Update of Ozone Absorption Cross-Section Value for Calibration of Low Concentration Ozone Monitors

September 25, 2025

Background

Ozone concentration measured by UV photometry is calculated by Beer-Lambert law using a constant known as the absorption cross-section.

- Since 1961, the value reported by Hearn (σ = 1.1476 x 10^{-17} cm^2 $molecule^{-1}$ at 253.65 nm) has been used internationally and served as the NIST-accepted reference in surface ozone measurement.
- In 2019, international collaborative work on surface ozone measurement led to a new consensus value CCQM.O3.2019 (σ = 1.1329 × 10^{-17} cm^2 $molecule^{-1}$ at 253.65 nm), which is 1.3% lower than the historical Hearn value.
- Since 1 January 2025, many international organisations including US EPA, ISO, ASTM, EN, JIS, AS have started the transition to this updated value in order to ensure consistency and comparability of ozone measurements worldwide.

Further information is available at: https://www.bipm.org/en/ozone

Implementation of the Updated Cross-Section Value

Low Concentration Ambient Ozone Monitor (BMT 932 series)

The calibration of BMT's low concentration ambient ozone monitors is traceable to NIST via an internal transfer standard. The internal transfer standard was calibrated in 2024 against the SRP 29 using the Hearn 1961 value. In line with the international transition, adoption of the updated ozone absorption cross-section value is **planned for Q4/2025**. At that time, the internal transfer standard will then be adjusted to and verified against the updated value and all calibration certificates will reference CCQM.O3.2019 as the basis of traceability.

High Concentration Ozone Analyser (BMT 963, 964, 965 series)

For high concentration ozone analysers no national standard currently exists. Calibration accuracy in this range relies on the quality of BMT's own primary standards, which are based on UV photometry at 253.65 nm and reference the molar extinction coefficient defined in IOA Regulation 002/87 (F). Calibration certificates will continue to cite this regulation. BMT remains in contact with industry associations to monitor and discuss whether an update to this regulation may be considered in the future.

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Effect on Results

The updated absorption cross-section will increase reported ozone concentrations by about +1.3% compared to results based on the previous value. Example: An ozone concentration of 100.0 ppb_v measured with an instrument calibrated to the Hearn (1961) value will correspond to 101.3 ppb_v when calibrated to the CCQM.O3.2019 value.

For further information please contact us.

BMT MESSTECHNIK GMBH

Hamburger Straße 19

D-14532 Stahnsdorf

Germany

Tel.: +49 – 3329 – 69677 – 0

Fax: +49 – 3329 – 69677 – 29

www.bmt-berlin.de

info@bmt-berlin.de