



Executive Summary

Request for Alternative Test Method Methane

Detection Technology

§60.5398b(b) Periodic Screening

The Environmental Protection Agency

Emission Measurement Center

<https://www.epa.gov/emc/oil-and-gas-alternative-test-methods>

Exploration Robotics Technologies Inc.

<https://www.xplorobot.com>

This document does not contain Confidential Business Information.

Xplorobot Methane Alternative Test Method Request – Executive Summary

Request Number – ALTTECH-20

Submission Date – June 28, 2024

Company Name	Exploration Robotics Technologies Inc.
Submission Point of Contact Name	Oleg Mikhailov
Product Name	Xplorobot Laser OGI
Technology Type	Component-level hand-held sensor and reporting software
Target Applicability	Broadly applicable across the sector
Target Emission Leak Rate Threshold	1 gram per hour
Request Numbers of Connected Submitted Requests	NA

Technical Summary of Technology

This method is an alternative test method for demonstrating compliance for fugitive emissions components affected facilities and compliance with continuous inspection and monitoring requirements for covers and closed vent systems under 40 CFR §60.5398b(b).

This method is a quantitative periodic monitoring hand-held device and component-level reporting software platform. This alternative is significantly less expensive than existing methods and could significantly lower the cost of compliance for oil and gas facilities subject to regulation. The technology is also generally “fool proof” as it requires little training and as discussed further in the attached, Alternative Testing Procedure: Determination of Methane Emissions from Stationary Sources submittal, results are verifiable.

The hand-held device combines Tunable Diode Laser Absorption Spectroscopy (TDLAS) sensor, a high-resolution visual camera, a wind sensor and a GPS sensor. The device falls into the category of Active Optical Gas Imaging as the computer-vision software in the sensor combines real-time TDLAS measurements and the visual images to create real-time visualization of methane emission otherwise not visible to the naked eye, thereby meeting the US EPA definition of Optical Gas Imaging (insert reference here). The device uses TDLAS sensor to record path-integrated methane concentration, local wind speed, images of the equipment being scanned, and the GPS position of the sensor. For each emission source, the device records a Digital Emission Tag that combines the visualization of methane emission on the component image, the maximum concentration of methane for that emission source, the local wind speed at the time of the detection and the estimate of emission rate in grams per hour based on a proprietary model that combines dispersion and buoyancy. The device communicates the Digital Emission Tags to the cloud-based component-level reporting platform via cellular network. The reporting platform, in turn, generates notifications to relevant parties via email in order to initiate timely mitigation of the emission.



The component-level reporting platform hosts the data recorded by the Xplorobot Laser OGI device for each site and equipment. It automatically identifies all of the components inspected and creates methane concentration maps for each, resulting in a digital, auditable record of inspection for each component in the form of Digital Emission Tag or the Digital Record of Compliance (for components that are verified to have zero emission or that have emissions within allowable or design limits). The reporting platform uses a proprietary plume model that combines wind dispersion, buoyancy and jet flow to create an improved estimation of the emission rate in grams per hour for each Digital Emission Tag. The platform can generate specific emission factors or actual emissions calculations for Subpart W reporting.

Notes for the MATM Review Team:

It is important to note that Xplorobot does not develop any sensors (e.g. TDLAS, cameras, anemometers, GPS, etc.) and only integrates off-the-shelf hardware into an integrated **Xplorobot Laser OGI** device. It is the selection of sensors with certain operating parameters, the Xplorobot embedded software in the **Xplorobot Laser OGI**, and computer vision and ML software applied to the data recorded by the device that achieves the visualization of emissions otherwise not visible to the naked eye, enables accurate detection and quantification of the emissions, component-level analytics and reporting.

Updates to the Application:

None to list at this time.

Summary of Documents Submitted:**Description Document Submission Category:**

Document Name(s) with extension	Document Description
Xplorobot – Description of Technology.pdf	Submission Location: CBI Submission Description: This document demonstrates how the technology works, from the first principles through calculated data product. This document includes a description of measurement technology, description of conversion to mass emission rate, and description of data handling and storage.
Xplorobot – Description of Technology – non CBI.pdf	Submission Location: Publicly Facing Portal Description: Same as above, with confidential information removed.

Alternative Test Method:

Document Name(s) with extension	Document Description
Xplorobot – Formal Alternative Test Method.pdf	Submission Location: Publicly Facing Portal Description: Alternative Test Method Formatted Method, including the protocols for running the technology in the field and other method protocols.

Supporting Documents:

Document Name(s) with extension	Document Description
Xplorobot – SD – Datasets and Validation.pdf	Submission Location: CBI submission Description: This supporting documentation (SD) provides data demonstrating operation, applicability, resilience, and spatial resolution.
Xplorobot – SD – Detection Threshold Validation.pdf	Submission Location: CBI submission Description: This supporting documentation (SD) provides verification that the technology meets the detection threshold, including demonstration as applied in the field, and how probability of detection is determined.

Xplorobot – SD – Operating Manual.pdf	<p>Submission Location: CBI Submission</p> <p>Description: This supporting documentation (SD) provides instructions for operation of the technology, data upload, reporting and recordkeeping.</p>
Xplorobot – SD – Public Document – Xplorobot Methane Solutions.pdf	<p>Submission Location: Publicly Facing Portal</p> <p>Description: This supporting documentation provides a technical slide deck that help to describe the technology and method.</p>
Xplorobot – SD – METEC Xplorobot Laser OGI Detection and Quantification Report 20231011.pdf	<p>Submission Location: Publicly Facing Portal</p> <p>Description: This supporting documentation (SD) provides results of blind tests at the Methane Emissions Technology Evaluation Center.</p>

Additional Contextualizing Information

It may be helpful for reviewers to note Xplorobot is actively working with the Colorado Department of Public Health & Environment on approval of **Xplorobot Laser OGI** for replacement of OGI and AVO requirements in Colorado under Regulation 7 as an Alternative AIMM (Approved Instrument Monitoring Method). Xplorobot intends to submit an application for Approved Test Method to the Wyoming Division of Air Quality in July of 2024.

Xplorobot Laser OGI is currently operating in the field on upstream and midstream oil and gas facilities (well pads, tank batteries, compressor stations, processing facilities, etc.) with oil and gas producing companies and midstream operators in 6 countries on 3 continents. The accuracy of Xplorobot technology was evaluated in blind tests at the Methane Emissions Technology Evaluation Center.

Xplorobot Laser OGI results matched the blind tests results of infrared OGI cameras operated by highly experienced LDAR inspectors. **Xplorobot Laser OGI** detection limit of 1 gram per hour was confirmed in controlled release experiments and in field campaigns led by the US Forest Service and the Lawrence Berkley National Laboratory.