

A plenary session was open to the general public concerning the *Redefinition of the Second*.

Session:	Redefinition of the Second (C5L-A)
Date:	Thursday, June 27, 2024
Time:	17h15 - 18h15
Session Chair:	James Camparo , The Aerospace Corporation, El Segundo, CA, USA
Place:	Main Aula, ROOM 1 University of Neuchâtel Espace Tilo-Frey 1
Language:	English
Parking	The use of public transport is encouraged.
Registration/Fee:	Included with EFTF 2024 registration. Free to general public.

Why does the community want to redefine the second?

From a metrological point of view, we have reached the point where the best realizations of the current definition (i.e. caesium cold atom fountain clocks) have been surpassed by several optical frequency standards already constituting secondary representations of the second. Some of these have achieved two orders of magnitude lower systematic uncertainties and correspondingly lower frequency instabilities than caesium fountain clocks, with continuing progress being made.

The accuracy of frequency measurements is, therefore, limited by the current definition, rather than being limited by the technological level reached by the most advanced scientific teams. This challenges the recognition of the SI second as the universal common time unit and may hinder scientific and technological progress. As in 1967, this prompts the community to examine alternative options and choose a new definition, in-line with contemporary technological capacities, and able to remain on top of the metrological pyramid for a long time.

For complete information concerning this topic, please visit the following documents, which have been prepared by **The International Bureau of Weights and Measures (BIPM)**:

>> www.bipm.org/en/faq-redefinition-second (english)

>> www.bipm.org/en/redefinition-second (english)

>> www.bipm.org/fr/faq-redefinition-second (french)

Invited Speakers



Noël Dimarcq, Senior scientist at CNRS, ARTEMIS - Member of CIPM and president of CCTF - President of Bureau des Longitudes

Redefinition of the second: why, how, when?

Abstract:

Since 1967, the definition of the SI second relies on the Caesium atom hyperfine transition frequency. Caesium primary frequency standards are currently realizing this unit with a relative frequency uncertainty at low $1E-16$ level, but in the last two decades they have been surpassed by optical frequency standards (OFS) demonstrating the capability of much lower realization uncertainties, typically 2 orders of magnitude better, after a redefinition. The CCTF has set up in 2020 a dedicated Task Force to update its roadmap towards the redefinition of the second. This updated roadmap has been approved in 2022 by the General Conference on Weights and Measures (CGPM) that adopted Resolution 5 "On the future redefinition of the second" The global objective is to converge on a new definition that offers a real improvement in the quality of its realization (relative frequency uncertainty) and is acceptable by all National Metrology Institutes and stakeholders. After a reminder of the current and previous definitions of the second, this presentation will address various aspects of the future redefinition concerning the rationale (Why?), the methodology (How?) and the schedule (When?).

Sebastien Bize, LNE-SYRTE

Toward a Redefinition of the second: Analysis of Options

Abstract:

We present the work of the subgroup options of the CCTF task force for the redefinition of the second. The mission of this subgroup is to provide analysis of the different types of options for the redefinition and of the specific atomic transitions and species that might be used to implement these options. It shall also make proposals to help reach a consensus on the choice of a particular option and atomic species.

Davide Calonico, Head of Division "Quantum Metrology and Nanotech" at INRIM - President at Consorzio TOP-IX

Toward a Redefinition of the second: Criteria

Abstract:

In 2022 CGPM adopted the Resolution "On the future redefinition of the second", noting that the CCTF prepared a roadmap toward the redefinition of the second. The CCTF operates a Task Force for the redefinition of the second, composed of 3 sub-groups respectively on Op-tions, Criteria and Education. This presentation will focus on the work of the subgroup devoted to criteria and their fulfillment level. The mission of this subgroup is to provide a continuous monitoring of the advances with respect to the fulfillment level of criteria required for a redefini-tion. This monitoring will also include the assessment of a fulfillment index for each criterion, updated each year.
