Teseo III and Teseo-Modules

Anti-spoofing and anti-jamming

ADG/Positioning

Version: 1.1

GNSS attacks

- Spoofing:
  - 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

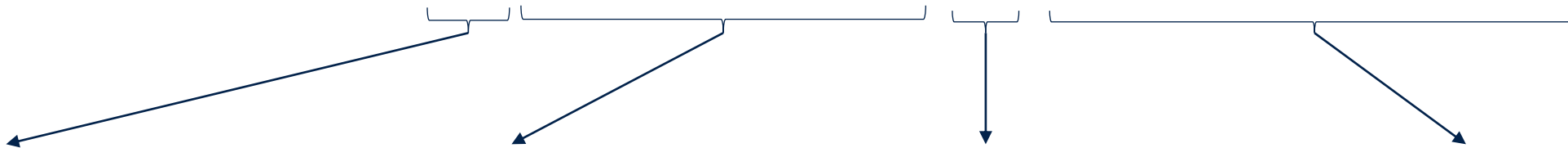|	

1. Enable **three** GNSS constellations
   • GPS, Galileo and Glonass
   • GPS, Galileo and BeiDuo
	`$PSTMCFGCONST,2,2,2,0,0`
	`$PSTMCFGCONST,2,0,2,0,2`

2. Enable GNSS integrity feature	`$PSTMSETPAR,1272,3,1`
3. Enable GNSS integrity in the message-list	`$PSTMSETPAR,1228,0x200000,1`
4. Save on flash and **5. Reset**	`$PSTMSAVEPAR` `$PSTMSRR`

`Firmware version >= 4.x.9`

$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	• Gap_ConstA_vs_ConstB • Gap_ConstA_vs_ConstC • Gap_ConstB_vs_ConstC	bit 0: GPS bit 1: GLONASS bit 3: GALILEO bit 7: BEIDOU	• Gap_ConstA_vs_ConstB • Gap_ConstA_vs_ConstC • Gap_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 **$PSTMFEDATA** in the message list	`$PSTMSETPAR,1228,0x10000,1`
2. **Save on flash and** 3. **Reset**	`$PSTMSAVEPAR` `$PSTMSRR`

$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) • 0x00 max gain • 0x3f min gain	AGC Gain (6 bits hex value) • 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.
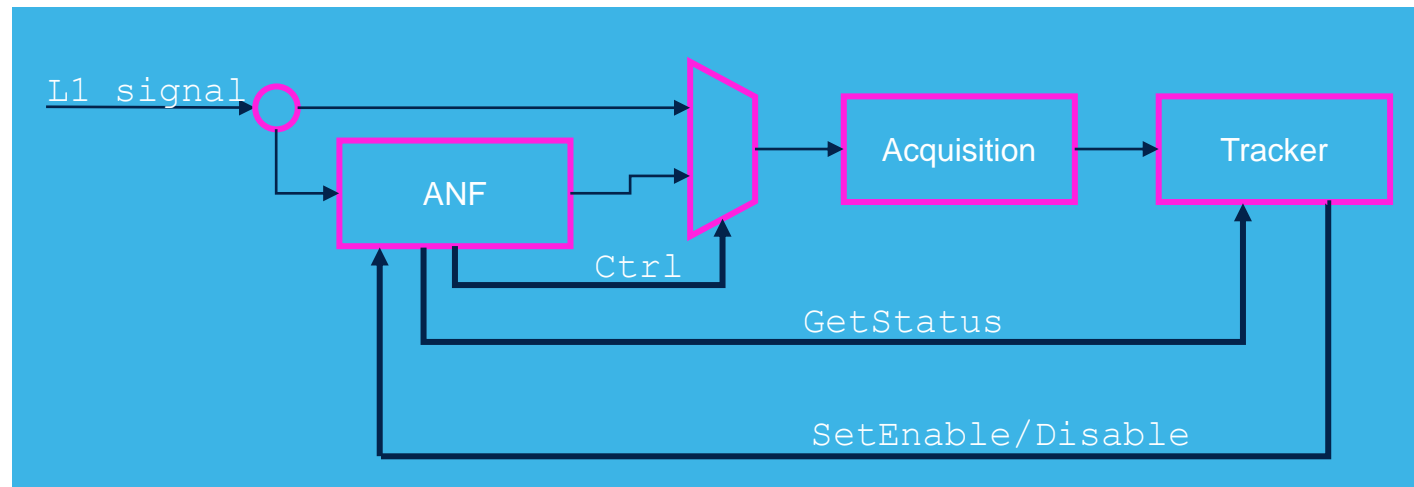
Teseo III – Adaptive Notch Filter

- 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 **4. Reset**	`$PSTMSAVEPAR` `$PSTMSRR`

$PSTMNOTCHSTATUS message

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

GPS   Glonass

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

Current Notch Freq	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
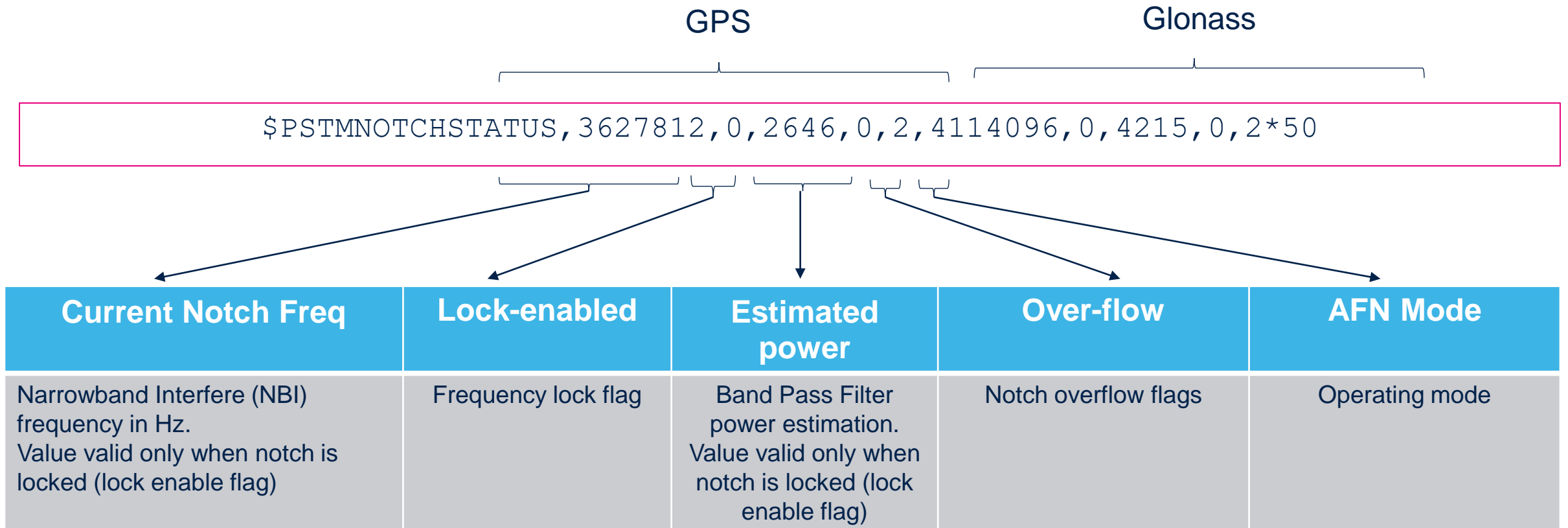
All documents are available on:
www.st.com

- ## Teseo III IC: Webpage
  - Datasheet
  - User Manuals

- ## Teseo Modules: Webpage
  - Datasheet
  - User Manuals

- ## Teseo-Suite: Webpage
  - Datasheet
  - Install program

Find us on the GNSS Community.st.com