Navigation Relevant Products And Solutions

Transcom Instruments
NSS Series Navigation Signal Simulator

RTS Series Closed Loop Test System

RPS Series Record and Playback System

SNRTest Test and Evaluation System
NSS Series Multi-Frequency Constellation Simulator

- **NSS9000 Multi-Frequency Constellation Simulator**
  - Support BDS /GPS/GLONASS/GALILEO
  - Up to 12 independent frequencies
  - 18 channels per independent frequency
  - Support BPSK, QPSK, BOC
  - Support RTK test
  - Pseudorange Accuracy :1mm

- **NSS8000 Multi-Constellation Simulator**
  - Support BDS/GPS/GLONASS/GALILEO full frequency, 18 channels per every frequency point
  - Support GPS L1/BDS B1 Controlled Reception Pattern Antenna (CRPA) testing

- **NSS6800 Simulator**
  - Support BDS, GPS L1 and GLONASS L1
  - Multiple testing scenario pre-set, includes static simulation, vehicle dynamics, flight dynamics
  - Support customized testing setting
  - Support satellite antenna pattern and receiver
  - Open remote control command interface for system integration

**NSS series Optional Accessories**
- Support inertial navigation, difference, directional testing
- Support spoofing or interference/jamming signals simulation
- BDS open and encrypted signals

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<table>
<thead>
<tr>
<th></th>
<th>NSS9000</th>
<th>Spirent GSS9000</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Frequency</strong></td>
<td>BD2\GPS\GLONASS\Galileo full range</td>
<td>BD2\GPS\GLONASS\Galileo (BD-B3 not included)</td>
</tr>
<tr>
<td><strong>Beidou global signal</strong></td>
<td>included</td>
<td>not included</td>
</tr>
<tr>
<td><strong>Pseudorange Accuracy</strong></td>
<td>0.001m</td>
<td>0.003m</td>
</tr>
<tr>
<td><strong>Harmonic Wave</strong></td>
<td>$\leq -40$ dBc</td>
<td>$\leq -40$ dBc</td>
</tr>
<tr>
<td><strong>Level Control Range</strong></td>
<td>-150dBm~ -10dBm</td>
<td>-170dBm~ -60dBm</td>
</tr>
<tr>
<td><strong>RF Signal Level Run to Run Repeatability</strong></td>
<td>0.2dB</td>
<td>0.1dB</td>
</tr>
<tr>
<td><strong>Signal Level Absolute Accuracy</strong></td>
<td>0.5 dB</td>
<td>0.5 dB</td>
</tr>
<tr>
<td><strong>Maximum Relative Velocity</strong></td>
<td>±120,000m/s</td>
<td>120,000 m/s</td>
</tr>
<tr>
<td><strong>Maximum Relative Acceleration</strong></td>
<td>±3000m/s²</td>
<td>192600m/s²</td>
</tr>
<tr>
<td><strong>Maximum Relative Jerk</strong></td>
<td>±5000m/s³</td>
<td>890,400m/s³</td>
</tr>
<tr>
<td><strong>Phase Noise</strong></td>
<td>$\leq 0.005$ rad (RMS)</td>
<td>$\leq 0.005$ rad (RMS)</td>
</tr>
<tr>
<td><strong>Internal 10.00 MHz OCX Oscillator</strong></td>
<td>$\leq 5 \times 10^{-10}$</td>
<td>$\leq 5 \times 10^{-10}$</td>
</tr>
</tbody>
</table>
RTS Closed Loop Test System

**RTS7000 Closed Loop Test System**

- Simulate satellite outbound signals of 5 RDSS GEO satellites, 2 beams for each satellites
- Simulate satellites orbit constellation, support passive positioning calculation
- Support RDSS user machine inbound signals, Pseudorange calculation, Power Measurement and Doppler estimation
- Support Information Encryption Test
- Auto test for more than 30 parameters under both wireless and wired conditions.

**RTS7400 Closed Loop Test System**

- Support 4 instruments doing test at the same time under wireless or wired conditions
- Hardware platform support RDSS multi users parallel test and configuration of GNSS Navigation signals
- Simulate satellite outbound signals of 5 RDSS GEO satellites, 2 beams for each satellites
- Synchronize with other navigation signal sources, support multi users’ instruments development and test
- Support user machine inbound signals, inbound signals demodulation, Pseudorange calculation, power calculation and Doppler Support Information Encryption Test
- Provide data interface, used for auto test and reports generation
- Store inbound and outbound signals information, benefits for further analysis

**RTS7800 Closed Loop Test System**

- All RTS7000 functions included, support 8 instruments doing test at the same time under wireless or wired conditions
**Applications**

**RPS2000 data record and playback system**
- 4 channels sampling simultaneously, with 400MHz maximum sampling
- Support more than 1GHz/s data flow disc
- Every channel has 20MHz to 100MHz sampling bandwidth, and support configuration of 4 ways BDS/GPS/GLONASS/GALILEO navigation frequency point.
- High accuracy: the synchronism between multiple channels is nano-second level, suitable for test like antenna differential test and RF receiver test
- Support all kinds of constellation, 4 in-build channels with 100MHz bandwidth, could be extended to 8 channels
- Support GPS L1/L2/L5, BDS B1/B2, GLONASS L1/L2, CALILEO, QZSS and SBAS satellite signals
- In-built GPS module, support online monitoring navigation signal states

**RPS RECORD and Playback System**
- Frequency point configurable
- Remote control via Smart phone
- 4 systems for capture and playback
- One-touch operation, 6 hours operation time
- In-built GPS module, support online monitoring navigation signal states
- No need for PC and external hard disk
- Easy operation
- Charged by various kinds of external power source
- Record GNSS signals in real environment easily with high efficiency, and repeatedly playback when required
- Easy to carry
- Recorded signal and resolving signal could be playback at the same time, benefits for comparison between receivers and standard receivers

**RPS1000 Hand held Signal record and playback apparatus**
- Hand held signal record and playback apparatus
- Frequency point configurable
- Remote control via Smart phone
- 4 systems for capture and playback
- One-touch operation, 6 hours operation time
- In-built GPS module, support online monitoring navigation signal states
- No need for PC and external hard disk
- Easy operation
- Charged by various kinds of external power source
- Record GNSS signals in real environment easily with high efficiency, and repeatedly playback when required
- Easy to carry
- Recorded signal and resolving signal could be playback at the same time, benefits for comparison between receivers and standard receivers
## Specifications

<table>
<thead>
<tr>
<th></th>
<th>RPS1000</th>
<th>Spirent GSS6450</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Frequency Point</strong></td>
<td>BD2\GPS\GLONASS\Galileo</td>
<td>BD2\GPS\GLONASS\Galileo</td>
</tr>
<tr>
<td><strong>Number of Frequency</strong></td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td><strong>Point of simultaneously acquisition</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Signal Sampling</strong></td>
<td>2bit, 4bit, 8bit, 12bit, 16bit</td>
<td>4bit, 8bit, 16bit</td>
</tr>
<tr>
<td><strong>Signal Bandwidth</strong></td>
<td>2MHz to 71MHz</td>
<td>10MHz, 30MHz, 50MHz</td>
</tr>
<tr>
<td><strong>In-built disk</strong></td>
<td>-</td>
<td>2TB</td>
</tr>
<tr>
<td><strong>Mobile HD</strong></td>
<td>2TB</td>
<td>2TB</td>
</tr>
<tr>
<td><strong>In-built GNSS Receiver</strong></td>
<td>BD B1+GPS L1+GLO L1</td>
<td>BD1+GPS L1+GLO L1</td>
</tr>
<tr>
<td><strong>Operation Time</strong></td>
<td>3h</td>
<td>1.5h</td>
</tr>
<tr>
<td><strong>Removable Battery</strong></td>
<td>-</td>
<td>Removable</td>
</tr>
<tr>
<td><strong>CANBUS</strong></td>
<td>Support</td>
<td>Optional</td>
</tr>
<tr>
<td><strong>SPIBUS</strong></td>
<td>Support</td>
<td>Optional</td>
</tr>
<tr>
<td><strong>Screen size</strong></td>
<td>5 inch</td>
<td>2.7 inch</td>
</tr>
<tr>
<td><strong>Resolution</strong></td>
<td>800*480</td>
<td>640*480</td>
</tr>
<tr>
<td><strong>Size</strong></td>
<td>145<em>210</em>50</td>
<td>216<em>200</em>76</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>1.8Kg</td>
<td>2.2Kg</td>
</tr>
</tbody>
</table>

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The test and evaluation system, SNRTest, supports auto test depending on default or user-defined scripts, by comparing test data with reference data, it will generate test report automatically.

<table>
<thead>
<tr>
<th>Testing Center follows following 17 standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. GB/T 18214.1-2000 Global navigation satellite systems (GNSS)-Part 1: Global positioning system (GPS)-Receiver equipment-Performance STANDARDS, methods of testing and required test results</td>
</tr>
<tr>
<td>2. GB/T 15527-1995 General specification for marine GPS receiver</td>
</tr>
<tr>
<td>3. GB 12267-1990 Marine navigational equipment - General requirements - Methods of testing and required test results</td>
</tr>
<tr>
<td>4. GB/T 19056-2012 Vehicle travelling data recorder</td>
</tr>
<tr>
<td>5. GB/T 19392-2003 General specification for in-vehicle GPS navigation system</td>
</tr>
<tr>
<td>6. GBT 26782.3-2011 Satellite navigation based ship monitoring and management system - Part 3: Technical requirements for shipborne terminal</td>
</tr>
<tr>
<td>7. GB/T 26766-2011 On-board information terminal of urban public transit dispatching</td>
</tr>
<tr>
<td>8. SJ/T 11420-2010 General specification for GPS navigation receiver</td>
</tr>
<tr>
<td>9. SJ/T 11423-2010 General specification for GPS timing receiver</td>
</tr>
<tr>
<td>10. SJ 20726-1999 General specification for GPS timing receiving equipment</td>
</tr>
<tr>
<td>11. SJ/T 11428-2010 Performance requirements and test methods for GPS receivers OEM board</td>
</tr>
<tr>
<td>12. JT/T 794-2011 GNSS system for operating vehicles-technical specification for vehicle terminals</td>
</tr>
<tr>
<td>13. JT/T 732.2-2008 Technical requirements for vessel satellite positioning application system part 2: shipborne terminal</td>
</tr>
<tr>
<td>14. AQ 3004-2005 Telematics control unit for monitoring safety of on-road vehicle transportation of dangerous chemical goods</td>
</tr>
<tr>
<td>15. QJ 20007-2011 General specification for navigational GNSS receiver</td>
</tr>
<tr>
<td>16. QJ 20008-2011 Performance requirements and test methods for baseband processing chip of GNSS receiver</td>
</tr>
<tr>
<td>17. CHB5.6-2009 Verification regulation for Beidou user equipment</td>
</tr>
</tbody>
</table>
Solutions

1. **Simulation performance Test**
   - Interface test platform
   - GNSS wired test platform
   - GNSS wireless test platform
   - Terminal production line test platform

2. **Real signal test**
   - Real Signal Static Test Platform
   - Real Signal Dynamic Test Platform

- **DUT**
  - Chip
  - OEM Module
  - Receiver

- **Anti-jamming receiver, CRPA**

- **RTK applications**
  - Integrated navigation
  - Precision positioning
GNSS Wired Test Platform could test navigation terminals homogeneity of product and software quickly, suitable for defective terminals detection. It support test of RDSS/GNSS signals, also it has anti-interference. The navigation source of the platform could be generated by navigation signal simulator, signal acquisition and playback apparatus and satellite transponder, suitable for all kinds of navigation terminals research and manufacturing.
Solutions Cases: GNSS Wired Test Platform

Beidou Satellite Navigation Products 2301 Quality Supervision Test Center
Solutions Cases: GNSS Wired Test Platform

Testing Center of Institute of Shanghai Metrological Testing Technology
Solutions: GNSS Wireless Test Platform

GNSS Wireless Test Platform follows. General specification for Beidou subscriber terminal test system. GNSS Wireless Test Platform will simulate user terminals’ signal receiving conditions, then it could build a environment which could reflect user terminals’ RDSS and GNSS performance and functions, then it could provide test environment and verification environment. GNSS Wireless Test Platform is constructed of simulation control, test and evaluating, RF signal simulator I/O, test environment and time and frequency standards signals.
Solutions Cases: GNSS Wireless Test Platform

China Federal Radio Commission
Solutions Cases: GNSS Wireless Test Platform

Testing Center of Institute of Shanghai Metrological Testing Technology
Solutions Cases: GNSS Wireless Test Platform

One of Research Institution in China
Solutions Cases: GNSS Wireless Test Platform

Beidou Satellite Navigation Products 2301 Quality Supervision Test Center
Solutions Cases: GNSS Wireless Test Platform

One of Research Institution in China
Solutions: Interface Test Platform

- RDSS/RNSS Signal Source
- Interface protocol controller
- RDSS/RNSS Interface test software

Support compliance test on data interface protocol and electrical interface protocol of RF signal ICD interface and external interfaces
Solutions Cases: Interface Test Platform

Testing Center of Institute of Shanghai Metrological Testing Technology
Follows General specification for Beidou subscriber terminal test system, benefits for improving production test efficiency. Terminal production line test platform is designed for delivery inspection and tests. The platform support various kinds of RDSS terminals, Beidou dual modes user machine, Beidou GNSS terminals, BDS/GPS dual modes navigation terminals, BDS/GPS/GLONASS triple mode terminals.
Solutions Cases: Terminal production line test platform

Guizhou Beidou Testing Center and Sichuan Jiuzhou Electric Group Co., Ltd
Solutions Cases: Terminal production line test platform

Guangzhou Haige Communications Group Incorporated Company
Solutions Cases: Terminal production line test platform

Shanxi Fenghuo Electric Group Co., Ltd.
Real Signal Static Test Platform could do static test on positional accuracy, differential positional accuracy, antenna phase center, receiver inner noise and receiver timing parameter. Test system for navigation model receiver will finish the measurement in a short baseline, ignore parameters like Ionosphere and Troposphere effects, including ionospheric scintillation, ephemeris, Satellite clocks errors and receiver time error, for a long period time, the difference between the baseline value and observed values could reflect the performance and stability of each receivers.

Zero baseline measurement technique is applied to measure inner noise level. Put the receiver at a known point in baseline field, the difference between real coordinate and resolving coordinate is the calibration result.
Solutions Cases: Real Signal Static Test Platform

Testing Center of Institute of Shanghai Metrological Testing Technology
Solutions Cases: Real Signal Static Test Platform

A research center in China
Reference Receiver is consisted of a datum-station at fixed location, a moving receiver fixed at test car, and the RTK difference between terminals. The location of datum-station is known, Moving station could get location information by RTK resolving. With INS, the reference signal will not get lost in complex environments, terminals location could be obtained by RTK real time resolving. The drive test data could be stored and recalled for test.
Solutions: GNSS/INS integrated navigation terminal test System and Wired Array Anti-jam System

Wired Array Anti-jam Test System will build a real anti-jam environment without antenna, then simulating various interference signal, like forward interference, spoofing interference, multi-path interference, custom interference, narrow band interference, broadband interference, continuous wave, sweep signal, FM signal and other self-defined interference signals.

GNSS/INS integrated navigation terminal test System is a kind of auto dead reckoning system, it features high capacity of resisting disturbance, short term high accuracy, but easy error accumulation. Add the INS simulating unit to GNSS navigation signal source to make a good dynamic performance GNSS navigation signal sources used for GNSS or INS system test. The GNSS/INS system will receive GNSS simulating signal and IMU simulation data. By comparing the real simulating trace with system output, the navigation algorithm could be evaluated.
In a Differential Positioning Wired Test System, a navigation signal source will simulate a moving receiver used for receiving satellite signal, meanwhile it will transfer data to other moving receivers differential information via serial ports, then the receiver could finish resolving. This solution could be used for whole machine test except antenna.

Differential Positioning Wireless Test system utilized a anechoic chamber to build a wireless test environment, the satellite signal simulated by navigation signal sources will radiate in the anechoic chamber, the differential correction data will be transmitted by data radio, finally all data will be processed by receiver which fixed at moving station.
Preparing Today for 5G of Tomorrow

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