PHM
PASSIVE HYDROGEN MASER

The PHM is an atomic clock with outstanding stability for averaging times from 1 to 100,000 seconds, to be used in precise positioning, time keeping and other on-boards applications. It is designed to perform in space environment for not less than 12 years.

The operating principle exploits the stimulated energy emission occurring during the hyperfine transition of the atomic hydrogen in a miniaturised microwave cavity. The ultra stable RF generated signal, at the frequency of 1420.4057517 …. MHz, is used as a reference in a frequency synthesiser to generate the 10 MHz standard reference frequency.

The PHM is the most stable spaceborne atomic clock ever developed for an operational programme. The design has been fully documented and qualified for all space requirements, including radiation.

The PHM Flight Models for the Galileo IOV satellites have been successfully delivered, while the production of the PHM Flight Models for the Galileo FOC satellites started on February 2010.
TECHNICAL SPECIFICATIONS

Output Frequency: 10.00285741 MHz (fH/142)
Output Level: +7 dBm (2 outputs)
Frequency Drift/Day: ≤1x10^{-14} after 1 week
               <1x10^{-15} after 30 days
Allan deviation, (1s<t<104s): <1x10^{-12}xτ^{-1/2}
               <7x10^{-13}xτ^{-1/2} typical
Temperature sensitivity: <2x10^{-14}/°C
Voltage sensitivity: ≤3x10^{-15}/V
Dimensions: 210 x 500 x 250 mm
Weight: 18 Kg
Main Bus Voltage: 50 V ± 1 V
Power consumption: ≤70 W at -5°C baseplate
               ≤60 W at +10°C baseplate
Qualification Temp. Range: -15 to +20 °C
Lifetime (MEO Orbit): >12 years