

Performance Validation of AROMA chemical analyzers: Ambient Air, Soil Vapor, Sewer Headspace, and Oilfield Produced Fluid



About the AROMA

Entanglement Technologies' AROMA trace vapor analyzers provide real-time, part-per-trillion chemical detection in many complex, real-world sampling environments.

Packaged into a mobile platform, the AROMA analyzers empower operators to make intelligent, data-driven decisions in a matter of minutes with confidence in the quality and reliability of the data at hand.

The AROMA analyzers have been extensively tested and validated in REAL field deployments with complex and highly variable matrix conditions. During these deployments, the AROMA line of analyzers routinely and reliably deliver true, laboratory-grade data in a fraction of the time compared to traditional analytical techniques.

The AROMA family of instruments all share a simple interface that can be accessed and controlled remotely, and that provides long-term, autonomous operation.

The intrinsic stability of the CRDS (cavity ring-down spectroscopy) analyzer core minimizes maintenance, sample preparation costs, and calibration requirements greatly, significantly reducing instrument operation overhead.

AROMA provides world-class performance. Anywhere. Anytime.

Authors:

Dr. Anthony Miller
Entanglement Technologies, Inc.
42 Adrian Ct
Burlingame, CA 94010

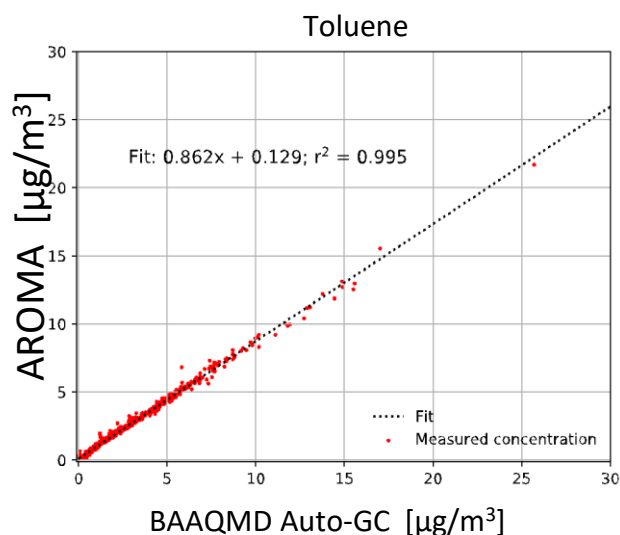
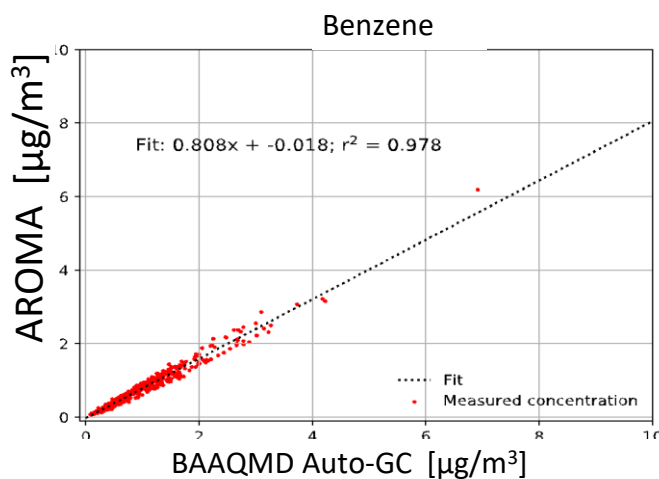
Daniel Brown
Entanglement Technologies, Inc.
42 Adrian Ct
Burlingame, CA 94010

Application #1: Live 30-day side-by-side study with the Bay Area Air Quality Management District (BAAQMD)

Sample Type: Ambient Air
 Comparison Instrument: GC-FID
 r^2 benzene > 0.97
 r^2 toluene > 0.99

The AROMA-VOC analyzer was deployed for a 30-day, side-by-side comparison with an operational dual-column GC-FID regulatory VOC monitor at the BAAQMD's Livermore ambient testing station. The AROMA was configured to co-sample with the Livermore analyzer (sampling from XX:05 to XX:35 each hour) from a common sampling manifold continuously purged with ambient atmosphere. AROMA was configured to match the Livermore analyzer with a nightly Calibration Verification from a standard cylinder at 1am. All CCV values were within DQOs and no corrections were applied to data. AROMA operated automatically without user intervention.

AROMA and BAAQMD data were in excellent agreement with benzene $r^2 > 0.97$ and toluene $r^2 > 0.99$ with no significant outliers.



Species	Mean Conc [µg/m³]	MDL [µg/m³]	MDL [pptv]
Benzene	0.05	0.0045	1.4
Toluene	0.08	0.01	2.6
Ethylbenzene	0.07	0.10	4.4
Xylenes	0.20	0.044	10



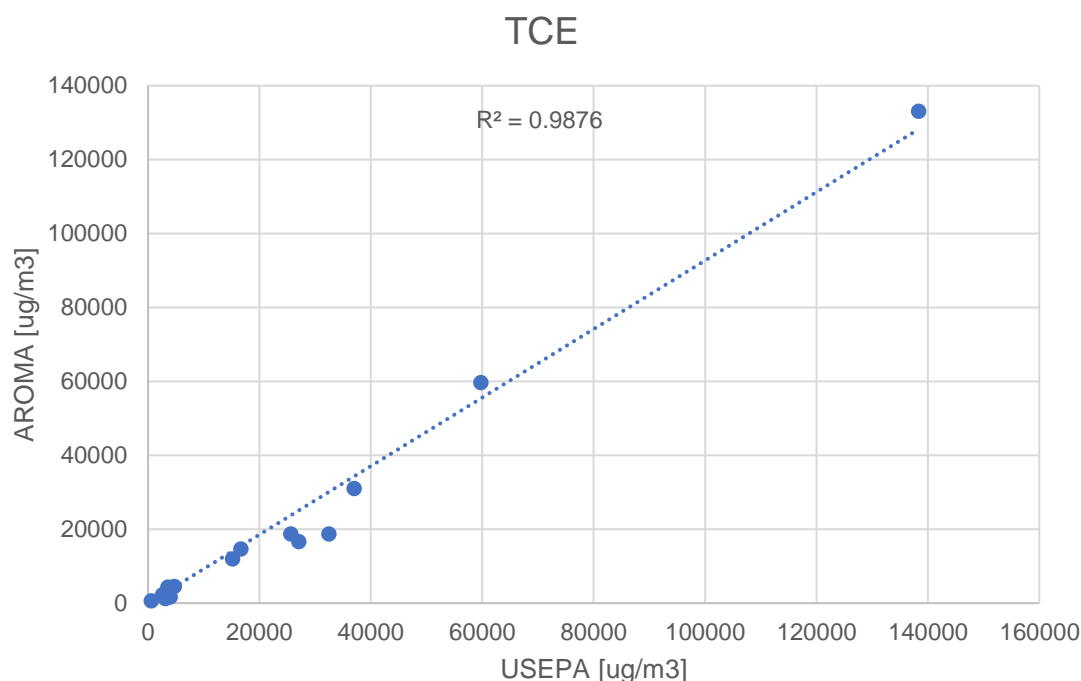
www.entanglementtech.com
 650.204.7875
 info@entanglementtech.com

Application #2: Trichloroethylene (TCE) Soil Vapor Side-by-side study with USEPA - Region 9

Sample Type: Soil Vapor (Tedlar, Direct Inject)
Comparison Instrument: TO-15 analysis by GC-MS
 r^2 TCE > 0.98

The AROMA analyzer performed a co-sampling validation study in a large-scale soil vapor survey at a contaminated superfund site in California. All samples analyzed were field duplicates with a sample for AROMA analysis collected immediately after samples for Laboratory analysis. AROMA sampled from both 1L tedlar bags collected via lung box and through direct gas-tight connection to the soil vapor point. Samples were analyzed for TCE, and the AROMA analyzer operated over the full dynamic range at a single dilution factor. Laboratory analysis was performed by the USEPA Region 9 at either dilution factor 1 or dilution factor 1000.

AROMA showed excellent agreement with the Region 9 samples with the degree of variability consistent with the variability of sequentially sampled field duplicates for soil vapor analysis.

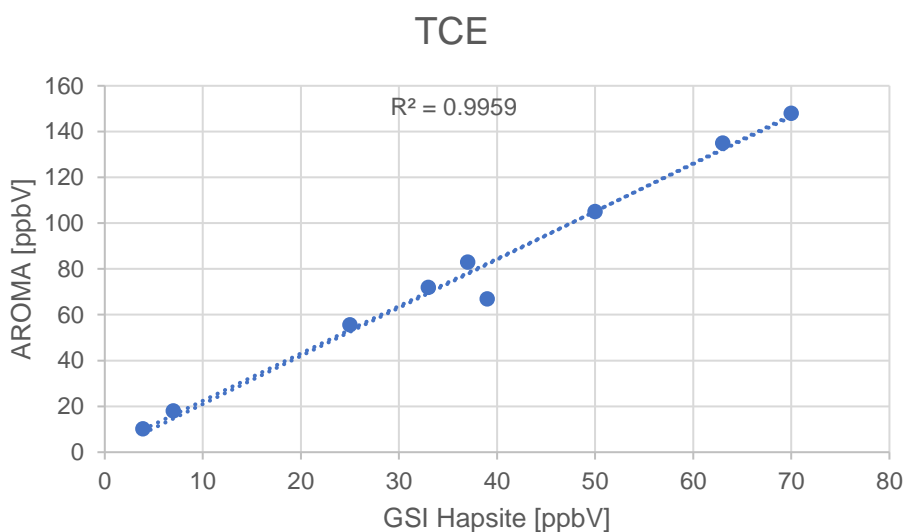


Application #3: Side-by-side with GSI Environmental & ESTCP

Sample Type: Sewer Vapor (Tedlar)
Comparison Instrument: Field GC-MS
 r^2 TCE > 0.99

AROMA performed a side-by-side with a field GC-MS instrument during an ESTCP study validating sanitary sewer methodologies (ESTCP Project ER-201505 final report). AROMA co-sampled (laboratory duplicate) tedlar bags collected by GSI environmental Personnel. Excellent agreement between AROMA and GSI was demonstrated over the ranged of samples with the calibration range of the on-site GC/MS. Increased variability was observed between samples labeled as qualitative by the GC/MS instrument due to elevated concentrations. AROMA was within calibration for all samples.

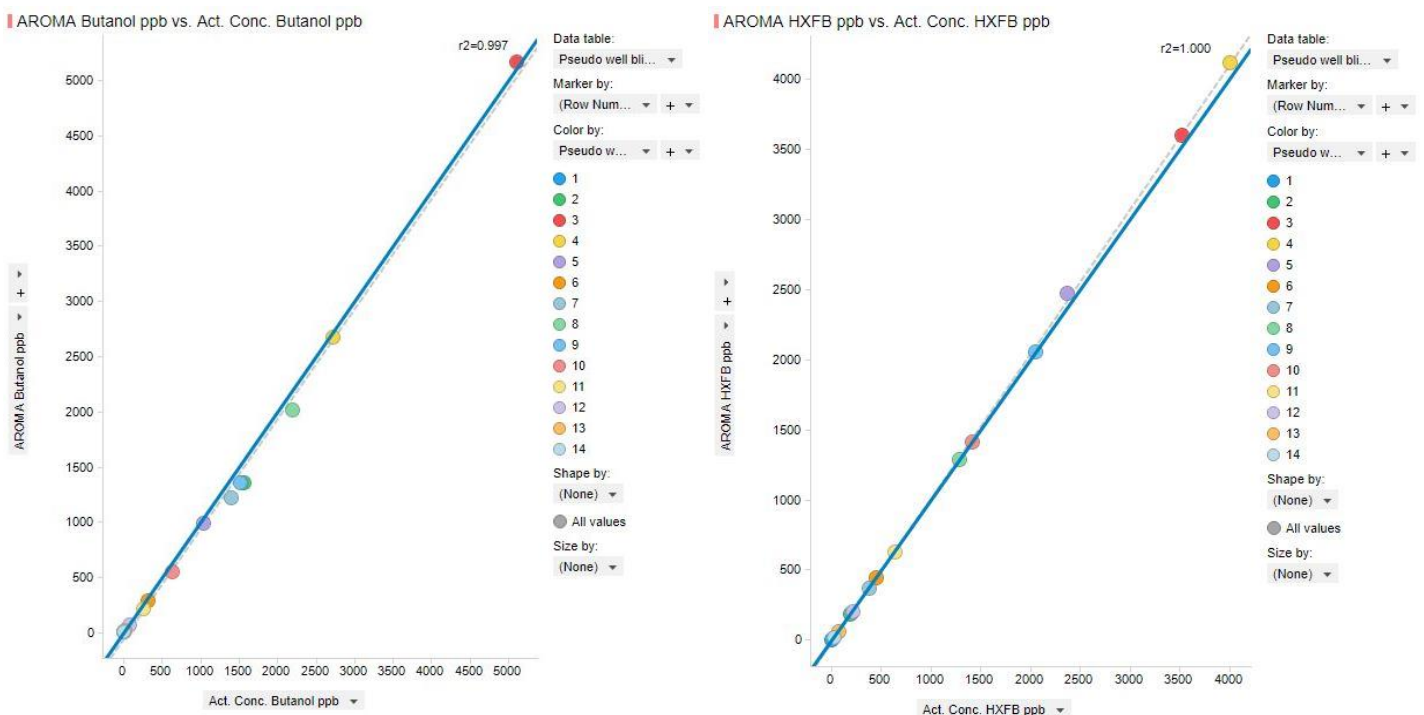
Samples were sanitary sewer headspace collected at Moffett field throughout the course of a sewer preferential pathway study. Samples were collected by GSI personnel at approximately 1' above liquid surface at the bottom of man-holes.



Application #4: Oil & Gas Field Chemical Tracer Analysis

Sample Type: Oilfield-produced Fluid
Comparison Instrument: Laboratory GC-MS
 r^2 Butanol > 0.99
 r^2 Fluoroalcohol > 0.999

The AROMA-Tracer model of the AROMA analyzer has been developed to analyze oilfield-produced fluid for the presence of a range of chemical tracers (alcohols) at part-per-billion concentrations. A long-term field trial was performed on-site, and samples were analyzed from 17-30 wells at intervals ranging from daily to monthly. This interval range was dependent upon concentration history and expected rate of change of chemical recovery. In this study AROMA delivered analytical limits of detection 10x-50x below laboratory GC/MS. In order to validate AROMA performance in at low concentrations where direct comparison was not possible, samples were prepared in field-collected matrices by Chevron ETC. These samples were analyzed blind by Entanglement Technologies. The reported results are shown below. For the two specific compounds used for this study $r^2 > 0.99$ was achieved.





For more information, go to:
www.entanglementtech.com/products

Or contact us at
info@entanglementtech.com

