

Toward a redefinition of the second: Analysis of Options

Bize S.¹, Fang F.², Peik E.³, Panfilo G.⁴, Dubé P.⁵, Lisdat C.⁶, Levi F.⁷, Margolis H. S.⁸, Yasuda M.⁹, Yu D.-H.¹⁰, Lodewyck J.¹¹, Arora P.¹², Terra O.¹³, Sherman J.¹⁴, Morel J.¹⁵, Weyers S.¹⁶, Ido T.¹⁷, Calonico D.¹⁸, Gertsolf M.¹⁹, Ullrich J.²⁰, Phillips W. D.²¹, Salomon C.²²

¹LNE-SYRTE, France, ²NIM, China, ³PTB, Germany, ⁴BIPM, ⁵NRC, Canada, ⁶PTB, Germany, ⁷INRIM, Italy, ⁸NPL, UK, ⁹NMIJ.AIST, Japan, ¹⁰KRISS, South-Korea, ¹¹LNE-SYRTE, France, ¹²NPLI, India, ¹³NIS, Egypt, ¹⁴NIST, USA, ¹⁵METAS, Switzerland, ¹⁶PTB, Germany, ¹⁷NICT, Japan, ¹⁸INRIM, Italy, ¹⁹NRC, Canada, ²⁰PTB, Germany, ²¹UMD, USA, ²²LKB, France

Email: sebastien.bize@obspm.fr

In 2022, at its 27th meeting, the General Conference on Weights and Measures (CGPM) adopted Resolution 5 “On the future redefinition of the second”¹. This Resolution notes that the Consultative Committee for Time and Frequency (CCTF) has prepared a roadmap toward the redefinition of the second. It encourages the International Committee for Weights and Measures (CIPM) to bring proposals to the 28th meeting of the CGPM for the choice of the preferred atomic species, or ensemble of species, for a new definition. The CCTF roadmap is published in *Metrologia*². To meet the request of the CGPM, the CCTF operates a Task Force for the redefinition of the second, composed of 3 subgroups respectively on *Options*, *Criteria* and *Education*.

This presentation will focus on the work of subgroup *Options*. 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 make proposals to help reach a consensus on the choice of a particular option and atomic species. To this end, the subgroup developed a description of options addressing what the explicit definition would be under each option, the practical implementation before, at, and after the redefinition, and a pros and cons analysis of these options. It also developed factsheets on the most promising atomic species. These documents are supplied to CCTF members to support their own analysis. We will present the status of this work and seek feedback from the community. This feedback will provide invaluable inputs to further update and improve these documents and to advance toward a consensus, having in view the preparation of the two sessions of the next CCTF in November 2024 and September 2025.

The CCTF task force on the roadmap for the redefinition of the SI second is led by the President of the CCTF and by the Head of the Time Department of the BIPM.

¹ Resolution 5 of the 27th CGPM (2022) “On the future redefinition of the second”. <https://www.bipm.org/en/cgpm-2022/resolution-5>.

² N. Dimarcq et al, *Roadmap towards the redefinition of the second*, *Metrologia* 61, 012001 (2024). Open access. <https://iopscience.iop.org/article/10.1088/1681-7575/ad17d2>.