Radio Frequency Exposure Evaluation Report

FOR:
Telular Corporation

Model Number:
ST90M

Marketing Name:
ST90 CAT-M

Product Description:
Tank level monitoring

FCC ID: MTFST90M
IC: 2175D-ST90M

Per:
CFR Part Part1 (1.1307 &1.1310), Part 2 (2.1091),
FCC KDB 447498 D01 General RF Exposure Guidance v06
ISEDC RSS-102 Issue 6

Report number: EMC_TELUL_222_24001_FCC_ISED_RF_Exposure

DATE: 2024-05-28

***CETECOM* Inc.**
411 Dixon Landing Road ◆ Milpitas, CA 95035 ◆ U.S.A.
Phone: + 1 (408) 586 6200 ◆ Fax: + 1 (408) 586 6299 ◆ E-mail: Contact@cetecom.com ◆ http://www.cetecom.com
CETECOM Inc. is a Delaware Corporation with Corporation number: 2905571

1 Assessment

This RF Exposure evaluation report provides evidence for compliance of the below identified device with the RF Exposure limits for mobile devices as defined in FCC CFR Part 1 (1.1307 &1.1310), Part 2 (2.1091) and IC standard RSS-102 issue 6 under worst case 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 for worst case conditions at 20cm distance to the body.

Company	Description	Model #
Telular Corporation	Tank level monitoring	ST90M

Responsible for the Report:

Date	Section	Name	Signature
2024-05-28	Compliance	Cheng Song (EMC Engineer)	cheng.song@cetecom.com Digitally signed by: cheng.song@cetecom.com DN: CN = cheng.song@cetecom.com Date: 2024.05.28 18:01:45 -07'00'

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
Street Address:	411 Dixon Landing Road
City/Zip Code	Milpitas, CA 95035
Country	USA
Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
EMC Engineer:	Cheng Song
Responsible Project Leader:	Sangeetha Sivaraman

2.2 Identification of the Client / Manufacturer

Client's Name:	Telular Corporation
Street Address:	3225 Cumberland Blvd.
City/Zip Code	Suite 300, Atlanta, GA 30339
Country	USA

Identification of the Manufacturer

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

3 Equipment under Assessment

<table>
<tr><td>Model No:</td><td>ST90M</td></tr>
<tr><td>Brand:</td><td>Tank Monitoring</td></tr>
<tr><td>HW Version :</td><td>A</td></tr>
<tr><td>SW Version :</td><td>2.50</td></tr>
<tr><td>FCC-ID :</td><td>MTFST90M</td></tr>
<tr><td>IC:</td><td>2175D-ST90M</td></tr>
<tr><td>Hardware Version Identification Number (HVIN):</td><td>ST90M</td></tr>
<tr><td>Product Marketing Name (PMN):</td><td>ST90 CAT-M</td></tr>
<tr><td>Product Description:</td><td>Tank level monitoring</td></tr>
<tr><td>Radio Information:</td><td><u>ISM:</u>
• Module: Texas Instruments CC1200 Chipset
• Frequency of Operation: 902-928 MHz

<u>Cellular:</u>
• Module: Telit ME910G1-W1
• LTE Bands: 2, 4, 12, 13
• FCC ID: RI7ME910G1W1; IC: 5131A-ME910G1W1 (CAT-M1)</td></tr>
<tr><td>Antenna Information:</td><td><u>LTE ISM US FPC Dual Feed Embedded Antenna:</u>
<table>
<tr><th>Feed</th><th>ISM</th><th colspan="2">LTE</th></tr>
<tr><td>Frequency (MHz)</td><td>902 - 928 MHz</td><td>700 - 900 MHz</td><td>1710 – 2155 MHz</td></tr>
<tr><td>Average Efficiency</td><td>50%</td><td>52%</td><td>59%</td></tr>
<tr><td>Peak Gain</td><td>0.5dBi</td><td>0.9dBi</td><td>3dBi</td></tr>
<tr><td>VSWR Match</td><td>2.0:1 max</td><td>4.5:1 max</td><td>3.5:1 max</td></tr>
</table></td></tr>
<tr><td>Maximum Conducted Output Power:</td><td><u>ISM:</u> 10.38 dBm

<u>Cellular:</u>
• LTE 2: 22 dBm
• LTE 4: 22 dBm
• LTE 12: 22 dBm
• LTE 13: 22 dBm</td></tr>
<tr><td>Power Supply/ Rated Operating Voltage Range:</td><td>Vmin: 5 VDC/ Vnom: 6 VDC / Vmax: 6.3 VDC</td></tr>
<tr><td>Operating Temperature Range:</td><td>-30 °C to 70 °C</td></tr>
<tr><td>Sample Revision:</td><td>☐Production Unit; ■Pre-Production</td></tr>
<tr><td colspan="2">Note: Details about the Equipment Under Test (EUT) are provided by the client or applicant.</td></tr>
</table>

4 RF Exposure Limits and FCC and IC Basic Rules

4.1 Routine Environmental Evaluation Categorical Exclusion Limits according to FCC 1.1307(b)(3)(i)(B), and FCC 1.1307(b)(3)(ii)(B)

Single RF sources is exempt if the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold Pth (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). Pth is given by:

$$P_{th}\ (\text{mW}) = \begin{cases} ERP_{20\ cm}(d/20\ \text{cm})^{x} & d \le 20\ \text{cm} \\ ERP_{20\ cm} & 20\ \text{cm} < d \le 40\ \text{cm} \end{cases}$$

Where

$$x = -\log_{10}\left(\frac{60}{ERP_{20\ cm}\sqrt{f}}\right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20\ cm}\ (\text{mW}) = \begin{cases} 2040f & 0.3\ \text{GHz} \le f < 1.5\ \text{GHz} \\ 3060 & 1.5\ \text{GHz} \le f \le 6\ \text{GHz} \end{cases}$$

d = the separation distance (cm);

In the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation.

$$\sum_{i=1}^{a}\frac{P_i}{P_{\text{th},i}} + \sum_{j=1}^{b}\frac{ERP_j}{ERP_{\text{th},j}} + \sum_{k=1}^{c}\frac{Evaluated_k}{Exposure\ Limit_k} \le 1$$

4.2 Field reference level (FRL) exposure exemption limits according to RSS-102 Issue 6, section 6.6

Field reference level (FRL) exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm (i.e. mobile devices), except when the device operates as follows:

- below 20 MHz and the source-based, time-averaged maximum EIRP. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 4.49/f0.5 W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1.31 x 10-2 f0.6834 W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the EIRP was derived.

5 Evaluations

5.1 Analysis of RF Exposure

FCC

Tech-Band	Freq-Low[GHz]	Pwr[dBm]	Power[W]	Ant-G[dBi]	EIRP[W]	ERP[mW]	FCC 2.1091(c)(1) Pth[mW] = ERP20cm
LTE 2	1.8550	22.00	0.158	3.00	0.316	192.752	3060.00
LTE 4	1.7150	22.00	0.158	3.00	0.316	192.752	3060.00
LTE 12	0.7040	22.00	0.158	0.90	0.195	118.850	1436.16
LTE 13	0.7795	22.00	0.158	0.90	0.195	118.850	1590.18
Tech-Band	**Freq-Low[GHz]**	**Pwr[dBm]**	**Power[W]**	**Ant-G[dBi]**	**EIRP[W]**	**ERP[mW]**	**FCC 2.1091(c)(1) Pth[mW] = ERP20cm**
ISM	0.9020	10.38	0.011	0.50	0.012	7.464	1840.08

The worst simultaneous transmissions is LTE B12 and ISM:
TER (Total Exposure Ratio) = 0.116
RF exposure exemption applicable

IC

Tech-Band	Freq-Low [MHZ]	Pwr[dBm]	Power[W]	Ant-G [dBi]	EIRP[W]	Exemption limit for Routine Evaluation
LTE 2	1855.0	22.00	0.158	3	0.316	2.24
LTE 4	1715.0	22.00	0.158	3	0.316	2.13
LTE 12	704.0	22.00	0.158	0.9	0.195	1.16
LTE 13	779.5	22.00	0.158	0.9	0.195	1.24
Tech-Band	**Freq-Low [MHZ]**	**Pwr[dBm]**	**Power[W]**	**Ant-G [dBi]**	**EIRP[W]**	**Exemption limit for Routine Evaluation**
ISM	902.0	10.38	0.011	0.5	0.012	1.37

The worst simultaneous transmissions is LTE B12 and ISM:
TER (Total Exposure Ratio) = 0.177
RF exposure exemption applicable

Revision History

Date	Report Name	Changes to report	Prepared by
2024-05-28	EMC_TELUL_222_24001_FCC_ISED_RF_Exposure	Initial Release	Cheng Song

<<< The End >>>