

Intention to change the Ozone Cross-Section Value for Surface Ozone Measurement

Intention to Change Statement:

Following stakeholder consultation during the [BIPM hosted Workshop on Accurate Monitoring of Surface Ozone, 5-9 October 2020](#), and the [CCQM Recommendation 1 \(2020\)](#): On the recommended value of the ozone absorption cross-section per molecule at 253.65 nm (air) for applications including the measurement of atmospheric ozone amount fractions, the CCQM Gas Analysis Working Group is issuing a statement on its intention to change the Ozone Cross-Section Value used for Surface Ozone Standards and Measurement. A globally coordinated change for surface ozone measurements foresees a 3 to 5-year change process with the date of 1 January 2024, identified as a provisional date for change.

The following changes will be implemented:

- The 2019 value of $1.1329 \times 10^{-17} \text{ cm}^2$ [1] and standard uncertainty $0.0035 \times 10^{-17} \text{ cm}^2$ [1] will be adopted for the ozone absorption cross-section per molecule at 253.65 nm (air) for use in ozone measurement standards maintained at the BIPM and for the calculation of the reference value for the BIPM.QM-K1 on-going comparison of surface ozone measurement standards;
- The identifier CCQM.O3.2019 will be used as a unique shorthand identifier to identify the 2019 value;
- A CCQM GAWG task group, with membership to include all stakeholder communities, will be established to manage and coordinate the change process, including developing and publishing a timeline for implementing the change in the ozone cross section value used worldwide for surface ozone measurements taking into account the times needed for documentary change as well as implementation of the change in measurement instruments and networks, and actions necessary by various stakeholders.

Benefits and impact of change:

The reference method for ground-level ozone measurements is based on UV photometry, with NIST Standard Reference Photometers (SRP) acting as primary standards for numerous national and international ozone-monitoring networks. Measurements of ozone amount fractions in ambient air are ultimately anchored to the value and uncertainty of the ozone absorption cross-section at the wavelength 253.65 nm. A review of all measurements of the absorption was carried out and published in 2019, providing a consensus value 1.23 % lower, and an uncertainty six times smaller, than the historically used value. The new value represents the most accurate value of ozone cross section available, and will provide a significant improvement in the accuracy of surface ozone measurements. It will also improve the consistency of ozone measurements made throughout the electromagnetic spectrum, with the value at this wavelength providing a reference for other measurement systems.

¹ This is the value in the 2019 publication, [J T Hodges et al 2019 Metrologia 56 034001](#)

Preparing for change:

In order to prepare for change, surface ozone measurement networks, data centres, instrument manufacturers, research communities and metrology institutes should verify their ability to flag ozone concentration measurement data to be able to identify which cross-section value is used for measurement (CCQM.O3.2019 or Hearn 1961). Early implementation of data flagging (inclusion in metadata) is recommended.

A CCQM-GAWG task group on ozone cross-section change management will prepare for the change by:

Establishing and publishing a timeline for transition to the CCQM.O3.2019 value, taking into account the requirements for documenting the change, implementing it into measurement instruments and networks and identifying the necessary actions for the various stakeholders.

Coordinating with regulatory bodies and standards organizations to identify the required changes to worldwide regulations and documentary standards, including their interrelationships. Documentary standards already identified are ISO 13964, EN 14625 and US EPA 40 CFR Appendix D to Part 50. Time periods required for change of these documents will be determined and organizations/individuals able to initiate and keep track of the change process identified.

Developing a communication plan, including a website where all central information on the change process will be disseminated. This will include a database containing information on interested stakeholders, enabling updates on progress of the change process. The communications team will also continue to promote best practice to the user community for flagging (providing metadata) on ozone concentration measurements, clearly identifying which cross-section value is used for measurement (CCQM.O3.2019 or Hearn 1961).

Preparing publications for the atmospheric community and contributing to a peer-reviewed publication on the importance and challenges of ensuring uniformity of measurements of ozone concentrations in different parts of the atmosphere using different measurement techniques that utilize different parts of the electromagnetic spectrum.

Developing guidance documents for instrument manufacturers and users in the field on how to deal with the change, ensure instruments are making measurements using the new cross section value correctly and how to report results in any transitional period. It will also include guidance on how type testing of instruments maybe affected by the change.

Contacting communities focusing on ozone concentration trend analysis to inform them of the potential step function effects in historic data and the need to consider cross-section meta data when analysing data for trends, especially over the transition period.