

Ozone Testing of Ion Modules

Preface

MAXMAC uses a common ozone testing procedure to evaluate its ion modules under specified conditions. The process records the ambient background and the maximum ozone concentration during continuous module operation, providing a clear basis for technical review.

This application note explains the arrangement, 24-hour monitoring procedure, result calculation and acceptance criterion. Completed sample data illustrate the method. Each sample is monitored continuously for 24 hours. The original verification record supplies the measurement results and photographic evidence.

Applicability

This note is intended for customers evaluating MAXMAC ion modules for integration into finished products. It describes the common test process; numerical results refer to the completed six-sample verification presented on page 3.

The test sequence is:

1. Identify the sample and arrange the probe and analyzer.
2. Confirm distance, voltage and environmental conditions.
3. Record the pre-test ambient ozone background.
4. Operate and monitor each sample continuously for 24 hours.
5. Select the highest displayed reading during that period.
6. Subtract the background, convert the units and evaluate the result.

Overview

The operating reading includes the ambient ozone background. The reported sample result is therefore the **background-corrected increase**, rather than the absolute ozone concentration of the surrounding air.

The maximum is the highest displayed reading within the 24-hour monitoring period. It is **not a 24-hour average**. The analyzer averaging setting determines the time basis of each individual reading and should be retained with the test record.

Measurement Equipment

The photographed instrument is a **2B Technologies Model 106-L Ozone Monitor**. The source report identifies the laboratory instrument as 2657L. Its recorded equipment validity period covered the reported test dates.

Manufacturer Specifications [1]

Principle: Single-beam UV absorption, 254 nm.

Resolution: 0.1 ppb.

Accuracy: Greater of 1.5 ppb or 2% of reading.

Precision: 1 σ : greater of 1.5 ppb or 2%, at 10-s averaging.

Detection limit: 3.0 ppb (2 σ , 10-s averaging).

Measurement interval: 2 seconds.

Averaging options: 10 s, 1 min, 5 min or 1 hour.

Outputs: LCD, USB and RS-232.

These are manufacturer specifications, not a calibration certificate for the specific laboratory unit. The actual averaging and logging settings used in the completed verification have not yet been identified in the source report.

Method Recognition

The Model 106-L has U.S. EPA Federal Equivalent Method designation **EQOA-0914-218** [1]. The designation applies under its prescribed operating conditions; it does not certify the ion module or this particular test setup.

Test Setup and Operation Procedure

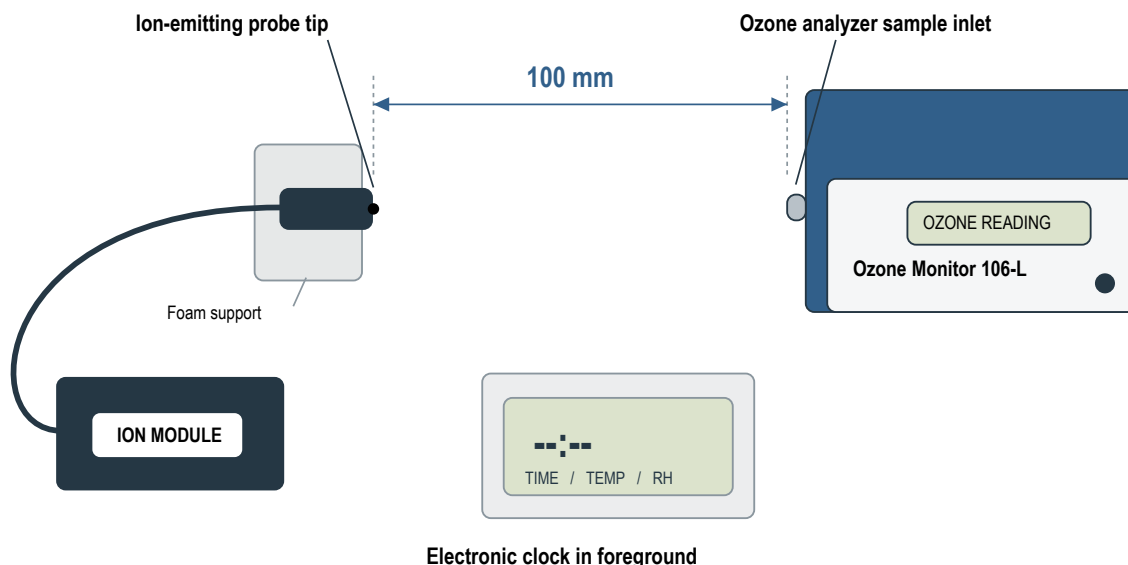


Figure 1 Probe tip to analyzer sample inlet: 100 mm. The electronic clock is positioned in front to document time and ambient temperature / relative humidity. The clock is not the ozone sensor.

Test Conditions

- Temperature: 23 ± 5 °C.
- Relative humidity: 45-75% RH.
- Module voltage: 14 ± 0.2 V.
- Probe-to-sample-inlet distance: 100 mm.
- Monitoring duration: 24 hours per sample, continuously, without stopping module operation.

Background Measurement

Record the ambient ozone reading before the sample operates. Link this background value to the corresponding sample identification and measurement record.

Operating Measurement

Maintain the test arrangement and operate the sample continuously for 24 hours. Monitor the ozone reading throughout the period and retain the highest displayed value as $C_{\max}$. Retain time-stamped readings where available to support review of the selected maximum.

Result Calculation

For displayed readings $C(t)$ during the monitoring period:

$$C_{\max} = \max \{C(t), 0 \leq t \leq 24 \text{ h}\}$$

Subtract the pre-test ambient background:

$$\Delta C_{\text{ppb}} = C_{\max, \text{ppb}} - C_{\text{background, ppb}}$$

Convert to parts per million:

$$\Delta C_{\text{ppm}} = \Delta C_{\text{ppb}} / 1,000$$

1 ppm = 1,000 ppb. The calculation uses the highest displayed reading in the period, not the mean of the readings.

Test Limit

The acceptance criterion used for the completed verification is:

$$\Delta C < 0.01 \text{ ppm at } 100 \text{ mm}$$

This is equivalent to an increase below 10 ppb. The original report records the sample-level pass decisions. Display resolution alone does not establish measurement uncertainty.

Verification Results and Method References

Completed Verification

The six reported background-corrected increases were **0.0032-0.0099 ppm**. All six samples were recorded as passing the specified criterion. Table 1 retains the original measurements with simplified sample labels.

Sample	Background ppb	Maximum ppb	Increase ppm	Result
01	16	19.2	0.0032	Pass
02	10.6	19.9	0.0093	Pass
03	17.7	26.8	0.0091	Pass
04	22.7	32.6	0.0099	Pass
05	27.7	36.1	0.0084	Pass
06	8.2	18	0.0098	Pass

Table 1 Reported background, operating maximum and calculated ozone increase.

Calculation Example: Sample 04

$$32.6 - 22.7 = 9.9 \text{ ppb}$$

$$9.9 / 1,000 = 0.0099 \text{ ppm}$$

$$0.0099 \text{ ppm} < 0.01 \text{ ppm: Pass}$$

Photographic Evidence

The adjacent photographs show the background measurement and the operating record for the same original sample (62#, shown here as Sample 04). The foreground clock documents time and ambient conditions; the ozone measurement is on the analyzer or computer record.

Standards and Their Roles

HJ 590-2010 [2] describes UV photometry for ambient ozone monitoring. Its principle is relevant to the analyzer; this does not establish full procedural compliance or Chinese instrument certification.

GB 4706.45: the original report cites this series without an edition. The current GB/T 4706.45-2024 took effect on 1 August 2026 [3]. That edition postdates the 2025 verification. The 0.01 ppm criterion presented here is the project requirement recorded in the original report.

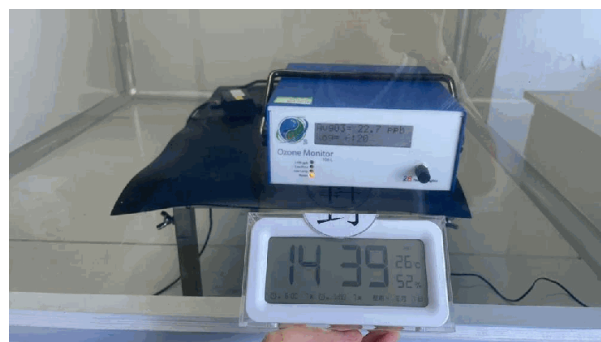


Figure 2 Pre-test ambient background: 22.7 ppb, displayed on the ozone analyzer.

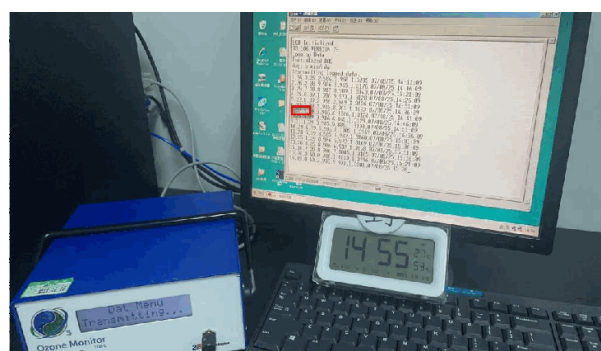


Figure 3 Operating record corresponding to the reported maximum of 32.6 ppb. The analyzer transmits data to the computer.

Documentation and Scope

Keep sample identification, start / end time, measurement settings, equipment records, background, maximum and setup photographs together. Numerical results apply to the samples and conditions reported. Confirm the applicable verification for each intended module and finished-product configuration.

Revision 1.1: 19 October 2026. Added setup schematic, MAXMAC-confirmed 24-hour monitoring, instrument specifications and method references.

References

- [1] 2B Technologies: Model 106-L specifications and EPA FEM designation.
- [2] Ministry of Ecology and Environment: HJ 590-2010 and amendment.
- [3] SAMR: GB/T 4706.45-2024 standard record.