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Measurement Services

Time and Frequency Laboratory

Valid from: 01.01.2016

Our time and frequency laboratory at METAS performs high accuracy calibrations of frequency standards, of measuring instruments and of clocks and chronographs. Our measurement results are traceable to national standards and thus to internationally supported realizations of the SI units.

The services listed in this catalogue correspond to our standard measurement capabilities. Other services, with e.g. reduced measurement uncertainty or with an extended measurement range, are possible and may be discussed directly with the responsible expert. In addition, our competent lab team is available for consultation and assisting in finding solutions to special requests.

Measurement uncertainty

The measurement uncertainties are supplied for information only and can be evaluated only after the measurements being completed. They contain contributions originating from the measurement standard, from the calibration method, from the environmental conditions and from the device under test. The indicated uncertainty of measurement is stated as the combined standard uncertainty multiplied by a coverage factor $k = 2$. The measured value (y) and the associated uncertainty (U) represent the interval ($y \pm U$) which contains the value of the measured quantity with a probability of approximately 95 %. The uncertainty is estimated following the guidelines of the ISO.

„METAS General Terms and Conditions” are applied to all services of METAS. They are available at www.metas.ch. Amendments, subsidiary agreements and supplements shall always have to be made in writing.

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1. Frequency standards

1.1. Standalone frequency standards (at METAS)

Quantity	Relative frequency offset $f < 1.3$ GHz
Uncertainty	4E-11 Hz/Hz
Procedure	Counter measurement
Parameters	10 s < gate time < 100 s
Extend of service	Measurement for one gate time / frequency
Extend of service	additional gate time / frequency
Quantity	Relative frequency offset $f = 1,5,10$ MHz
Uncertainty	2E-12 Hz/Hz
Procedure	Phase comparison
Parameters	Signal: Sine, Amp rms: 0.5 V - 1 V on 50 Ohm
Extend of service	Measurement of the frequency offset
Quantity	Relative frequency offset $f = 5,10$ MHz
Uncertainty	1E-13 Hz/Hz
Procedure	Phase comparison
Parameters	Signal: Sine, Amp rms: 0.5 V - 1 V on 50 Ohm
Extend of service	Measurement of the frequency offset
Extend of service	Adjust frequency offset
Extend of service	Adjust frequency offset

1.2. Standalone frequency standards (outside METAS)

Quantity	Relative frequency offset $f < 1.3$ GHz
Uncertainty	4E-11 Hz/Hz
Procedure	Counter measurement
Parameters	10 s < gate time < 100 s
Extend of service	Measurement of the frequency offset for one gate time / frequency
Extend of service	additional gate time / frequency
Quantity	Relative frequency offset $f = 1,5,10$ MHz
Uncertainty	2E-12 Hz/Hz
Procedure	Phase comparison
Parameters	Signal: Sine, Amp rms: 0.5 V - 1 V on 50 Ohm
Extend of service	Measurement of the frequency offset

1.3. Radiosync. Frequency standards (outside METAS)

Quantity	Relative frequency offset $f < 1.3$ GHz
Uncertainty	4E-11 Hz/Hz
Procedure	Counter measurement
Quantity	Relative frequency offset $f = 1,5,10$ MHz
Uncertainty	2E-12 Hz/Hz
Procedure	Phase comparison
Parameters	Signal: Sine, Amp rms: 0.5 V - 1 V on 50 Ohm

2. Frequency counters

2.1. Frequency Counter (at METAS)

Quantity	Relative frequency offset $f < 1.3$ GHz
Uncertainty	4E-11 Hz/Hz
Procedure	Counter measurement
Extend of service	Calibration of the frequency offset of the internal time base of the DUT
Quantity	Relative frequency offset $f = 1,5,10$ MHz
Uncertainty	2E-12 Hz/Hz
Procedure	Phase measurement
Parameters	Signal: Sinus, Amp rms: 0.5 V - 1V on 50 Ohm
Extend of service	Calibration of the frequency offset of the internal time base of the DUT
Quantity	Relative frequency offset $f = 5,10$ MHz
Uncertainty	1E-13 Hz/Hz
Procedure	Phase measurement
Parameters	Signal: Sine, Amp rms: 0.5 V - 1V à 50 Ohm
Extend of service	Calibration of the frequency offset of the internal time base of the DUT

2.2. Frequency counter (outside METAS)

Quantity	Relative frequency offset $f < 1.3$ GHz
Uncertainty	4E-11 Hz/Hz
Procedure	Counter measurement
Extend of service	Calibration of the frequency offset of the internal time base of the unit under test
Quantity	Relative frequency offset $f = 1, 5, 10$ MHz
Uncertainty	2E-12 Hz/Hz
Procedure	Phase comparison
Parameters	Signal: Sine, Amp rms: 0.5 V - 1 V on 50 Ohm
Extend of service	Calibration of the frequency offset of the internal time base of the unit under test

3. Time standards

3.1. Atomic clocks (at METAS)

Quantity	Offset of the timescale
Uncertainty	10 ns with respect to UTC-R, 100 ns with respect to UTC
Procedure	Time difference measurement
Extend of service	Calibration of the difference of the timescales DUT vs. UTC-R
Quantity	Offset of the timescale
Uncertainty	50 ns vs. UTC
Extend of service	Calibration of the difference of the timescales DUT vs. UTC
Extend of service	Adjust the difference of the timescales

4. Time interval counters

4.1. Time interval counter (at METAS)

Quantity	Relative frequency offset $f < 1.3$ GHz
Uncertainty	$4 \text{ E-}11$ Hz/Hz
Procedure	Counter measurement
Extend of service	Calibration of frequency offset of the internal time base of the DUT
Quantity	Relative frequency offset $f = 1, 5, 10$ MHz
Uncertainty	$2\text{E-}12$ Hz/Hz
Procedure	Phase measurement
Parameters	Signal: Sine, Amp rms $0.5 \text{ V} - 1 \text{ V}$ on 50 ohm
Extend of service	Calibration frequency offset of the internal time base of the DUT
Quantity	Relative frequency offset $f = 5, 10$ MHz
Uncertainty	$1\text{E-}13$ Hz/Hz
Procedure	Phase measurement
Parameters	Signal: Sine, Amp rms $0.5 \text{ V} - 1 \text{ V}$ on 50 ohm
Extend of service	Calibration of frequency offset of the internal time base of the DUT

4.2. Time interval counter (outside METAS)

Quantity	Relative frequency offset $f < 1.3$ GHz
Uncertainty	$4 \text{ E-}11$ Hz/Hz
Procedure	Counter measurement
Extend of service	Calibration of the frequency offset of the internal time base of the DUT
Quantity	Relative frequency offset $f = 1, 5, 10$ MHz
Uncertainty	$2\text{E-}12$ Hz/Hz
Procedure	Phase measurement
Parameters	Signal: Sine, Amp rms: $0.5 \text{ V} - 1 \text{ V}$ on 50 ohm
Extend of service	Calibration of the frequency offset of the internal time base of the DUT

4.3. Stopwatch

Quantity	Relative time deviation
Quantity	Rate deviation