

Assessment report No:

NIE: 48278RAN.001

Assessment report RF EXPOSURE REPORT ACCORDING TO FCC 47 CFR Part 2.1091

Identification of item tested.....:	Radio with Navigation
Trademark	Panasonic
Model and /or type reference	VP4R-A
Other identification of the product	S/N: T M9 0 1 3700322 & T M9 0 1 3700321 FCC ID: ACJ-VP4RA ISED: 216A-VP4RA
Final HW version	VP4RA
Final SW version	VP4RA US SW
Features	Navigation, Tuner, DAB, Class D Amp, Modem, BT, Wi-Fi
Manufacturer	Panasonic Automotive Systems Company of America 776 Georgia Hwy 74 Peachtree City, GA 30269
Test method requested, standard.....:	FCC 47 CFR Part 2.1091 Radiofrequency radiation exposure evaluation: mobile devices.
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Rafael López EMC Lab Manager
Date of issue	2017-04-21
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Identification of the client

Panasonic Corporation of North America

Two Riverfront Plaza, 9th Floor, 07102-5490 Newark, New Jersey, USA

General description of the device under evaluation

The device under evaluation consists of a 8.4" Integrated Display Radio (TI J6, QNX6.6) with Navigation, Tuner, DAB, Class D Amp, Modem, BT, Wi-Fi.

The device has two transmitting antennas, one for Bluetooth/Wi-Fi (Embedded antenna) and onther for WWAN (External Antenna installed on the vehicle roof).

Bluetooth and Wi-Fi transmitters are not able to transmit simultaneously. Bluetooth/Wi-Fi transmitter is not co-located with WWAN transmitter due to the installation distance between both antennas, one inside the car and the other outside on the car roof.

The minimum separation distance between both antennas and anyone inside the car will be greater than 20 cm during normal use conditions. Configuration and use of the device may require direct user contact with the device, but for a short period of time.

For the Bluetooth technology, as stated into DEKRA test report 48278RRF.001 the maximum output power and antenna gain values are:

Assessment	Band (MHz)	Technology	Mode	Frequency	Maximum RF output power (dBm)	Maximum antenna gain (dBi)	Average radiated power (E.I.R.P.) (dBm)
1	2450	Bluetooth	GFSK	2402	-2.13	+0.0	1.87
				2441	-1.78	+0.0	2.22
				2480	-1.60	+0.0	2.40

Table 1: Maximum output power and antenna gain values for Bluetooth mode.

For the Wi-Fi technology, as stated into DEKRA test report 1740217R-RFUSP05V00 the maximum output power and antenna gain values are:

Assessment	Band (GHz)	Technology	Mode	Frequency	Maximum RF output power (dBm)	Maximum antenna gain (dBi)	Average radiated power (E.I.R.P.) (dBm)
2	5.8	Wifi	802.11a	5745	8.04	+1.0	9.04
				5785	8.07	+1.0	9.07
				5825	8.28	+1.0	9.28

Table 2: Maximum output power and antenna gain values for Wi-Fi mode.

The equipment specifications declared by the manufacturer for each supported WWAN feature are:

Assessment	Band (MHz)	Technology	Band	Maximum RF output power (dBm)	Maximum antenna gain (dBi)	Average radiated power (E.I.R.P.) (dBm)
3	700	LTE	17	25.0	+5.0	30.0
4	850	WCDMA/HSPA	V	25.7	+5.0	30.7
5	850	LTE	5	25.0	+5.0	30.0
6	1700	LTE	4	25.0	+5.0	30.0
7	1900	WCDMA/HSPA	II	25.7	+5.0	30.7
8	1900	LTE	2	25.0	+5.0	30.0
9	2500	LTE	7	25.7	+7.0	30.7

Table 3: Maximum output power and antenna gain values for WWAN modes.

Assessment summary

Radiofrequency radiation exposure limits				
FCC 47 CFR § 2.1091				
Antenna	Band (MHz)	Technology	Band	VERDICT (Pass/Fail)
1	2450	Bluetooth	ISM	Pass
	5000	Wifi	UNII Bands	Pass
2	700	LTE	17	Pass
	850	WCDMA /HSPA	V	Pass
	850	LTE	5	Pass
	1700	LTE	4	Pass
	1900	WCDMA /HSPA	II	Pass
	1900	LTE	2	Pass
	2500	LTE	7	Pass

Table 4: Assessment summary.

Appendix A – FCC RF Exposure

FCC RF Exposure evaluation for mobile devices

Devices operating in standalone mobile device exposure conditions may contain a single transmitter or multiple transmitters that do not transmit simultaneously. A minimum test separation distance ≥ 20 cm is required between the antenna and radiating structures of the device and nearby persons to apply mobile device exposure limits. The distance must be at least 20 cm and fully supported by the operating and installation configurations of the transmitter and its antenna(s), according to the source-based time-averaged maximum power requirements of § 2.1091(d)(2). In cases where cable losses or other attenuations are applied to determine compliance, the most conservative operating configurations and exposure conditions must be evaluated. The minimum test separation distance required for a device to comply with mobile device exposure conditions must be clearly identified in the installation and operating instructions, for all installation and exposure conditions, to enable users and installers to comply with RF exposure requirements. For mobile devices that have the potential to operate in portable device exposure conditions, similar to the configurations described in § 2.1091(d)(4), a KDB inquiry is required to determine the SAR test requirements for demonstrating compliance.

When a device qualifies for the categorical exclusion provision of § 2.1091(c), the minimum test separation distance may be estimated, when applicable, by simple calculations according to plane-wave equivalent conditions, to ensure the transmitter and its antenna(s) can operate in manners that meet or exceed the estimated distance. The source-based time-averaged maximum radiated power, according to the maximum antenna gain, must be applied to calculate the field strength and power density required to establish the minimum test separation distance. When the estimated test separation distance becomes overly conservative and does not support compliance, MPE measurement or computational modeling may be used to determine the required minimum separation distance.

According to §1.1310 Radiofrequency radiation exposure limits, paragraph (e), the limits for Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic fields are:

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3–3.0	614	1.63	* 100	6
3.0–30	1842/f	4.89/f	* 900/f ²	6
30–300	61.4	0.163	1.0	6
300–1,500			f/300	6
1,500–100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	* 100	30
1.34–30	824/f	2.19/f	* 180/f ²	30
30–300	27.5	0.073	0.2	30
300–1,500			f/1500	30
1,500–100,000			1.0	30

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

FCC MPE Evaluation Results

In order to perform the assessment, the following equations have been used for the calculations:

$$\lambda[m] = \frac{c[m/s]}{f[Hz]}$$

Wavelength:

$$d_{FarF} = \frac{2D[m]^2}{\lambda[m]}$$

Far field distance:

$$S[mW/cm^2] = \frac{P_{E.I.R.P.}[mW]}{4\pi R[cm]^2}$$

Power density:

$$R_{min}[m] = \sqrt{\frac{P_{E.I.R.P.}[mW]}{4\pi S[mW/cm^2]}}$$

Minimum compliance distance:

Where:

S = power density

$P_{E.I.R.P.}$ = Equivalent isotropically radiated power

R = distance to the center of radiation of the antenna (evaluation distance)

R_{min} = distance to the center of radiation of the antenna

Assessment 1 – Bluetooth 2.45 GHz

Minimum use distance (cm):	20.0
Worst Case Frequency (MHz):	2480
Maximum EIRP (dBm):	2.40
Maximum EIRP (mW):	1.74
General public - Power density limit (mW/cm ²):	1.0

Power density at minimum use distance:

Power density (mW/cm ²):	0.0003
Verdict for general public:	PASS

The power density level for this transmission mode is below general public and controlled exposure power density limits.

Minimum compliance distance for this technology:

Minimum distance for general public (cm):	0.37
Verdict for general public:	PASS

The minimum use distance is larger than general public and controlled exposure minimum compliance distances.

Assessment 2 – Wi-Fi 5 GHz

Minimum use distance (cm):	20.0
Worst Case Frequency (MHz):	5825
Maximum EIRP (dBm):	9.28
Maximum EIRP (mW):	8.47
General public - Power density limit (mW/cm ²):	1.0

Power density at minimum use distance:

Power density (mW/cm ²):	0.0017
Verdict for general public:	PASS

The power density level for this transmission mode is below general public and controlled exposure power density limits.

Minimum compliance distance for this technology:

Minimum distance for general public (cm):	0.82
Verdict for general public:	PASS

The minimum use distance is larger than general public and controlled exposure minimum compliance distances.

Assessment 3 – LTE Band 17

Minimum use distance (cm):	20.0
Worst Case Frequency (MHz):	704.0
Maximum EIRP (dBm):	30.0
Maximum EIRP (mW):	10000.0
General public - Power density limit (mW/cm ²):	0.469

Power density at minimum use distance:

Power density (mW/cm ²):	0.1989
Verdict for general public:	PASS

The power density level for this transmission mode is below general public and controlled exposure power density limits.

Minimum compliance distance for this technology:

Minimum distance for general public (cm):	13.02
Verdict for general public:	PASS

The minimum use distance is larger than general public and controlled exposure minimum compliance distances.

Assessment 4 – WCDMA Band V

Minimum use distance (cm):	20.0
Worst Case Frequency (MHz):	824.0
Maximum EIRP (dBm):	30.70
Maximum EIRP (mW):	1174.9
General public - Power density limit (mW/cm ²):	0.549

Power density at minimum use distance:

Power density (mW/cm ²):	0.2337
Verdict for general public:	PASS

The power density level for this transmission mode is below general public and controlled exposure power density limits.

Minimum compliance distance for this technology:

Minimum distance for general public (cm):	13.05
Verdict for general public:	PASS

The minimum use distance is larger than general public and controlled exposure minimum compliance distances.

Assessment 5 – LTE Band 5

Minimum use distance (cm):	20.0
Worst Case Frequency (MHz):	824.0
Maximum EIRP (dBm):	30.0
Maximum EIRP (mW):	1000.0
General public - Power density limit (mW/cm ²):	0.549

Power density at minimum use distance:

Power density (mW/cm ²):	0.1989
Verdict for general public:	PASS

The power density level for this transmission mode is below general public and controlled exposure power density limits.

Minimum compliance distance for this technology:

Minimum distance for general public (cm):	12.04
Verdict for general public:	PASS

The minimum use distance is larger than general public and controlled exposure minimum compliance distances.

Assessment 6 – LTE Band 4

Minimum use distance (cm):	20.0
Worst Case Frequency (MHz):	1710.0
Maximum EIRP (dBm):	30.0
Maximum EIRP (mW):	1000.0
General public - Power density limit (mW/cm ²):	1.0

Power density at minimum use distance:

Power density (mW/cm ²):	0.1989
Verdict for general public:	PASS

The power density level for this transmission mode is below general public and controlled exposure power density limits.

Minimum compliance distance for this technology:

Minimum distance for general public (cm):	8.92
Verdict for general public:	PASS

The minimum use distance is larger than general public and controlled exposure minimum compliance distances.

Assessment 7 – WCDMA Band II

Minimum use distance (cm):	20.0
Worst Case Frequency (MHz):	1850.0
Maximum EIRP (dBm):	30.7
Maximum EIRP (mW):	1174.9
General public - Power density limit (mW/cm ²):	1.0

Power density at minimum use distance:

Power density (mW/cm ²):	0.2337
Verdict for general public:	PASS

The power density level for this transmission mode is below general public and controlled exposure power density limits.

Minimum compliance distance for this technology:

Minimum distance for general public (cm):	9.67
Verdict for general public:	PASS

The minimum use distance is larger than general public and controlled exposure minimum compliance distances.

Assessment 8 – LTE Band 2

Minimum use distance (cm):	20.0
Worst Case Frequency (MHz):	1850.0
Maximum EIRP (dBm):	30.0
Maximum EIRP (mW):	1000.0
General public - Power density limit (mW/cm ²):	1.0

Power density at minimum use distance:

Power density (mW/cm ²):	0.1989
Verdict for general public:	PASS

The power density level for this transmission mode is below general public and controlled exposure power density limits.

Minimum compliance distance for this technology:

Minimum distance for general public (cm):	8.92
Verdict for general public:	PASS

The minimum use distance is larger than general public and controlled exposure minimum compliance distances.

Assessment 9 – LTE Band 7

Minimum use distance (cm):	20.0
Worst Case Frequency (MHz):	2500.0
Maximum EIRP (dBm):	30.70
Maximum EIRP (mW):	1174.90
General public - Power density limit (mW/cm ²):	1.0

Power density at minimum use distance:

Power density (mW/cm ²):	0.2337
Verdict for general public:	PASS

The power density level for this transmission mode is below general public and controlled exposure power density limits.

Minimum compliance distance for this technology:

Minimum distance for general public (cm):	9.67
Verdict for general public:	PASS

The minimum use distance is larger than general public and controlled exposure minimum compliance distances.