

STATEMENT BY THE CCTF PRESIDENT

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It is with pleasure, in my capacity as President of the Consultative Committee for Time and Frequency (CCTF), to inform you that three resolutions related to time metrology were adopted at the CGPM earlier today. These resolutions will have a profound impact on future timekeeping both on the earth and other planets.

Resolution 4 *On the future definition of the second* lays the groundwork for a new definition of the second to be presented for adoption at the 29th meeting of the CGPM in 2030.

Resolution 4 is based on the roadmap constructed by the CCTF in 2022 and updated in 2025. Among the mandatory criteria that have been defined to ensure the success of the new definition, there is still 2 criteria that are far to be fulfilled, for example, the contribution of optical frequency standards to the calibration of the International Atomic Time. However, given the rapid progress in this field, these criteria could realistically be fulfilled by 2030 through coordinated international efforts supported by the CCTF.

From a metrological perspective, we have reached an important point. The best realizations of the current definition of the second, based on caesium cold-atom fountain clocks, have been surpassed by optical frequency standards. Some of these optical standards have achieved systematic uncertainties around two orders of magnitude lower than those of caesium fountain clocks, and progress is continuing. This means that the accuracy of frequency measurements is limited by the current definition of the second itself, rather than by the technological capabilities of the most advanced laboratories.

There are currently two options under consideration for the new definition. Option 1 would select a single optical atomic transition and use its frequency as the defining constant for the second. Option 2 would use a weighted geometric average of optical frequencies from a specified set of atomic transitions to establish the new defining constant.

Resolution 4 therefore asks the CIPM to continue promoting the objectives of the roadmap and encourages the international community to work towards a consensus on the new definition of the second, and to pursue the efforts to increase the fulfilment level of the two critical criteria.

Resolution 5 *On the technical actions to ensure the continuity of UTC* addresses an important change to Coordinated Universal Time (UTC), to ensure that it remains continuous over the next centuries.

UTC is the international reference for timekeeping; it is the basis of civil time in most countries and it ensures the interoperability of operational systems, for instance the global navigation satellite systems. However, in the past, UTC has been adjusted by the insertion of leap seconds to remain close to the time scale UT1 defined by Earth's rotation. These adjustments, linked to the fluctuations of the Earth's rotation, create disruption in industries and critical infrastructures that

depend on precise and continuous synchronization, including transportation, energy and telecommunications.

After 30 years of debates, Resolution 5 establishes a new rule to ensure the continuity of UTC, thus eliminating leap-second discontinuities. This decision has become particularly timely because recent changes in the Earth's rotation have raised the possibility of a first-ever negative leap second, which has never been experienced and that could create additional risks for critical infrastructures.

Following discussions with the relevant scientific organizations and user communities, the CCTF proposed to accelerate the process. As a direct result, Resolution 5 states that continuous UTC will take effect on 20 May 2027.

The resolution also sets a long-term limit of one hour for the difference between UTC and UT1. This provides a framework that is expected to maintain the continuity of UTC for several millennia.

Resolution 6 *On the definition of an international lunar reference time scale and its traceability to UTC* addresses an important question for the future of lunar exploration: how we define and international reference time for the Moon, the equivalent of UTC for the Earth

As more space agencies develop lunar infrastructure, including Positioning, Navigation and Timing systems, we need an internationally agreed way of defining lunar time. Such systems and their interoperability require common reference frames and reference time to be recognized and adopted internationally.

Resolution 6 encourages space agencies to share their experience from pioneering lunar projects, particularly on how lunar time can be related accurately to UTC and how relativistic effects and uncertainties are handled.

The broader objective is to develop one coherent international approach to lunar time, avoiding a proliferation of competing time scales, while ensuring that lunar reference time remains accurately traceable to UTC. This work will continue through collaboration between the metrology community, space agencies, astronomers, geodesists and other international organizations.