943466**.

2.2. Co-location with other transmitter in mixed mobile and portable host platform exposure conditions

According to KDB 447498 D01 General RF Exposure Guidance v05r01, 7.2:

> *When one of the following test exclusion conditions is satisfied for all combinations of simultaneous transmission configurations, further equipment approval is not required to incorporate transmitter modules in host devices that operate in the mixed mobile and portable host platform exposure conditions. The grantee is responsible for documenting this according to Class I permissive change requirements. Antennas that qualify for standalone SAR test exclusion must apply the estimated standalone SAR to determine simultaneous transmission test exclusion.*
>
> - *The [∑ of (the highest measured or estimated SAR for each standalone antenna configuration, adjusted for maximum tune-up tolerance) / 1.6 W/kg] + [∑ of MPE ratios] is ≤ 1.0.*
> - *The SAR to peak location separation ratios of all simultaneous transmitting antenna pairs operating in portable exposure conditions are all ≤ 0.04 and the [∑ of MPE ratios] is ≤ 1.0.*

As the maximum calculated MPE ratio for the device is **0,056534**, the equipment can be co-located with other transmitters in a mixed mobile and portable conditions providing that the exposure of the co-located transmitter complies with:

- The [∑ of (the highest measured or estimated SAR for each standalone antenna configuration, adjusted for maximum tune-up tolerance) / 1.6 W/kg] + [∑ of MPE ratios] is ≤ 1.0 – **0,056534** = **0,943466**

OR

- The SAR to peak location separation ratios of all simultaneous transmitting antenna pairs operating in portable exposure conditions are all ≤ **0.04** and the [∑ of MPE ratios] is ≤ 1.0 – **0,056534** = **0,943466**

Sincerely,

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p.a._____
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