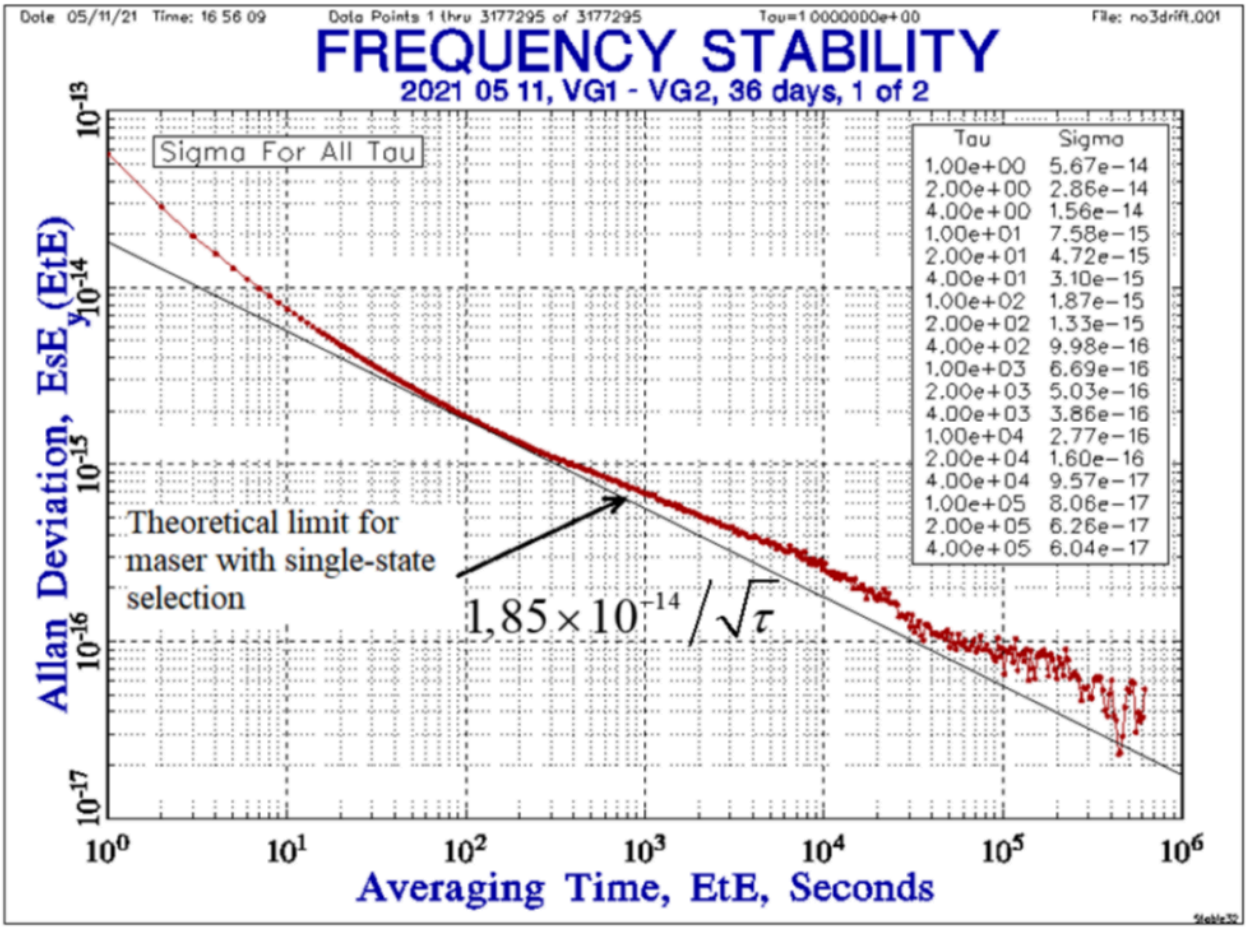
Active Hydrogen Maser VCH-2021

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

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	$1.0\cdot10^{-13}$	$5.0\cdot10^{-14}$	$7.0\cdot10^{-14}$

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	$1.0 \cdot 10^{-16}$ * (typical value $8.0 \cdot 10^{-17}$)	$1.0 \cdot 10^{-16}$ * (typical value $8.0 \cdot 10^{-17}$)	$1.0 \cdot 10^{-16}$ * (typical value $8.0 \cdot 10^{-17}$)

* 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):

	Standard			Option L		
Offset from carrier	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.