DEKRA Testing and Certification, S.A.U.
Parque Tecnológico de Andalucía,
c/ Severo Ochoa nº 2 · 29590 Campanillas · Málaga · España
C.I.F. A29 507 456

Assessment report No:

NIE: 51334RAN.001

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

Identification of item tested.....:	Automotive Radio with Navigation
Trademark .....:	Panasonic
Model and /or type reference .....:	CA-180-CTPL-HS
Other identification of the product .....:	FCC ID: ACJ- CA180CTPLHS ISED: 216A- CA180CTPLHS
Final HW version .....:	CA180CTPLHS US HW
Final SW version .....:	CA180CTPLHS US SW
Features.....:	Car Radio with BT, Wi-Fi, Navigation transmitters
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) .....:	Miguel Lacave Antennas Lab Manager  MIGUEL LACAVE GARCÍA 2017.04.28 13:55:08 +02'00'
Date of issue .....:	2017-04-28
Report template No.....:	FAN24_01

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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 car radio with BT, Wi-Fi and navigation transmitters.

The minimum separation distance between the external antenna and anyone inside the car will be greater than 20 cm during normal use conditions. Bluetooth and Wi-Fi transmitters are not able to transmit simultaneously.

For the Bluetooth technology, as stated into DEKRA test report 51334RRF.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	-2.63	+3.0	0.37
				2441	-1.16	+3.0	1.84
				2480	-1.41	+3.0	1.59

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

For the Wi-Fi technology, as stated into DEKRA test report 1740449R-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	7.61	+5.0	12.61
				5785	7.74	+5.0	12.74
				5825	7.80	+5.0	12.80

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

Assessment summary

Radiofrequency radiation exposure limits			
FCC 47 CFR § 2.1091			
Band (MHz)	**Technology**	**Band**	**VERDICT (Pass/Fail)**
2450	Bluetooth	ISM	Pass
5000	Wifi	UNII Bands	Pass

Table 3: 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:

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

Far field distance: $d_{FarF} = \frac{2D[m]^2}{\lambda[m]}$

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

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

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):	2441
Maximum EIRP (dBm):	1.84
Maximum EIRP (mW):	1.53
General public - Power density limit (mW/cm2):	1.0

Power density at minimum use distance:

Power density (mW/cm2):	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):	0.35
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):	12.80
Maximum EIRP (mW):	19.05
General public - Power density limit (mW/cm2):	1.0

Power density at minimum use distance:

Power density (mW/cm2):	0.0038
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):	1.23
Verdict for general public:	PASS

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