

FCC PART 22H, 24E
MEASUREMENT AND TEST REPORT

For

Shenzhen Castel Wireless Telecommunications Co., Ltd.

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Hi-Tech Industrial Park, Nanshan, Shenzhen, Guangdong, China

FCC ID: XDV802

| | |
|---|--|
| Report Type: Original Report | Product Type: Iridium /GPRS Dual Mode Communication Terminal |
| Test Engineer: Felix Li | <i>Felix Li</i> |
| Report Number: RSZ11041907-22H&24E | |
| Report Date: 2011-06-03 | |
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Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. This report **must not** be used by the customer to claim product certification, approval, or endorsement by NVLAP*, or any agency of the Federal Government.

* This report contains data that are not covered by the NVLAP accreditation and are marked with an asterisk "★" (Rev.2)

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Shenzhen Castel Wireless Telecommunications Co., Ltd.*'s product, model number: SAT802 (FCC ID: XDV802) or the "EUT" as referred to in this report is an *Iridium /GPRS Dual mode communication terminal*, which measures approximately: 11.5 cm (L) x 8.5 cm (W) x 4.5 cm (H), rated input voltage: DC 9-36 V.

** All measurement and test data in this report was gathered from production sample serial number: 1104073 (Assigned by BACL, Shenzhen). The EUT was received on 2011-04-19.*

Objective

This type approval report is prepared on behalf of *Shenzhen Castel Wireless Telecommunications Co., Ltd.* in accordance with Part 2, Subpart J, Part 22 Subpart H, and Part 24 Subpart E of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC rules for output power, modulation characteristic, occupied bandwidth, and spurious emission at antenna terminal, spurious radiated emission, frequency stability, band edge and radiated margin.

Related Submittal(s)/Grant(s)

GSM/GPRS module with FCC ID: UDV-0912142009007
FCC Part 25 submission with FCC ID: XDV802

Test Methodology

All tests and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2, Sub-part J as well as the following parts:

Part 22 Subpart H - Public Mobile Services
Part 24 Subpart E - Personal Communication Services

Applicable Standards: TIA/EIA 603-C, ANSI C63.4-2009.

All radiated and conducted emissions measurements were performed at Bay Area Compliance Laboratories Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp.(Shenzhen) to collect test data is located in the 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China.

Test site at Bay Area Compliance Laboratories Corp. (Shenzhen) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on December 06, 2010. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2009.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 382179. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, Bay Area Compliance Laboratories Corp. (Shenzhen) is an ISO/IEC 17025 guide accredited laboratory, and is accredited by National Voluntary Laboratory Accredited Program (Lab Code 200707-0).



The current scope of accreditations can be found at <http://ts.nist.gov/Standards/scopes/2007070.htm>

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The EUT was configured for testing according to TIA/EIA-603-C.

The GSM/PCS test items were performed with the EUT operating at normal mode.

EUT Exercise Software

Iridium Serial Tool.exe which was provided by client.

Equipment Modifications

No modifications were made to the EUT.

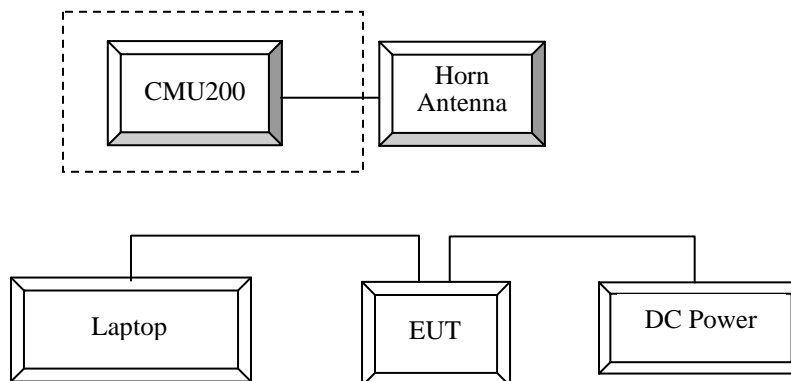
Local Support Equipment List and Details

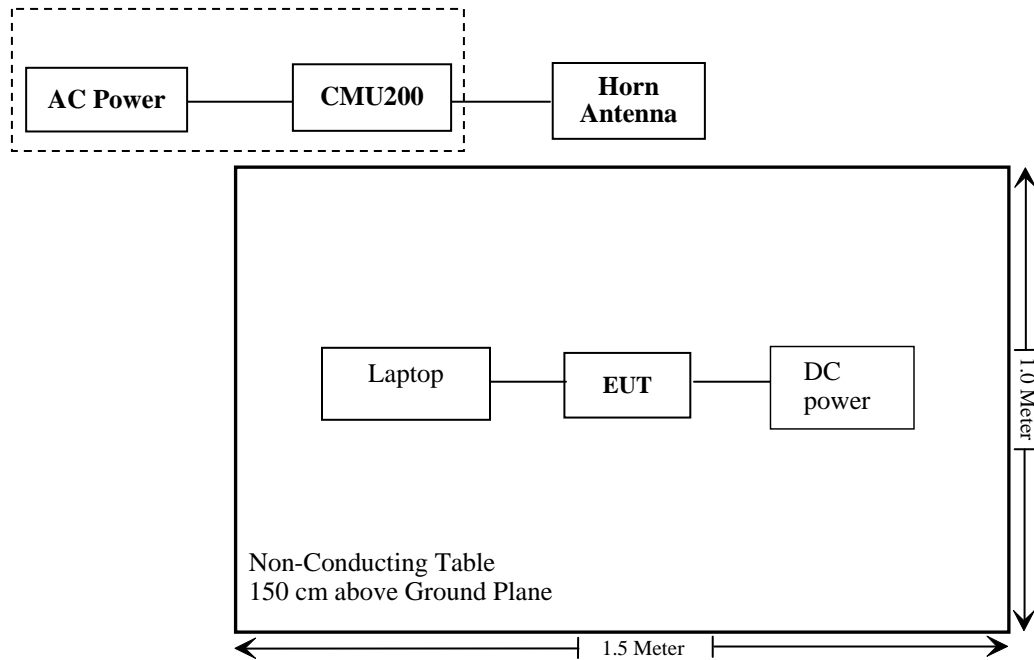
| Manufacturer | Description | Model | Serial Number |
|--------------|-----------------|----------|---------------|
| DELL | Laptop | D600 | B5RF831 |
| ZAOXIN | DC Power Supply | RXN-605D | 20030842184 |

External I/O Cable

| Cable Description | Length (m) | From/Port | To |
|-----------------------------------|------------|-----------|----------|
| Unshielded detachable power cable | 1.5 | EUT | DC Power |

Configuration of Test Setup



Block Diagram of Test Setup

SUMMARY OF TEST RESULTS

| FCC Rules | Description of Test | Result |
|--------------------------------------|--|------------|
| §1.1307, §2.1091 | Maximum Permissible exposure (MPE) | Compliance |
| §2.1046; §22.913 (a); §24.232 (c) | RF Output Power | Compliance |
| §2.1049; §22.905 §22.917; §24.238 | 99% & -26 dB Occupied Bandwidth | N/A* |
| §2.1051, §22.917 (a); §24.238 (a) | Spurious Emissions at Antenna Terminal | N/A* |
| §2.1053 §22.917 (a); §24.238 (a) | Field Strength of Spurious Radiation | Compliance |
| §22.917 (a); §24.238 (a) | Out of band emission, Band Edge | N/A* |
| §2.1055 §22.355; §24.235 | Frequency stability vs. temperature Frequency stability vs. voltage | N/A* |

Note: N/A* please refer to FCC ID: UDV-0912142009007, report No.: SHEMO09120140807.

FCC §1.1307 (b)(1) & §2.1091 - MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to FCC Part 2.1091 and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

| (B) Limits for General Population/Uncontrolled Exposure | | | | |
|---|-------------------------------|-------------------------------|-------------------------------------|--------------------------|
| Frequency Range (MHz) | Electric Field Strength (V/m) | Magnetic Field Strength (A/m) | Power Density (mW/cm ²) | Averaging Time (minutes) |
| 0.3–1.34 | 614 | 1.63 | *(100) | 30 |
| 1.34–30 | 824/f | 2.19/f | *(180/f ²) | 30 |
| 30–300 | 27.5 | 0.073 | 0.2 | 30 |
| 300–1500 | / | / | f/1500 | 30 |
| 1500–100,000 | / | / | 1.0 | 30 |

f = frequency in MHz;

* = Plane-wave equivalent power density;

MPE Calculation

Predication of MPE at a given distance, equation from OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

S= power density (in appropriate units, e.g. mW/cm²);

P = power input to the antenna (in appropriate units, e.g., mW);

G = 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);

| Band | Antenna Gain | | Conducted Power | | | | Time-Averaged Transmit Power (mW) | Evaluation Distance (cm) | Power Density (mW/cm ²) | MPE Limit (mW/cm ²) |
|---------|--------------|-----------|-----------------|-------|------|-------------|-----------------------------------|--------------------------|-------------------------------------|---------------------------------|
| | (dBi) | (numeric) | Slot No. | (dBm) | (mW) | Duty Factor | | | | |
| GSM850 | 2.0 | 1.58 | 1 slot | 33.1 | 2042 | 1/8 | 255.25 | 20 | 0.08 | 0.55 |
| | 2.0 | 1.58 | 2 slot | 33.1 | 2042 | 1/4 | 510.5 | 20 | 0.16 | 0.55 |
| PCS1900 | 2.0 | 1.58 | 1 slot | 30.5 | 1122 | 1/8 | 140.25 | 20 | 0.04 | 1.0 |
| | 2.0 | 1.58 | 2 slot | 30.3 | 1072 | 1/4 | 268 | 20 | 0.08 | 1.0 |

Result:

The MPE meets FCC limit at 20 cm distance.

FCC §2.1046, §22.913 (a) & §24.232 (c) - RF OUTPUT POWER

Applicable Standard

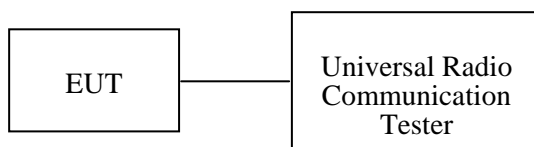
According to FCC §2.1046 and §22.913 (a), the ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

According to FCC §2.1046 and §24.232 (C), mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

Test Procedure

Conducted method:

The RF output of the transmitter was connected to the wireless test set and the spectrum analyzer through sufficient attenuation.



Radiated method:

TIA 603-C section 2.2.17

Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|-----------------|--------------------------------------|-------------|---------------|------------------|----------------------|
| Sunol Sciences | Horn Antenna | DRH-118 | A052604 | 2011-05-05 | 2012-05-04 |
| Rohde & Schwarz | Spectrum Analyzer | FSEM30 | 849720/019 | 2010-07-08 | 2011-07-07 |
| Sunol Sciences | Broadband Antenna | JB1 | A040904-1 | 2010-07-05 | 2011-07-04 |
| Mini-Circuits | Amplifier | ZVA-213+ | T-E27H | 2011-03-08 | 2012-03-07 |
| HP | Signal Generator | HP8657A | 2849U00982 | 2010-10-28 | 2011-10-27 |
| HP | Amplifier | HP8447D | 2944A09795 | 2010-08-02 | 2011-08-02 |
| HP | Synthesized Sweeper | 8341B | 2624A00116 | 2010-11-07 | 2011-11-06 |
| COM POWER | Dipole Antenna | AD-100 | 041000 | 2010-09-25 | 2011-09-25 |
| A.H. System | Horn Antenna | SAS-200/571 | 135 | 2010-05-17 | 2011-05-17 |
| Rohde & Schwarz | Universal Radio Communication Tester | CMU200 | 109038 | 2010-06-11 | 2011-06-10 |

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Data**Environmental Conditions**

| | |
|---------------------------|----------|
| Temperature: | 25 °C |
| Relative Humidity: | 56 % |
| ATM Pressure: | 100.0kPa |

The testing was performed by Felix Li on 2011-05-06.

ERP & EIRP**ERP for Cellular Band (Part 22H)**

| Indicated | | Table Angle Degree | Test Antenna | | Substituted | | | Antenna Gain Correction (dBd) | Cable Loss (dB) | Absolute Level (dBm) | Part 22H Limit (dBm) |
|-----------------|---------------------|--------------------|--------------|-------------|-----------------|------------------|------------------|-------------------------------|-----------------|----------------------|----------------------|
| Frequency (MHz) | S.A. Reading (dBμV) | | Height (m) | Polar (H/V) | Frequency (MHz) | S.G. Level (dBm) | Ant. Polar (H/V) | | | | |
| Low Channel | | | | | | | | | | | |
| 824.2 | 95.16 | 125 | 1.8 | H | 824.2 | 26.3 | H | 0 | 0.9 | 25.4 | 38.45 |
| 824.2 | 100.36 | 23 | 1.5 | V | 824.2 | 28.8 | V | 0 | 0.9 | 27.9 | 38.45 |
| Middle Channel | | | | | | | | | | | |
| 836.6 | 96.6 | 118 | 1.7 | H | 836.6 | 27.3 | H | 0 | 0.9 | 26.4 | 38.45 |
| 836.6 | 101.05 | 334 | 1.7 | V | 836.6 | 29.5 | V | 0 | 0.9 | 28.6 | 38.45 |
| High Channel | | | | | | | | | | | |
| 848.8 | 95.83 | 32 | 1.5 | H | 848.8 | 26.4 | H | 0 | 0.9 | 25.5 | 38.45 |
| 848.8 | 100.45 | 360 | 2.0 | V | 848.8 | 29.2 | V | 0 | 0.9 | 28.3 | 38.45 |

EIRP for PCS Band (Part 24E)

| Indicated | | Table Angle Degree | Test Antenna | | Substituted | | | Antenna Gain Correction (dBi) | Cable Loss (dB) | Absolute Level (dBm) | Part 24E Limit (dBm) |
|-----------------|---------------------|--------------------|--------------|-------------|-----------------|------------------|------------------|-------------------------------|-----------------|----------------------|----------------------|
| Frequency (MHz) | S.A. Reading (dBμV) | | Height (m) | Polar (H/V) | Frequency (MHz) | S.G. Level (dBm) | Ant. Polar (H/V) | | | | |
| Low Channel | | | | | | | | | | | |
| 1850.2 | 85.54 | 327 | 1.8 | H | 1850.2 | 19.8 | H | 6.2 | 1.02 | 24.98 | 33 |
| 1850.2 | 92.25 | 245 | 1.6 | V | 1850.2 | 22.2 | V | 6.2 | 1.02 | 27.38 | 33 |
| Middle Channel | | | | | | | | | | | |
| 1880 | 85.3 | 254 | 1.5 | H | 1880 | 19.5 | H | 6.2 | 1.03 | 24.67 | 33 |
| 1880 | 93.4 | 312 | 1.5 | V | 1880 | 22.8 | V | 6.2 | 1.03 | 27.97 | 33 |
| High Channel | | | | | | | | | | | |
| 1909.8 | 85.27 | 236 | 1.8 | H | 1909.8 | 19.4 | H | 6.2 | 1.03 | 24.57 | 33 |
| 1909.8 | 92.06 | 164 | 1.7 | V | 1909.8 | 22.1 | V | 6.2 | 1.03 | 27.27 | 33 |

Note: all data was collected without the amplifier.

FCC §2.1053, §22.917 & §24.238 - SPURIOUS RADIATED EMISSIONS

Applicable Standard

FCC §2.1053, §22.917 and §24.238.

Test Procedure

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB = $10 \lg (\text{TX pwr in Watts}/0.001)$ – the absolute level

Spurious attenuation limit in dB = $43 + 10 \text{ Log}_{10} (\text{power out in Watts})$

Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|-----------------|--------------------------------------|-------------|---------------|------------------|----------------------|
| Sunol Sciences | Horn Antenna | DRH-118 | A052604 | 2011-05-05 | 2012-05-04 |
| Sunol Sciences | Broadband Antenna | JB1 | A040904-1 | 2010-07-05 | 2011-07-04 |
| Rohde & Schwarz | Spectrum Analyzer | FSEM30 | 849720/019 | 2010-07-08 | 2011-07-07 |
| Mini-Circuits | Amplifier | ZVA-213+ | T-E27H | 2011-03-08 | 2012-03-07 |
| HP | Signal Generator | HP8657A | 2849U00982 | 2010-10-28 | 2011-10-27 |
| HP | Amplifier | HP8447D | 2944A09795 | 2010-08-02 | 2011-08-02 |
| HP | Synthesized Sweeper | 8341B | 2624A00116 | 2010-11-07 | 2011-11-06 |
| COM POWER | Dipole Antenna | AD-100 | 041000 | 2010-09-25 | 2011-09-25 |
| A.H. System | Horn Antenna | SAS-200/571 | 135 | 2010-05-17 | 2011-05-17 |
| Rohde & Schwarz | Universal Radio Communication Tester | CMU200 | 109038 | 2010-06-11 | 2011-06-10 |

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Data**Environmental Conditions**

| | |
|---------------------------|----------|
| Temperature: | 25 °C |
| Relative Humidity: | 56 % |
| ATM Pressure: | 100.0kPa |

The testing was performed by Felix Li on 2011-05-06.

Test mode: Transmitting

Cellular Band (Part 22H)

| Indicated | | Table Angle Degree | Test Antenna | | Substituted | | | | Absolute Level (dBm) | Limit (dBm) | Margin (dB) |
|-----------------------------|---------------------|--------------------|--------------|-------------|-----------------|-------------|----------------|-----------------|----------------------|-------------|-------------|
| Frequency (MHz) | S.A. Reading (dBμV) | | Height (m) | Polar (H/V) | Frequency (MHz) | Level (dBm) | Ant. Gain (dB) | Cable Loss (dB) | | | |
| Below 1 GHz, Middle Channel | | | | | | | | | | | |
| 443.95 | 45.25 | 25 | 1.3 | H | 443.95 | -52.2 | 0 | 0.46 | -52.66 | -13 | 39.66 |
| 264.98 | 45.70 | 234 | 1.5 | V | 264.98 | -54.0 | 0 | 0.32 | -54.32 | -13 | 41.32 |
| 333.09 | 44.34 | 128 | 1.5 | V | 333.09 | -55.1 | 0 | 0.39 | -55.49 | -13 | 42.49 |
| 398.52 | 42.34 | 145 | 1.5 | H | 398.52 | -56.2 | 0 | 0.44 | -56.64 | -13 | 43.64 |
| Above 1 GHz, Middle Channel | | | | | | | | | | | |
| 3346.6 | 44.20 | 232 | 1.60 | V | 3346.6 | 53.5 | 6.7 | 1.38 | -48.18 | -13 | 35.18 |
| 1673.2 | 48.78 | 325 | 1.50 | V | 1673.2 | -55.3 | 6.2 | 0.94 | -50.04 | -13 | 37.04 |
| 2509.8 | 42.41 | 0 | 1.60 | V | 2509.8 | -57.2 | 7.3 | 1.19 | -51.09 | -13 | 38.09 |
| 1673.2 | 46.25 | 235 | 1.50 | H | 1673.2 | -57.2 | 6.2 | 0.94 | -51.94 | -13 | 38.94 |
| 3346.6 | 41.38 | 147 | 1.50 | H | 3346.6 | -57.8 | 6.7 | 1.38 | -52.48 | -13 | 39.48 |
| 2509.8 | 40.25 | 325 | 1.60 | H | 2509.8 | -59.1 | 7.3 | 1.19 | -52.99 | -13 | 39.99 |

PCS Band (Part 24E)

| Indicated | | Table Angle Degree | Test Antenna | | Substituted | | | | Absolute Level (dBm) | Limit (dBm) | Margin (dB) |
|-----------------------------|---------------------|--------------------|--------------|-------------|-----------------|-------------|----------------|-----------------|----------------------|-------------|-------------|
| Frequency (MHz) | S.A. Reading (dBμV) | | Height (m) | Polar (H/V) | Frequency (MHz) | Level (dBm) | Ant. Gain (dB) | Cable Loss (dB) | | | |
| Below 1 GHz, Middle Channel | | | | | | | | | | | |
| 39.85 | 45.25 | 45 | 1.5 | V | 39.85 | -46.7 | 0 | 0.10 | -46.8 | -13 | 33.8 |
| 98.42 | 47.45 | 134 | 1.5 | V | 98.42 | -50.2 | 0 | 0.20 | -50.4 | -13 | 37.4 |
| 299.68 | 43.57 | 157 | 1.6 | H | 299.68 | -55.4 | 0 | 0.36 | -55.76 | -13 | 42.76 |
| 333.12 | 42.06 | 58 | 1.3 | H | 333.12 | -56.3 | 0 | 0.39 | -56.69 | -13 | 43.69 |
| Above 1 GHz, Middle Channel | | | | | | | | | | | |
| 3760 | 55.61 | 324 | 1.6 | V | 3760 | -39.8 | 6.9 | 1.47 | -34.37 | -13 | 21.37 |
| 3760 | 54.18 | 157 | 1.8 | H | 3760 | -41.6 | 6.9 | 1.47 | -36.17 | -13 | 23.17 |
| 5640 | 49.66 | 254 | 1.6 | V | 5640 | -43.6 | 8.3 | 1.76 | -37.06 | -13 | 24.06 |
| 7520 | 47.62 | 118 | 1.6 | V | 7520 | -43.1 | 7.6 | 2.09 | -37.59 | -13 | 24.59 |
| 5640 | 43.85 | 21 | 1.5 | H | 5640 | -49.8 | 8.3 | 1.76 | -43.26 | -13 | 30.26 |
| 7520 | 42.18 | 124 | 2.0 | H | 7520 | -49.2 | 7.6 | 2.09 | -43.69 | -13 | 30.69 |

***** END OF REPORT *****