

## Specification of

### Precise Position and Attitude Determination (PAD) solution of ANAVS with two GNSS receivers, a 3D accelerometer and a 3D gyroscope

#### Time to first fix:

Time for signal acquisition and orbit reception:	1 s (hot start) – 29 s (cold start)
Time for search of integer candidate vectors:	10 s to 60 s (depending on environment)
Time for selection of final integer candidate:	10 s
Total time for fixed RTK solution:	21 s (hot start, open sky) to 100 s (cold start, limited satellite visibility)

#### Positioning and attitude accuracies:

Synchronization correction - accuracy:	sigma = <b>0.1 mm</b>
Relative position (RTK fixed) - accuracy:	sigma = <b>1 cm</b>
Relative position (RTK fixed) - update rate:	<b>5 Hz</b> for GPS-only solution and <b>100 Hz</b> for GPS/ INS tightly coupled solution
Speed in E/N/U direction - accuracy:	sigma = <b>0.1 m/s</b>
Speed in E/N/U direction - update rate:	<b>5 Hz</b> for GPS-only solution and <b>100 Hz</b> for GPS/ INS tightly coupled solution
Heading - accuracy:	sigma = <b>0.25°</b> / baseline length [m]
Heading - update rate:	<b>5 Hz</b> for GPS-only solution and <b>100 Hz</b> for GPS/ INS tightly coupled solution
Rate of turn/ rate of heading - accuracy:	sigma = <b>0.1°/s</b>
Rate of turn/ rate of heading - update rate:	<b>5 Hz</b> for GPS-only solution and <b>100 Hz</b> for GPS/ INS tightly coupled solution

#### Additional information:

Code multipath estimates:	1 parameter per receiver – satellite link and per epoch
Fixed phase residuals:	1 parameter per receiver – satellite link and per epoch
Fixed code residuals:	1 parameter per receiver – satellite link and per epoch

**NMEA standard:** Support of NMEA standard

#### ANAVS algorithms and methods are protected by several international patents:

EP 14176425.8, EP 13 152 931.5, EP 12 199 772.0, EP 12 153 398.8, EP 2 479 588 A2,  
WO 2012/052307.

## Processing hardware:

- 2 single frequency **LEA 6T GPS receivers** of u-blox with 5 Hz output of code phase, carrier phase and Doppler shift measurements, integrated in **ANAVS GPS module with USB or Bluetooth connection** with temperature range between -40 and +85°C
- 2 single frequency **L1 patch antennas**
- **MPU 9150 inertial sensor** with 3D accelerometer, 3D gyroscope and 3D magnetometer from Invensense with 100 Hz data rate
- ARM-based embedded MPU SAMA5D3 of Atmel
  - **Atmel ARMv7 ARM Cortex-A5 microprocessor**
    - core
      - CPU frequency up to 536 MHz
      - 32 kB data cache, 32 kB instruction cache
      - fully integrated MMU and Floating Point Unit (VFPv4)
    - memories
      - 160 KB internal ROM, Single-cycle Access at System Speed
      - 128 KB internal SRAM, Single-cycle Access at System Speed
      - high-bandwidth 32-bit multi-port dynamic RAM controller supporting 512 MB
    - power consumption: less than 100 mW at full speed.
  - DDR2/ LPDDR/ LPDDR2 with 512 MB
  - LCD controller with overlays for hardware accelerated image composition and touchscreen interface
  - Connectivity peripherals:
    - Gigabit EMAC with IEEE1588, 10/100 EMAC, multiple CAN, UART, SPI, I<sup>2</sup>C
- Alternative microprocessing unit: **Raspberry Pi, model B**
  - ARMv6 ARM 11 microprocessor with CPU frequency of 700 MHz
  - RAM with 512 MB
  - Peripheral interfaces: 17 GPIO pins, SPI, I<sup>2</sup>C, UART, EGL.
  - 2 USB ports, 10/ 100 MB Ethernet port, HDMI interface
  - Size: 85.6 mm x 56 mm x 21 mm
  - Power consumption: 5 V (via MicroUSB or GPIO header), 700 mA, 3.5 W
  - Weight: 45 g.

This specification was issued in July 2014.

The given data include typical values and are subject to change without notice.