



OFFICE OF AIR QUALITY PLANNING AND STANDARDS
RESEARCH TRIANGLE PARK, NC 27711

19 August 2025

Dr. Drew Pomerantz
SLB
1 Hampshire Street
Cambridge, MA 02139

Dear Dr. Pomerantz:

We are writing in response to your submission on behalf of SLB, located in Cambridge, MA, dated March 28, 2025. In that request you seek approval of an “Alternative Test Method for Methane Detection Technology” under the 40 CFR part 60, Subpart OOOOb – Performance Standards for Crude Oil and Natural Gas Facilities for Which Construction, Modification or Reconstruction Commenced after December 6, 2022 (Subpart OOOOb). We are considering this request under 40 CFR 60.5398b(d), based on the information you have submitted (as described below). EPA’s Office of Air Quality Planning and Standards has been delegated certain authorities under this provision, including the authority to consider and/or approve alternative test methods for methane detection technology.

As we understand, SLB has developed a measurement solution, a methane lidar camera, which deploys on a fixed mast/tower, collocated with an anemometer, GPS compass, and calibration target. To ensure 100% site coverage, the methane lidar camera(s) is mounted on the mast/tower and sits on a pan/tilt stage to facilitate scanning sources across a site. When in use, the methane lidar camera utilizes a tunable diode lidar (TDLidar) that combines a traditional differential absorption lidar (DIAL) approach with aspects of tunable diode laser absorption spectroscopy (TDLAS) and time correlated single photon counting (TCSPC) to quantify methane emissions. When a methane plume is identified, a methane mass emission rate is calculated from a simple mass balance approach based on Gauss’ Law. SLB shares the results of periodic screening with the operator within 5 calendar days of the periodic screening. SLB will alert the owner/operator for a follow up response if the site-wide emission rate is above the set periodic screening threshold. SLB will also provide leak locations at component-level resolution. The

requirements for owner/operator follow up response to this information is then stated in 40 CFR 60.5398b(b).

To support the submittal, SLB has provided the following documents associated with the submission. This information was submitted through EPA's publicly facing portal or through EPA's Confidential Business Information (CBI) Office when a CBI claim was made.

- "Executive Summary" document, submitted March 28, 2025, which provides a summary description of the technology, a list of all documents submitted as part of the application, and a list of documents that serve as supporting documentation including patents, a technical paper, conference presentations, and a product sheet. This document also indicates that SLB is requesting approval under the periodic screening approach at the 1, 2, 3, 5, 10, and 15 kg/hr thresholds. See §60.5398b(d)(2) and §60.5398b(d)(3)(iv).
- "Description of Technology" document, submitted March 28, 2025, providing an in-depth discussion of the theory behind the measurement technology, including mass emissions rate calculation, data management, and reporting practices. SLB also supplemented the publicly facing document with additional documentation claimed as Confidential Business Information (CBI) received on July 3, 2024, which includes further claimed proprietary information and data regarding how the technology works. See §60.5398b(d)(3)(iii) and §60.5398b(d)(3)(iv).
- A "Visual Workflow" document, submitted March 28, 2025, indicating how data are collected, processed, maintained, and provided to the owner/operator. See §60.5398b(d)(3)(v).
- Publicly facing supporting Information, submitted on March 28, 2025, including several patents covering technology use and measurement approach, a brochure and white paper detailing the theory of operation, and a presentation summarizing the solution's capabilities (sensitivity, spatial resolution). Additional data and reports, claimed as CBI, were received on July 3, 2024. These materials, including a third-party validation study, serve as supporting evidence that SLB can appropriately detect methane emissions at the 1 kg/hr threshold under the conditions defined in the alternative test method, as applied in the field. See §60.5398b(d)(3)(vi)(A).
- A sampling protocol (i.e. alternative test method) titled "SLB Methane Lidar Camera: Periodic Fugitive Methane Emission Monitoring", initially submitted on March 28, 2025. EPA received the final version on July 31, 2025, which includes all the required

procedures and applicable quality assurance and control requirements, consistent with the operation of the solution, and consistent with the requirements in §60.5398b(d)(3)(vi)(C).

EPA conducted an initial review of the submitted material. Based on this review and receipt of additional information, and consistent with the requirements in §60.5398b(d)(1)(i), EPA determined the submission to be complete on June 26, 2025.

Recognizing that SLB meets the criteria found in §60.5398b(d)(2) to submit an alternative test method for consideration, and based on a review of the completed materials, EPA has determined that the Methane Lidar Camera meets the periodic screening requirements for the 1, 2, 3, 5, 10, and 15 kg/hr threshold with component-level spatial resolution. EPA is approving the solution for use by an owner or operator, at an affected facility, for the alternative periodic screening process as described in §60.5398b(b), subject to the caveats below:

- As detailed in the approved alternative test method, maximum allowable wind speed and maximum camera distance requirements vary depending on the alerting threshold.
- As detailed in the approved alternative test method, all major changes to the detection and quantification algorithm or measurement technology must be submitted to, and reviewed by, EPA prior to field implementation.

Furthermore, the alternative test method may be used as an alternative to fugitive emissions monitoring under 40 CFR part 60, Subpart OOOOa - New Source Performance Standards for Crude Oil and Natural Gas Facilities for which construction, modification or reconstruction commenced after September 18, 2015, and on or before December 6, 2022 (Subpart OOOOa) provided the owner/operator using the solution complies with §60.5398b, including the notification, recordkeeping, and reporting requirements outlined in §60.5424b.

EPA has created a docket, EPA-HQ-OAR-2024-0619, and will make the relevant documents mentioned in this letter publicly available there. Additional material developed by EPA to justify these decisions is also attached to this letter.

EPA will post this letter as MATM-012 on the EPA website at <https://www.epa.gov/emc/oil-and-gas-alternative-testmethods> for use by interested parties. This will allow SLB's alternative method to be used by other owners and operators of affected facilities subject to the monitoring of fugitive emissions components, covers, and closed vent systems subject to Subparts OOOOa and OOOOb,

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If you should have any questions or require further information regarding this approval, please contact my staff at MethaneATM@epa.gov.

Sincerely,

Steffan M. Johnson, Group Leader
Measurement Technology Group

cc: Greg Fried, OECA/AED
Elizabeth Leturgey, OECA/OC
Ned Shappley, OAQPS/AQAD
Karen Wesson, OAQPS/AQAD
Regional Testing Contacts

Attachments (2)

SLB MLC Alternative Test Method (MATM-012).pdf

Acceptance Justification: SLB Methane Lidar Camera

MEMORANDUM

TO: EPA-HQ-OAR-2024-0619

FROM: Paul Van Rooy, EPA; Dave Nash, EPA

DATE: August 19, 2025

Subject: **Acceptance Justification: SLB Methane Lidar Camera (Technology)**

This memorandum summarizes EPA's technical consideration of SLB's approach for their periodic measurement solution, the Methane Lidar Camera (MLC), documented in ALTECH-104, 110, 111, 112, 113, and 114. SLB submitted these applications on 28 March 2025 and 1 April 2025 as part of the Advanced Methane Detection Alternative Test Method program (40 CFR 60.5398b(d)). EPA's consideration of this technology as a periodic measurement solution under this program, and its application to this program, is further described in EPA's approval letter dated August 19, 2025. This Memorandum also includes a summary of meetings between the company and EPA staff related to the company's request for approval of this technology.

Background Information

SLB is a technology company based in Houston, Texas focused on providing solutions for energy industries, including the oil and gas industry. The Methane Lidar Camera is a licensed product of QLM Technology Ltd. This product has been deployed across several U.S. oil and gas production basins, including the Appalachian Basin, Denver Basin, Permian Basin, TX-LA-MS Salt Basin, Western Gulf Basin, and Western Canadian Sedimentary Basin, as well as in Japan. In addition to field deployments, SLB also participated in the 2023 Advancing Development of Emissions Detection (ADED) Tests performed at the Methane Emissions Technology Evaluation Center (METEC) by Colorado State University. For purposes of their submission to EPA, SLB requested their technology be broadly applicable across the sector in the periodic screening program at sensitivities of 1, 2, 3, 5, 10, and 15 kg/hr. Based on the information provided in their submittal to EPA, referenced above, they were eligible to apply as required under §60.5398b(d)(2). Additionally, the submittal was clear as to the applicability of the request and provided the EPA the information included in §60.5398b(d)(3)(i-ii).

Technology Description

Consistent with the requirements in §60.5398b(d)(3)(iii-iv), SLB's Description of Technology Document details their measurement technology. This document describes the scientific theory and working principles of SLB's Methane Lidar Camera, which is used to screen for leaks at oil and gas sites that may require leak detection and repair. The Methane Lidar Camera quantifies path-integrated methane concentration (ppm-m) using tunable diode Lidar (TDLidar). TDLidar combines tunable diode laser absorption spectroscopy, differential absorption Lidar, and time-correlated single photon counting. As detailed in the Description of Technology, SLB's Methane Lidar Camera simultaneously measures path-integrated concentration (ppm-m) and measurement range by laser wavelength tuning and amplitude modulation.

To quantify methane, a beam is emitted from the Methane Lidar Camera and travels until it hits a surface. When the beam hits the surface, the beam scatters and reflects back to the Methane Lidar Camera where it is detected. As the beam travels, the laser light is absorbed by methane. The detector in the Methane Lidar Camera measures the remaining photons and an absorption curve is applied to determine the path-integrated concentration.

To identify, locate, and image a methane plume, the beam rapidly scans the environment of interest, methane is quantified as described above, and a plume detection algorithm is applied to identify connected regions of methane above background. The imaged plume can be overlain on a background image of the area of interest to determine the location of the leak. If a plume is identified, the mass emission rate is calculated using the mass balance equation with measured wind data.

Potential limitations and techniques to mitigate those limitations are clearly outlined in the Description of Technology. Obstructed views can be overcome by mounting a camera above all equipment or mounting multiple cameras on the site to ensure 100% site coverage. Highly reflective surfaces, like water, can result in saturation of the detector. These can be avoided during initial camera set up. Heavy precipitation can result in poor sensitivity, however QAQC metrics are in place to avoid testing during these times. Finally, the sensitivity of the camera is dependent on both the wind speed as well as the distance between the camera and the surface.

To ensure 90% probability of detection is maintained, the wind speed envelope of operation and the maximum camera distance requirements are defined based on the desired detection and alerting threshold.

SLB also detailed their workflow from initial measurements to end products that are passed on to the owner or operator. This documentation is consistent with the regulatory requirements in §60.5398b(d)(3)(vi)(A) and §60.5398b(d)(3)(v).

Method Sensitivity and Spatial Resolution

SLB demonstrated a solution sensitivity (90% Probability of Detection) below the 1 kg/hr alerting threshold, based on 2023 ADED test conducted at METEC. The METEC facility was designed to mimic and simulate a wide range of emission scenarios associated with upstream and midstream natural gas operations. The facility was built using surface equipment donated from oil and gas operators. A controlled release system allowed metering and control of gas releases at realistic sources such as vents, flanges, fittings, valves, and pressure relief devices found throughout equipment. The test consisted of 256 individual methane releases over 81 days. Emissions rates ranged from 0.05 to 7 kg/hr with leak durations between 15 minutes to 10 hours. Average wind speeds ranged from approximately 1 to 10 m/s.

SLB provided information on the reanalysis of the Methane Lidar Camera METEC data to determine their 90% probability of detection threshold (submitted as CBI). EPA found the reanalysis appropriate to support the periodic test method as it was written. SLB discussed, in detail, the Methane Lidar Camera sensitivity dependence on windspeed and camera distance. The required bounds for windspeed and camera distance are defined in the alternative test method, based on the desired alerting threshold. SLB demonstrated component-level resolution based on 2023 ADED tests as well as field data. Data supporting the 90% PoD and component-level spatial resolution are included in the presentation titled “Severn Trent QLM EGU presentation,” available on the public-facing submission portal under Supporting Documentation. Additional examples demonstrating component-level detections are include in the description of technology section. The CSU analysis of the ADED tests are published in the

manuscript titled “Assessing the Progress of the Performance of Continuous Monitoring Solutions under a Single-Blind Controlled Testing Protocol”

Consistent with the requirements in §60.5398b(d)(3)(vi)(A), SLB’s data has provided sufficient evidence to support their requested Methane Lidar Camera detection threshold. Additionally, data provided by SLB showing the Methane Lidar Camera could identify the approximate source of emissions within 0.5 meters of a release point, satisfied the component-level spatial resolution requirements in §60.5398b(d)(3)(vii).

Testing Protocol

The alternative test method, developed by SLB and refined based on feedback from EPA, reasonably matches EPA’s understanding how data will be collected. The application of the Methane Lidar Camera in their method is consistent with the operation of the system in the validation report. The alternative test method includes all the information as required in §40 CFR 60.5398b(d)(3)(vi)(B) and (C) and appears to be adequate for use for in the alternative monitoring standards identified in §40 CFR 60.5398b(b). The method includes a defined siting protocol in Appendix I of the method designed to ensure 100% site coverage and identifies any potential interferences (e.g., weather conditions) that would be outside the envelope of operation which could affect the technology’s probability of detection, while also developing substantial QA/QC around these limitations to ensure when valid data is being collected and potential corrective actions are needed. The method also details the amount of valid data needed to verify either the presence or the absence of an emission and is written to include sufficient recordkeeping of their procedures that would allow a third-party (e.g., state regulatory authority) to audit the SLB’s processes.

Applicability

SLB requested the Methane Lidar Camera be approved broadly across all basins in the continental United States based on successful deployment in several basins including the Appalachian Basin, Denver Basin, Permian Basin, TX-LA-MS Salt Basin, Western Gulf Basin, Western Canadian Sedimentary Basin, as well as basins in Japan. The detection principle of the Methane Lidar Camera is not dependent on topography. Any meteorological or land cover

differences between basins that may cause challenges (high winds, reflective surfaces) are identified during siting and ongoing QAQC checks defined in the method. For these reasons, EPA agrees with the broad approval request.

Meeting Summary between EPA Measurement Technology Group and SLB

| Date | Venue | Participants | Topics |
|-------------|---------------|--|---|
| 2025-02-13 | Teams meeting | Drew Pomerantz, Dave Nash, Ned Shappley, Paul Van Rooy | Intro meeting, discuss continuous application withdrawal, discuss how to proceed with periodic submission |
| 2025-02-27 | Teams meeting | Drew Pomerantz, Dave Nash, Paul Van Rooy | Answer ATM formatting questions, discuss required QAQC metrics |
| 2025-03-12 | Teams meeting | Drew Pomerantz, Karen Marsh, Dave Nash, Paul Van Rooy | Discuss validation testing, operational window |
| 2025-05-27 | Teams meeting | Drew Pomerantz, Karen Marsh, Dave Nash, Paul Van Rooy | Discuss initial ATM feedback, siting considerations |
| 2025-06-17 | Teams meeting | Drew Pomerantz, Karen Marsh, Dave Nash, Paul Van Rooy | Continued discussion of ATM feedback |
| 2025-07-09 | Teams meeting | Drew Pomerantz, Karen Marsh, Dave Nash, Paul Van Rooy | Continued discussion of ATM feedback and revisions. Discuss calibration requirements. |
| 2025-07-23 | Teams meeting | Drew Pomerantz, Karen Marsh, Dave Nash, Paul Van Rooy | Discuss final edits to method and how to move forward. |