

# Development of an IMS Detector for MINICAMS<sup>®</sup>

# Background

Why do we want to do this?

*There is a need to detect non-P or S simulants and TICs and TIMs at low levels to referee laboratory and field tests using a MINICAMS<sup>®</sup>*

Issue:

*MINICAMS<sup>®</sup> with an FID cannot detect MeS at 0.0001 mg/m<sup>3</sup>.*

*This limits the simulant options. The current MINICAMS<sup>®</sup> detector options do not allow for TICs and TIMs analysis*

## Technical Approach

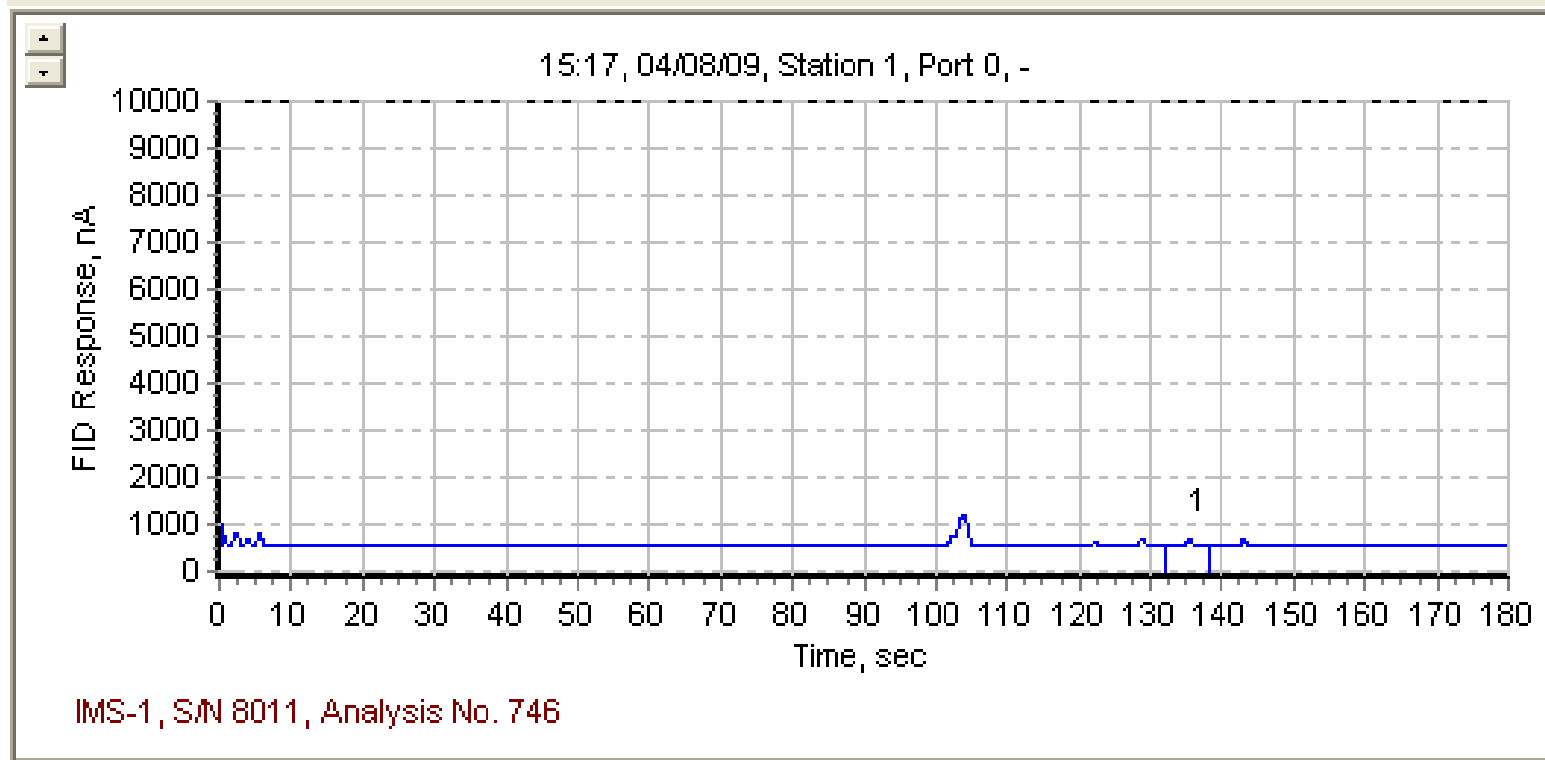
- An IMS detector should provides similar sensitivity for MeS or TEP
- Air and hydrogen are not required to run an IMS
- Nitrogen used to run MINICAMS<sup>®</sup> can be used as IMS drift gas
- Design requirements for IMS:
  - Can be operated at elevated temperature (> 100 °C)
  - Can be mounted directly on the MINICAMS<sup>®</sup> without increasing the instrument footprint
  - No modification to MINICAMS<sup>®</sup> electronics or software.
  - Minimal to no additional training for most MINICAMS<sup>®</sup> operators

## Project Goals

- Use a MINICAMS<sup>®</sup> with an IMS to detect TEP and MeS at 0.1 ng or 0.0001 mg/m<sup>3</sup>
- Ensure that the IMS can detect the same amount of TEP mass as a standard FPD
- Improve MINICAMS<sup>®</sup> MeS sensitivity by a factor of 1000
- Use the separation capability of a MINICAMS<sup>®</sup> GC and the IMS drift time to create a 2-dimensional chemical analysis

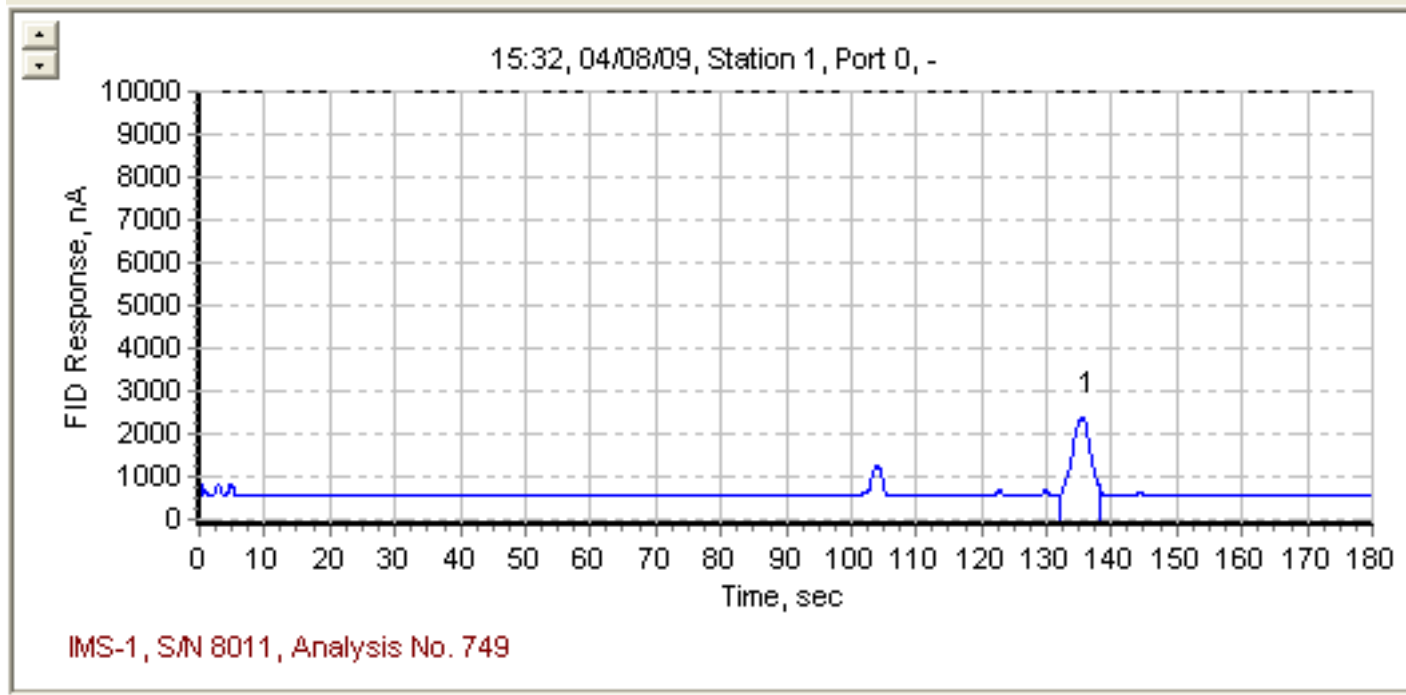
# Blank MeS Chromatogram

No	Compd	TEST	mg/m3	Height	Area	RT	Width	Det	Status
1	MS	0.05	0.000005	118	156	135.6	0.8	FID	RUN



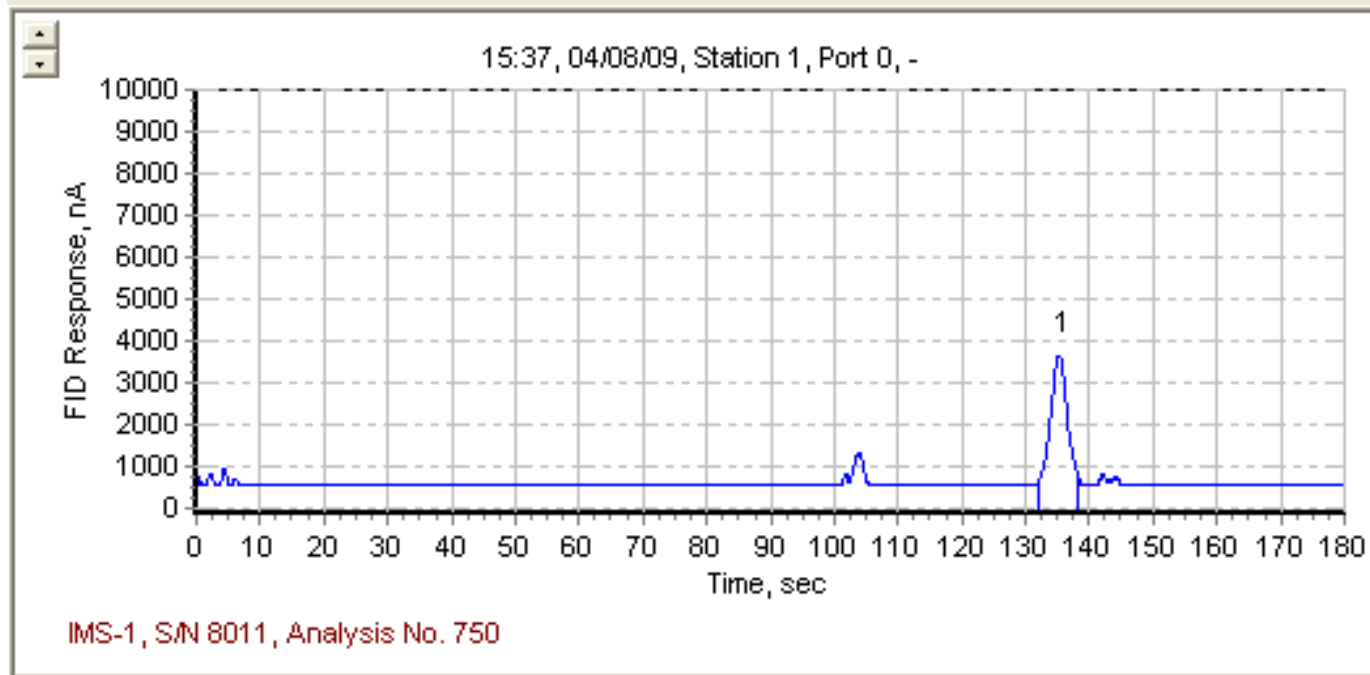
# 0.05 ng MeS

No	Compd	TEST	mg/m3	Height	Area	RT	Width	Det	Status
1	MS	0.57	0.000057	1796	5858	135.5	2.9	FID	RUN



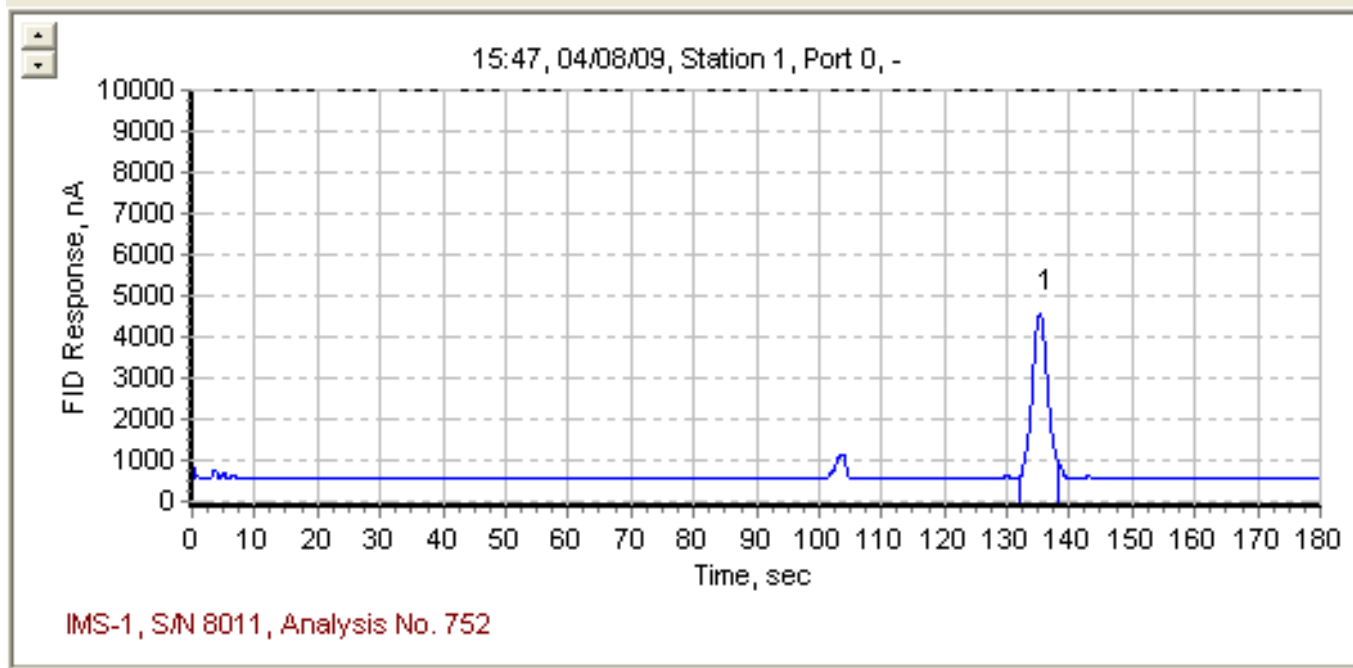
# 0.075 ng MeS

No	Compd	TEST	mg/m3	Height	Area	RT	Width	Det	Status
1	MS	0.84	0.000084	3062	9333	135.2	2.7	FID	RUN



# 0.1 ng MeS

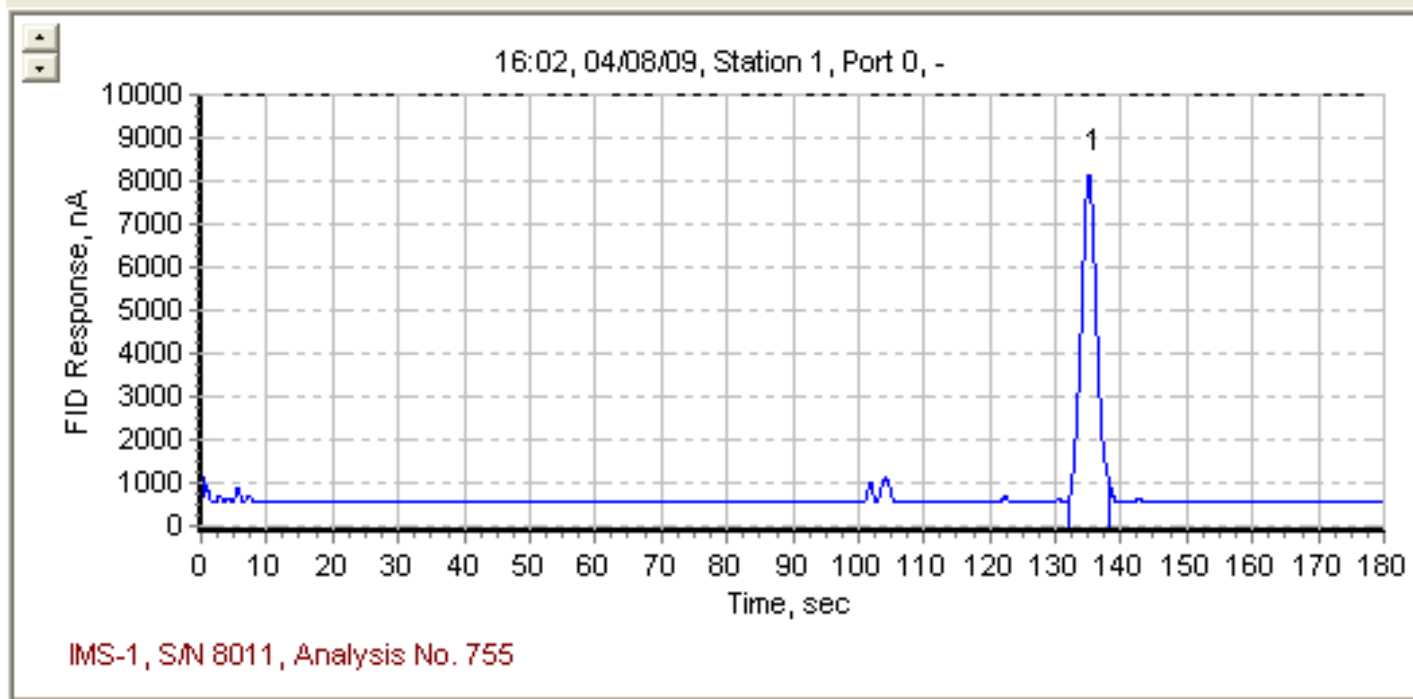
No	Compd	TEST	mg/m3	Height	Area	RT	Width	Det	Status
1	MS	1.01	0.000101	4004	11945	135.3	2.5	FID	RUN



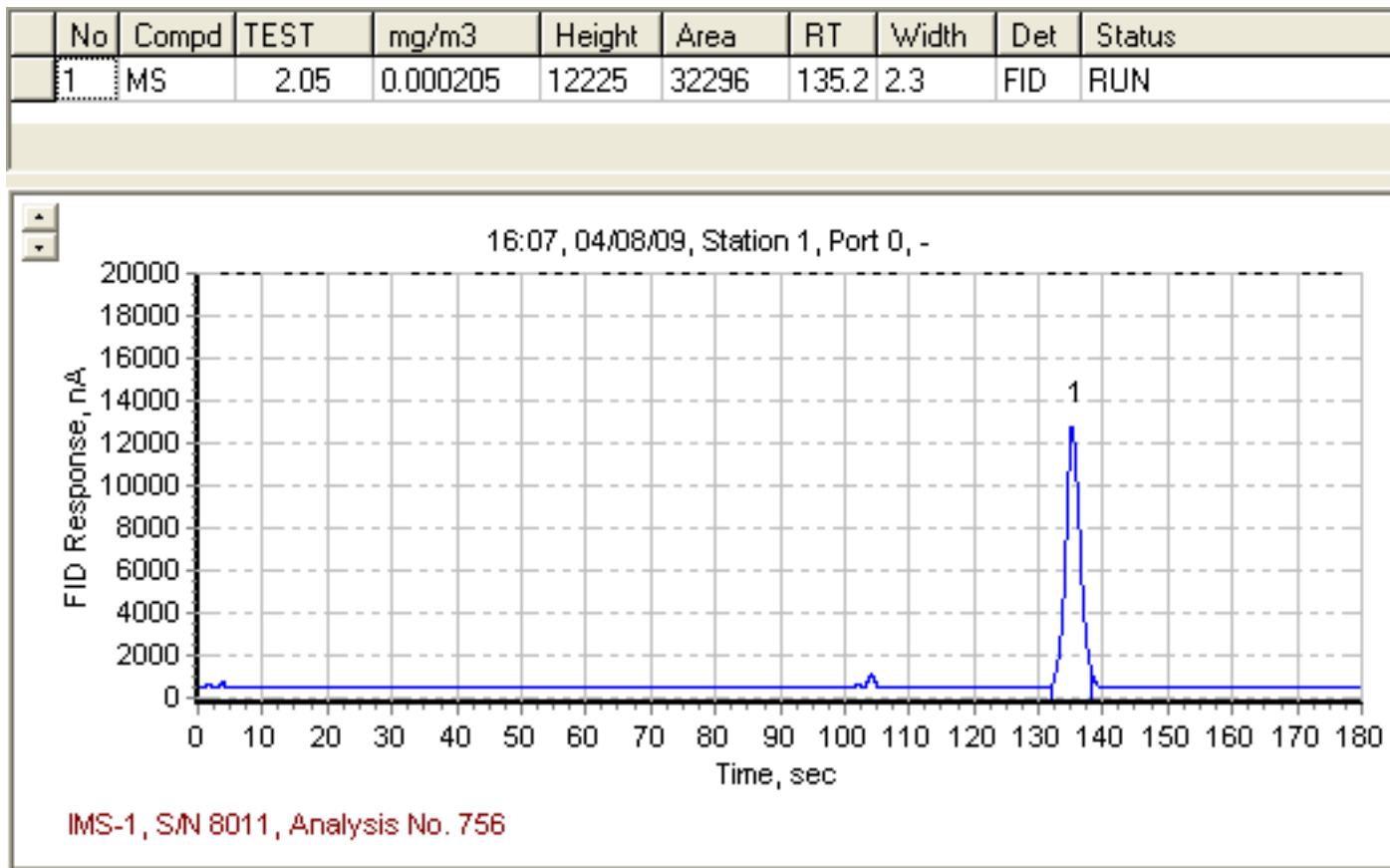


# 0.15 ng MeS

No	Compd	TEST	mg/m3	Height	Area	RT	Width	Det	Status
1	MS	1.52	0.000152	7576	21221	135.0	2.4	FID	RUN

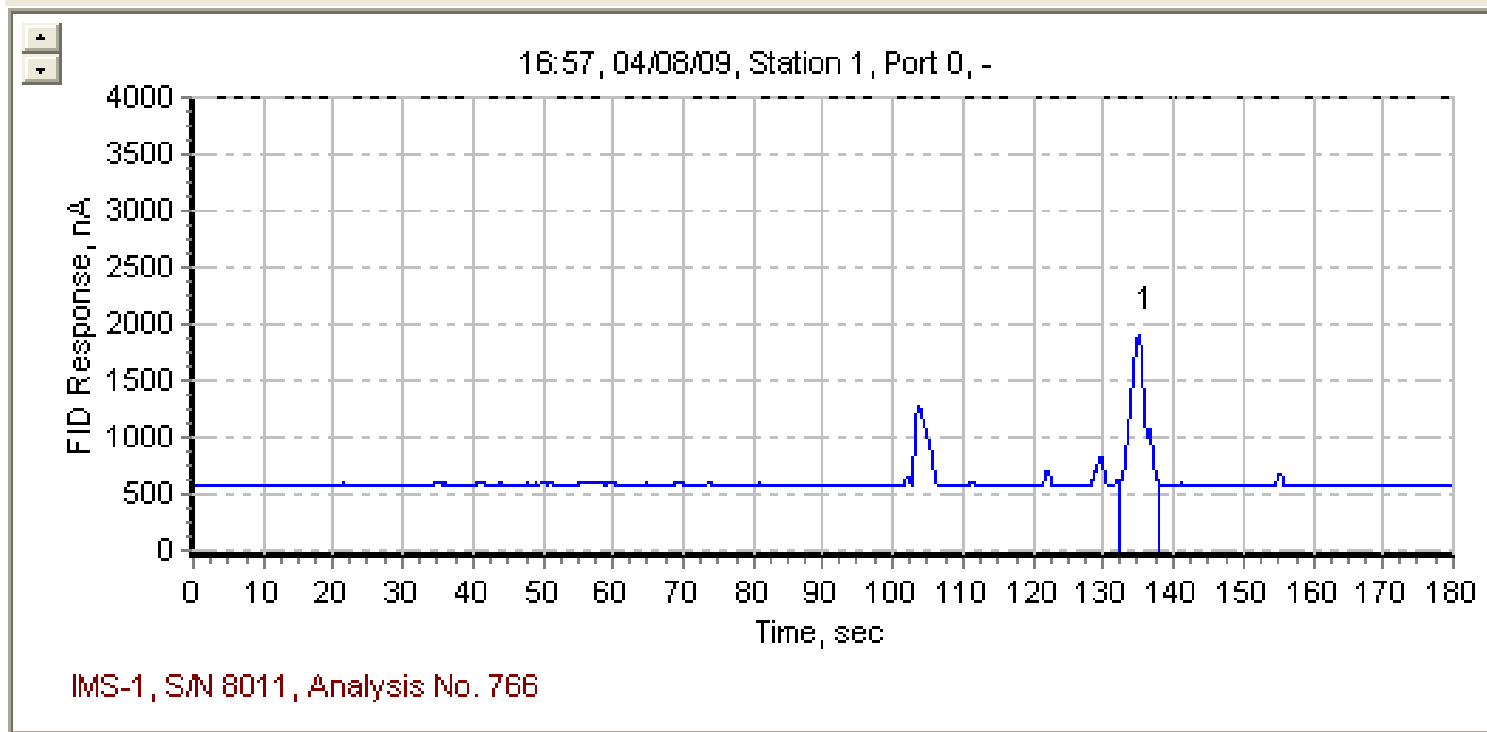


# 0.2 ng MeS



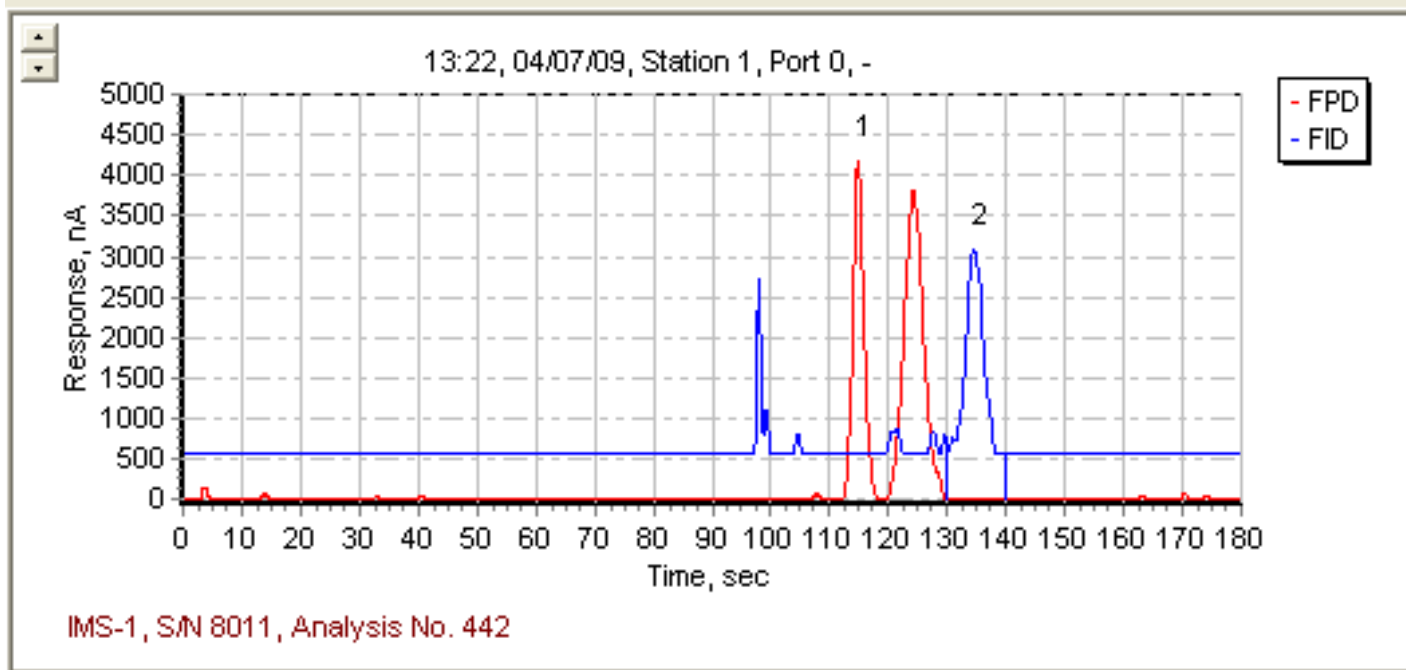
# 0.025 ng MeS

No	Compd	TEST	mg/m3	Height	Area	RT	Width	Det	Status
1	MS	0.31	0.000031	1324	3439	135.0	2.1	FID	RUN

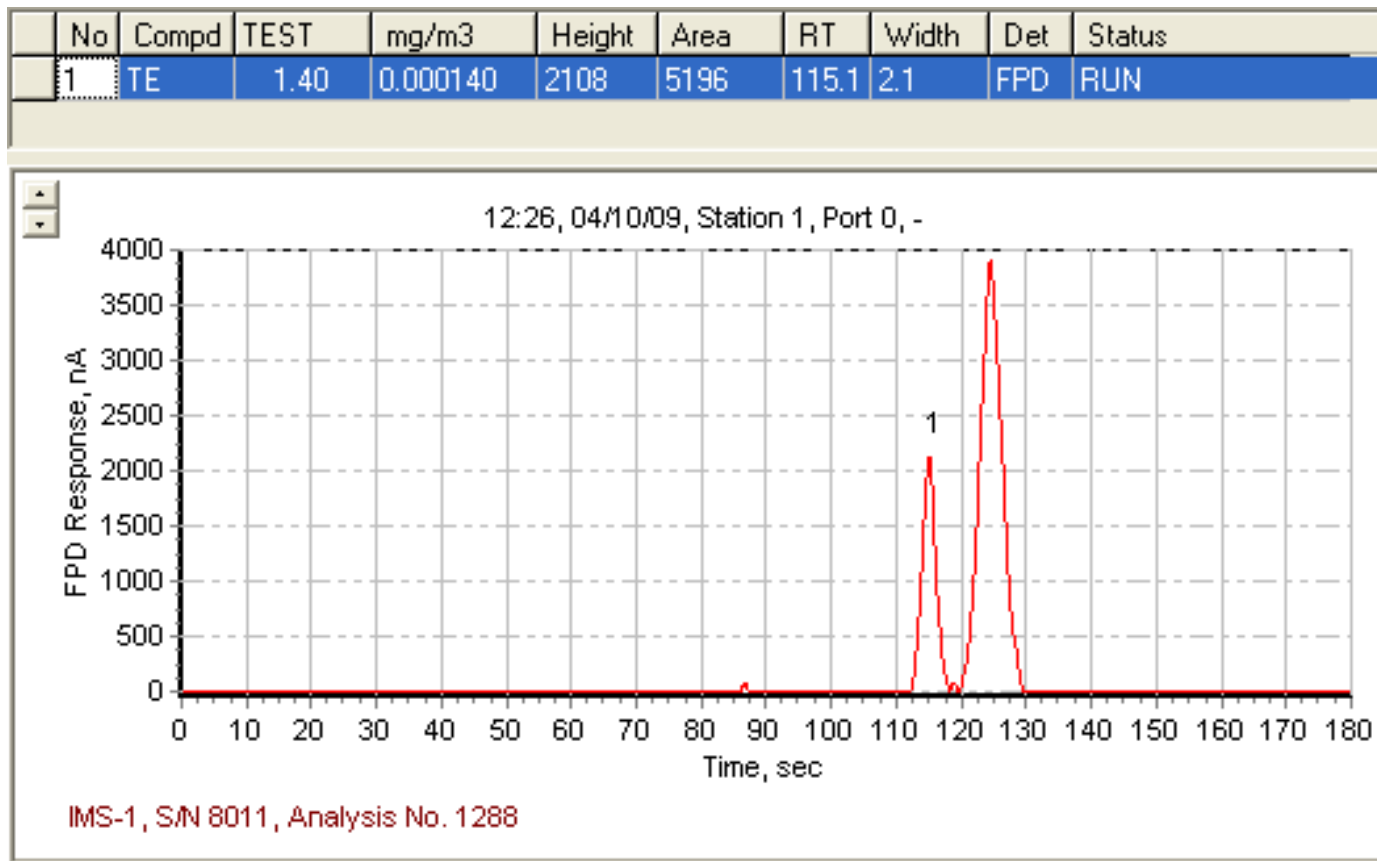


## Approximately 0.2 ng TEP and 0.05 ng MeS

No	Compd	TEST	mg/m3	Height	Area	RT	Width	Det	Status
1	TE	0.00	0	4147	9001	114.8	1.9	FPD	RUN
2	MS	0.00	0	2390	7651	134.5	2.9	FID	RUN



## 0.1 ng TEP over approximately 0.04 ng TEP Background



## MINICAMS<sup>®</sup> Detector Sensitivity Comparison

Compound	FPD	FID	IMS
MeS	NA	50 to 100 ng	0.025 ng
TEP	0.05 to 0.1 ng	50 to 100 ng	0.1 ng

## MINICAMS<sup>®</sup> Detector Compressed Gas Consumption Rates

GAS	FPD/FID	IMS
N2	30 mL/min for carrier gas	30 mL/min for carrier gas 90 mL/min for IMS Drift Tube
H2	50 mL/min for flame	none, no flame
Zero Air	100 mL/min for flame	none, no flame

## **MINICAMS<sup>®</sup>/IMS Setup**

- Operators will need only nitrogen to operate the MINICAMS<sup>®</sup>
- Critical flow rates will be column flow and IMS drift tube flow
- The MINICAMS<sup>®</sup> will become more portable, could be placed inside a large test item, will reduce the expense of costly compressed gases, and become safer to operate



## IMS Software

- The IMS software is only used to set drift time windows. Once this is complete, the IMS operates independently sending signal to the MINICAMS<sup>®</sup> for further electrometer processing and data collection through Chrom-Net

*Note: The signal processing is completely transparent to the operator and requires no further training.*

**IMS Mounted to a MINICAMS®**

