



Teseo III and Teseo-Modules

Anti-spoofing and anti-jamming technology

ADG/Positioning

Version: 1.0





- **Spoofing:**
 - It's a GNSS attack that broadcasts fake/simulated satellite signals
 - Due to the fake signals, the position, velocity, and time (PVT) solution is incorrectly estimated

- **Jamming:**
 - It is a GNSS attack that injects noise in the GNSS bands
 - Due to the higher power received in the RF chain, communications can be saturated



Teseo III - Anti-spoofing

- Teseo III IC and Teseo modules support GNSS integrity messages.
- These modules monitor the gaps between the LMS-based PT solutions against three active constellations
- Host is able to detect spoofing by monitoring the gaps

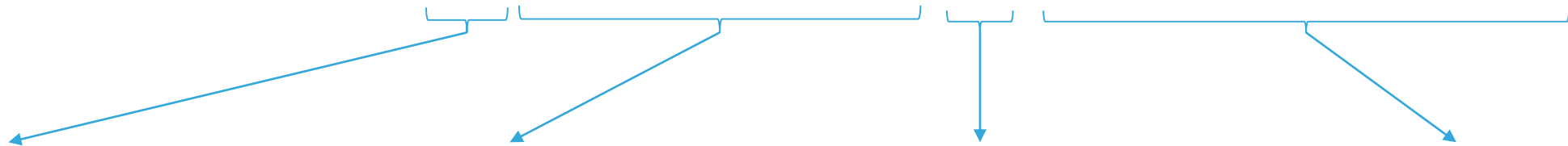
1. Enable three GNSS constellations	
• GPS, Galileo and Glonass	<code>\$PSTMCFGCONST,2,2,2,0,0</code>
• GPS, Galileo and BeiDuo	<code>\$PSTMCFGCONST,2,0,2,0,2</code>
2. Enable GNSS integrity feature	<code>\$PSTMSETPAR,1272,3,1</code>
3. Enable GNSS integrity in the message-list	<code>\$PSTMSETPAR,1228,0x200000,1</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_ConstB • Gap_ConstA_vs_ConstC • Gap_ConstB_vs_ConstC 	bit 0: GPS bit 1: GLONASS bit 3: GALILEO bit 7: BEIDOU	<ul style="list-style-type: none"> • Gap_ConstA_vs_ConstB • Gap_ConstA_vs_ConstC • Gap_ConstB_vs_ConstC



Constellation mask: identify which constellations are valid



Automatic Gain Control and 3-bit ADC

In the Teseo III GNSS module:

- 3-bit ADC converter guarantees:
 - Less sensitivity to the incoming interferer
 - More robust reconstruction of digital signals
- Automatic Gain Control (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:

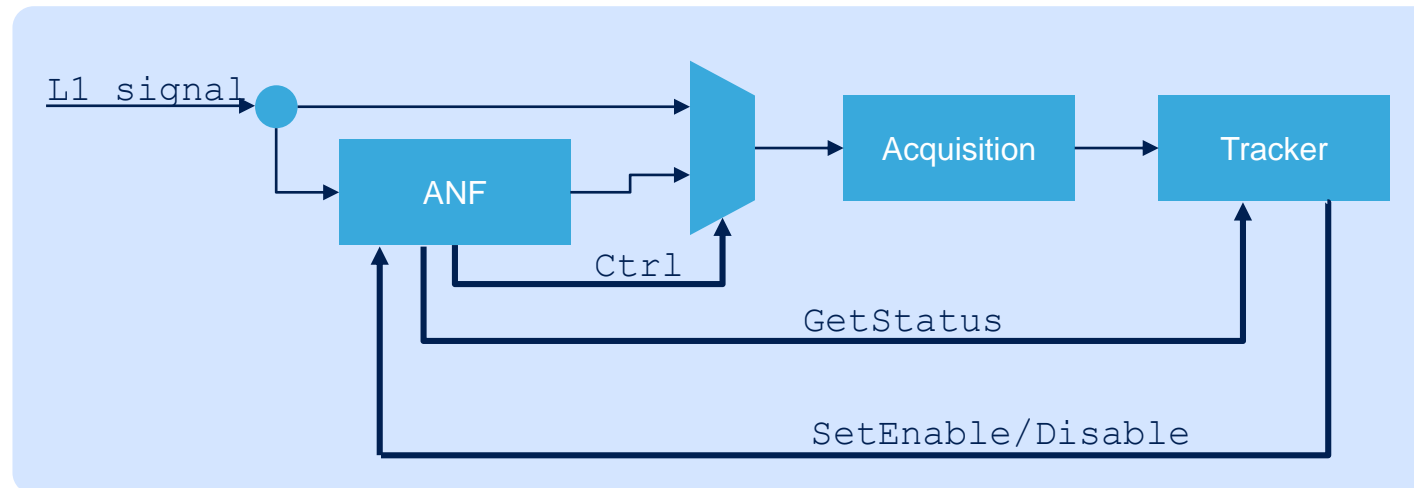
```
$PSTMFEDATA, ff, ff, 3c, 6f, 9d, 4d, be, 93, 00, 00, 20, 9a, a8, f0, 3f, 30, 80, 1a, 28, e0, 7f, 30, 40, 3e, 3d*76
```

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 modules include an Adaptive Notch Filter (ANF) used for:

- Self-tuning to the position of the jammer frequency
- Searching autonomously for the Narrow Band Interferer (NBI)
- Identifying and eliminating an eventual NBI without affecting the incoming signal





Teseo III

Adaptive Notch Filter

- The Adaptive Notch Filter has to be enabled in the firmware configuration
- The Host can monitor the ANF's status (optional)

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



\$PSTMNOTCHSTATUS Message

- The Adaptive Notch Filter's status can be monitored in the \$PSTMNOTCHSTATUS message:

GPS

Glonass

```
$PSTMNOTCHSTATUS, 3627812, 0, 2646, 0, 2, 4114096, 0, 4215, 0, 2*50
```

Current Notch frequency	Lock-enabled	Estimated power	Over-flow	AFN Mode
Narrowband Interfere (NBI) frequency in Hz. Value valid only when notch is locked (Lock Enable flag)	Frequency lock flag	Band Pass Filter power estimation. Value valid only when notch is locked (Lock Enable flag)	Notch overflow flags	Operating mode



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.

TESEO-SUITE

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

On each ST TESEO GNSS solution the Teseo Suite is able to read, modify and NMEA sentences logging and analysis supported. NMEA message-list configuration.

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	
SLA0056 Software license agreement	1.0	

EVB-T3

TESEO III evaluation board

Download Databrief

QUICK VIEW | **RESOURCES** | **TOOLS AND SOFTWARE** | **SAMPLE & BUY** | **QUALITY & RELIABILITY**

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, I2C, UART and CAN.

Performance and configuration can be analyzed using the ST TESEO-SUITE PC Tool2.

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	