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Release note

Topic	u-blox M10 ROM 5.10 Release Notes
	UBX-22001426 C1-Public
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1 General information

1.1 Scope

This release note describes the u-blox M10 ROM SPG 5.10 firmware. It covers the changes compared to the u-blox M10 ROM firmware SPG 5.00. It also shows changes compared to the u-blox M8 firmware SPG 3.01 and the u-blox M9 firmware SPG 4.04 to support customers migrating from previous u-blox receiver generations.

1.2 Open-Source declaration

This u-blox positioning product described in this release note, comprising the company's proprietary software, does not contain open-source software to declare.

1.3 Related documentation

- [1] u-blox 8/M8 SPG 3.01 firmware Release note, [UBX-16000319](#)
- [2] u-blox M9 SPG 4.04 firmware Release note, [UBX-20036165](#)
- [3] u-blox M10 SPG 5.10 Interface description, [UBX-21035062](#)

2 Released firmware image

2.1 ROM firmware

Released firmware image for u-blox M10	
Firmware version	ROM SPG 5.10 (7b202e)
Protocol version	PROTVER=34.10

2.2 Released software tools

2.2.1 u-center

u-center GNSS evaluation software	
File	https://www.u-blox.com/sites/default/files/u-centersetup_v22.02.zip
Version	22.02

2.2.2 u-center 2

u-center GNSS evaluation software	
File	https://www.u-blox.com/sites/default/files/u-center2-21.11.13554.exe.zip
Version	21.11

2.3 Identification

2.3.1 Boot screen

The receiver shall output a boot screen similar to the following one, with the differences expected in the CHIPID=... row (this is meant to be unique for every chip).

```
$GNTXT,01,01,02,u-blox AG - www.u-blox.com*4E
```

```
$GNTXT,01,01,02,HW UBX 10 000A0000*53
```

```
$GNTXT,01,01,02,EXT SPG 5.10 (7b202e)*65
```

```
$GNTXT,01,01,02,ROM BASE 0xF8BE6B24*55
```

```
$GNTXT,01,01,02,FWVER=SPG 5.10*40
```

```
$GNTXT,01,01,02,PROTVER=34.10*1E
```

```
$GNTXT,01,01,02,CHIPID=000000D0D69D0F7A54*0B
```

```
$GNTXT,01,01,02,GPS;GLO;GAL;BDS*77
```

```
$GNTXT,01,01,02,SBAS;QZSS*60
```

```
$GNTXT,01,01,02,ANTSUPERV=*22
```

```
$GNTXT,01,01,02,ANTSTATUS=DONTKNOW*2D
```

```
$GNTXT,01,01,02,PF=F6FFB*4A
```

```
$GNTXT,01,01,02,Starting GNSS*5A
```

3 Changes compared to ROM firmware SPG 5.00

3.1 Added features

3.1.1 Protection level

The new protection level message provides a real-time position accuracy estimate with 95% confidence. It can be used as an alternative to the position accuracy estimate provided in UBX-NAV-PVT or other messages.

3.1.2 CloudLocate

The u-blox CloudLocate service extends the life of energy-constrained IoT applications. Besides the existing UBX-RXM-MEASX message, new messages with a size of 12, 20 and 50 bytes were added for a reduced payload supporting bandwidth-constrained connectivity solutions.

3.1.3 Super-S

The weak signal compensation (aka signal attenuation compensation) improves the position and velocity accuracy when using small antennas or in case of bad antenna placement.

3.1.4 BeiDou B1C signal support

In addition to the BeiDou B1I signal already supported in previous products, the SPG 5.10 firmware also supports the BeiDou B1C signal with lower power consumption rate. The product works with either one of these signal types at a time.

Neither AssistNow (Online, Offline or Autonomous) nor power save mode is supported when using BeiDou B1C signals.

3.1.5 Main oscillator support

In addition to AC-coupled TCXOs, the ROM firmware version SPG 5.10 also supports DC-coupled TCXOs and crystal oscillators. Compared to TCXOs, crystal oscillators provide reduced cost and a lower power consumption.

3.1.6 Power save modes (PSM)

Power save modes for on/off operation (PSMOO) and for cyclic tracking (PSMCT) have been added. The 1 Hz cyclic tracking PSM reduces the power consumption by about 50% compared to normal mode.

3.2 Changed features

3.2.1 Improved data batching

The firmware supports the storage of navigation solutions for up to 10 minutes (at 1 Hz) within the receiver without the need of an external flash. This reduces the system power consumption by allowing the application processor to stay in low-power mode for a longer time.

The option to map the fill data indicator to the GPIO5 (EXTINT) pin has been added.

3.2.2 Changed NMEA-GSV message

Information about the SBAS SV IDs and signal strength (C/N0) has been added to the message.

3.2.3 Improved QZSS support in NMEA 4.10 GxGSV

The QZSS satellites are reported correctly. In the ROM firmware version SPG 5.00, they were reported as GPS satellite 1-10.

3.2.4 Improved BeiDou PRN38 to 63 satellite signal support

The SPG 5.10 firmware supports searching and using of PRN01 to PRN63 for BeiDou B1C or B1I SVs. In ROM firmware SPG 5.00, only BeiDou SVs up to PRN37 were supported.

3.2.5 Improved SLAS corrections

By default, SLAS corrections are only used within max 200 km from the nearest monitoring station. The SPG 5.10 firmware provides a new configuration option to change the correction range.

3.3 Removed features

None

4 Changes compared to u-blox M9 firmware SPG 4.04

4.1 Added features

4.1.1 Protection level

The new protection level message provides a real-time position accuracy estimate with 95% confidence. It can be used as an alternative to the position accuracy estimate provided in UBX-NAV-PVT or other messages.

4.1.2 CloudLocate

The u-blox CloudLocate service extends the life of energy-constrained IoT applications. Besides the existing UBX-RXM-MEASX message, new messages with a size of 12, 20 and 50 bytes were added for a reduced payload supporting bandwidth-constrained connectivity solutions.

4.1.3 BeiDou B1C signal support

In addition to the BeiDou B1I signal already supported in previous products, the SPG 5.10 firmware also supports the BeiDou B1C signal with lower power consumption rate. The product works with either one of these signal types at a time.

Neither AssistNow (Online, Offline or Autonomous) nor power save mode is supported when using BeiDou B1C signals.

4.1.4 Main oscillator support

In addition to AC-coupled TCXOs, the ROM firmware version SPG 5.10 also supports DC-coupled TCXOs and crystal oscillators. Compared to TCXOs, crystal oscillators provide reduced cost and a lower power consumption.

4.2 Changed features

4.2.1 Improved cold start performance with BeiDou B1I and Galileo

The cold start acquisition sensitivity improved for Galileo and BeiDou B1I by about 1 dB. The TTFF figures at reference signal level improved slightly.

The TTFF with weak signals improved significantly. For BeiDou B1I, it went down to around <50 s and for Galileo, the TTFF it is about 30 s.

For more information, see UBX-M10050-KB Data sheet [4].

4.2.2 Changed boot screen and version string

The boot screen changed in two ways:

1. A unique chip ID (the same that is available by polling UBX-SEC-UNIQID) is output automatically as part of the boot screen.
2. The version string has changed slightly. Where previously a user would have read “ROM CORE 5.10” we now output “ROM SPG 5.10”. The content of the fwVer field in UBX-MON-VER changed in the same way.

4.2.3 Improved data batching

Doubled the maximum buffer available up to 10 minutes for data batching. Also made it possible to select the EXTINT pin as the fill level indicator.

4.2.4 Changed AssistNow Autonomous

AssistNow Autonomous is enabled by default in firmware SPG 4.04. In the SPG 5.10 firmware, it is not.

4.2.5 Improved SLAS corrections

By default, SLAS corrections are only used within max 200 km from the nearest monitoring station. The SPG 5.10 firmware provides a new configuration option to change the correction range.

4.3 Removed features

4.3.1 Geofence

The SPG 5.10 firmware does not support this feature.

4.3.2 Data logger

The SPG 5.10 firmware does not support this feature.

4.3.3 D-GNSS / RTCM

The SPG 5.10 firmware does not process any RTCM differential correction messages.

4.3.4 Antenna supervisor

The discrete antenna supervisor is not supported in the SPG 5.10 firmware. The two-pin and three-pin antenna supervisor is supported.

4.3.5 Temperature measurements

The SPG 5.10 firmware does not support this feature.

4.3.6 GNSS signal support

The SPG 5.10 firmware does not support the GNSS signal combination GLO L1OF and BeiDou B1I.

4.3.7 NMEA 4.10+ GxGSV: Signal ID is 0 for untracked signals

If the signal's CNO level is 0, the Signal ID for this signal is 0 (All Signals).

This can happen when:

1. The signal was provided by a tracking intelligence provider (TIP) for navigation to tracking, and it is not yet tracked.
2. The signal is weak

Before the implementation, the untracked signals had the Signal ID as one of the signals already available in the system.

4.3.8 NMEA GxGSV: New group for each Signal ID

A new group is created for each Signal ID.

Before the implementation, different Signal IDs were packed within the same group.

Although the Signal ID was introduced in the NMEA 4.10, downgrading the NMEA version below 4.10 only removes Signal ID from the message, does not change the grouping format.

5 Changes compared to u-blox M8 firmware SPG 3.01

5.1 Added features

5.1.1 Protection level

The new protection level message provides a real-time position accuracy estimate with 95% confidence. It can be used as an alternative to the position accuracy estimate provided in UBX-NAV-PVT or other messages.

5.1.2 CloudLocate

The u-blox CloudLocate service extends the life of energy-constrained IoT applications. Besides the existing UBX-RXM-MEASX message, new messages with a size of 12, 20 and 50 bytes (RXM-MEASC12, RXM-MEASD12, RXM-MEAS20, RXM-MEAS50) were added for a reduced payload supporting bandwidth-constrained connectivity solutions.

5.1.3 Super-S

The weak signal compensation (known as “signal attenuation compensation”) improves the position and velocity accuracy when using small antennas or in case of bad antenna placement.

5.1.4 Data batching

The firmware supports storage of navigation solutions for up to 10 minutes (at 1 Hz) within the receiver without the need of an external flash. This can reduce the system power consumption by allowing the application processor to stay in low-power mode for a longer time.

5.1.5 BeiDou B1C signal support

In addition to the BeiDou B1I signal already supported in previous products, the SPG 5.10 firmware also supports the BeiDou B1C signal with lower power consumption rate. The product works with either one of these signal types at a time.

Neither AssistNow (Online, Offline or Autonomous) nor power save mode is supported when using BeiDou B1C signals.

5.1.6 RF spectrum analyzer view

The SPG 5.10 firmware supports the UBX-MON-SPAN message. When using the u-center software, this message can be helpful to analyze customer designs and find interference signals via a simple spectrum analyzer view implementation.

5.1.7 Secure boot

The SPG 5.10 firmware is signed by u-blox to improve the device integrity.

5.1.8 Authentication of data output

u-blox M10 receivers can authenticate all output data using asymmetric key-based cryptographic signatures. Users need to provide a private/public key pair for this communication.

5.2 Changed features

5.2.1 Changed default GNSS configuration

The default GNSS signal configuration has been changed in the firmware:

GPS L1C/A, QZSS L1C/A, GLO L1OF, SBAS L1 (SPG 3.01 firmware)

GPS L1C/A, QZSS L1C/A, GAL E1, SBAS L1 (SPG 5.10 firmware)

5.2.2 Improved Galileo support

Sensitivity and TTFF values for the Galileo system have been improved in the SPG 5.10 firmware compared to SPG 3.01.

5.2.3 Improved PRN default setting for SBAS search

A more up-to-date selection of SBAS PRN is used for signal acquisition in the SPG 5.10 firmware:

PRN 123, 126-129, 131, 133, 136-138

5.2.4 Improved BeiDou PRN38 to 63 satellite signal support

The product supports searching and using of PRN01 to PRN63 for BeiDou B1C or B1I SVs. In the SPG 3.01 firmware, only BeiDou SVs up to PRN37 were supported.

5.2.5 Improved QZSS SLAS (L1S signal) corrections support

The SPG 3.01 firmware receives and decodes QZSS SLAS signals (formerly called SAIF) but does not actually apply the correction data for navigation. The SPG 5.10 firmware takes full benefit of available SLAS corrections.

Using QZSS SLAS correction data results in better availability especially under challenging signal conditions, e.g. in urban canyons.

5.2.6 Changed boot screen and UBX-MON-VER message

The version string format changed in the boot screen and in UBX-MON-VER:

“ROM CORE 3.01” (SPG 3.01)

“ROM SPG 5.10” (SPG 5.10)

For a clear identification of every single product, the output of a unique chip ID has been added to the boot screen (CHIPID=XXX). The chip ID can be retrieved by polling the UBX-SEC-UNIQID message as well.

5.2.7 Changed week number rollover and default UTC leap second setting

- Default GPS time to UTC time leap second is set to 18 s
- Default GPS week rollover number is set to 2148

5.2.8 Changed default NMEA version

The SPG 5.10 firmware supports the same NMEA versions as SPG 3.01: 2.1, 2.3, 4.00, 4.10, and 4.11.

The default NMEA version is different:

4.11 (SPG 5.10)

4.00 (SPG 3.01)

The main differences between NMEA 4.11 and NMEA 4.10 are the talker ID, system ID, and signal ID introduced for QZSS and BeiDou.

- For BeiDou, the talker ID, system ID and signal ID used by u-blox for version 4.10 were aligned to those specified in the new NMEA 4.11, except for the BeiDou B2I signal ID. It is set to “11” in the NMEA version 4.11.
- For QZSS, the specific talker ID (‘GQ’) and system ID (“5”) were introduced. The signal ID remains unchanged.

5.2.9 Changed configuration messages

SPG 5.10 introduces a set of new configuration messages:

UBX-CFG-VALSET, UBX-CFG-VALDEL and UBX-CFG-VALGET

Most configuration messages from the SPG 3.01 firmware were removed.

5.2.10 Changed power save mode (PSM) configuration

The Extended power management configuration message UBX-CFG-PM2 is no longer supported in SPG 5.10. More impactful options are still available using the new configuration messages mentioned in 5.2.9.

With the SPG 5.10 firmware, some limitations apply:

- 4 Hz cyclic tracking mode is not supported. It is recommended to use power save modes with longer time periods or continuous operation.
- The same update rate for continuous and power optimized tracking applies. In the SPG 3.01 firmware, it was possible to set a different update rate for the PSM mode using the UBX-CFG-PM2 message.

5.2.11 Improved AssistNow Offline and AssistNow Autonomous interworking

The SPG 5.10 firmware supports an improved interworking between the u-blox AssistNow Offline service and the stand-alone AssistNow Autonomous.

The receiver intelligently selects the most reliable source of orbit prediction, eliminating the need for the host to manage this.

5.2.12 NMEA 4.10+ GxGSV, GxGRS, GxGBS messages: Explicit Signal ID for each signal

With SPG 5.10 and NMEA versions 4.10 and later, the Signal ID (*1-F*) for each signal is explicitly set as defined in the NMEA standard table “GNSS Identification Table”.

In the SPG 3.01 firmware, the Signal ID for all the signals was 0.

5.3 Removed features

5.3.1 Geofence

The SPG 5.10 firmware does not support this feature.

5.3.2 Data logger

The SPG 5.10 firmware does not support this feature.

5.3.3 D-GNSS / RTCM

The SPG 5.10 firmware does not support this feature.

5.3.4 GNSS signal support

The SPG 5.10 firmware does not support the GLO L1OF and BeiDou B1I GNSS signal combination.

The SPG 5.10 firmware does not support IMES signals.

5.3.5 Time pulse quantization error

The SPG 5.10 firmware does not support the output of “quantization error” via UBX-TIM-TP2.

6 Message interface

The symbol (•) shown in the tables of this chapter indicates the presence of the message in the firmware column where it appears.

6.1 NMEA protocol

6.1.1 New NMEA messages

Message	Audience	Description/Comment	FW301	FW404	FW500	FW510
NMEA-Standard-RLM	PUB	Return link message.		•	•	•

6.1.2 Modified NMEA messages

Message	Audience	Description/Comment	FW301	FW404	FW500	FW510
NMEA-Standard-GAQ	PUB	It is now possible to poll a standard message if the current Talker ID is GA		•	•	•
NMEA-Standard-DTM	PUB	The message now supports the display of PZ90 datum (as P90)		•	•	•
NMEA-Standard-GST	PUB	Support the output of the error ellipse as defined by its semi-major and semi-minor axis as well as its orientation		•	•	•
NMEA-Standard-GSV	PUB	Various implementation errors fixed, e.g. null fields, range of azimuth angle [0..359], etc.		•	•	•
		Contains SBAS signal IDs and CNOs				•
		NMEA 4.10+: QZSS support				•
		NMEA 4.10+: Explicit Signal ID (1-F) for		•	•	•

Message	Audience	Description/Comment	FW301	FW404	FW500	FW510
		each signal				
		NMEA 4.10+: Signal ID is 0 for untracked signals (i.e. signals with CN0=0)			•	•
		NMEA 4.10+: New group for each Signal ID			•	•
NMEA-Standard-GRS	PUB	Various implementation errors fixed, e.g., null fields, residual ordering		•	•	•
		NMEA 4.10+: Explicit <i>Signal ID</i> (1-F) for each signal		•	•	•
NMEA-Standard-VLW	PUB	The fields that were only introduced in NMEA version 4.00 have been removed from this message for version 2.30		•	•	•
NMEA-Standard-GBS	PUB	NMEA 4.10+: Explicit <i>Signal ID</i> (1-F) for each signal		•	•	•

6.2 UBX protocol

The firmware supports the UBX protocol version 34.10.

6.2.1 New and removed messages

Message	Audience	Description/Comment	FW301	FW404	FW500	FW510
UBX-CFG-GEOFENCE	PUB	Geofencing configuration	•	•		
UBX-NAV-GEOFENCE	PUB	Geofencing status	•	•		
UBX-RXM-IMES	PUB	IMES beacon information (replacement for UBX-NAV-IMES)	•			
UBX-CFG-VALDEL	PUB	Part of the new configuration interface		•	•	•
UBX-CFG-VALGET	PUB	Part of the new configuration interface		•	•	•
UBX-CFG-VALSET	PUB	Part of the new configuration interface		•	•	•
UBX-LOG-BATCH	PUB	Data batching output data		•	•	•
UBX-LOG-RETRIEVEBATCH	PUB	Data batching request for retrieval		•	•	•
UBX-MON-BATCH	PUB	Data batching state monitoring		•	•	•
UBX-MON-HW3	PUB	Replaces and extends part of UBX-MON-HW and UBX-MON-HW2 functionality		•	•	•
UBX-MON-RF	PUB	Replaces and extends part of UBX-MON-HW and UBX-MON-HW2 functionality		•	•	•
UBX-MON-SPAN	PUB	Crude spectrum analyzer functionality		•	•	•
UBX-NAV-SAT	PUB	Replaces UBX-NAV-SVINFO, contains satellite information but does not contain signal specific information		•	•	•
UBX-NAV-SIG	PUB	Replaces UBX-NAV-SVINFO, contains signal specific information		•	•	•
UBX-NAV-TIMEQZSS	PUB	QZSS time information, QZSS time is estimated when QZSS L1S is used in navigation		•	•	•
UBX-SEC-SESSID	PUB	Session ID for message authentication		•	•	•

Message	Audience	Description/Comment	FW301	FW404	FW500	FW510
		when locking configuration				
UBX-NAV-PL	PUB	Provides protection level (PL) values per protection level state (e.g. position ECEF X/Y/Z) and w.r.t. the given target misleading information risk (TMIR) per coordinate axis.				•
UBX-RXM-MEASD12	PUB	RXM Doppler measurements message for CloudLocate 12 bytes				•
UBX-RXM-MEASC12	PUB	RXM codephase measurements message for CloudLocate 12 bytes				•
UBX-RXM-MEAS20	PUB	RXM Doppler and codephase measurements message for CloudLocate 20 bytes				•
UBX-RXM-MEAS50	PUB	RXM Doppler and codephase measurements message for CloudLocate 50 bytes				•
UBX-AID-*	PUB	GPS assistance data; use UBX-MGA-* instead	•			
UBX-NAV-SVINFO	PUB	Use UBX-NAV-SAT or UBX-NAV-SIG instead	•			
UBX-NAV-SOL	PUB	Use UBX-NAV-PVT instead	•			
UBX-RXM-IMES	PUB	IMES is not supported in this firmware	•			
UBX-RXM-SVSI	PUB	Use UBX-NAV-ORB instead	•			
UBX-CFG-GEOFENCE	PUB	Geofence feature is not supported in this firmware	•	•		
UBX-CFG-LOGFILTER	PUB	Data logger feature is not supported in this firmware	•	•		
UBX-CFG-USB	PUB	USB (functionality not available in the hardware)	•	•		
UBX-LOG-CREATE	PUB	Data logger feature is not supported in this firmware	•	•		
UBX-LOG-ERASE	PUB	Data logger feature is not supported in this firmware	•	•		
UBX-LOG-FINDTIME	PUB	Data logger feature is not supported in this firmware	•	•		
UBX-LOG-INFO	PUB	Data logger feature is not supported in this firmware	•	•		
UBX-LOG-RETRIEVE	PUB	Data logger feature is not supported in this firmware	•	•		
UBX-LOG-RETRIEVEPOS	PUB	Data logger feature is not supported in this firmware	•	•		
UBX-LOG-RETRIEVEPOSEXTRA	PUB	Data logger feature is not supported in this firmware	•	•		
UBX-LOG-RETRIEVESTRING	PUB	Data logger feature is not supported in this firmware	•	•		
UBX-LOG-STRING	PUB	Data logger feature is not supported in this firmware	•	•		
UBX-NAV-GEOFENCE	PUB	Geofence feature is not supported in this firmware	•	•		

Message	Audience	Description/Comment	FW301	FW404	FW500	FW510
UBX-CFG-ANT	PUB	Antenna supervisor	•	•	•	
UBX-CFG-BATCH	PUB	Data batching	•	•	•	
UBX-CFG-DAT	PUB	Datum	•	•	•	
UBX-CFG-INF	PUB	Text information output	•	•	•	
UBX-CFG-ITFM	PUB	Interference monitor	•	•	•	
UBX-CFG-MSG	PUB	Message output rate	•	•	•	
UBX-CFG-NAV5	PUB	Navigation	•	•	•	
UBX-CFG-NAVX5	PUB	Navigation	•	•	•	
UBX-CFG-NMEA	PUB	NMEA version and extensions	•	•	•	
UBX-CFG-ODO	PUB	Odometer	•	•	•	
UBX-CFG-PM2	PUB	Power save modes	•	•	•	
UBX-CFG-PMS	PUB	Power save modes	•	•	•	
UBX-CFG-PRT	PUB	Serial interface ports	•	•	•	
UBX-CFG-RATE	PUB	Measurement and navigation rate	•	•	•	
UBX-CFG-RINV	PUB	Remote inventory	•	•	•	
UBX-CFG-RXM	PUB	Power save mode and sensitivity	•	•	•	
UBX-CFG-SBAS	PUB	SBAS	•	•	•	
UBX-CFG-TP5	PUB	Time pulse	•	•	•	
UBX-CFG-DGNSS	PUB	Use UBX-CFG-VAL[SET DEL GET] instead; see “Legacy UBX message fields reference in the Interface Description.	•	•	•	
UBX-CFG-GEOFENCE	PUB	Use UBX-CFG-VAL[SET DEL GET] instead; see “Legacy UBX message fields reference in the Interface Description.	•	•	•	
UBX-CFG-LOGFILTER	PUB	Use UBX-CFG-VAL[SET DEL GET] instead; see “Legacy UBX message fields reference in the Interface Description.	•	•	•	
UBX-CFG-GNSS	PUB	GNSS signal configuration	•	•	•	
UBX-CFG-PWR	PUB	Command to enter backup modes;	•	•	•	

6.2.2 Changed messages

Message	Audience	Description/Comment	FW301	FW404	FW500	FW510
UBX-TIM-TP	PUB	Added “qErrInvalid” flag to indicate when quantization error is not provided		•	•	•
UBX-MON-HW	PUB	Extended content to better fit the generation 10 hardware, but it is still considered deprecated (UBX-MON-RF and UBX-MON-HW3 should be used instead)			•	•
UBX-SEC-UNIQID	PUB	Unique chip identifier: the size of the identifier increased to 6 bytes			•	•

7 Known limitations and issues

7.1 System

- Under certain rare circumstances, during startup the receiver may output a false warning “Reboot reason: V_CORE_HIGH undervoltage”.

7.2 Power save mode (PSM)

- PSM cannot be used with BeiDou B1C. Configuration combinations of PSM (both CT and OO) and GNSS configuration which include B1C will be rejected by the receiver and an explanatory ERROR message will be output.

Workaround: use BeiDou B1I in combination with PSM

- The CS pin (PIO3) is not available as a wake-up source in PSM and some UBX messages. Due to this, the PSM involving software backup does not work reliably with the SPI interface.

Workaround: Use a different pin as a wake-up source

7.3 Acquisition and tracking

- For operations with only BeiDou B1I signal, the receiver reacquisition sensitivity is degraded after ~1min of no signal.

Workaround: Avoid BeiDou B1I only operation when this use case is relevant.

- For operations with only GLO or GAL signals, high C/N0 degradation can occur when using a passive antenna setup.

Workaround: Use an active antenna setup for this use case.

- Some BeiDou B1C related values are not correctly reported in NMEA GBS message, they are reported with incorrect signal ID value 0. NMEA GSV and GRS messages do not support BeiDou B1C signals, the C/N0 level and residual data are not reported at all.

Workaround: Use UBX-NAV-SAT message to obtain the C/N0 and residual data for BeiDou B1C signals.

7.4 Navigation

- The receiver may rarely emit warning messages of the form of e.g., “SF OV SV G13[43]:0”. Users can safely ignore the warning if it is seen sporadically. No degradation of performance expected.

- Protection Level (PL):

The MI target rate (as given in UBX-NAV-PL) can only be fulfilled with 1Hz navigation rate.

8 Revision history

Revision	Date	Name	Comments
R01	25-Feb-2022	bhei	Initial release
R02	17-Jan-2023	bhei	Section 1.2, open source software declaration; New sections 4.3.7 and 4.3.8; Section 7.3, added NMEA GBS, GSV and GRS message limitations with BeiDou B1C signals