

Transportable hydrogen quantum clock PKVCH-M «SAPFIR»

The transportable hydrogen quantum clock, developed by VNIIFTRI, is based on a small-sized active hydrogen generator with a storage vessel made of single-crystal leucosapphire.

Small-sized, cost-effective, has high metrological characteristics, can function in harsh operating conditions, transportation by all means of transport in working condition is possible.



DESIGNED FOR

- time scale comparison of geographically dispersed objects;
- time scale formation and storage;
- precision signal formation with frequencies 5 MHz, 10 MHz, 100 MHz.

PURPOSE AND APPLICATION

measuring the difference of time scales of spatially separated standards of time located at a distance of up to 1000 km with an error of not more than 2 ns;

measuring the frequency of the reference signals of remote standards, as well as determining the instability parameters of their frequencies and spectral characteristics of the signals;

storage of a time scale and a source of reference precision signal at mobile and stationary objects.

OUTPUT SIGNALS

100 MHz	Sinusoidals, $R_H = 50 \text{ Ohm}$	$U_{\text{rms}} = (1,0 \pm 0,2) \text{ V}$
10 MHz		
5 MHz		
1 Hz	Positive polarity pulses, $R_H = 50 \text{ Ohm}$	$U_m = 3,5 \text{ V}$
		$t_{\text{И}} = 10 \mu\text{s}$
		$\tau\phi = 3 \text{ ns}$
Output frequency tuning range		$\pm 1 \cdot 10^{-9}$ with step $1 \cdot 10^{-15}$

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OUTPUT FREQUENCY INSTABILITY (RMSD)

TIME OF MEASUREMENT	RMSD
1 s	$5 \cdot 10^{-13}$
10 s	$1 \cdot 10^{-13}$
100 s	$3 \cdot 10^{-14}$
1000 s	$8 \cdot 10^{-15}$
3600 s	$5 \cdot 10^{-15}$
24 h	$4 \cdot 10^{-15}$
Error of storage of a time scale during transportation time of 24 h and running time of 12 h	not more than 2 ns
Operating temperature range	$+(5 \div 40)^\circ\text{C}$
Temperature frequency coefficient	$\text{TFC} \leq 3 \cdot 10^{-15} \text{ 1/K}$
Frequency magnetic coefficient	$\text{FMC} \leq 4 \cdot 10^{-15} \text{ 1/Э}$

Electric power supply:	
from AC mains by voltage	$100 \div 240 \text{ V (48 - 440 Hz)}$
from DC mains by voltage	$10 \div 36 \text{ V}$
Consumed power:	
when warming up and charging the battery	not more than 200 Wt
in a heated state (at $+ 20^\circ\text{C}$)	not more than 100 Wt
Independent operation time from accumulator battery	not less than 3 hours
Weight	75 kg