



RF Exposure Evaluation Report

FOR:

Manufacturer: 3SI Security Systems

Model Name: AT140317US

Product Description: Asset Tracking and Alert Device

FCC ID: Q6KAT140317A

IC ID: 5043A-AT140317A

References:

1. FCC OET Bulletin 65 Supplement
2. FCC CFR Part 1 (1.1307 & 1.1310), Part 2 (2.1091)
3. RSS-102- Radio Frequency Exposure Compliance of Radio communication Apparatus
Issue 4 March 2010, Ch, 2.5 and Ch. 4

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1 Assessment

This report serves as the Technical Information regarding RF Exposure evaluation of the below identified device according to the rules as stipulated in the documents listed under References above.


The device meets the RF exposure limits, or - for some of it's radio functions / bands - the conditions for exemption from routine evaluation as defined in the referenced FCC and IC rule parts.

Company	Description	Model #
3SI Security Systems	Asset Tracking and Alert Device	AT140317US

Responsible for Testing Laboratory:

2014-07-07	Compliance	Josie Sabado (Test Lab Manager)	 Singing on Behalf of Franz Engert (Compliance Manager)
Date	Section	Name	Signature

Responsible for the Report:

2014-07-07	Compliance	James Donnellan (Sr Emc Engineer)	 Digitally signed by James Donnellan DN: cn=James Donnellan, c=US, o=Cetecom Inc., ou=Compliance, email=james.donnellan@cetecom.com Date: 2014.07.09 17:31:11 -07'00'
Date	Section	Name	Signature

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
Address:	411 Dixon Landing Road Milpitas, CA 95035 U.S.A.
Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
Test Lab Manager:	Franz Engert
Test Engineer:	James Donnellan

2.2 Identification of the Client

Applicant's Name:	3SI Security Systems
Street Address:	486 Thomas Jones Way
City/Zip Code	Exton, PA 19341
Country	USA
Contact Person:	Brandon Cromer
Phone No.	610-280-2043
e-mail:	brandon_cromer@3sisecurity.com

2.3 Identification of the Manufacturer

Manufacturer's Name:	Same as client
Manufacturer Address:	
City/Zip Code	
Country	

3 Equipment under Test (EUT)

3.1 Specification of the Equipment under Test

Marketing Name:	Asset Recovery Device
Model No:	AT140317US
Product Description:	Asset Tracking and Alert Device
FCC-ID:	Q6KAT140317A
IC-ID :	5043A-AT140317A
Supported frequency bands of operation:	GSM/GPRS: 850/900/1800/1900 MHz UMTS: FDD I, II, IV, V & VIII Beacon Transmitter: 216.475 MHz & 219.6MHz
Type(s) of Modulation:	GMSK/ QPSK & 16QAM
Antenna Info:	PCB Trace Inverted F type
Rated Operating Voltage Range(DC):	Internal Battery Operated V min: 3.3V – V max: 4.2V
Rated Operating Temperature Range:	-20 °C to 60 °C
Test Sample status:	Production
Prototype / Production unit:	Prototype
Dates of Testing:	2014-05-05 to 2014-05-25

4 RF Exposure Evaluation Requirements

4.1 FCC:

Calculations can be made to predict RF field strength and power density levels around typical RF sources using the general equations (3) and (4) on page 19 of the following FCC document: "OET Bulletin 65, Edition 97-01 - Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields".

The table below is excerpted from Table 1B of 47 CFR 1.1310 titled Limits for Maximum Permissible Exposure (MPE), Limits for General Population/Uncontrolled Exposure:

Frequency Range (MHz)	Power density (mW/cm ²)	Averaging time (minutes)
300 – 1500	f (MHz) /1500	30
1500 – 100.000	1.0	30

Using the equation from page 19 of OET Bulletin 65, Edition 97-01:

$$S = \frac{PG}{4\pi R^2}$$

where: S = power density (in appropriate units, e.g. mW/cm²)
P = power input to the antenna (in appropriate units, e.g., mW)
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

Note:

1. This device is used only for fixed and mobile applications.

Additionally, according to § 2.1091:

The limit for <1.5 GHz mobile operations where no routine evaluation is required is: 1.5W ERP
The limit for >1.5 GHz mobile operations where no routine evaluation is required is: 3W ERP

4.2 IC:

RSS-102 Section 2.5.2

RF exposure evaluation is required if the separation distance between the user and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 1.5 GHz and the maximum EIRP of the device is equal to or less than 2.5 W;
- at or above 1.5 GHz and the maximum EIRP of the device is equal to or less than 5 W.

RSS-102 4.2: RF Field strength limits for devices used by the General Public (Uncontrolled Environment):

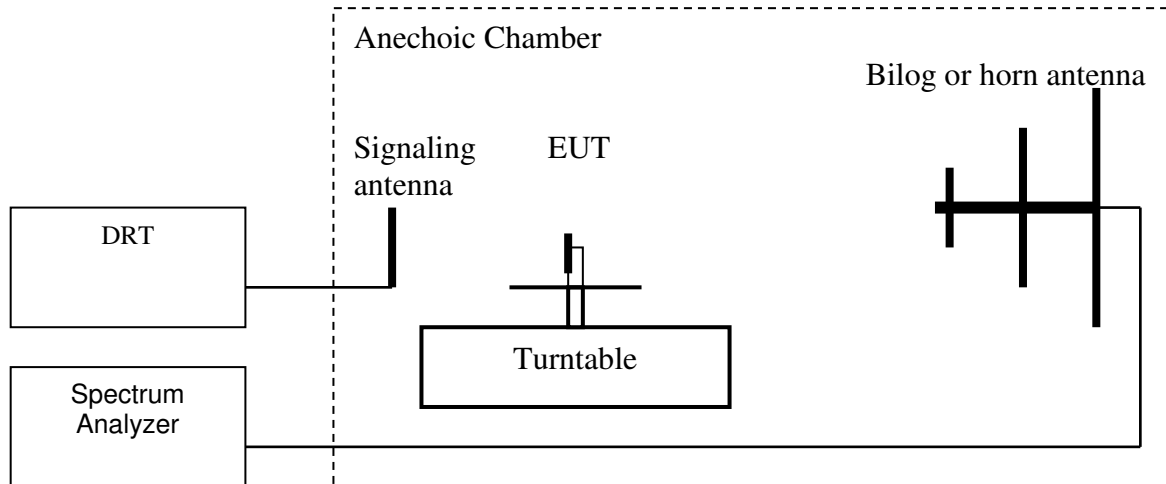
Power density

$$300\text{MHz}- 1500 \text{ MHz}= f/150 \text{ W/m}^2$$

$$1500 \text{ MHz}- 1500000 \text{ MHz}= 10 \text{ W/m}^2$$

5 Measurement procedure:

5.1 Radiated power measurement- ERP/EIRP-

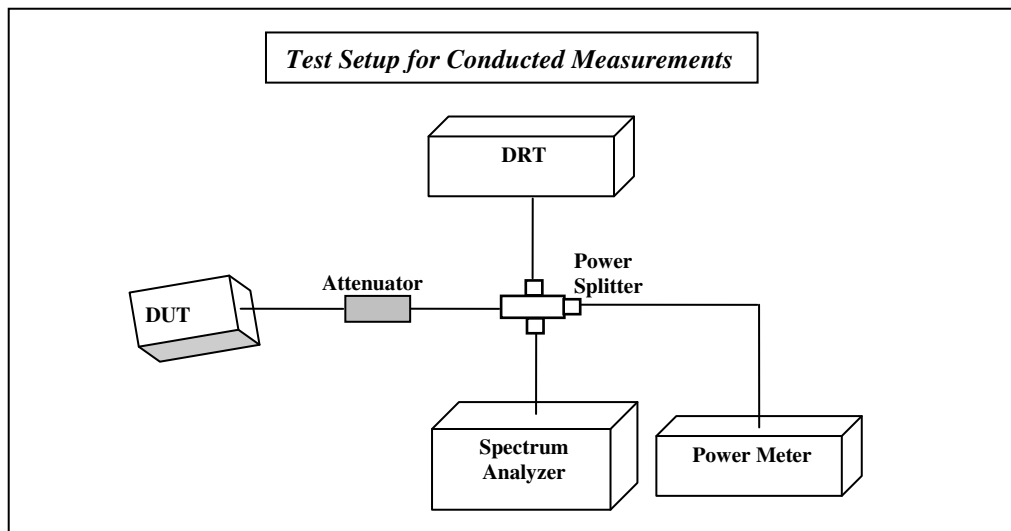


1. Connect the equipment as shown in the above diagram with the EUT's antenna in center of the turn table.
2. Adjust the settings of the Digital Radio Communication Tester (DRT) to set the EUT to its maximum power at the required channel.
3. Set the spectrum analyzer to the channel frequency. Set the analyzer to measure peak hold with the required settings.
4. Rotate the EUT 360°. Record the peak level in dBm (**LVL**).
5. Replace the EUT with a vertically polarized half wave dipole or known gain antenna. The center of the antenna should be at the same location as the center of the EUT's antenna.
6. Connect the antenna to a signal generator with known output power and record the path loss in dB (**LOSS**). **LOSS** = Generator Output Power (dBm) – Analyzer reading (dBm).
7. Determine the ERP using the following equation:
ERP (dBm) = LVL (dBm) + LOSS (dB)
8. Determine the EIRP using the following equation:
EIRP (dBm) = ERP (dBm) + 2.14 (dB)
9. Measurements are to be performed with the EUT set to the low, middle and high channel of each frequency band.

Measurement uncertainty: +/-3.0 dB

(**Note:** Steps 5 and 6 above are performed prior to testing and **LOSS** is recorded by test software. Steps 3, 4, 7 and 8 above are performed with test software.)

5.2 Radiated power Calculation- ERP/EIRP-



1. Connect the equipment as shown in the above diagram.
2. Adjust the settings of the Digital Radio Communication Tester (DRT) to connect the EUT at the required channel (OR) alternatively use the EUT to set to transmit at a specific mode.
3. Measure conducted power using the power meter or the Spectrum Analyzer.
4. ERP/EIRP is calculated by adding the antenna gain to the measured conducted power.

EIRP= Measured conducted power+ Antenna Gain (dBi)

(Antenna gain based on measurement or data from the antenna manufacturer.)

ERP= EIRP- 2.14

5.3 Measurement Equipment information:

No.	Equipment Name	Manufacturer	Type/model	Serial No.	Cal Date	Cal Interval
3m Semi- Anechoic Chamber:						
	Digital Radio Comm. Tester	Rohde&Schwarz	CMU 200	101821	Jun 2013	2 Years
	EMC32 Measurement Software	Rohde&Schwarz	8.52.0	N/A	N/A	N/A
	Turn table	EMCO	2075	N/A	N/A	N/A
	MAPS Position Controller	ETS Lindgren	2092	0004-1510	N/A	N/A
	Antenna Mast	EMCO	2075	N/A	N/A	N/A
	Relay Switch Unit	Rohde&Schwarz	RSU	338964/001	N/A	N/A
	EMI Receiver/Analyzer	Rohde&Schwarz	ESU 40	100251	Sep 2013	1 Year
	1500MHz HP Filter	Filtek	HP12/1700	14c48	N/A	N/A
	2800 MHz HP Filter	Filtek	HP12/2800	14C47	N/A	N/A
	Pre-Amplifier	Miteq	JS40010260	340125	N/A	N/A
	Binconilog Antenna	EMCO	3141	0005-1186	Apr 2012	3 Years
	Horn Antenna	EMCO	3115	35114	Mar 2012	3 Years
	Horn Antenna	ETS Lindgren	3116	70497	Mar 2012	3 Years
	Spectrum Analyzer	Rohde&Schwarz	FSU	100189	Jun 2013	2 Years
	Loop Antenna 6512	ETS Lindgren	6512	49838	Mar 2014	3 Years
Ancillary equipment						
	Humidity Temperature Logger	Dickson	TM320	03280063	Apr 2013	2 Year
	Communication Antenna	IBP5-900/1940	Kathrein	N/A	N/A	N/A

5.4 Measurement Summary:

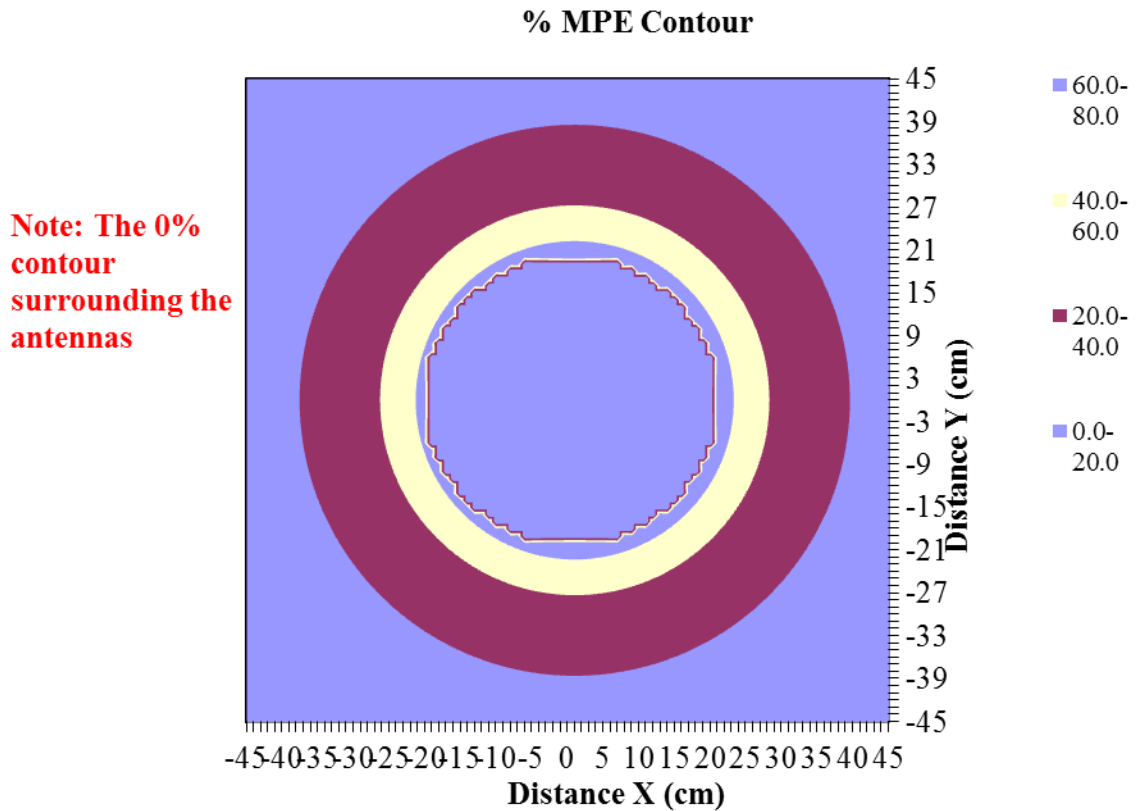
Band of operation	Peak Radiated Power-EIRP		Limits (IC) (where no routine evaluation is required)	Peak Radiated Power ERP		Limits (FCC) (where no routine evaluation is required)
	MHz	dBm		mW	dBm	
GSM/GPRS 824.2-848.8	33.237	2107.2	2500	31.097	1287.35	1500
GSM/GPRS 1850.2-1909.8	30.968	1250.26	5000	28.828	763.48	3000
VHF 219.6	-23.194	.0047	2500	-25.334	.0029	1500
VHF 216.475	-24.433	.0036	2500	-26.573	.0022	1500

Since the Peak ERP <3W (FCC) and Peak EIRP <5W (IC), this device is exempt from Routine evaluation.

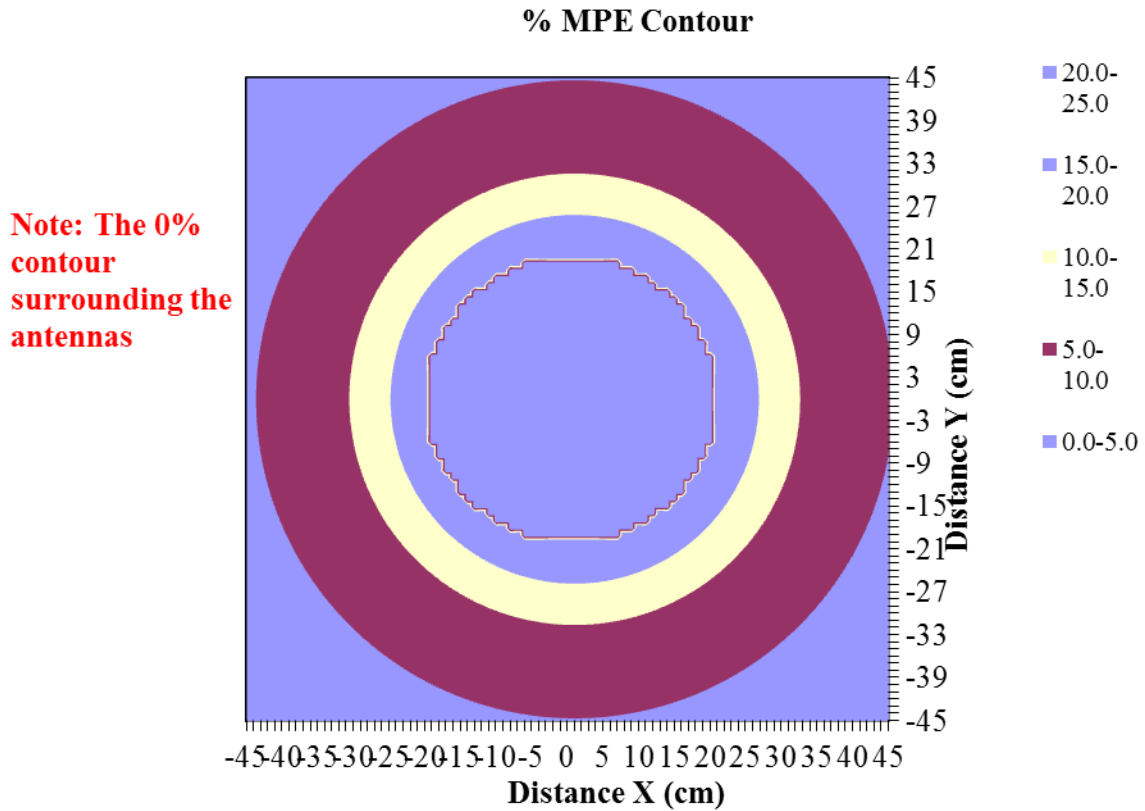
Prediction for Simultaneous Transmission

The MPE limit was made using a separation distance of 1 cm to represent the worse case. Output power listed below is for 50% duty cycle in GSM mode.

Antenna No.		Total	1	2
Tx Status			On	On
Frequency	MHz		219.6	848.09
MPE Limit	mW/cm ²		0.20	0.57
Max % MPE	%	74.1	0.0	74.1
Power	(W)	2.107	0.000	2.107
Antenna Gain	dBi		0.00	0.00
EIRP	(W)	2.11	0.000	2.107
X	(cm)		0.0	1.0
Y	(cm)		0.0	0.0



Antenna No.		Total	1	2
Tx Status			On	On
Frequency	MHz		219.6	1879.64
MPE Limit	mW/cm2		0.20	1.00
Max % MPE	%	24.9	0.0	24.9
Power	(W)	1.250	0.000	1.250
Antenna Gain	dBi		0.00	0.00
EIRP	(W)	1.25	0.000	1.250
X	(cm)		0.0	1.0
Y	(cm)		0.0	0.0

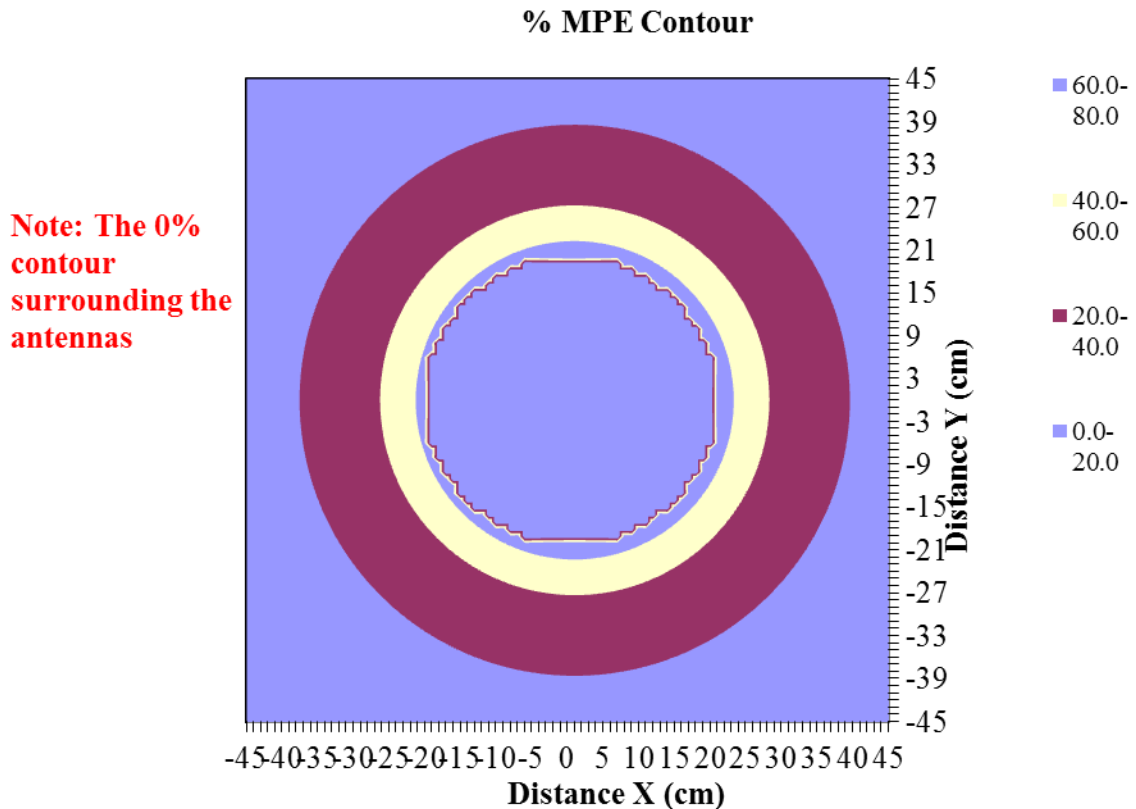


Verdict: Since the max MPE is <100%, the device is compliant in simultaneous transmission mode for the Beacon Transmitter and GSM 850/1900 MHz bands of operation.

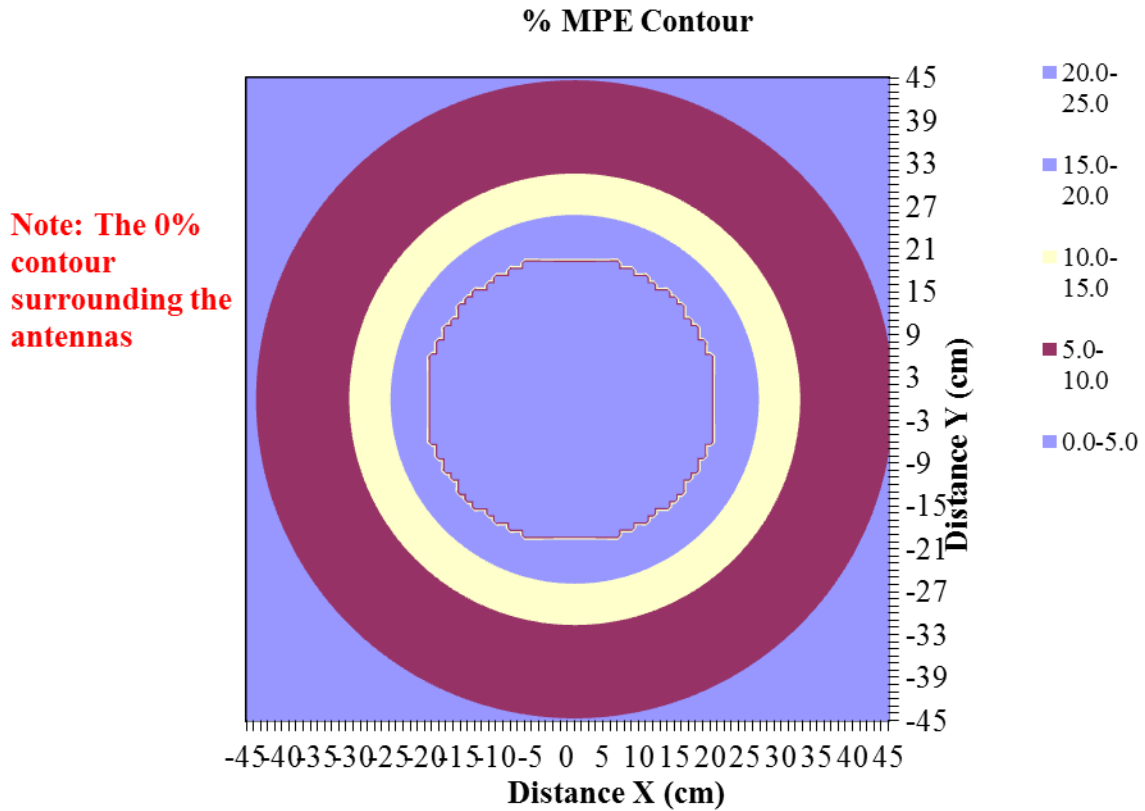
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Power	(W)	2.107	0.000	2.107
Antenna Gain	dBi		0.00	0.00
EIRP	(W)	2.11	0.000	2.107
X	(cm)		0.0	1.0
Y	(cm)		0.0	0.0



Antenna No.		Total	1	2
Tx Status			On	On
Frequency	MHz		216.47	1879.64
MPE Limit	mW/cm ²		0.20	1.00
Max % MPE	%	24.9	0.0	24.9
Power	(W)	1.250	0.000	1.250
Antenna Gain	dBi		0.00	0.00
EIRP	(W)	1.25	0.000	1.250
X	(cm)		0.0	1.0
Y	(cm)		0.0	0.0



6 Revision History

Date	Report Name	Changes to report	Report prepared by
2011-7-8	EMC_ETHEO_018_14001_MPE	Original	James Donnellan