



Radio Frequency Exposure Evaluation Report

for

3SI Security Systems

Model: AT140901US

Asset Tracking and Alert Device

FCC ID: Q6KAT140901A

IC Certification Number: 5043A-AT140901A

Applied Rules and Standards

**CFR Part Part 1 (1.1307 &1.1310), Part 2 (2.1091),
FCC KDB 447498 D01 General 24 RF Exposure Guidance v05r02**

Industry Canada RSS-102, Issue 4 of March 2010

Report number: EMC-3SISE-040-14001_MPE_Rev0

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1 Administrative Data

1.1 Identification of the Testing Laboratory Issuing the Test Report

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1.2 Identification of the Client / Manufacturer

Applicant's Name:	3SI Security Systems
Street Address:	2055 N Brown Road, ste 225, Lawrenceville
City/Zip Code	GA 30043
Country	USA
Contact Person:	Waldemar Sierocinski
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2 Equipment under Assessment

Marketing Name / Description:	Asset Tracking and Alert Device
Model Number:	AT140901US
FCC-ID :	Q6KAT140901A
IC Cert Number:	5043A-AT140901A
Product Description:	Asset Tracking and Alert Device equipped with 3G cellular radio module, beacon radio and GPS
Transmitter information:	<ol style="list-style-type: none"> 1. 3G cellular radio module: Telit, model UE910-NAD, FCC-ID: RI7UE910NA, IC ID: 5131A-UE910NA, GSM 850/1900MHz, GPRS / EDGE multi-slot class 12/33 operation WCDMA / HSPA+ 850/1900/ MHz; 2. 216.475 MHz / 219.6 MHz* / Beacon (*US only), pulsed CW at 20% duty cycle; 3. GPS 1575.42 MHz;
Co-located Transmitters/ Antennas?	<input checked="" type="checkbox"/> Yes (Cellular and Beacon) <input type="checkbox"/> No
Device Category:	<input checked="" type="checkbox"/> Fixed Installation <input type="checkbox"/> Mobile <input type="checkbox"/> Portable <input type="checkbox"/> mixed Mobile and Portable
Exposure Category:	<input type="checkbox"/> Occupational/ Controlled <input checked="" type="checkbox"/> General Population/ Uncontrolled
Antenna info:	<i>cellular: internal: inverted F Antenna,</i> 850MHz: +2.4 dBi, 1900MHz: +2.8 dBi <i>beacon (pcb loop): less than minus 30 dBi;</i>
Rated Operating Voltage Range:	Vmin: 3.4V - Vmax: 4.2V
Rated Operating Temperature Range:	Tmin: -20°C/ Tmax: 60°C
Test Sample Status:	Prototype

3 Assessment

This RF Exposure evaluation report provides information about compliance of the below identified device with the RF Exposure limits for mobile or fixed devices as defined in FCC CFR Part 1 (1.1307 & 1.1310), Part 2 (2.1091) and IC standard RSS-102 under given conditions (measured or rated RF output power, antenna gain, distance towards human body, multiple transmitter information as presented by the applicant).

In addition, maximum antenna gain or minimum distance towards the human body is calculated, respectively, where relevant.

The device meets the limits as stipulated by the above given FCC and IC rule parts based on available specifications.

Company	Description	Model #
3SI Security Systems	Asset Tracking and Alert Devices	AT140901US

Report reviewed by:

2014-12-18	Compliance	Franz Engert (Compliance Manager)	
Date	Section	Name	Signature

Responsible for the Report:

2014-12-18	Compliance	James Donnellan (EMC Engineer)	
Date	Section	Name	Signature

4 RF Exposure Limits and FCC and IC Basic Rules

For the specific described radio apparatus the following basic limits and rules apply for both, FCC and IC where not indicated differently.

4.1 Maximum Permissible Exposure (MPE) Limits acc. to FCC 1.1310(e) / RSS-102, cl. 4.2:

Frequency Range (MHz)	Power density (mW/cm ²)	Averaging time (minutes)
300 – 1500	f (MHz) / 1500	30 (IC:6)
1500 – 100.000 (IC:1500 – 150000)	1.0	30 (IC:6)

4.2 Routine Environmental Evaluation Categorical Exclusion Limits acc. to FCC 2.109(c) / RSS-102, cl. 2.5 (rounded to 1 decimal point):

Operating frequency < 1.5GHz: excluded if ERP < 1.5W / 31.8dBm (IC: 2.5W / 34.0dBm EIRP);
Operating frequency > 1.5GHz: excluded if ERP < 3.0W / 34.8dBm (IC: 5.0W / 37.0dBm EIRP);

4.3 EMC Output Power Limits (ERP/EIRP) acc. to FCC part 22/24/27 / IC RSS-132, RSS-133, RSS-139 (to be additionally taken into account for maximum antenna gain considerations)

part 22: 7W ERP / 38.5dBm (IC: 11.5W / 40.6dBm EIRP)
part 24: 2W EIRP / 33.0dBm
part 27: 1W EIRP / 30.0dBm

Per KDB 447498 D01 FCC allows calculative estimation of RF exposure for mobile applications when routine environmental evaluation categorical exclusion applies and also for fixed applications.

When categorical exclusion cannot be claimed for mobile applications MPE measurement is required for TCB approval.

RSS-102 of Industry Canada does generally not require RF exposure evaluation for fixed or mobile applications which stay below the given exclusion limits.

4.4 RF Exposure Estimation (MPE Estimation)

Having available the source based average output power and peak antenna gain or the ERP/EIRP of the specified device and for a known minimum distance of it's radiating structures from the body of persons according to it's use cases (at least 20cm) the power density at that distance can be estimated by the following formula for plane-wave equivalent conditions (far-field conditions), when ground reflection is neglected.

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

where: S = power density (mW/cm² or W/m²)

P = power input to the antenna (mW or W)

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 (cm or m)

5 Evaluations

The following calculations are – for the portion of the cellular transmitter - based on the specified maximum conducted average output power of the cellular module incorporated in the EUT and thus – considering the specified peak antenna gain of the internal antennae - resulting in the theoretical worst case maximum average ERP/EIRP, because all measured conducted average values are lower.

5.1 Routine Environmental Evaluation Applicability

Based on the theoretical maximum average ERP/EIRP, see above.

Pmax is the target conducted output power plus the upper tolerance as specified for the integrated cellular module for the diverse transmission modes .

For the beacon transmitter the maximum output power value is taken from the relevant part 90 and part 95 emc reports being part of the exhibits filed for FCC/IC certification of this product;

Only the known worst cases with highest resulting average EIRP are listed per band.

Transmission Mode	Pmax (Target Power + Upper Tolerance)	Peak Gain + cable attenuation	Duty Cycle	EIRP, source based time averaged (EIRP _{max})	Total EIRP simultaneous transmissions intra-band (worst cases only)	FCC & IC Limit for Routine Environmental Evaluation Applicability, EIRP	Excluded?
	dBm	dB	%	dBm	dBm	dBm	
GPRS 850 1TS	32.5+1	+2.4 dBi	12.5	26.9	n.a.	33.9	yes
GPRS 850 2TS	32.5+1	+2.4 dBi	25	29.9	n.a.	33.9	yes
GPRS 850 3TS	32.5+1	+2.4 dBi	37.5	31.65	n.a.	33.9	yes
GPRS 850 4TS	32.5+1	+2.4 dBi	50	32.9	n.a.	33.9	yes
WCDMA Bd V	23+1	+2.4 dBi	100	26.4	n.a.	33.9	yes
GPRS 1900 1TS	29.5+1	+2.8 dBi	12.5	24.3	n.a.	36.9	yes
GPRS 1900 2TS	29.5+1	+2.8 dBi	25	27.3	n.a.	36.9	yes
GPRS 1900 3TS	29.5+1	+2.8 dBi	37.5	29.05	n.a.	33.9	yes
GPRS 1900 4TS	29.5+1	+2.8 dBi	50	30.3	n.a.	36.9	yes
WCDMA Bd II	23+1	+2.8 dBi	100	26.8	n.a.	36.9	yes
Beacon				< - 20.0	n.a.	36.9	yes

highest powers within bands in bold letters;

Result: The transmitters in the equipment are categorically excluded from Routine Environmental Evaluation. There are no intra-band co-transmissions possible in the device.

Also, the beacon transmitter can be neglected for simultaneous transmission considerations due to it's very low output power.

5.2 Compliance with MPE (Power Density) limits

Limits:

Smax @ 824MHz = 0.55mW/cm² (824MHz is the worst case as lowest operating frequency in the cellular band);

Smax @ 1900MHz and @ 2400MHz = 1.0mW/cm²;

Taking the highest source base time averaged EIRPmax per band according to the table in section 5.1 above, applying the plane wave power density formula: $S = \text{EIRPmax} / 4 * \pi * r^2$
for the minimum distance of $r = 20\text{cm}$:

Highest source base time averaged EIRP with GPRS 850 MHz, 4TS: **32.9 dBm**;

Resulting maximum power density at 850MHz: **S(850MHz) = 0.39 mW/cm²**

Highest source base time averaged EIRP with GPRS 1900 MHz, 4TS: **30.3 dBm**;

Resulting maximum power density at 1900MHz: **S(1900MHz) = 0.21 mW/cm²**

Result: The equipment fulfills the MPE limits for the minimum distance between the antenna and the human body of 20cm, for the rated peak antenna gain.

5.3 Simultaneous Transmission MPE Test Exclusion (per KDB 447498 D01)

n.a. due to very low power of beacon transmitter.

5.4 Maximum allowed Antenna Gain - Gmax

n.a. since only internal antenna is used.

6 Revision History

Date	Report Name	Revision	Prepared By
2014-12-18	EMC-3SISE-040-14001_MPE	Initial Release	James Donnellan