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Client: Panasonic Corporation
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Test item: Car Navigation

Identification: AT2201

FCC Requirement

According to FCC §2.1091, Mobile Devices must comply with the following applicable limit for maximum permissible exposure (MPE) specified in FCC §1.1310 (e)(1), Table 1:

Equipment Use	Frequency Range	Power Density Limit	Average Time
General Population / Uncontrolled Exposure	1,500 – 100,000 [MHz]	1.0 [mW/cm ²]	<30 [min]

ISED Requirement

According to RSS-102 (Issue 5), clause 2.5.2, no routine RF Exposure Evaluation is required if the transmitter has a minimum separation distance to the user greater than 20cm and has an output power (e.i.r.p.) below the following threshold:

Transmitter Frequency Range	Transmitter	Operating Frequency Range	RF Exp. Evaluation Threshold
300MHz – 6GHz	Wireless LAN and BLE (DTS)	2400 – 2483.5 [MHz]	2.675 [W]
	Classic Bluetooth (DSS)		
	Wireless LAN (NII)	5150 – 5850 [MHz]	4.507 [W]

Note: RF Exposure Evaluation Threshold mentioned above is calculated according to the following formula:

$$\text{RF Exposure Evaluation Threshold} = 1.31 \times 10^{-2} f^{0.6834} \text{ [W]}$$

Frequency f is used as the lowest frequency in each Operating Frequency Range as the worst case.

Measurement Result

The maximum measured transmitter power is given in the following table:

Equipment Class	Transmitter	RF Port	Conducted Output Power P _{out}		Maximum Antenna Gain [dBi]	e.i.r.p. Output Power [mW]	Power Density at 20cm [mW/cm ²]
			[dBm]	[mW]			
DTS	Wireless LAN	RF0	11.78	15.0661	+0.07	15.3109	0.003046
DSS	Bluetooth	RF1	4.27 (*)	2.6730	+1.01	3.3729	0.000671
DTS	BLE		3.27 (*)	2.1232	+1.01	2.6792	0.000533

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Equipment Class	Transmitter	RF Port	Conducted Output Power P _{out}		Maximum Antenna Gain [dBi]	e.i.r.p. Output Power [mW]	Power Density at 20cm [mW/cm ²]
			[dBm]	[mW]			
NII	Wireless LAN	RF0	3.33	2.1528	+2.14	3.5237	0.000701
NII	Wireless LAN	RF1	4.24	2.6546	+2.43	4.6452	0.000924

Note:

(*) Peak conducted output power was applied instead of average power.

Gray shading data shows each highest Power Density on each RF port.

The power density S in mW/cm² is calculated according to the formula:

- $S = (P_{out} \cdot G) / (4\pi \cdot D^2)$, where
- P_{out} = antenna conducted output power in mW, G = antenna gain in linear scale
- D = distance between observation point and radiating structure in cm (here: 20cm).

Simultaneous Operation

As per the specification of the EUT, the following simultaneous cases are expected:

Case	Equipment Class	Transmitter	RF Port	e.i.r.p. Output Power [mW]	Sum of e.i.r.p. Output Power [mW]	Power Density at 20cm [mW/cm ²]	Sum of Power Density [mW/cm ²]
Case 1	DTS	Wireless LAN	RF0	15.3109	18.6838	0.003046	0.003717
	DSS	Bluetooth	RF1	3.3729		0.000671	
Case 2	NII	Wireless LAN	RF0	3.5237	8.1689	0.000701	0.001625
		Wireless LAN	RF1	4.6452		0.000924	
Case 3	DTS	Wireless LAN	RF0	15.3109	26.8527	0.003046	0.005342
	DSS	Bluetooth	RF1	3.3729		0.000671	
	NII	Wireless LAN	RF0	3.5237		0.000701	
		Wireless LAN	RF1	4.6452		0.000924	

Gray shading data shows the highest simultaneous operation case on the device, for details refer to the submitted operational description from the applicant.

Each MPE ratio for FCC and for ISED are calculated at the worst case operation at the next page.

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For FCC:

Equipment Class	Transmitter	RF Port	The worst Power Density at 20cm [mW/cm ²]	Power Density Limit [mW/cm ²]	Power Density: MPE Ratio to FCC Limit	Sum of Ratio of Power Density against Limit
DTS	Wireless LAN	RF0	0.003046	1.0	0.003046	0.005342
DSS	Bluetooth	RF1	0.000671	1.0	0.000671	
NII	Wireless LAN	RF0	0.000701	1.0	0.000701	
	Wireless LAN	RF1	0.000924	1.0	0.000924	

For ISED:

Equipment Class	Transmitter	RF Port	The worst e.i.r.p. Output Power [mW]	RF Exp. Evaluation Threshold [W]	EIRP: MPE Ratio to ISED Limit	Sum of ratio of e.i.r.p. Output Power against Threshold
DTS	Wireless LAN	RF0	15.3109	2.675	0.00572370	0.00879709
DSS	Bluetooth	RF1	3.3729	2.675	0.00126090	
NII	Wireless LAN	RF0	3.5237	4.507	0.00078183	
	Wireless LAN	RF1	4.6452	4.507	0.00103066	

Conclusion

This transmitter is classified as Mobile Devices by the client.

The device complies with the FCC and ISED RF Exposure requirements, since the maximum transmitter power density is below the FCC limit. And the e.i.r.p. output power is below the ISED RF exposure evaluation exemption threshold. In additions, **MPE ratios** were calculated according to the KDB 447498 D01 (v06) and **were less than 1.**

Refer to the submitted test reports JP2290QR 001 (DTS) JP229S3F 001 (DSS) and JP211UTZ 001 (NII) for more details of measurement data.