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Powercast Corporation MPE REPORT

SCOPE OF WORK

MPE CALCULATION
ON THE POWERCAST RFID READER MODEL PCR91501

REPORT NUMBER

105207900LEX-003

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MPE TEST REPORT

Report Number: 105207900LEX-003

Project Number: G105207900

Report Issue Date: 12/12/2022

Product Name: Powercast RFID Reader model PCR91501

Standards: FCC Part 1.1310 Limits for Maximum Permissible Exposure (MPE)

Tested by:
Intertek Testing Services NA, Inc.
731 Enterprise Drive
Lexington, KY 40510
USA

Client:
Powercast Corporation
620 Alpha Drive
Pittsburgh, PA 15238-2912
USA

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Table of Contents

1 Introduction and Conclusion..... 4

2 Test Summary 4

3 Client Information 5

4 Description of Equipment under Test and Variant Models..... 6

5 Antenna Gain 7

6 FCC Limits 8

7 Test Procedure 9

8 Results: 10

9 Revision History 11



1 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 4.0. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product tested **complies** with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

2 Test Summary

Section	Test full name	Result
8	FCC Part 1.1310 Limits for Maximum Permissible Exposure (MPE) (Limits for General Population / Uncontrolled Exposure)	Pass



3 Client Information

This product was tested at the request of the following:

Client Information	
Client Name:	Powercast Corporation
Address:	620 Alpha Drive Pittsburgh, PA 15238-2912 USA
Contact:	Jason Gill
Telephone:	+1 (413) 923-4796
Email:	jgill@powercastco.com
Manufacturer Information	
Manufacturer Name:	Powercast Corporation
Manufacturer Address:	620 Alpha Drive Pittsburgh, PA 15238-2912 USA



4 Description of Equipment under Test and Variant Models

Equipment Under Test	
Product Name	Powercast RFID Reader
Model Number	PCR91501
Test Start Date	9/30/2022
Test End Date	12/8/2022
Device Received Condition	Good
Test Sample Type	Pre-Production
Transmit Band	902 MHz – 928 MHz
Test Channels	906.36 MHz, 915 MHz, 924 MHz
Equipment Time	Frequency Hopping Spread Spectrum (FHSS)
Antenna Make, Model, and Gain¹	PCR91501 Integrated Patch Antenna Peak gain 3.8 (5.8 dBi, 3.65 dBd)
Input Rating	5V 1A USB-C
Description of Equipment Under Test (provided by client)	
RFID Reader.	

4.1 Variant Models:

There were no variant models covered by this evaluation.

¹ This information was provided by the client and deviations from these values may affect compliance. Intertek does not make any claim of compliance for other than these values.



5 Antenna Gain

The antenna gain was taken from the PCR91501 datasheet provided by the client. Deviations from these values may affect compliance. Intertek does not make any claim of compliance for other than these values.

PARAMETER	SPECIFICATION
Frequency Range	902-928MHz
Peak Gain	3.8 (5.8dBi)
Return Loss	< -10dB (898-928MHz)
Impedance	50 ohms
Radiation Pattern	Directional
Half-Power Bandwidth	
Polarization	Linear - Horizontal



6 FCC Limits

§ 1.1310: The criteria listed in table 1 shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

Part 1.1310 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 Exposures				
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
300–1500 .....	.....	.....	f/300	6
1500–100,000 .....	.....	.....	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
300–1500 .....	.....	.....	f/1500	30
1500–100,000 .....	.....	.....	1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.



7 Test Procedure

An MPE evaluation for was performed in order to show that the device was compliant with the general population exposure limits from FCC §2.1091. The maximum power density was calculated for each transmitter band at a separation distance of 20cm using the maximum declared output power including tune up tolerance.

For each transmitter the maximum RF exposure at a 20 cm distance using the formula:

$$\text{ConductedPower}_{mW} = 10^{\text{ConductedPower}(dBm)/10}$$

$$\text{PowerDensity} = \frac{\text{ConductedPower}_{mW} \times \text{Ant. Gain}}{4\pi \times (20_{cm})^2}$$

For transmitters that could operate simultaneously, the MPE to limit ratio for each was calculated and then summed. If the sum of the MPE to limit ratios was less than 1, that specific combination of transmitters was deemed to comply.



8 Results:

The calculated maximum power density at 20cm distance was equal to or less than the required limits for general population exposure for FCC Part 1.1310.

FCC MPE Data

Duty Cycle	100 (%)							
Separation Dist.	20 (cm)							
Operating Mode	Frequency (MHz)	Declared Max Cond. Power (Inc. Tolerance) (dBm)	Duty Cycle Adjusted Cond. Output Power (dBm)	Antenna Gain (dB)	MPE Value (mW/cm ²)	MPE Limit (mW/cm ²)	Margin to Limit (mW/cm ²)	MPE / Limit Ratio (for Co-Location)
Low	906.36	28.76	28.76	5.8	0.5685	0.6042	0.0357	0.9409
Middle	915	28.57	28.57	5.8	0.5442	0.6100	0.0658	0.8921
High	924	28.67	28.67	5.8	0.5568	0.6160	0.0592	0.9040

ISED MPE Data

Duty Cycle	100 (%)							
Separation Dist.	30 (cm)							
Operating Mode	Frequency (MHz)	Declared Max Cond. Power (Inc. Tolerance) (dBm)	Duty Cycle Adjusted Cond. Output Power (dBm)	Antenna Gain (dB)	MPE Value (W/m ²)	MPE Limit (W/m ²)	Margin to Limit (W/m ²)	MPE / Limit Ratio (for Co-Location)
Low	906.36	28.76	28.76	5.8	2.5267	2.7489	0.2222	0.9192
Middle	915	28.57	28.57	5.8	2.4185	2.7668	0.3482	0.8741
High	924	28.67	28.67	5.8	2.4748	2.7853	0.3105	0.8885



9 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	12/12/2022	105207900LEX-003	<i>GP</i>	<i>BL</i>	Original Issue