

Aspects of Applied Metrology

V.A. Grushnikov¹, VINITI RAS, PhD (Tech.), viniti@mach04.ru

¹ Senior Researcher, Moscow, Russia

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key words

metrology, parameters, measurements, standards, standards, reliability, certainty, accuracy

Modern studies of various phenomena and processes, and the development of efficient production and technological equipment and instruments require the use of methods and means of measuring physical, chemical, etc. parameters with high reliability, certainty, accuracy and reproducibility. Their achievement is impossible without a system of metrological support based on the results of research, comparative or comparative tests of standardization and the use of standards of measures, weights and other recorded parameters recognized by international authorized measuring and calibration laboratories. Permanent improvement of methodological support is achieved primarily through cross-comparative tests and calibrations. Thus, the metrological support system allows manufacturers and consumers of technical objects of various purposes anywhere in the world, including in space and in the ocean, to create and evaluate their properties and characteristics on the basis of uniform internationally prescribed and recognized principles. So, the effectiveness of the implementation of production processes controlled by technological parameters is achieved.

References

- Schödel R., Yacoot A., Lewis A. The new mise en pratique for the metre — a review of approaches for the practical realization of traceable length metrology from 10^{-11} m to 10^{13} m, *Metrologia: International Journal of Pure and Applied Metrology*, 2021, vol. 58, no. 5, pp. 31–40.
- Carminat M., Scandurra G. Advances in measurements and instrumentation leveraging embedded systems, *Review of Scientific Instruments*, 2021, vol. 92, no. 12, pp. 121–126.
- Hirai A., Bitou Y., Bae J., Park J., Jin J. Precise measurement of the thickness of silicon wafers by double-sided interferometer and bilateral comparison, *Metrologia: International Journal of Pure and Applied Metrology*, 2021, vol. 58, no. 5, pp. 51–57.
- An W., Xu J., He H., Jiang P. A method of deflection of the vertical measurement based on attitude difference compensation, *IEEE Sensors Journal*, 2021, vol. 21, no. 123, pp. 13125–13136.
- Patil S., Livezey D., Ahmad S., Singh B., Margala M. Accuracy of echo detection using differentiation for compact lidar implementation // *Proceedings of SPIE*, 2020, vol. 5, pp. 12–20.
- Misumi I., Kizu R., Sugawara K., Hirai A., Gonda S. A standard used for probe-tip diameter evaluation in surface roughness measurements using metrological atomic force microscope, *Measurement Science and Technology*, 2020, vol. 31, no. 9, pp. 19–25.
- Nemitz N., Gotoh T., Nakagawa F., Ito H., Hanado Y., Ido T., Hachisu H. Absolute frequency of ^{87}Sr at 1.8×10^{-16} uncertainty by reference to remote primary frequency standards, *Metrologia: International Journal of Pure and Applied Metrology*, 2021, vol. 58, no. 2, pp. 40–45.
- Pan Z., Ye P., Yang K., Gao J., Huang W., Zhao Y. Frequency response mismatch calibration in 2-channel time-interleaved oscilloscopes, *Review of Scientific Instruments*, 2021, vol. 92, no. 6, pp. 64711–64719.
- Luo L., Qiao H., Ai D., Zhou M., Zhang S., Zhang S., Sun C., Qi Q., Peng C., Jin T., Fang W., Yang Z., Li T., Liang K., Xu X. Absolute frequency measurement of an Yb optical clock at the 10^{-16} level using International Atomic Time, *Metrologia: International Journal of Pure and Applied Metrology*, 2020, vol. 57, no. 6, pp. 65–71.
- Galleani L., Signorile G., Formichella V., Sesia I. Generating a real-time time scale making full use of the available frequency standards, *Metrologia: International Journal of Pure and Applied Metrology*, 2020, vol. 57, no. 6, pp. 56–64.
- Hobson R., Bowden W., Vianello A., Silva A., Baynham C. F. A., Margolis H. S., Baird P. E. G., Gill P., Hill I. R. A strontium optical lattice clock with 1×10^{-17} uncertainty and measurement of its absolute frequency, *Metrologia: International Journal of Pure and Applied Metrology*, 2020, vol. 57, no. 6, pp. 95–102.
- Laurent Ph., Esnaut F. X., Gibble K., Peterman P., Lévêque T., Delaroche Ch., Grosjean O., Moric I., Abgrall M., Massonnet D., Salomon Ch. Qualification and frequency accuracy of the space-based primary frequency standard PHARAO, *Metrologia: International Journal of Pure and Applied Metrology*, 2020, vol. 57, no. 5, pp. 35–46.
- Lin Y., Wang Q., Meng F., Cao S., Wang Y., Li Y., Sun Z., Lu B., Yang T., Lin B., Zhang A., Fang F., Wang Z. A ^{87}Sr optical lattice clock with 2.9×10^{-17} uncertainty and its absolute frequency measurement, *Metrologia: International Journal of Pure and Applied Metrology*, 2021, vol. 58, no. 3, pp. 35–40.
- Pratt J. R., Schlamminger S., Seifert F., Newell D. B. Verification of an in situ calibrated optomechanical accelerometer for use as a strong ground motion seismic reference, *Metrologia: International Journal of Pure and Applied Metrology*, 2021, vol. 58, no. 5, pp. 65–72.
- Zhao M.-M., Tan Y.-J., Wang P.-P., Shao C.-G., Hu Z.-K. A proposal for designing the source mass to accurately determine G with atom interferometry, *Metrologia: International Journal of Pure and Applied Metrology*, 2021, vol. 58, no. 5, pp. 41–50.
- Pan C., Sparasci F., Plimmer M., Risegari L., Daugas J.-M., Rouille G., Gao B., Pitre L. Direct comparison of ITS-90 and PLTS-2000 from 0.65 K to 1 K at LNE-CNAM, *Metrologia: International Journal of Pure and Applied Metrology*, 2021, vol. 58, no. 2, pp. 33–39.
- Ripa D. M., Imbraguglio D., Gaiser C., Steur P. P. M., Giraudi D., Fogliati M., Bertinetti M., Lopardo G., Dematteis R., Gavioso R. M. Refractive index gas thermometry between 13.8 K and 161.4 K, *Metrologia: International Journal of Pure and Applied Metrology*, 2021, vol. 58, no. 2, pp. 46–52.
- Adhikari R., Doesinger K., Lindner P., Faina B., Bonanni A. Low temperature and high magnetic field performance of a commercial piezo-actuator problem via laser interferometry, *Review of Scientific Instruments*, 2021, vol. 92, no. 3, pp. 19–25.
- Herzog J. M., Witkowski D., Rothamer D. A. Characterization of Ce:CSSO, Pr:CSSO, and co-doped Ce,Pr:CSSO phosphors for aerosol phosphor thermometry, *Measurement Science and Technology*, 2021, vol. 32, no. 5, pp. 54–58.
- Bong C., Lee J., Sun H., Yoo J., Bak M. S. TDLAS measurements of temperature and water vapor concentration in a flameless MILD combustor, *Measurement Science and Technology*, 2021, vol. 32, no. 5, pp. 59–62.
- Kraus M., Drung D., Krause C., Palafox L., Behr R. Linearity measurements of critical Johnson noise thermometer components with low-distortion multitones from a Josephson arbitrary waveform synthesizer, *Measurement Science and Technology*, 2021, vol. 32, no. 6, pp. 65–76.
- Hao X., Song J., Ding L., Wen P., Sun J., Liu Y., Yuan Z., Duan Y., Zhang Y. Spaceborne radiance temperature standard blackbody for Chinese high-precision infrared spectrometer, *Metrologia: International Journal of Pure and Applied Metrology*, 2020, vol. 57, no. 6, pp. 65–71.
- Gao B., Zhang H., Han D., Pan C., Chen H., Song Y., Liu W., Hu J., Kong X., Sparasci F., Plimmer M., Luo E., Pitre L. Measurement of thermodynamic temperature between 5 K and 24.5 K with single-pressure refractive-index gas thermometry, *Metrologia: International Journal of Pure and Applied Metrology*, 2020, vol. 57, no. 6, pp. 8–12.
- Rourke P. M. C. ITS-90 reproducibility, xenon fixed point substitution and new interpolating equations between 13.8033 K and 273.16 K, *Metrologia: International Journal of Pure and Applied Metrology*, 2021, vol. 58, no. 5, pp. 58–64.
- Duncan P. M., Whittaker D. S. Distribution identification and information loss in a measurement uncertainty network, *Metrologia: International Journal of Pure and Applied Metrology*, 2021, vol. 58, no. 3, pp. 61–70.
- Lira I. A proposal for assessing the uncertainty in the measurement of mean nanoparticle diameter with electron microscopy, *Metrologia: International Journal of Pure and Applied Metrology*, 2021, vol. 58, no. 3, pp. 71–79.