



life.augmented

Teseo III and Teseo-Modules

Anti-spoofing and anti-jamming

ADG/Positioning

Version: 1.1



GNSS attacks

- **Spooing:**
 - It's a GNSS attack where a fake/simulated satellite signals are broadcast provided;
 - Due to the fake signal the PVT solution is wrongly estimated;

- **Jamming:**
 - It a GNSS attack where noise is injected in the GNSS bands.
 - Due to the higher power received in the RF-chain can saturate;



Teseo III - Anti-Spoofing

- Teseo III IC and Teseo Modules support GNSS integrity message.
- It's a module which monitors the gaps between the LMS based PT solutions against three active constellations
- Host can detect spoofing through the gaps monitoring

| | |
|---|--|
| | |
| 1. Enable three GNSS constellations <ul style="list-style-type: none">• GPS, Galileo and Glonass• GPS, Galileo and BeiDuo | <code>\$PSTMCFGCONST,2,2,2,0,0</code> <code>\$PSTMCFGCONST,2,0,2,0,2</code> |
| 2. Enable GNSS integrity feature | <code>\$PSTMSETPAR,1272,3,1</code> |
| 3. Enable GNSS integrity in the message-list | <code>\$PSTMSETPAR,1228,0x200000,1</code> |
| 4. Save on flash and | <code>\$PSTMSAVEPAR</code> |
| 5. Reset | <code>\$PSTMSRR</code> |

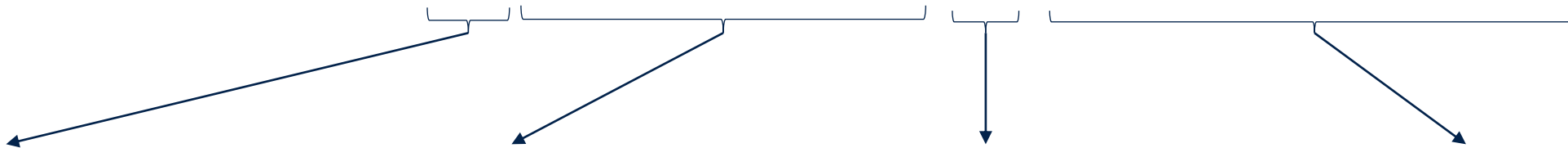




\$PSTMGNSSINTEGRITY message

Integrity can be monitored in the \$PSTMGNSSINTEGRITY message:

```
$PSTMGNSSINTEGRITY,0,3,136.6,0.0,0.0,11,255.0,30.9,-224.2*6A
```



| Position const. mask: | Position gaps (in meters) | Timing const. mask | Timing gaps (in ns) |
|---|--|---|--|
| bit 0: GPS bit 1: GLONASS bit 3: GALILEO bit 7: BEIDOU | <ul style="list-style-type: none">Gap_ConstA_vs_ConstBGap_ConstA_vs_ConstCGap_ConstB_vs_ConstC | bit 0: GPS bit 1: GLONASS bit 3: GALILEO bit 7: BEIDOU | <ul style="list-style-type: none">Gap_ConstA_vs_ConstBGap_ConstA_vs_ConstCGap_ConstB_vs_ConstC |

Constellation mask: identify which constellations are valid



Teseo III – AGC and 3 bits ADC

- In the Teseo III RF-FE:
- 3 bits ADC converter guarantees:
 - Less sensitivity to the incoming interferer;
 - Much robust digital signal reconstruction;
- AGC can monitor the incoming Power detection



Incoming Power Detection

- Incoming power detection can be monitored in the AGC (\$PSTMFEDATA)
- When higher power is detected the AGC will decrease the gain.

| | |
|---|---|
| | |
| 1. Enable \$PSTMFEDATA in the message list | <code>\$PSTMSETPAR, 1228, 0x10000, 1</code> |
| 2. Save on flash and | <code>\$PSTMSAVEPAR</code> |
| 3. Reset | <code>\$PSTMSRR</code> |



\$PSTMFEDATA message

AGC gain can be monitored in the \$PSTMFEDATA periodic message:

```
$PSTMFEDATA, ff, ff, 3c, 6f, 9d, 4d, be, 93, 00, 00, 20, 9a, a8, f0, 3f, 30, 80, 1a, 28, e0, 7f, 30, 40, 3e, 3d*76
```

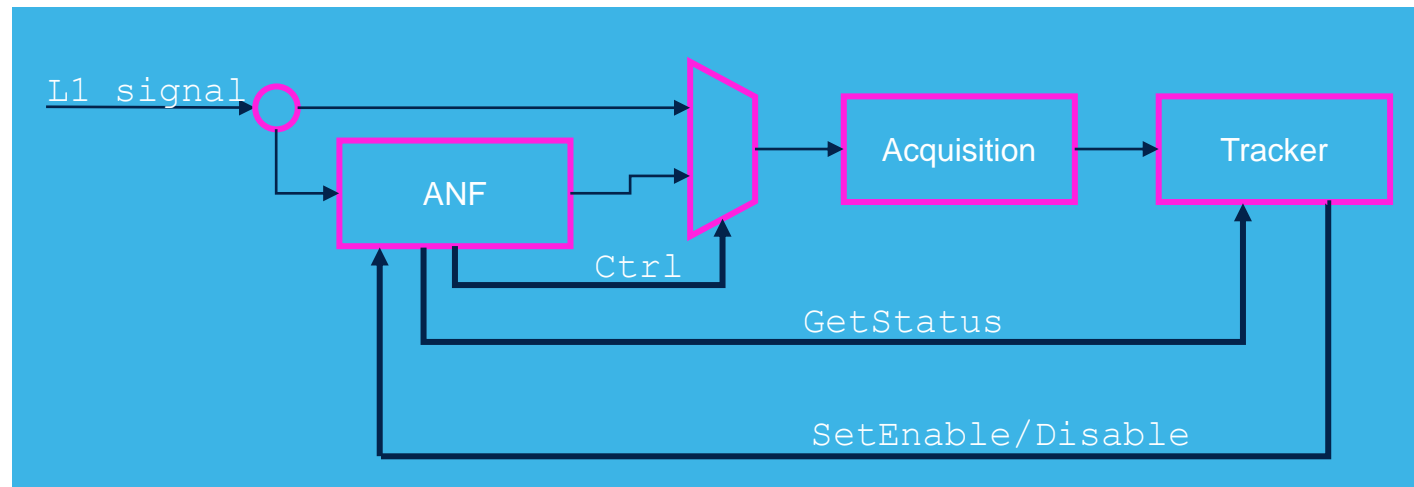
| Reserved | GPS/Galileo | Glonass/BeiDou |
|--------------------|---|---|
| Reserved registers | AGC gain (6 bits hex value) <ul style="list-style-type: none">• 0x00 max gain• 0x3f min gain | AGC Gain (6 bits hex value) <ul style="list-style-type: none">• 0x00 max gain• 0x3f min gain |



Teseo III – Adaptive Notch Filter

The Adaptive Notch Filter (ANF) is an HW-IP in Teseo III, which supports:

- self-tuning to the position of the jammer frequency
- searching autonomously Narrow Band Interferer (NBI)
- identifying and eliminating an eventual NBI without affecting the incoming signal.





Teseo III – Adaptive Notch Filter

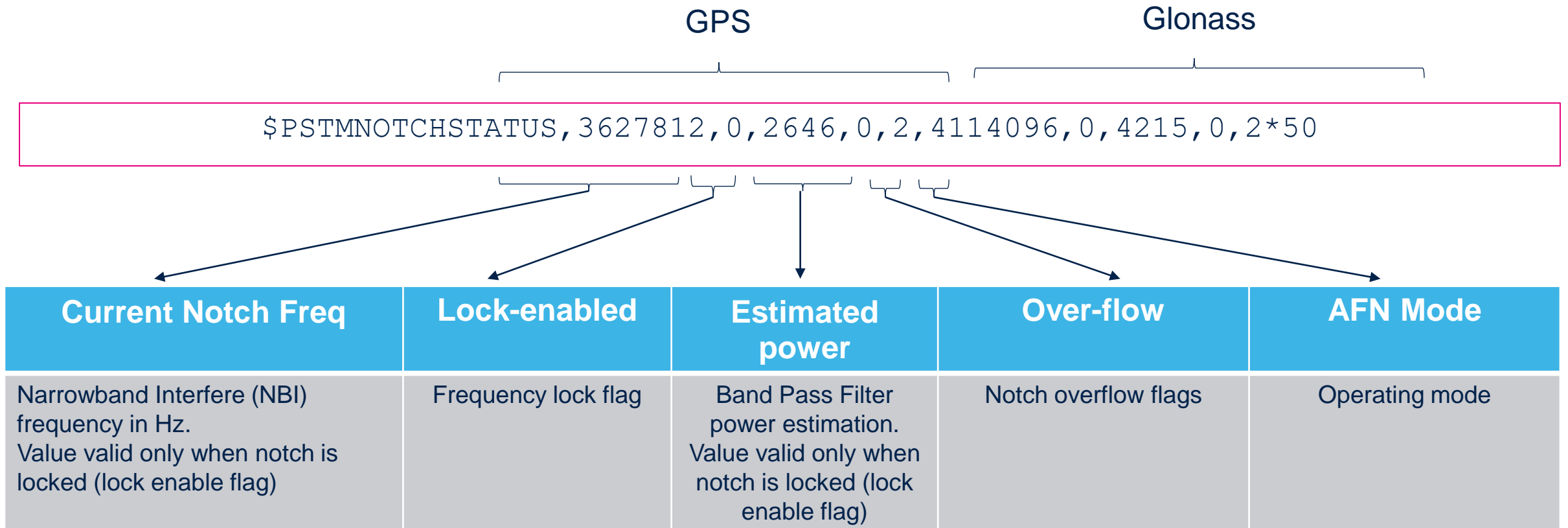
- Notch filter has to be enabled in the firmware configuration
- Host can monitor Notch filter status (optional)

| | |
|--|-----------------------------------|
| | |
| 1. Enable Notch filter in the firmware configuration | \$PSTMCFGAJM, 2, 2 |
| 2. Enable Notch message in the message-list (optional) | \$PSTMSETPAR, 1228, 0x40000000, 1 |
| 3. Save on flash and | \$PSTMSAVEPAR |
| 4. Reset | \$PSTMSRR |



\$PSTMNOTCHSTATUS message

Notch filter status can be monitored in the \$PSTMNOTCHSTATUS message:





Documents & related resources

All documents are available on:
www.st.com

- Teseo III IC: [Webpage](#)
 - Datasheet
 - User Manuals
- Teseo Modules: [Webpage](#)
 - Datasheet
 - User Manuals
- Teseo-Suite: [Webpage](#)
 - Datasheet
 - Install program

GNSS ICs

ST's Teseo family of Global Navigation Satellite System ICs combines high positioning accuracy and indoor sensitivity with powerful processing capabilities, to simultaneously support multiple global navigation systems (BeiDou, Galileo, GLONASS, GPS, and QZSS).

Teseo III is the latest generation of GNSS ICs, and compared to Teseo II offers reduced power consumption, carrier-phase tracking for higher accuracy, and support for Ready-only Memory (ROM).

Our product offering includes standalone positioning chips (SAL) and configurable system-on-chips (SOCs). The standalone devices are offered with GNSS firmware embedded, to perform all positioning operations including tracking, acquisition, navigation and data output. The SoCs offer power processing and spare memory to enable customers and partners to easily and efficiently merge their code or specific IPs with ST's GNSS library to create a highly optimized platform.

Both solutions come with different package options and memory size, and are compatible with the TESEO-DRAW sensor fusion firmware for dead-reckoning and assisted navigation.

Teseo devices address e-call and telematics systems, personal navigation in PNDs and handheld devices, as well as marine and in-car navigation systems.

| Package | GNSS library solutions (SAL) |
|---------------|--|
| WL3P77 4x4 mm | STAN0300W (Smallest footprint and lowest cost) |
| | STAN0300F (Stacked Flash, Automotive grade option available) |
| GN06 7x7 mm | STAN0300 (Low cost PCB design) |
| GN06 9x9 mm | STAN0300A (Automotive grade) |
| | STAN0300G (Wearable Form Factor QFN 8, Speech, Automotive grade) |
| BGA109 8x5 mm | STAN0300E (SAL with GNSS capability SOC) |
| BGA109 9x9 mm | STAN0300F (SAL) |

TESEO-SUITE

PC software tool to manage, configure and evaluate the performance of Teseo III GNSS solutions in parallel.

On each ST TESEO GNSS solution the Teseo Suite is able to read, modify and save the configuration.

NMEA sentences logging and analysis supported. NMEA message-list configurable per port.

Key Features

- Multiple GNSS tracer
- Multiple protocol support
- GNSS firmware configuration tool
- GNSS flashing tool
- Dead reckoning panel
- NMEA diagnostic tool
- Satellites signal monitoring viewer
- Map viewer
- Log viewer

RESOURCES

Quick Links

Technical Documentation

| Product Specifications | | |
|---|---------|--|
| Description | Version | |
| DB3224 PC GUI software to control, configure and performance analyze of Teseo GNSS family | 1.0 | |

Legal

| License Agreement | | |
|------------------------------------|---------|-------|
| Description | Version | Size |
| SLA0056 Software license agreement | 1.0 | 59 KB |

EVB-T3

TESEO III evaluation board

Teseo EVB board is a complete standalone evaluation platform for Teseo III GNSS ST solution.

Teseo III embeds the high performance ARM946 microprocessor with dedicated SRAM and several serial communication interfaces, including USB, SPI, PC, UART and CAN.

Performance and configuration can be analyzed using the ST TESEO-SUITE PC Tool.

Key Features

- ST Teseo III GNSS platform
- Multiconstellation GNSS: GPS, Galileo, Glonass, BeiDou, QZSS are supported
- USB Power Supply and battery charge
- Internal battery for standalone usage
- ON/OFF and Reset buttons available
- NMEA over

RESOURCES

Technical Documentation

| Product Specifications | | |
|--|---------|--------|
| Description | Version | Size |
| DB3223 Teseo III GNSS evaluation board | 1.0 | 137 KB |

