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## **DRYWALL ANALYSIS REPORT**

**Results from**  
**Carbon Disulfide & Carbonyl Sulfide Verification**

**Regarding:**  
**Gypsum Wallboard - 1/2" Regular**  
**Fletcher, OK**

**MAS Project: M49786**

**For:**  
**Mr. Patrick Miller**  
**Temple-Inland EHS**  
**303 S. Temple Drive**  
**Diboll, Texas 75941**

**October 13, 2009**

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**SUMMARY:**

*Regular drywall samples from Temple-Inland's Fletcher, OK manufacturing plant were submitted for testing of carbon disulfide and carbonyl sulfide, (two problematic compounds associated with sulfur gas emissions) by a modified headspace analysis using gas chromatography and mass spectroscopy (GC/MS). A total of four samples were analyzed from the drywall submitted.*

*For comparison purposes, a series of MAS drywall controls (non-problematic drywall) were previously analyzed and found to contain an average of 2.6 ppb carbon disulfide. For each of the submitted samples, M49786-001 thru -004 the emission levels of carbon disulfide and carbonyl sulfide were below the quantitation limit (BQL). Based on these results, all of the submitted samples M49786-001 thru -004 were determined to be negative for sulfur off-gassing and are not considered problematic corrosive drywall types.*

**DESCRIPTION OF SAMPLES:**

<u>MAS No.</u>	<u>Client Description</u>
M49786-001	½" Regular – Gypsum Wallboard (1)
M49786-002	½" Regular - Gypsum Wallboard (2)
M49786-003	½" Regular - Gypsum Wallboard (3)
M49786-004	½" Regular - Gypsum Wallboard (4)

**PREPARATION AND ANALYSIS:**

PREPARATION: A small subsample was removed from each of the submitted bulk drywall sample materials and weighed on an analytical balance. Each sample was powdered with a mortar and pestle then placed in a typical headspace container for analysis by GC/MS.

ANALYSIS: Tert-butyl methyl ether (MTBE) was used as an internal standard, and known concentrations of carbon disulfide and carbonyl sulfide were used as the external standards. The sample was then analyzed by GC/MS then compared to both the internal and external standards for quantification of carbon disulfide and carbonyl sulfide. Along with the submitted drywall samples, controls (corrosive problematic and non-problematic

type drywall) were run along with the primary samples as described. The amount of carbon disulfide found in the submitted drywall bulk samples were then compared to the MAS in-house controls.

**RESULTS AND DISCUSSION:**

Table 1 shows the results from the analysis of the submitted drywall sample.

**TABLE 1**  
**Four Samples of a Bulk Drywall Material from the Temple-Inland (Fletcher, OK)**

<b>MAS No.</b>	<b>Client Description/Location</b>	<b>Weight (grams)</b>	<b>Carbon Disulfide (CS<sub>2</sub>) Concentration (ppb)</b>	<b>Carbonyl Sulfide (COS) Concentration (ppb)</b>
M49786-001	½" Regular Gypsum Wallboard (1)	3.20	<b>BQL (1.0)</b>	<b>BQL (3.9)</b>
M49786-002	½" Regular - Gypsum Wallboard (2)	3.05	<b>BQL (1.1)</b>	<b>BQL (4.1)</b>
M49786-003	½" Regular - Gypsum Wallboard (3)	3.04	<b>BQL (1.1)</b>	<b>BQL (4.2)</b>
M49786-004	½" Regular - Gypsum Wallboard (4)	3.13	<b>BQL (1.0)</b>	<b>BQL (4.0)</b>

The attached GC/MS spectra shows that the Temple-Inland samples M49786-001 thru -004 of the submitted drywall material emitted carbon disulfide below the quantitation limit (1.1 ppb). The average concentration of carbon disulfide (background amounts) in the MAS in-house controls is 2.6 ppb. Using the criteria of 4 X the standard deviation\* of the in-house MAS controls (2.6 + (4 X 1.5) = 8.6 ppb), it is our opinion, that the findings of BQL or ≤1.1 ppb of carbon disulfide along with BQL or ≤4.2 carbonyl sulfide confirms that these samples are not considered problematic corrosive drywall.

\*Statistically 3 times the standard deviation (SD) encompasses 99.7 percent of the variation around the average for emission of carbon disulfide (CS<sub>2</sub>) from the control drywall samples tested. Any CS<sub>2</sub> emission values at or beyond 3 times the SD would be considered significantly different from the controls and the sample would be considered an offensive drywall type. It is our opinion that a value of 4 times the SD is even more conservative statistically and would further strengthen the finding that the sample tested is an offensive drywall product.



Mark W. Rigler, Ph.D.  
Senior Consulting Scientist



William E. Longo, Ph.D.  
President

## ***GC/MS RESULTS***



**Materials Analytical Services, LLC - Test Report**

Patrick Miller  
 Temple-Inland EHS  
 303 S. Temple Drive  
 Diboll, TX 75941

October 12, 2009

**MAS Project #:** M49786

**Date Sampled:** 09/14/09

**Client Proj. Name:** 1/2" Regular Wallboard-Fletcher, OK

**Date Received:** 09/16/09

**Date Analyzed:** 09/23/09

**Analysis:** Carbon Disulfide (CS<sub>2</sub>) and Carbonyl Sulfide (COS) by GC/MS

**Method:** Headspace by GC/MS

**Media:** Drywall

MAS Sample ID	Client Sample ID	Analyte	ng/g	ppb	LOQ	Analyte	ng/g	ppb	LOQ
M49786 - 001	0 091209 0259A (1)	Carbon Disulfide	BQL	BQL	1.0	Carbonyl Sulfide	BQL	BQL	3.9
M49786 - 002	0 091209 0259A (2)	Carbon Disulfide	BQL	BQL	1.1	Carbonyl Sulfide	BQL	BQL	4.1
M49786 - 003	0 091209 0259A (3)	Carbon Disulfide	BQL	BQL	1.1	Carbonyl Sulfide	BQL	BQL	4.2
M49786 - 004	0 091209 0259A (4)	Carbon Disulfide	BQL	BQL	1.0	Carbonyl Sulfide	BQL	BQL	4.0

Control ID	Analyte	ng/g	ppb	LOQ	Analyte	ng/g	ppb	LOQ
Negative Control	Carbon Disulfide	BQL	BQL	1.0	Carbonyl Sulfide	BQL	BQL	3.9
Positive Control	Carbon Disulfide	272	87	1.0	Carbonyl Sulfide	44	18	4.1

BQL-Below Quantitation Limit  
 LOQ-Limit Of Quantitation

**Analyst:** JJ

**Review:** Randy Brown  
 Randy Brown  
 Chemistry Department Manager

## ***GC/MS SPECTRA***

CS<sub>2</sub> & COS Sample Analysis Spreadsheet

Job No. M49786  
 Client Temple-Inland EHS  
 Analyst JJ  
 Date 10/12/2009  
 Instrument GC/MS

Client Job ID: CS<sub>2</sub> & COS in Wallboard  
 Project Name: 1/2" Regular Wallboard-Fletcher, OK  
 Date Sampled: 09/14/09  
 Date Received: 09/16/09  
 Date Analyzed: 09/23/09

MW(COS)= 60.075  
 k factor = 0.407

MW(CS<sub>2</sub>)= 76.139  
 k factor = 0.321

Lowest STD (ug/ml): 10

31

Carbon Disulfide

MAS Sample ID	Client Sample ID	Sample Aliquot (g)	Result	ng/g	ppb	Detection Limit
M49786 -001	0 091209 0259A (1)	3.20	BQL	BOL	BOL	1.0
M49786 -002	0 091209 0259A (2)	3.05	BQL	BOL	BOL	1.1
M49786 -003	0 091209 0259A (3)	3.04	BQL	BOL	BOL	1.1
M49786 -004	0 091209 0259A (4)	3.13	BQL	BOL	BOL	1.0

Control ID  
 Negative Control  
 Positive Control

BOL 272  
 BOL 87  
 BOL 1.0  
 BOL 1.0

Carbonyl Sulfide

MAS Sample ID	Client Sample ID	Sample Aliquot (g)	Result	ng/g	ppb	Quantitation Limit
M49786 -001	0 091209 0259A (1)	3.20	BQL	BOL	BOL	3.9
M49786 -002	0 091209 0259A (2)	3.05	BQL	BOL	BOL	4.1
M49786 -003	0 091209 0259A (3)	3.04	BQL	BOL	BOL	4.2
M49786 -004	0 091209 0259A (4)	3.13	BQL	BOL	BOL	4.0

Control ID  
 Negative Control  
 Positive Control

BOL 43.7  
 BOL 18  
 BOL 3.9  
 BOL 4.1

Quantitation Report

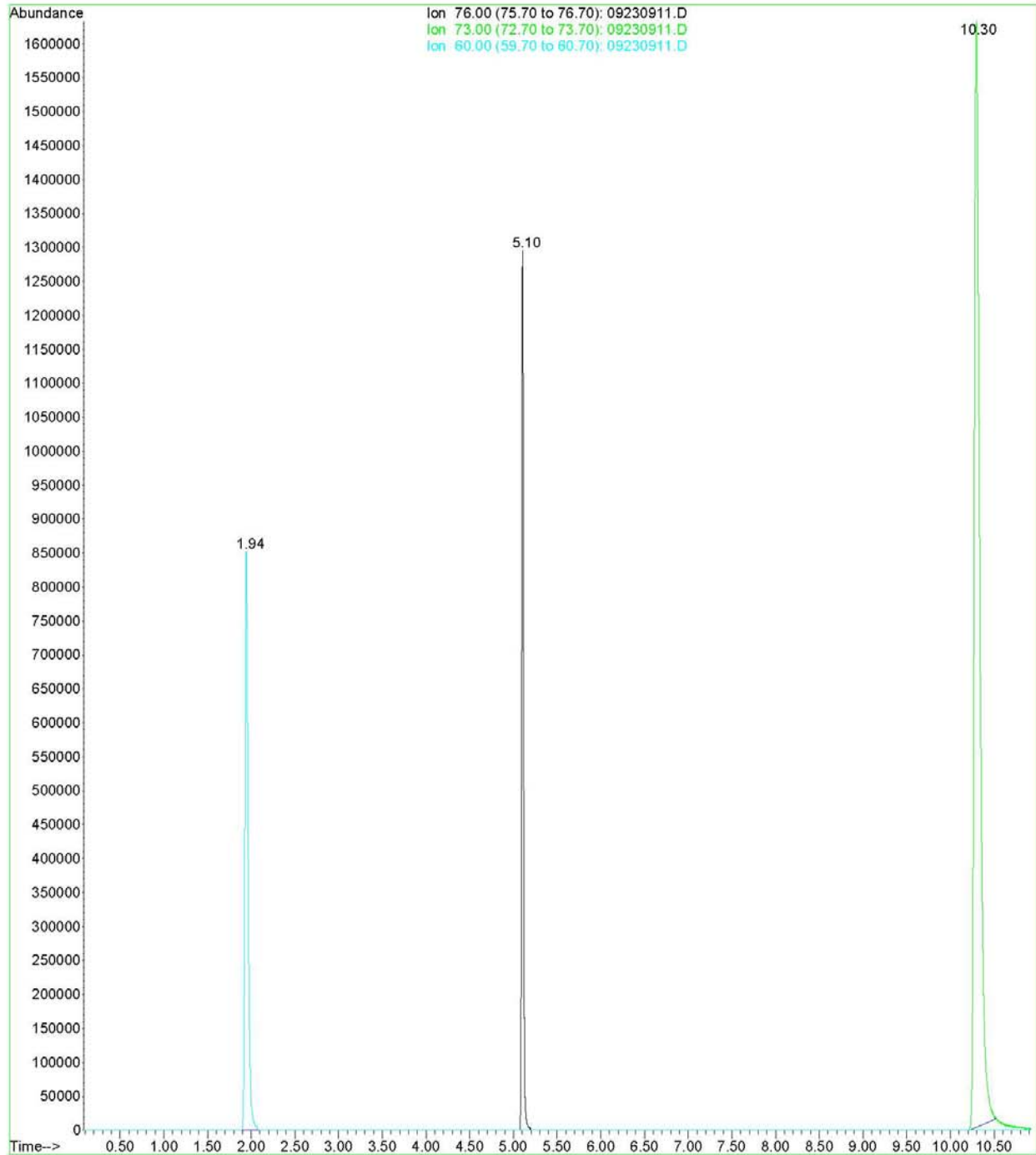
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 Sample : CCV-L4 Inst : Instrumen  
 Misc : Multiplr: 1.00  
 MS Integration Params: EVENTS.E  
 Quant Time: Sep 23 16:56:22 2009 Quant Results File: 092209CS2\_DRYWALL.RES

Quant Method : C:\MSDCHEM\1...\092209CS2\_DRYWALL.M (Chemstation Integrator)  
 Title :  
 Last Update : Tue Sep 22 17:26:55 2009  
 Response via : Initial Calibration  
 DataAcq Meth : 8260WALL

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
-----	-----	-----	-----	-----	-----	-----
1) MTBE	10.30	73	71604356	740.00	ng	0.00
Target Compounds						Qvalue
2) Carbonyl sulfide	1.94	60	21343219	332.29	ng	99
3) Carbon Disulfide	5.10	76	18299935	162.75	ng	100
-----	-----	-----	-----	-----	-----	-----

(#) = qualifier out of range (m) = manual integration (+) = signals summed  
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File : C:\MSDCHEM\1\DATA\092309\09230911.D  
Operator : JJ  
Acquired : 23 Sep 2009 4:44 pm using AcqMethod 8260WALL  
Instrument : Instrumen  
Sample Name: CCV-L4  
Misc Info :  
Vial Number: 11



Quantitation Report

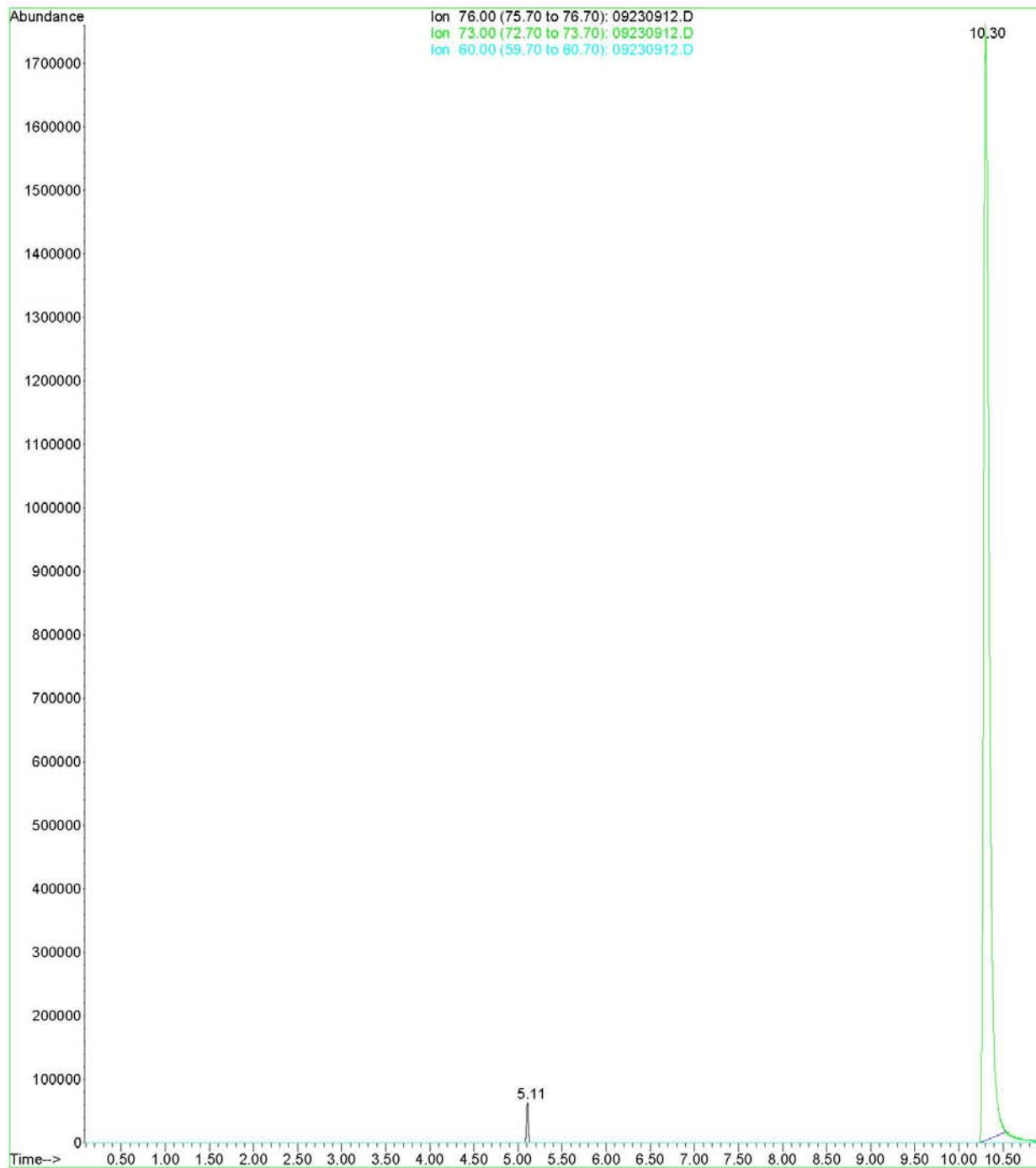
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Sample : Blank Inst : Instrumen  
Misc : Multiplr: 1.00  
MS Integration Params: EVENTS.E  
Quant Time: Sep 24 10:38:56 2009 Quant Results File: 092209CS2\_DRYWALL.RES

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Title :  
Last Update : Tue Sep 22 17:26:55 2009  
Response via : Initial Calibration  
DataAcq Meth : 8260WALL

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
-----	-----	-----	-----	-----	-----	-----
1) MTBE	10.30	73	76493335	740.00	ng	0.00
Target Compounds						Qvalue
2) Carbonyl sulfide	0.00	60	0		N.D.	
3) Carbon Disulfide	5.11	76	876388		Below Cal	95
-----	-----	-----	-----	-----	-----	-----

(#) = qualifier out of range (m) = manual integration (+) = signals summed  
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Operator : JJ  
Acquired : 23 Sep 2009 5:20 pm using AcqMethod 8260WALL  
Instrument : Instrumen  
Sample Name: Blank  
Misc Info :  
Vial Number: 12



Quantitation Report

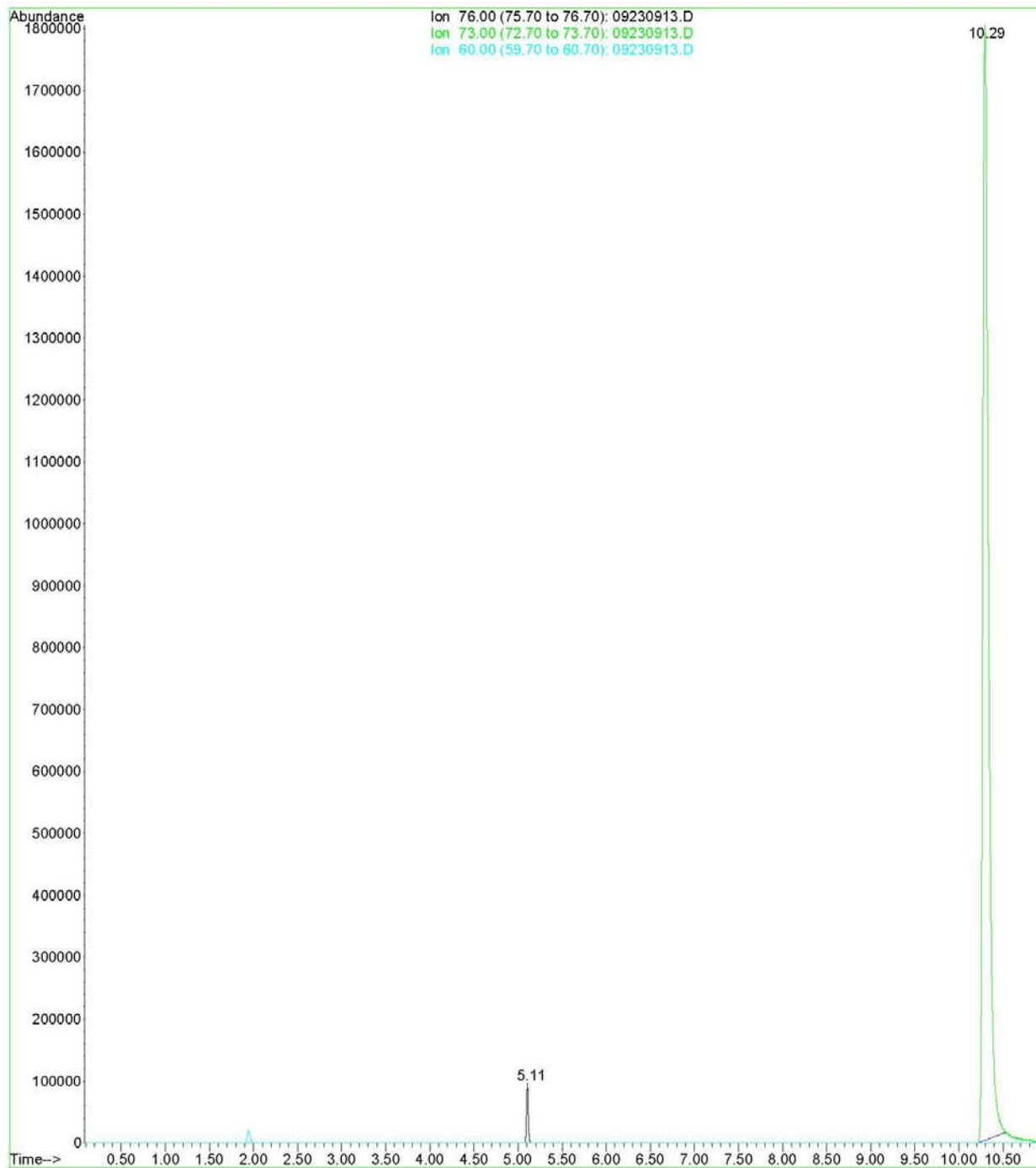
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 Acq On : 23 Sep 2009 5:55 pm Operator: JJ  
 Sample : Negative Control Inst : Instrumen  
 Misc : 3.20g Multiplr: 1.00  
 MS Integration Params: EVENTS.E  
 Quant Time: Sep 24 10:40:21 2009 Quant Results File: 092209CS2\_DRYWALL.RES

Quant Method : C:\MSDCHEM\1...\092209CS2\_DRYWALL.M (Chemstation Integrator)  
 Title :  
 Last Update : Tue Sep 22 17:26:55 2009  
 Response via : Initial Calibration  
 DataAcq Meth : 8260WALL

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
1) MTBE	10.30	73	80396552	740.00	ng	-0.01
						Qvalue
2) Carbonyl sulfide	1.94	60	449031	Below	Cal	92
3) Carbon Disulfide	5.11	76	1315408	Below	Cal	97

(#) = qualifier out of range (m) = manual integration (+) = signals summed  
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File : C:\MSDCHEM\1\DATA\092309\09230913.D  
Operator : JJ  
Acquired : 23 Sep 2009 5:55 pm using AcqMethod 8260WALL  
Instrument : Instrumen  
Sample Name: Negative Control  
Misc Info : 3.20g  
Vial Number: 13



Quantitation Report

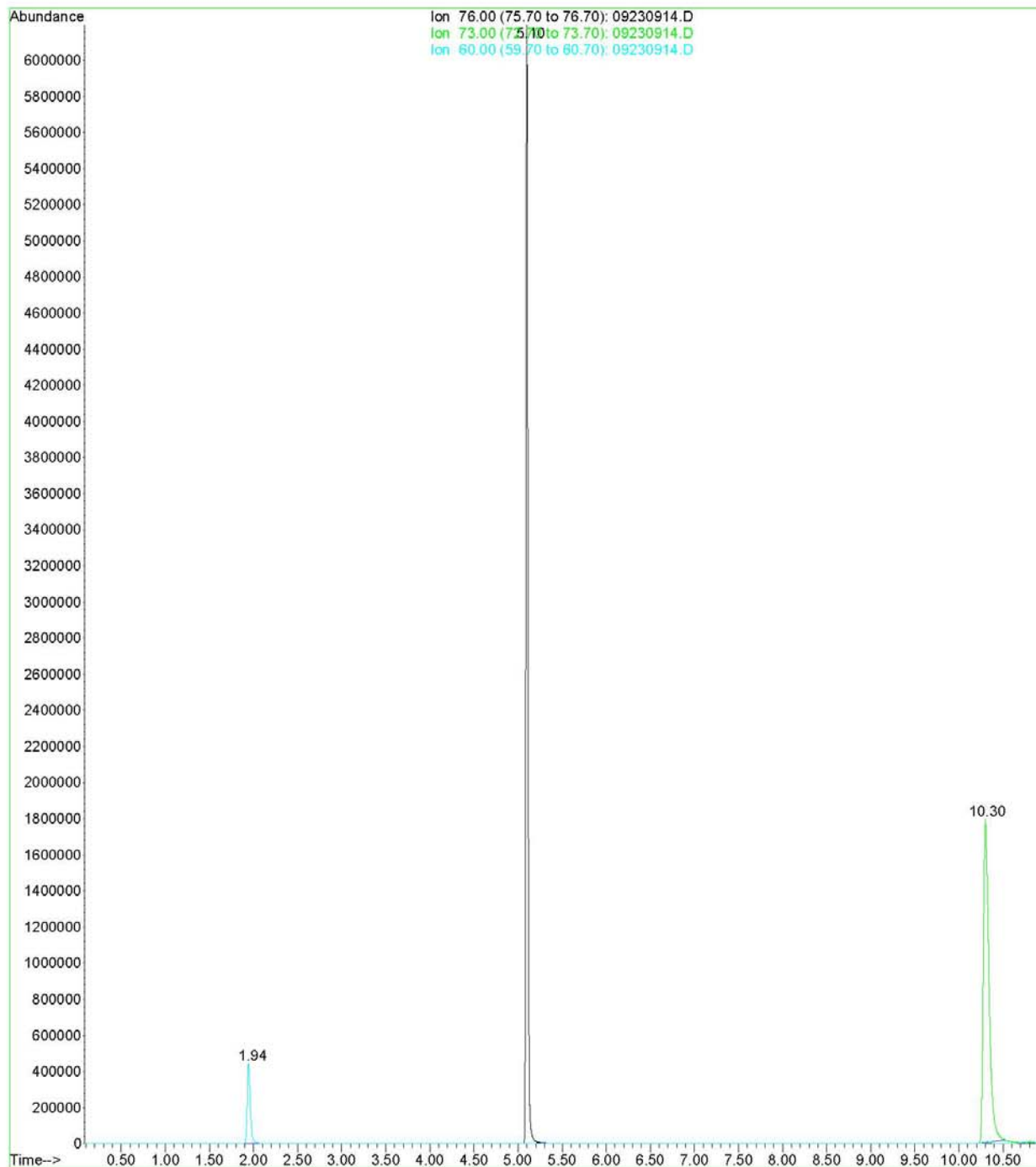
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 Acq On : 23 Sep 2009 6:31 pm Operator: JJ  
 Sample : Positive Control Inst : Instrumen  
 Misc : 3.10g Multiplr: 1.00  
 MS Integration Params: EVENTS.E  
 Quant Time: Sep 24 10:42:02 2009 Quant Results File: 092209CS2\_DRYWALL.RES

Quant Method : C:\MSDCHEM\1...\092209CS2\_DRYWALL.M (Chemstation Integrator)  
 Title :  
 Last Update : Tue Sep 22 17:26:55 2009  
 Response via : Initial Calibration  
 DataAcq Meth : 8260WALL

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
1) MTBE	10.30	73	78614807	740.00	ng	0.00
Target Compounds						Qvalue
2) Carbonyl sulfide	1.94	60	10888131	135.39	ng	100
3) Carbon Disulfide	5.10	76	95051217	842.91	ng	100

(#) = qualifier out of range (m) = manual integration (+) = signals summed  
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Operator : JJ  
Acquired : 23 Sep 2009 6:31 pm using AcqMethod 8260WALL  
Instrument : Instrumen  
Sample Name: Positive Control  
Misc Info : 3.10g  
Vial Number: 14



Quantitation Report

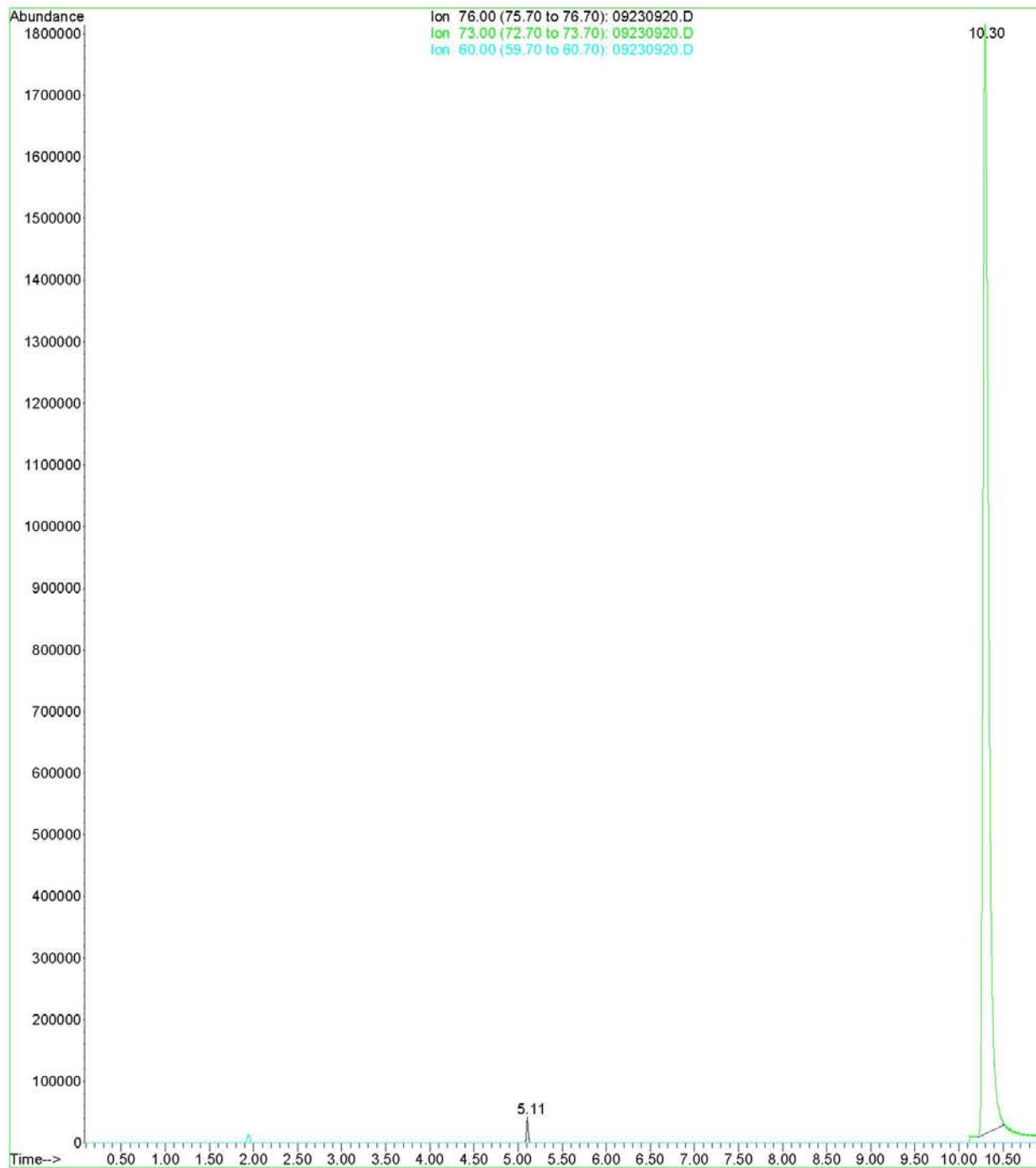
Data File : C:\MSDCHEM\1\DATA\092309\09230920.D Vial: 20  
 Acq On : 23 Sep 2009 10:02 pm Operator: JJ  
 Sample : M49786-001 Inst : Instrumen  
 Misc : 3.20g Multiplr: 1.00  
 MS Integration Params: EVENTS.E  
 Quant Time: Sep 24 16:36:11 2009 Quant Results File: 092209CS2\_DRYWALL.RES

Quant Method : C:\MSDCHEM\1...\092209CS2\_DRYWALL.M (Chemstation Integrator)  
 Title :  
 Last Update : Tue Sep 22 17:26:55 2009  
 Response via : Initial Calibration  
 DataAcq Meth : 8260WALL

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
-----	-----	-----	-----	-----	-----	-----
1) MTBE	10.30	73	78678600	740.00	ng	0.00
Target Compounds						Qvalue
2) Carbonyl sulfide	1.94	60	266164	Below Cal	#	58
3) Carbon Disulfide	5.11	76	514573	Below Cal	#	75
-----	-----	-----	-----	-----	-----	-----

(#) = qualifier out of range (m) = manual integration (+) = signals summed  
 09230920.D 092209CS2\_DRYWALL.M Thu Sep 24 16:36:12 2009

File : C:\MSDCHEM\1\DATA\092309\09230920.D  
Operator : JJ  
Acquired : 23 Sep 2009 10:02 pm using AcqMethod 8260WALL  
Instrument : Instrumen  
Sample Name: M49786-001  
Misc Info : 3.20g  
Vial Number: 20



Quantitation Report

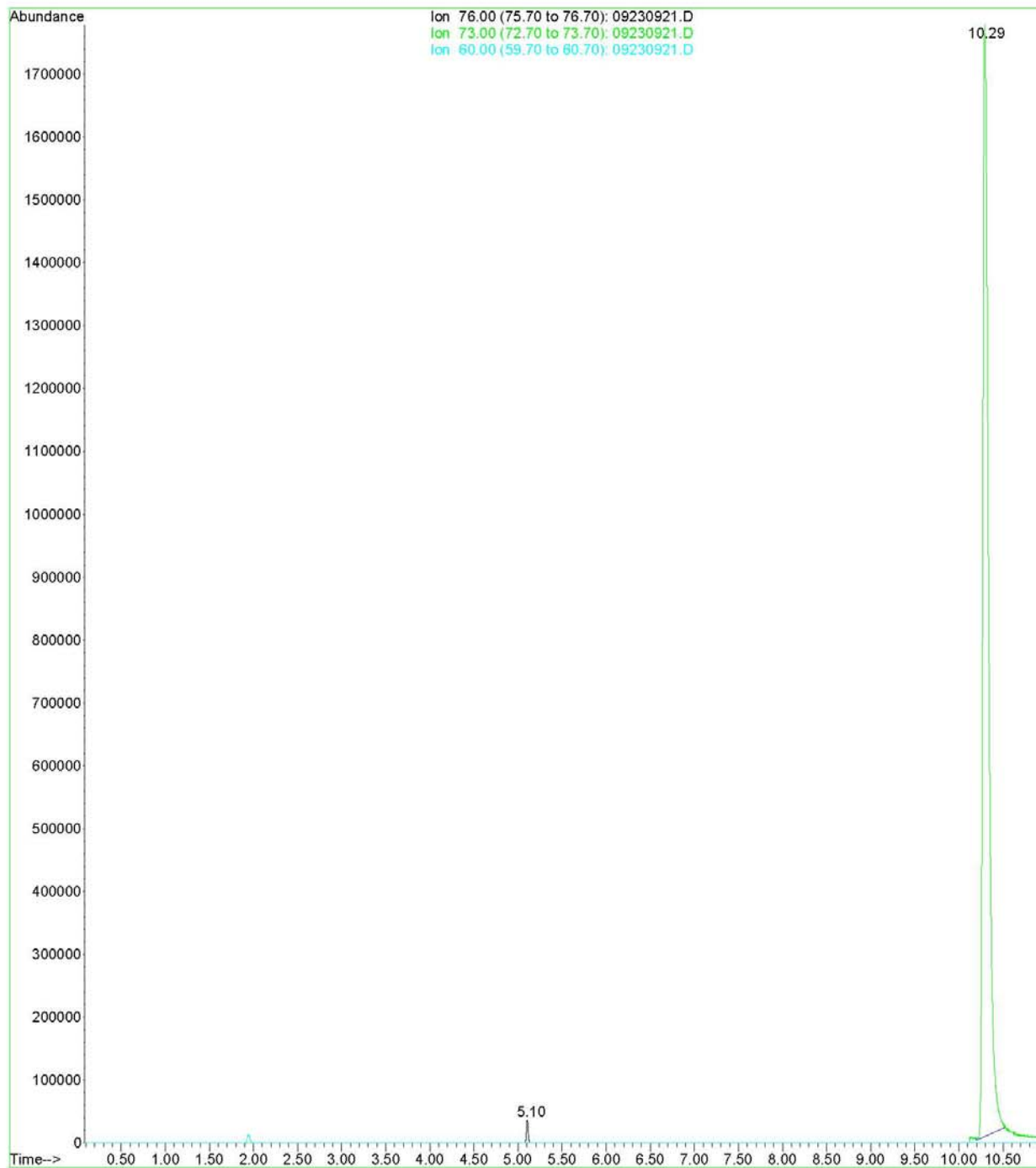
Data File : C:\MSDCHEM\1\DATA\092309\09230921.D Vial: 21  
 Acq On : 23 Sep 2009 10:37 pm Operator: JJ  
 Sample : M49786-002 Inst : Instrumen  
 Misc : 3.05g Multiplr: 1.00  
 MS Integration Params: EVENTS.E  
 Quant Time: Sep 24 16:39:05 2009 Quant Results File: 092209CS2\_DRYWALL.RES

Quant Method : C:\MSDCHEM\1...\092209CS2\_DRYWALL.M (Chemstation Integrator)  
 Title :  
 Last Update : Tue Sep 22 17:26:55 2009  
 Response via : Initial Calibration  
 DataAcq Meth : 8260WALL

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
1) MTBE	10.29	73	78630517	740.00	ng	-0.01
						Qvalue
2) Carbonyl sulfide	1.94	60	295848	Below Cal	#	61
3) Carbon Disulfide	5.10	76	476152	Below Cal	#	75

(#) = qualifier out of range (m) = manual integration (+) = signals summed  
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File : C:\MSDCHEM\1\DATA\092309\09230921.D  
Operator : JJ  
Acquired : 23 Sep 2009 10:37 pm using AcqMethod 8260WALL  
Instrument : Instrumen  
Sample Name: M49786-002  
Misc Info : 3.05g  
Vial Number: 21



Quantitation Report

Data File : C:\MSDCHEM\1\DATA\092309\09230922.D Vial: 22  
Acq On : 23 Sep 2009 11:12 pm Operator: JJ  
Sample : M49786-003 Inst : Instrumen  
Misc : 3.04g Multiplr: 1.00  
MS Integration Params: EVENTS.E  
Quant Time: Sep 24 16:40:11 2009 Quant Results File: 092209CS2\_DRYWALL.RES

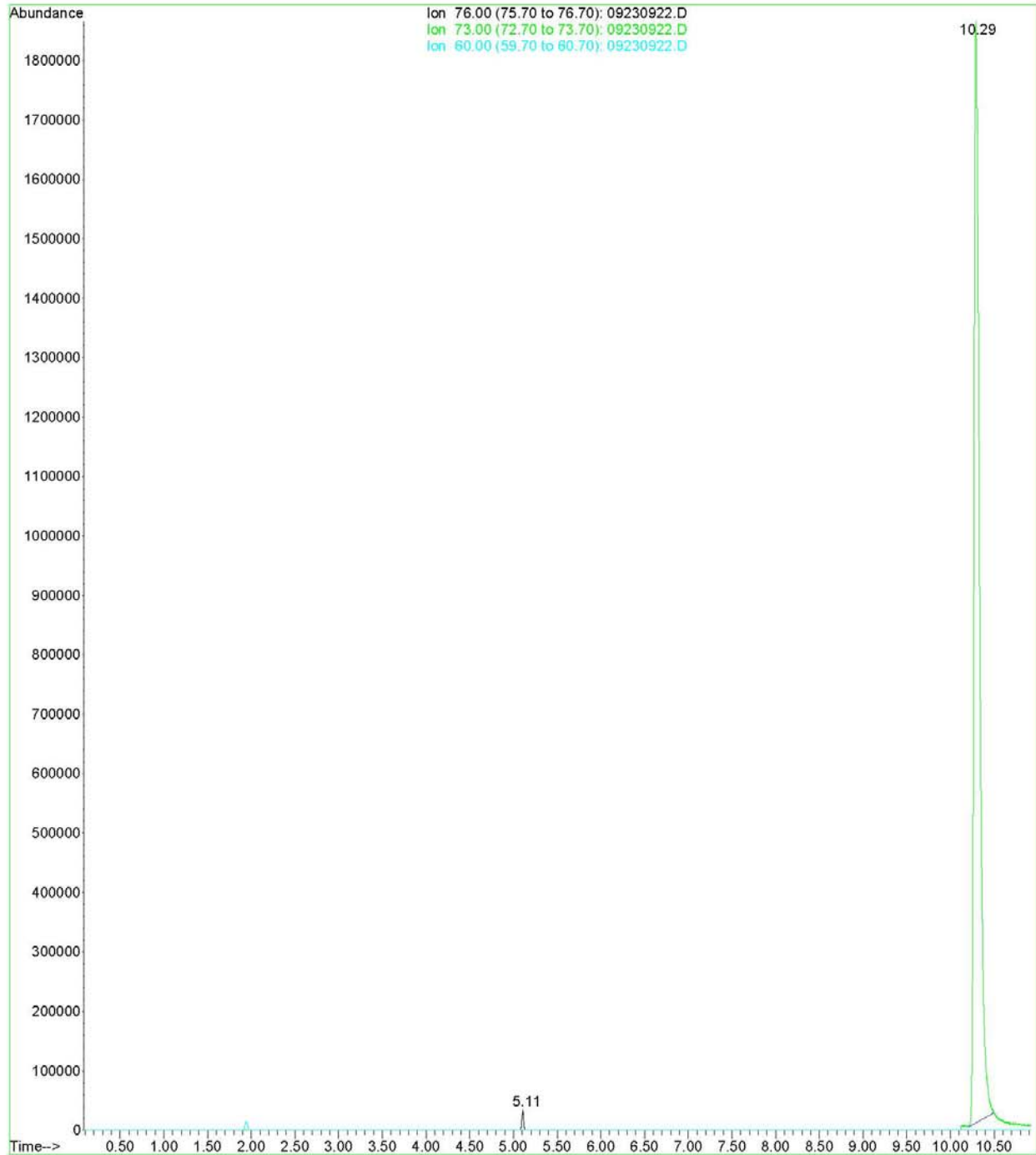
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Title :  
Last Update : Tue Sep 22 17:26:55 2009  
Response via : Initial Calibration  
DataAcq Meth : 8260WALL

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
-----	-----	-----	-----	-----	-----	-----
1) MTBE	10.29	73	81711176	740.00	ng	-0.01

Target Compounds	R.T.	QIon	Response	Conc	Units	Qvalue
-----	-----	-----	-----	-----	-----	-----
2) Carbonyl sulfide	1.94	60	301109	Below Cal	#	70
3) Carbon Disulfide	5.11	76	437309	Below Cal	#	75
-----	-----	-----	-----	-----	-----	-----

(#) = qualifier out of range (m) = manual integration (+) = signals summed  
09230922.D 092209CS2\_DRYWALL.M Thu Sep 24 16:40:27 2009

File : C:\MSDCHEM\1\DATA\092309\09230922.D  
Operator : JJ  
Acquired : 23 Sep 2009 11:12 pm using AcqMethod 8260WALL  
Instrument : Instrumen  
Sample Name: M49786-003  
Misc Info : 3.04g  
Vial Number: 22



Quantitation Report

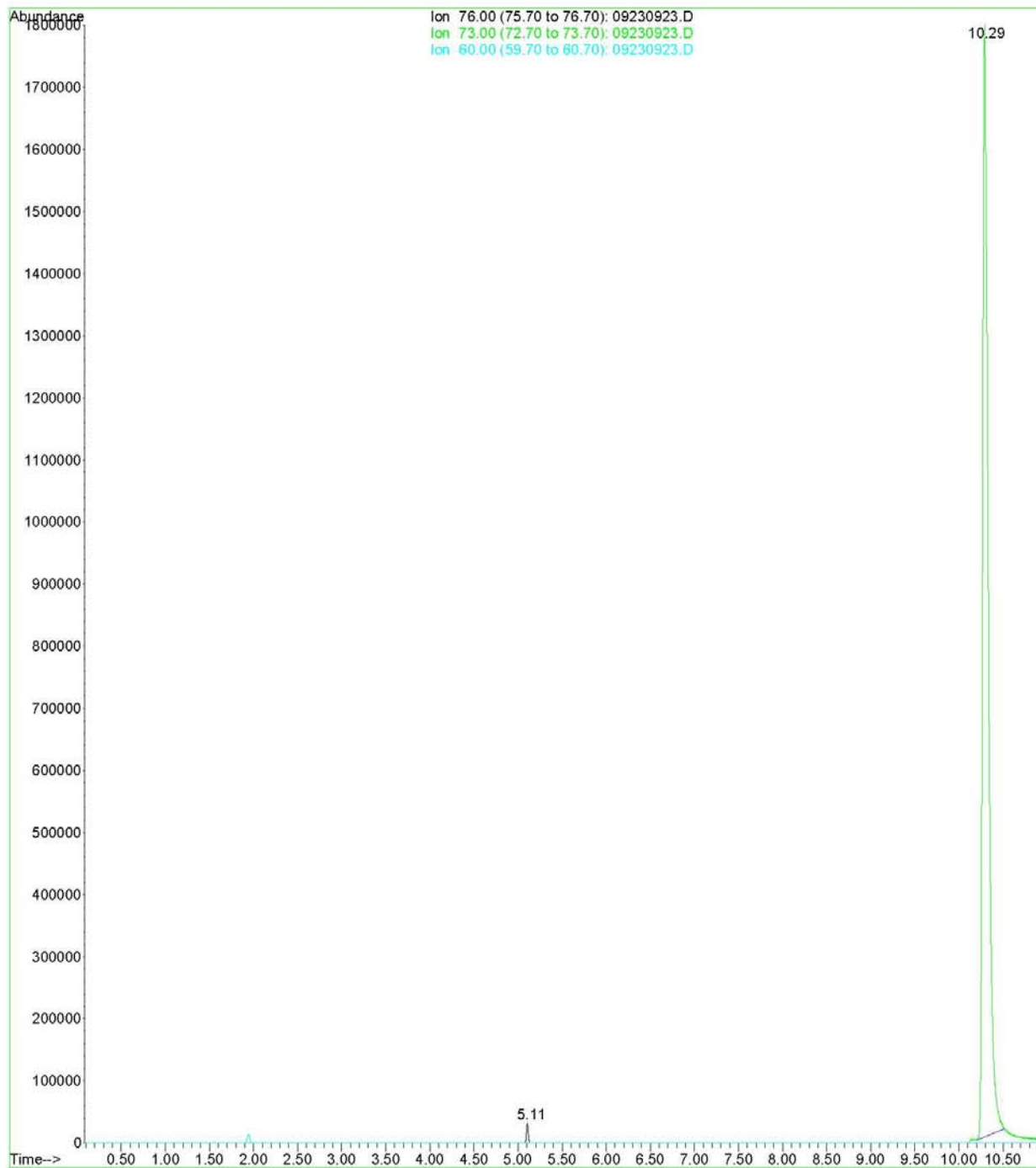
Data File : C:\MSDCHEM\1\DATA\092309\09230923.D Vial: 23  
 Acq On : 23 Sep 2009 11:46 pm Operator: JJ  
 Sample : M49786-004 Inst : Instrumen  
 Misc : 3.13g Multiplr: 1.00  
 MS Integration Params: EVENTS.E  
 Quant Time: Sep 24 16:41:23 2009 Quant Results File: 092209CS2\_DRYWALL.RES

Quant Method : C:\MSDCHEM\1...\092209CS2\_DRYWALL.M (Chemstation Integrator)  
 Title :  
 Last Update : Tue Sep 22 17:26:55 2009  
 Response via : Initial Calibration  
 DataAcq Meth : 8260WALL

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
-----	-----	-----	-----	-----	-----	-----
1) MTBE	10.29	73	78542207	740.00	ng	-0.01
-----	-----	-----	-----	-----	-----	-----
Target Compounds						Qvalue
2) Carbonyl sulfide	1.94	60	277428	Below Cal	#	56
3) Carbon Disulfide	5.11	76	410077	Below Cal	#	75
-----	-----	-----	-----	-----	-----	-----

(#) = qualifier out of range (m) = manual integration (+) = signals summed  
 09230923.D 092209CS2\_DRYWALL.M Thu Sep 24 16:41:23 2009

File : C:\MSDCHEM\1\DATA\092309\09230923.D  
Operator : JJ  
Acquired : 23 Sep 2009 11:46 pm using AcqMethod 8260WALL  
Instrument : Instrumen  
Sample Name: M49786-004  
Misc Info : 3.13g  
Vial Number: 23



## ***CHAIN OF CUSTODY***



M49780

**Materials Analytical Services LLC**  
 3945 Lakefield Court  
 Suwanee, Georgia 30024  
 Phone: 770-866-3200  
 Fax: 770-866-3269

Georgia Department of Public Health  
**Standard Method** (Section 01350)  
**PRODUCT EMISSIONS TESTING**  
**CHAIN OF CUSTODY**

**Client Information**

Company: Temple Island  
 Street Address: 1850 NE 135th St  
 City/State: Ellettsville OK  
 Zip/Postal Code: 73541  
 Country: United States  
 Contact Name: Randy Smith  
 Title: Process Improvement Manager  
 Phone Number: 580 549 7159  
 Fax Number: 580 549 7123  
 Email Address: Randy.Smith@TempleIsland.com

**Manufacturer information (if different)**

Company:  
 City/State/Country:  
 Contact Name/Title:  
 Phone Number:

**Sample Details**

Sample ID: 0-091209-0259A  
 Product Name: 1/2 Regular  
 Product Type: Ceiling/Wall Panels  Flooring  Trim  Wall Paint  Wall Coverings  Thermal Insulation  Furnishings (desks  chairs  other  Other   
 Date Manufactured: 9/12/09 for unknown inventory stock   
 Warehouse  Vendor Supplied   
 Sample Collected by: Jacob Moser  
 Date & Time Collected: 9/14/09 14:23  
 Number of Sample Pieces: 4

**Shipping Details**

Packed By: Jacob Moser  
 Shipping Date: 9/15/09 15:00  
 Carrier/Airbill Number: FedEx 7979 3303 9112

**Specific Building Parameters (per CHPS)**

Organization:  
 City/State/Country:  
 Office or School:  
 Material exposed area (ft²):  
 Building volume (ft³):  
 Room floor area (ft²):  
 Ceiling height (ft):

**Furnishing Construction Details (as applicable)**

Covering Type: Fabric  (Primary Fiber type: \_\_\_\_\_), Vinyl  Leather   
 Polymer Type(s): Nylon  PVC  PE  PP  PU  PS  PC  ABS  Acrylic  Lexan   
 Substrate Type: MDF  Particle Board  Plywood  Solid Wood (Type: \_\_\_\_\_)  
 Finish Type: Oil  Water  Catalyzed  Conversion  Polyurethane  Laminate  Other   
 Foam Type: Polyurethane  Memory  Latex  Evlon  High Resilience  High Density   
 Paint Type: Latex  Oil  Low VOC  No VOCs  PowderCoat

**Notes or Comments from Manufacturer:**

**Laboratory Receipt (to be completed by Laboratory Representative)**

Received By: Nangseas  
 Received Date: 9-16-09  
 Condition of Shipping Package: OK  
 Condition of Sample: OK  
 Remarks:

Sample Handling		Received By	Company	Date/Time
Relinquished By	Jacob Moser	Nangseas	MAS	9-16-09