


Active Hydrogen Maser VCH-2021

 vremya-ch.com/index.php/en/products-en/activehm-en/vch-2021-en/index.html



The model is being tested now, orders are accepted from the beginning of 2023.

VCH-2021 is the first successful realization of hydrogen maser with a single state selection system. It demonstrates absolutely record frequency stability for active H-masers.

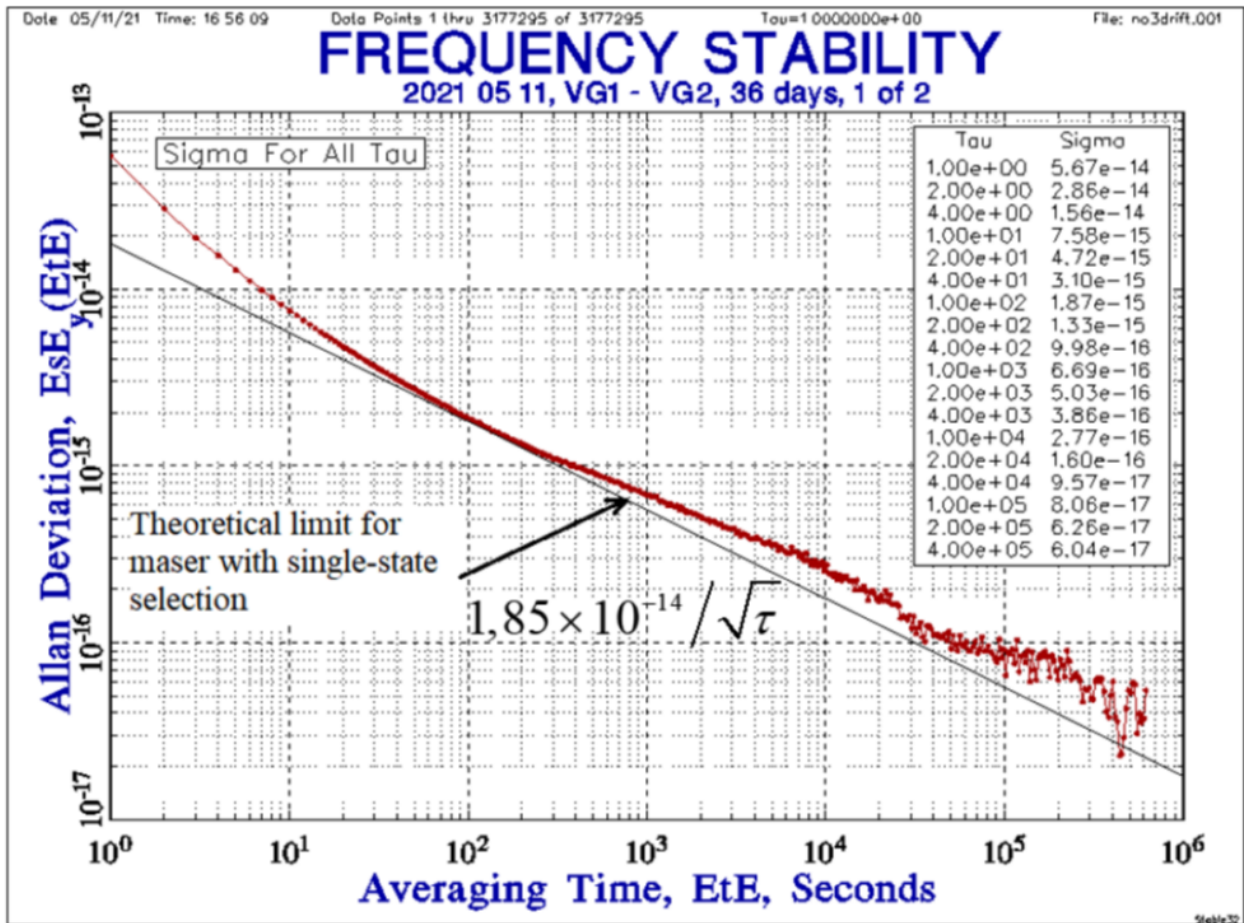
Best technologies including internal stand-alone Cavity Auto Tuning system are inherited from the previous model VCH-1003M.

New option: optical output with wavelengths 1310 nm and 1550 nm.

Key Applications:

- National Time Keeping Service.
- Deep space tracking and navigation.
- VLBI systems.
- GNSS satellite monitoring.

Factory test results



Polyakov V., Timofeev Y. and Demidov N., "Frequency Stability Improvement of an Active Hydrogen Maser with a Single-State Selection System," 2021 Joint Conference of the European Frequency and Time Forum and IEEE International Frequency Control Symposium (EFTF/IFCS), 2021, pp. 1-4, doi: 10.1109/EFTF/IFCS52194.2021.9604270.

Specifications

Output signals:

- sine: 5 MHz; 10 MHz, 100 MHz, 1±0.2 V RMS into 50 Ohms;
 - pulse: 1 Hz, Amplitude: >2.5 V into 50 Ohms, width: (15±5) µs.
- Rise time <2ns, positive polarity;
- optical: wavelengths 1310 nm and 1550 nm, modulated by 100 MHz and 1 Hz signals, respectively; power of optical radiation (0.1-1) mW.

Metrological characteristics are given in the table:

Frequency stability (Allan deviation) 5 MHz, 10 MHz, 100 MHz

	Standard	Option L	
Averaging time, τ	3 Hz measuring bandwidth	0.5 Hz measuring bandwidth	3 Hz measuring bandwidth
1 s	$1.0 \cdot 10^{-13}$	$5.0 \cdot 10^{-14}$	$7.0 \cdot 10^{-14}$

10 s	$1.5 \cdot 10^{-14}$	$0.9 \cdot 10^{-14}$	$1.0 \cdot 10^{-14}$
100 s	$3.0 \cdot 10^{-15}$	$2.5 \cdot 10^{-15}$	$2.5 \cdot 10^{-15}$
1000 s	$1.0 \cdot 10^{-15} *$	$1.0 \cdot 10^{-15} *$	$1.0 \cdot 10^{-15} *$
1 hour	$8.0 \cdot 10^{-16} *$	$8.0 \cdot 10^{-16} *$	$8.0 \cdot 10^{-16} *$
1 day	$1.0 \cdot 10^{-16} *$	$1.0 \cdot 10^{-16} *$	$1.0 \cdot 10^{-16} *$

* Specified only under laboratory conditions: ambient temperature in the range ± 0.1 °C, changing rate < 0.3 °C/hour. ADEV at 1 day is specified for measurements with removed linear frequency drift

Frequency drift is no more $2.0 \cdot 10^{-15}$ per day at release and no more $3.0 \cdot 10^{-16}$ per day after 1 year of continuous operation.

Temperature sensitivity: $\leq 1.5 \cdot 10^{-15}$ / °C.

Magnetic sensitivity: $\leq 5 \cdot 10^{-15}$ /Gauss.

Frequency trim range: $1 \cdot 10^{-10}$.

Frequency setting resolution: 10^{-16} . Manual synchronization to external 1 PPS TTL signal in the range: ± 15 ns.

Phase noise (SSB Phase Noise, dBc/Hz):

Offset from carrier	Standard			Option L		
	5 MHz	10 MHz	100 MHz	5 MHz	10 MHz	100 MHz
1 Hz	≤ -118	≤ -112	≤ -92	≤ -130	≤ -121	≤ -100
10 Hz	≤ -135	≤ -129	≤ -109	≤ -148	≤ -135	≤ -115
100 Hz	≤ -149	≤ -143	≤ -122	≤ -151	≤ -145	≤ -125
1 kHz	≤ -156	≤ -149	≤ -122	≤ -158	≤ -150	≤ -130
10 kHz	≤ -158	≤ -153	≤ -153	≤ -158	≤ -153	≤ -153
100 kHz	≤ -158	≤ -153	≤ -153	≤ -158	≤ -153	≤ -153

Harmonic distortion: ≤ -40 dBc (for 5 MHz output).

Non-harmonic distortion: < -100 dBc in the range from 10 Hz to 10 kHz.

Full data monitoring and functions control. Application software running under Microsoft Windows and Linux.

Operating temperature range: 10...30 °C.

Storage temperature range: -30...50 °C.

Power supply: AC(85÷264)V, (49÷51)Hz; DC(24÷27)V.

Power consumption: 150 V·A (AC), 100 W (DC).

Weight: <115 kg.

Weight in shipping container: <200 kg.

Dimensions (W×H×D): 445×950×625mm.

Warranty: 3 years (7 years extended).

Lifetime: 15 years.