

RF Exposure Report

Project Number: 4808444

Offer Number: SUW-202107001262

Report Number: 4808444EMC03

Revision Level: 1

Client: Persistent Systems LLC

Equipment Under Test: Embedded Module (with RF-2150 Radio)

Host Model: WR-5200

Module Model: RF-2150

Module FCC ID: 2AG3J-RF2150

Applicable Standards: 47 C.F.R. §§ 2.1091

FCC KDB 447498 D01 General RF Exposure Guidance v06

FCC OET Bulletin 65

Report issued on: 23 March 2023

Test Result: Compliant



FOR THE SCOPE OF ACCREDITATION UNDER CERTIFICATE NUMBER: 3212.01

This report must not be used by the client to claim product certification, approval, or endorsement by A2LA, NIST, or any agency of the Federal Government.

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1 General Information

1.1 Client Information

Name: Persistent Systems LLC
Address: 601 West 26th St, Suite 905
City, State, Zip, Country: New York, NY 10001, USA

1.2 Test Laboratory

Name: SGS North America, Inc.
Address: 620 Old Peachtree Road NW, Suite 100
City, State, Zip, Country: Suwanee, GA 30024, USA

Accrediting Body: A2LA
Type of lab: Testing Laboratory
Certificate Number: 3212.01
FCC Designation: US1126
ISED Registration: 9984A
CAB Identifier: US0186

1.3 General Information of EUT

Equipment Under Test: Embedded Module (with RF-2150 Radio)
Host Model: WR-5200
Serial Number: 58676
Module Model: RF-2150
Module FCC ID: 2AG3J-RF2150

Frequency Range: 2412 – 2462 MHz
Data Modes: WLAN IEEE 802.11b/g/n (DSSS, OFDM)
Antenna: ANT-2005 (2.15 dBi)* – Antenna configuration 1
ANT-2012 (4.1 dBi)* – Antenna configuration 2
ANT-2010 (8.5 dBi)* – Antenna configuration 3

Max Output Power: Multiple values depending on antenna configuration and # of active chains

Rated Voltage: 12Vdc
Test Voltage: 12Vdc (supplied by AC adapter with 120Vac, 60Hz input)

Sample Received Date: 17 September 2018
Dates of testing: 19 September to 17 December 2018

**Data was not measured by SGS laboratory and therefore SGS is not responsible for accuracy. Data obtained via customer, specification sheet, previous regulatory filing or other.*

1.4 Operating Modes and Conditions

Evaluation was performed as specified in FCC KDB 558074 D01 v05r02 and FCC KDB 447498 D01 v06.

2 RF Exposure

2.1 Test Result

Test Description	Product Specific Standard	Test Result
RF Exposure	FCC Part 1.1310	Compliant

2.2 Test Method

Using the maximum power (including tune-up tolerances), the power density was calculated. Maximum antenna gains were used.

The formula below was used to calculate power density.

$$S = \frac{PG}{4\pi R^2} \quad \text{or} \quad S = \frac{EIRP}{4\pi R^2}$$

where:

S = power density (mW/cm²)

P = maximum sourced based average power delivered to antenna port (mW)

G = maximum numeric power gain of antenna relative to an isotropic radiator (dBi -> linear)

R = distance from reference point of antenna (cm)

$EIRP$ = equivalent (or effective) isotropically radiated power

A spreadsheet named "MPE-mobile.xls" from the FCC for Mobile Multi-transmitter MPE Estimation was used for estimating MPE limits for multiple antennas. This spreadsheet is referenced in KDB 447498 D01 General RF Exposure Guidance v06, section 7.2, which states, in part, the following: "Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneously transmitting antennas incorporated in a host device is ≤ 1.0 , according to calculated/estimated, numerically modeled, or measured field strengths or power density." This spreadsheet is available at: <http://www.fcc.gov/oet/ea/presentations/files/oct05/MPE-mobile.xls>

In the spreadsheet, the power densities for each antenna are summed, and the results are plotted in percentage of the applicable frequency dependent MPE limit. A frequency of 2450 MHz was used in the spreadsheet, but in this case the MPE limit remains constant across the 2412-2462 MHz frequency range. The limit is shown below.

Limit: 1.0 mW/cm²

from FCC §1.1310(e)(1) Table 1 Limits for MPE (ii) Limits for General Population/Uncontrolled Exposure

2.3 EUT Photographs (showing example antenna arrangements)

3 high-gain (8.5dBi) antennas



3 medium-gain (4.1dBi) antennas

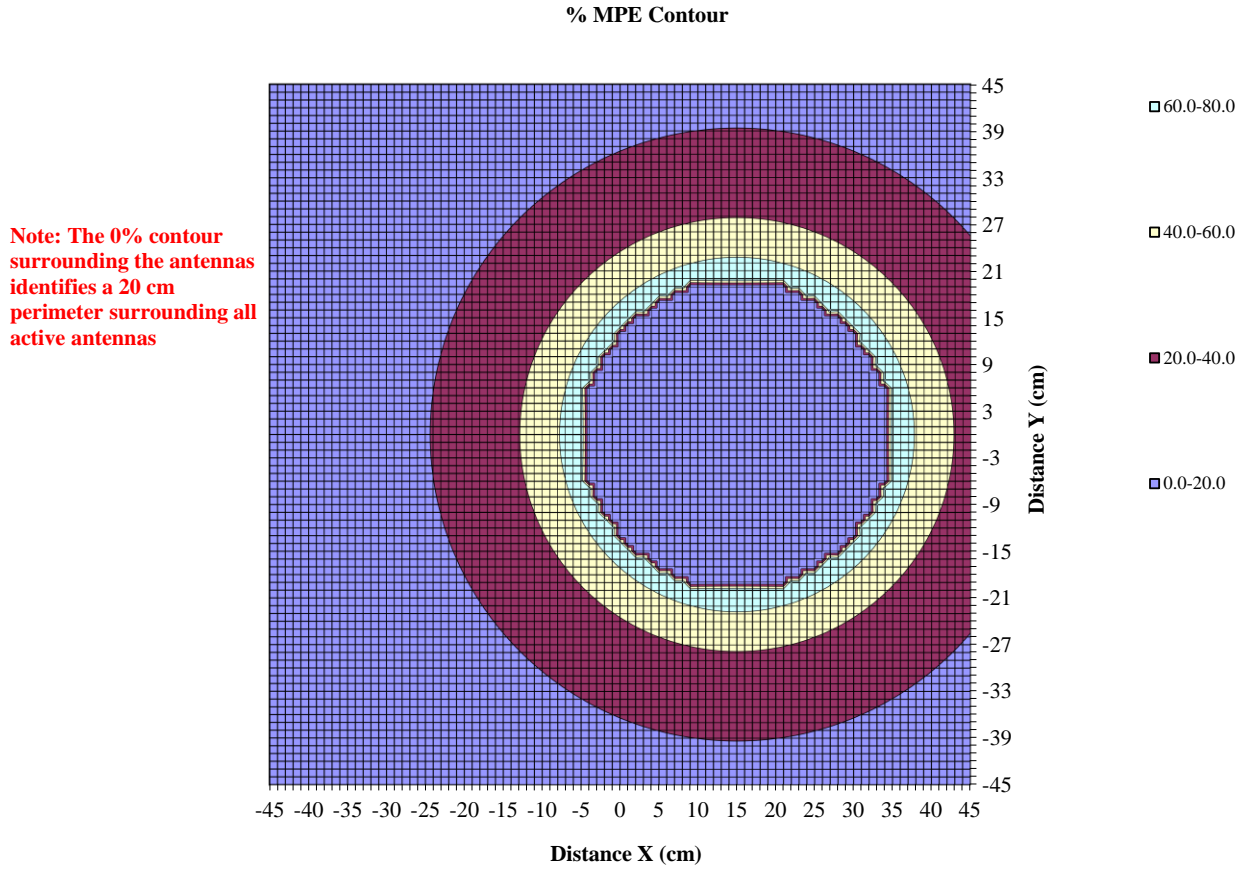


3 low-gain (2.15dBi) antennas



2.4 Single, Double, Triple Transmission RF Exposure Levels (mW/cm^2)

1 tx antenna @ 27.4dBm, gain = 8.5dBi

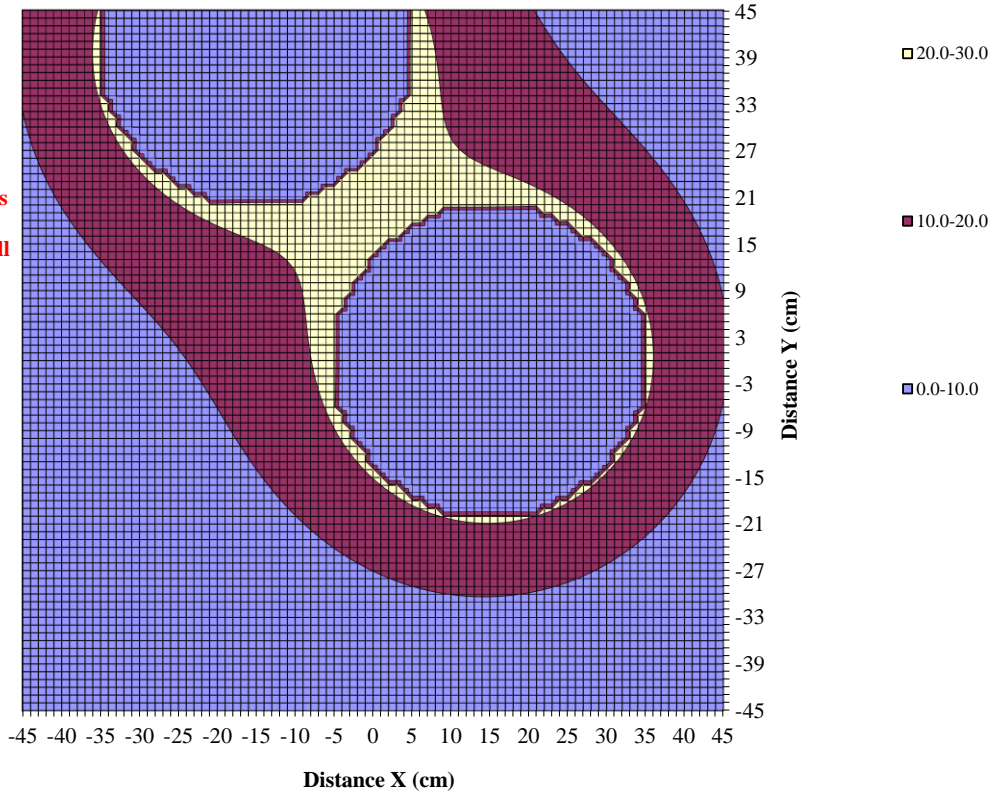


Maximum % of MPE limit at 20 cm separation distance: 77.5%

2 tx antennas @ 21.5dBm, gain for each = 8.5dBi

% MPE Contour

Note: The 0% contour surrounding the antennas identifies a 20 cm perimeter surrounding all active antennas

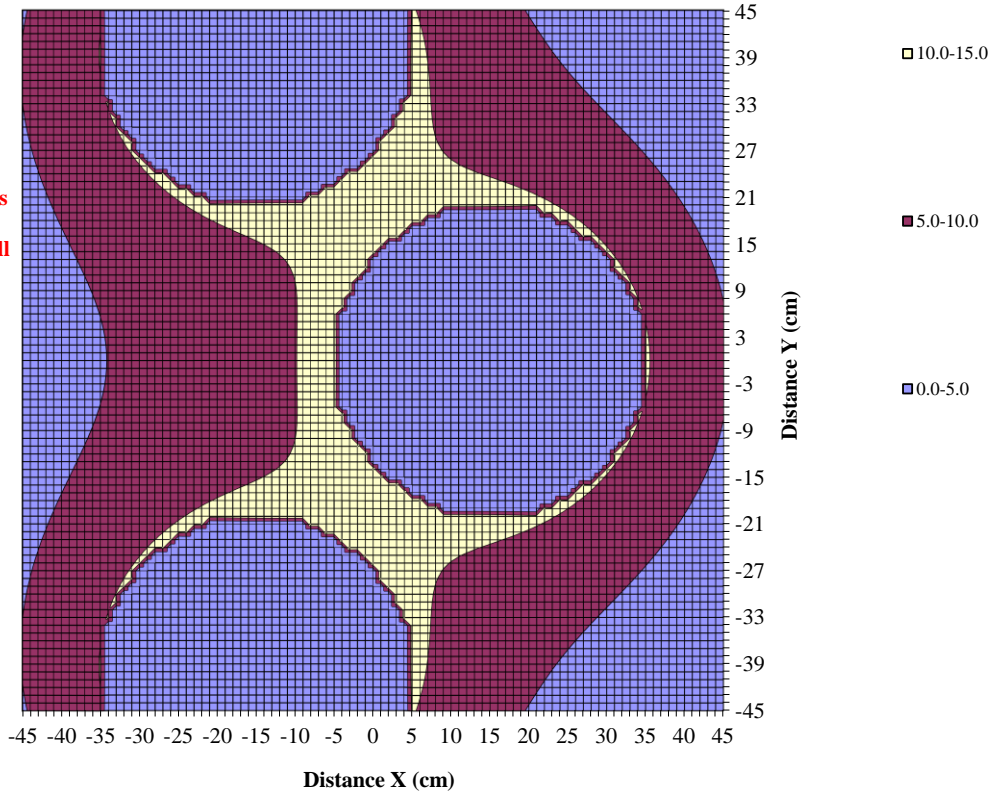


Maximum % of MPE limit at 20 cm separation distance: 28.7%

3 tx antennas @ 17.9dBm, gain for each = 8.5dBi

% MPE Contour

Note: The 0% contour surrounding the antennas identifies a 20 cm perimeter surrounding all active antennas

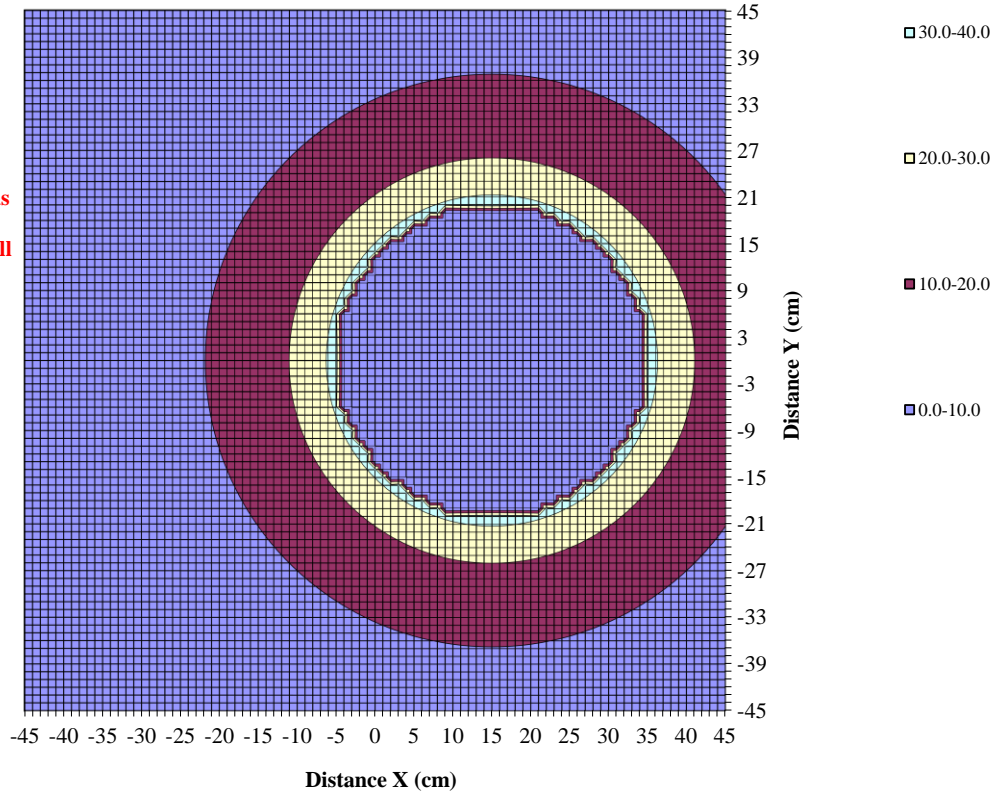


Maximum % of MPE limit at 20 cm separation distance: 13.6%

1 tx antenna @ 28.2dBm, gain = 4.1dBi

% MPE Contour

Note: The 0% contour surrounding the antennas identifies a 20 cm perimeter surrounding all active antennas

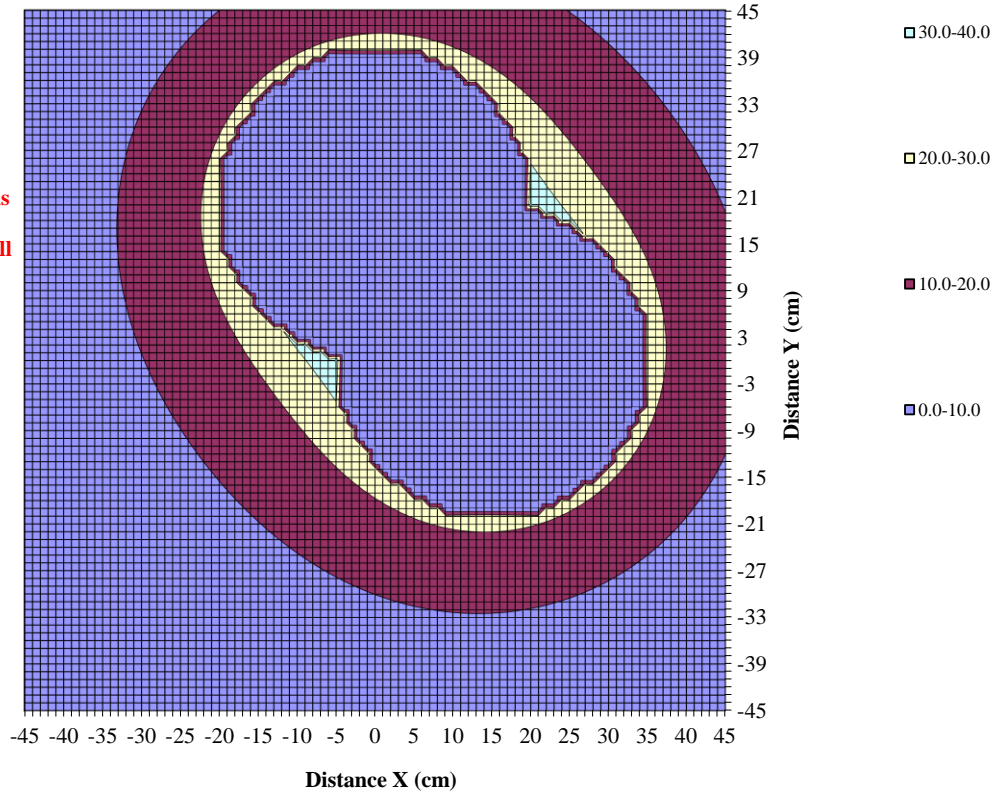


Maximum % of MPE limit at 20 cm separation distance: 33.8%

2 tx Antennas @ 25.8dBm, gain for each = 4.1dBi

% MPE Contour

Note: The 0% contour surrounding the antennas identifies a 20 cm perimeter surrounding all active antennas

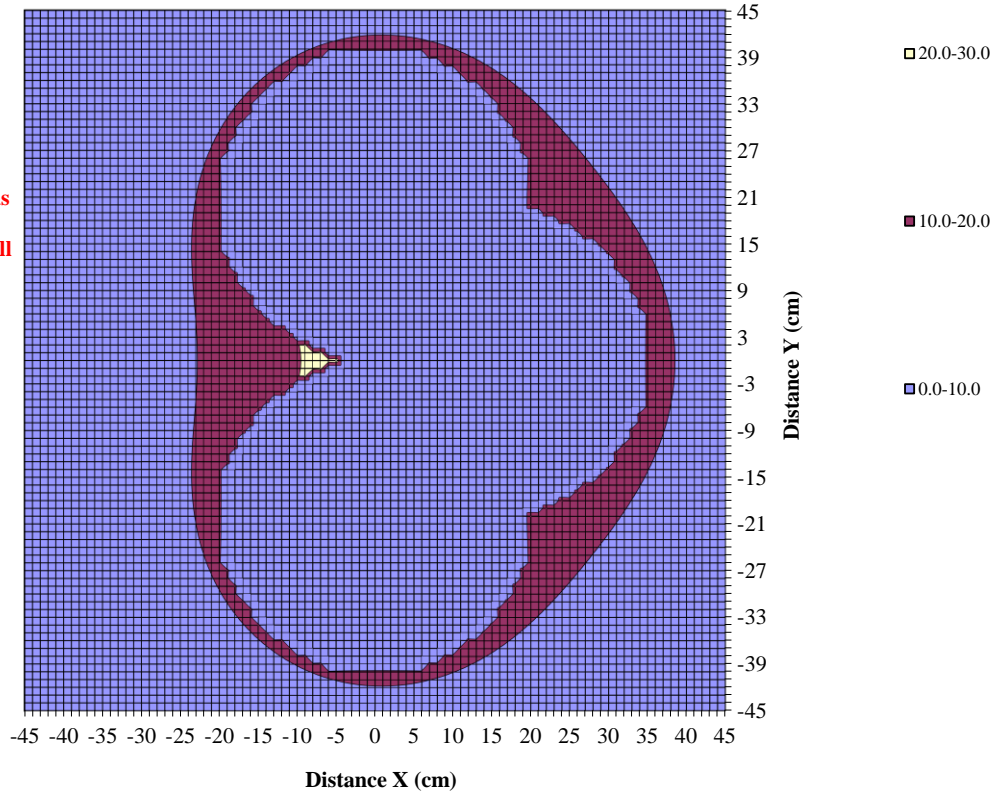


Maximum % of MPE limit at 20 cm separation distance: 37.7%

3 tx antennas @ 22.3dBm, gain for each = 4.1dBi

% MPE Contour

Note: The 0% contour surrounding the antennas identifies a 20 cm perimeter surrounding all active antennas

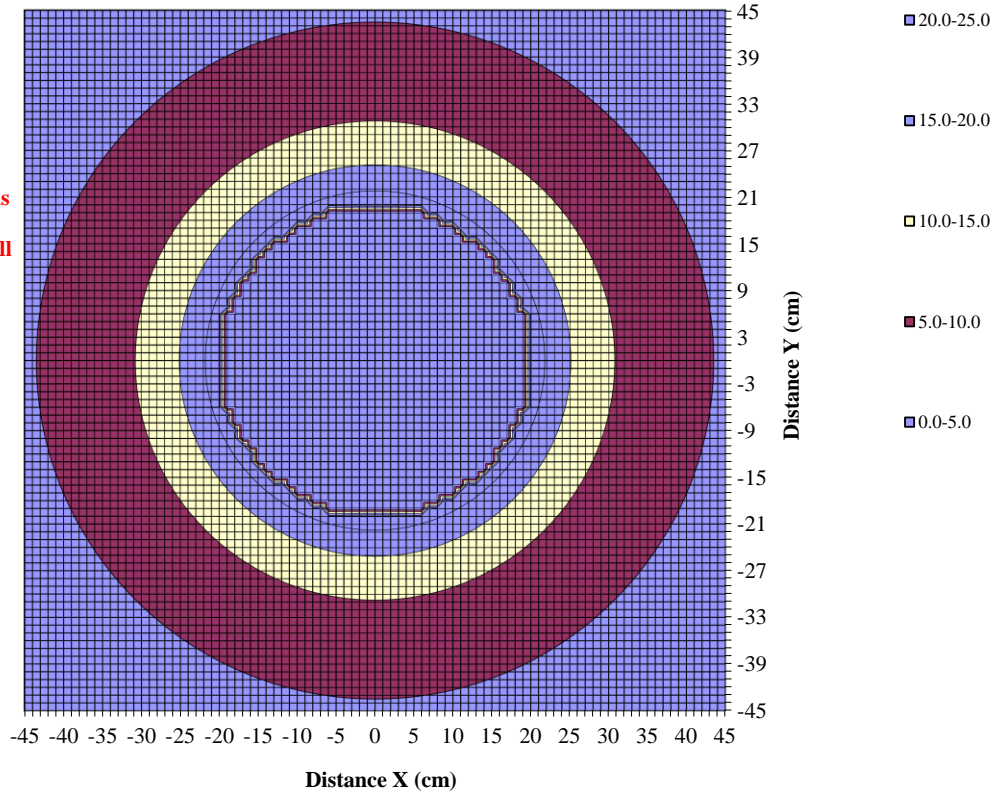


Maximum % of MPE limit at 20 cm separation distance: 25.1%

1 tx antenna @ 28.6dBm, gain = 2.15dBi

% MPE Contour

Note: The 0% contour surrounding the antennas identifies a 20 cm perimeter surrounding all active antennas

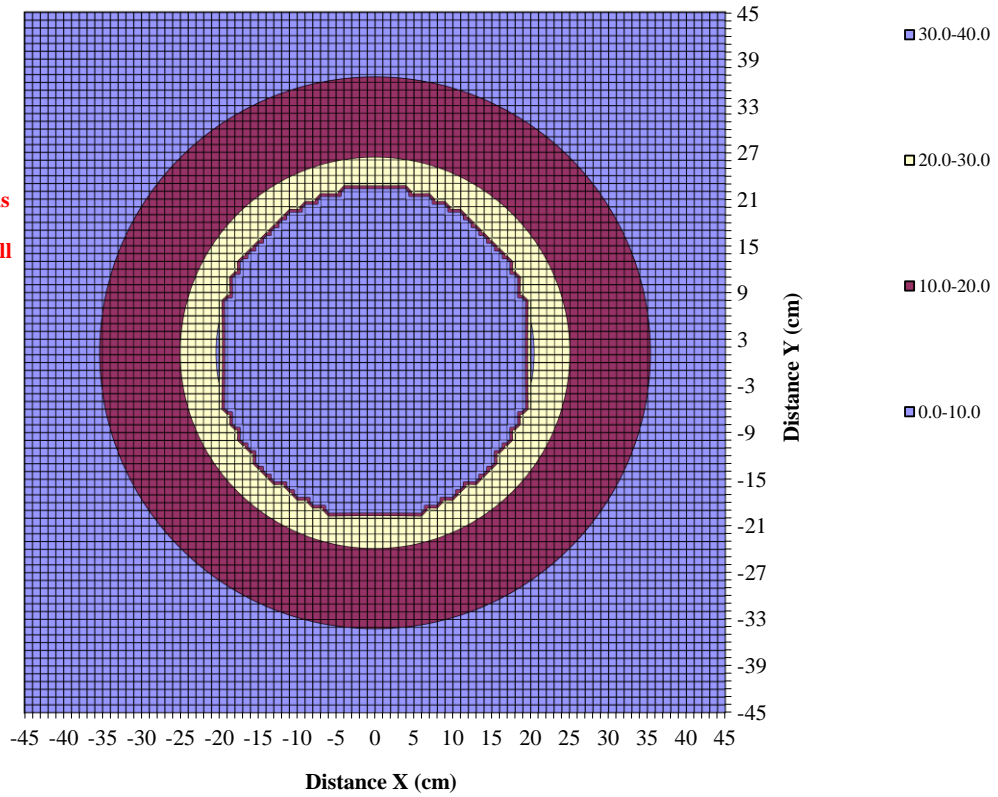


Maximum % of MPE limit at 20 cm separation distance: 23.6%

2 tx Antennas @ 26.8dBm, gain for each = 2.15dBi

% MPE Contour

Note: The 0% contour surrounding the antennas identifies a 20 cm perimeter surrounding all active antennas

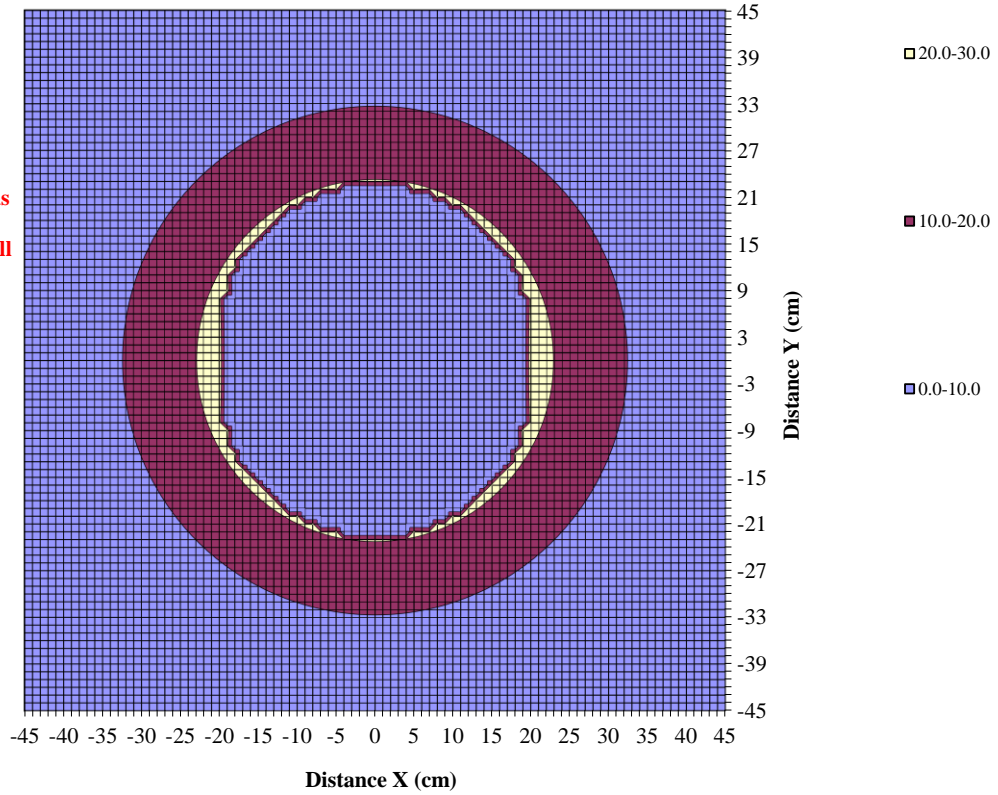


Maximum % of MPE limit at 20 cm separation distance: 31.1%

3 tx Antennas @ 24.3dBm, gain for each = 2.15dBi

% MPE Contour

Note: The 0% contour surrounding the antennas identifies a 20 cm perimeter surrounding all active antennas



Maximum % of MPE limit at 20 cm separation distance: 26.1%

3 Revision History

Revision Level	Description of changes	Revision Date
0	Initial release	22 March 2023
1	Power density formula added in section 2.2	23 March 2023