

Carbon Mapper Airborne System

Executive Summary

Version 1.0.0

Document Status: Approved

Document Owner: Daniel Bon, Daniel Cusworth, Riley Duren

Description: Formal ATM, Submitted document

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1. Submission Information

Request Number	ALTTECH-58
Submission Date	October 4, 2024
Company Name	Carbon Mapper
Point of Contact	Daniel Bon
Technology Type	Imaging Spectrometer, Aerial Platform Deployment
Target Applicability	Super Emitter Detection
Emission Rate Threshold	<100 kg/hr

2. Summary of Technology

This method describes Carbon Mapper's airborne deployments in the context of meeting EPA Superemitter detection and quantification thresholds. In this context EPA's superemitter program (SEP) requires that a method:

- 1) can detect super-emitters with sufficient sensitivity to confidently differentiate sources above the 100 kg/hr notification threshold
- 2) can quantify emission rates including uncertainty bounds
- 3) can geolocate plumes to within 50 meters of the origin of the emission
- 4) can deliver a digital image of methane plumes

All aerial deployment of imaging spectrometers based on design criteria developed by NASA's Jet Propulsion Laboratory allow for detection of methane plumes during aircraft campaigns. While detection limits vary based on operational and environmental variables, the quantification algorithms developed by Carbon Mapper are sensor agnostic and do not vary with aircraft flight altitude. As such, for all airborne applications, Carbon Mapper's methods meet all SEP criteria.

Carbon Mapper methods and findings have been demonstrated in multiple aerial surveys spanning the majority of US oil and gas production basins and published in peer-reviewed journals.

3. Notes for Review Team

This application applies to Carbon Mapper's aerial deployment of NASA-designed imaging spectrometers and the detection and quantification of methane plumes to meet EPA's Superemitter program requirements. Quantification of methane emission rates, including uncertainty estimates, are sensor agnostic and independent of flight conditions.

4. Summary of Documents Submitted

Document	Document Name	Type/Purpose
Description of Technology	Carbon_Mapper_Airborne_System_Description_of_Technology.pdf	Required document
Formal Alternative Technology Method	Carbon_Mapper_Airborne_System_formal_ATM.pdf	Required document
Carbon Mapper QC Guide	Carbon_Mapper_QC_Guide.pdf	Supporting document
Carbon Mapper Product Guide	Carbon_Mapper_Product_Guide_v1_1_4.pdf	Supporting document
Carbon Mapper L2b Algorithm Theoretical Basis Document	Carbon_Mapper_L2B_ATBD.pdf	Supporting document
Carbon Mapper L3/4 Algorithm Theoretical Basis Document	Carbon_Mapper_L3_L4_ATBD.pdf	Supporting document
El Abbadi, S. H., <i>et al.</i> , Technological Maturity of Aircraft-Based Methane Sensing for Greenhouse Gas Mitigation, <i>Environ. Sci. Technol.</i> 2024, 58, 9591–9600.	El_Abbadi_et_al_2024.pdf	Supporting Document for method validation, peer reviewed
Duren, R. M. et al., California's methane super-emitters. <i>Nature</i> 2019, 575, 180–184.	Duren_et_al_Nature_2019.pdf	Supporting Document for method demonstration, peer reviewed

For Further Information on this Application, Contact:

Daniel Bon
dbon@carbonmapper.org

Carbon Mapper, Inc.
 Pasadena, CA
<https://carbonmapper.org/>
data@carbonmapper.org