

**Consultative Committee for Amount of Substance – Metrology in Chemistry and Biology
submitted to the International Committee for Weights and Measures**

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 Consultative Committee for Amount of Substance – Metrology in Chemistry and Biology (CCQM),
noting

- the importance of comparable and accurate measurements of atmospheric ozone concentrations for human health and the environment,
- the prevalence of standards and instruments based on the absorption of UV radiation at the mercury-line wavelength of 253.65 nm (air) for amount fraction measurements of surface ozone,
- that the key comparison, BIPM.QM-K1, for ozone measurement standards requires knowledge of the ozone absorption cross-section per molecule at 253.65 nm (air), with the current conventional value of $1.147 \times 10^{-17} \text{ cm}^2$ [1] being used with a standard uncertainty, as estimated by the Task Group, of $0.024 \times 10^{-17} \text{ cm}^2$ [2],¹
- that the uncertainty in the value of the ozone absorption cross-section per molecule is the biggest impediment to achieving accurate and SI-traceable values from ozone reference photometers that are useful to end users,
- that the value of the ozone absorption cross-section per molecule at the mercury-line wavelength of 253.65 nm (air) is an important anchor point for referencing the absorption cross-sections of ozone throughout the electromagnetic spectrum,
- the research activities undertaken at the BIPM, National Metrology Institutes (NMIs) and research institutes to obtain accurate measurements of ozone absorption cross-section per molecule with reduced uncertainties,
- the work on ozone absorption cross-section completed by the Task Group of the CCQM Gas Analysis Working Group (GAWG), including the value and uncertainty of the ozone absorption cross-section per molecule at the wavelength of 253.65 nm (air) published in 2019 [2].

recommends that

- the 2019 value of **$1.1329 \times 10^{-17} \text{ cm}^2$** [2] and standard uncertainty **$0.0035 \times 10^{-17} \text{ cm}^2$** [2] 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 BIPM and the NMIs work with the atmospheric monitoring community and other stakeholders towards a global implementation of the 2019 value for the ozone absorption cross-section per molecule at the mercury-line air wavelength,

¹ The community most interested in this result expresses it in the non-SI unit: $\text{cm}^2 \text{ molecule}^{-1}$.

- the date of implementation of the 2019 value for the ozone absorption cross-section per molecule at 253.65 nm (air) be decided after consultation with stakeholder communities, including the CCQM-GAWG workshop scheduled for October 2020,
- all NMIs / DIs adopt the new value and uncertainty of the ozone absorption cross-section per molecule at 253.65 nm (air) at the date of implementation to ensure international comparability of surface ozone measurements is maintained.

References

[1] Hearn A G 1961 Absorption of ozone in ultra-violet and visible regions of spectrum *Proc. Phys. Soc.* **78** 932–40.

[2] Hodges J T, Viallon J, Brewer P J, Drouin B J, Gorshchev V, Janssen C, Lee S, Possolo A, Smith M A H, Walden J, Wielgosz R I 2019 Recommendation of a consensus value of the ozone absorption cross-section at 253.65 nm based on a literature review *Metrologia* **56(3)** 034001.