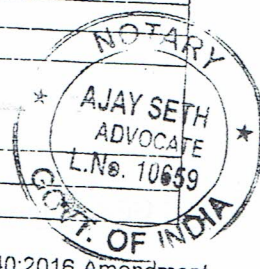


**TYPE APPROVAL TEST REPORT**

Report No. ARAI/AED/CT/SO-1819-3000002732/637  
Dated: 23-Aug-2018

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1.0	Name and Address of the Customer	Roadpoint Ltd E243, East of Kailsh, New Delhi-110065	
2.0	Customer Letter Reference	Email Date: 29-May-2018	
3.0	Test Objective	<b>Component Level Type Approval:</b> Testing of Intelligent Transport Systems (ITS) as per AIS 140: 2016 , amendment 1 (11 <sup>th</sup> December 2017) notified vide G.S.R. 1095 (E) dated 28 Nov 2016 and notified vide S.O 1663 (E) dated 18 April 2018.	
4.0	Description of the Device Under Test (DUT)	DUT Name	Vehicle Tracking Device with Emergency Button
4.1	Vehicle Tracking Device	Model Name	GAGAN-01
		Model No	GAGAN-01
		Hardware Version	1.0
		Software Version	1.0.0
		GPS chip Make and Model	MC60 Quectel
		GSM chip Make and Model	MC60 Quectel
		Embedded SIM Make and Service Providers	Tata Communication Ltd Idea, Airtel
3 axis accelerometer and 3 axis gyroscope Make & Model	MPU6050, TDK		
4.2	Emergency Button	Part No.	NOPOW
4.3	GPS Antenna	Internal Patch Antenna	



\*Note: This report of vehicle Tracking Device is for GPS constellation. However as per AIS 140:2016 Amendment 1, it is mandatory to provide support for IRNSS from 1<sup>st</sup> Oct 2018. Hence, this certificate is valid for interim period as per AIS 140:2016 guidelines as amended from time to time.

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PHOTOCOPY  
ATTESTED

Notary Public Delhi  
**AJAY SETH**  
Advocate

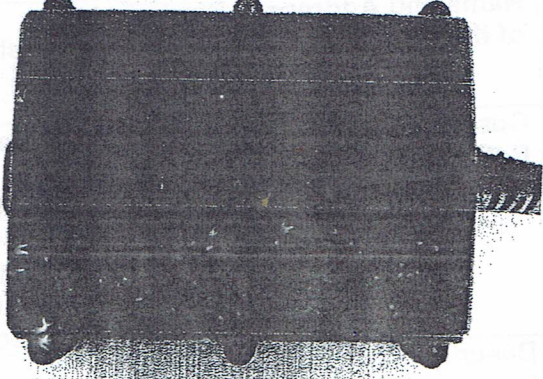
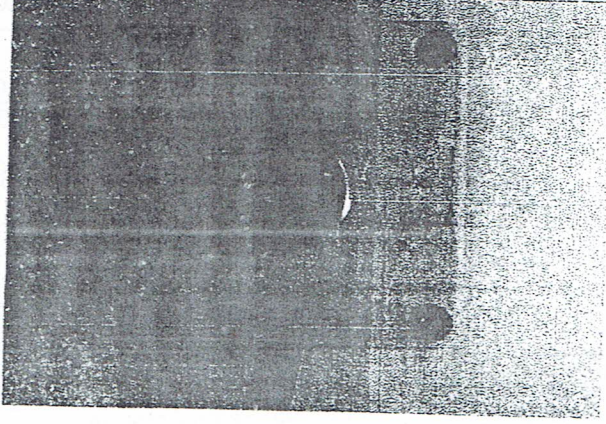
An ISO 9001, ISO 14001, OHSAS 18001 Certified Organization


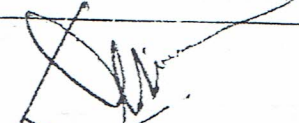

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5.0	Condition of the Test Component	The test components were received in good condition.
5.1	Vehicle Tracking Device	
5.2	Emergency Button	
5.3	GPS Antenna	Internal Patch Antenna

		
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<b>6.0 Laboratory Environment condition</b>			
Temperature	25.2°C	Humidity	46%

<b>7.0 Power Supply Details</b>			
Voltage	12V and 24V	Current Consumption	< 1 A

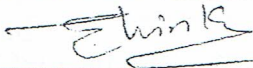
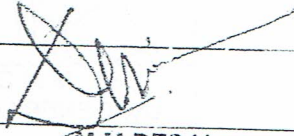
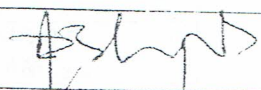
<b>8.0 DUT Details:</b>
DUT is a Vehicle Tracking System with Emergency Button Powered with 12V and 24V DC power supply. DUT has internal battery of 3 V. DUT has provision of internal as well as external GPS antenna. Tracking functionality test as per table 6A of AIS 140:2016 was performed before, during and after each test.

<b>9.0 FUNCTIONAL STATUS CLASSIFICATION</b>
<b>9.1 Class A</b> All functions of a device/system perform as designed during and after exposure to disturbance.
<b>9.2 Class B</b> All functions of a device/system perform as designed during exposure; however, one or more of them can go beyond specified tolerance. All functions return automatically to within normal limits after exposure is removed. Memory functions remain Class A.
<b>9.3 Class C</b> One or more functions of a device/system does not perform as designed during exposure but returns automatically to normal operation after exposure is removed.
<b>9.4 Class D</b> One or more functions of a device/system does not perform as designed during exposure and does not return to normal operation until exposure is removed and the device/system is reset by simple "operator/use" action.
<b>9.5 Class E</b> One or more functions of a device/system does not perform as designed during and after exposure and cannot be returned to proper operation without repairing or replacing the device/system.

		
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10.0 Test Details and Result:

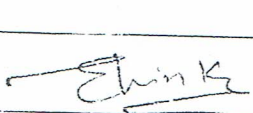

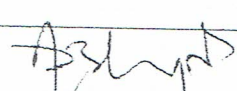
Clause No.	Requirement	Observation	Remark
3.0	ITS FUNCTIONS AND REQUIREMENTS		
	Safety and Security : Emergency Buttons and Vehicle Location Tracking (VLT) , The above functions and their requirements shall be met by only single device that can be interfaced by external emergency buttons. The communications to Backend Control Server (Government authorized server) shall be done by device as per the protocol and functionalities defined below.		
3.1	Vehicle Location Tracking (VLT) With Emergency Button		
3.1.1	Functional Requirements for VLT		
3.3.1.1	Device shall be capable of obtaining position information using Global Navigation Satellite System (GNSS). GNSS receiver specifications are as follows:		
a	Device shall be capable for operating in L and/or S band and include support for NAVIC/IRNSS (Indian Regional Navigation Satellite System) for devices installed on vehicles manufactured on or after 1st October, 2018. However VLT devices shall be compliant as per other GNSS constellation in the interim period.	DUT is capable for operating L band (1.57542 GHz) for GPS constellation.	Satisfactory.
b	The Device shall support GAGAN, the Indian SBAS (Satellite Based Augmentation System).	Verified from component datasheet.	Satisfactory.
c	Device shall have a position accuracy of minimum 2.5 m CEP or 6 m 2DRMS.	Tested and verified.	Satisfactory.

		
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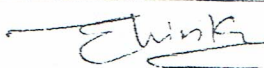
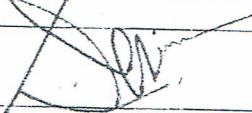

Clause No.	Requirement	Observation	Remark
d	Device shall have an acquisition sensitivity of minimum (-) 145 dBm with GNSS/ (-) 140 dBm IRNSS (NAVIC as applicable).	Observed acquisition sensitivity is (-) 145 dBm with GPS.	Satisfactory.
e	Device shall have a tracking sensitivity of minimum (-) 160 dBm with GNSS/ (-) 153 dBm IRNSS (NAVIC as applicable).	Observed tracking sensitivity is (-) 160 dBm with GPS.	Satisfactory.
f	Device shall have an internal antenna; however if in case of Integrated systems with vehicle OEM approved kits if the fitment location prevents the internal antenna from functioning, then external antenna may be provided.	DUT has inbuilt internal antenna.	Satisfactory.
3.1.1.2	Device shall support standard minimum I/Os as mentioned: 4 Digital, 2 Analogue Input and 1 Serial Communication (e.g. RS232) for interfacing external systems (E.g. Digital input for Emergency request button interfacing).	DUT has 4 digital I/O, 2 analogue I/O and 1 serial interface.	Satisfactory.
3.1.1.3	Device shall be capable of transmitting data to Backend Control Server (Government authorized server) via Wide Area (Mobile) Communications network (cellular) as per Communication Protocol in Section 4.	Verified.	Satisfactory.

		
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Clause No.	Requirement	Observation	Remark
3.1.1.4	Device shall be capable of transmitting Position, Velocity and Time (PVT data) along with heading (direction of travel) to a Backend Control Server (Government authorized server) at configurable frequency as per Communication Protocol of Section 4. The fixed frequency shall be user configurable, highest data transmission rate shall be 5 sec during vehicle operation and not less than 10 minutes in sleep/IGN OFF) as per the protocol defined in Communication Protocol of Section 4.	Verified.	Satisfactory.
3.1.1.5	Device shall be capable of transmitting data to minimum 2 different IP addresses (1 IP address for regulatory purpose (PVT data) and 1 IP address for Emergency response system other than the IP's required for Operational purpose.	Verified.	Satisfactory.
3.1.1.6	On pressing of Emergency button, the system implementing VLT function shall send emergency Alert (Alert ID 10 as mentioned in Sub-section 4.2.1 of Communication Protocol Section 4) to the configured IP address(s) as per the Communication Protocol mentioned in Section 4. In the absence of GPRS network, the emergency alert shall be sent as SMS message along with vehicle location data to configured control center number(s). The SMS shall consist parameters as given in Sub-section 4.2.2.	Verified.	Satisfactory.
3.1.1.7	Device shall have an internal back-up battery to support 4 hours of normal operations (to be tested for positional record transmission at a frequency of 60 sec).	Tested.	Satisfactory.

		
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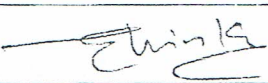
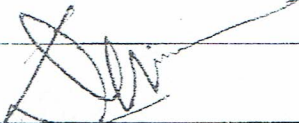
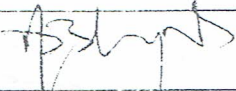
Clause No.	Requirement	Observation	Remark
3.1.1.8	Device shall be capable of transmitting alerts to the Backend Control Server (Government authorized server) directly. The applicable list of alerts is given in Section 4.2 (Alert ID 3 to 12) of Section 4.	Verified.	Satisfactory.
3.1.1.9	Device shall support over the air software and configuration update.	Verified.	Satisfactory.
3.1.1.10	Device shall support basic standard configuration (Mobile communications network settings, Backend Control Server (Government authorized server) details, data frequencies, alert thresholds etc.) as per configuration specification defined in Section 4.	Verified.	Satisfactory.
3.1.1.11	Device shall support store and forward mechanism for all type of data (periodic data and alerts) meant for backend transmission. The system shall store data in internal memory during communication network unavailability and transmit the data when the connection resumes in last in first out (LIFO) manner. The live data shall be given higher priority for transmission than back log (stored data) at any point in time.	Verified.	Satisfactory.

		
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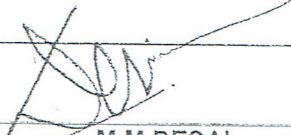
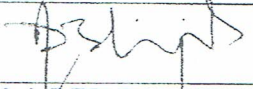
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Clause No.	Requirement	Observation	Remark
3.1.1.12	The Device shall have a unique identifier for identifying the VLT device and data. The unique ID shall be stored in a read only memory area so that it cannot be altered or overwritten by any person. The unique identifier is IMEI (International Mobile Station Equipment Identity) Number.	Verified.	Satisfactory.
3.1.1.13	Device shall store/write the registration number of the vehicle in the internal nonvolatile memory.	Verified.	Satisfactory.
3.1.1.14	Device shall have an Embedded SIM/UICC	Verified.	Satisfactory.
3.1.1.15	Device shall be designed to operate 12V DC and or 24V DC.	DUT works on 12 V and 24 V DC.	Satisfactory.
3.1.1.16	Device shall have a sleep mode current $\leq 50$ mA.	Sleep mode current is 37mA.	Satisfactory.
3.1.1.17	Device shall support any operational GNSS system with 12 (minimum) acquisition channels	DUT supports GNSS constellation with 12 channels.	Satisfactory.
3.1.1.18	The Device shall support:		
	Location on Cellular/SMS	Verified.	Satisfactory.
	Non-volatile memory to store min 40,000 positional log	Verified.	Satisfactory.
	Configurable backup SMS facility in case of Cellular failure	Verified.	Satisfactory.
	Capability to send serving and adjacent cell ID as well as network measurement report (NMR)	Verified.	Satisfactory.
3.1.1.19	The VLT Device shall have:		Satisfactory.
	The capability of Hot start <10s	2 sec	
	The capability of Warm start : < 60s	26.4 sec	
	The capability of Cold start < 120 s	39 sec	
3.1.1.20	Device shall support data Outputs as per protocol covered in this standard.	Verified.	Satisfactory.

		
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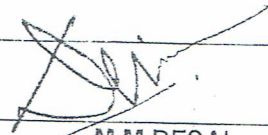
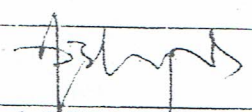
Clause No.	Requirement	Observation	Remark
3.1.1.21	The Device Cellular module shall have:		
	Multi slot Cellular with In - built Quad-band GPRS module/Modem	Verified from component datasheet.	Satisfactory.
	GPRS class 10 or above	Verified from component datasheet.	Satisfactory.
	Support Embedded SIM/UICC to cater to the automotive operational requirement such as vibration, temperature and humidity and provide long life span with at least 10 years life and more than 1 million read/write cycles	Verified from component datasheet.	Satisfactory.
	Cellular module & SIM/UICC shall support <ul style="list-style-type: none"> <li>• SMS, Data (Cellular, TCP/IP) and</li> <li>• Support multiple network OTA switching (on-demand/automatic) capabilities.</li> </ul>	Verified.	Satisfactory.
3.1.1.22	Device shall be dust, temperature, vibration, water splash resistant, IP 65 rated or better, tamper proof as per Section 6.	Refer clause No. 6.3.2 and 6.3.3	Satisfactory.
3.1.1.23	Device shall be manufactured by manufacturer whose quality management system has been certified for compliance to ISO/TS 16949 or ISO 9001 or any equivalent National or International Standard.	Certificate of management system as per ISO/TS 16949 for design and manufacture of Intelligent Transport System is verified.	Satisfactory.
3.1.1.24	Device shall support A-GPS (Assisted GPS).	Verified from component datasheet.	Satisfactory.
3.1.1.25	Device shall have provision of secured data transmission to the Backend Control Centre from the devices through secured channel (e.g. secured dedicated APN).	Verified.	Satisfactory.
3.1.1.26	Device shall have 3 axis accelerometer and 3 axis gyroscope for getting the alerts on harsh breaking harsh acceleration, and rash turning.	Verified.	Satisfactory.
3.1.2	Functional Requirement for Emergency System		
3.1.2.1	Passengers or in-vehicle crew present in the vehicle shall be able to make an emergency request by pressing the emergency button provided.	Verified.	Satisfactory.

		
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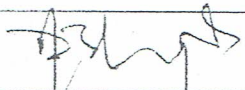
Clause No.	Requirement	Observation	Remark
3.1.2.2	The emergency request function shall not exist as standalone. The function shall be part of Vehicle Location Tracking (VLT) system. An alert shall be sent to the Backend Control Server (Government authorized server) when emergency request is raised. De-activation shall always be from authorized government server who receives alert message i.e. NERS system as mentioned in Sub-section 4.2.2.	Tested and verified.	Satisfactory.
3.1.2.3	The Emergency Buttons will be such that disconnection between switch and controller should be detected through controller logic or 'Normally Closed' (NC) Type Switch. For emergency button, there shall be indication of its working status visible for passengers in Ignition ON condition. The form factor of Emergency Buttons will be such that the button is easy to press in the case of an emergency, and simultaneously also minimizes the possibility of accidental or unintended press thereby causing a false alert.	Tested and verified.	Satisfactory.

		
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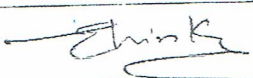
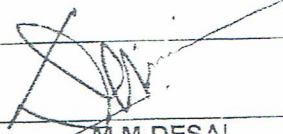
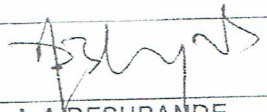
Clause No.	Requirement	Observation	Remark
3.1.2.5	In absence of both Cellular and GSM networks and on pressing of Emergency Button, the system implementing VLT function shall store the emergency Alert (Alert ID 10 as mentioned in Sub-section 4.2.1 of Communication Protocol Section 4). Once the Cellular or GSM is available, this alert information shall be sent on high priority to the configured IP addresses as per the communication protocol mentioned in Section 4 or as SMS message along with vehicle location data to configured control center number. The SMS shall consist of parameters as given in Sub-section 4.2.2.	Tested and verified.	Satisfactory.
3.1.3	Configuration of Device Parameters Over the Air (OTA)		
	The device shall support at least the below parameters to be configurable over the air (through SMS and Cellular). The updation shall be allowed only over an 'authenticated' channel:	Tested and verified.	Satisfactory.
	1. Setting/ Change of the Primary or Secondary IP and port number		
	2. Setting/ Change of the APN		
	3. Set configuration parameter like sleep time, over speed limit, harsh braking, harsh acceleration, rash turning threshold limits etc.		
	4. Emergency control SMS Centre Number(s)		
	5. Configuring the vehicle registration number		
	6. Configuring the frequency of data transmission in normal / Ignition state / OFF state sleep mode/ Emergency state, etc.		
	7. Configuring the time duration for Emergency state		
	8. Capability to reset the device		

		
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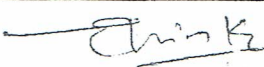
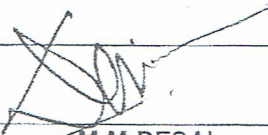
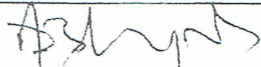
Clause No.	Requirement	Observation	Remark
	<p>9. Command to get the IMEI of the device</p> <p>Configurable commands must involve the following features:</p> <p>9.1 SET: For setting the parameters.</p> <p>9.2 GET: For enquiring regarding the parameters such as mobile number, GSM strength, vehicle number and other important parameters.</p> <p>9.3 CLR: For clearing certain commands, alarms, alerts etc. except emergency alert</p> <p>After each SET, GET, CLR command the device should send alert to Backend Control Centre, as mentioned in Section 4 Alert 12, giving the details of Mode, mobile no/ IP of control center sending commands.</p>	Tested and verified.	Satisfactory.
3.1.4	<p>Tracking Device Health Monitoring Parameters: The device shall send status of health parameters at configurable interval and this threshold value shall also be configurable over the air. It shall be possible for health parameters to be fetched on demand via command as set out below in Table 3B.</p>	Verified.	Satisfactory.
3.1.5	<p>SMS Fall Back</p> <p>In case of emergency state, (i.e. on pressing of Alert button), the device will shift to the SMS mode in case GPRS connectivity is not available. In such case, the device will send the Alert message and tracking data through SMS mode. Since SMS has the limitation of sending only 160 characters, so the tracking data to be sent in one SMS will have fields - IMEI, Latitude, Direction, Longitude, Direction, location fix, speed, Cell ID, LAC (Location Area Code), Date and Time as per emergency alert . The details is provided in Sub-section 4.2.2.</p>	Verified.	Satisfactory.

		
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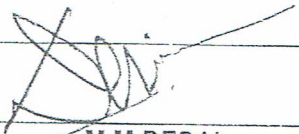
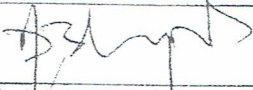
Clause No.	Requirement	Observation	Remark
4.3	Testing of Configuration of Device Parameters Over the Air (OTA)		
	<p>The following testing will be done for</p> <ol style="list-style-type: none"> <li>1. Setting/ Change of the Primary or Secondary IP and port number</li> <li>2. Setting/ Change of the APN</li> <li>3. Set configuration, parameter like sleep time for speed, harsh braking, rash turns, etc.</li> <li>4. Emergency SMS Centre Number</li> <li>5. Configuring the vehicle registration number</li> <li>6. Configuring the frequency of data transmission in normal / Ignition state / OFF state sleep mode, Emergency state, etc.</li> <li>7. Configuring the time duration for Emergency state</li> <li>8. Capability to reset the device</li> <li>9. Command to get the IMEI of the device</li> </ol> <p>Configurable commands must involve the following features:</p> <ul style="list-style-type: none"> <li>• SET: For setting the parameters.</li> <li>• GET: For enquiring regarding the parameters such as mobile number, GSM strength, vehicle number and other important parameters.</li> <li>• CLR: For clearing certain commands, alarms, alerts etc. except emergency alert</li> </ul>	Verified.	Satisfactory.

		
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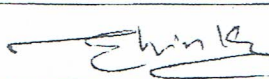

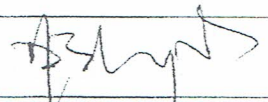
Clause No.	Requirement	Observation	Remark
5.0	CONSTRUCTION AND INSTALLATION		
5.1	Requirements on vehicle interface for VLT with Emergency Button		
	Connector for Power The requirements for interface shall be as agreed between vehicle manufacturer and device manufacturer.	-	This clause will be verified at vehicle level hence it is excluded.
5.2	Requirement of Emergency System		
	Emergency button shall be one time press type. Separate release action from authorized server shall be required to bring back the emergency button to normal mode or clear emergency flag.	Verified.	Satisfactory.
5.3	Physical Mounting		
	The VLT system shall be mounted in a suitable location such a way that it is not easily accessible /exposed to passengers. Emergency button(s) shall be fitted in such a way that every passenger including driver shall be able to access the Emergency button(s). Passenger Car shall have at least one emergency buttons on each passenger row easily assessable by each of the passenger. There shall also be one dedicated emergency button for the driver row. Passenger Transport bus shall have emergency buttons at locations easily visible & assessable to all the passengers such as every 2 meters on both the sides on passenger seating area. For seats reserved for ladies there shall be a dedicated panic button for each row. It shall be permissible to have a single emergency button for two successive ladies rows on both sides of the vehicle provided each lady passenger in either rows are able to reach and operate the emergency button.	-	This clause will be verified at vehicle level hence it is excluded.

		
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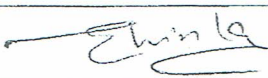

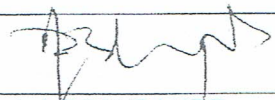
Clause No.	Requirement	Observation	Remark
5.4	Power Supply Vehicle power interface shall have <ul style="list-style-type: none"> <li>• One common ground linked to vehicle chassis</li> <li>• One permanent power Supply (12/24V) connected to the vehicle battery (+Vbat)</li> <li>• One non-permanent power line (12/24V) connect to the battery after ignition (+Vbat)</li> </ul>	-	DUT has 03 line for VBat, IGN and GND. However fitment and connections will be verified at vehicle level hence it is excluded.
5.4.1	Electric wiring The wiring harness used in the device shall be tested for flammability as per IS 2465.	Representative wires are tested vide test report number ERL/2018-19/3000002527/90 Dt.11.08.2018	Satisfactory.
6.0	FUNCTIONAL, PERFORMANCE, DURABILITY, ENVIRONMENTAL AND PROTOCOL TESTS		
6.1	Vehicle Level Functional Tests	-	This clause will be verified at vehicle level hence it is excluded.
	Following functionalities for each of the systems shall be demonstrated at the vehicle, in case system is provided by the vehicle OEM.		
6.1.1	Vehicle Location Tracking With Emergency Button		
6.1.1.1	Vehicle OEM shall only provide/ installed devices approved under component level testing.		
6.1.1.2	System transmits PVT information to Backend Control Center (2 different IPs) at user configurable frequency (minimum 5 seconds) via GSM/Cellular.		
6.1.1.3	System to communicate to control center on the occurrence of the alerts captured in Communication Protocol of Section 4.		
6.1.2	Emergency Request		
	Emergency request function - When the emergency buttons (as applicable) placed anywhere in the vehicle is pressed by any passenger / crew, make sure that the emergency request message is send/received at the control center.		

		
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Clause No.	Requirement	Observation	Remark
6.2	Component Level Functional Tests		
	Following functionalities for each of the systems shall be demonstrated. At the choice of the manufacturer, these functionalities can also be alternately demonstrated at the vehicle level and shall be deemed to be complied with at component level as well.		
6.2.1	Vehicle Location Tracking		
6.2.1.1	Standard connector provided for Power and other signals as per Clause No. 5.1.	Verified.	Satisfactory.
6.2.1.2	Configuration of device as per the standard format mentioned in Section 4. <input type="checkbox"/> Local configuration upload shall be verified. <input type="checkbox"/> Configuration upload from control center shall be verified.		
6.2.1.3	Vehicle Location data transmission to Backend Control Center.		
6.2.1.4	Backend Control Centre shall be able to check the version of firmware loaded on the system.		
6.2.1.5	Update the firmware of the system from Backend Control Centre		

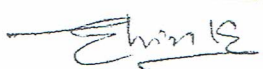
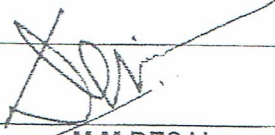
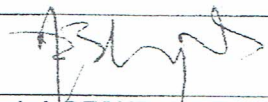
		
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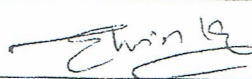
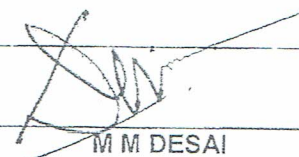
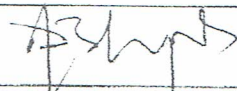
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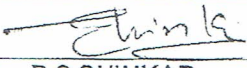

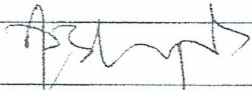
Clause No.	Requirement	Observation	Remark
6.3	Device Level Functional, Performance & Durability Tests		
6.3.1	Functional Testing		
	1. Tracking Functionality Test	Connectivity of VLT with server and its capability to send two location messages is tested.	Satisfactory.
	2. Location Accuracy Test	It meets 2.5m CEP.	Satisfactory.
	3. Acquisition Sensitivity Test	Observed Acquisition Sensitivity is - 145 dBm.	Satisfactory.
	4. Tracking Sensitivity Test	Observed tracking Sensitivity is - 160 dBm.	Satisfactory.
	5. Cold-Start Time to First Fix (TTFF) Test	39 sec	Satisfactory.
	6. Warm-Start Time to First Fix Test	26.4 sec	
	7. Hot-Start Time to First Fix Test	2 sec	
	8. Embedded SIM/UICC Test	Tested and verified.	Satisfactory.
	9. Function Endurance Test	Tested for 96 hrs and functionality verified.	Satisfactory.
	10. On Vehicle Dynamic Location Test	Tested and verified. PVT data is within 12 meters for more than 90% of fixed location data.	Satisfactory.

		
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6.3.2	Performance & Durability Test		
	1. Shock Test	Refer Annexure 01	Satisfactory.
	2. Vibration Test	Refer Annexure 01	Satisfactory.
	3. Ingress Protection (IP)	Tested vide report number SHL/161/2018-2019/300000222 3/RT/2397 dt.23/Aug/2018	Satisfactory.
	4. EMI /EMC (As per AIS004 Part03:2009)	Refer Annexure 02 to 06	Satisfactory.
	5. Battery Backup Test	Tested and verified.	Satisfactory.
	6. Reverse Polarity Protection without Fuse	Refer Annexure 02	Satisfactory.
	7. Wiring Harness - Flammability Test	Representative wires are tested vide test report number ERL/2018-19/ 3000002527/90 Dt.11.08.2018	Satisfactory.
	8. Wiring Harness - Electrical Properties		
	9. Free Fall	Refer Annexure 01	Satisfactory.
	10. Performance Parametric Test (Nine points, tri temperature/tri voltage)	Refer Annexure 01	Satisfactory.
	11. Insulation Resistance Test	Refer Annexure 01	Satisfactory.
	12. Load Dump Test Pulse 5a	Refer Annexure 02	Satisfactory.

		
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Clause No.	Requirement	Observation	Remark
6.3.3	Device Level Environmental Tests		
	1. Dry Heat / High Temperature Test	Refer Annexure 01	Satisfactory.
	2. Cold Test		
	3. Damp Heat Test		
	4. Temperature Shock		
	5. High Temperature Test		
	6. Salt Spray Test	Tested vide test report No. SDL/80004002(18-19)/AED/277(18-19) dt. 23/08/2018	Satisfactory.
	7. High Voltage Test	Refer Annexure 02	Satisfactory.
6.3.4	Protocol Testing		
a)	Memory Storage The device shall support 40000 or more positional logs/packets. This is a functional test and the device will be simulated to be in non – Cellular coverage area and the logs will be maintained. The capacity of logging will be checked by monitoring the logs on the device.	Verified.	Satisfactory.
b)	Messages & Alerts from Devices: Alerts that need to come from the tracking devices.		
	1. Location Update	Verified.	Satisfactory.
	2. Location Update (history)		
	3. Alert – Disconnect from main battery		
	4. Alert – Low battery		
	5. Alert – Low battery removed		
	6. Alert – Connect back to main battery		
	7. Alert – Ignition ON		
	8. Alert – Ignition OFF		
	9. Alert – GPS box opened (Optional)		
	10. Alert – Emergency state ON		
	11. Alert – emergency State OFF		
	12. Alert Over the air parameter change		
	13. Harsh Braking		
	14. Harsh Acceleration		
	15. Rash Turning		
7.0	Device to backend communication mechanism	Verified.	Satisfactory.

		
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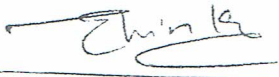
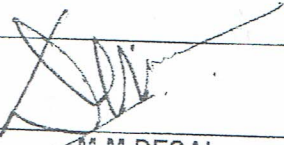
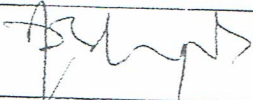
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11.0 Conclusion:

DUT complies with requirements of as per AIS 140: 2016 , amendment 1 (11th December 2017) notified vide G.S.R. 1095 (E) dated 28 Nov 2016 and notified vide S.O 1663 (E) dated 18 April 2018 excluding clause No 5.1, 5.3, 5.4 and 6.1.

This test report pertains only to the components / parts / assemblies /vehicles etc. actually tested at ARAI in the presented condition based on the documents / information produced / submitted by the customer. The issuance of this test report alone does not indicate any measure of approval, certification, supervision, control of quality surveillance by ARAI of the product. No extract, abridgement or abstraction from this test report shall be published or used to advertise the product without the written consent of the Director, ARAI, who reserves the absolute right to agree or reject all or any of the details of any items of publicity for which consent may be sought. ARAI is in no way responsible for any misuse of copying of any design / type / system in connection with entire vehicle / components / parts and assemblies. Breach of any statutory provision of Indian laws or laws of other countries, will be the sole responsibility of the customer and ARAI shall not be liable for any claims or damages, made by the party, whatsoever, the customer shall alone be liable for the same, and undertakes to indemnify ARAI in this regard. Further, the ARAI has the right to initiate cancellation / withdrawal of the certificate / report issued, in case of any fraud, misrepresentation, when it surfaces and comes in the knowledge of ARAI. The appropriate local courts at Pune shall have the jurisdiction in respect of any dispute, claim or liability arising out of this report.

Place of Issue: PUNE

		
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12.0 LIST OF TEST EQUIPMENTS			
Radiated immunity equipment list			
Description	ARAI ID	Status	Cal due date
<b>Signal generators</b>			
Rohde & Schwarz SML 02 Signal Generator	AED/GEN/02	■	19/11/2018
Rohde & Schwarz SMB 100A Signal Generator	AED/GEN/03	□	09/11/2017
<b>Antennas</b>			
Frankonia Gmbh BTA-M Broad Band Antenna (1MHz-3000MHz)	AED/ANT/09	■	N/A
Schwarzbeck Mess Elektronik BBHA 9120 F 022 Broad Band Horn Antenna (200MHz-2000MHz)	AED/ANT/10	□	N/A
ETS-Lindgren 3109PX Biconical Antenna (Type 2) (20MHz-300MHz)	AED/ANT/11	□	N/A
Schwarzbeck Mess Elektronik UHA 9105 & UHA 9125 D Handy Transmitter Antenna Set (26 MHz-2590MHz)	AED/ANT/12	□	N/A
Schwarzbeck Mess Elektronik BBHA 9120 D Double Ridge Horn Antenna (1GHz-18GHz)	AED/ANT/14	■	N/A
<b>Amplifiers</b>			
AR 250A250AM3 250W RF Power Amplifier	AED/RFAMP/01	□	N/A
AR 250T1G3M1 250W RF Power Amplifier	AED/RFAMP/03	□	N/A
AR 500W1000AM1 500W RF Power Amplifier	AED/RFAMP/04	■	N/A
AR BLMA 0820-200 200W RF Power Amplifier	AED/RFAMP/05	■	N/A
AR 1000A225 RF Power Amplifier	AED/RFAMP/06	□	N/A
AR 175S1G4 RF Power Amplifier	AED/RFAMP/07	□	N/A
<b>Power sensors</b>			
Agilent Technologies E9304A E-Series Power Sensor	AED/Power Sensor/01	□	N/A
Agilent Technologies E9304A E-Series Power Sensor	AED/Power Sensor/02	□	N/A
Agilent Technologies E9304A E-Series Power Sensor	AED/Power Sensor/03	□	N/A
Rohde & Schwarz NRP-Z91 Power Sensor	AED/Power Sensor/04	■	N/A
Rohde & Schwarz NRP-Z91 Power Sensor	AED/Power Sensor/05	■	N/A
<b>Power meters</b>			
Rohde & Schwarz NRP2 Power Meter	AED/RFPM/03	■	N/A
<b>LISN</b>			
Rohde & Schwarz ESH3-Z6 (5μH/50Ω) LISN	AED/AN/01	■	09/02/2019
Rohde & Schwarz ESH3-Z6 (5μH/50Ω) LISN	AED/AN/03	■	09/02/2019
Rohde & Schwarz ESH3-Z6 (5μH/50Ω) LISN	AED/AN/04	■	09/02/2019
EM Test AN200N100 (5μH/50Ω) LISN	AED/AN/07	■	09/02/2019

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Description	ARAI ID	Status	Cal due date
<b>Laser powered field probe</b>			
RF FL 7006 Star Probe 2 Laser Powered Field Probe	AED/Field Probe/07	<input type="checkbox"/>	18/04/2018
<b>Oscilloscopes</b>			
Tektronics DPO 7104 Digital Phosphor Oscilloscope	AED/OSC/05	<input type="checkbox"/>	25/02/2018
Tektronics DPO 3052 Digital Phosphor Oscilloscope	AED/OSC/07	<input checked="" type="checkbox"/>	30/08/2018
Rohde & Schwarz RTM 2052 Digital Oscilloscope	AED/OSC/09	<input type="checkbox"/>	30/08/2018
<b>Test facility</b>			
Frankonia Gmbh Semi-Anachoic ALSE Chamber, ARAI Pune.	AED/ALSE/01	<input type="checkbox"/>	13/06/2017
Frankonia Gmbh Semi-Anachoic ALSE Chamber, ARAI Pune.	AED/ALSE/02	<input checked="" type="checkbox"/>	28/09/2018
<b>Test software</b>			
Rohde & Schwarz EMC32 Measurement Software Ver. 9.21.00	N/A	<input checked="" type="checkbox"/>	N/A
<b>Miscellaneous</b>			
Freemans Measuring Tape	AED/TAPE/01	<input checked="" type="checkbox"/>	23/12/2018
Aplab L3260 Regulated DC Power Supply	AED/RPS/32	<input checked="" type="checkbox"/>	N/A
Automotive Battery 12V	N/A	<input checked="" type="checkbox"/>	N/A
<b>Bulk current injection equipment list</b>			
<b>Signal generators/amplifiers</b>			
EM Test CWS 500D Continuous Wave Simulator	AED/CWS/01	<input checked="" type="checkbox"/>	1/06/2019
<b>Bulk current injection probes</b>			
FCC F-130A-1 Bulk Current Injection Probe	AED/INJ CLAMP/01	<input checked="" type="checkbox"/>	N/A
FCC F-120-6A Bulk Current Injection Probe	AED/INJ CLAIMP/02	<input type="checkbox"/>	N/A
<b>Current monitor probes</b>			
FCC F-55 Current Monitor Probe	AED/CURRENT PROBE/01	<input checked="" type="checkbox"/>	20/03/2019
<b>LISN</b>			
Rohde & Schwarz ESH3-Z6 (5 $\mu$ H/50 $\Omega$ ) LISN	AED/AN/04	<input checked="" type="checkbox"/>	09/02/2019
EM Test AN200N100 (5 $\mu$ H/50 $\Omega$ ) LISN	AED/AN/07	<input checked="" type="checkbox"/>	02/02/2019
<b>Test software</b>			
EM Test ICD Software Ver. 3.31.00	N/A	<input checked="" type="checkbox"/>	N/A

Description	ARAI ID	Status	Cal due date
<b>Miscellaneous</b>			
FCC-BCICF-1 Bulk Current Injection Clamp/Jig	N/A	<input type="checkbox"/>	N/A
FCC ATT3/100 Attenuator 3dB	N/A	<input type="checkbox"/>	N/A
FCC Attenuator 20dB	N/A	<input type="checkbox"/>	N/A
FCC Terminating resistor 50 Ohm	N/A	<input type="checkbox"/>	N/A
Spectron PLC 3250 MP DC Regulated Power Supply	AED/RPS/19	<input checked="" type="checkbox"/>	N/A
Automotive Battery 12V	N/A	<input checked="" type="checkbox"/>	N/A
<b>Radiated emission equipment list</b>			
<b>Receivers</b>			
Rohde & Schwarz ESU 8 EMI Test Receiver 8GHz	AED/EMIR/04	<input checked="" type="checkbox"/>	19/02/2019
Rohde & Schwarz ESR 3 EMI Test Receiver 3.6 GHz	AED/EMIR/06	<input type="checkbox"/>	18/05/2018
<b>Antennas</b>			
Schwarzbeck Mess Elektronik VAMP 9243 Vertical Active Monopole Antenna	AED/ANT/06	<input type="checkbox"/>	11/05/2018
Schwarzbeck Mess Elektronik VHBB 9124 Bi-Conical Antenna	AED/ANT/07	<input type="checkbox"/>	11/03/2018
Schwarzbeck Mess Elektronik VUSLP 9111B Log-Periodic Antenna	AED/ANT/08	<input type="checkbox"/>	11/03/2018
Schwarzbeck Mess Elektronik VHBB 9124 Bi-Conical Antenna	AED/ANT/15	<input checked="" type="checkbox"/>	18/07/2019
Schwarzbeck Mess Elektronik VUSLP 9111B Log-Periodic Antenna	AED/ANT/16	<input checked="" type="checkbox"/>	18/07/2019
<b>LISN</b>			
Rohde & Schwarz ESH3-Z6 (5 $\mu$ H/50 $\Omega$ ) LISN	AED/AN/01	<input checked="" type="checkbox"/>	09/02/2019
Rohde & Schwarz ESH3-Z6 (5 $\mu$ H/50 $\Omega$ ) LISN	AED/AN/03	<input checked="" type="checkbox"/>	09/02/2019
Rohde & Schwarz ESH3-Z6 (5 $\mu$ H/50 $\Omega$ ) LISN	AED/AN/04	<input type="checkbox"/>	09/02/2019
EM Test AN200N100 (5 $\mu$ H/50 $\Omega$ ) LISN	AED/AN/07	<input type="checkbox"/>	02/02/2019

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Description	ARAI ID	Status	Cal due date
<b>Preamplifiers</b>			
Schwarzbeck Mess Elektronik BBV 9745 Preamplifier (9kHz-2GHz)	AED/PREAMP/03	<input type="checkbox"/>	07/01/2017
Schwarzbeck Mess Elektronik BBV 9743 Preamplifier (10MHz-6GHz)	AED/PREAMP/04	<input type="checkbox"/>	07/01/2017
<b>Test facility</b>			
Frankonia Gmbh Semi-Anachoic ALSE Chamber, ARAI Pune.	AED/ALSE/01	<input type="checkbox"/>	13/06/2017
Frankonia Gmbh Semi-Anachoic ALSE Chamber, ARAI Pune.	AED/ALSE/02	<input checked="" type="checkbox"/>	28/09/2018
<b>Test software</b>			
Rohde & Schwarz EMC32 Measurement Software Ver. 9.21.00	N/A	<input checked="" type="checkbox"/>	N/A
<b>Miscellaneous</b>			
Aplab L3260 Regulated DC Power Supply	AED/RPS/32	<input checked="" type="checkbox"/>	N/A
Automotive Battery 12V	N/A	<input checked="" type="checkbox"/>	N/A



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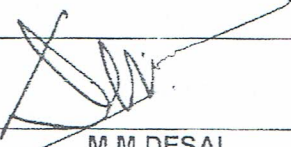
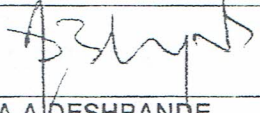
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Description	ARAI ID	Status	Cal due date
<b>Conducted immunity on supply line equipment list</b>			
<b>60A EM TEST conducted immunity test system for 12V/24V DC</b>			
EM Test Auto wave Arbitrary Generator	AED/EM/04	<input type="checkbox"/>	N/A
EM Test LD 200B Load Dump Generator	AED/EM/02	<input checked="" type="checkbox"/>	31/08/2018
EM Test MPG 200B Micro Pulse Generator	AED/EM/02	<input checked="" type="checkbox"/>	31/08/2018
EM Test EFT 200B EFT/Burst Generator	AED/EM/02	<input checked="" type="checkbox"/>	31/08/2018
EM Test VDS 200B Voltage Drop Simulator	AED/EM/02	<input checked="" type="checkbox"/>	31/08/2018
<b>60A TESEQ conducted immunity test system for 12V/24V DC</b>			
TESEQ MT5511 Micro Transients	AED/CISYSTEM/02	<input type="checkbox"/>	22/01/2017
TESEQ FT5531 Fast Transients	AED/CISYSTEM/02	<input type="checkbox"/>	22/01/2017
TESEQ LD5550 Load Dump Generator	AED/CISYSTEM/02	<input type="checkbox"/>	22/01/2017
TESEQ PA5840-150/400 Power Supply	AED/CISYSTEM/02	<input type="checkbox"/>	22/01/2017
<b>Oscilloscope</b>			
Tektronics DPO 7104 Digital Phosphor Oscilloscope	AED/OSC/05	<input type="checkbox"/>	25/02/2017
<b>Test facility</b>			
Conducted Immunity Testing Lab, ARAI Pune.	N/A	<input checked="" type="checkbox"/>	N/A
<b>Test software</b>			
EM Test ISMISO Transient Software (Ver 3.91)	N/A	<input checked="" type="checkbox"/>	N/A
<b>Miscellaneous</b>			
EM Test CNA 200B Coupling Network	AED/EM/02	<input checked="" type="checkbox"/>	N/A
Aplab L3260 Regulated DC Power Supply	AED/RPS/34	<input checked="" type="checkbox"/>	N/A
Automotive Battery 12V	N/A	<input type="checkbox"/>	N/A
<b>Electrostatic Discharge (ESD) Test Equipment List</b>			
<b>ESD Generator</b>			
TESEQ NSG-437 ESD Simulator	AED/ESD/02	<input type="checkbox"/>	01/02/2018
<b>Oscilloscope</b>			
Tektronics DPO 7104 Digital Phosphor Oscilloscope	AED/OSC/05	<input type="checkbox"/>	25/02/2017
Tektronics DPO 3052 Digital Phosphor Oscilloscope	AED/OSC/07	<input type="checkbox"/>	30/08/2017
Rohde & Schwarz RTM 2052 Digital Oscilloscope	AED/OSC/09	<input type="checkbox"/>	30/08/2017
<b>Energy Consumption Test Equipment List</b>			
Yokogawa WT 230 Digital Power Meter	AED/POWERMETE R/01	<input checked="" type="checkbox"/>	27-02-2019

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<b>Cyclic Temperature &amp; Humidity Chamber</b>			
Cyclic Temperature & Humidity Chamber	AED/CHAMBER/03	<input type="checkbox"/>	27/07/2018
Universal Oven	AED/CHAMBER/04	<input type="checkbox"/>	15/07/2018
Cyclic Temperature & Humidity Chamber	AED/CHAMBER/05	<input checked="" type="checkbox"/>	03/07/2019
Cyclic Temperature & Humidity Chamber	AED/CHAMBER/06	<input type="checkbox"/>	11/09/2018
Cyclic Temperature & Humidity Chamber	AED/CHAMBER/07	<input type="checkbox"/>	12/12/2018
Environmental Chamber (Temp)	AED/CHAMBER/08	<input type="checkbox"/>	30/05/2019
Thermal Shock Chamber	AED/TSC/01	<input type="checkbox"/>	09/03/2019
Thermal Shock Chamber	AED/TSC/02	<input checked="" type="checkbox"/>	09/01/2019
<b>Electrodynamic Vibration Test System</b>			
Electrodynamic Vibration Test System	AED/EDVS/01	<input checked="" type="checkbox"/>	25/07/2019
Electrodynamic Vibration Test System	AED/EDVS/02	<input checked="" type="checkbox"/>	04/07/2019
<b>GNSS Simulator</b>			
Vector Signal Generator	N5172B	<input checked="" type="checkbox"/>	5/08/2019

		
P S SHINKAR Dy. MANAGER	M M DESAI Dy. GENERAL MANAGER	A A DESHPANDE Dy. DIRECTOR & HoD