

TOGETHER WITH SpectraTime iPrecision Timing Solutions

RAFS

Rubidium Atomic Frequency Standard

The RAFS (Rubidium Atomic Frequency Standard) is a space-qualified radiation hard high-performance 10.00 MHz frequency standard based on the atomic reference given by the spectral absorption line of the Rb87 isotope. This product is the result of long-term cooperation between AIRBUS DS and SpectraTime. It has been designed and qualified according to ESA standards and was first flown on GIOVE-A with successful operation since 2005. The current baseline includes a thermal baseplate to improve the frequency stability and an integrated DC/DC converter allowing the clock to be powered directly from the primary satellite bus (<50 V). Tailoring with respect to mass, power, performance and environment aspects is possible according to customers needs. This clock was developed specifically for satellite navigation systems within the Galileo programme but could also be incorporated in high-performance space communications systems or scientific instruments.

Optionally the RAFS can be delivered with a Clock Monitoring and Control Unit (CMCU) to form a complete timing subsystem.

Key Features

- Frequency stability:
  - $5 \cdot 10^{-12}$ @ 1 s
  - $1.5 \cdot 10^{-12}$ @ 10 s
  - $5 \cdot 10^{-13}$ @ 100 s
  - $1.5 \cdot 10^{-13}$ @ 1,000 s
  - $5 \cdot 10^{-14}$ @ 10,000 s (drift removed)
- Flicker floor: $< 5 \cdot 10^{-14}$ (drift removed)
- Thermal sensitivity: $< \pm 1 \cdot 10^{-13}$ / °C
- Magnetic sensitivity: $< \pm 1 \cdot 10^{-13}$ / Gauss

Main application fields

- Navigation payloads (global or regional)
- High-performance communications systems
- Scientific applications
- GNSS overlay systems

Customers / Applications

- Giove A & Giove B
- Galileo
- ISRO (Indian regional navigation satellite system)

Support

- EGSE including high-precision time-generation and verification equipment
- Expertise in high-precision timing subsystems

Budgets

- Mass 3.3 kg
- Volume 210 x 106 x 107 mm3
- Power (steady state): 30 W

Interfaces

- Power bus: 26–48.5 V (adaptable) or 50 V (regulated)
- Output frequency: 10 MHz
- Connectors:
  - SMA: 10 MHz output main & redundant)
  - DSUB 44: high level commands & telemetries
  - DSUB 9: power

Environments

- Temperature:
  - Operating: -5 °C to +10 °C
  - Non-operating (qualification): -25 °C to +70 °C
- Radiation tolerance: Suitable for LEO, MEO and GEO
- Lifetime: > 15 years
- Reliability: < 1,200 FIT
- Magnetic field: < 5 Gauss

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