September 7, 2017

Jeff Wright
Weston Solutions
13702 Coursey Blvd
Building #7, Suite A
Baton Rouge, LA 70817

RE: Arkema
Project Number: 66666

Pace Analytical received 6 samples on September 3, 2017 for the following analyses:

1. C3-C12 Quantitative Molecular Characterization by GC/MS
2. C8-C40 Qualitative Molecular Characterization by GC/MS

The field and laboratory IDs are presented below.

| Field IDs | Lab IDs |
|---|---|
| HH01-01-01-170901-21 | 237330001 |
| HH-01-01-02-170901-21 | 237330002 |
| HH01-01-03-170901-21 | 237330003 |
| HH01-01-03-170901-22 | 237330004 |
| HH-01-01-04-170901-21 | 237330005 |
| HH01-01-05-170901-21 | 237330006 |

The sample was performed in house under laboratory number **23733**.

Please call the lab at 412-826-5245, or you may email any questions or concerns to ruth.welsh@pacelabs.com regarding any analytical data reports.

Respectfully submitted,

Ruth Welsh

Ruth Welsh
Project Manager

Pace Analytical®
Energy Services™

**(C3-C12) Quantitative Molecular Characterization by GC/MS - full scan mode**

***PIANO, Oxygenated Blending Agents, Lead Scavengers, MMT & Thiophenes***

Pace Analytical® Energy Services

**Jeff Wright**
**Weston Solutions**
**13702 Coursey Blvd**
**Baton Rouge, LA 70817**

**Lab ID:** 23733-1
**Collected:** 9/1/2017
**Received:** 9/3/2017
**Matrix:** Water

**Project:** Arkema
**Project #:** 66666
**Collected by:**

**Client ID:** HH01-01-01-170901-21
**Analyzed:** 9/6/2017
**Q Method:** 082317.M

| CONSTITUENTS | CLASS | ABBR. | ssRL ug/L | RESULT ug/L | QUALIFIER |
|---|---|---|---|---|---|
| Isopentane (2-Methylbutane) | I | IP | 10.0 | 10.0 | U |
| 1-Pentene | O | 1P | 10.0 | 10.0 | U |
| 2-Methyl-1-butene | O | 2M1B | 10.0 | 10.0 | U |
| Pentane (nC5) | P | C5 | 10.0 | 10.0 | U |
| trans-2-pentene | O | T2P | 10.0 | 10.0 | U |
| cis-2-pentene | O | C2P | 10.0 | 10.0 | U |
| 2-Methyl-2-butene (t) | O | 2M2B | 10.0 | 10.0 | U |
| 2,2-Dimethylbutane (t) | I | 22DMB | 10.0 | 10.0 | U |
| Cyclopentane | N | CYP | 10.0 | 10.0 | U |
| 2,3-Dimethylbutane | I | 23DMB | 10.0 | 10.0 | U |
| 2-Methylpentane | I | 2MP | 10.0 | 10.0 | U |
| Methyl-tert-butyl ether (MTBE) | ADD | MTBE | 10.0 | 10.0 | U |
| 3-Methylpentane | P | 3MP | 10.0 | 10.0 | U |
| 1-Hexene | O | 1HX | 10.0 | 10.0 | U |
| Hexane (nC6) | P | C6 | 10.0 | 10.0 | U |
| Di-isopropyl ether (DIPE) | ADD | DIPE | 10.0 | 10.0 | U |
| trans-2-hexene (t) | O | T2HE | 10.0 | 10.0 | U |
| 2-Methyl-2-pentene (t) | O | 2M2P | 10.0 | 10.0 | U |
| cis-2-hexene (t) | O | C2HE | 10.0 | 10.0 | U |
| cis-3-Methyl-2-pentene (t) | O | C3M2P | 10.0 | 10.0 | U |
| Ethyl-tert-butyl ether (ETBE) | ADD | ETBE | 10.0 | 10.0 | U |
| 2,2-Dimethylpentane (t) | I | 22DMP | 10.0 | 10.0 | U |
| Methylcyclopentane | N | MCYP | 10.0 | 10.0 | U |
| 2,4-Dimethylpentane | I | 24DMP | 10.0 | 10.0 | U |
| 1,2-Dichloroethane (EDC) | ADD | EDC | 10.0 | 10.0 | U |
| Benzene | A | B | 10.0 | 10.0 | U |
| 3,3-Dimethylpentane (t) | I | 33DMP | 10.0 | 10.0 | U |
| Thiophene | S | THIO | 10.0 | 10.0 | U |
| Cyclohexane | N | CYH | 10.0 | 10.0 | U |
| 2-Methylhexane | I | 2MH | 10.0 | 10.0 | U |
| 2,3-Dimethylpentane | I | 23DMP | 10.0 | 10.0 | U |
| Tert-amyl methyl ether (TAME) | ADD | TAME | 10.0 | 10.0 | U |
| 3-Methylhexane | I | 3MH | 10.0 | 10.0 | U |

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|---|---|---|---|
| **Jeff Wright** | | **Lab ID:** | **23733-1** |
| **Weston Solutions** | | **Collected:** | **9/1/2017** |
| **13702 Coursey Blvd** | | **Received:** | **9/3/2017** |
| **Baton Rouge, LA 70817** | | **Matrix:** | **Water** |
| **Project:** | **Arkema** | **Client ID:** | **HH01-01-01-170901-21** |
| **Project #:** | **66666** | **Analyzed:** | **9/6/2017** |
| **Collected by:** | | **Q Method:** | **082317.M** |

| CONSTITUENTS | CLASS | ABBR. | ssRL ug/L | RESULT ug/L | QUALIFIER |
|---|---|---|---|---|---|
| trans-1,3-Dimethylcyclopentane (t) | N | T13DMCYP | 10.0 | 10.0 | U |
| cis-1,3-Dimethylcyclopentane (t) | N | C13DMCYP | 10.0 | 10.0 | U |
| trans-1,2-Dimethylcyclopentane (t) | N | T12DMCYP | 10.0 | 10.0 | U |
| 2,2,4-Trimethylpentane (isooctane) | I | 224TMP | 10.0 | 10.0 | U |
| 1-Heptene | O | 1HP | 10.0 | 10.0 | U |
| Heptane (nC7) | P | C7 | 10.0 | 10.0 | U |
| trans-2-heptene (t) | O | T2HP | 10.0 | 10.0 | U |
| Methylcyclohexane | N | MCYH | 10.0 | 10.0 | U |
| 2,5-Dimethylhexane | I | 25DMH | 10.0 | 10.0 | U |
| 2,2,3-Trimethylpentane | I | 233TMP | 10.0 | 10.0 | U |
| 2,4-Dimethylhexane | I | 24DMH | 10.0 | 10.0 | U |
| 2,3,4-Trimethylpentane | I | 234TMP | 10.0 | 10.0 | U |
| 2,3,3-Trimethylpentane | I | 233TMP | 10.0 | 10.0 | U |
| Toluene | A | T | 10.0 | 10.0 | U |
| 2-Methylthiophene | S | 2MTHIO | 10.0 | 10.0 | U |
| 2,3-Dimethylhexane | I | 23DMH | 10.0 | 10.0 | U |
| 3-Methylthiophene | S | 3MTHIO | 10.0 | 10.0 | U |
| 2-Methylheptane | I | 2MHP | 10.0 | 10.0 | U |
| 4-Methylheptane (t) | I | 4MHP | 10.0 | 10.0 | U |
| 3-Methylheptane | I | 3MHP | 10.0 | 10.0 | U |
| 3-Ethylhexane | I | 3EHX | 10.0 | 10.0 | U |
| 1,2-Dibromoethane (EDB) | ADD | EDB | 10.0 | 10.0 | U |
| 1-Octene | O | 1O | 10.0 | 10.0 | U |
| Octane (nC8) | P | C8 | 10.0 | 10.0 | U |
| 2,4-Dimethylheptane (t) | I | 24DMHP | 10.0 | 10.0 | U |
| 2,5-Dimethylheptane (t) | I | 25DMHP | 10.0 | 10.0 | U |
| Ethylbenzene | A | EB | 10.0 | 10.0 | U |
| 2-Ethylthiophene | S | 2ETHIO | 10.0 | 10.0 | U |
| 2,3-Dimethylheptane (t) | I | 23DMHP | 10.0 | 10.0 | U |
| m-Xylene | A | MX | 10.0 | 10.0 | U |
| p-Xylene | A | PX | 10.0 | 10.0 | U |
| 4-Methyloctane (t) | I | 4MO | 10.0 | 10.0 | U |
| 2-Methyloctane (t) | I | 2MO | 10.0 | 10.0 | U |

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|---|---|---|---|
| **Jeff Wright** | | **Lab ID:** | **23733-1** |
| **Weston Solutions** | | **Collected:** | **9/1/2017** |
| **13702 Coursey Blvd** | | **Received:** | **9/3/2017** |
| **Baton Rouge, LA 70817** | | **Matrix:** | **Water** |
| **Project:** | **Arkema** | **Client ID:** | **HH01-01-01-170901-21** |
| **Project #:** | **66666** | **Analyzed:** | **9/6/2017** |
| **Collected by:** | | **Q Method:** | **082317.M** |

| CONSTITUENTS | CLASS | ABBR. | ssRL ug/L | RESULT ug/L | QUALIFIER |
|---|---|---|---|---|---|
| 3-Methyloctane (t) | I | 3MO | 10.0 | 10.0 | U |
| Styrene | A | STRE | 10.0 | 10.0 | U |
| o-Xylene | A | OX | 10.0 | 10.0 | U |
| 1-Nonene | O | 1N | 10.0 | 10.0 | U |
| Nonane (nC9) | P | C9 | 10.0 | 10.0 | U |
| Isopropylbenzene (cumene) | A | IPROPB | 10.0 | 10.0 | U |
| n-Propylbenzene | A | NPRPPB | 10.0 | 10.0 | U |
| 1-Methyl-3-ethylbenzene | A | 1M3EB | 10.0 | 10.0 | U |
| 1-Methyl-4-ethylbenzene | A | 1M4EB | 10.0 | 10.0 | U |
| 1,3,5-Trimethylbenzene (mesitylene) | A | 135TMB | 10.0 | 10.0 | U |
| 1-Methyl-2-ethylbenzene | A | 1M2EB | 10.0 | 10.0 | U |
| 1,2,4-Trimethylbenzene | A | 124TMB | 10.0 | 10.0 | U |
| 1-Decene | O | 1D | 10.0 | 10.0 | U |
| Decane (nC10) | P | C10 | 10.0 | 10.8 | |
| sec-Butylbenzene | A | SBUB | 10.0 | 10.0 | U |
| 1-Methyl-3-isopropylbenzene (m-cymene) | A | 1M3IPROPE | 10.0 | 10.0 | U |
| 1-Methyl-4-isopropylbenzene (p-cymene) | A | 1M4IPROPE | 10.0 | 10.0 | U |
| Indane | A | IA | 10.0 | 10.0 | U |
| Indene | A | IE | 10.0 | 10.0 | U |
| 1-Methyl-2-isopropybenzene (o-cymene) | A | 1M2IPROPE | 10.0 | 10.0 | U |
| 1-Methyl-3-propylbenzene | A | 1M3PROPB | 10.0 | 10.0 | U |
| 1-Methyl-4-propylbenzene | A | 1M4PROPB | 10.0 | 10.0 | U |
| n-Butylbenzene | A | NBB | 10.0 | 10.0 | U |
| 1,3-Dimethyl-5-ethylbenzene | A | 13DM5EB | 10.0 | 10.0 | U |
| 1,2,diethylbenzene | A | 12DEB | 10.0 | 10.0 | U |
| 1-Methyl-2-propylbenzene | A | 1M2PROPB | 10.0 | 10.0 | U |
| 1,4-Dimethyl-2-ethylbenzene | A | 14DM2EB | 10.0 | 10.0 | U |
| 1,3-Dimethyl-4-ethylbenzene | A | 13DM4EB | 10.0 | 10.0 | U |
| 1,2-Dimethyl-4-ethylbenzene | A | 12DM4EB | 10.0 | 10.0 | U |
| 1,3-Dimethyl-2-ethylbenzene | A | 13DM2EB | 10.0 | 10.0 | U |
| 1,2-Dimethyl-3-ethylbenzene | A | 12DM3EB | 10.0 | 10.0 | U |
| Undecane (nC11) | P | C11 | 10.0 | 10.0 | U |
| 1,2,4,5-Tetramethylbenzene | A | 1245TMB | 10.0 | 10.0 | U |

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|---|---|---|---|
| **Jeff Wright** | | **Lab ID:** | **23733-1** |
| **Weston Solutions** | | **Collected:** | **9/1/2017** |
| **13702 Coursey Blvd** | | **Received:** | **9/3/2017** |
| **Baton Rouge, LA 70817** | | **Matrix:** | **Water** |
| **Project:** | **Arkema** | **Client ID:** | **HH01-01-01-170901-21** |
| **Project #:** | **66666** | **Analyzed:** | **9/6/2017** |
| **Collected by:** | | **Q Method:** | **082317.M** |

| CONSTITUENTS | CLASS | ABBR. | ssRL ug/L | RESULT ug/L | QUALIFIER |
|---|---|---|---|---|---|
| 1,2,3,5-Tetramethylbenzene (t) | A | 1235TMB | 10.0 | 10.0 | U |
| n-Pentylbenzene | A | NPYB | 10.0 | 10.0 | U |
| Naphthalene | A | N | 10.0 | 10.0 | U |
| Benzothiophene | S | BTHIO | 10.0 | 10.0 | U |
| Dodecane (nC12) | P | C12 | 10.0 | 10.0 | U |
| 1,2,3,4-Tetramethylbenzene (t) | A | 1234TMB | 10.0 | 10.0 | U |
| MMT | ADD | MMT | 10.0 | 10.0 | U |
| 2-Methylnaphthalene | A | 2MN | 10.0 | 10.0 | U |
| 1-Methylnaphthalene | A | 1MN | 10.0 | 10.0 | U |

| | | |
|---|---|---|
| 1,2-Dichloroethane-d4 (RS) | 90.87 | % |
| Toluene-d8 (RS) | 114.46 | % |
| p-Bromofluorobenzene (RS) | 91.65 | % |

**ssRL - Sample Specific Reporting Limit**
**Results listed as U would have been reported if present at or above the listed ssRL**
**J - Values greater than the ssRL but less than the PQL (3 x ssRL).**
**D - Secondary dilution perfomed**
**Q - Surrogate recovery limit exceedance**
**I - Matrix Interference**
**NC - Not calibrated**
**Note: Extracted by EPA 5030 (Purge and Trap).**

**US631**

**090417-WATER1.D & dilution**
**090417-WATER1.D**

**Submitted by,**
**Pace Energy Services, LLC**

| PAES ID | 23733-1 |
|---|---|
| **Sample ID** | **HH01-01-01-170901-21** |
| **Evaporation** | |
| n-Pentane / (n-Pentane+n-Heptane) | U |
| 2-Methylpentane / (2-Methylpentane+2-Methylheptane) | U |
| **Waterwashing** | |
| Benzene / (Benzene+Cyclohexane) | U |
| Toluene / (Toluene+Methylcyclohexane) | U |
| Aromatics / Total Paraffins (n+iso+cyc) | U |
| Aromatics / Naphthenes | U |
| wt% < o-xylene | U |
| **Biodegradation** | |
| (C4-C8 Para +Isopara) / C4-C8 Olefins | U |
| 3-Methylhexane / n-Heptane | U |
| Methylcyclohexane / n-Heptane | U |
| Isoparaffins + Naphthenes / Paraffins | U |
| **Diagnostic Ratios (Refining Properties)** | |
| 2,2,4-Trimethylpentane / (2,2,4-Trimethylpentane+Methylcyclohexane) | U |
| 2,2,4-Trimethylpentane / Total TMPs | U |
| nC9 / Isopropylbenzene | U |
| nC10 / 1-Methyl-2-ethylbenzene | U |
| nC11 / 1,4-Dimethyl-2-ethylbenzene | U |
| iC5 / (iC5+nC5) | U |
| (2-methylhexane + 2,3dimethylpentane) / (3-methylhexane + 2,4 | U |
| Naphthalene / (Naphthalene+nC12) | U |
| Methylcyclohexane/(Methylcyclohexane+Toluene) | U |
| Toluene/n-Octane | U |
| **Oxygenates & Other (ug/L)** | |
| Methyl-tert-butyl ether (MTBE) | U |
| Di-isopropyl ether (DIPE) | U |
| Ethyl-tert-butyl ether (ETBE) | U |
| Tert-amyl methyl ether (TAME) | U |
| MMT | U |
| **Lead Scavengers (ug/L)** | |
| 1,2-Dichloroethane (EDC) | U |
| 1,2-Dibromoethane (EDB) | U |
| **Sulfur containing HCs (ug/L)** | |
| Thiophene | U |
| 2-Methylthiophene | U |
| 3-Methylthiophene | U |
| 2-Ethylthiophene | U |
| Benzothiophene | U |
| **Relative Percentages** | |
| % Paraffinic | 100.0 |
| % Isoparaffinic | 0.0 |
| % Aromatic | 0.0 |
| % Naphthenic | 0.0 |
| % Olefinic | 0.0 |

Pace Analytical® Energy Services

**Jeff Wright**
**Weston Solutions**
**13702 Coursey Blvd**
**Baton Rouge, LA 70817**

**Lab ID:** 23733-2
**Collected:** 9/1/2017
**Received:** 9/3/2017
**Matrix:** Water

**Project:** Arkema
**Project #:** 66666
**Collected by:**

**Client ID:** HH01-01-02-170901-21
**Analyzed:** 9/6/2017
**Q Method:** 082317.M

| CONSTITUENTS | CLASS | ABBR. | ssRL ug/L | RESULT ug/L | QUALIFIER |
|---|---|---|---|---|---|
| Isopentane (2-Methylbutane) | I | IP | 10.0 | 10.0 | U |
| 1-Pentene | O | 1P | 10.0 | 10.0 | U |
| 2-Methyl-1-butene | O | 2M1B | 10.0 | 10.0 | U |
| Pentane (nC5) | P | C5 | 10.0 | 10.0 | U |
| trans-2-pentene | O | T2P | 10.0 | 10.0 | U |
| cis-2-pentene | O | C2P | 10.0 | 10.0 | U |
| 2-Methyl-2-butene (t) | O | 2M2B | 10.0 | 10.0 | U |
| 2,2-Dimethylbutane (t) | I | 22DMB | 10.0 | 10.0 | U |
| Cyclopentane | N | CYP | 10.0 | 10.0 | U |
| 2,3-Dimethylbutane | I | 23DMB | 10.0 | 10.0 | U |
| 2-Methylpentane | I | 2MP | 10.0 | 10.0 | U |
| Methyl-tert-butyl ether (MTBE) | ADD | MTBE | 10.0 | 10.0 | U |
| 3-Methylpentane | P | 3MP | 10.0 | 10.0 | U |
| 1-Hexene | O | 1HX | 10.0 | 10.0 | U |
| Hexane (nC6) | P | C6 | 10.0 | 10.0 | U |
| Di-isopropyl ether (DIPE) | ADD | DIPE | 10.0 | 10.0 | U |
| trans-2-hexene (t) | O | T2HE | 10.0 | 10.0 | U |
| 2-Methyl-2-pentene (t) | O | 2M2P | 10.0 | 10.0 | U |
| cis-2-hexene (t) | O | C2HE | 10.0 | 10.0 | U |
| cis-3-Methyl-2-pentene (t) | O | C3M2P | 10.0 | 10.0 | U |
| Ethyl-tert-butyl ether (ETBE) | ADD | ETBE | 10.0 | 10.0 | U |
| 2,2-Dimethylpentane (t) | I | 22DMP | 10.0 | 10.0 | U |
| Methylcyclopentane | N | MCYP | 10.0 | 10.0 | U |
| 2,4-Dimethylpentane | I | 24DMP | 10.0 | 10.0 | U |
| 1,2-Dichloroethane (EDC) | ADD | EDC | 10.0 | 10.0 | U |
| Benzene | A | B | 10.0 | 10.0 | U |
| 3,3-Dimethylpentane (t) | I | 33DMP | 10.0 | 10.0 | U |
| Thiophene | S | THIO | 10.0 | 10.0 | U |
| Cyclohexane | N | CYH | 10.0 | 10.0 | U |
| 2-Methylhexane | I | 2MH | 10.0 | 10.0 | U |
| 2,3-Dimethylpentane | I | 23DMP | 10.0 | 10.0 | U |
| Tert-amyl methyl ether (TAME) | ADD | TAME | 10.0 | 10.0 | U |
| 3-Methylhexane | I | 3MH | 10.0 | 10.0 | U |

Pace Analytical® Energy Services

**Jeff Wright**
**Weston Solutions**
**13702 Coursey Blvd**
**Baton Rouge, LA 70817**

**Lab ID:** 23733-2
**Collected:** 9/1/2017
**Received:** 9/3/2017
**Matrix:** Water

**Project:** Arkema
**Project #:** 66666
**Collected by:**

**Client ID:** HH01-01-02-170901-21
**Analyzed:** 9/6/2017
**Q Method:** 082317.M

| CONSTITUENTS | CLASS | ABBR. | ssRL ug/L | RESULT ug/L | QUALIFIER |
|---|---|---|---|---|---|
| trans-1,3-Dimethylcyclopentane (t) | N | T13DMCYP | 10.0 | 10.0 | U |
| cis-1,3-Dimethylcyclopentane (t) | N | C13DMCYP | 10.0 | 10.0 | U |
| trans-1,2-Dimethylcyclopentane (t) | N | T12DMCYP | 10.0 | 10.0 | U |
| 2,2,4-Trimethylpentane (isooctane) | I | 224TMP | 10.0 | 10.0 | U |
| 1-Heptene | O | 1HP | 10.0 | 10.0 | U |
| Heptane (nC7) | P | C7 | 10.0 | 10.0 | U |
| trans-2-heptene (t) | O | T2HP | 10.0 | 10.0 | U |
| Methylcyclohexane | N | MCYH | 10.0 | 10.0 | U |
| 2,5-Dimethylhexane | I | 25DMH | 10.0 | 10.0 | U |
| 2,2,3-Trimethylpentane | I | 233TMP | 10.0 | 10.0 | U |
| 2,4-Dimethylhexane | I | 24DMH | 10.0 | 10.0 | U |
| 2,3,4-Trimethylpentane | I | 234TMP | 10.0 | 10.0 | U |
| 2,3,3-Trimethylpentane | I | 233TMP | 10.0 | 10.0 | U |
| Toluene | A | T | 10.0 | 10.0 | U |
| 2-Methylthiophene | S | 2MTHIO | 10.0 | 10.0 | U |
| 2,3-Dimethylhexane | I | 23DMH | 10.0 | 10.0 | U |
| 3-Methylthiophene | S | 3MTHIO | 10.0 | 10.0 | U |
| 2-Methylheptane | I | 2MHP | 10.0 | 10.0 | U |
| 4-Methylheptane (t) | I | 4MHP | 10.0 | 10.0 | U |
| 3-Methylheptane | I | 3MHP | 10.0 | 10.0 | U |
| 3-Ethylhexane | I | 3EHX | 10.0 | 10.0 | U |
| 1,2-Dibromoethane (EDB) | ADD | EDB | 10.0 | 10.0 | U |
| 1-Octene | O | 1O | 10.0 | 10.0 | U |
| Octane (nC8) | P | C8 | 10.0 | 10.0 | U |
| 2,4-Dimethylheptane (t) | I | 24DMHP | 10.0 | 10.0 | U |
| 2,5-Dimethylheptane (t) | I | 25DMHP | 10.0 | 10.0 | U |
| Ethylbenzene | A | EB | 10.0 | 10.0 | U |
| 2-Ethylthiophene | S | 2ETHIO | 10.0 | 10.0 | U |
| 2,3-Dimethylheptane (t) | I | 23DMHP | 10.0 | 10.0 | U |
| m-Xylene | A | MX | 10.0 | 10.0 | U |
| p-Xylene | A | PX | 10.0 | 10.0 | U |
| 4-Methyloctane (t) | I | 4MO | 10.0 | 10.0 | U |
| 2-Methyloctane (t) | I | 2MO | 10.0 | 10.0 | U |

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| | | | |
|---|---|---|---|
| **Jeff Wright** | | **Lab ID:** | **23733-2** |
| **Weston Solutions** | | **Collected:** | **9/1/2017** |
| **13702 Coursey Blvd** | | **Received:** | **9/3/2017** |
| **Baton Rouge, LA 70817** | | **Matrix:** | **Water** |
| **Project:** | **Arkema** | **Client ID:** | **HH01-01-02-170901-21** |
| **Project #:** | **66666** | **Analyzed:** | **9/6/2017** |
| **Collected by:** | | **Q Method:** | **082317.M** |

| CONSTITUENTS | CLASS | ABBR. | ssRL ug/L | RESULT ug/L | QUALIFIER |
|---|---|---|---|---|---|
| 3-Methyloctane (t) | I | 3MO | 10.0 | 10.0 | U |
| Styrene | A | STRE | 10.0 | 10.0 | U |
| o-Xylene | A | OX | 10.0 | 10.0 | U |
| 1-Nonene | O | 1N | 10.0 | 10.0 | U |
| Nonane (nC9) | P | C9 | 10.0 | 10.0 | U |
| Isopropylbenzene (cumene) | A | IPROPB | 10.0 | 10.0 | U |
| n-Propylbenzene | A | NPRPPB | 10.0 | 10.0 | U |
| 1-Methyl-3-ethylbenzene | A | 1M3EB | 10.0 | 10.0 | U |
| 1-Methyl-4-ethylbenzene | A | 1M4EB | 10.0 | 10.0 | U |
| 1,3,5-Trimethylbenzene (mesitylene) | A | 135TMB | 10.0 | 10.0 | U |
| 1-Methyl-2-ethylbenzene | A | 1M2EB | 10.0 | 10.0 | U |
| 1,2,4-Trimethylbenzene | A | 124TMB | 10.0 | 10.0 | U |
| 1-Decene | O | 1D | 10.0 | 10.0 | U |
| Decane (nC10) | P | C10 | 10.0 | 10.0 | U |
| sec-Butylbenzene | A | SBUB | 10.0 | 10.0 | U |
| 1-Methyl-3-isopropylbenzene (m-cymene) | A | 1M3IPROPE | 10.0 | 10.0 | U |
| 1-Methyl-4-isopropylbenzene (p-cymene) | A | 1M4IPROPE | 10.0 | 10.0 | U |
| Indane | A | IA | 10.0 | 10.0 | U |
| Indene | A | IE | 10.0 | 10.0 | U |
| 1-Methyl-2-isopropybenzene (o-cymene) | A | 1M2IPROPE | 10.0 | 10.0 | U |
| 1-Methyl-3-propylbenzene | A | 1M3PROPB | 10.0 | 10.0 | U |
| 1-Methyl-4-propylbenzene | A | 1M4PROPB | 10.0 | 10.0 | U |
| n-Butylbenzene | A | NBB | 10.0 | 10.0 | U |
| 1,3-Dimethyl-5-ethylbenzene | A | 13DM5EB | 10.0 | 10.0 | U |
| 1,2,diethylbenzene | A | 12DEB | 10.0 | 10.0 | U |
| 1-Methyl-2-propylbenzene | A | 1M2PROPB | 10.0 | 10.0 | U |
| 1,4-Dimethyl-2-ethylbenzene | A | 14DM2EB | 10.0 | 10.0 | U |
| 1,3-Dimethyl-4-ethylbenzene | A | 13DM4EB | 10.0 | 10.0 | U |
| 1,2-Dimethyl-4-ethylbenzene | A | 12DM4EB | 10.0 | 10.0 | U |
| 1,3-Dimethyl-2-ethylbenzene | A | 13DM2EB | 10.0 | 10.0 | U |
| 1,2-Dimethyl-3-ethylbenzene | A | 12DM3EB | 10.0 | 10.0 | U |
| Undecane (nC11) | P | C11 | 10.0 | 10.0 | U |
| 1,2,4,5-Tetramethylbenzene | A | 1245TMB | 10.0 | 10.0 | U |

Pace Analytical® Energy Services

| | | | |
|---|---|---|---|
| **Jeff Wright** | | **Lab ID:** | **23733-2** |
| **Weston Solutions** | | **Collected:** | **9/1/2017** |
| **13702 Coursey Blvd** | | **Received:** | **9/3/2017** |
| **Baton Rouge, LA 70817** | | **Matrix:** | **Water** |
| **Project:** | **Arkema** | **Client ID:** | **HH01-01-02-170901-21** |
| **Project #:** | **66666** | **Analyzed:** | **9/6/2017** |
| **Collected by:** | | **Q Method:** | **082317.M** |

| CONSTITUENTS | CLASS | ABBR. | ssRL ug/L | RESULT ug/L | QUALIFIER |
|---|---|---|---|---|---|
| 1,2,3,5-Tetramethylbenzene (t) | A | 1235TMB | 10.0 | 10.0 | U |
| n-Pentylbenzene | A | NPYB | 10.0 | 10.0 | U |
| Naphthalene | A | N | 10.0 | 10.0 | U |
| Benzothiophene | S | BTHIO | 10.0 | 10.0 | U |
| Dodecane (nC12) | P | C12 | 10.0 | 10.0 | U |
| 1,2,3,4-Tetramethylbenzene (t) | A | 1234TMB | 10.0 | 10.0 | U |
| MMT | ADD | MMT | 10.0 | 10.0 | U |
| 2-Methylnaphthalene | A | 2MN | 10.0 | 10.0 | U |
| 1-Methylnaphthalene | A | 1MN | 10.0 | 10.0 | U |

| | | |
|---|---|---|
| 1,2-Dichloroethane-d4 (RS) | 94.63 | % |
| Toluene-d8 (RS) | 112.12 | % |
| p-Bromofluorobenzene (RS) | 90.68 | % |

**ssRL - Sample Specific Reporting Limit**
**Results listed as U would have been reported if present at or above the listed ssRL**
**J - Values greater than the ssRL but less than the PQL (3 x ssRL).**
**D - Secondary dilution perfomed**
**Q - Surrogate recovery limit exceedance**
**I - Matrix Interference**
**NC - Not calibrated**
**Note: Extracted by EPA 5030 (Purge and Trap).**

**US631**

**090417-WATER2.D & dilution**
**090417-WATER2.D**

**Submitted by,**
**Pace Energy Services, LLC**

| PAES ID | 23733-2 |
|---|---|
| **Sample ID** | **HH01-01-02-170901-21** |
| **Evaporation** | |
| n-Pentane / (n-Pentane+n-Heptane) | U |
| 2-Methylpentane / (2-Methylpentane+2-Methylheptane) | U |
| **Waterwashing** | |
| Benzene / (Benzene+Cyclohexane) | U |
| Toluene / (Toluene+Methylcyclohexane) | U |
| Aromatics / Total Paraffins (n+iso+cyc) | U |
| Aromatics / Naphthenes | U |
| wt% < o-xylene | U |
| **Biodegradation** | |
| (C4-C8 Para +Isopara) / C4-C8 Olefins | U |
| 3-Methylhexane / n-Heptane | U |
| Methylcyclohexane / n-Heptane | U |
| Isoparaffins + Naphthenes / Paraffins | U |
| **Diagnostic Ratios (Refining Properties)** | |
| 2,2,4-Trimethylpentane / (2,2,4-Trimethylpentane+Methylcyclohexane) | U |
| 2,2,4-Trimethylpentane / Total TMPs | U |
| nC9 / Isopropylbenzene | U |
| nC10 / 1-Methyl-2-ethylbenzene | U |
| nC11 / 1,4-Dimethyl-2-ethylbenzene | U |
| iC5 / (iC5+nC5) | U |
| (2-methylhexane + 2,3dimethylpentane) / (3-methylhexane + 2,4 | U |
| Naphthalene / (Naphthalene+nC12) | U |
| Methylcyclohexane/(Methylcyclohexane+Toluene) | U |
| Toluene/n-Octane | U |
| **Oxygenates & Other (ug/L)** | |
| Methyl-tert-butyl ether (MTBE) | U |
| Di-isopropyl ether (DIPE) | U |
| Ethyl-tert-butyl ether (ETBE) | U |
| Tert-amyl methyl ether (TAME) | U |
| MMT | U |
| **Lead Scavengers (ug/L)** | |
| 1,2-Dichloroethane (EDC) | U |
| 1,2-Dibromoethane (EDB) | U |
| **Sulfur containing HCs (ug/L)** | |
| Thiophene | U |
| 2-Methylthiophene | U |
| 3-Methylthiophene | U |
| 2-Ethylthiophene | U |
| Benzothiophene | U |
| **Relative Percentages** | |
| % Paraffinic | 0.0 |
| % Isoparaffinic | 0.0 |
| % Aromatic | 0.0 |
| % Naphthenic | 0.0 |
| % Olefinic | 0.0 |

Pace Analytical® Energy Services

**Jeff Wright**
**Weston Solutions**
**13702 Coursey Blvd**
**Baton Rouge, LA 70817**

**Lab ID:** 23733-3
**Collected:** 9/1/2017
**Received:** 9/3/2017
**Matrix:** Water

**Project:** Arkema
**Project #:** 66666
**Collected by:**

**Client ID:** HH01-01-03-170901-21
**Analyzed:** 9/6/2017
**Q Method:** 082317.M

| CONSTITUENTS | CLASS | ABBR. | ssRL ug/L | RESULT ug/L | QUALIFIER |
|---|---|---|---|---|---|
| Isopentane (2-Methylbutane) | I | IP | 10.0 | 10.0 | U |
| 1-Pentene | O | 1P | 10.0 | 10.0 | U |
| 2-Methyl-1-butene | O | 2M1B | 10.0 | 10.0 | U |
| Pentane (nC5) | P | C5 | 10.0 | 10.0 | U |
| trans-2-pentene | O | T2P | 10.0 | 10.0 | U |
| cis-2-pentene | O | C2P | 10.0 | 10.0 | U |
| 2-Methyl-2-butene (t) | O | 2M2B | 10.0 | 10.0 | U |
| 2,2-Dimethylbutane (t) | I | 22DMB | 10.0 | 10.0 | U |
| Cyclopentane | N | CYP | 10.0 | 10.0 | U |
| 2,3-Dimethylbutane | I | 23DMB | 10.0 | 10.0 | U |
| 2-Methylpentane | I | 2MP | 10.0 | 10.0 | U |
| Methyl-tert-butyl ether (MTBE) | ADD | MTBE | 10.0 | 10.0 | U |
| 3-Methylpentane | P | 3MP | 10.0 | 10.0 | U |
| 1-Hexene | O | 1HX | 10.0 | 10.0 | U |
| Hexane (nC6) | P | C6 | 10.0 | 10.0 | U |
| Di-isopropyl ether (DIPE) | ADD | DIPE | 10.0 | 10.0 | U |
| trans-2-hexene (t) | O | T2HE | 10.0 | 10.0 | U |
| 2-Methyl-2-pentene (t) | O | 2M2P | 10.0 | 10.0 | U |
| cis-2-hexene (t) | O | C2HE | 10.0 | 10.0 | U |
| cis-3-Methyl-2-pentene (t) | O | C3M2P | 10.0 | 10.0 | U |
| Ethyl-tert-butyl ether (ETBE) | ADD | ETBE | 10.0 | 10.0 | U |
| 2,2-Dimethylpentane (t) | I | 22DMP | 10.0 | 10.0 | U |
| Methylcyclopentane | N | MCYP | 10.0 | 10.0 | U |
| 2,4-Dimethylpentane | I | 24DMP | 10.0 | 10.0 | U |
| 1,2-Dichloroethane (EDC) | ADD | EDC | 10.0 | 10.0 | U |
| Benzene | A | B | 10.0 | 10.0 | U |
| 3,3-Dimethylpentane (t) | I | 33DMP | 10.0 | 10.0 | U |
| Thiophene | S | THIO | 10.0 | 10.0 | U |
| Cyclohexane | N | CYH | 10.0 | 10.0 | U |
| 2-Methylhexane | I | 2MH | 10.0 | 10.0 | U |
| 2,3-Dimethylpentane | I | 23DMP | 10.0 | 10.0 | U |
| Tert-amyl methyl ether (TAME) | ADD | TAME | 10.0 | 10.0 | U |
| 3-Methylhexane | I | 3MH | 10.0 | 10.0 | U |

Pace Analytical® Energy Services

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|---|---|---|---|
| **Jeff Wright** | | **Lab ID:** | **23733-3** |
| **Weston Solutions** | | **Collected:** | **9/1/2017** |
| **13702 Coursey Blvd** | | **Received:** | **9/3/2017** |
| **Baton Rouge, LA 70817** | | **Matrix:** | **Water** |
| **Project:** | **Arkema** | **Client ID:** | **HH01-01-03-170901-21** |
| **Project #:** | **66666** | **Analyzed:** | **9/6/2017** |
| **Collected by:** | | **Q Method:** | **082317.M** |

| CONSTITUENTS | CLASS | ABBR. | ssRL ug/L | RESULT ug/L | QUALIFIER |
|---|---|---|---|---|---|
| trans-1,3-Dimethylcyclopentane (t) | N | T13DMCYP | 10.0 | 10.0 | U |
| cis-1,3-Dimethylcyclopentane (t) | N | C13DMCYP | 10.0 | 10.0 | U |
| trans-1,2-Dimethylcyclopentane (t) | N | T12DMCYP | 10.0 | 10.0 | U |
| 2,2,4-Trimethylpentane (isooctane) | I | 224TMP | 10.0 | 10.0 | U |
| 1-Heptene | O | 1HP | 10.0 | 10.0 | U |
| Heptane (nC7) | P | C7 | 10.0 | 10.0 | U |
| trans-2-heptene (t) | O | T2HP | 10.0 | 10.0 | U |
| Methylcyclohexane | N | MCYH | 10.0 | 10.0 | U |
| 2,5-Dimethylhexane | I | 25DMH | 10.0 | 10.0 | U |
| 2,2,3-Trimethylpentane | I | 233TMP | 10.0 | 10.0 | U |
| 2,4-Dimethylhexane | I | 24DMH | 10.0 | 10.0 | U |
| 2,3,4-Trimethylpentane | I | 234TMP | 10.0 | 10.0 | U |
| 2,3,3-Trimethylpentane | I | 233TMP | 10.0 | 10.0 | U |
| Toluene | A | T | 10.0 | 10.0 | U |
| 2-Methylthiophene | S | 2MTHIO | 10.0 | 10.0 | U |
| 2,3-Dimethylhexane | I | 23DMH | 10.0 | 10.0 | U |
| 3-Methylthiophene | S | 3MTHIO | 10.0 | 10.0 | U |
| 2-Methylheptane | I | 2MHP | 10.0 | 10.0 | U |
| 4-Methylheptane (t) | I | 4MHP | 10.0 | 10.0 | U |
| 3-Methylheptane | I | 3MHP | 10.0 | 10.0 | U |
| 3-Ethylhexane | I | 3EHX | 10.0 | 10.0 | U |
| 1,2-Dibromoethane (EDB) | ADD | EDB | 10.0 | 10.0 | U |
| 1-Octene | O | 1O | 10.0 | 10.0 | U |
| Octane (nC8) | P | C8 | 10.0 | 10.0 | U |
| 2,4-Dimethylheptane (t) | I | 24DMHP | 10.0 | 10.0 | U |
| 2,5-Dimethylheptane (t) | I | 25DMHP | 10.0 | 10.0 | U |
| Ethylbenzene | A | EB | 10.0 | 10.0 | U |
| 2-Ethylthiophene | S | 2ETHIO | 10.0 | 10.0 | U |
| 2,3-Dimethylheptane (t) | I | 23DMHP | 10.0 | 10.0 | U |
| m-Xylene | A | MX | 10.0 | 10.0 | U |
| p-Xylene | A | PX | 10.0 | 10.0 | U |
| 4-Methyloctane (t) | I | 4MO | 10.0 | 10.0 | U |
| 2-Methyloctane (t) | I | 2MO | 10.0 | 10.0 | U |

Pace Analytical® Energy Services

| | | | |
|---|---|---|---|
| **Jeff Wright** | | **Lab ID:** | **23733-3** |
| **Weston Solutions** | | **Collected:** | **9/1/2017** |
| **13702 Coursey Blvd** | | **Received:** | **9/3/2017** |
| **Baton Rouge, LA 70817** | | **Matrix:** | **Water** |
| **Project:** | **Arkema** | **Client ID:** | **HH01-01-03-170901-21** |
| **Project #:** | **66666** | **Analyzed:** | **9/6/2017** |
| **Collected by:** | | **Q Method:** | **082317.M** |

| CONSTITUENTS | CLASS | ABBR. | ssRL ug/L | RESULT ug/L | QUALIFIER |
|---|---|---|---|---|---|
| 3-Methyloctane (t) | I | 3MO | 10.0 | 10.0 | U |
| Styrene | A | STRE | 10.0 | 10.0 | U |
| o-Xylene | A | OX | 10.0 | 10.0 | U |
| 1-Nonene | O | 1N | 10.0 | 10.0 | U |
| Nonane (nC9) | P | C9 | 10.0 | 10.0 | U |
| Isopropylbenzene (cumene) | A | IPROPB | 10.0 | 10.0 | U |
| n-Propylbenzene | A | NPRPPB | 10.0 | 10.0 | U |
| 1-Methyl-3-ethylbenzene | A | 1M3EB | 10.0 | 10.0 | U |
| 1-Methyl-4-ethylbenzene | A | 1M4EB | 10.0 | 10.0 | U |
| 1,3,5-Trimethylbenzene (mesitylene) | A | 135TMB | 10.0 | 10.0 | U |
| 1-Methyl-2-ethylbenzene | A | 1M2EB | 10.0 | 10.0 | U |
| 1,2,4-Trimethylbenzene | A | 124TMB | 10.0 | 10.0 | U |
| 1-Decene | O | 1D | 10.0 | 10.0 | U |
| Decane (nC10) | P | C10 | 10.0 | 10.0 | U |
| sec-Butylbenzene | A | SBUB | 10.0 | 10.0 | U |
| 1-Methyl-3-isopropylbenzene (m-cymene) | A | 1M3IPROPE | 10.0 | 10.0 | U |
| 1-Methyl-4-isopropylbenzene (p-cymene) | A | 1M4IPROPE | 10.0 | 10.0 | U |
| Indane | A | IA | 10.0 | 10.0 | U |
| Indene | A | IE | 10.0 | 10.0 | U |
| 1-Methyl-2-isopropybenzene (o-cymene) | A | 1M2IPROPE | 10.0 | 10.0 | U |
| 1-Methyl-3-propylbenzene | A | 1M3PROPB | 10.0 | 10.0 | U |
| 1-Methyl-4-propylbenzene | A | 1M4PROPB | 10.0 | 10.0 | U |
| n-Butylbenzene | A | NBB | 10.0 | 10.0 | U |
| 1,3-Dimethyl-5-ethylbenzene | A | 13DM5EB | 10.0 | 10.0 | U |
| 1,2,diethylbenzene | A | 12DEB | 10.0 | 10.0 | U |
| 1-Methyl-2-propylbenzene | A | 1M2PROPB | 10.0 | 10.0 | U |
| 1,4-Dimethyl-2-ethylbenzene | A | 14DM2EB | 10.0 | 10.0 | U |
| 1,3-Dimethyl-4-ethylbenzene | A | 13DM4EB | 10.0 | 10.0 | U |
| 1,2-Dimethyl-4-ethylbenzene | A | 12DM4EB | 10.0 | 10.0 | U |
| 1,3-Dimethyl-2-ethylbenzene | A | 13DM2EB | 10.0 | 10.0 | U |
| 1,2-Dimethyl-3-ethylbenzene | A | 12DM3EB | 10.0 | 10.0 | U |
| Undecane (nC11) | P | C11 | 10.0 | 10.0 | U |
| 1,2,4,5-Tetramethylbenzene | A | 1245TMB | 10.0 | 10.0 | U |

Pace Analytical® Energy Services

| | | | |
|---|---|---|---|
| **Jeff Wright** | | **Lab ID:** | **23733-3** |
| **Weston Solutions** | | **Collected:** | **9/1/2017** |
| **13702 Coursey Blvd** | | **Received:** | **9/3/2017** |
| **Baton Rouge, LA 70817** | | **Matrix:** | **Water** |
| **Project:** | **Arkema** | **Client ID:** | **HH01-01-03-170901-21** |
| **Project #:** | **66666** | **Analyzed:** | **9/6/2017** |
| **Collected by:** | | **Q Method:** | **082317.M** |

| CONSTITUENTS | CLASS | ABBR. | ssRL ug/L | RESULT ug/L | QUALIFIER |
|---|---|---|---|---|---|
| 1,2,3,5-Tetramethylbenzene (t) | A | 1235TMB | 10.0 | 10.0 | U |
| n-Pentylbenzene | A | NPYB | 10.0 | 10.0 | U |
| Naphthalene | A | N | 10.0 | 10.0 | U |
| Benzothiophene | S | BTHIO | 10.0 | 10.0 | U |
| Dodecane (nC12) | P | C12 | 10.0 | 10.0 | U |
| 1,2,3,4-Tetramethylbenzene (t) | A | 1234TMB | 10.0 | 10.0 | U |
| MMT | ADD | MMT | 10.0 | 10.0 | U |
| 2-Methylnaphthalene | A | 2MN | 10.0 | 10.0 | U |
| 1-Methylnaphthalene | A | 1MN | 10.0 | 10.0 | U |

| | | |
|---|---|---|
| 1,2-Dichloroethane-d4 (RS) | 97.27 | % |
| Toluene-d8 (RS) | 113.17 | % |
| p-Bromofluorobenzene (RS) | 91.87 | % |

**ssRL - Sample Specific Reporting Limit**
**Results listed as U would have been reported if present at or above the listed ssRL**
**J - Values greater than the ssRL but less than the PQL (3 x ssRL).**
**D - Secondary dilution perfomed**
**Q - Surrogate recovery limit exceedance**
**I - Matrix Interference**
**NC - Not calibrated**
**Note: Extracted by EPA 5030 (Purge and Trap).**

**US631**

**090417-WATER3.D & dilution**
**090417-WATER3.D**

**Submitted by,**
**Pace Energy Services, LLC**

| PAES ID | 23733-3 |
|---|---|
| **Sample ID** | **HH01-01-03-170901-21** |
| **Evaporation** | |
| n-Pentane / (n-Pentane+n-Heptane) | U |
| 2-Methylpentane / (2-Methylpentane+2-Methylheptane) | U |
| **Waterwashing** | |
| Benzene / (Benzene+Cyclohexane) | U |
| Toluene / (Toluene+Methylcyclohexane) | U |
| Aromatics / Total Paraffins (n+iso+cyc) | U |
| Aromatics / Naphthenes | U |
| wt% < o-xylene | U |
| **Biodegradation** | |
| (C4-C8 Para +Isopara) / C4-C8 Olefins | U |
| 3-Methylhexane / n-Heptane | U |
| Methylcyclohexane / n-Heptane | U |
| Isoparaffins + Naphthenes / Paraffins | U |
| **Diagnostic Ratios (Refining Properties)** | |
| 2,2,4-Trimethylpentane / (2,2,4-Trimethylpentane+Methylcyclohexane) | U |
| 2,2,4-Trimethylpentane / Total TMPs | U |
| nC9 / Isopropylbenzene | U |
| nC10 / 1-Methyl-2-ethylbenzene | U |
| nC11 / 1,4-Dimethyl-2-ethylbenzene | U |
| iC5 / (iC5+nC5) | U |
| (2-methylhexane + 2,3dimethylpentane) / (3-methylhexane + 2,4 | U |
| Naphthalene / (Naphthalene+nC12) | U |
| Methylcyclohexane/(Methylcyclohexane+Toluene) | U |
| Toluene/n-Octane | U |
| **Oxygenates & Other (ug/L)** | |
| Methyl-tert-butyl ether (MTBE) | U |
| Di-isopropyl ether (DIPE) | U |
| Ethyl-tert-butyl ether (ETBE) | U |
| Tert-amyl methyl ether (TAME) | U |
| MMT | U |
| **Lead Scavengers (ug/L)** | |
| 1,2-Dichloroethane (EDC) | U |
| 1,2-Dibromoethane (EDB) | U |
| **Sulfur containing HCs (ug/L)** | |
| Thiophene | U |
| 2-Methylthiophene | U |
| 3-Methylthiophene | U |
| 2-Ethylthiophene | U |
| Benzothiophene | U |
| **Relative Percentages** | |
| % Paraffinic | 0.0 |
| % Isoparaffinic | 0.0 |
| % Aromatic | 0.0 |
| % Naphthenic | 0.0 |
| % Olefinic | 0.0 |

Pace Analytical® Energy Services

**Jeff Wright**
**Weston Solutions**
**13702 Coursey Blvd**
**Baton Rouge, LA 70817**

**Lab ID:** 23733-4
**Collected:** 9/1/2017
**Received:** 9/3/2017
**Matrix:** Water

**Project:** Arkema
**Project #:** 66666
**Collected by:**

**Client ID:** HH01-01-03-170901-22
**Analyzed:** 9/6/2017
**Q Method:** 082317.M

| CONSTITUENTS | CLASS | ABBR. | ssRL ug/L | RESULT ug/L | QUALIFIER |
|---|---|---|---|---|---|
| Isopentane (2-Methylbutane) | I | IP | 10.0 | 10.0 | U |
| 1-Pentene | O | 1P | 10.0 | 10.0 | U |
| 2-Methyl-1-butene | O | 2M1B | 10.0 | 10.0 | U |
| Pentane (nC5) | P | C5 | 10.0 | 10.0 | U |
| trans-2-pentene | O | T2P | 10.0 | 10.0 | U |
| cis-2-pentene | O | C2P | 10.0 | 10.0 | U |
| 2-Methyl-2-butene (t) | O | 2M2B | 10.0 | 10.0 | U |
| 2,2-Dimethylbutane (t) | I | 22DMB | 10.0 | 10.0 | U |
| Cyclopentane | N | CYP | 10.0 | 10.0 | U |
| 2,3-Dimethylbutane | I | 23DMB | 10.0 | 10.0 | U |
| 2-Methylpentane | I | 2MP | 10.0 | 10.0 | U |
| Methyl-tert-butyl ether (MTBE) | ADD | MTBE | 10.0 | 10.0 | U |
| 3-Methylpentane | P | 3MP | 10.0 | 10.0 | U |
| 1-Hexene | O | 1HX | 10.0 | 10.0 | U |
| Hexane (nC6) | P | C6 | 10.0 | 10.0 | U |
| Di-isopropyl ether (DIPE) | ADD | DIPE | 10.0 | 10.0 | U |
| trans-2-hexene (t) | O | T2HE | 10.0 | 10.0 | U |
| 2-Methyl-2-pentene (t) | O | 2M2P | 10.0 | 10.0 | U |
| cis-2-hexene (t) | O | C2HE | 10.0 | 10.0 | U |
| cis-3-Methyl-2-pentene (t) | O | C3M2P | 10.0 | 10.0 | U |
| Ethyl-tert-butyl ether (ETBE) | ADD | ETBE | 10.0 | 10.0 | U |
| 2,2-Dimethylpentane (t) | I | 22DMP | 10.0 | 10.0 | U |
| Methylcyclopentane | N | MCYP | 10.0 | 10.0 | U |
| 2,4-Dimethylpentane | I | 24DMP | 10.0 | 10.0 | U |
| 1,2-Dichloroethane (EDC) | ADD | EDC | 10.0 | 10.0 | U |
| Benzene | A | B | 10.0 | 10.0 | U |
| 3,3-Dimethylpentane (t) | I | 33DMP | 10.0 | 10.0 | U |
| Thiophene | S | THIO | 10.0 | 10.0 | U |
| Cyclohexane | N | CYH | 10.0 | 10.0 | U |
| 2-Methylhexane | I | 2MH | 10.0 | 10.0 | U |
| 2,3-Dimethylpentane | I | 23DMP | 10.0 | 10.0 | U |
| Tert-amyl methyl ether (TAME) | ADD | TAME | 10.0 | 10.0 | U |
| 3-Methylhexane | I | 3MH | 10.0 | 10.0 | U |

Pace Analytical® Energy Services

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|---|---|---|---|
| **Jeff Wright** | | **Lab ID:** | **23733-4** |
| **Weston Solutions** | | **Collected:** | **9/1/2017** |
| **13702 Coursey Blvd** | | **Received:** | **9/3/2017** |
| **Baton Rouge, LA 70817** | | **Matrix:** | **Water** |
| **Project:** | **Arkema** | **Client ID:** | **HH01-01-03-170901-22** |
| **Project #:** | **66666** | **Analyzed:** | **9/6/2017** |
| **Collected by:** | | **Q Method:** | **082317.M** |

| CONSTITUENTS | CLASS | ABBR. | ssRL ug/L | RESULT ug/L | QUALIFIER |
|---|---|---|---|---|---|
| trans-1,3-Dimethylcyclopentane (t) | N | T13DMCYP | 10.0 | 10.0 | U |
| cis-1,3-Dimethylcyclopentane (t) | N | C13DMCYP | 10.0 | 10.0 | U |
| trans-1,2-Dimethylcyclopentane (t) | N | T12DMCYP | 10.0 | 10.0 | U |
| 2,2,4-Trimethylpentane (isooctane) | I | 224TMP | 10.0 | 10.0 | U |
| 1-Heptene | O | 1HP | 10.0 | 10.0 | U |
| Heptane (nC7) | P | C7 | 10.0 | 10.0 | U |
| trans-2-heptene (t) | O | T2HP | 10.0 | 10.0 | U |
| Methylcyclohexane | N | MCYH | 10.0 | 10.0 | U |
| 2,5-Dimethylhexane | I | 25DMH | 10.0 | 10.0 | U |
| 2,2,3-Trimethylpentane | I | 233TMP | 10.0 | 10.0 | U |
| 2,4-Dimethylhexane | I | 24DMH | 10.0 | 10.0 | U |
| 2,3,4-Trimethylpentane | I | 234TMP | 10.0 | 10.0 | U |
| 2,3,3-Trimethylpentane | I | 233TMP | 10.0 | 10.0 | U |
| Toluene | A | T | 10.0 | 10.0 | U |
| 2-Methylthiophene | S | 2MTHIO | 10.0 | 10.0 | U |
| 2,3-Dimethylhexane | I | 23DMH | 10.0 | 10.0 | U |
| 3-Methylthiophene | S | 3MTHIO | 10.0 | 10.0 | U |
| 2-Methylheptane | I | 2MHP | 10.0 | 10.0 | U |
| 4-Methylheptane (t) | I | 4MHP | 10.0 | 10.0 | U |
| 3-Methylheptane | I | 3MHP | 10.0 | 10.0 | U |
| 3-Ethylhexane | I | 3EHX | 10.0 | 10.0 | U |
| 1,2-Dibromoethane (EDB) | ADD | EDB | 10.0 | 10.0 | U |
| 1-Octene | O | 1O | 10.0 | 10.0 | U |
| Octane (nC8) | P | C8 | 10.0 | 10.0 | U |
| 2,4-Dimethylheptane (t) | I | 24DMHP | 10.0 | 10.0 | U |
| 2,5-Dimethylheptane (t) | I | 25DMHP | 10.0 | 10.0 | U |
| Ethylbenzene | A | EB | 10.0 | 10.0 | U |
| 2-Ethylthiophene | S | 2ETHIO | 10.0 | 10.0 | U |
| 2,3-Dimethylheptane (t) | I | 23DMHP | 10.0 | 10.0 | U |
| m-Xylene | A | MX | 10.0 | 10.0 | U |
| p-Xylene | A | PX | 10.0 | 10.0 | U |
| 4-Methyloctane (t) | I | 4MO | 10.0 | 10.0 | U |
| 2-Methyloctane (t) | I | 2MO | 10.0 | 10.0 | U |

Pace Analytical® Energy Services

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|---|---|---|---|
| **Jeff Wright** | | **Lab ID:** | **23733-4** |
| **Weston Solutions** | | **Collected:** | **9/1/2017** |
| **13702 Coursey Blvd** | | **Received:** | **9/3/2017** |
| **Baton Rouge, LA 70817** | | **Matrix:** | **Water** |
| **Project:** | **Arkema** | **Client ID:** | **HH01-01-03-170901-22** |
| **Project #:** | **66666** | **Analyzed:** | **9/6/2017** |
| **Collected by:** | | **Q Method:** | **082317.M** |

| CONSTITUENTS | CLASS | ABBR. | ssRL ug/L | RESULT ug/L | QUALIFIER |
|---|---|---|---|---|---|
| 3-Methyloctane (t) | I | 3MO | 10.0 | 10.0 | U |
| Styrene | A | STRE | 10.0 | 10.0 | U |
| o-Xylene | A | OX | 10.0 | 10.0 | U |
| 1-Nonene | O | 1N | 10.0 | 10.0 | U |
| Nonane (nC9) | P | C9 | 10.0 | 10.0 | U |
| Isopropylbenzene (cumene) | A | IPROPB | 10.0 | 10.0 | U |
| n-Propylbenzene | A | NPRPPB | 10.0 | 10.0 | U |
| 1-Methyl-3-ethylbenzene | A | 1M3EB | 10.0 | 10.0 | U |
| 1-Methyl-4-ethylbenzene | A | 1M4EB | 10.0 | 10.0 | U |
| 1,3,5-Trimethylbenzene (mesitylene) | A | 135TMB | 10.0 | 10.0 | U |
| 1-Methyl-2-ethylbenzene | A | 1M2EB | 10.0 | 10.0 | U |
| 1,2,4-Trimethylbenzene | A | 124TMB | 10.0 | 10.0 | U |
| 1-Decene | O | 1D | 10.0 | 10.0 | U |
| Decane (nC10) | P | C10 | 10.0 | 10.0 | U |
| sec-Butylbenzene | A | SBUB | 10.0 | 10.0 | U |
| 1-Methyl-3-isopropylbenzene (m-cymene) | A | 1M3IPROPE | 10.0 | 10.0 | U |
| 1-Methyl-4-isopropylbenzene (p-cymene) | A | 1M4IPROPE | 10.0 | 10.0 | U |
| Indane | A | IA | 10.0 | 10.0 | U |
| Indene | A | IE | 10.0 | 10.0 | U |
| 1-Methyl-2-isopropybenzene (o-cymene) | A | 1M2IPROPE | 10.0 | 10.0 | U |
| 1-Methyl-3-propylbenzene | A | 1M3PROPB | 10.0 | 10.0 | U |
| 1-Methyl-4-propylbenzene | A | 1M4PROPB | 10.0 | 10.0 | U |
| n-Butylbenzene | A | NBB | 10.0 | 10.0 | U |
| 1,3-Dimethyl-5-ethylbenzene | A | 13DM5EB | 10.0 | 10.0 | U |
| 1,2,diethylbenzene | A | 12DEB | 10.0 | 10.0 | U |
| 1-Methyl-2-propylbenzene | A | 1M2PROPB | 10.0 | 10.0 | U |
| 1,4-Dimethyl-2-ethylbenzene | A | 14DM2EB | 10.0 | 10.0 | U |
| 1,3-Dimethyl-4-ethylbenzene | A | 13DM4EB | 10.0 | 10.0 | U |
| 1,2-Dimethyl-4-ethylbenzene | A | 12DM4EB | 10.0 | 10.0 | U |
| 1,3-Dimethyl-2-ethylbenzene | A | 13DM2EB | 10.0 | 10.0 | U |
| 1,2-Dimethyl-3-ethylbenzene | A | 12DM3EB | 10.0 | 10.0 | U |
| Undecane (nC11) | P | C11 | 10.0 | 10.0 | U |
| 1,2,4,5-Tetramethylbenzene | A | 1245TMB | 10.0 | 10.0 | U |

Pace Analytical® Energy Services

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|---|---|---|---|
| **Jeff Wright** | | **Lab ID:** | **23733-4** |
| **Weston Solutions** | | **Collected:** | **9/1/2017** |
| **13702 Coursey Blvd** | | **Received:** | **9/3/2017** |
| **Baton Rouge, LA 70817** | | **Matrix:** | **Water** |
| **Project:** | **Arkema** | **Client ID:** | **HH01-01-03-170901-22** |
| **Project #:** | **66666** | **Analyzed:** | **9/6/2017** |
| **Collected by:** | | **Q Method:** | **082317.M** |

| CONSTITUENTS | CLASS | ABBR. | ssRL ug/L | RESULT ug/L | QUALIFIER |
|---|---|---|---|---|---|
| 1,2,3,5-Tetramethylbenzene (t) | A | 1235TMB | 10.0 | 10.0 | U |
| n-Pentylbenzene | A | NPYB | 10.0 | 10.0 | U |
| Naphthalene | A | N | 10.0 | 10.0 | U |
| Benzothiophene | S | BTHIO | 10.0 | 10.0 | U |
| Dodecane (nC12) | P | C12 | 10.0 | 10.0 | U |
| 1,2,3,4-Tetramethylbenzene (t) | A | 1234TMB | 10.0 | 10.0 | U |
| MMT | ADD | MMT | 10.0 | 10.0 | U |
| 2-Methylnaphthalene | A | 2MN | 10.0 | 10.0 | U |
| 1-Methylnaphthalene | A | 1MN | 10.0 | 10.0 | U |

| | | |
|---|---|---|
| 1,2-Dichloroethane-d4 (RS) | 86.70 | % |
| Toluene-d8 (RS) | 113.50 | % |
| p-Bromofluorobenzene (RS) | 90.98 | % |

**ssRL - Sample Specific Reporting Limit**
**Results listed as U would have been reported if present at or above the listed ssRL**
**J - Values greater than the ssRL but less than the PQL (3 x ssRL).**
**D - Secondary dilution perfomed**
**Q - Surrogate recovery limit exceedance**
**I - Matrix Interference**
**NC - Not calibrated**
**Note: Extracted by EPA 5030 (Purge and Trap).**

**US631**

**090417-WATER4.D & dilution**
**090417-WATER4.D**

**Submitted by,**
**Pace Energy Services, LLC**

| PAES ID | 23733-4 |
|---|---|
| **Sample ID** | **HH01-01-03-170901-22** |
| **Evaporation** | |
| n-Pentane / (n-Pentane+n-Heptane) | U |
| 2-Methylpentane / (2-Methylpentane+2-Methylheptane) | U |
| **Waterwashing** | |
| Benzene / (Benzene+Cyclohexane) | U |
| Toluene / (Toluene+Methylcyclohexane) | U |
| Aromatics / Total Paraffins (n+iso+cyc) | U |
| Aromatics / Naphthenes | U |
| wt% < o-xylene | U |
| **Biodegradation** | |
| (C4-C8 Para +Isopara) / C4-C8 Olefins | U |
| 3-Methylhexane / n-Heptane | U |
| Methylcyclohexane / n-Heptane | U |
| Isoparaffins + Naphthenes / Paraffins | U |
| **Diagnostic Ratios (Refining Properties)** | |
| 2,2,4-Trimethylpentane / (2,2,4-Trimethylpentane+Methylcyclohexane) | U |
| 2,2,4-Trimethylpentane / Total TMPs | U |
| nC9 / Isopropylbenzene | U |
| nC10 / 1-Methyl-2-ethylbenzene | U |
| nC11 / 1,4-Dimethyl-2-ethylbenzene | U |
| iC5 / (iC5+nC5) | U |
| (2-methylhexane + 2,3dimethylpentane) / (3-methylhexane + 2,4 | U |
| Naphthalene / (Naphthalene+nC12) | U |
| Methylcyclohexane/(Methylcyclohexane+Toluene) | U |
| Toluene/n-Octane | U |
| **Oxygenates & Other (ug/L)** | |
| Methyl-tert-butyl ether (MTBE) | U |
| Di-isopropyl ether (DIPE) | U |
| Ethyl-tert-butyl ether (ETBE) | U |
| Tert-amyl methyl ether (TAME) | U |
| MMT | U |
| **Lead Scavengers (ug/L)** | |
| 1,2-Dichloroethane (EDC) | U |
| 1,2-Dibromoethane (EDB) | U |
| **Sulfur containing HCs (ug/L)** | |
| Thiophene | U |
| 2-Methylthiophene | U |
| 3-Methylthiophene | U |
| 2-Ethylthiophene | U |
| Benzothiophene | U |
| **Relative Percentages** | |
| % Paraffinic | 0.0 |
| % Isoparaffinic | 0.0 |
| % Aromatic | 0.0 |
| % Naphthenic | 0.0 |
| % Olefinic | 0.0 |

Pace Analytical® Energy Services

**Jeff Wright**
**Weston Solutions**
**13702 Coursey Blvd**
**Baton Rouge, LA 70817**

**Lab ID:** 23733-5
**Collected:** 9/1/2017
**Received:** 9/3/2017
**Matrix:** Water

**Project:** Arkema
**Project #:** 66666
**Collected by:**

**Client ID:** HH01-01-04-170901-21
**Analyzed:** 9/6/2017
**Q Method:** 082317.M

| CONSTITUENTS | CLASS | ABBR. | ssRL ug/L | RESULT ug/L | QUALIFIER |
|---|---|---|---|---|---|
| Isopentane (2-Methylbutane) | I | IP | 10.0 | 10.0 | U |
| 1-Pentene | O | 1P | 10.0 | 10.0 | U |
| 2-Methyl-1-butene | O | 2M1B | 10.0 | 10.0 | U |
| Pentane (nC5) | P | C5 | 10.0 | 10.0 | U |
| trans-2-pentene | O | T2P | 10.0 | 10.0 | U |
| cis-2-pentene | O | C2P | 10.0 | 10.0 | U |
| 2-Methyl-2-butene (t) | O | 2M2B | 10.0 | 10.0 | U |
| 2,2-Dimethylbutane (t) | I | 22DMB | 10.0 | 10.0 | U |
| Cyclopentane | N | CYP | 10.0 | 10.0 | U |
| 2,3-Dimethylbutane | I | 23DMB | 10.0 | 10.0 | U |
| 2-Methylpentane | I | 2MP | 10.0 | 10.0 | U |
| Methyl-tert-butyl ether (MTBE) | ADD | MTBE | 10.0 | 10.0 | U |
| 3-Methylpentane | P | 3MP | 10.0 | 10.0 | U |
| 1-Hexene | O | 1HX | 10.0 | 10.0 | U |
| Hexane (nC6) | P | C6 | 10.0 | 10.0 | U |
| Di-isopropyl ether (DIPE) | ADD | DIPE | 10.0 | 10.0 | U |
| trans-2-hexene (t) | O | T2HE | 10.0 | 10.0 | U |
| 2-Methyl-2-pentene (t) | O | 2M2P | 10.0 | 10.0 | U |
| cis-2-hexene (t) | O | C2HE | 10.0 | 10.0 | U |
| cis-3-Methyl-2-pentene (t) | O | C3M2P | 10.0 | 10.0 | U |
| Ethyl-tert-butyl ether (ETBE) | ADD | ETBE | 10.0 | 10.0 | U |
| 2,2-Dimethylpentane (t) | I | 22DMP | 10.0 | 10.0 | U |
| Methylcyclopentane | N | MCYP | 10.0 | 10.0 | U |
| 2,4-Dimethylpentane | I | 24DMP | 10.0 | 10.0 | U |
| 1,2-Dichloroethane (EDC) | ADD | EDC | 10.0 | 10.0 | U |
| Benzene | A | B | 10.0 | 10.0 | U |
| 3,3-Dimethylpentane (t) | I | 33DMP | 10.0 | 10.0 | U |
| Thiophene | S | THIO | 10.0 | 10.0 | U |
| Cyclohexane | N | CYH | 10.0 | 10.0 | U |
| 2-Methylhexane | I | 2MH | 10.0 | 10.0 | U |
| 2,3-Dimethylpentane | I | 23DMP | 10.0 | 10.0 | U |
| Tert-amyl methyl ether (TAME) | ADD | TAME | 10.0 | 10.0 | U |
| 3-Methylhexane | I | 3MH | 10.0 | 10.0 | U |

Pace Analytical® Energy Services

| | | | |
|---|---|---|---|
| **Jeff Wright** | | **Lab ID:** | **23733-5** |
| **Weston Solutions** | | **Collected:** | **9/1/2017** |
| **13702 Coursey Blvd** | | **Received:** | **9/3/2017** |
| **Baton Rouge, LA 70817** | | **Matrix:** | **Water** |
| **Project:** | **Arkema** | **Client ID:** | **HH01-01-04-170901-21** |
| **Project #:** | **66666** | **Analyzed:** | **9/6/2017** |
| **Collected by:** | | **Q Method:** | **082317.M** |

| CONSTITUENTS | CLASS | ABBR. | ssRL ug/L | RESULT ug/L | QUALIFIER |
|---|---|---|---|---|---|
| trans-1,3-Dimethylcyclopentane (t) | N | T13DMCYP | 10.0 | 10.0 | U |
| cis-1,3-Dimethylcyclopentane (t) | N | C13DMCYP | 10.0 | 10.0 | U |
| trans-1,2-Dimethylcyclopentane (t) | N | T12DMCYP | 10.0 | 10.0 | U |
| 2,2,4-Trimethylpentane (isooctane) | I | 224TMP | 10.0 | 10.0 | U |
| 1-Heptene | O | 1HP | 10.0 | 10.0 | U |
| Heptane (nC7) | P | C7 | 10.0 | 10.0 | U |
| trans-2-heptene (t) | O | T2HP | 10.0 | 10.0 | U |
| Methylcyclohexane | N | MCYH | 10.0 | 10.0 | U |
| 2,5-Dimethylhexane | I | 25DMH | 10.0 | 10.0 | U |
| 2,2,3-Trimethylpentane | I | 233TMP | 10.0 | 10.0 | U |
| 2,4-Dimethylhexane | I | 24DMH | 10.0 | 10.0 | U |
| 2,3,4-Trimethylpentane | I | 234TMP | 10.0 | 10.0 | U |
| 2,3,3-Trimethylpentane | I | 233TMP | 10.0 | 10.0 | U |
| Toluene | A | T | 10.0 | 10.0 | U |
| 2-Methylthiophene | S | 2MTHIO | 10.0 | 10.0 | U |
| 2,3-Dimethylhexane | I | 23DMH | 10.0 | 10.0 | U |
| 3-Methylthiophene | S | 3MTHIO | 10.0 | 10.0 | U |
| 2-Methylheptane | I | 2MHP | 10.0 | 10.0 | U |
| 4-Methylheptane (t) | I | 4MHP | 10.0 | 10.0 | U |
| 3-Methylheptane | I | 3MHP | 10.0 | 10.0 | U |
| 3-Ethylhexane | I | 3EHX | 10.0 | 10.0 | U |
| 1,2-Dibromoethane (EDB) | ADD | EDB | 10.0 | 10.0 | U |
| 1-Octene | O | 1O | 10.0 | 10.0 | U |
| Octane (nC8) | P | C8 | 10.0 | 10.0 | U |
| 2,4-Dimethylheptane (t) | I | 24DMHP | 10.0 | 10.0 | U |
| 2,5-Dimethylheptane (t) | I | 25DMHP | 10.0 | 10.0 | U |
| Ethylbenzene | A | EB | 10.0 | 10.0 | U |
| 2-Ethylthiophene | S | 2ETHIO | 10.0 | 10.0 | U |
| 2,3-Dimethylheptane (t) | I | 23DMHP | 10.0 | 10.0 | U |
| m-Xylene | A | MX | 10.0 | 10.0 | U |
| p-Xylene | A | PX | 10.0 | 10.0 | U |
| 4-Methyloctane (t) | I | 4MO | 10.0 | 10.0 | U |
| 2-Methyloctane (t) | I | 2MO | 10.0 | 10.0 | U |

Pace Analytical® Energy Services

| | | | |
|---|---|---|---|
| **Jeff Wright** | | **Lab ID:** | **23733-5** |
| **Weston Solutions** | | **Collected:** | **9/1/2017** |
| **13702 Coursey Blvd** | | **Received:** | **9/3/2017** |
| **Baton Rouge, LA 70817** | | **Matrix:** | **Water** |
| **Project:** | **Arkema** | **Client ID:** | **HH01-01-04-170901-21** |
| **Project #:** | **66666** | **Analyzed:** | **9/6/2017** |
| **Collected by:** | | **Q Method:** | **082317.M** |

| CONSTITUENTS | CLASS | ABBR. | ssRL ug/L | RESULT ug/L | QUALIFIER |
|---|---|---|---|---|---|
| 3-Methyloctane (t) | I | 3MO | 10.0 | 10.0 | U |
| Styrene | A | STRE | 10.0 | 10.0 | U |
| o-Xylene | A | OX | 10.0 | 10.0 | U |
| 1-Nonene | O | 1N | 10.0 | 10.0 | U |
| Nonane (nC9) | P | C9 | 10.0 | 10.0 | U |
| Isopropylbenzene (cumene) | A | IPROPB | 10.0 | 10.0 | U |
| n-Propylbenzene | A | NPRPPB | 10.0 | 10.0 | U |
| 1-Methyl-3-ethylbenzene | A | 1M3EB | 10.0 | 10.0 | U |
| 1-Methyl-4-ethylbenzene | A | 1M4EB | 10.0 | 10.0 | U |
| 1,3,5-Trimethylbenzene (mesitylene) | A | 135TMB | 10.0 | 10.0 | U |
| 1-Methyl-2-ethylbenzene | A | 1M2EB | 10.0 | 10.0 | U |
| 1,2,4-Trimethylbenzene | A | 124TMB | 10.0 | 10.0 | U |
| 1-Decene | O | 1D | 10.0 | 10.0 | U |
| Decane (nC10) | P | C10 | 10.0 | 10.0 | U |
| sec-Butylbenzene | A | SBUB | 10.0 | 10.0 | U |
| 1-Methyl-3-isopropylbenzene (m-cymene) | A | 1M3IPROPE | 10.0 | 10.0 | U |
| 1-Methyl-4-isopropylbenzene (p-cymene) | A | 1M4IPROPE | 10.0 | 10.0 | U |
| Indane | A | IA | 10.0 | 10.0 | U |
| Indene | A | IE | 10.0 | 10.0 | U |
| 1-Methyl-2-isopropybenzene (o-cymene) | A | 1M2IPROPE | 10.0 | 10.0 | U |
| 1-Methyl-3-propylbenzene | A | 1M3PROPB | 10.0 | 10.0 | U |
| 1-Methyl-4-propylbenzene | A | 1M4PROPB | 10.0 | 10.0 | U |
| n-Butylbenzene | A | NBB | 10.0 | 10.0 | U |
| 1,3-Dimethyl-5-ethylbenzene | A | 13DM5EB | 10.0 | 10.0 | U |
| 1,2,diethylbenzene | A | 12DEB | 10.0 | 10.0 | U |
| 1-Methyl-2-propylbenzene | A | 1M2PROPB | 10.0 | 10.0 | U |
| 1,4-Dimethyl-2-ethylbenzene | A | 14DM2EB | 10.0 | 10.0 | U |
| 1,3-Dimethyl-4-ethylbenzene | A | 13DM4EB | 10.0 | 10.0 | U |
| 1,2-Dimethyl-4-ethylbenzene | A | 12DM4EB | 10.0 | 10.0 | U |
| 1,3-Dimethyl-2-ethylbenzene | A | 13DM2EB | 10.0 | 10.0 | U |
| 1,2-Dimethyl-3-ethylbenzene | A | 12DM3EB | 10.0 | 10.0 | U |
| Undecane (nC11) | P | C11 | 10.0 | 10.0 | U |
| 1,2,4,5-Tetramethylbenzene | A | 1245TMB | 10.0 | 10.0 | U |

Pace Analytical® Energy Services

| | | | |
|---|---|---|---|
| **Jeff Wright** | | **Lab ID:** | **23733-5** |
| **Weston Solutions** | | **Collected:** | **9/1/2017** |
| **13702 Coursey Blvd** | | **Received:** | **9/3/2017** |
| **Baton Rouge, LA 70817** | | **Matrix:** | **Water** |
| **Project:** | **Arkema** | **Client ID:** | **HH01-01-04-170901-21** |
| **Project #:** | **66666** | **Analyzed:** | **9/6/2017** |
| **Collected by:** | | **Q Method:** | **082317.M** |

| CONSTITUENTS | CLASS | ABBR. | ssRL ug/L | RESULT ug/L | QUALIFIER |
|---|---|---|---|---|---|
| 1,2,3,5-Tetramethylbenzene (t) | A | 1235TMB | 10.0 | 10.0 | U |
| n-Pentylbenzene | A | NPYB | 10.0 | 10.0 | U |
| Naphthalene | A | N | 10.0 | 10.0 | U |
| Benzothiophene | S | BTHIO | 10.0 | 10.0 | U |
| Dodecane (nC12) | P | C12 | 10.0 | 10.0 | U |
| 1,2,3,4-Tetramethylbenzene (t) | A | 1234TMB | 10.0 | 10.0 | U |
| MMT | ADD | MMT | 10.0 | 10.0 | U |
| 2-Methylnaphthalene | A | 2MN | 10.0 | 10.0 | U |
| 1-Methylnaphthalene | A | 1MN | 10.0 | 10.0 | U |

| | | |
|---|---|---|
| 1,2-Dichloroethane-d4 (RS) | 88.01 | % |
| Toluene-d8 (RS) | 114.82 | % |
| p-Bromofluorobenzene (RS) | 92.20 | % |

**ssRL - Sample Specific Reporting Limit**
**Results listed as U would have been reported if present at or above the listed ssRL**
**J - Values greater than the ssRL but less than the PQL (3 x ssRL).**
**D - Secondary dilution perfomed**
**Q - Surrogate recovery limit exceedance**
**I - Matrix Interference**
**NC - Not calibrated**
**Note: Extracted by EPA 5030 (Purge and Trap).**

**US631**

**090417-WATER5.D & dilution**
**090417-WATER5.D**

**Submitted by,**
**Pace Energy Services, LLC**

| PAES ID | 23733-5 |
|---|---|
| **Sample ID** | **HH01-01-04-170901-21** |
| **Evaporation** | |
| n-Pentane / (n-Pentane+n-Heptane) | U |
| 2-Methylpentane / (2-Methylpentane+2-Methylheptane) | U |
| **Waterwashing** | |
| Benzene / (Benzene+Cyclohexane) | U |
| Toluene / (Toluene+Methylcyclohexane) | U |
| Aromatics / Total Paraffins (n+iso+cyc) | U |
| Aromatics / Naphthenes | U |
| wt% < o-xylene | U |
| **Biodegradation** | |
| (C4-C8 Para +Isopara) / C4-C8 Olefins | U |
| 3-Methylhexane / n-Heptane | U |
| Methylcyclohexane / n-Heptane | U |
| Isoparaffins + Naphthenes / Paraffins | U |
| **Diagnostic Ratios (Refining Properties)** | |
| 2,2,4-Trimethylpentane / (2,2,4-Trimethylpentane+Methylcyclohexane) | U |
| 2,2,4-Trimethylpentane / Total TMPs | U |
| nC9 / Isopropylbenzene | U |
| nC10 / 1-Methyl-2-ethylbenzene | U |
| nC11 / 1,4-Dimethyl-2-ethylbenzene | U |
| iC5 / (iC5+nC5) | U |
| (2-methylhexane + 2,3dimethylpentane) / (3-methylhexane + 2,4 | U |
| Naphthalene / (Naphthalene+nC12) | U |
| Methylcyclohexane/(Methylcyclohexane+Toluene) | U |
| Toluene/n-Octane | U |
| **Oxygenates & Other (ug/L)** | |
| Methyl-tert-butyl ether (MTBE) | U |
| Di-isopropyl ether (DIPE) | U |
| Ethyl-tert-butyl ether (ETBE) | U |
| Tert-amyl methyl ether (TAME) | U |
| MMT | U |
| **Lead Scavengers (ug/L)** | |
| 1,2-Dichloroethane (EDC) | U |
| 1,2-Dibromoethane (EDB) | U |
| **Sulfur containing HCs (ug/L)** | |
| Thiophene | U |
| 2-Methylthiophene | U |
| 3-Methylthiophene | U |
| 2-Ethylthiophene | U |
| Benzothiophene | U |
| **Relative Percentages** | |
| % Paraffinic | 0.0 |
| % Isoparaffinic | 0.0 |
| % Aromatic | 0.0 |
| % Naphthenic | 0.0 |
| % Olefinic | 0.0 |

Pace Analytical® Energy Services

**Jeff Wright**
**Weston Solutions**
**13702 Coursey Blvd**
**Baton Rouge, LA 70817**

**Lab ID:** 23733-6
**Collected:** 9/1/2017
**Received:** 9/3/2017
**Matrix:** Water

**Project:** Arkema
**Project #:** 66666
**Collected by:**

**Client ID:** HH01-01-05-170901-21
**Analyzed:** 9/6/2017
**Q Method:** 082317.M

| CONSTITUENTS | CLASS | ABBR. | ssRL ug/L | RESULT ug/L | QUALIFIER |
|---|---|---|---|---|---|
| Isopentane (2-Methylbutane) | I | IP | 10.0 | 10.0 | U |
| 1-Pentene | O | 1P | 10.0 | 10.0 | U |
| 2-Methyl-1-butene | O | 2M1B | 10.0 | 10.0 | U |
| Pentane (nC5) | P | C5 | 10.0 | 10.0 | U |
| trans-2-pentene | O | T2P | 10.0 | 10.0 | U |
| cis-2-pentene | O | C2P | 10.0 | 10.0 | U |
| 2-Methyl-2-butene (t) | O | 2M2B | 10.0 | 10.0 | U |
| 2,2-Dimethylbutane (t) | I | 22DMB | 10.0 | 10.0 | U |
| Cyclopentane | N | CYP | 10.0 | 10.0 | U |
| 2,3-Dimethylbutane | I | 23DMB | 10.0 | 10.0 | U |
| 2-Methylpentane | I | 2MP | 10.0 | 10.0 | U |
| Methyl-tert-butyl ether (MTBE) | ADD | MTBE | 10.0 | 10.0 | U |
| 3-Methylpentane | P | 3MP | 10.0 | 10.0 | U |
| 1-Hexene | O | 1HX | 10.0 | 10.0 | U |
| Hexane (nC6) | P | C6 | 10.0 | 10.0 | U |
| Di-isopropyl ether (DIPE) | ADD | DIPE | 10.0 | 10.0 | U |
| trans-2-hexene (t) | O | T2HE | 10.0 | 10.0 | U |
| 2-Methyl-2-pentene (t) | O | 2M2P | 10.0 | 10.0 | U |
| cis-2-hexene (t) | O | C2HE | 10.0 | 10.0 | U |
| cis-3-Methyl-2-pentene (t) | O | C3M2P | 10.0 | 10.0 | U |
| Ethyl-tert-butyl ether (ETBE) | ADD | ETBE | 10.0 | 10.0 | U |
| 2,2-Dimethylpentane (t) | I | 22DMP | 10.0 | 10.0 | U |
| Methylcyclopentane | N | MCYP | 10.0 | 10.0 | U |
| 2,4-Dimethylpentane | I | 24DMP | 10.0 | 10.0 | U |
| 1,2-Dichloroethane (EDC) | ADD | EDC | 10.0 | 10.0 | U |
| Benzene | A | B | 10.0 | 10.0 | U |
| 3,3-Dimethylpentane (t) | I | 33DMP | 10.0 | 10.0 | U |
| Thiophene | S | THIO | 10.0 | 10.0 | U |
| Cyclohexane | N | CYH | 10.0 | 10.0 | U |
| 2-Methylhexane | I | 2MH | 10.0 | 10.0 | U |
| 2,3-Dimethylpentane | I | 23DMP | 10.0 | 10.0 | U |
| Tert-amyl methyl ether (TAME) | ADD | TAME | 10.0 | 10.0 | U |
| 3-Methylhexane | I | 3MH | 10.0 | 10.0 | U |

Pace Analytical® Energy Services

**Jeff Wright**
**Weston Solutions**
**13702 Coursey Blvd**
**Baton Rouge, LA 70817**

**Lab ID:** 23733-6
**Collected:** 9/1/2017
**Received:** 9/3/2017
**Matrix:** Water

**Project:** Arkema
**Project #:** 66666
**Collected by:**

**Client ID:** HH01-01-05-170901-21
**Analyzed:** 9/6/2017
**Q Method:** 082317.M

| CONSTITUENTS | CLASS | ABBR. | ssRL ug/L | RESULT ug/L | QUALIFIER |
|---|---|---|---|---|---|
| trans-1,3-Dimethylcyclopentane (t) | N | T13DMCYP | 10.0 | 10.0 | U |
| cis-1,3-Dimethylcyclopentane (t) | N | C13DMCYP | 10.0 | 10.0 | U |
| trans-1,2-Dimethylcyclopentane (t) | N | T12DMCYP | 10.0 | 10.0 | U |
| 2,2,4-Trimethylpentane (isooctane) | I | 224TMP | 10.0 | 10.0 | U |
| 1-Heptene | O | 1HP | 10.0 | 10.0 | U |
| Heptane (nC7) | P | C7 | 10.0 | 10.0 | U |
| trans-2-heptene (t) | O | T2HP | 10.0 | 10.0 | U |
| Methylcyclohexane | N | MCYH | 10.0 | 10.0 | U |
| 2,5-Dimethylhexane | I | 25DMH | 10.0 | 10.0 | U |
| 2,2,3-Trimethylpentane | I | 233TMP | 10.0 | 10.0 | U |
| 2,4-Dimethylhexane | I | 24DMH | 10.0 | 10.0 | U |
| 2,3,4-Trimethylpentane | I | 234TMP | 10.0 | 10.0 | U |
| 2,3,3-Trimethylpentane | I | 233TMP | 10.0 | 10.0 | U |
| Toluene | A | T | 10.0 | 10.0 | U |
| 2-Methylthiophene | S | 2MTHIO | 10.0 | 10.0 | U |
| 2,3-Dimethylhexane | I | 23DMH | 10.0 | 10.0 | U |
| 3-Methylthiophene | S | 3MTHIO | 10.0 | 10.0 | U |
| 2-Methylheptane | I | 2MHP | 10.0 | 10.0 | U |
| 4-Methylheptane (t) | I | 4MHP | 10.0 | 10.0 | U |
| 3-Methylheptane | I | 3MHP | 10.0 | 10.0 | U |
| 3-Ethylhexane | I | 3EHX | 10.0 | 10.0 | U |
| 1,2-Dibromoethane (EDB) | ADD | EDB | 10.0 | 10.0 | U |
| 1-Octene | O | 1O | 10.0 | 10.0 | U |
| Octane (nC8) | P | C8 | 10.0 | 10.0 | U |
| 2,4-Dimethylheptane (t) | I | 24DMHP | 10.0 | 10.0 | U |
| 2,5-Dimethylheptane (t) | I | 25DMHP | 10.0 | 10.0 | U |
| Ethylbenzene | A | EB | 10.0 | 10.0 | U |
| 2-Ethylthiophene | S | 2ETHIO | 10.0 | 10.0 | U |
| 2,3-Dimethylheptane (t) | I | 23DMHP | 10.0 | 10.0 | U |
| m-Xylene | A | MX | 10.0 | 10.0 | U |
| p-Xylene | A | PX | 10.0 | 10.0 | U |
| 4-Methyloctane (t) | I | 4MO | 10.0 | 10.0 | U |
| 2-Methyloctane (t) | I | 2MO | 10.0 | 10.0 | U |

Pace Analytical® Energy Services

| | | | |
|---|---|---|---|
| **Jeff Wright** | | **Lab ID:** | **23733-6** |
| **Weston Solutions** | | **Collected:** | **9/1/2017** |
| **13702 Coursey Blvd** | | **Received:** | **9/3/2017** |
| **Baton Rouge, LA 70817** | | **Matrix:** | **Water** |
| **Project:** | **Arkema** | **Client ID:** | **HH01-01-05-170901-21** |
| **Project #:** | **66666** | **Analyzed:** | **9/6/2017** |
| **Collected by:** | | **Q Method:** | **082317.M** |

| CONSTITUENTS | CLASS | ABBR. | ssRL ug/L | RESULT ug/L | QUALIFIER |
|---|---|---|---|---|---|
| 3-Methyloctane (t) | I | 3MO | 10.0 | 10.0 | U |
| Styrene | A | STRE | 10.0 | 10.0 | U |
| o-Xylene | A | OX | 10.0 | 10.0 | U |
| 1-Nonene | O | 1N | 10.0 | 10.0 | U |
| Nonane (nC9) | P | C9 | 10.0 | 10.0 | U |
| Isopropylbenzene (cumene) | A | IPROPB | 10.0 | 10.0 | U |
| n-Propylbenzene | A | NPRPPB | 10.0 | 10.0 | U |
| 1-Methyl-3-ethylbenzene | A | 1M3EB | 10.0 | 10.0 | U |
| 1-Methyl-4-ethylbenzene | A | 1M4EB | 10.0 | 10.0 | U |
| 1,3,5-Trimethylbenzene (mesitylene) | A | 135TMB | 10.0 | 10.0 | U |
| 1-Methyl-2-ethylbenzene | A | 1M2EB | 10.0 | 10.0 | U |
| 1,2,4-Trimethylbenzene | A | 124TMB | 10.0 | 10.0 | U |
| 1-Decene | O | 1D | 10.0 | 10.0 | U |
| Decane (nC10) | P | C10 | 10.0 | 10.0 | U |
| sec-Butylbenzene | A | SBUB | 10.0 | 10.0 | U |
| 1-Methyl-3-isopropylbenzene (m-cymene) | A | 1M3IPROPE | 10.0 | 10.0 | U |
| 1-Methyl-4-isopropylbenzene (p-cymene) | A | 1M4IPROPE | 10.0 | 10.0 | U |
| Indane | A | IA | 10.0 | 10.0 | U |
| Indene | A | IE | 10.0 | 10.0 | U |
| 1-Methyl-2-isopropybenzene (o-cymene) | A | 1M2IPROPE | 10.0 | 10.0 | U |
| 1-Methyl-3-propylbenzene | A | 1M3PROPB | 10.0 | 10.0 | U |
| 1-Methyl-4-propylbenzene | A | 1M4PROPB | 10.0 | 10.0 | U |
| n-Butylbenzene | A | NBB | 10.0 | 10.0 | U |
| 1,3-Dimethyl-5-ethylbenzene | A | 13DM5EB | 10.0 | 10.0 | U |
| 1,2,diethylbenzene | A | 12DEB | 10.0 | 10.0 | U |
| 1-Methyl-2-propylbenzene | A | 1M2PROPB | 10.0 | 10.0 | U |
| 1,4-Dimethyl-2-ethylbenzene | A | 14DM2EB | 10.0 | 10.0 | U |
| 1,3-Dimethyl-4-ethylbenzene | A | 13DM4EB | 10.0 | 10.0 | U |
| 1,2-Dimethyl-4-ethylbenzene | A | 12DM4EB | 10.0 | 10.0 | U |
| 1,3-Dimethyl-2-ethylbenzene | A | 13DM2EB | 10.0 | 10.0 | U |
| 1,2-Dimethyl-3-ethylbenzene | A | 12DM3EB | 10.0 | 10.0 | U |
| Undecane (nC11) | P | C11 | 10.0 | 10.0 | U |
| 1,2,4,5-Tetramethylbenzene | A | 1245TMB | 10.0 | 10.0 | U |

Pace Analytical® Energy Services

| | | | |
|---|---|---|---|
| **Jeff Wright** | | **Lab ID:** | **23733-6** |
| **Weston Solutions** | | **Collected:** | **9/1/2017** |
| **13702 Coursey Blvd** | | **Received:** | **9/3/2017** |
| **Baton Rouge, LA 70817** | | **Matrix:** | **Water** |
| **Project:** | **Arkema** | **Client ID:** | **HH01-01-05-170901-21** |
| **Project #:** | **66666** | **Analyzed:** | **9/6/2017** |
| **Collected by:** | | **Q Method:** | **082317.M** |

| CONSTITUENTS | CLASS | ABBR. | ssRL ug/L | RESULT ug/L | QUALIFIER |
|---|---|---|---|---|---|
| 1,2,3,5-Tetramethylbenzene (t) | A | 1235TMB | 10.0 | 10.0 | U |
| n-Pentylbenzene | A | NPYB | 10.0 | 10.0 | U |
| Naphthalene | A | N | 10.0 | 10.0 | U |
| Benzothiophene | S | BTHIO | 10.0 | 10.0 | U |
| Dodecane (nC12) | P | C12 | 10.0 | 10.0 | U |
| 1,2,3,4-Tetramethylbenzene (t) | A | 1234TMB | 10.0 | 10.0 | U |
| MMT | ADD | MMT | 10.0 | 10.0 | U |
| 2-Methylnaphthalene | A | 2MN | 10.0 | 10.0 | U |
| 1-Methylnaphthalene | A | 1MN | 10.0 | 10.0 | U |

| | | |
|---|---|---|
| 1,2-Dichloroethane-d4 (RS) | 83.85 | % |
| Toluene-d8 (RS) | 113.37 | % |
| p-Bromofluorobenzene (RS) | 89.77 | % |

**ssRL - Sample Specific Reporting Limit**
**Results listed as U would have been reported if present at or above the listed ssRL**
**J - Values greater than the ssRL but less than the PQL (3 x ssRL).**
**D - Secondary dilution perfomed**
**Q - Surrogate recovery limit exceedance**
**I - Matrix Interference**
**NC - Not calibrated**
**Note: Extracted by EPA 5030 (Purge and Trap).**

**US631**

**090417-WATER6.D & dilution**
**090417-WATER6.D**

**Submitted by,**
**Pace Energy Services, LLC**

| PAES ID | 23733-6 |
|---|---|
| **Sample ID** | **HH01-01-05-170901-21** |
| **Evaporation** | |
| n-Pentane / (n-Pentane+n-Heptane) | U |
| 2-Methylpentane / (2-Methylpentane+2-Methylheptane) | U |
| **Waterwashing** | |
| Benzene / (Benzene+Cyclohexane) | U |
| Toluene / (Toluene+Methylcyclohexane) | U |
| Aromatics / Total Paraffins (n+iso+cyc) | U |
| Aromatics / Naphthenes | U |
| wt% < o-xylene | U |
| **Biodegradation** | |
| (C4-C8 Para +Isopara) / C4-C8 Olefins | U |
| 3-Methylhexane / n-Heptane | U |
| Methylcyclohexane / n-Heptane | U |
| Isoparaffins + Naphthenes / Paraffins | U |
| **Diagnostic Ratios (Refining Properties)** | |
| 2,2,4-Trimethylpentane / (2,2,4-Trimethylpentane+Methylcyclohexane) | U |
| 2,2,4-Trimethylpentane / Total TMPs | U |
| nC9 / Isopropylbenzene | U |
| nC10 / 1-Methyl-2-ethylbenzene | U |
| nC11 / 1,4-Dimethyl-2-ethylbenzene | U |
| iC5 / (iC5+nC5) | U |
| (2-methylhexane + 2,3dimethylpentane) / (3-methylhexane + 2,4 | U |
| Naphthalene / (Naphthalene+nC12) | U |
| Methylcyclohexane/(Methylcyclohexane+Toluene) | U |
| Toluene/n-Octane | U |
| **Oxygenates & Other (ug/L)** | |
| Methyl-tert-butyl ether (MTBE) | U |
| Di-isopropyl ether (DIPE) | U |
| Ethyl-tert-butyl ether (ETBE) | U |
| Tert-amyl methyl ether (TAME) | U |
| MMT | U |
| **Lead Scavengers (ug/L)** | |
| 1,2-Dichloroethane (EDC) | U |
| 1,2-Dibromoethane (EDB) | U |
| **Sulfur containing HCs (ug/L)** | |
| Thiophene | U |
| 2-Methylthiophene | U |
| 3-Methylthiophene | U |
| 2-Ethylthiophene | U |
| Benzothiophene | U |
| **Relative Percentages** | |
| % Paraffinic | 0.0 |
| % Isoparaffinic | 0.0 |
| % Aromatic | 0.0 |
| % Naphthenic | 0.0 |
| % Olefinic | 0.0 |

**Supporting Quality Control Results**

Pace Analytical® Energy Services™

| | | | |
|---|---|---|---|
| **Jeff Wright** | | **Lab ID:** | **090417-BLK.D** |
| **Weston Solutions** | | **Collected:** | |
| **13702 Coursey Blvd** | | **Received:** | |
| **Baton Rouge, LA 70817** | | **Matrix:** | **Water** |
| **Project:** | **Arkema** | **QC type:** | **Method Blank** |
| **Project #:** | **66666** | **Analyzed:** | **9/5/2017** |
| **Collected by:** | | **Q Method:** | **082317.M** |

| CONSTITUENTS | ssRL ug/L | RESULT ug/L | QUAL |
|---|---|---|---|
| Isopentane (2-Methylbutane) | 0.5 | 0.6 | |
| 1-Pentene | 0.5 | 0.5 | U |
| 2-Methyl-1-butene | 0.5 | 0.5 | U |
| Pentane (nC5) | 0.5 | 0.5 | U |
| trans-2-pentene | 0.5 | 0.5 | U |
| cis-2-pentene | 0.5 | 0.5 | U |
| 2-Methyl-2-butene (t) | 0.5 | 0.5 | U |
| 2,2-Dimethylbutane (t) | 0.5 | 0.5 | U |
| Cyclopentane | 0.5 | 0.5 | U |
| 2,3-Dimethylbutane | 0.5 | 0.5 | U |
| 2-Methylpentane | 0.5 | 0.5 | U |
| Methyl-tert-butyl ether (MTBE) | 0.5 | 0.5 | U |
| 3-Methylpentane | 0.5 | 0.5 | U |
| 1-Hexene | 0.5 | 0.5 | U |
| Hexane (nC6) | 0.5 | 0.5 | U |
| Di-isopropyl ether (DIPE) | 0.5 | 0.5 | U |
| trans-2-hexene (t) | 0.5 | 0.5 | U |
| 2-Methyl-2-pentene (t) | 0.5 | 0.5 | U |
| cis-2-hexene (t) | 0.5 | 0.5 | U |
| cis-3-Methyl-2-pentene (t) | 0.5 | 0.5 | U |
| Ethyl-tert-butyl ether (ETBE) | 0.5 | 0.5 | U |
| 2,2-Dimethylpentane (t) | 0.5 | 0.5 | U |
| Methylcyclopentane | 0.5 | 0.5 | U |
| 2,4-Dimethylpentane | 0.5 | 0.5 | U |
| 1,2-Dichloroethane (EDC) | 0.5 | 0.5 | U |
| Benzene | 0.5 | 0.5 | U |
| 3,3-Dimethylpentane (t) | 0.5 | 0.5 | U |
| Thiophene | 0.5 | 0.5 | U |
| Cyclohexane | 0.5 | 0.5 | U |
| 2-Methylhexane | 0.5 | 0.5 | U |
| 2,3-Dimethylpentane | 0.5 | 0.5 | U |
| Tert-amyl methyl ether (TAME) | 0.5 | 0.5 | U |

| | | | |
|---|---|---|---|
| **Jeff Wright** | | **Lab ID:** | **090417-BLK.D** |
| **Weston Solutions** | | **Collected:** | |
| **13702 Coursey Blvd** | | **Received:** | |
| **Baton Rouge, LA 70817** | | **Matrix:** | **Water** |
| **Project:** | **Arkema** | **QC type:** | **Method Blank** |
| **Project #:** | **66666** | **Analyzed:** | **9/5/2017** |
| **Collected by:** | | **Q Method:** | **082317.M** |

| CONSTITUENTS | ssRL ug/L | RESULT ug/L | QUAL |
|---|---|---|---|
| 3-Methylhexane | 0.5 | 0.5 | U |
| trans-1,3-Dimethylcyclopentane (t) | 0.5 | 0.5 | U |
| cis-1,3-Dimethylcyclopentane (t) | 0.5 | 0.5 | U |
| trans-1,2-Dimethylcyclopentane (t) | 0.5 | 0.5 | U |
| 2,2,4-Trimethylpentane (isooctane) | 0.5 | 0.5 | U |
| 1-Heptene | 0.5 | 0.5 | U |
| Heptane (nC7) | 0.5 | 0.5 | U |
| trans-2-heptene (t) | 0.5 | 0.5 | U |
| Methylcyclohexane | 0.5 | 0.5 | U |
| 2,5-Dimethylhexane | 0.5 | 0.5 | U |
| 2,2,3-Trimethylpentane | 0.5 | 0.5 | U |
| 2,4-Dimethylhexane | 0.5 | 0.5 | U |
| 2,3,4-Trimethylpentane | 0.5 | 0.5 | U |
| 2,3,3-Trimethylpentane | 0.5 | 0.5 | U |
| Toluene | 0.5 | 0.5 | U |
| 2-Methylthiophene | 0.5 | 0.5 | U |
| 2,3-Dimethylhexane | 0.5 | 0.5 | U |
| 3-Methylthiophene | 0.5 | 0.5 | U |
| 2-Methylheptane | 0.5 | 0.5 | U |
| 4-Methylheptane (t) | 0.5 | 0.5 | U |
| 3-Methylheptane | 0.5 | 0.5 | U |
| 3-Ethylhexane | 0.5 | 0.5 | U |
| 1,2-Dibromoethane (EDB) | 0.5 | 0.5 | U |
| 1-Octene | 0.5 | 0.5 | U |
| Octane (nC8) | 0.5 | 0.5 | U |
| 2,4-Dimethylheptane (t) | 0.5 | 0.5 | U |
| 2,5-Dimethylheptane (t) | 0.5 | 0.5 | U |
| Ethylbenzene | 0.5 | 0.5 | U |
| 2-Ethylthiophene | 0.5 | 0.5 | U |
| 2,3-Dimethylheptane (t) | 0.5 | 0.5 | U |
| m-Xylene | 0.5 | 0.5 | U |
| p-Xylene | 0.5 | 0.5 | U |

| | | | |
|---|---|---|---|
| **Jeff Wright** | | **Lab ID:** | **090417-BLK.D** |
| **Weston Solutions** | | **Collected:** | |
| **13702 Coursey Blvd** | | **Received:** | |
| **Baton Rouge, LA 70817** | | **Matrix:** | **Water** |
| **Project:** | **Arkema** | **QC type:** | **Method Blank** |
| **Project #:** | **66666** | **Analyzed:** | **9/5/2017** |
| **Collected by:** | | **Q Method:** | **082317.M** |

| CONSTITUENTS | ssRL ug/L | RESULT ug/L | QUAL |
|---|---|---|---|
| 4-Methyloctane (t) | 0.5 | 0.5 | U |
| 2-Methyloctane (t) | 0.5 | 0.5 | U |
| 3-Methyloctane (t) | 0.5 | 0.5 | U |
| Styrene | 0.5 | 0.5 | U |
| o-Xylene | 0.5 | 0.5 | U |
| 1-Nonene | 0.5 | 0.5 | U |
| Nonane (nC9) | 0.5 | 0.5 | U |
| Isopropylbenzene (cumene) | 0.5 | 0.5 | U |
| n-Propylbenzene | 0.5 | 0.5 | U |
| 1-Methyl-3-ethylbenzene | 0.5 | 0.5 | U |
| 1-Methyl-4-ethylbenzene | 0.5 | 0.5 | U |
| 1,3,5-Trimethylbenzene (mesitylene) | 0.5 | 0.5 | U |
| 1-Methyl-2-ethylbenzene | 0.5 | 0.5 | U |
| 1,2,4-Trimethylbenzene | 0.5 | 0.5 | U |
| 1-Decene | 0.5 | 0.5 | U |
| Decane (nC10) | 0.5 | 0.5 | U |
| sec-Butylbenzene | 0.5 | 0.5 | U |
| 1-Methyl-3-isopropylbenzene (m-cymene) | 0.5 | 0.5 | U |
| 1-Methyl-4-isopropylbenzene (p-cymene) | 0.5 | 0.5 | U |
| Indane | 0.5 | 0.5 | U |
| Indene | 0.5 | 0.5 | U |
| 1-Methyl-2-isopropybenzene (o-cymene) | 0.5 | 0.5 | U |
| 1-Methyl-3-propylbenzene | 0.5 | 0.5 | U |
| 1-Methyl-4-propylbenzene | 0.5 | 0.5 | U |
| n-Butylbenzene | 0.5 | 0.5 | U |
| 1,3-Dimethyl-5-ethylbenzene | 0.5 | 0.5 | U |
| 1,2,diethylbenzene | 0.5 | 0.5 | U |
| 1-Methyl-2-propylbenzene | 0.5 | 0.5 | U |
| 1,4-Dimethyl-2-ethylbenzene | 0.5 | 0.5 | U |
| 1,3-Dimethyl-4-ethylbenzene | 0.5 | 0.5 | U |
| 1,2-Dimethyl-4-ethylbenzene | 0.5 | 0.5 | U |
| 1,3-Dimethyl-2-ethylbenzene | 0.5 | 0.5 | U |

| | | | |
|---|---|---|---|
| **Jeff Wright** | | **Lab ID:** | **090417-BLK.D** |
| **Weston Solutions** | | **Collected:** | |
| **13702 Coursey Blvd** | | **Received:** | |
| **Baton Rouge, LA 70817** | | **Matrix:** | **Water** |
| **Project:** | **Arkema** | **QC type:** | **Method Blank** |
| **Project #:** | **66666** | **Analyzed:** | **9/5/2017** |
| **Collected by:** | | **Q Method:** | **082317.M** |

| CONSTITUENTS | ssRL ug/L | RESULT ug/L | QUAL |
|---|---|---|---|
| 1,2-Dimethyl-3-ethylbenzene | 0.5 | 0.5 | U |
| Undecane (nC11) | 0.5 | 0.5 | U |
| 1,2,4,5-Tetramethylbenzene | 0.5 | 0.5 | U |
| 1,2,3,5-Tetramethylbenzene (t) | 0.5 | 0.5 | U |
| n-Pentylbenzene | 0.5 | 0.5 | U |
| Naphthalene | 0.5 | 0.5 | U |
| Benzothiophene | 0.5 | 0.5 | U |
| Dodecane (nC12) | 0.5 | 0.5 | U |
| 1,2,3,4-Tetramethylbenzene (t) | 0.5 | 0.5 | U |
| MMT | 0.5 | 0.5 | U |
| 2-Methylnaphthalene | 0.5 | 0.5 | U |
| 1-Methylnaphthalene | 0.5 | 0.5 | U |
| | | | |
| 1,2-Dichloroethane-d4 (RS) % | | 90 | |
| Toluene-d8 (RS) % | | 108 | |
| p-Bromofluorobenzene (RS) % | | 87 | |

**ssRL - Sample Specific Reporting Limit**
**Results listed as U would have been reported if present at or above the listed ssRL**
**B - Exceeds PQL - 3 x ssRL**
**Q - Surrogate recovery limit exceedance**
**NC - Not calibrated**
**J - Values greater than the ssRL but less than the PQL.**
**Note: Extracted by EPA 5030 (Purge and Trap).**

**US631**
**090417-BLK.D**

**Submitted by,**
**Pace Energy Services, LLC**

Pace Analytical® Energy Services

| | | | |
|---|---|---|---|
| **Jeff Wright** | | **Lab ID:** | **090417-25LCS.D** |
| **Weston Solutions** | | **Collected:** | |
| **13702 Coursey Blvd** | | **Received:** | |
| **Baton Rouge, LA 70817** | | **Matrix:** | **Water** |
| **Project:** | **Arkema** | **QC type:** | **LCS** |
| **Project #:** | **66666** | **Analyzed:** | **9/5/2017** |
| **Collected by:** | | **Q Method:** | **082317.M** |

| CONSTITUENTS | RESULT ug/L | Recovery % | Spike Conc. ug/L | QUAL |
|---|---|---|---|---|
| 1-Pentene | 33.0 | 132.1 | 25.0 | |
| Pentane (nC5) | 33.0 | 132.1 | 25.0 | |
| Cyclopentane | 11.5 | 46.1 | 25.0 | LQ |
| 1-Hexene | 21.6 | 86.2 | 25.0 | |
| Hexane (nC6) | 17.0 | 68.1 | 25.0 | |
| Di-isopropyl ether (DIPE) | 20.5 | 82.1 | 25.0 | |
| Ethyl-tert-butyl ether (ETBE) | 17.7 | 70.8 | 25.0 | |
| 2,4-Dimethylpentane | 21.0 | 83.8 | 25.0 | |
| Benzene | 18.2 | 72.9 | 25.0 | |
| Cyclohexane | 19.0 | 75.9 | 25.0 | |
| Tert-amyl methyl ether (TAME) | 17.2 | 68.6 | 25.0 | |
| 2,2,4-Trimethylpentane (isooctane) | 18.6 | 74.2 | 25.0 | |
| Heptane (nC7) | 24.4 | 97.5 | 25.0 | |
| Toluene | 21.8 | 87.0 | 25.0 | |
| Octane (nC8) | 19.6 | 78.6 | 25.0 | |
| Ethylbenzene | 21.6 | 86.5 | 25.0 | |
| m-Xylene | 21.1 | 84.5 | 25.0 | |
| p-Xylene | 21.2 | 84.7 | 25.0 | |
| o-Xylene | 20.5 | 81.8 | 25.0 | |
| Nonane (nC9) | 18.3 | 73.1 | 25.0 | |
| n-Propylbenzene | 21.3 | 85.0 | 25.0 | |
| 1,3,5-Trimethylbenzene (mesitylene) | 19.5 | 78.2 | 25.0 | |
| 1-Decene | 16.8 | 67.0 | 25.0 | |
| Decane (nC10) | 25.8 | 103.2 | 25.0 | |
| n-Butylbenzene | 19.8 | 79.1 | 25.0 | |
| n-Pentylbenzene | 16.1 | 64.6 | 25.0 | |
| Dodecane (nC12) | 250.6 | 400.9 | 62.5 | LQ |
| 1,2-Dichloroethane-d4 (RS) | | 93 | | |
| Toluene-d8 (RS) | | 109 | | |
| p-Bromofluorobenzene (RS) | | 89 | | |

**ssRL - Sample Specific Reporting Limit**
**Q - Surrogate recovery limit exceedance**
**I - Matrix Interference**
**NC - Not calibrated**
**LQ - Percent difference exceedance (50 - 140)**
**Note: Extracted by EPA 5030 (Purge and Trap).**

**US631**
**090417-25LCS.D**

**Submitted by,**
**Pace Energy Services, LLC**

Pace Analytical Energy Services

| | | | |
|---|---|---|---|
| **Jeff Wright** | | **Lab ID:** | **090417-25LCSD.D** |
| **Weston Solutions** | | **Collected:** | |
| **13702 Coursey Blvd** | | **Received:** | |
| **Baton Rouge, LA 70817** | | **Matrix:** | **Water** |
| **Project:** | **Arkema** | **QC type:** | **LCSD** |
| **Project #:** | **66666** | **Analyzed:** | **9/5/2017** |
| **Collected by:** | | **Q Method:** | **082317.M** |

| CONSTITUENTS | RESULT ug/L | Recovery % | Spike Conc. ug/L | RPD % | QUAL |
|---|---|---|---|---|---|
| 1-Pentene | 31.0 | 124.0 | 25.0 | 6.3 | |
| Pentane (nC5) | 30.8 | 123.3 | 25.0 | 6.9 | |
| Cyclopentane | 10.3 | 41.2 | 25.0 | 11.3 | |
| 1-Hexene | 19.4 | 77.6 | 25.0 | 10.5 | |
| Hexane (nC6) | 16.3 | 65.1 | 25.0 | 4.4 | |
| Di-isopropyl ether (DIPE) | 20.5 | 82.2 | 25.0 | 0.1 | |
| Ethyl-tert-butyl ether (ETBE) | 17.5 | 70.1 | 25.0 | 1.0 | |
| 2,4-Dimethylpentane | 18.7 | 74.6 | 25.0 | 11.6 | |
| Benzene | 16.5 | 66.0 | 25.0 | 9.8 | |
| Cyclohexane | 16.6 | 66.3 | 25.0 | 13.4 | |
| Tert-amyl methyl ether (TAME) | 16.1 | 64.3 | 25.0 | 6.5 | |
| 2,2,4-Trimethylpentane (isooctane) | 17.4 | 69.4 | 25.0 | 6.7 | |
| Heptane (nC7) | 23.4 | 93.4 | 25.0 | 4.3 | |
| Toluene | 21.2 | 84.7 | 25.0 | 2.7 | |
| Octane (nC8) | 20.2 | 80.6 | 25.0 | 2.6 | |
| Ethylbenzene | 20.8 | 83.2 | 25.0 | 3.9 | |
| m-Xylene | 21.3 | 85.2 | 25.0 | 0.9 | |
| p-Xylene | 19.9 | 79.5 | 25.0 | 6.3 | |
| o-Xylene | 20.4 | 81.5 | 25.0 | 0.3 | |
| Nonane (nC9) | 19.8 | 79.3 | 25.0 | 8.1 | |
| n-Propylbenzene | 21.4 | 85.4 | 25.0 | 0.5 | |
| 1,3,5-Trimethylbenzene (mesitylene) | 19.7 | 78.8 | 25.0 | 0.9 | |
| 1-Decene | 18.5 | 73.9 | 25.0 | 9.8 | |
| Decane (nC10) | 23.4 | 93.6 | 25.0 | 9.7 | |
| n-Butylbenzene | 18.0 | 72.0 | 25.0 | 9.4 | |
| n-Pentylbenzene | 16.2 | 64.7 | 25.0 | 0.2 | |
| Dodecane (nC12) | 261.1 | 417.8 | 62.5 | 4.1 | |
| 1,2-Dichloroethane-d4 (RS) | | 87 | | | |
| Toluene-d8 (RS) | | 115 | | | |
| p-Bromofluorobenzene (RS) | | 99 | | | |

**ssRL - Sample Specific Reporting Limit**
**Q - Surrogate recovery limit exceedance**
**I - Matrix Interference**

**NC - Not calibrated**
**RQ - Percent difference exceeded (15)**
**LQ - Percent difference exceedance (50 - 140)**
**Note: Extracted by EPA 5030 (Purge and Trap).**

**US631**
**090417-25LCSD.D**

**Submitted by,**
**Pace Energy Services, LLC**

Pace Analytical® Energy Services™

**Jeff Wright**
**Weston Solutions**
**13702 Coursey Blvd**
**Baton Rouge, LA 70817**

**Lab ID:** 23733
**Collected:**
**Received:**
**Matrix:** Product/Soil

**Project:** Arkema
**Project #:** 66666
**Collected by:**

**QC type:** NIST SRM 2295
**Analyzed:**
**Q Method:** 082317.M

| CONSTITUENTS | RESULT mg/kg | ssRL mg/kg | D Flag | NIST Result mg/kg | Passing Diff. % | Actual Diff. % | QUAL |
|---|---|---|---|---|---|---|---|
| 1-Pentene | 5740.9 | 55.6 | | 7400.0 | 40 | 25.3 | |
| Pentane (nC5) | 40416.2 | 277.8 | D | 35700.0 | 40 | 12.4 | |
| Methyl-tert-butyl ether (MTBE) | 104098.9 | 277.8 | D | 145400.0 | 40 | 33.1 | |
| Hexane (nC6) | 32010.0 | 277.8 | D | 37000.0 | 40 | 14.5 | |
| 2,4-Dimethylpentane | 77415.6 | 277.8 | D | 79000.0 | 40 | 2.0 | |
| Benzene | 7988.9 | 55.6 | | 9900.0 | 40 | 21.4 | |
| Thiophene | 234.6 | 55.6 | | 260.0 | 40 | 10.3 | |
| Cyclohexane | 76141.7 | 277.8 | D | 88400.0 | 40 | 14.9 | |
| 2,2,4-Trimethylpentane (isoocta | 100187.8 | 277.8 | D | 118000.0 | 40 | 16.3 | |
| 1-Heptene | 18507.4 | 277.8 | D | 15000.0 | 40 | 20.9 | |
| Heptane (nC7) | 81577.2 | 277.8 | D | 77700.0 | 40 | 4.9 | |
| Toluene | 64436.7 | 277.8 | D | 78900.0 | 40 | 20.2 | |
| 3-Methylthiophene | 326.7 | 55.6 | | 300.0 | 40 | 8.5 | |
| Octane (nC8) | 65773.3 | 277.8 | D | 79800.0 | 40 | 19.3 | |
| Ethylbenzene | 18655.2 | 277.8 | D | 19600.0 | 40 | 4.9 | |
| m,p-Xylenes | 53991.2 | 555.6 | D | 58700.0 | 40 | 8.4 | |
| o-Xylene | 19270.9 | 277.8 | D | 19700.0 | 40 | 2.2 | |
| 1,3,5-Trimethylbenzene (mesityl | 18168.3 | 277.8 | D | 19700.0 | 40 | 8.1 | |
| 1,2,4-Trimethylbenzene | 18218.7 | 277.8 | D | 20010.0 | 40 | 9.4 | |
| Decane (nC10) | 26996.6 | 277.8 | D | 41400.0 | 40 | 42.1 | SQ |
| 1,2,4,5-Tetramethylbenzene | 8496.6 | 55.6 | | 9600.0 | 40 | 12.2 | |
| Naphthalene | 8058.2 | 55.6 | | 11500.0 | 40 | 35.2 | |
| Benzothiophene | 336.2 | 55.6 | | 440.0 | 40 | 26.8 | |

| | |
|---|---|
| 1,2-Dichloroethane-d4 (RS) % | 102 |
| Toluene-d8 (RS) % | 108 |
| p-Bromofluorobenzene (RS) % | 99 |

**ssRL - Sample Specific Reporting Limit**
**D - Secondary dilution perfomed**
**Q - Surrogate recovery limit exceedance**
**SQ - SRM percent difference exceeded**
**I - Matrix Interference**
**NC - Not calibrated**
**Note: Extracted by EPA 5030 (Purge and Trap).**

**US631**
**FALSE**

**Submitted by,**
**Pace Energy Services, LLC**

Pace Analytical®
Energy Services™

**(C8-C40) Qualitative Molecular Characterization**
**by GC/MS - full scan mode**
***TIC, n-Alkanes, Iso-Alkanes, Isoprenoids, Alkylcyclohexanes,***
***C4-monoaromatics, Bicyclanes, Terpanes, Steranes***

Pace Analytical®
Energy Services™

**C8-C40 - Qualitative Hydrocarbons Characterization**
**by GC/MS - full scan mode**

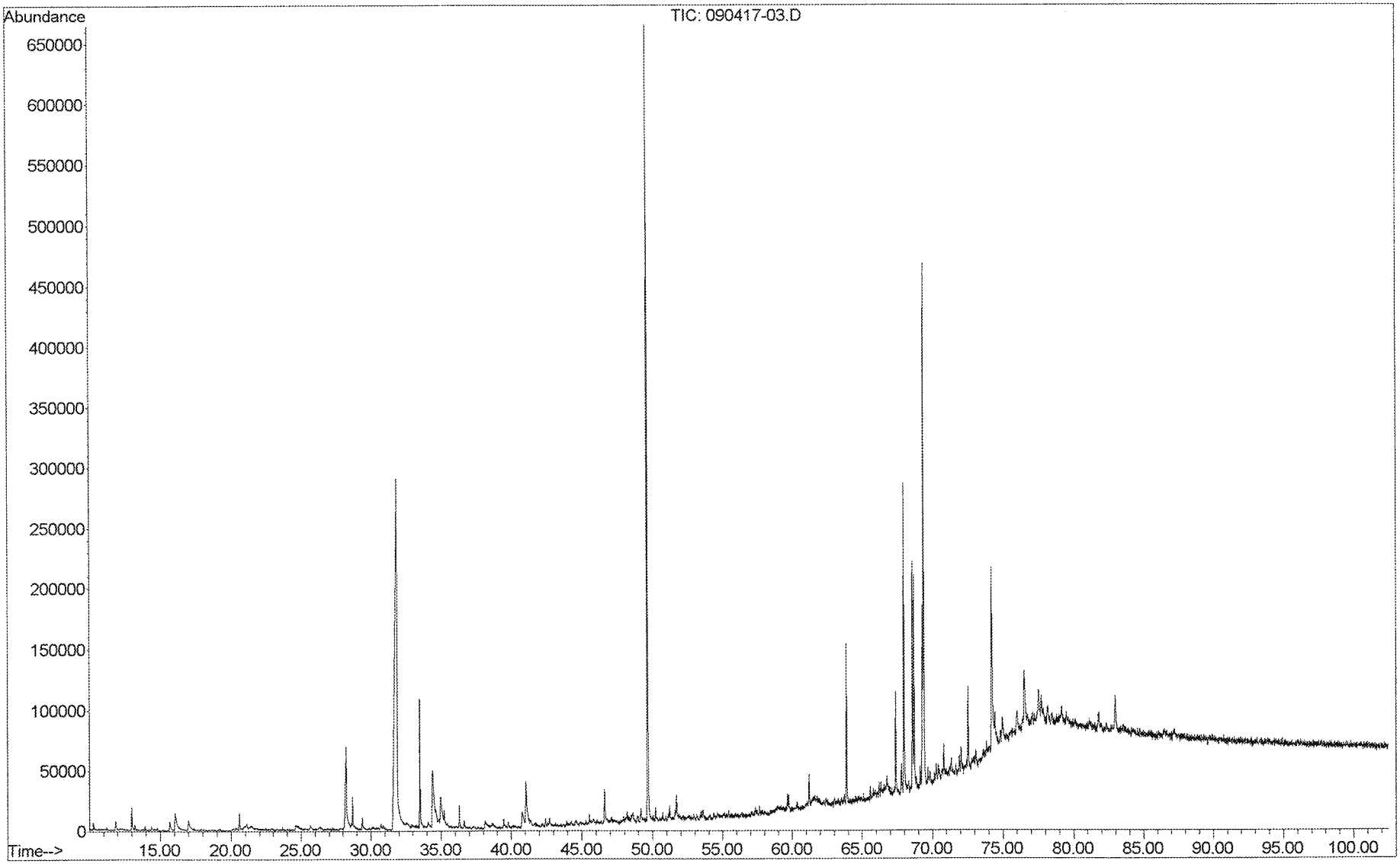
**Mass Chromatograms**

| ION (m/z) | COMPOUND CLASS |
|---|---|
| TIC | All Compounds |
| 85 | n-Alkanes (Paraffins) |
| 113 | Iso-Alkanes (Isoparaffins) & Isoprenoids |
| 83 | Alkylcyclohexanes |
| 134 | $C_4$-benzenes (monoaromatics) |
| 123 | Bicyclanes |
| 191 | Terpanes |
| 217 | Steranes |
| Bar Diagram | Monoaromatic and Polyaromatic Hydrocarbon Distribution |

**note: Chromatograms and data follow this cover page.**

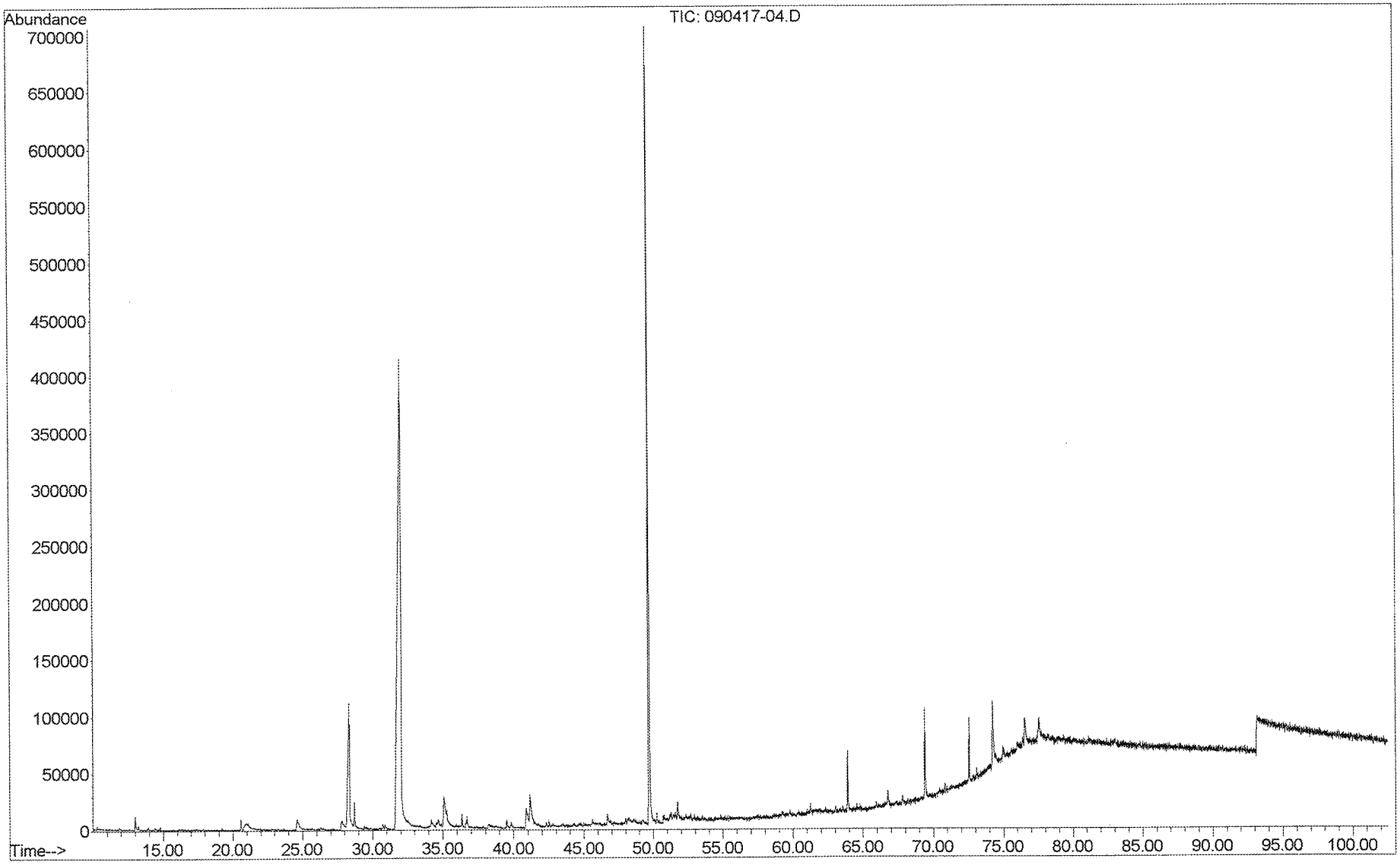
**Submitted by,**
**Pace Analytical Energy Services**

Sample Name: 23733-1 [HH01-01-01-170901-21]
Misc Info : 770mL->1mL



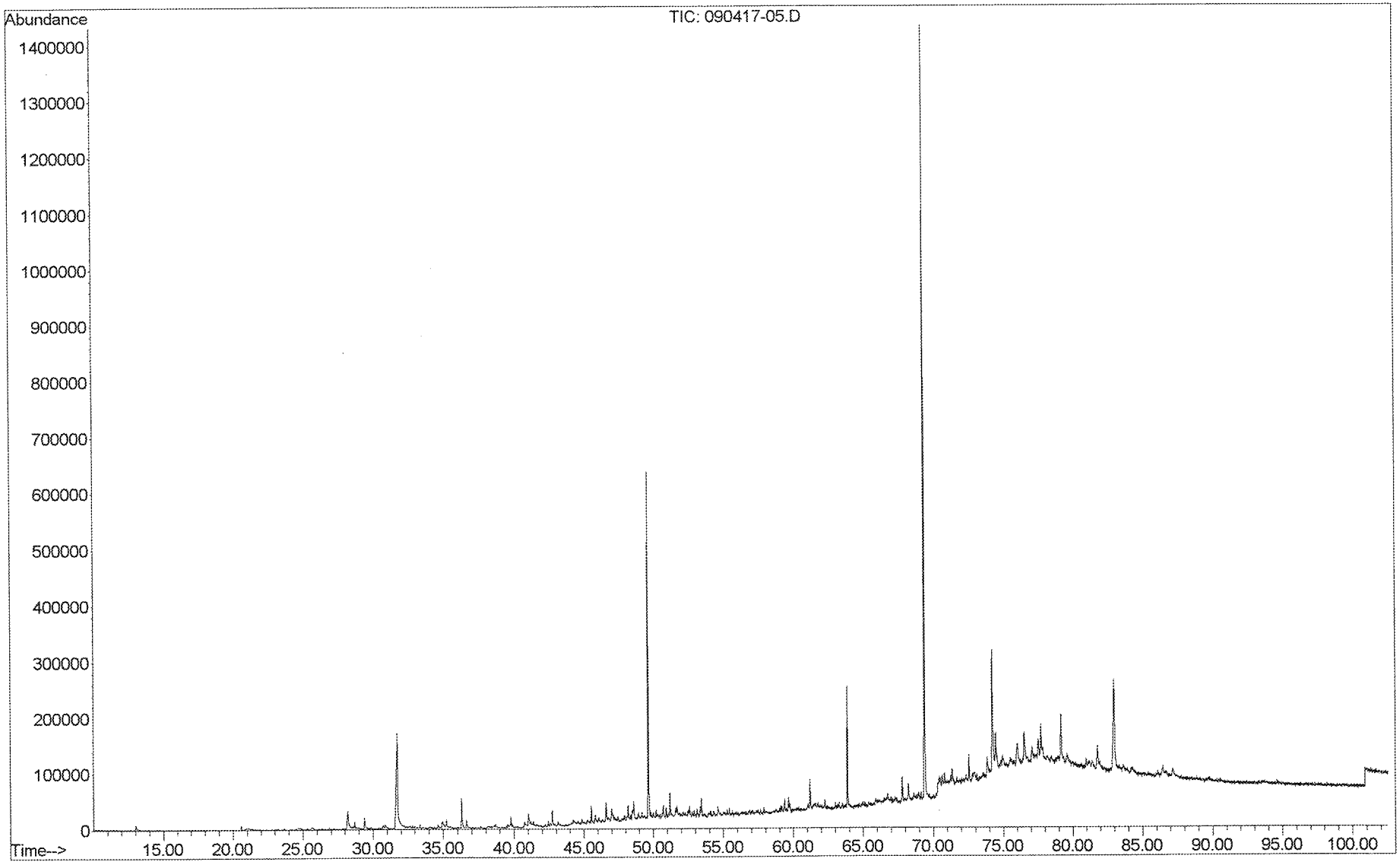

ED_004042_00000842-00043

Sample Name: 23733-2 [HH01-01-02-170901-21]
Misc Info : 950mL->1mL



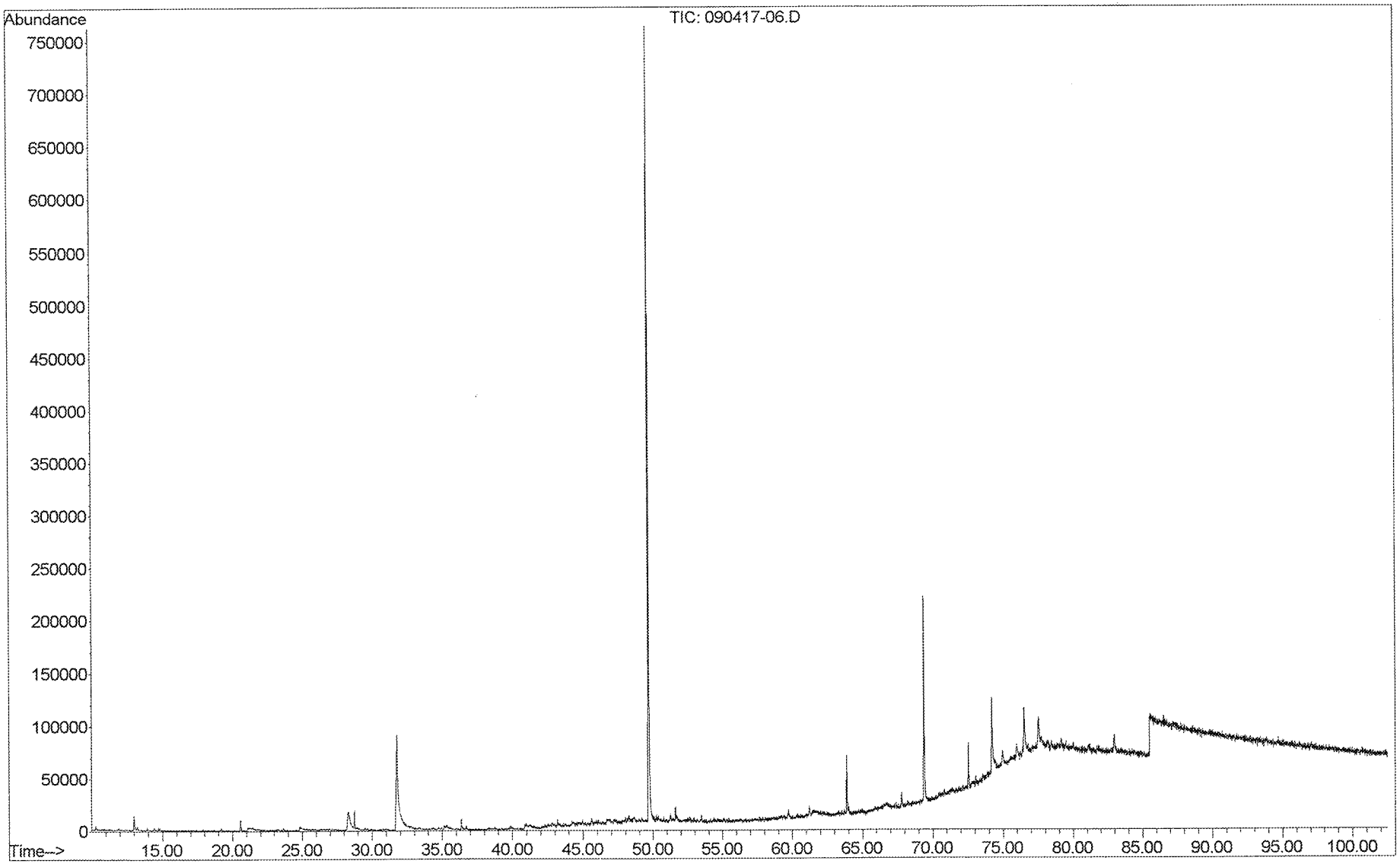

ED_004042_00000842-00044

Sample Name: 23733-3 [HH01-01-03-170901-21]
Misc Info : 910mL->1mL



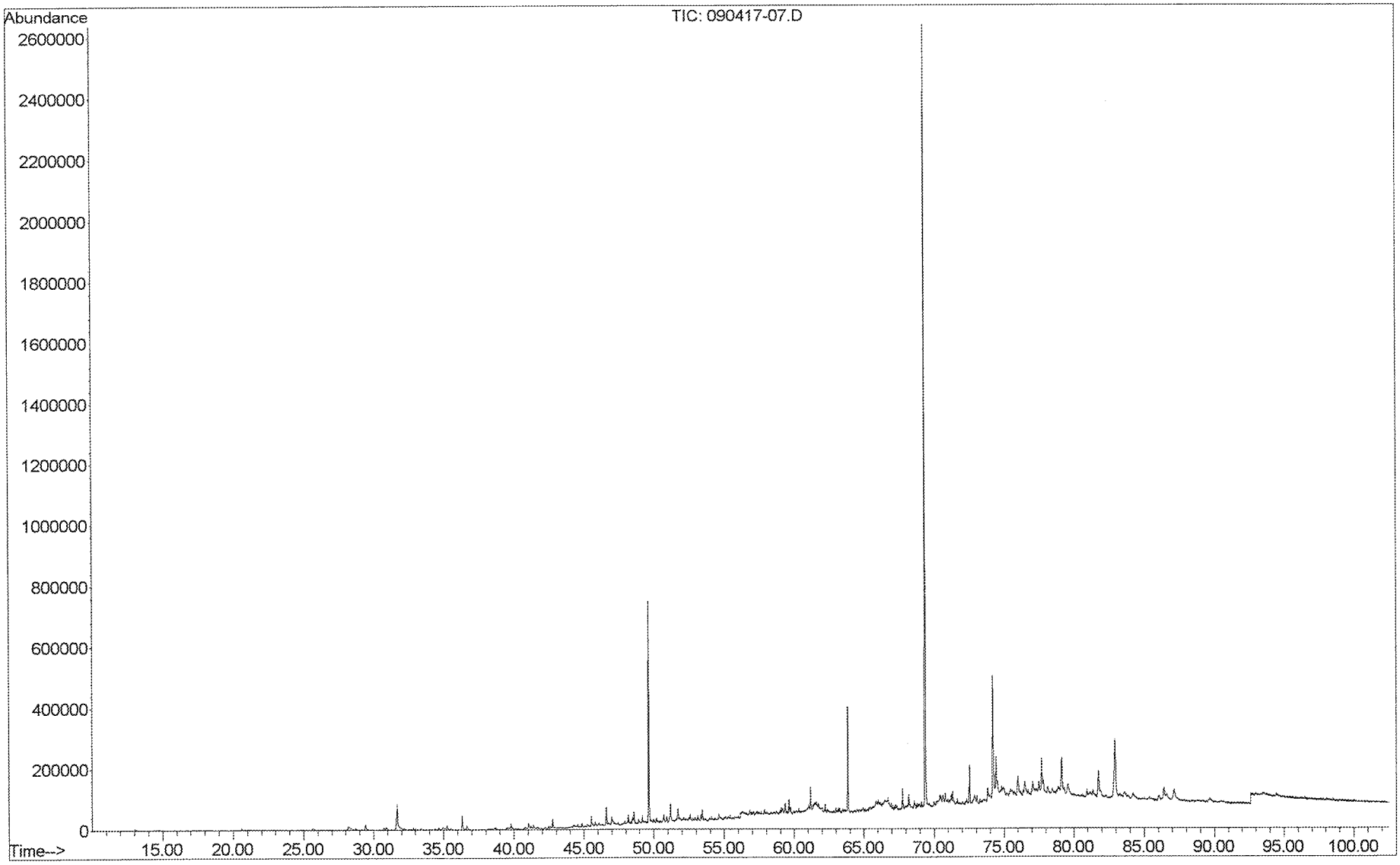

ED_004042_00000842-00045

Sample Name: 23733-4 [HH01-01-03-170901-22]
Misc Info : 870mL->1mL



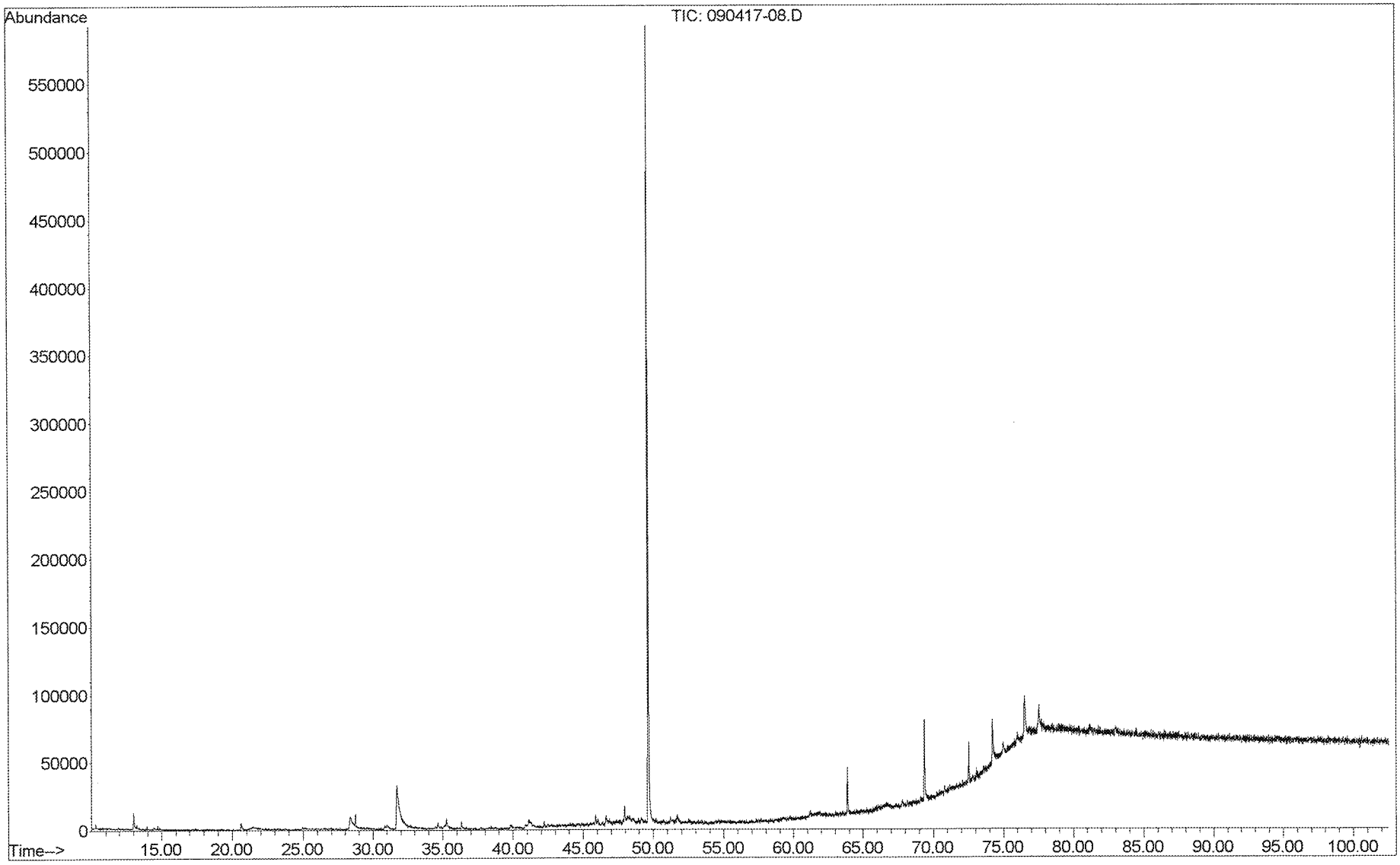

ED_004042_00000842-00046

Sample Name: 23733-5 [HH01-01-04-170901-21]
Misc Info : 910mL->1mL




ED_004042_00000842-00047

Sample Name: 23733-6 [HH01-01-05-170901-21]
Misc Info : 730mL->1mL




ED_004042_00000842-00048

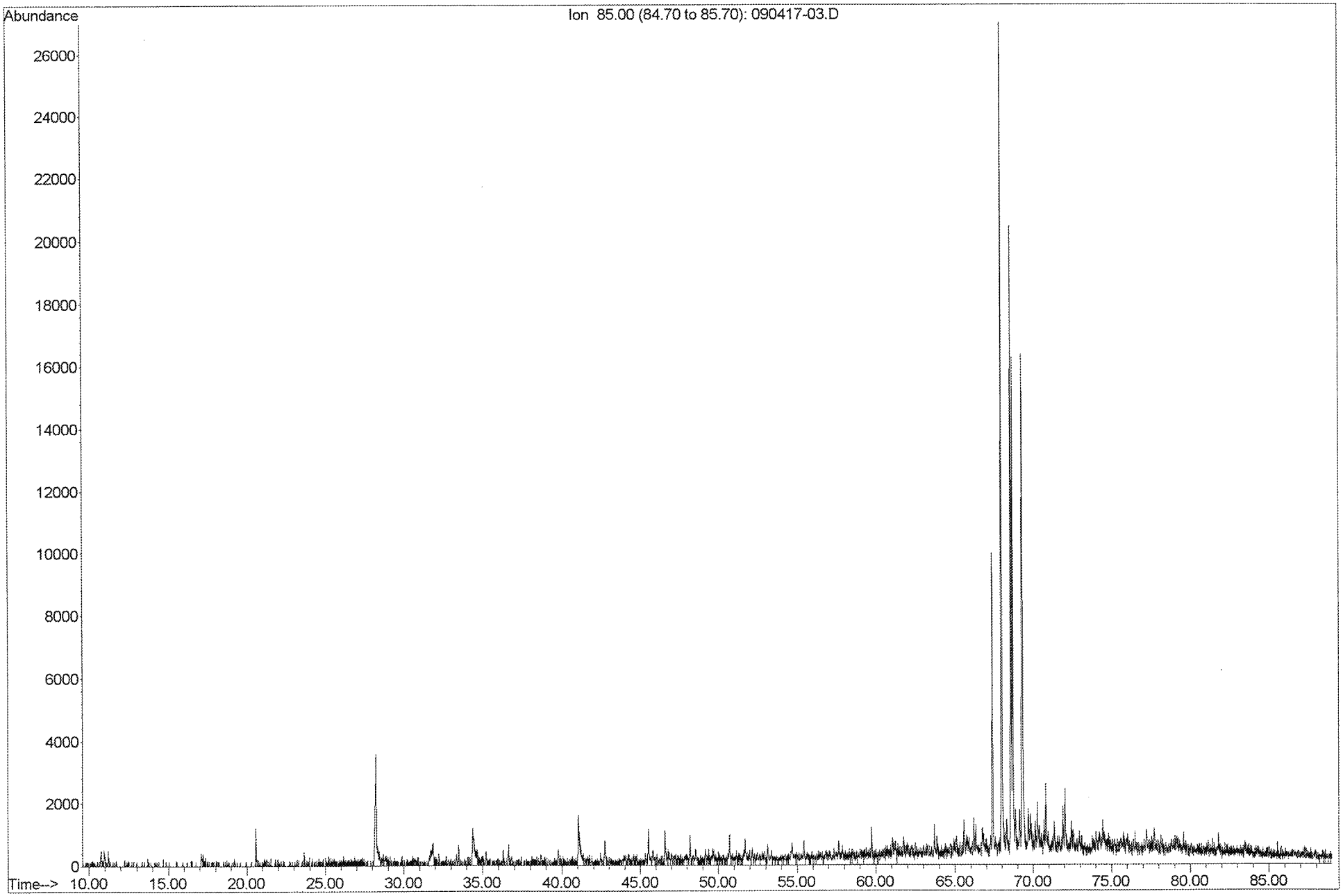
Pace Analytical®
Energy Services™

## Key to Chromatogram Symbol Identification

## For m/z 85 and m/z 113 Paraffins and Isoparaffins

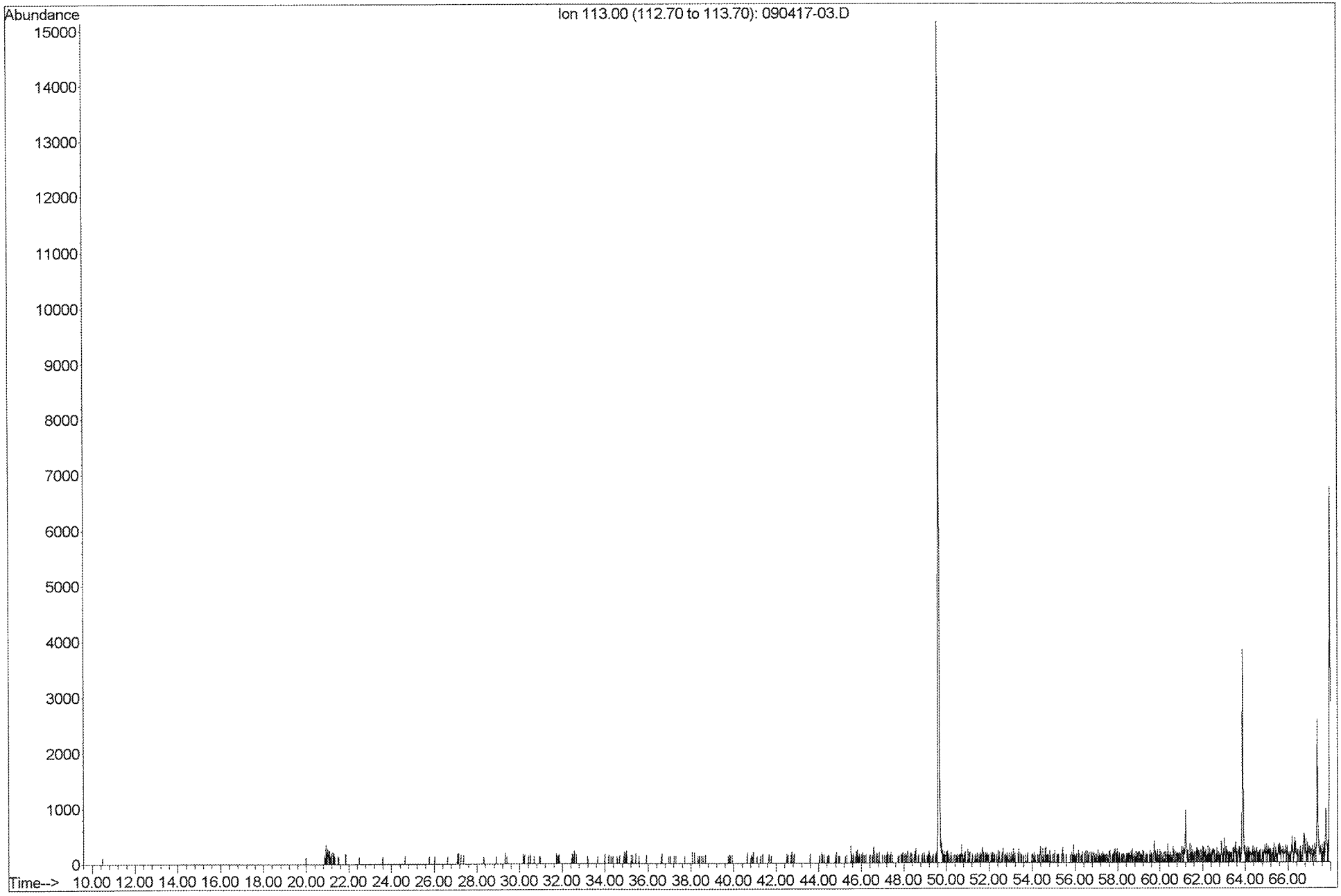
| Symbol | Detail |
|---|---|
| i-10 | Iso-alkane with 10 carbon atoms |
| i-15 | Farnesane (isoprenoid with 15 carbon atoms) |
| i-16 | Isoprenoid with 16 carbon atoms |
| Pr | Pristane (isoprenoid with 19 carbon atoms) |
| Ph | Phytane (isoprenoid with 20 carbon atoms) |
| $nC_8$ | n-$C_8$ normal Alkane |
| $nC_{15}$ | $_{n\text{-}C}$15 normal Alkane |
| i-8 | 2,5-(2,4)-Dimethylhexane |
| i-8′ | 2,3,4-Trimethylpentane |
| i-8$^n$ | 2-3-Dimethylhexane |
| CH-n | Alkylcyclohexane (where n indicates the number of carbon atoms in the side chain) |

23733-1 [HH01-01-01-170901-21]
770mL->1mL



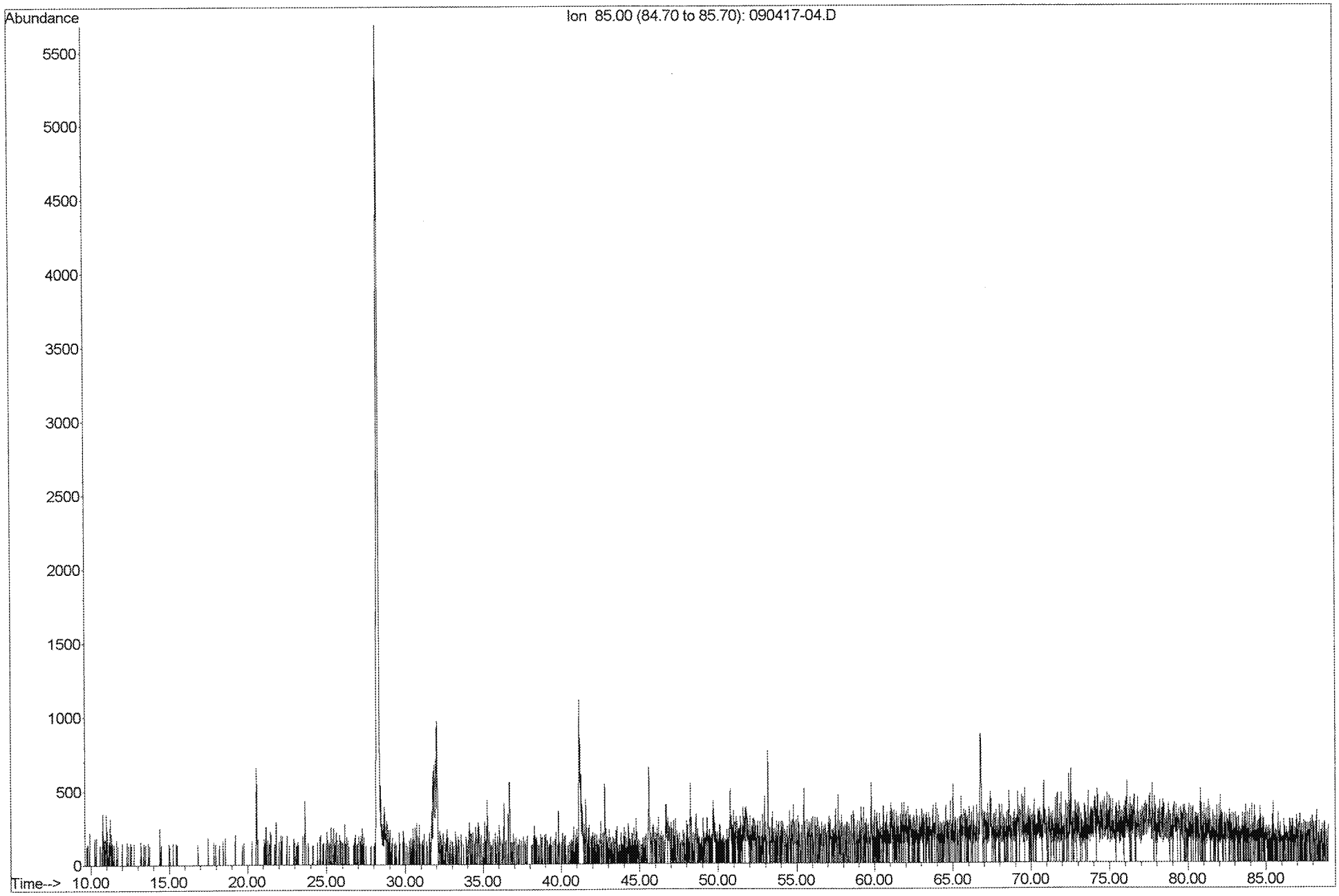

ED_004042_00000842-00050

23733-1 [HH01-01-01-170901-21]
770mL->1mL



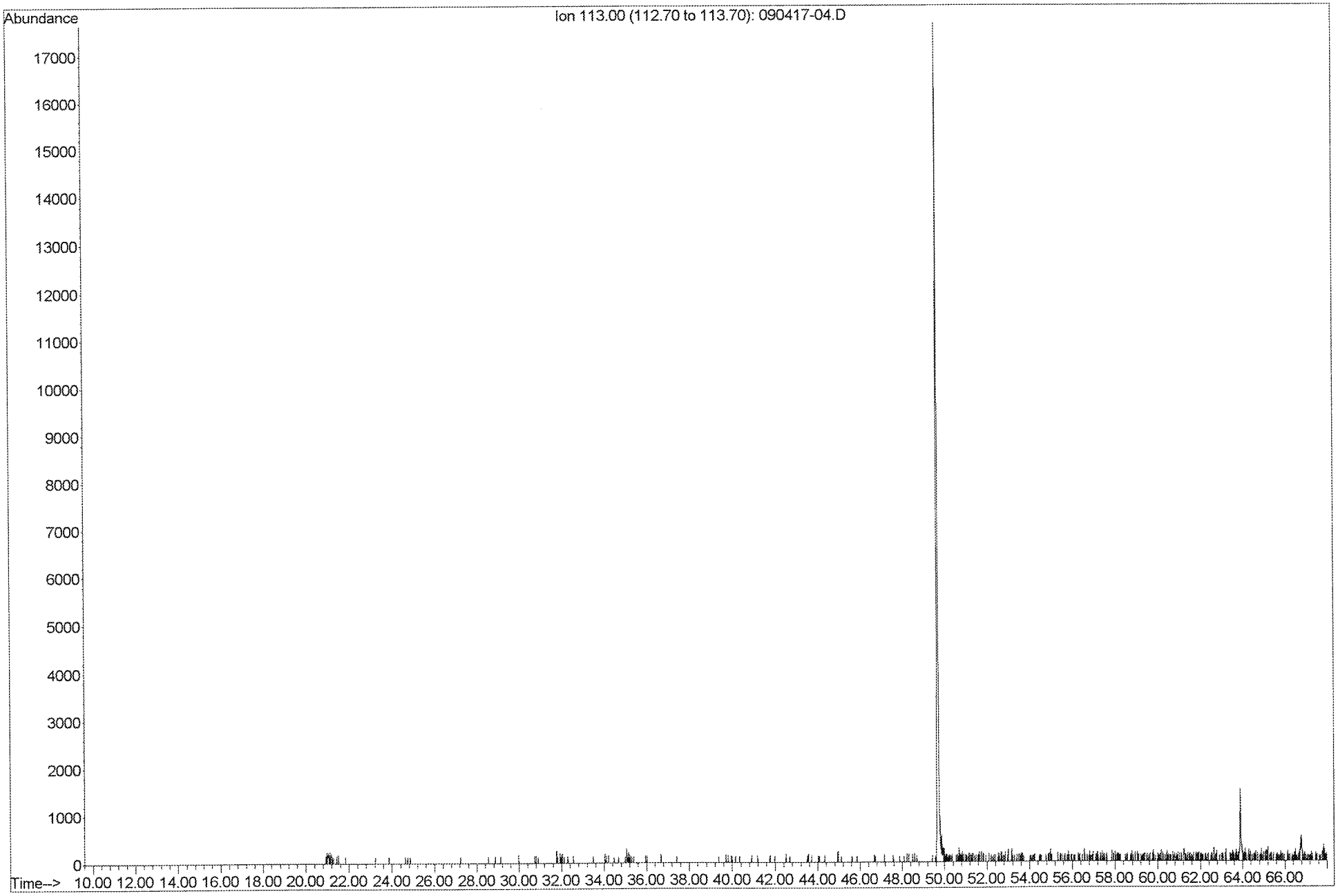

ED_004042_00000842-00051

23733-2 [HH01-01-02-170901-21]
950mL->1mL



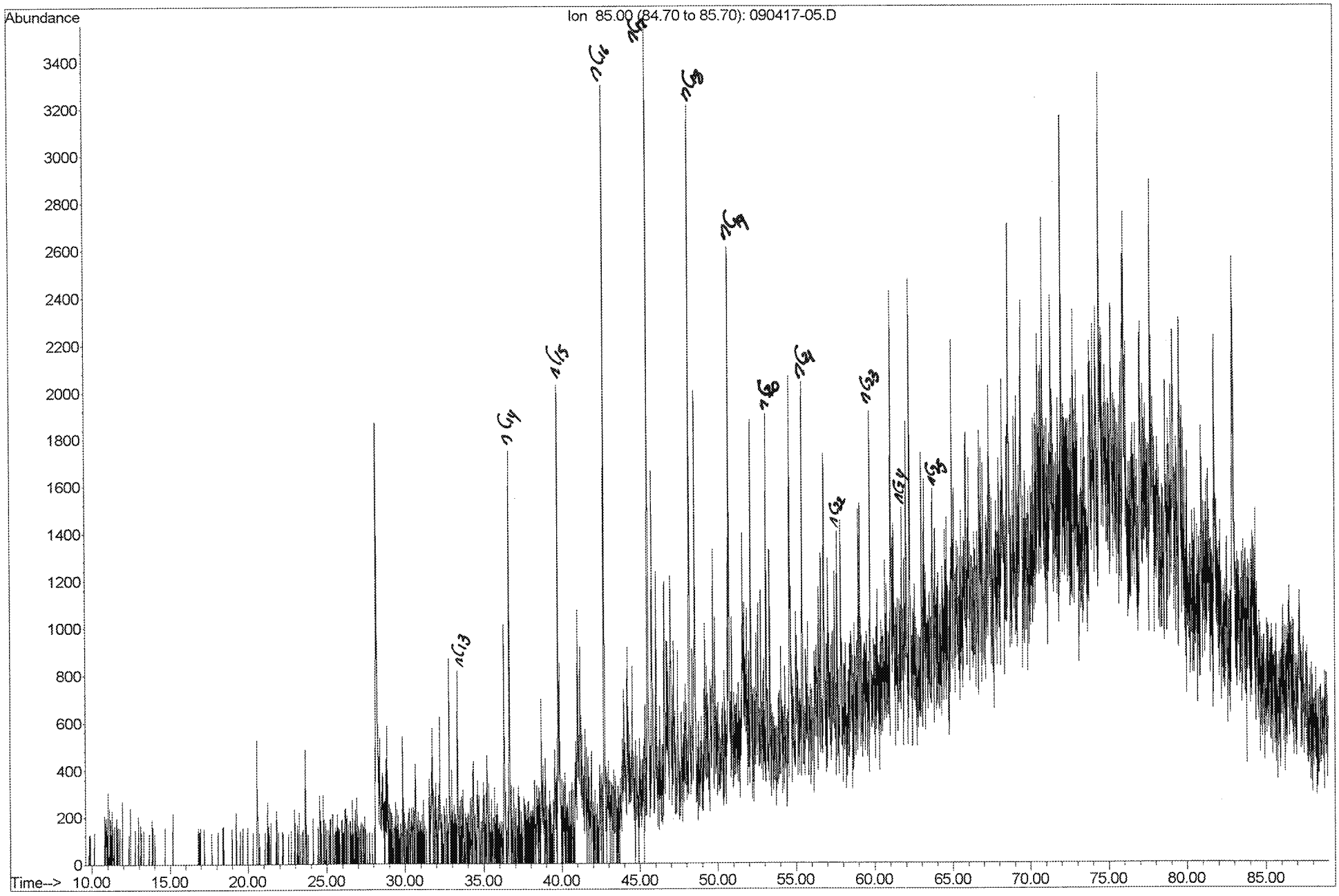

ED_004042_00000842-00052

23733-2 [HH01-01-02-170901-21]
950mL->1mL



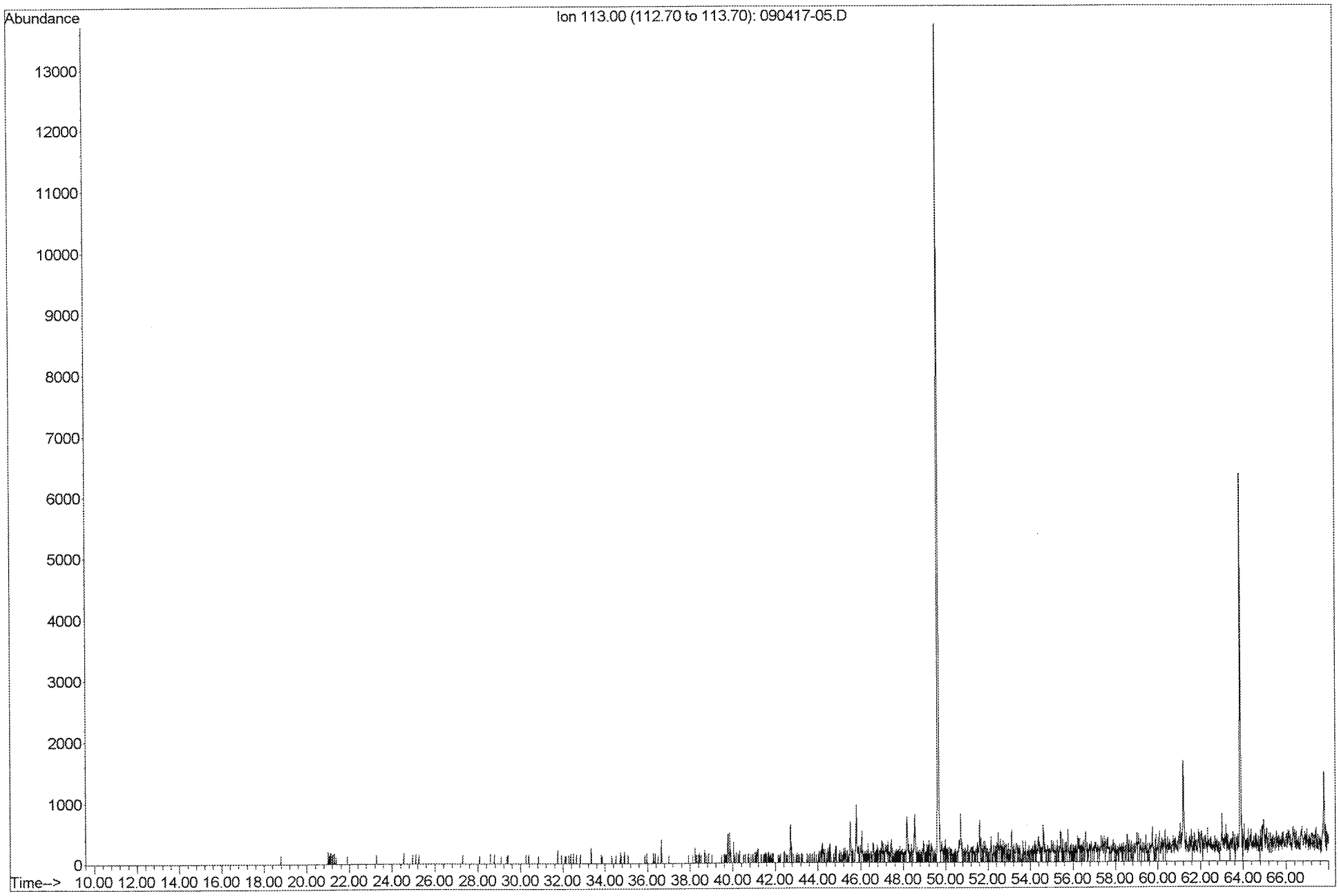

ED_004042_00000842-00053

23733-3 [HH01-01-03-170901-21]
910mL->1mL



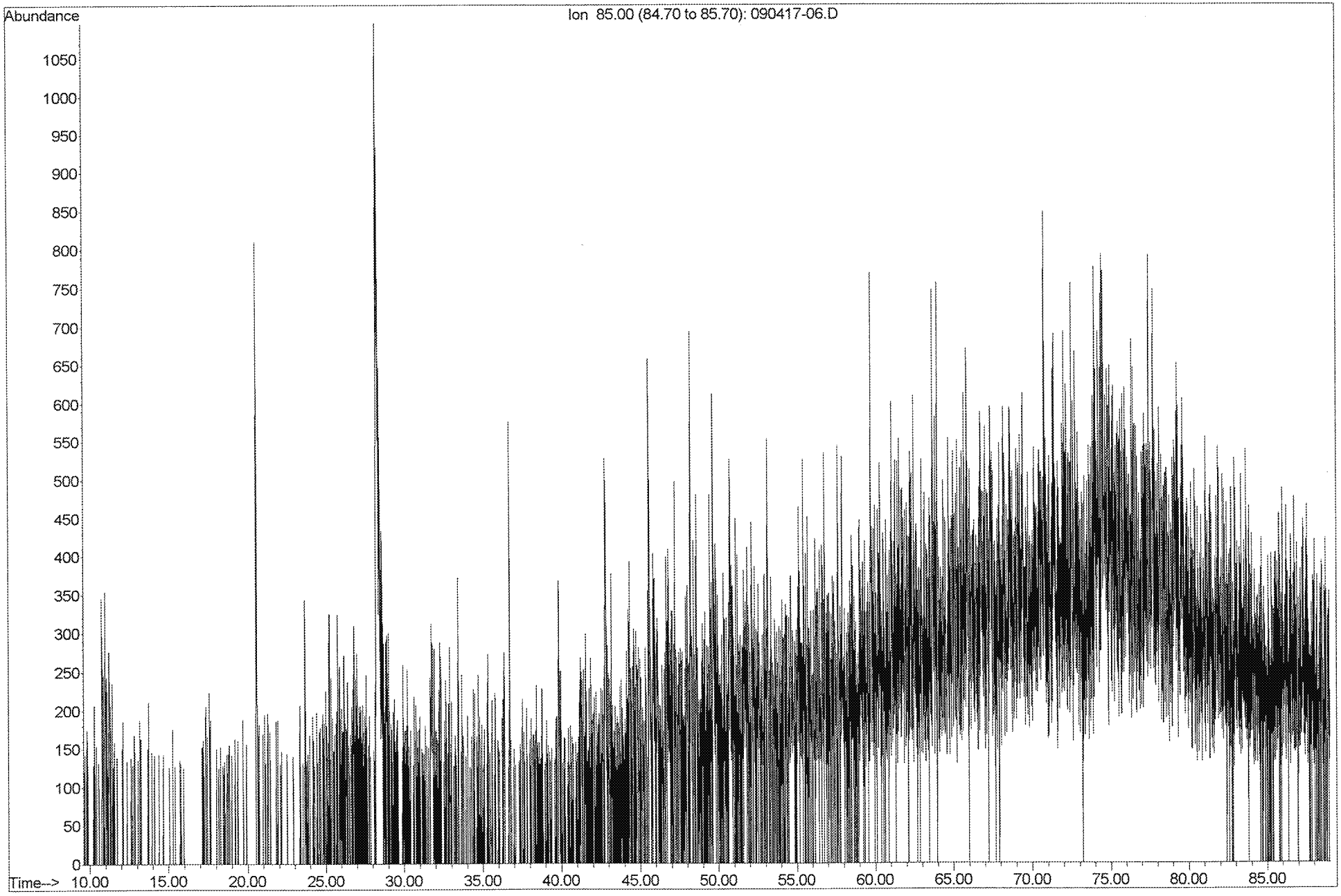

ED_004042_00000842-00054

23733-3 [HH01-01-03-170901-21]
910mL->1mL



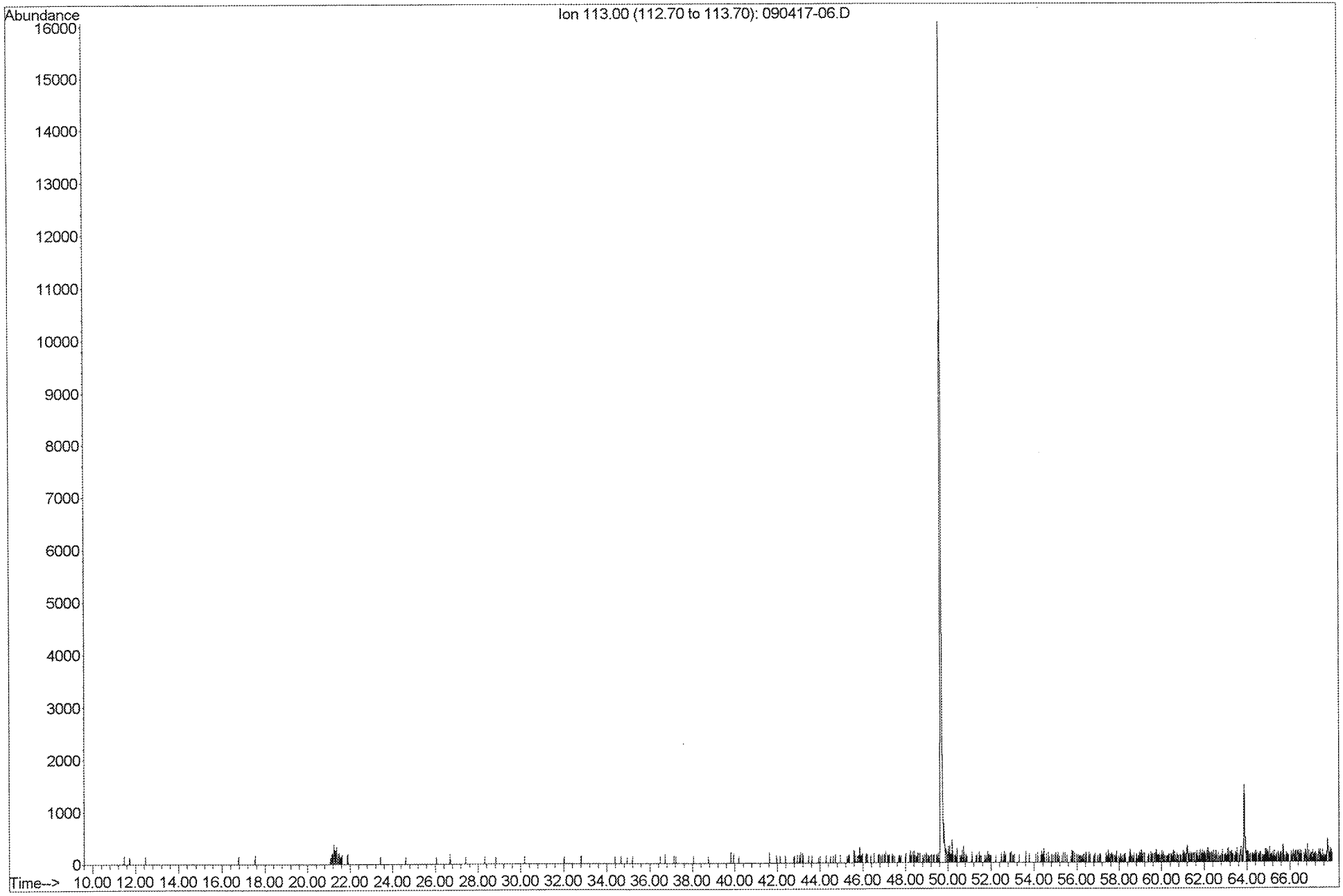

ED_004042_00000842-00055

23733-4 [HH01-01-03-170901-22]
870mL->1mL



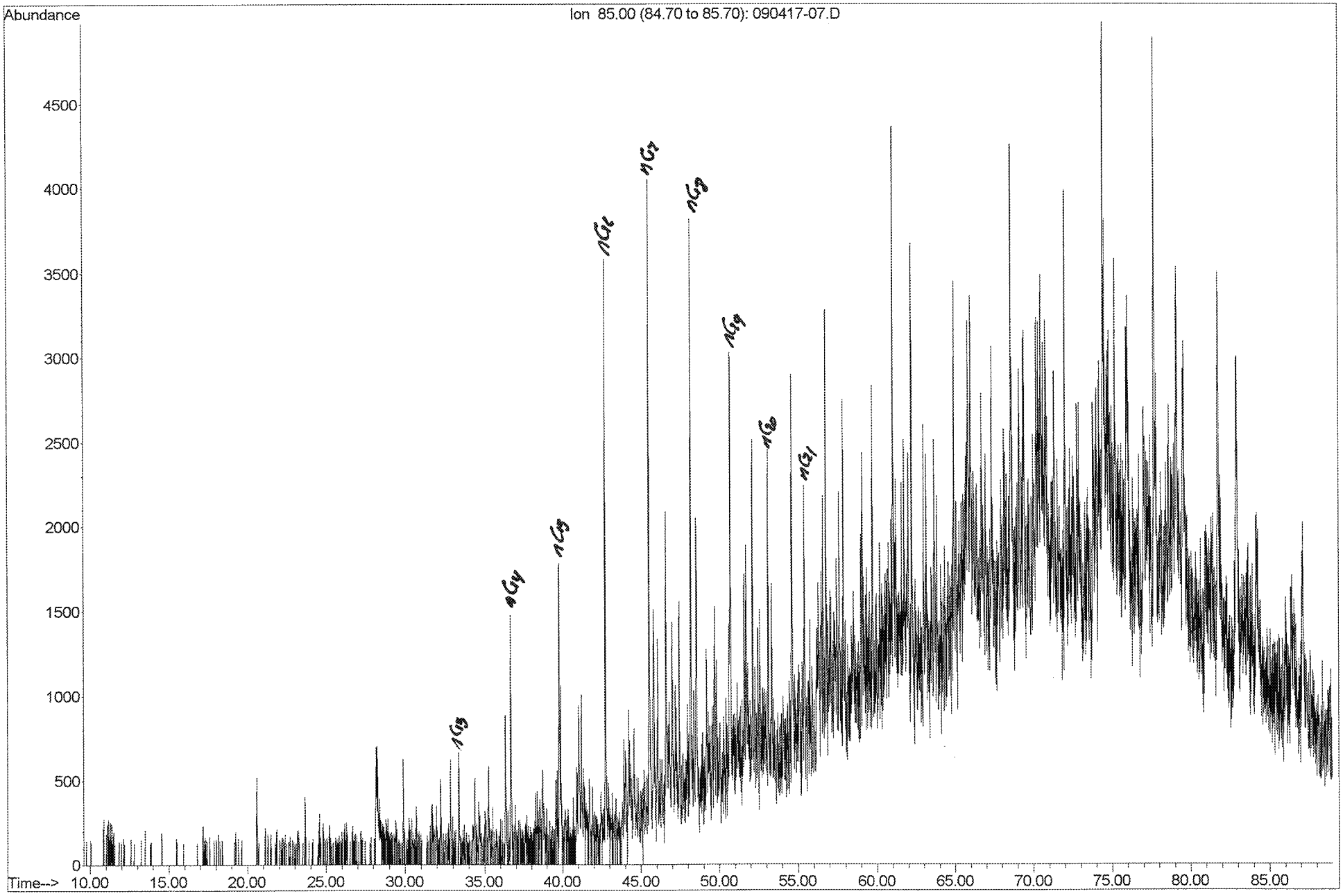

ED_004042_00000842-00056

23733-4 [HH01-01-03-170901-22]
870mL->1mL



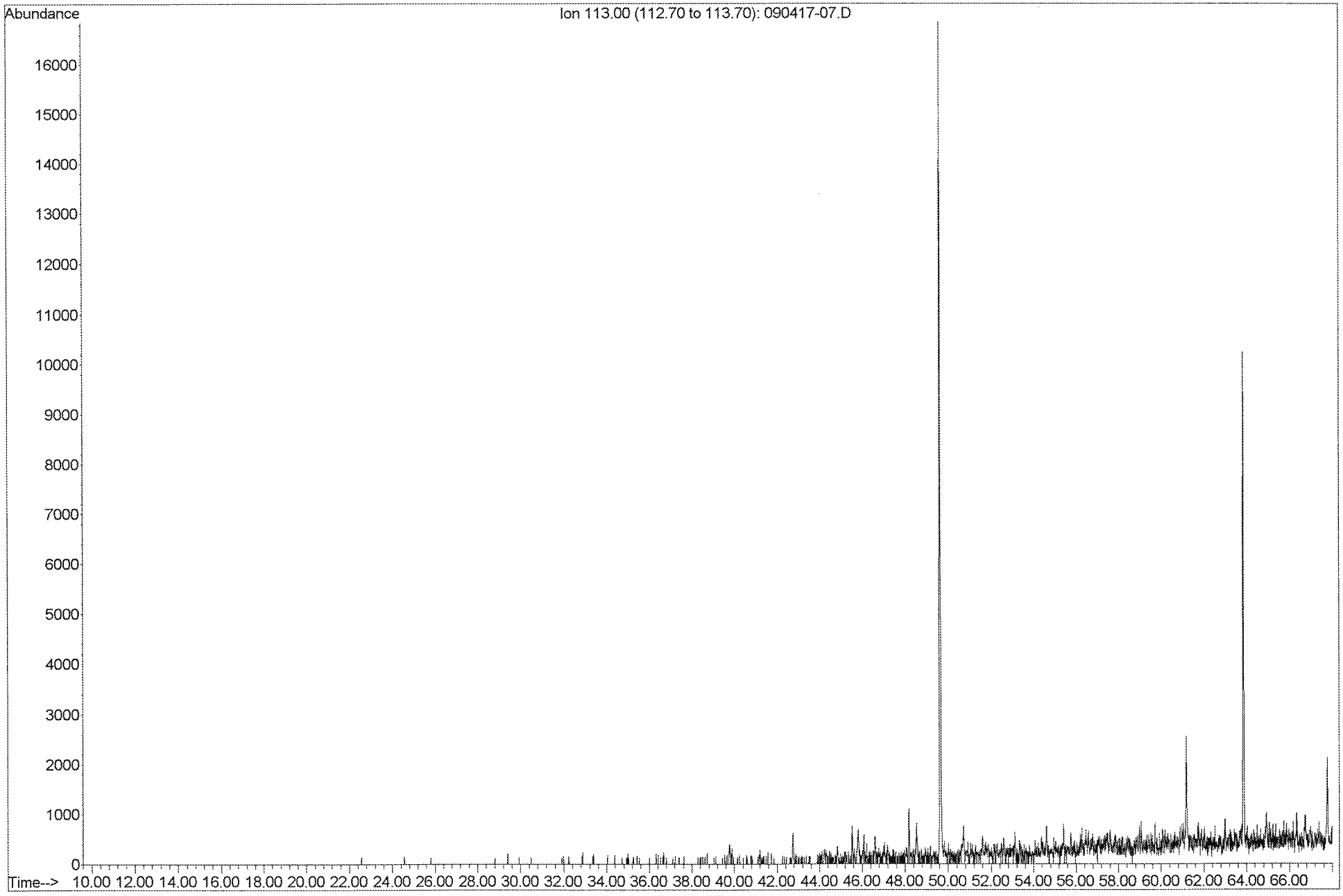

ED_004042_00000842-00057

23733-5 [HH01-01-04-170901-21]
910mL->1mL



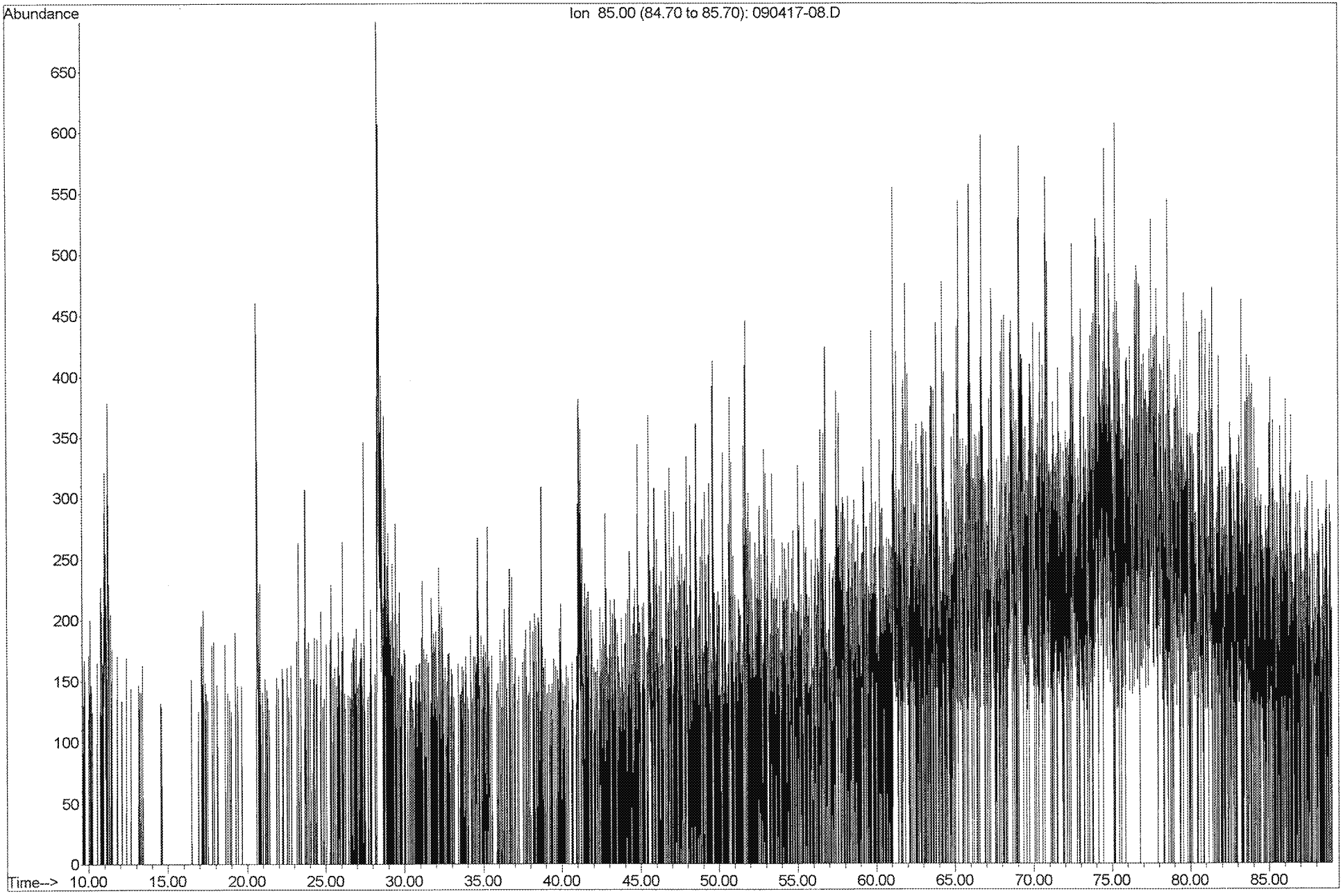

ED_004042_00000842-00058

23733-5 [HH01-01-04-170901-21]
910mL->1mL



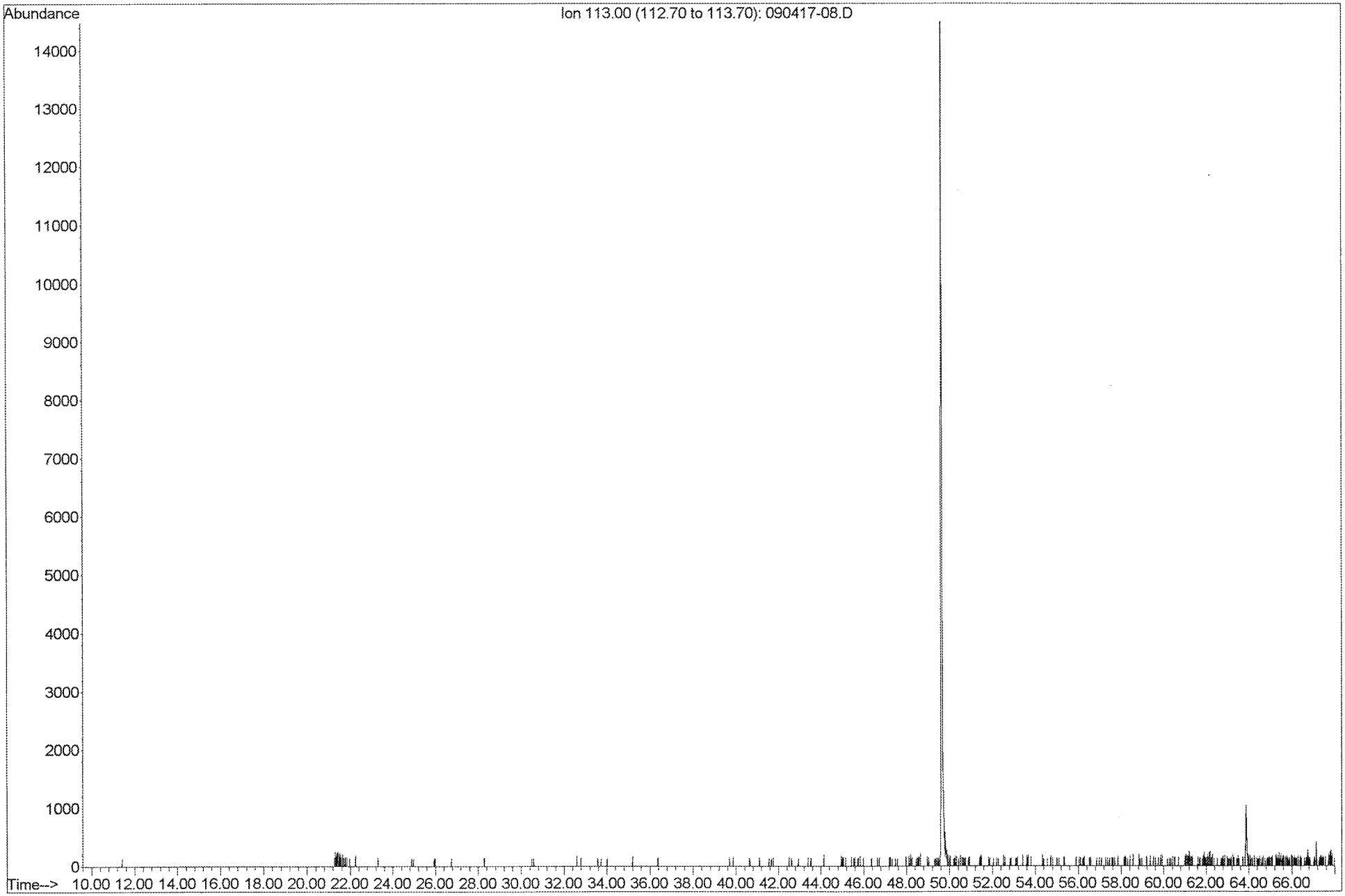

ED_004042_00000842-00059

23733-6 [HH01-01-05-170901-21]
730mL->1mL




ED_004042_00000842-00060

23733-6 [HH01-01-05-170901-21]
730mL->1mL




ED_004042_00000842-00061

Pace Analytical®
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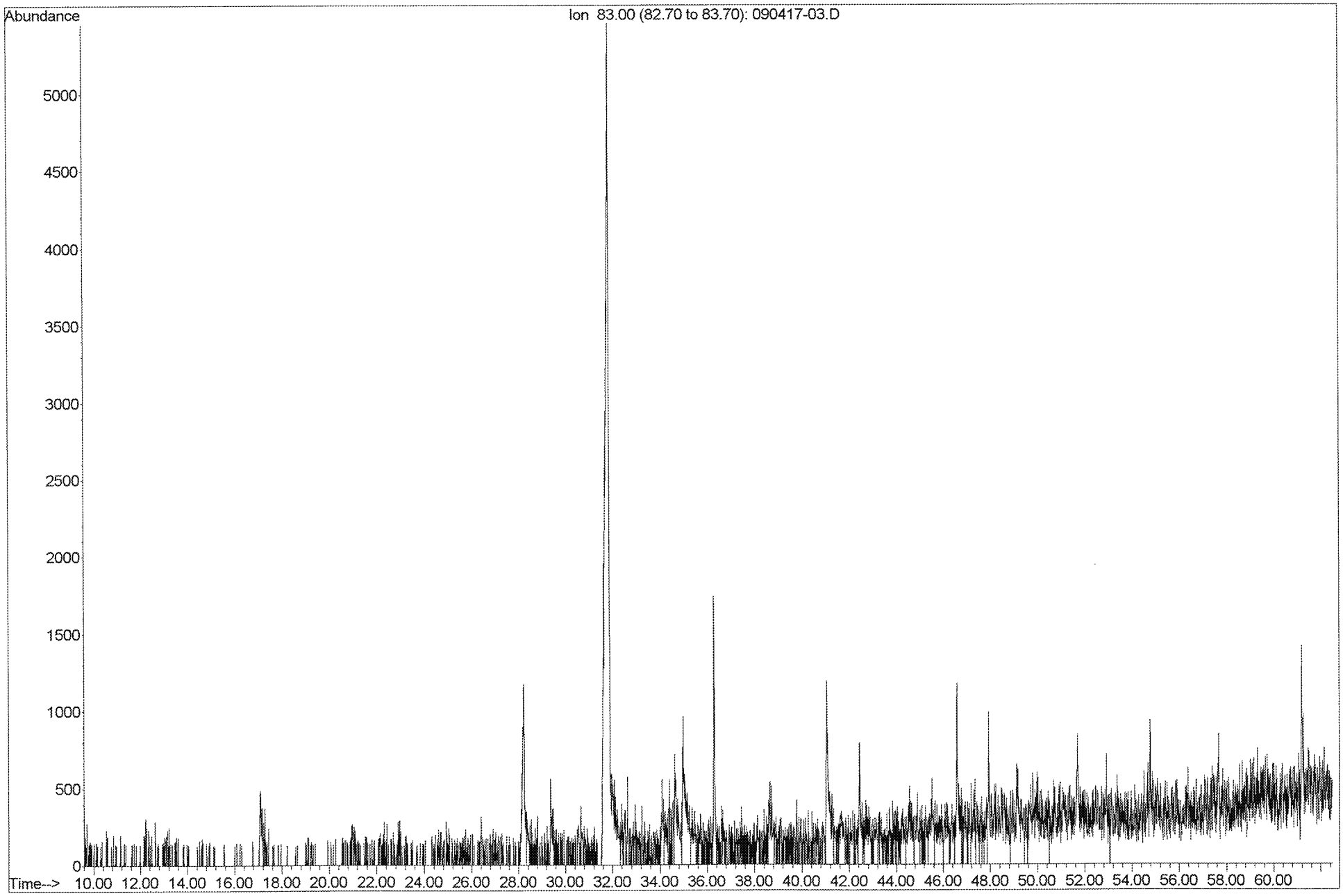
## Key for Alkylcyclohexanes at m/z 83

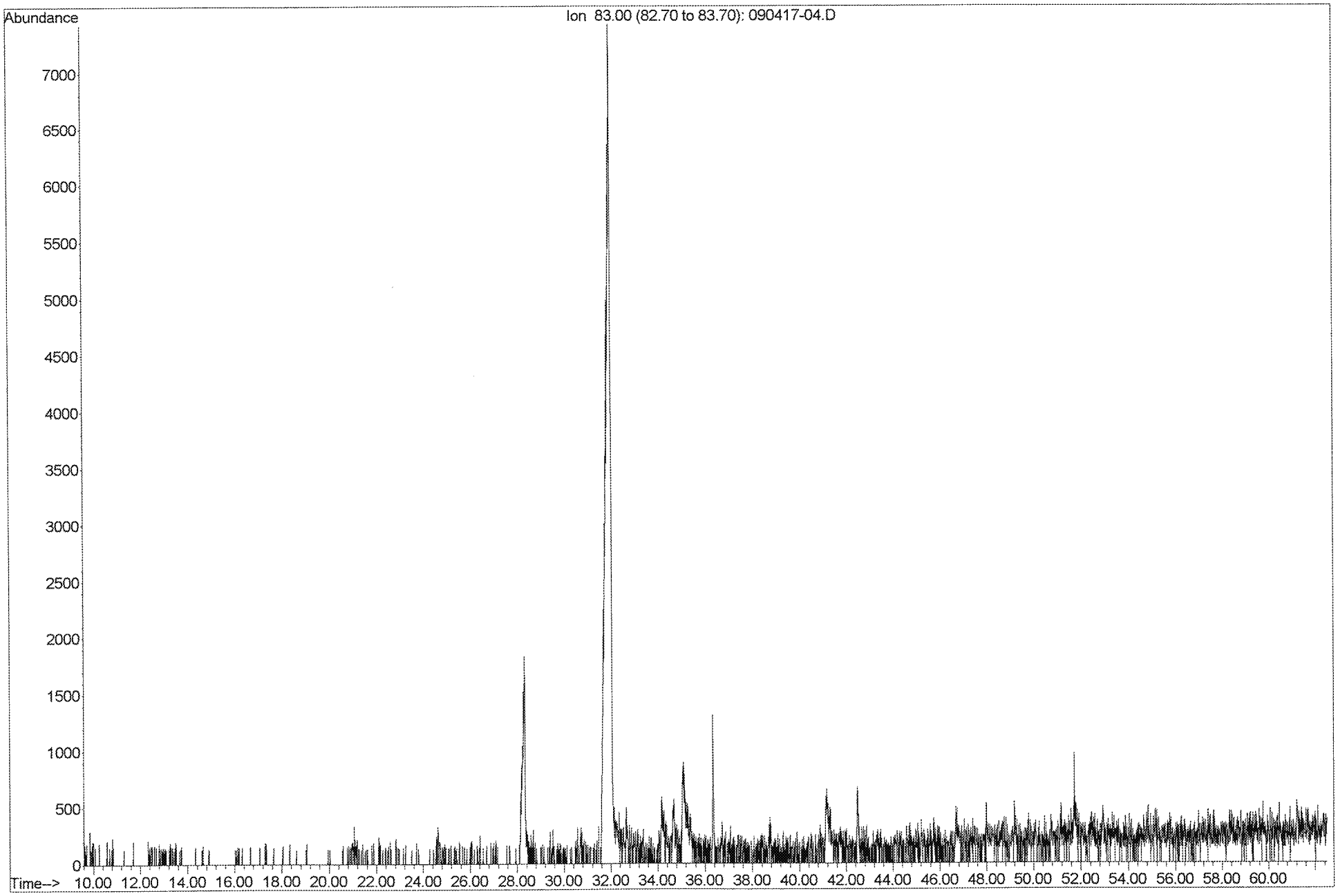
| Symbol | Detail |
|---|---|
| CH-1 | Methylcyclohexane |
| CH-2 | Ethylcyclohexane |
| CH-3 | Propylcyclohexane |
| CH-4 | Butylcyclohexane |
| CH-5 | Pentylcyclohexane |
| CH-6 | Hexylcyclohexane |
| CH-7 | Heptylcyclohexane |
| CH-8 | Octylcyclohexane |
| CH-9 | Nonylcyclohexane |
| CH-10 | Decylcyclohexane |
| CH-11 | Undecylcyclohexane |
| CH-12 | Dodecylcyclohexane |
| CH-13 | Tridecylcyclohexane |
| CH-14 | Tetradecylcyclohexane |

23733-1 [HH01-01-01-170901-21]
770mL->1mL



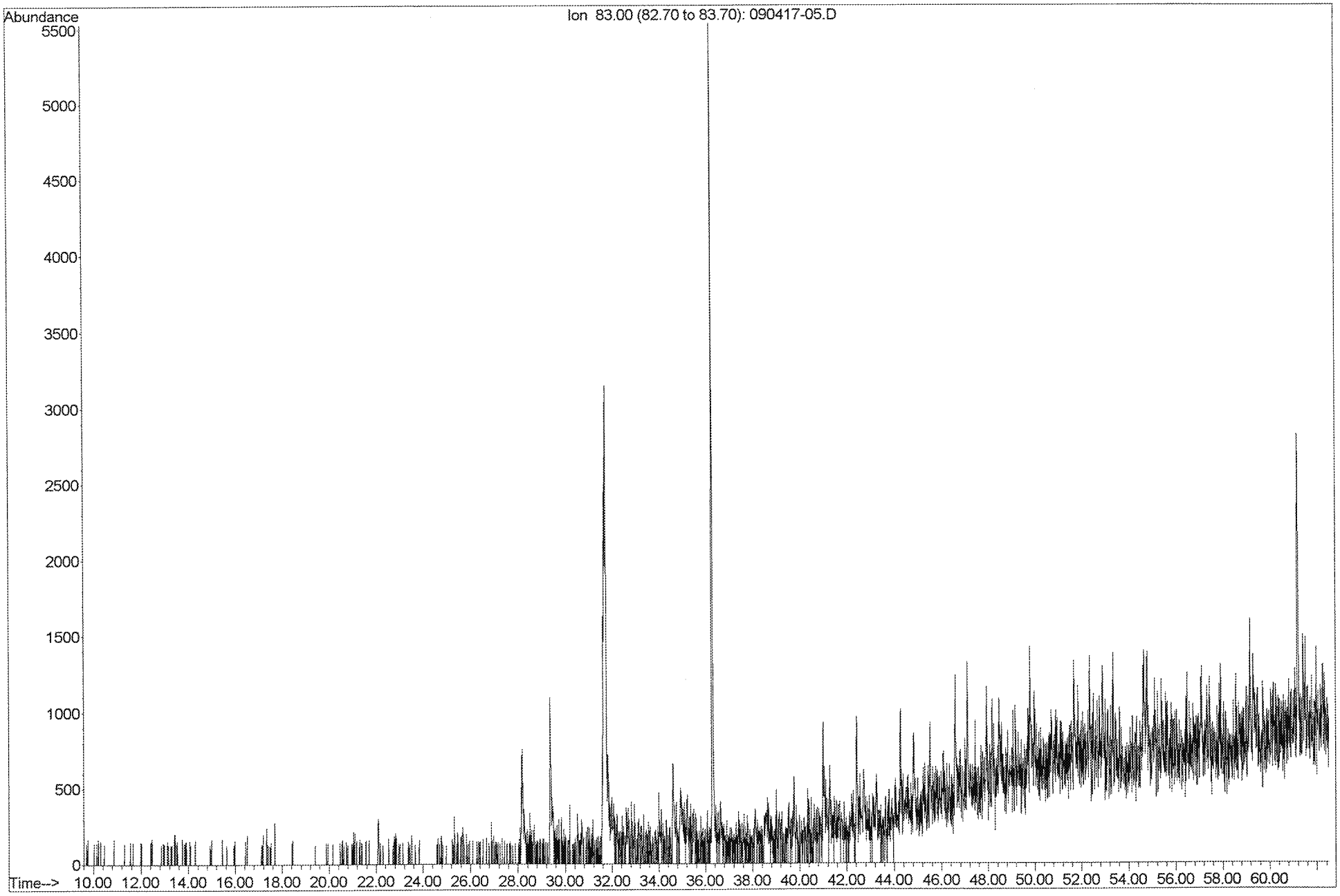

ED_004042_00000842-00063

23733-2 [HH01-01-02-170901-21]
950mL->1mL



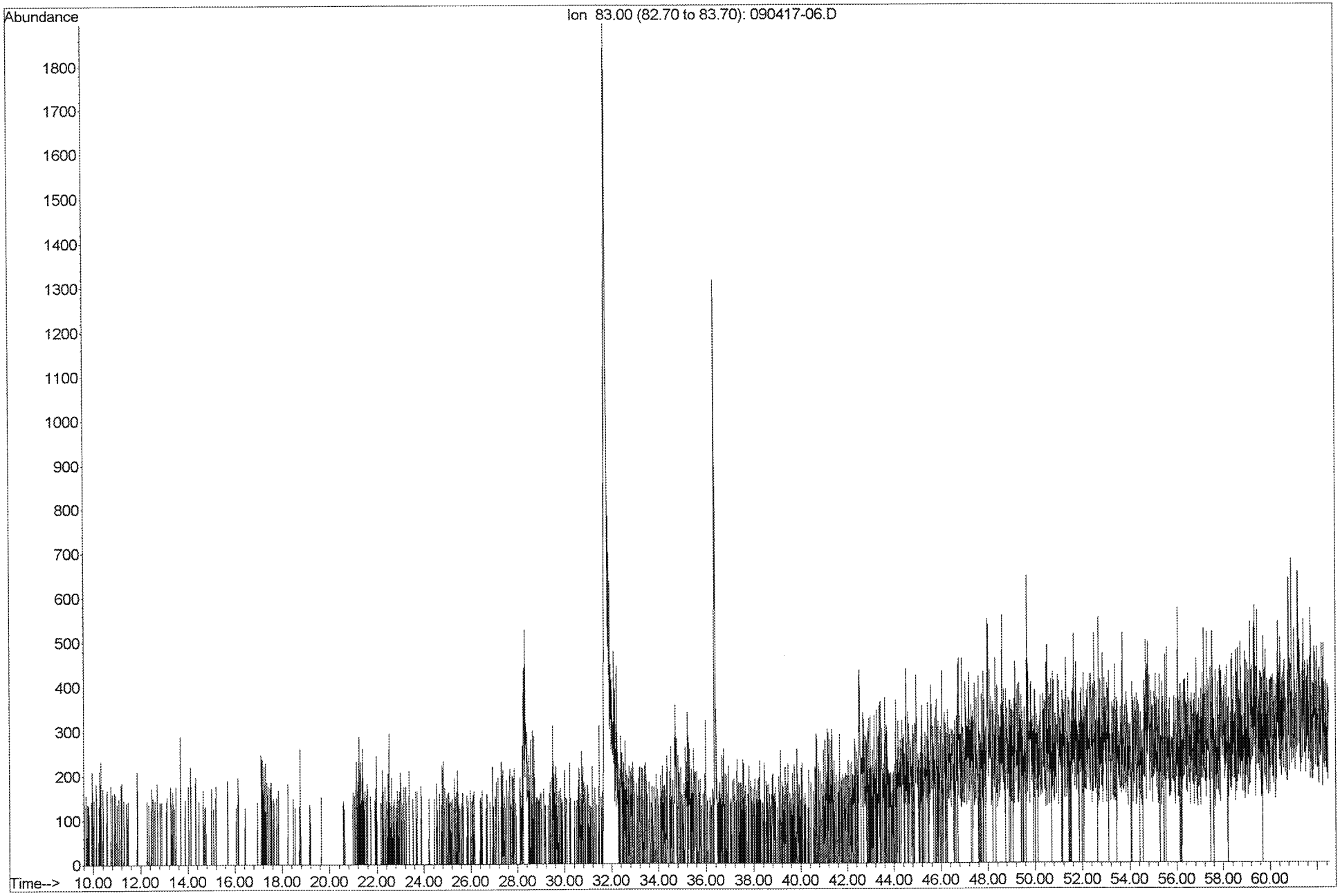

ED_004042_00000842-00064

23733-3 [HH01-01-03-170901-21]
910mL->1mL



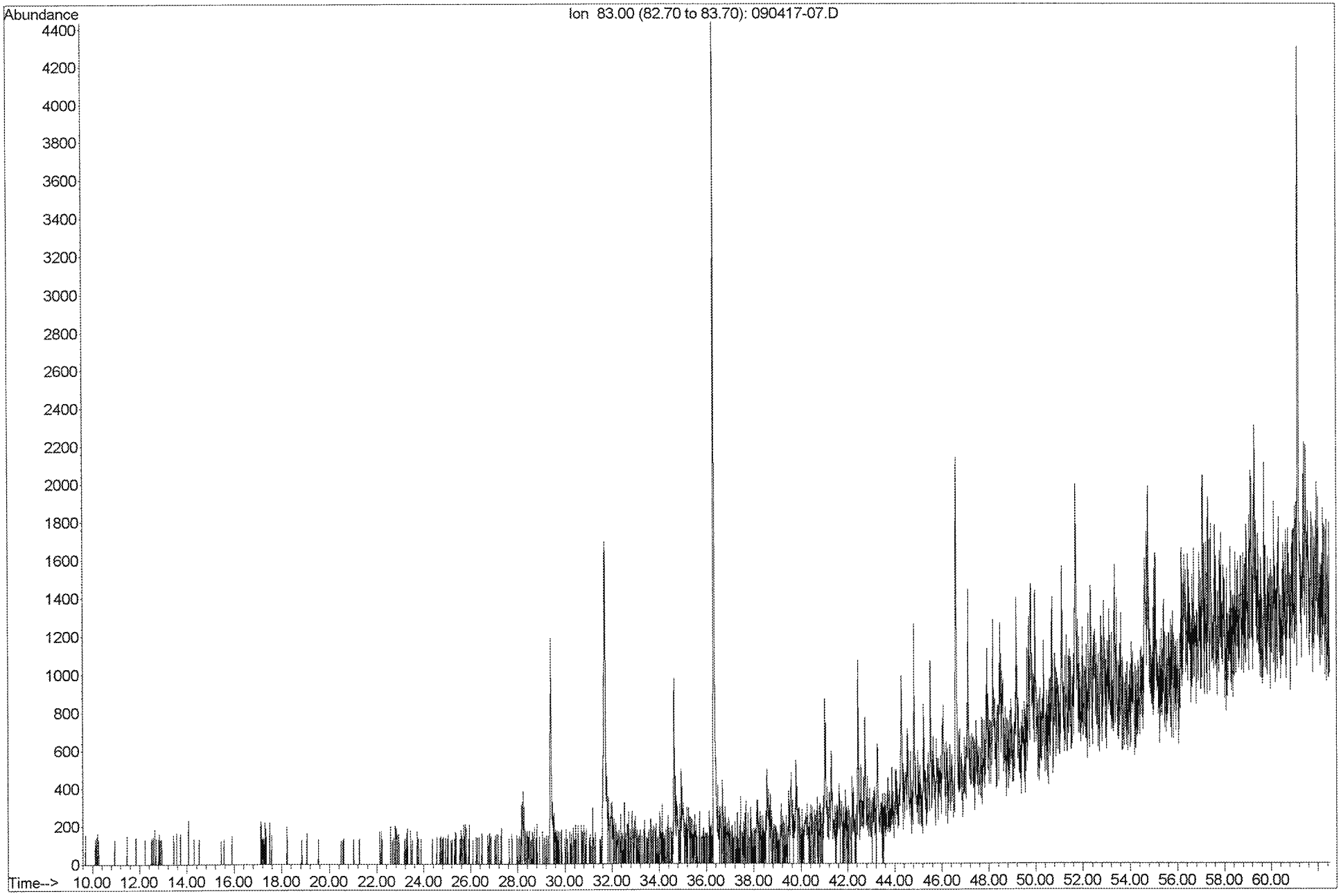

ED_004042_00000842-00065

23733-4 [HH01-01-03-170901-22]
870mL->1mL



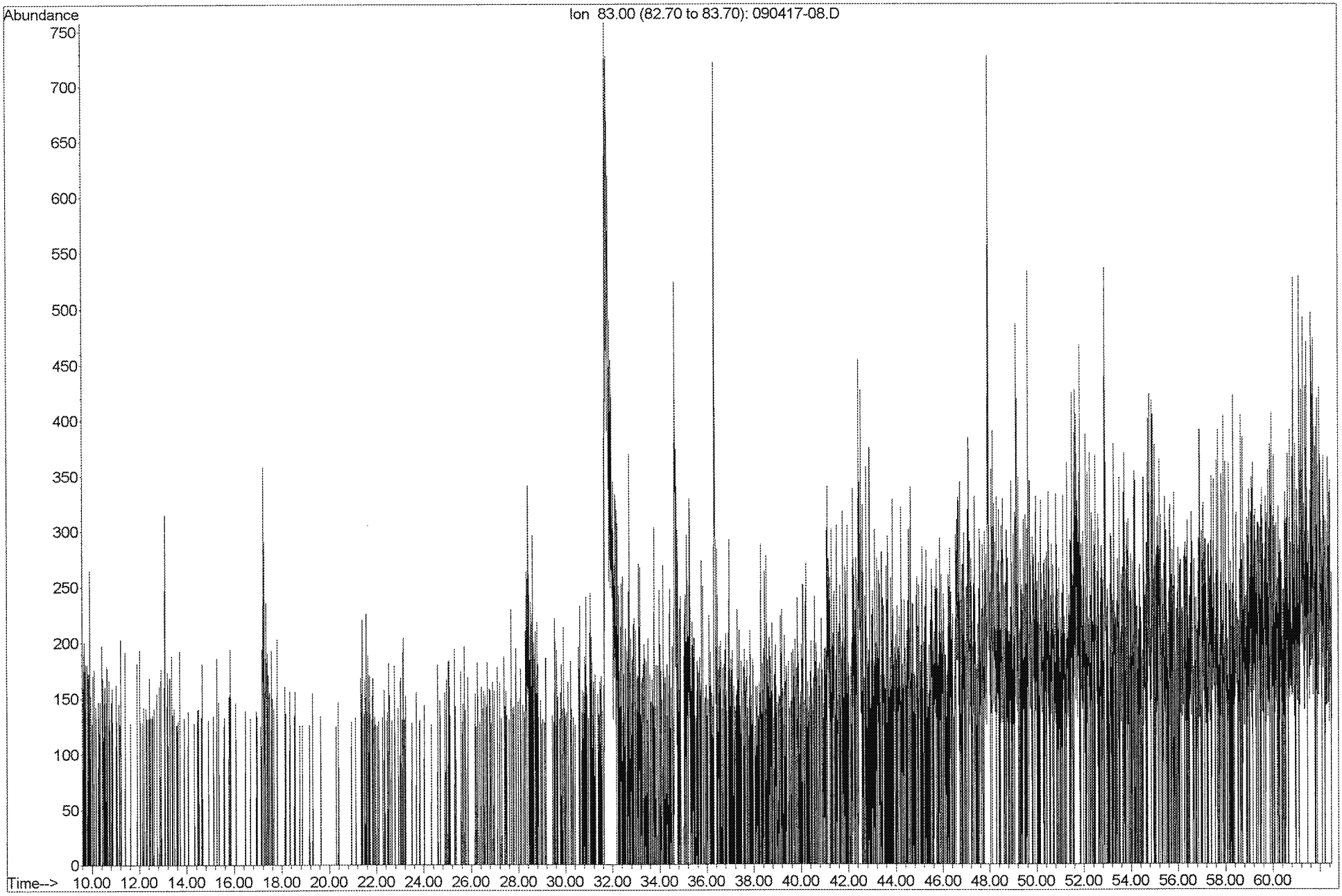

ED_004042_00000842-00066

23733-5 [HH01-01-04-170901-21]
910mL->1mL




ED_004042_00000842-00067

23733-6 [HH01-01-05-170901-21]
730mL->1mL




ED_004042_00000842-00068

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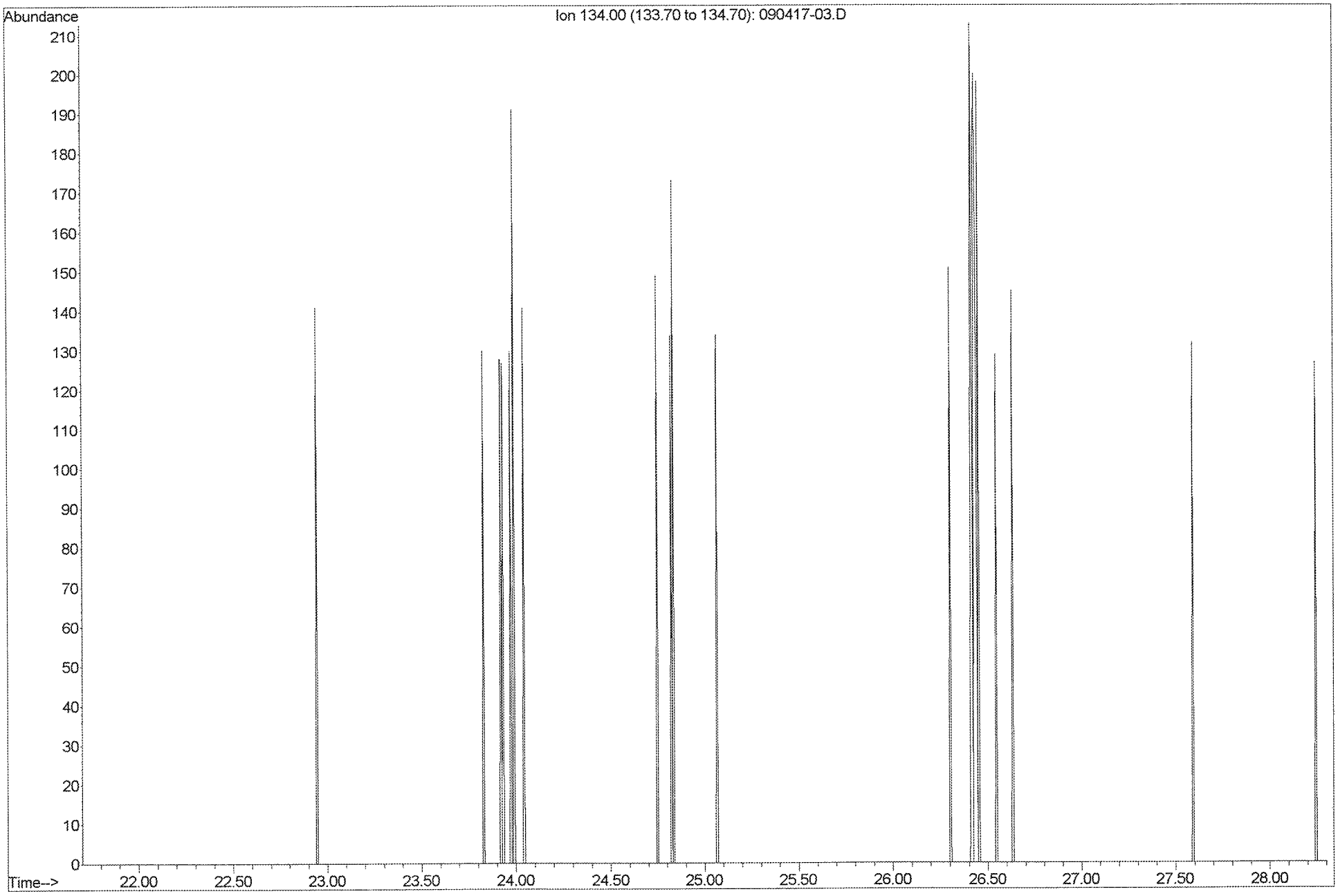
## Key for $C_4$-Alkylbenzenes (m/z 134)

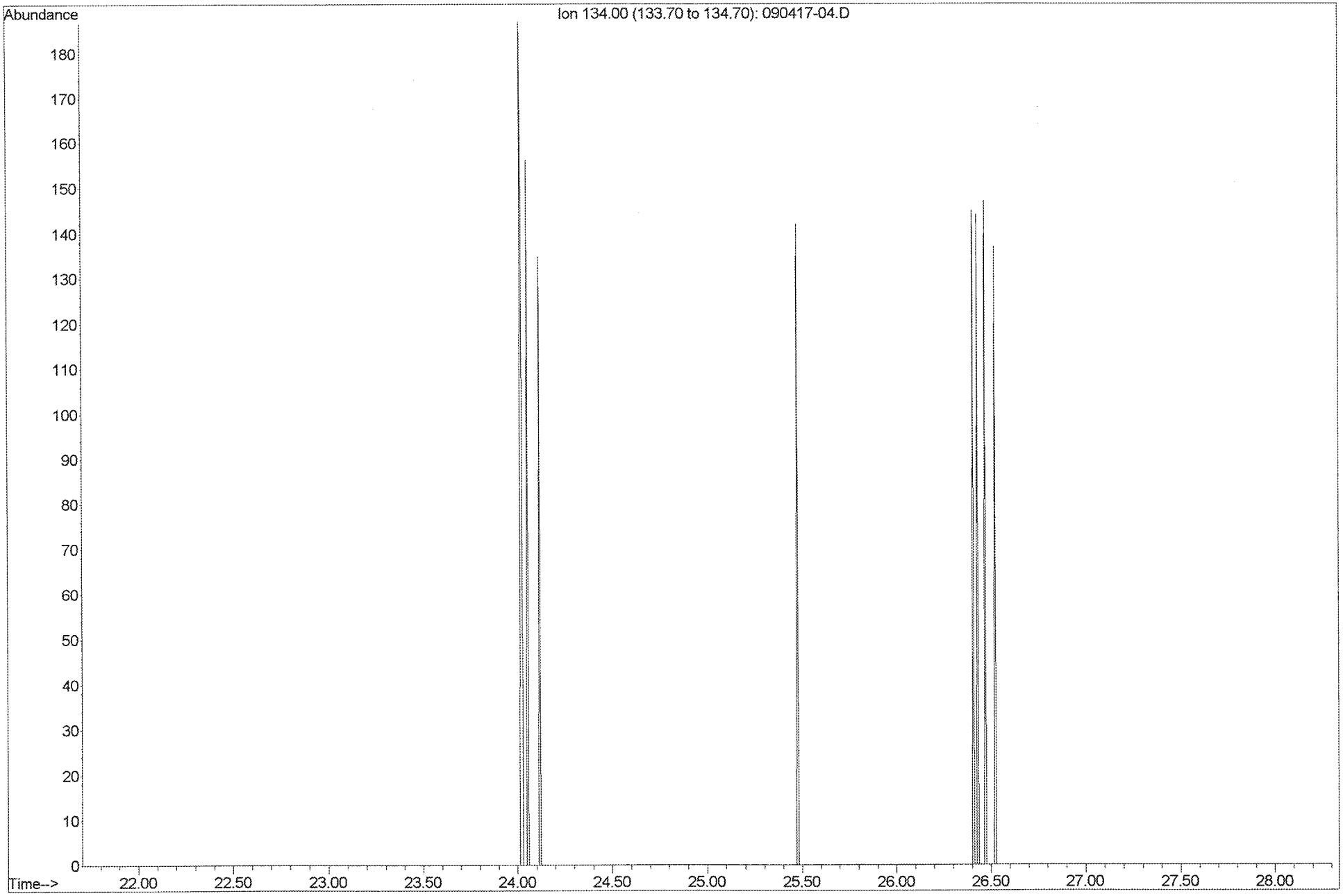
| Symbol | Detail |
|---|---|
| 16 | Sec-Butylbenzene |
| 17 | 1-Methyl-3-Isopropylbenzene |
| 18 | 1-Methyl-4-Isopropylbenzene |
| 19 | 1-Methyl-2-Isopropylbenzene |
| 20 | 1,3-Diethylbenzene |
| 21 | 1-Methyl-3-Propylbenzene |
| 22 | Butylbenzene |
| 23 | 1,3-Diethyl-5-Ethylbenzene |
| 24 | 1,2-Diethylbenzene |
| 25 | 1-Methyl-2-Propylbenzene |
| 26 | 1,4-Dimethyl-2-Ethylbenzene |
| 27 | 1,3-Dimethyl-4-Ethylbenzene |
| 28 | 1,2-Dimethyl-4-Ethylbenzene |
| 29 | 1,3-Dimethyl-2-Ethylbenzene |
| 30 | 1,2-Dimethyl-3-Ethylbenzene |
| 31a | 1,2,4,5-Tetramethylbenzene |
| 31 | 1,2,3,5-Tetramethylbenzene |
| 32 | 1,2,3,4-Tetramethylbenzene |

23733-1 [HH01-01-01-170901-21]
770mL->1mL



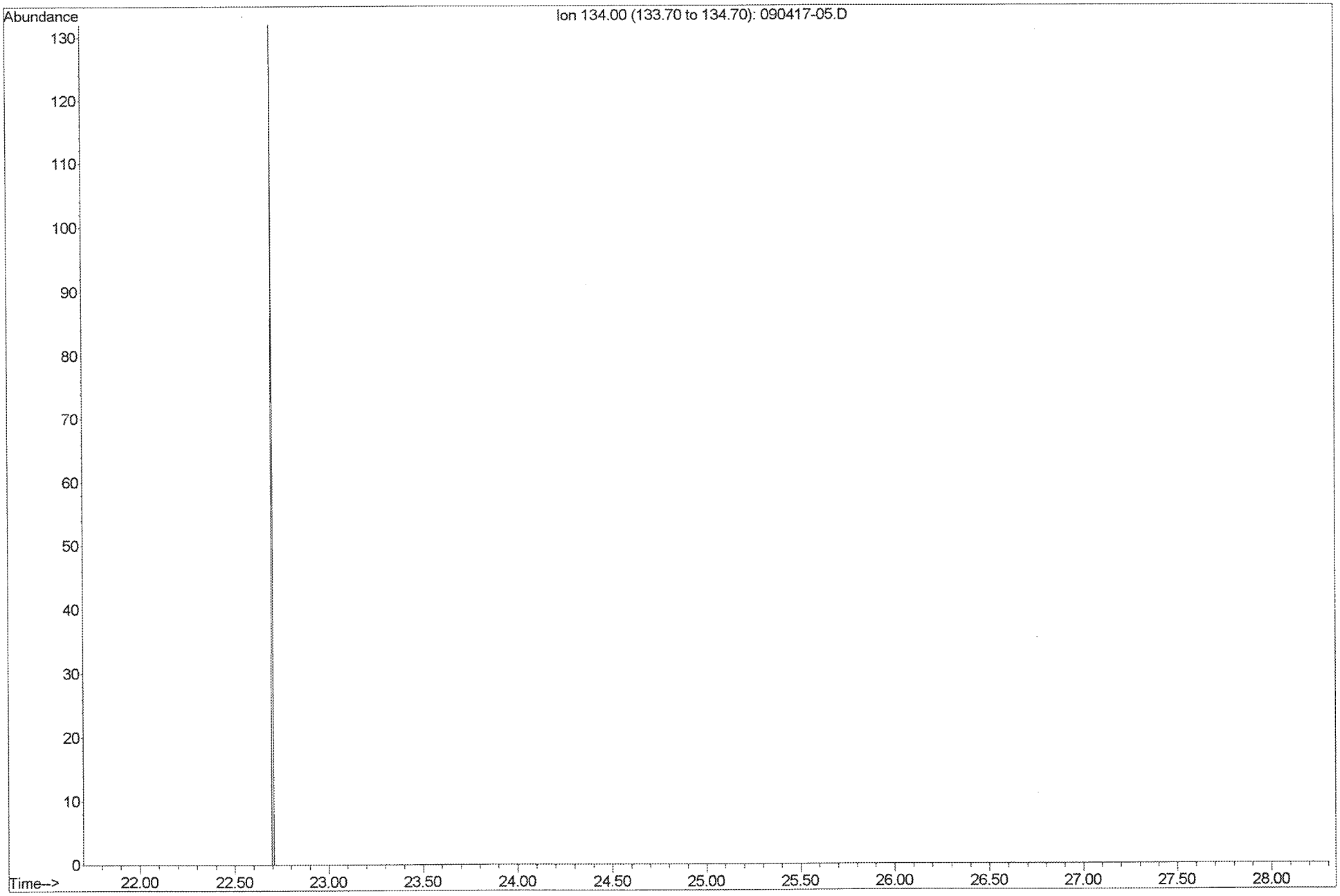

ED_004042_00000842-00070

23733-2 [HH01-01-02-170901-21]
950mL->1mL



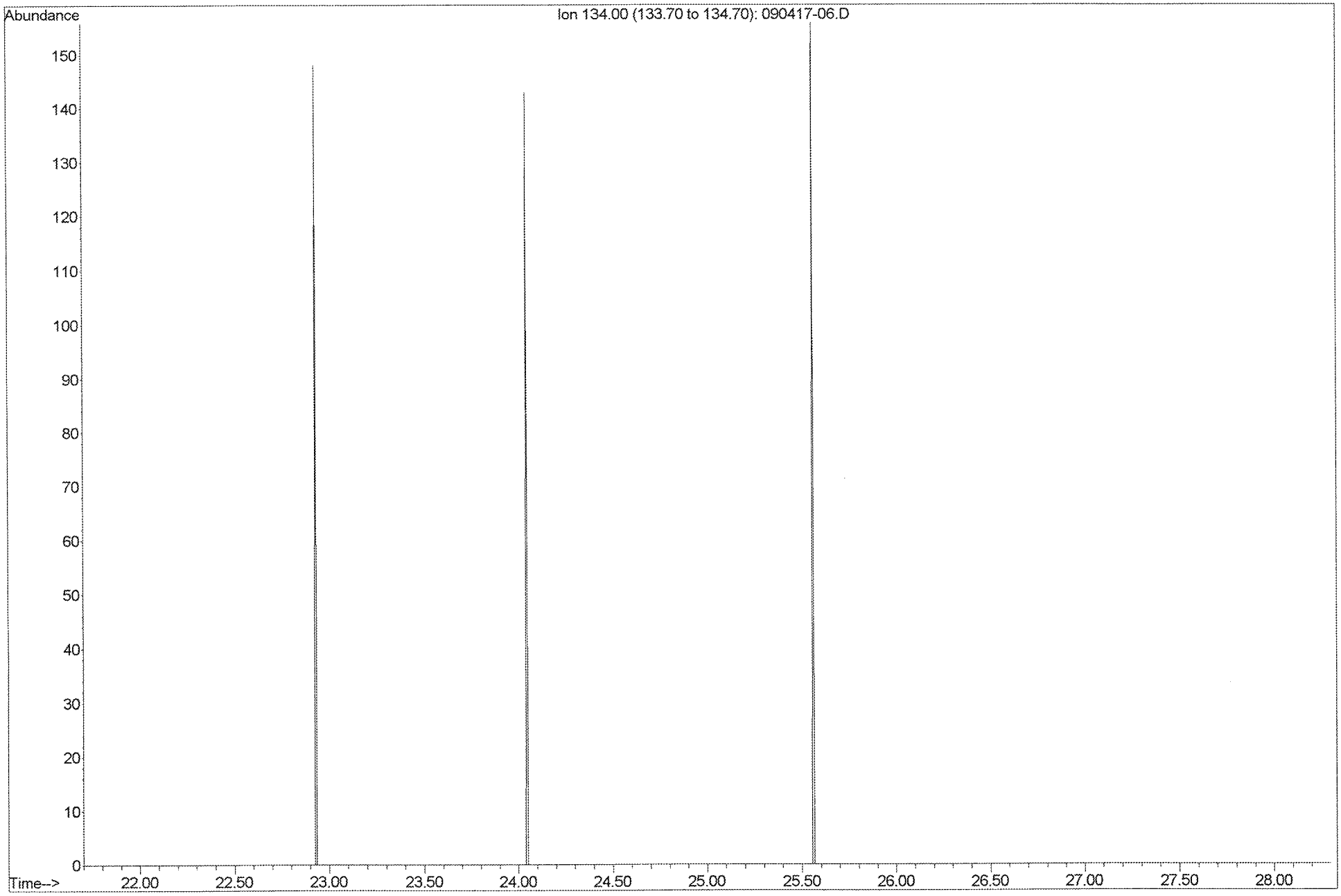

ED_004042_00000842-00071

23733-3 [HH01-01-03-170901-21]
910mL->1mL

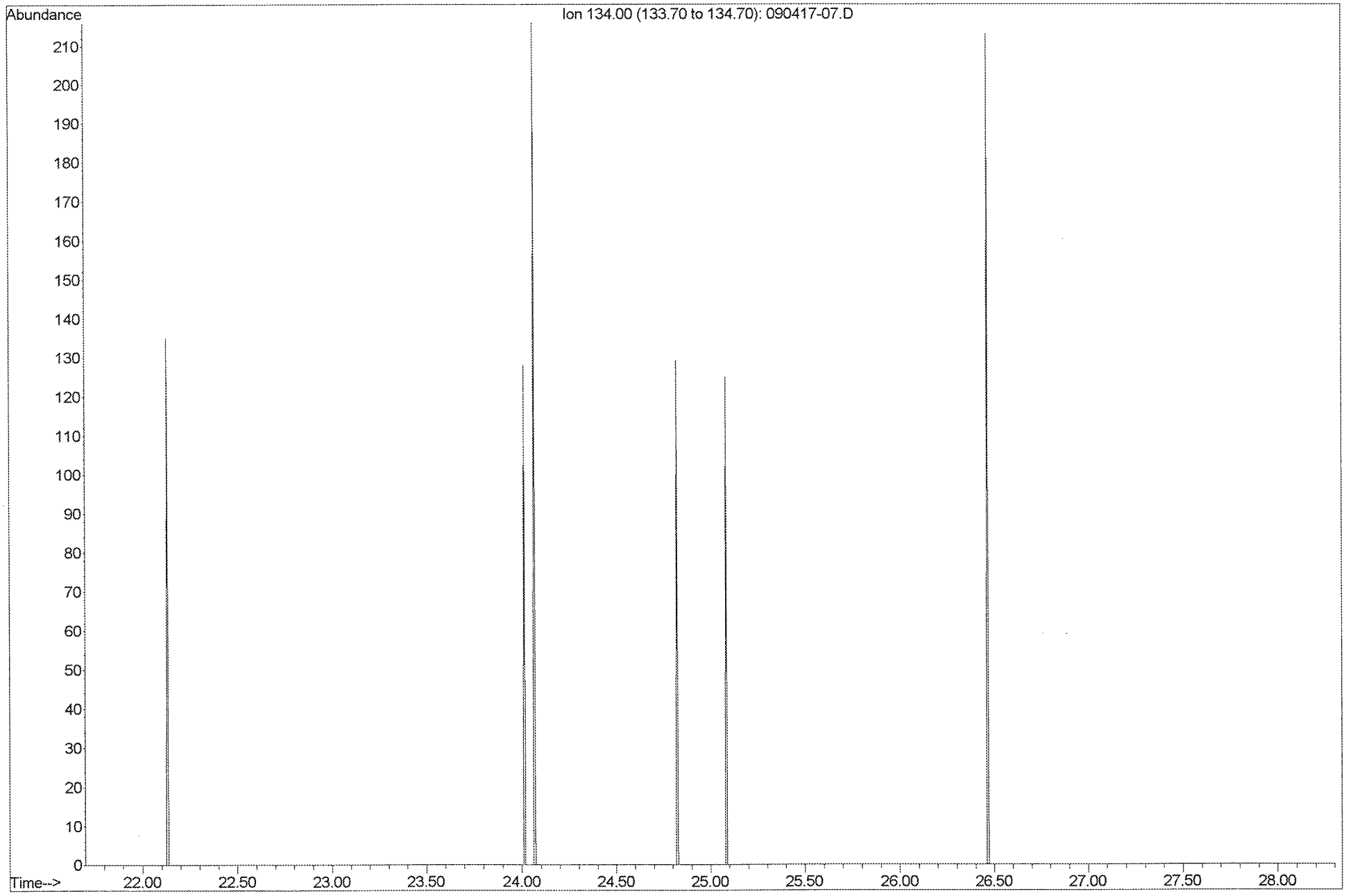



ED_004042_00000842-00072

23733-4 [HH01-01-03-170901-22]
870mL->1mL

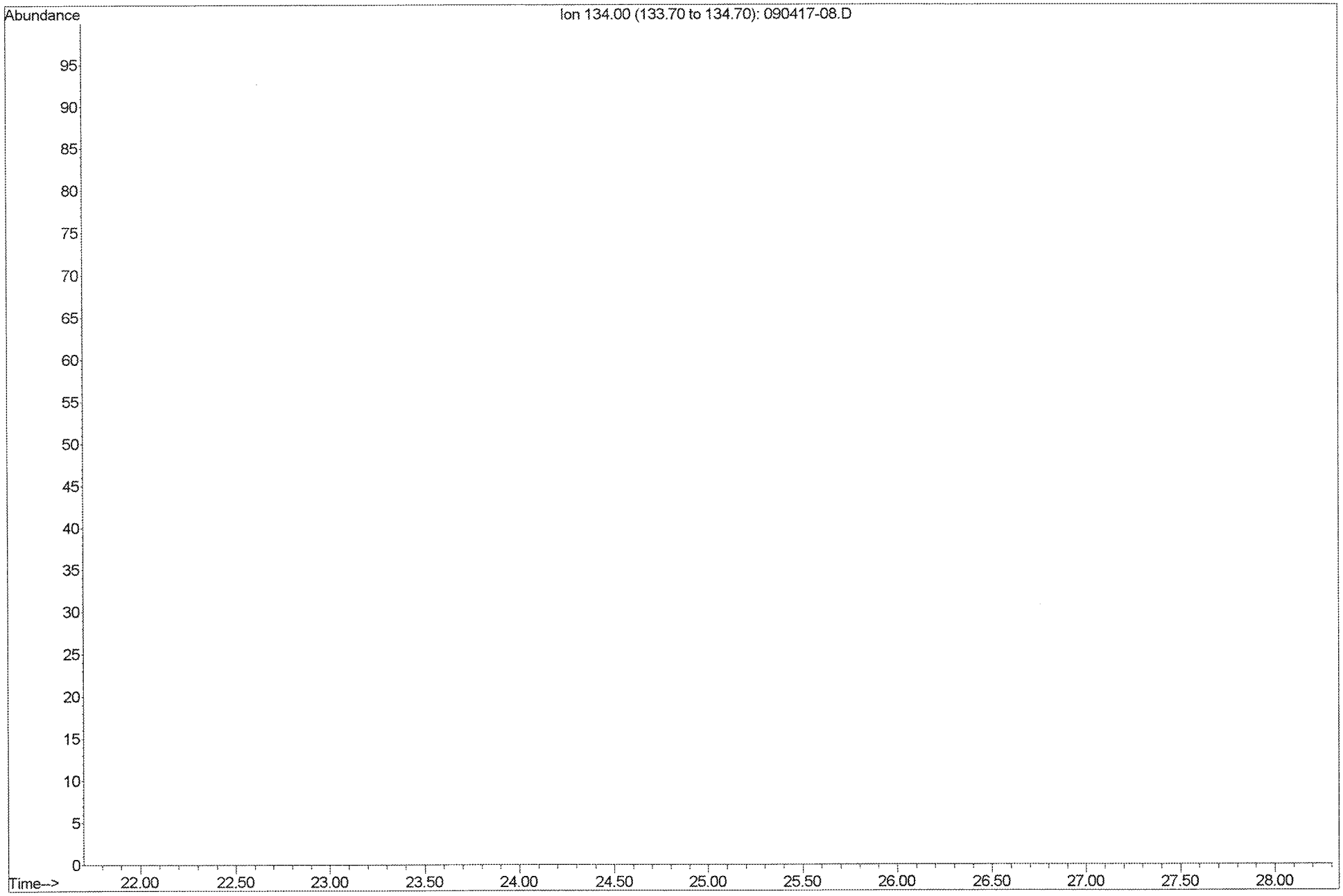


23733-5 [HH01-01-04-170901-21]
910mL->1mL




ED_004042_00000842-00074

23733-6 [HH01-01-05-170901-21]
730mL->1mL




ED_004042_00000842-00075

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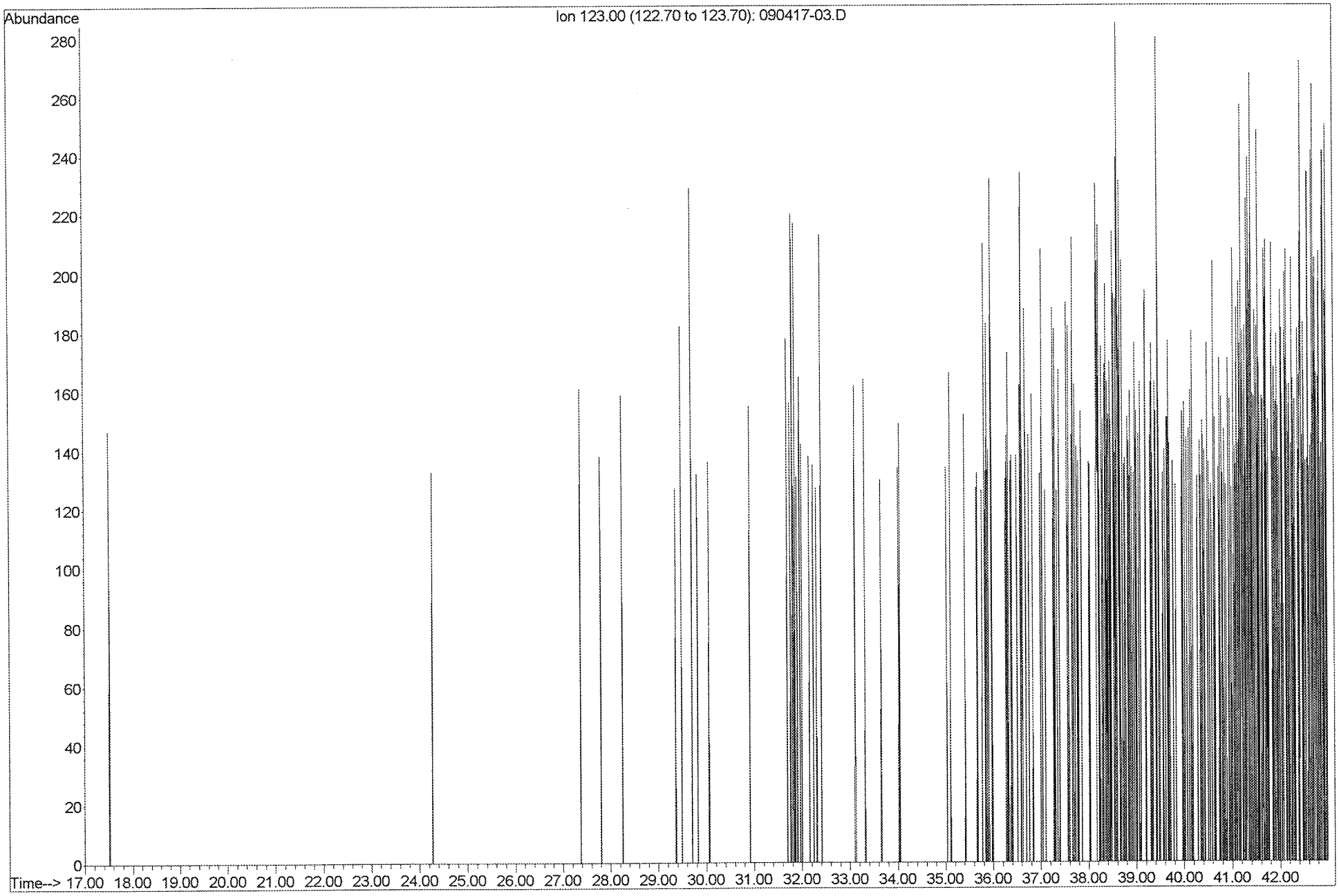
## Key for Identification of the Bicyclanes (m/z 123)

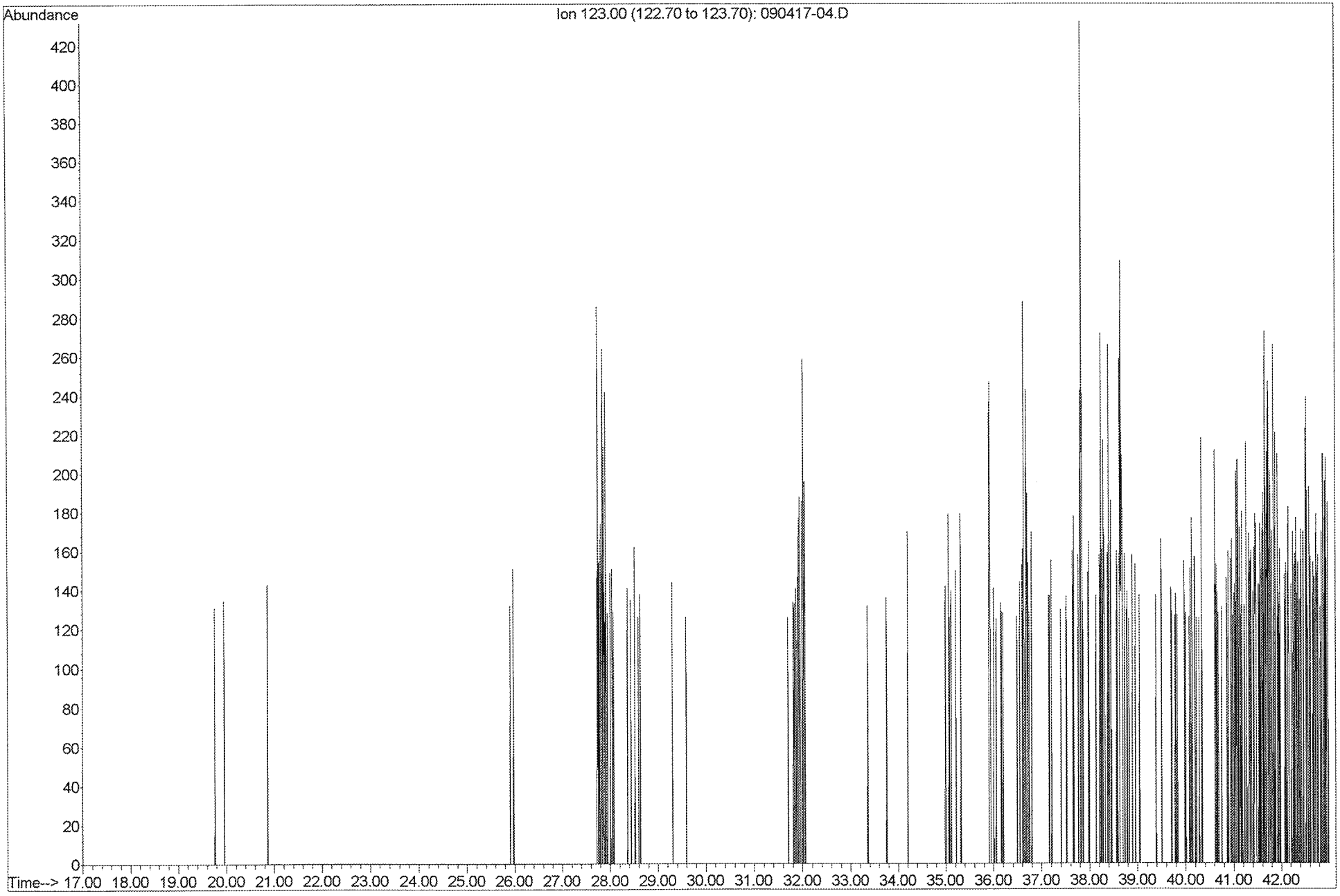
| Peak No. | Identity | Formula | M.W. |
|---|---|---|---|
| a | 2,2,3-Trimethylbicycloheptane | $C_{10}H_{18}$ | 138 |
| b | $C_{10}$ bicycloalkane | $C_{10}H_{18}$ | 138 |
| c | 3,3,7-Trimethylbicycloheptane | $C_{10}H_{18}$ | 138 |
| d | $C_{11}$ Decalin | $C_{11}H_{20}$ | 152 |
| f | Nordrimane | $C_{14}H_{26}$ | 194 |
| g | Nordrimane | $C_{14}H_{26}$ | 194 |
| h | Rearranged drimane | $C_{15}H_{28}$ | 208 |
| j | Rearranged drimane | $C_{15}H_{28}$ | 208 |
| k | Isomer of Eudesmane | $C_{15}H_{28}$ | 208 |
| l | 4β (H) Eudesmane | $C_{15}H_{28}$ | 208 |
| m | $C_{15}$ Bicyclic Sesquiterpane | $C_{15}H_{28}$ | 208 |
| n | 8β (H) Drimane | $C_{15}H_{28}$ | 208 |
| o | $C_{15}$ Bicyclic Sesquiterpane | $C_{15}H_{28}$ | 208 |
| p | $C_{16}$ Bicyclic Sesquiterpane | $C_{16}H_{30}$ | 222 |
| q | $C_{16}$ Bicyclic Sesquiterpane | $C_{16}H_{30}$ | 222 |
| r | 8β (H) Homodrimane | $C_{16}H_{30}$ | 222 |

23733-1 [HH01-01-01-170901-21]
770mL->1mL



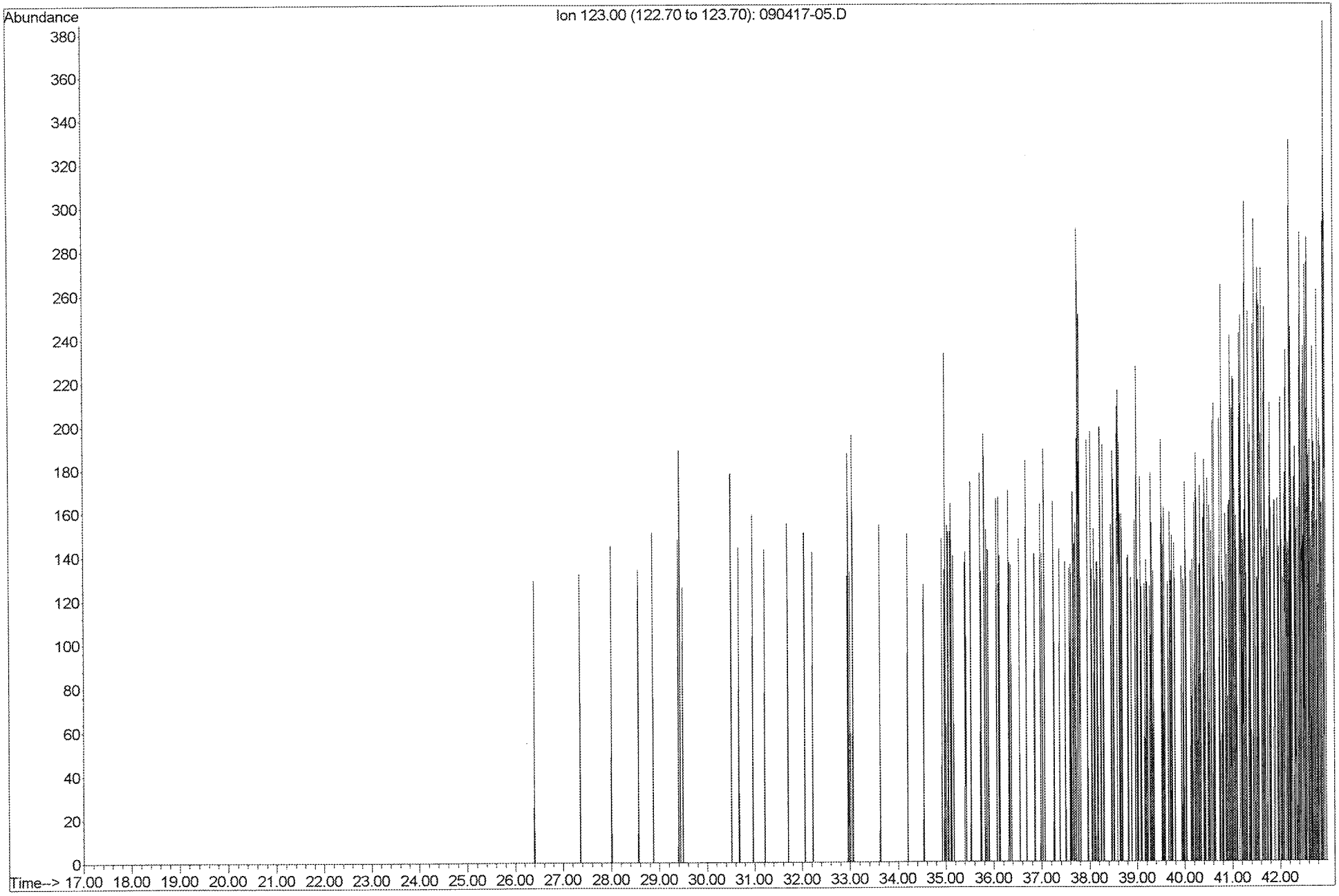

ED_004042_00000842-00077

23733-2 [HH01-01-02-170901-21]
950mL->1mL



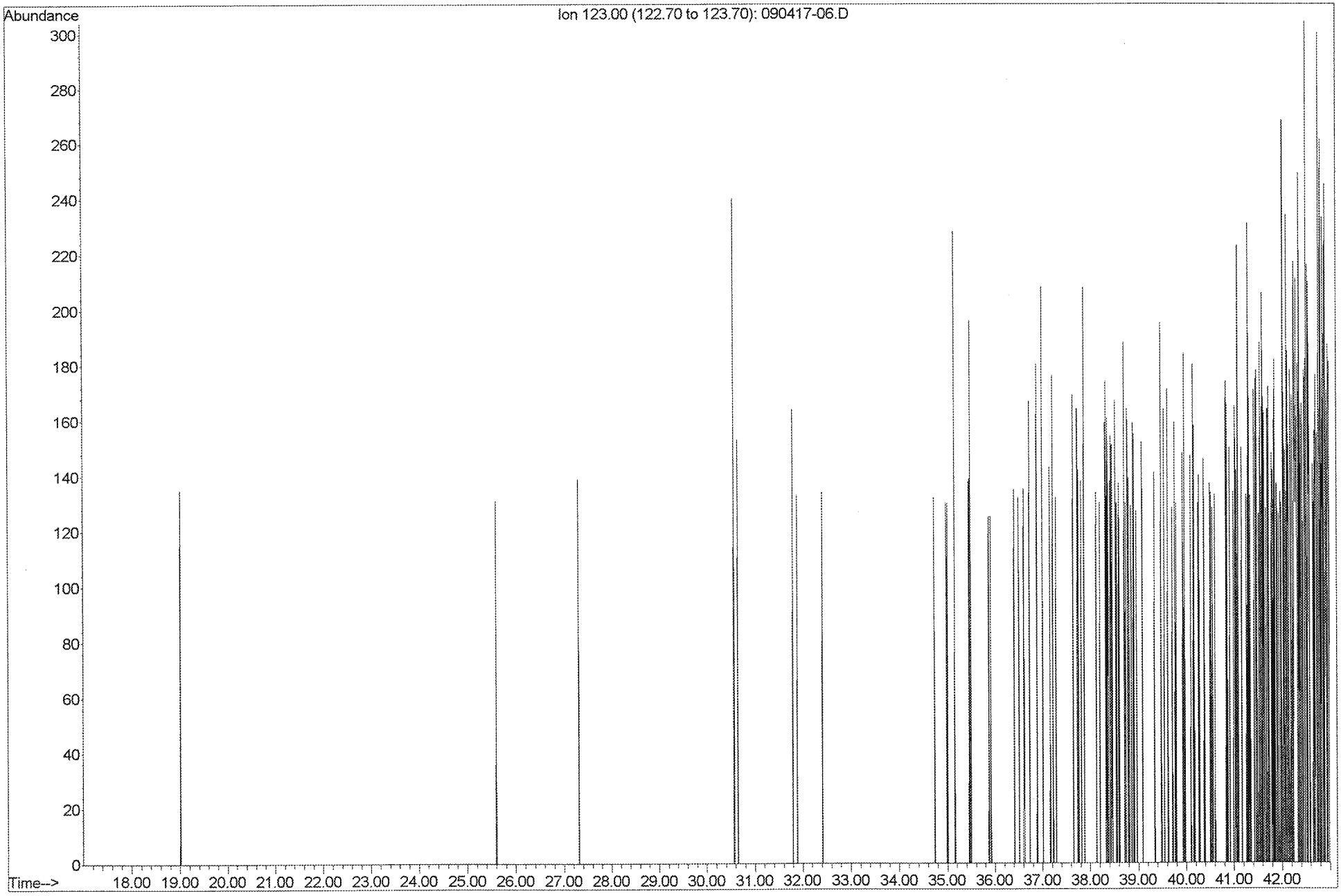

ED_004042_00000842-00078

23733-3 [HH01-01-03-170901-21]
910mL->1mL



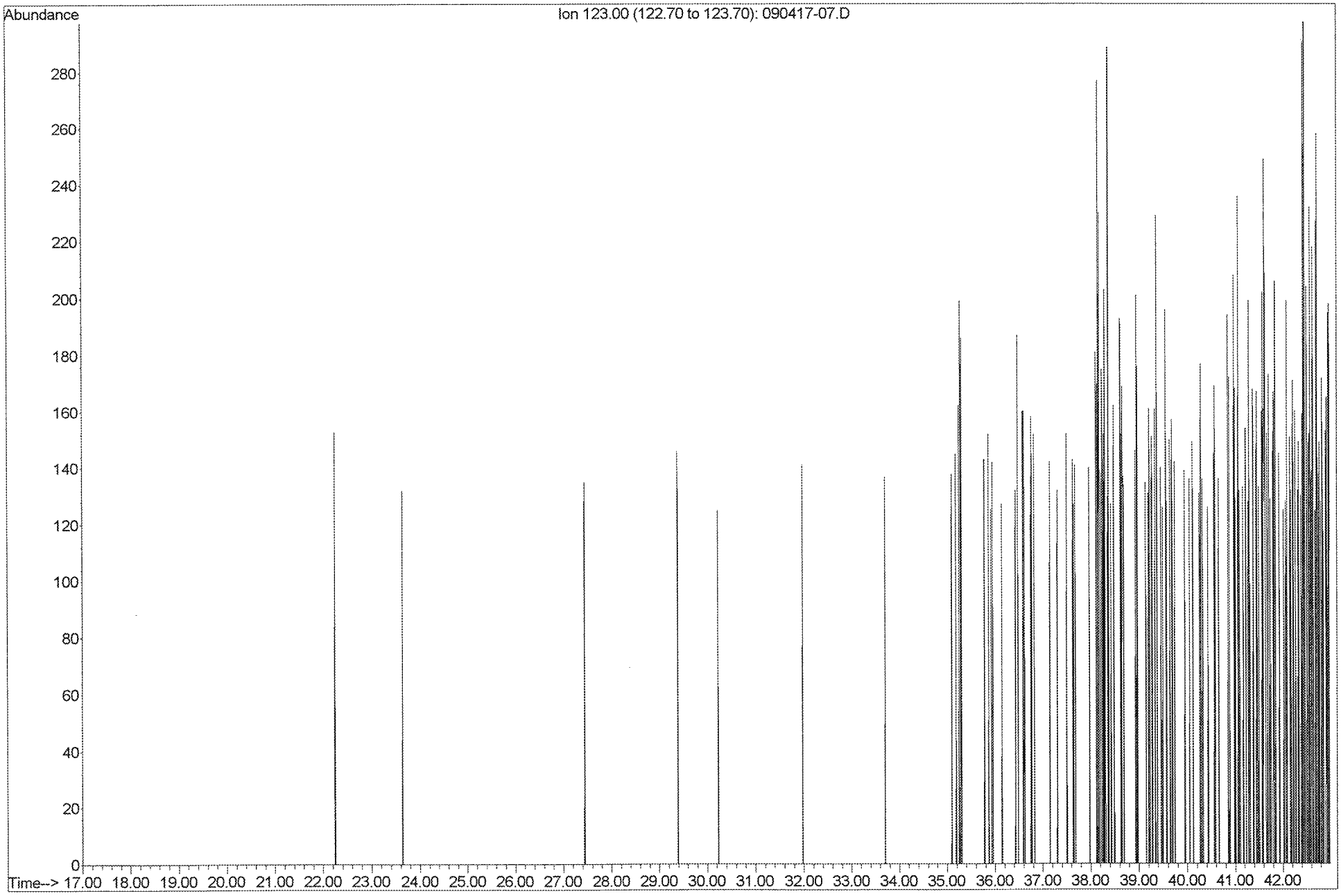

ED_004042_00000842-00079

23733-4 [HH01-01-03-170901-22]
870mL->1mL



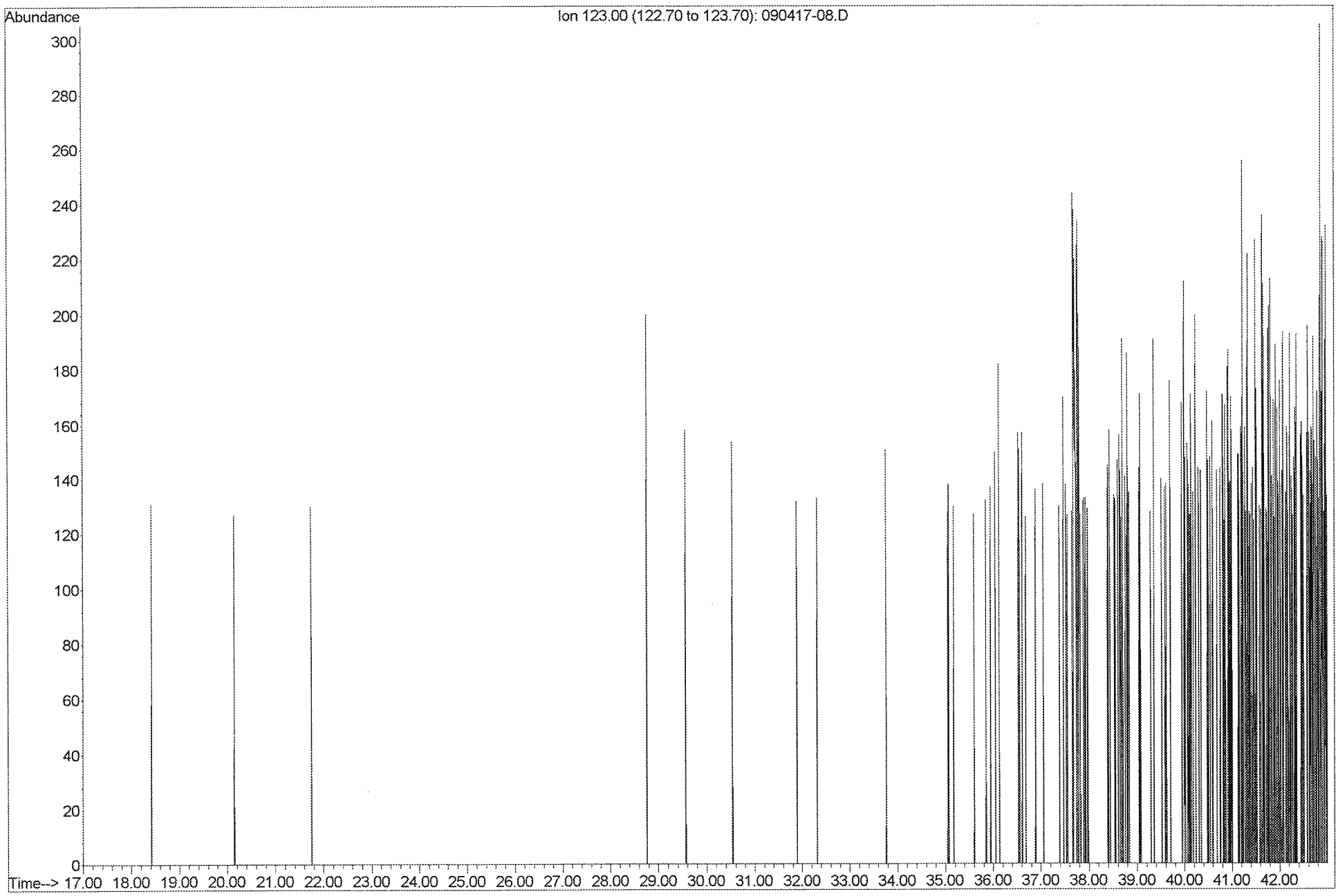

ED_004042_00000842-00080

23733-5 [HH01-01-04-170901-21]
910mL->1mL




ED_004042_00000842-00081

23733-6 [HH01-01-05-170901-21]
730mL->1mL




ED_004042_00000842-00082

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## Key for Tricyclic, Tetracyclic, and Pentacyclic Terpanes Identification (m/z 191 Mass chromatograms)

| Code | Identity | Carbon # |
|---|---|---|
| 0 | $C_{20}$-Tricyclic Terpane | 20 |
| 1 | $C_{21}$-Tricyclic Terpane | 21 |
| 2 | $C_{22}$-Tricyclic Terpane | 22 |
| 3 | $C_{23}$-Tricyclic Terpane | 23 |
| 4 | $C_{24}$-Tricyclic Terpane | 24 |
| 5 | $C_{25}$-Tricyclic Terpane | 25 |
| Z4 | $C_{24}$-Tetracyclic Terpane | 24 |
| 6a | $C_{26}$-Tricyclic Terpane | 26 |
| 6b | $C_{26}$-Tricyclic Terpane | 26 |
| 7 | $C_{27}$-Tricyclic Terpane | 27 |
| A | $C_{28}$-Tricyclic Terpane #1 | 28 |
| B | $C_{28}$-Tricyclic Terpane #2 | 28 |
| C | $C_{29}$-Tricyclic Terpane #1 | 29 |
| D | $C_{29}$-Tricyclic Terpane #2 | 29 |
| E | 18 α-22,29,30-Trisnorneohopane (Ts) | 27 |
| F | 17 α-22,29,30-Trisnorhopane (Tm) | 27 |
| G | 17 β-22,29,30-Trisnorhopane | 27 |
| H | 17 α-23,28-Bisnorlupane | 28 |
| 10a | $C_{30}$-Tricyclic Terpane #1 | 30 |
| 10b | $C_{30}$-Tricyclic Terpane #2 | 30 |
| I | 17 α-28,30 Bisnorhopane | 28 |
| 11a | $C_{31}$-Tricyclic Terpane #1 | 31 |
| J | 17α-25-Norhopane | 29 |
| 11b | $C_{31}$-Tricyclic Terpane #2 | 31 |
| K | 17 α,21β-30-Norhopane | 29 |
| $C_{29}$Ts | 18α-30-Norneohopane | 29 |
| $C_{30}^{*}$ | 17α-Diahopane | 30 |
| L | 17β-21α-30-Normoretane | 29 |
| Ma | 18α-Oleanane | 30 |
| Mb | 18β-Oleanane | 30 |
| N | 17α-21β-Hopane | 30 |
| O | 17β-21α-Moretane | 30 |
| 13a | $C_{33}$-Tricyclic Terpane #1 | 33 |
| 13b | $C_{33}$-Tricyclic Terpane #2 | 33 |

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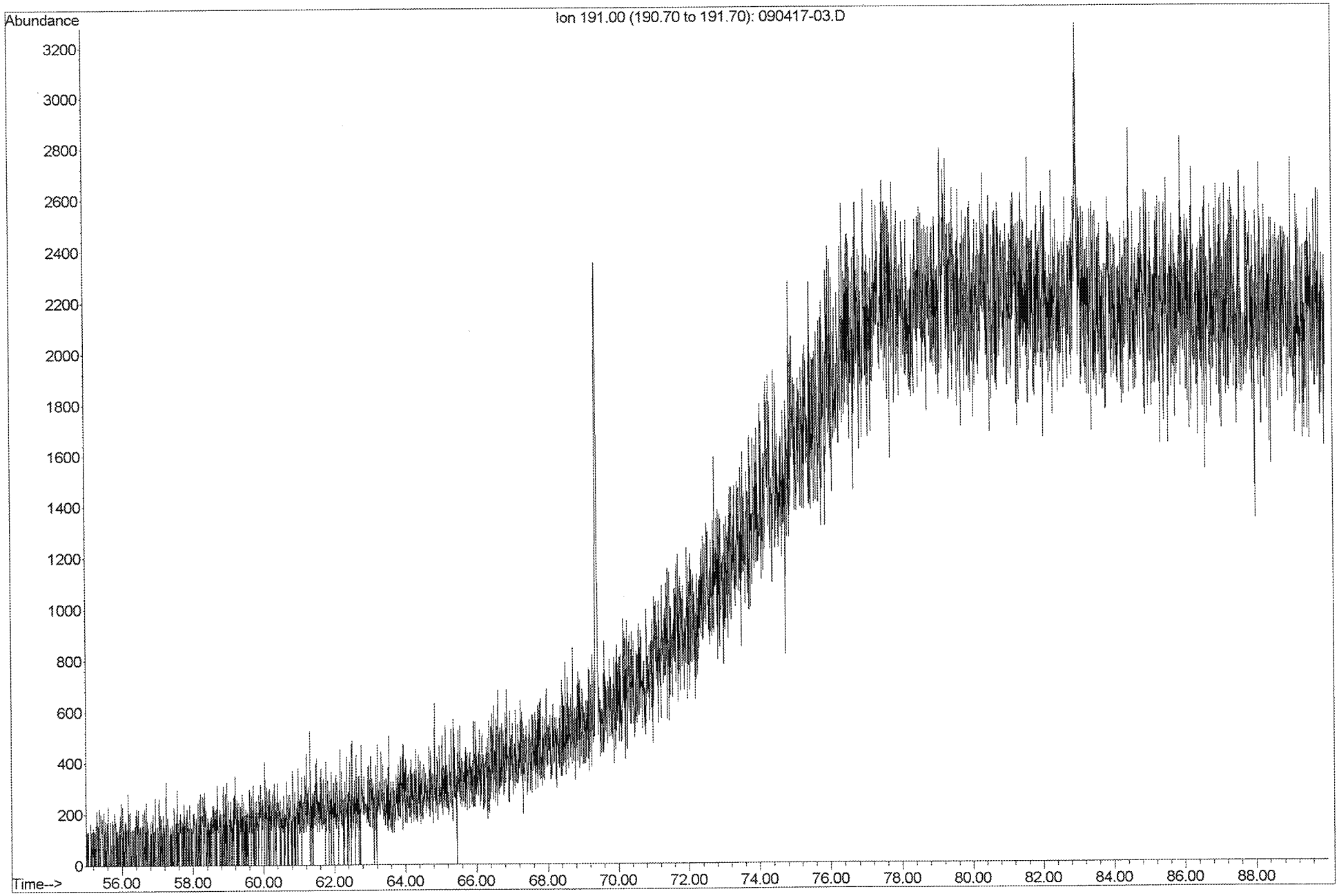
## Key for Tricyclic, Tetracyclic, and Pentacyclic Terpanes Identification (m/z 191 Mass chromatograms) – Cont.

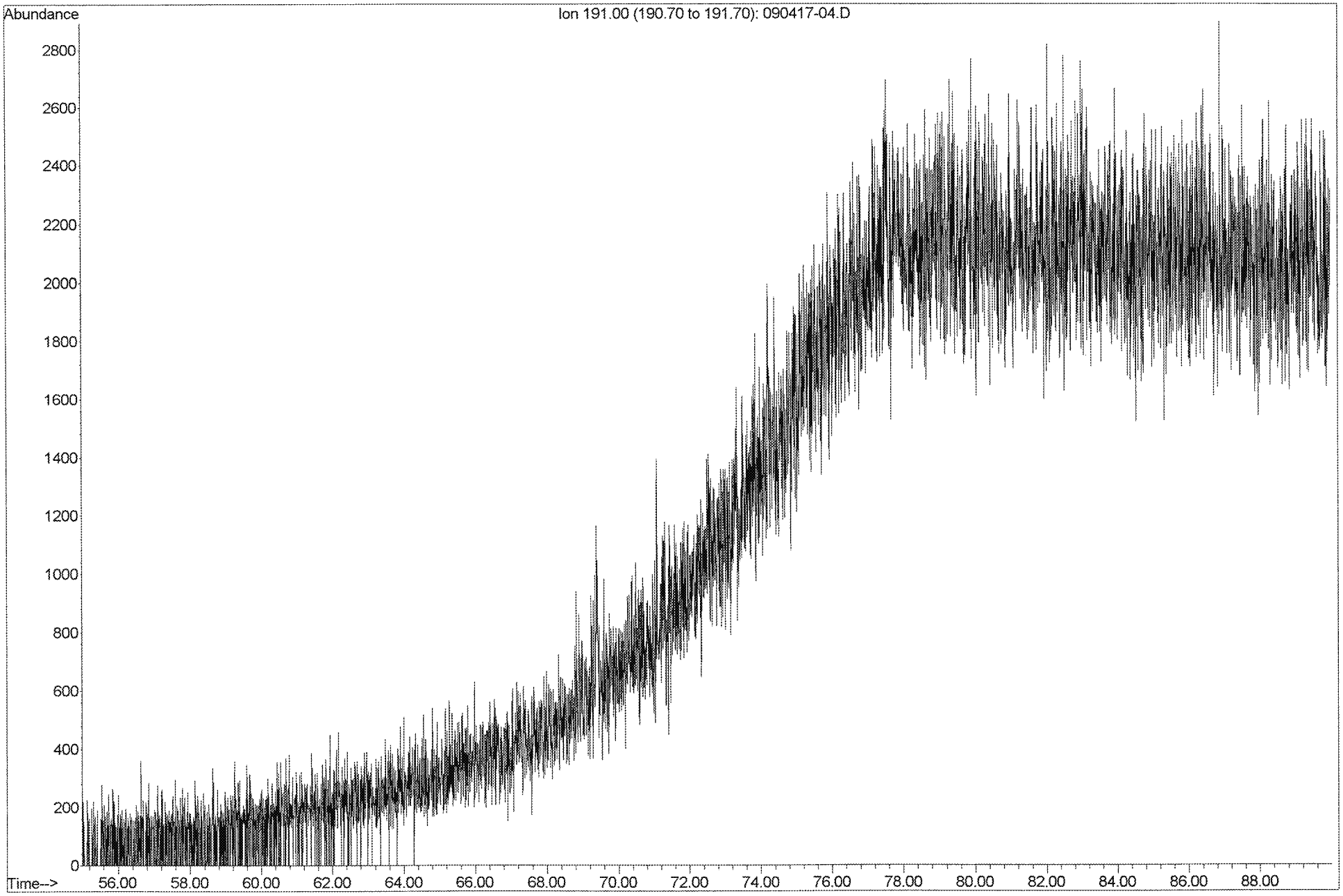
| Code | Identity | Carbon # |
|---|---|---|
| P | 22S-17α,21β-30-Homohopane | 31 |
| Q | 22R-17α,21β-30-Homohopane | 31 |
| R | Gammacerane | 30 |
| 14a | $C_{34}$-Tricyclic Terpane #1 | 34 |
| S | 17β,21α-Homomoretane | 31 |
| 14b | $C_{34}$-Tricyclic Terpane #2 | 34 |
| T | 22S-17α,21β-30-Bishomohopane | 32 |
| U | 22R-17α,21β-30-Bishomohopane | 32 |
| 15a | $C_{35}$-Tricyclic Terpane #1 | 35 |
| 15b | $C_{34}$-Tricyclic Terpane #2 | 35 |
| V | 17β,21α-$C_{32}$-Bishomomoretane | 32 |
| WS | 22S-17α,21β-30-Bishomohopane | 33 |
| WR | 22R-17α,21β-30,31,32-Trishomohopane | 33 |
| 16a | $C_{36}$-Tricyclic Terpane #1 | 36 |
| 16b | $C_{36}$-Tricyclic Terpane #2 | 36 |
| XS | 22S-17α,21β-30,31,32,33-Tetrahomohopane | 34 |
| XR | 22R-17α,21β-30,31,32,33-Tetrahomohopane | 34 |
| YS | 22S-17α,21β-30,31,32,33,34-Pentahomohopane | 35 |
| YR | 22R-17α,21β-30,31,32,33,34-Pentahomohopane | 35 |

23733-1 [HH01-01-01-170901-21]
770mL->1mL



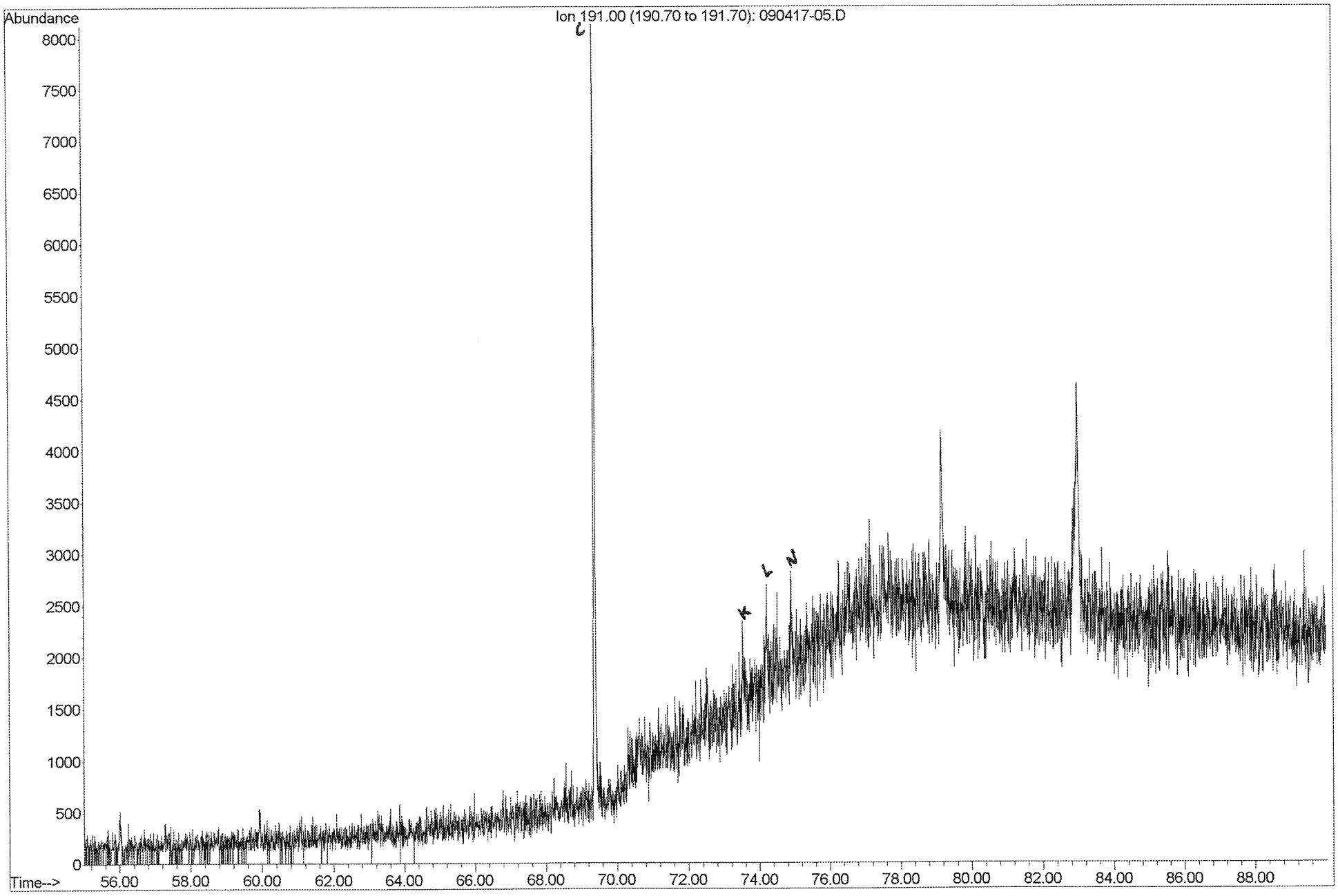

ED_004042_00000842-00085

23733-2 [HH01-01-02-170901-21]
950mL->1mL



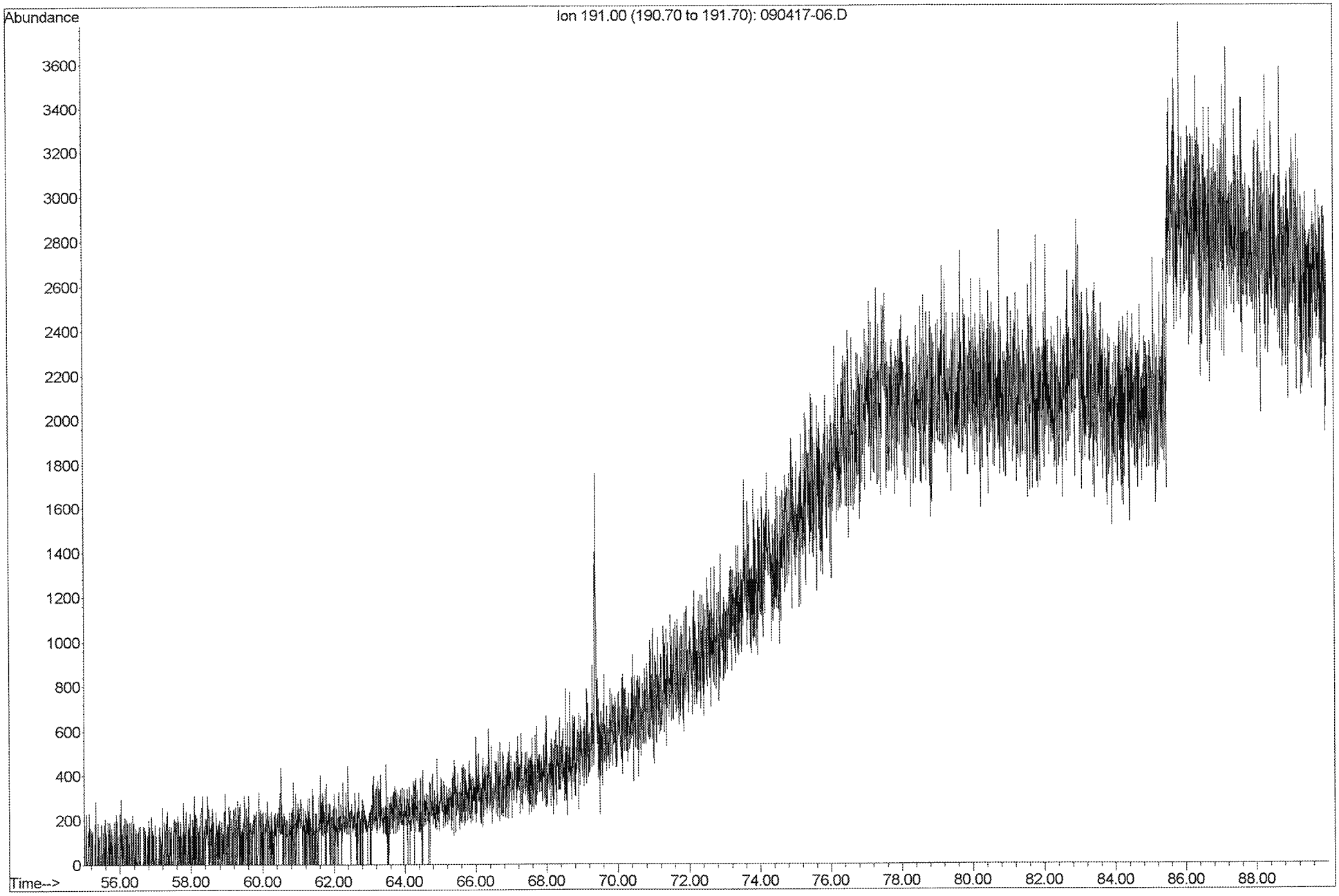

ED_004042_00000842-00086

23733-3 [HH01-01-03-170901-21]
910mL->1mL

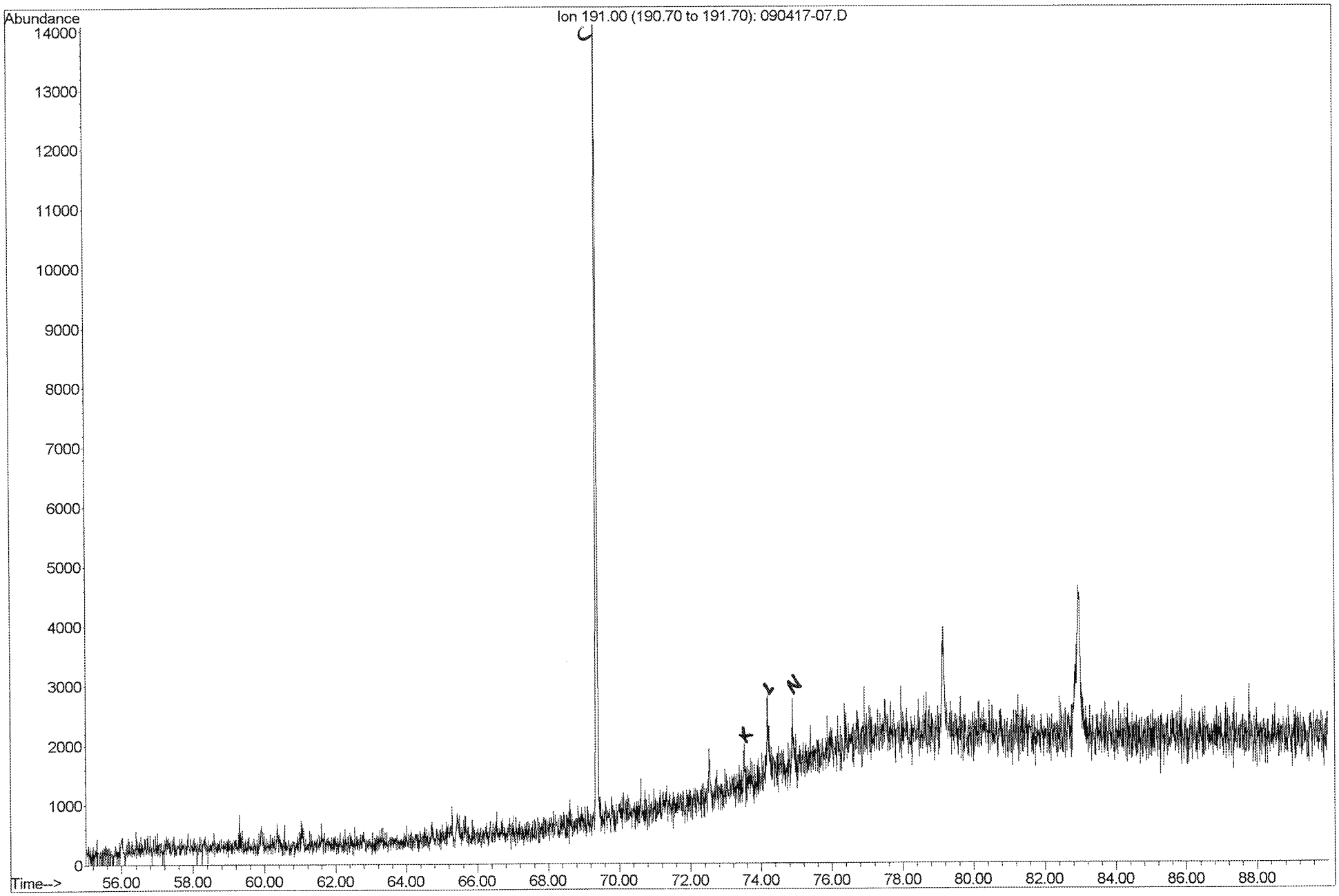



ED_004042_00000842-00087

23733-4 [HH01-01-03-170901-22]
870mL->1mL

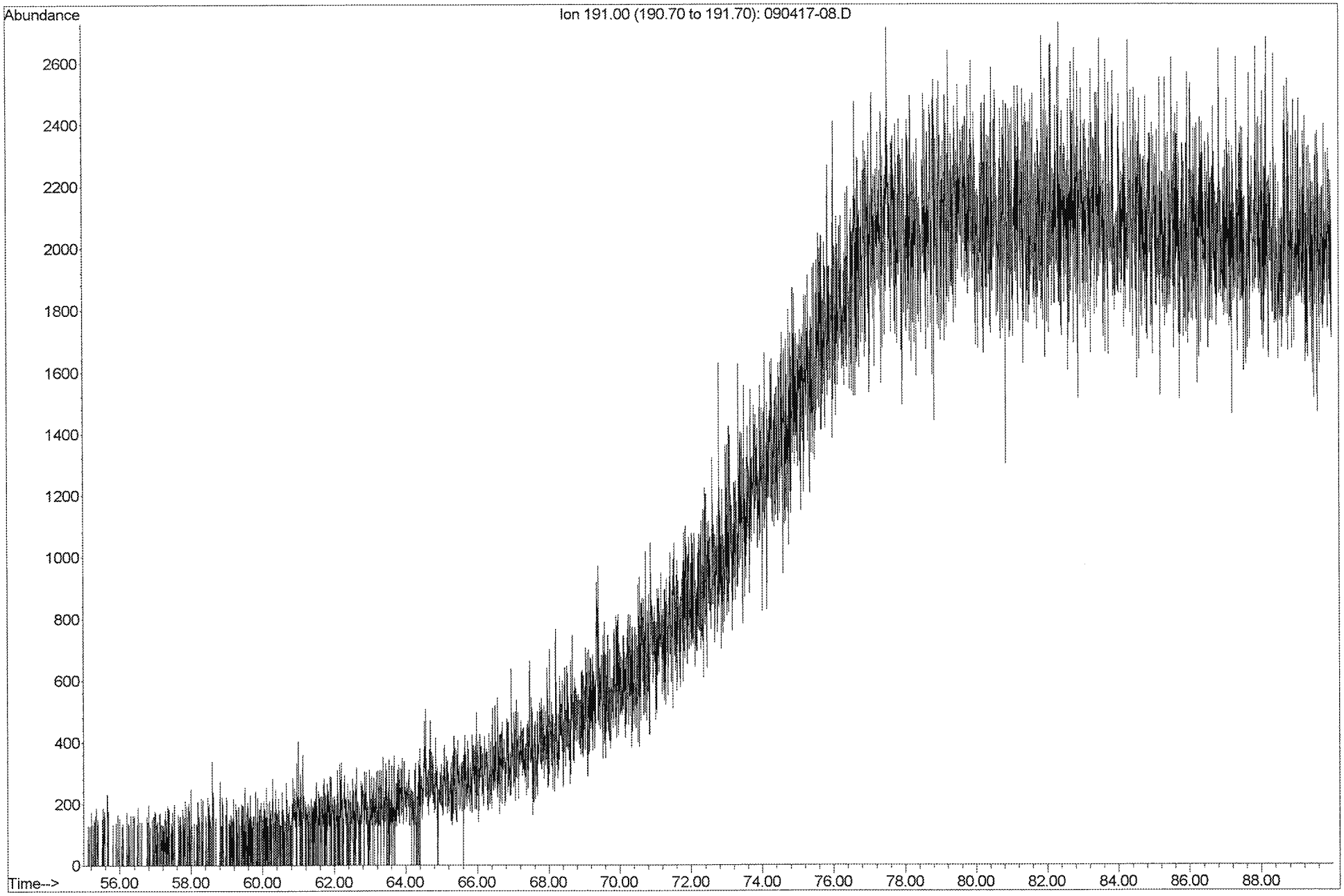


23733-5 [HH01-01-04-170901-21]
910mL->1mL




ED_004042_00000842-00089

23733-6 [HH01-01-05-170901-21]
730mL->1mL




ED_004042_00000842-00090

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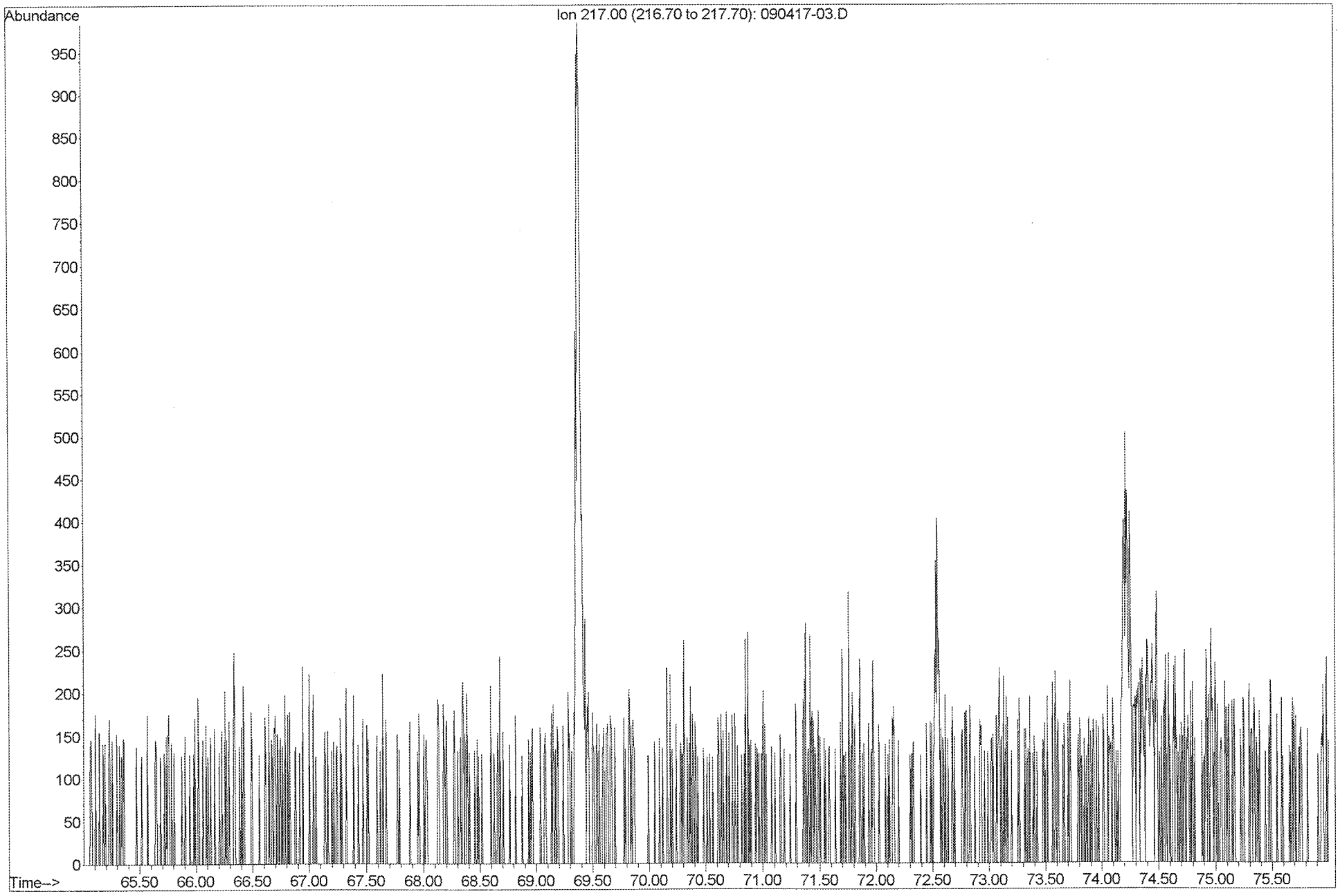
Key for Steranes Identification (m/z 217 Mass Chromatogram)

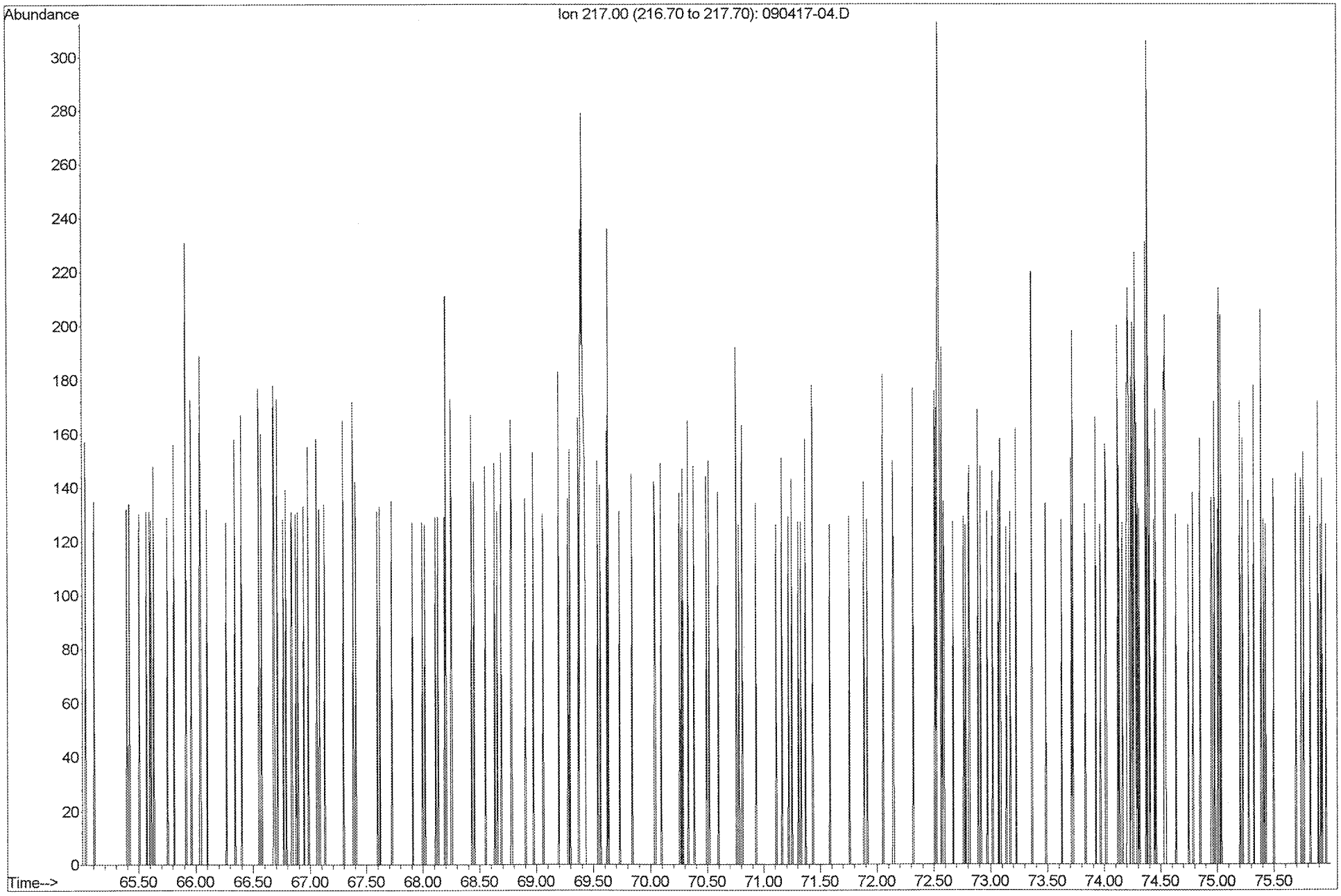
| Code | Identity | Carbon # |
|---|---|---|
| 1 | 13β, 17α-Diacholestane (20S) | 27 |
| 2 | 13β, 17α-Diacholestane (20R) | 27 |
| 3 | 13α, 17β-Diacholestane (20S) | 27 |
| 4 | 13α, 17β-Diacholestane (20R) | 27 |
| 5 | 24-methyl-13β,17α-Diacholestane (20S) | 28 |
| 6 | 24-methyl-13β,17α-Diacholestane (20S) | 28 |
| 7D | 24-methyl-13α,17β-Diacholestane (20S) | 28 |
| 7 | 14α,17α-Cholestane (20S) | 27 |
| 8D | 24-ethyl-13β, 17α-Diacholestane (20S) | 29 |
| 8 | 14β,17β-Cholestane (20R) | 27 |
| 9 | 14β,17β-Cholestane (20S) | 27 |
| 9D | 24-methyl-13α,17β-Diacholestane (20R) | 28 |
| 10 | 14α,17α-Cholestane (20R) | 27 |
| 11 | 24-ethyl-13β, 17α-Diacholestane (20R) | 29 |
| 12 | 24-ethyl-13α, 17β-Diacholestane (20S) | 29 |
| 13 | 24-ethyl-13α, 17α-Diacholestane (20S) | 28 |
| 14D | 24-ethyl-13α, 17β-Diacholestane (20R) | 29 |
| 14 | 24-methyl-14β, 17β-Cholestane (20R) | 28 |
| 15 | 24-methyl-14β, 17β-Cholestane (20S) | 28 |
| 16 | 24-methyl-14α, 17α-Cholestane (20R) | 28 |
| 17 | 24-ethyl-14α-Cholestane (20S) | 29 |
| 18 | 24-ethyl-14β, 17β-Cholestane (20R) | 29 |
| 19 | 24-ethyl-14β, 17β-Cholestane (20S) | 29 |
| 20 | 24-ethyl-14α, 17α-Cholestane (20R) | 29 |
| 21A | 24-n-Propylcholestane (20S) | 30 |
| 21B | 4-methyl-24-ethylcholestane (20S) | 30 |
| 22A | 4α-methyl-24-ethyl-14β,17β-cholestane (20S) | 30 |
| 22B | 24-n-Propyl-14β,17β-cholestane (20S) | 30 |
| 23A | 4α-methyl-24-ethyl-14β,17β-cholestane (20R) | 30 |
| 23B | 24-n-propyl-14β,17β-cholestane (20R) | 30 |
| 24A | 4α-methyl-24-ethylcholestane (20R) | 30 |
| 24B | 24-n-propylcholestane (20R) | 30 |

23733-1 [HH01-01-01-170901-21]
770mL->1mL



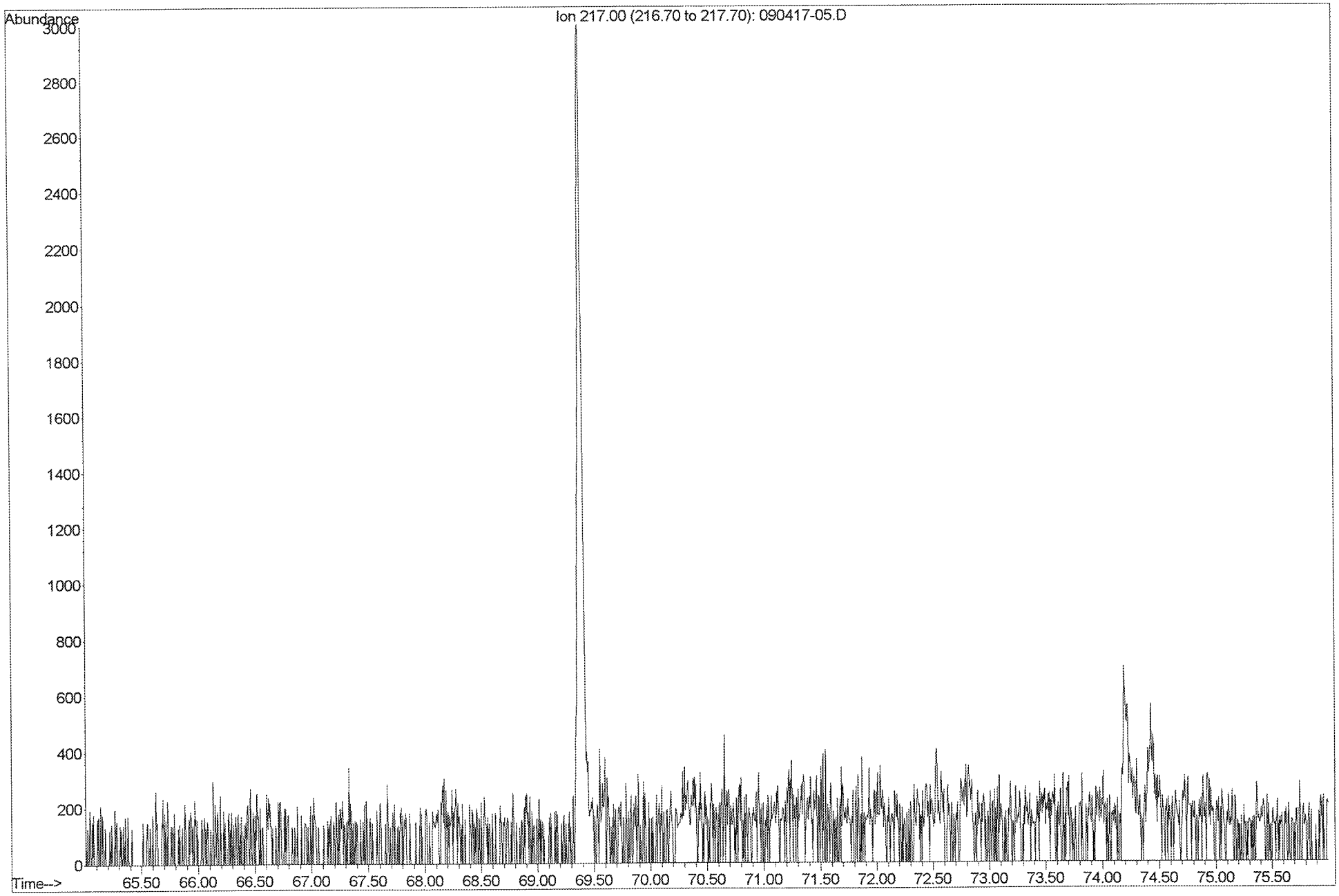

ED_004042_00000842-00092

23733-2 [HH01-01-02-170901-21]
950mL->1mL



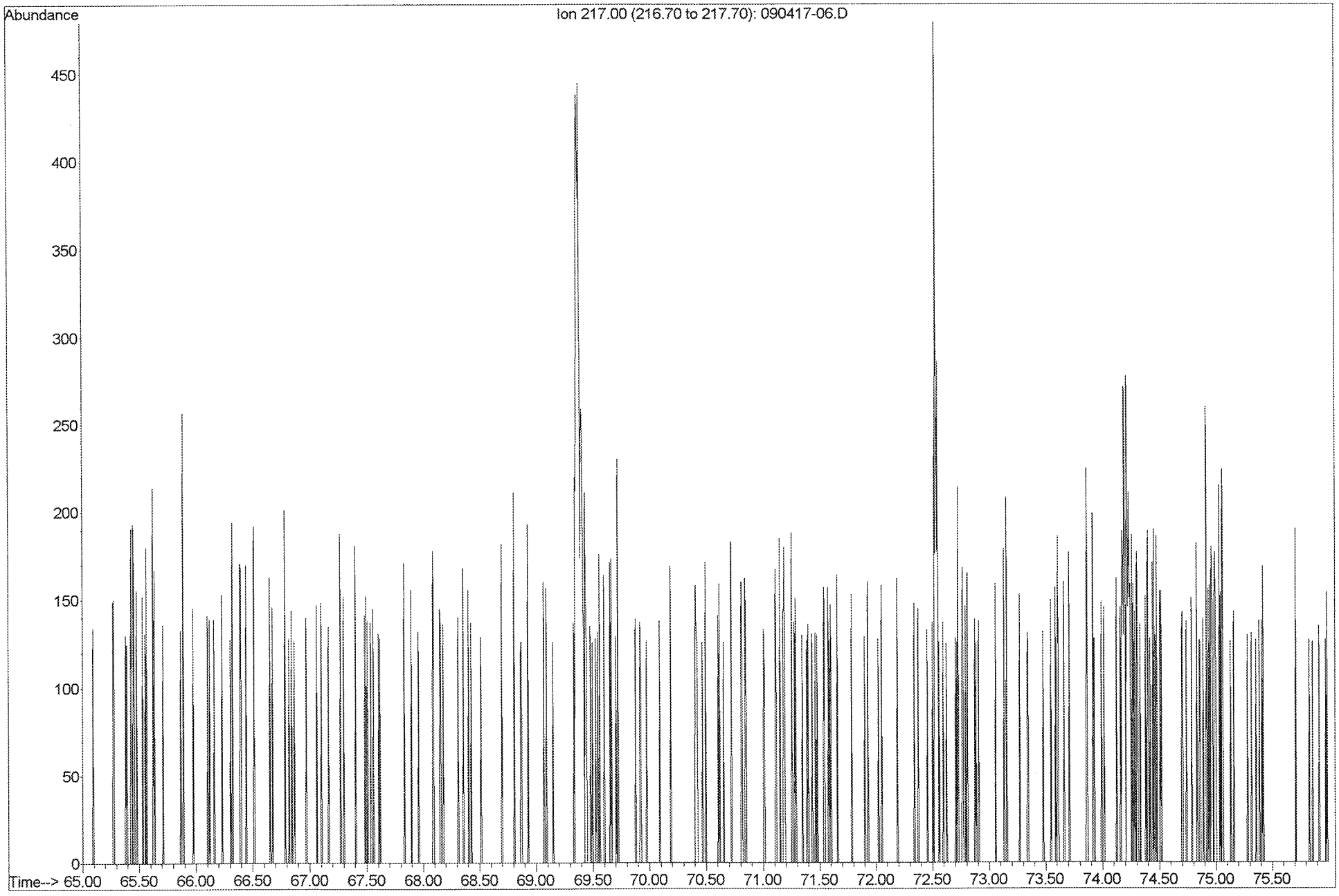

ED_004042_00000842-00093

23733-3 [HH01-01-03-170901-21]
910mL->1mL



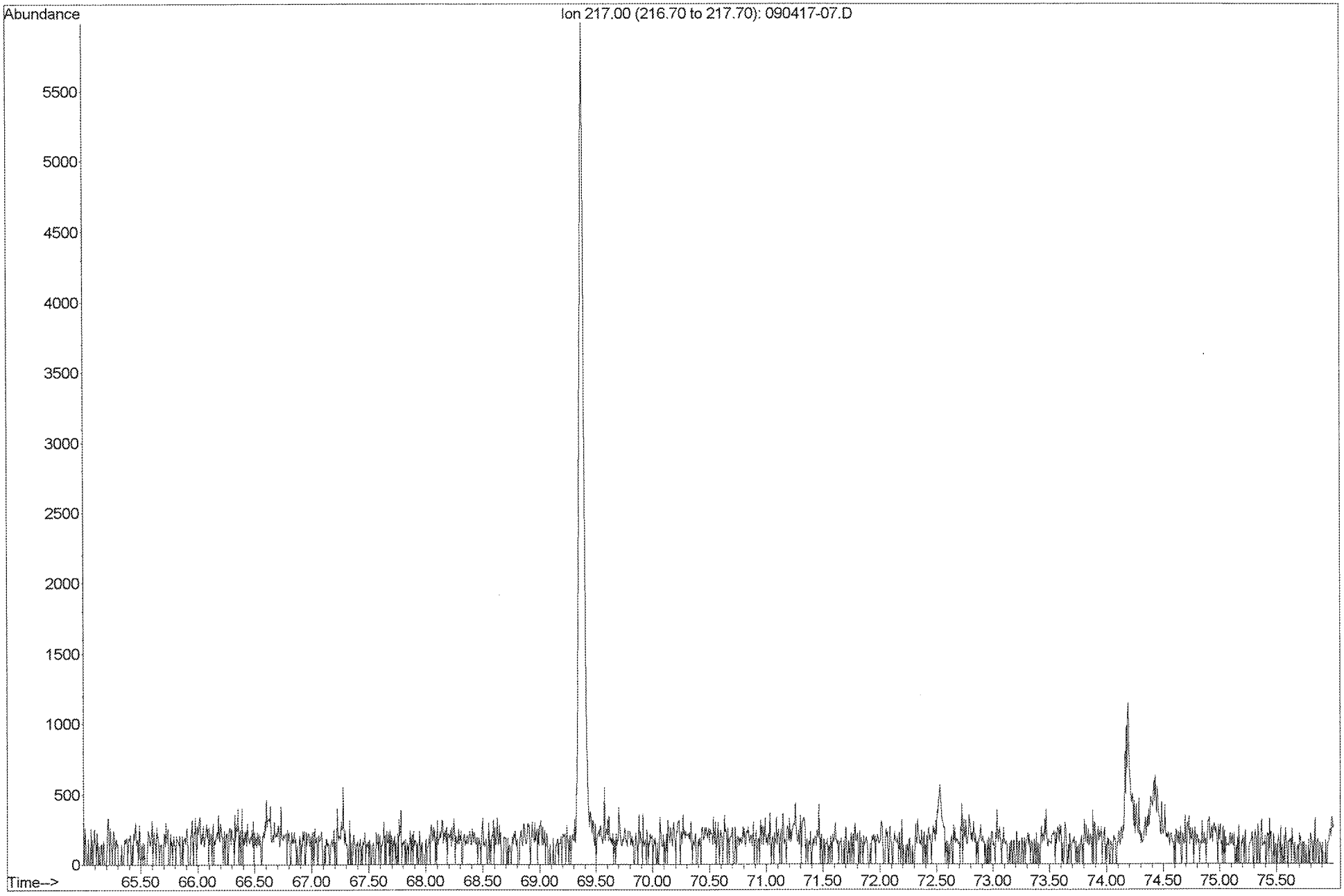

ED_004042_00000842-00094

23733-4 [HH01-01-03-170901-22]
870mL->1mL



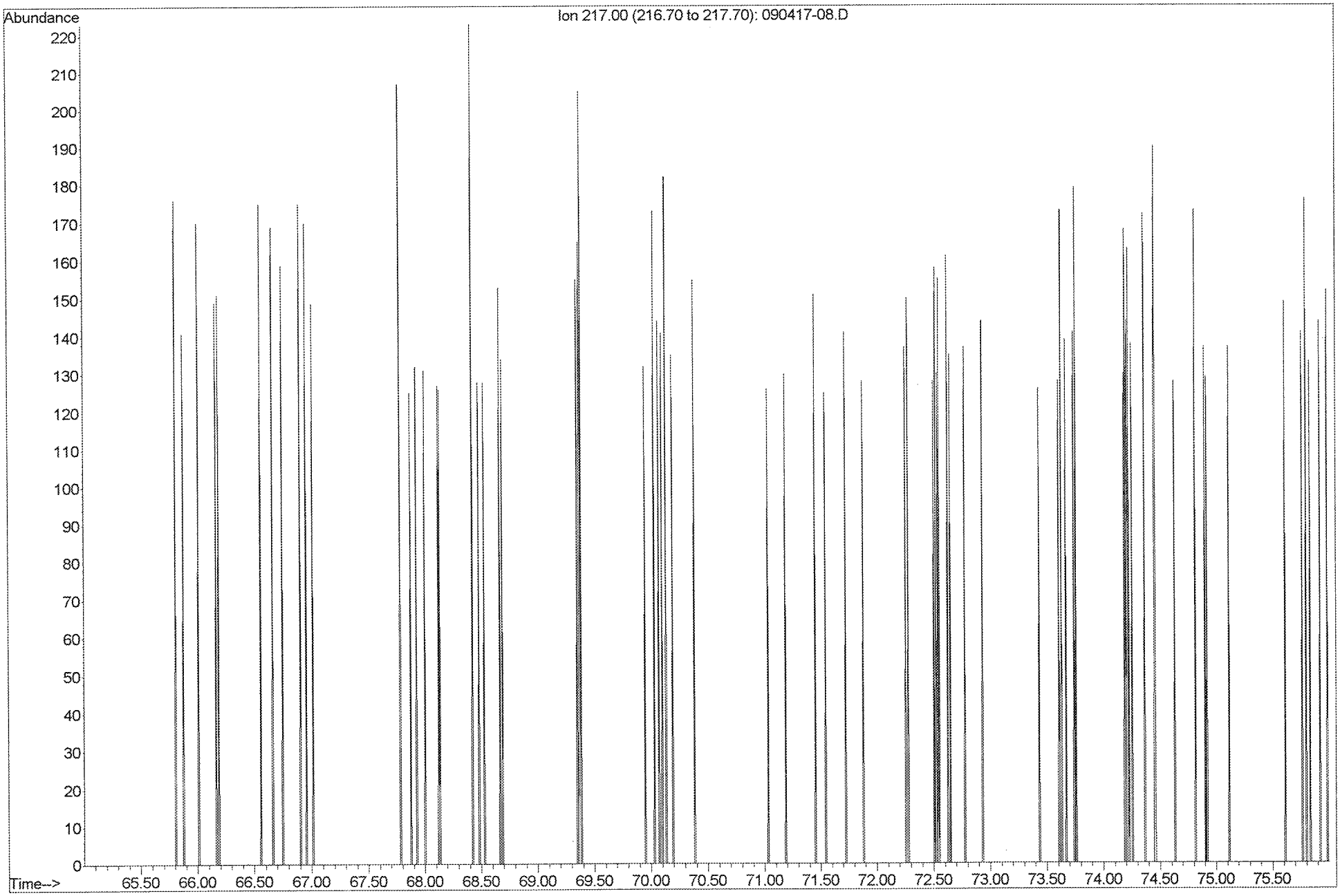

ED_004042_00000842-00095

23733-5 [HH01-01-04-170901-21]
910mL->1mL




ED_004042_00000842-00096

23733-6 [HH01-01-05-170901-21]
730mL->1mL

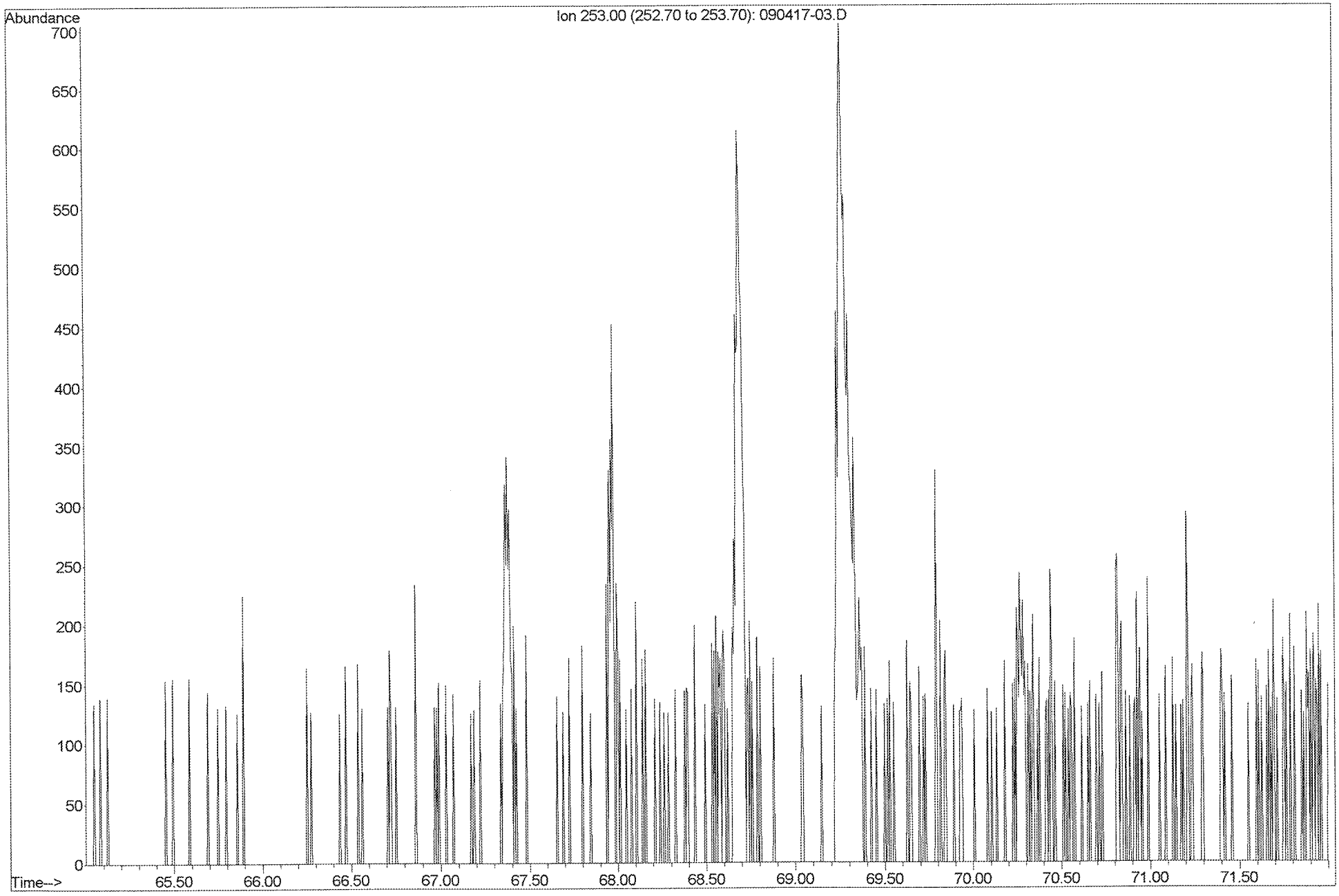



ED_004042_00000842-00097

Key for Monoaromatic Steranes Identification (m/z 253 Mass Chromatogram)

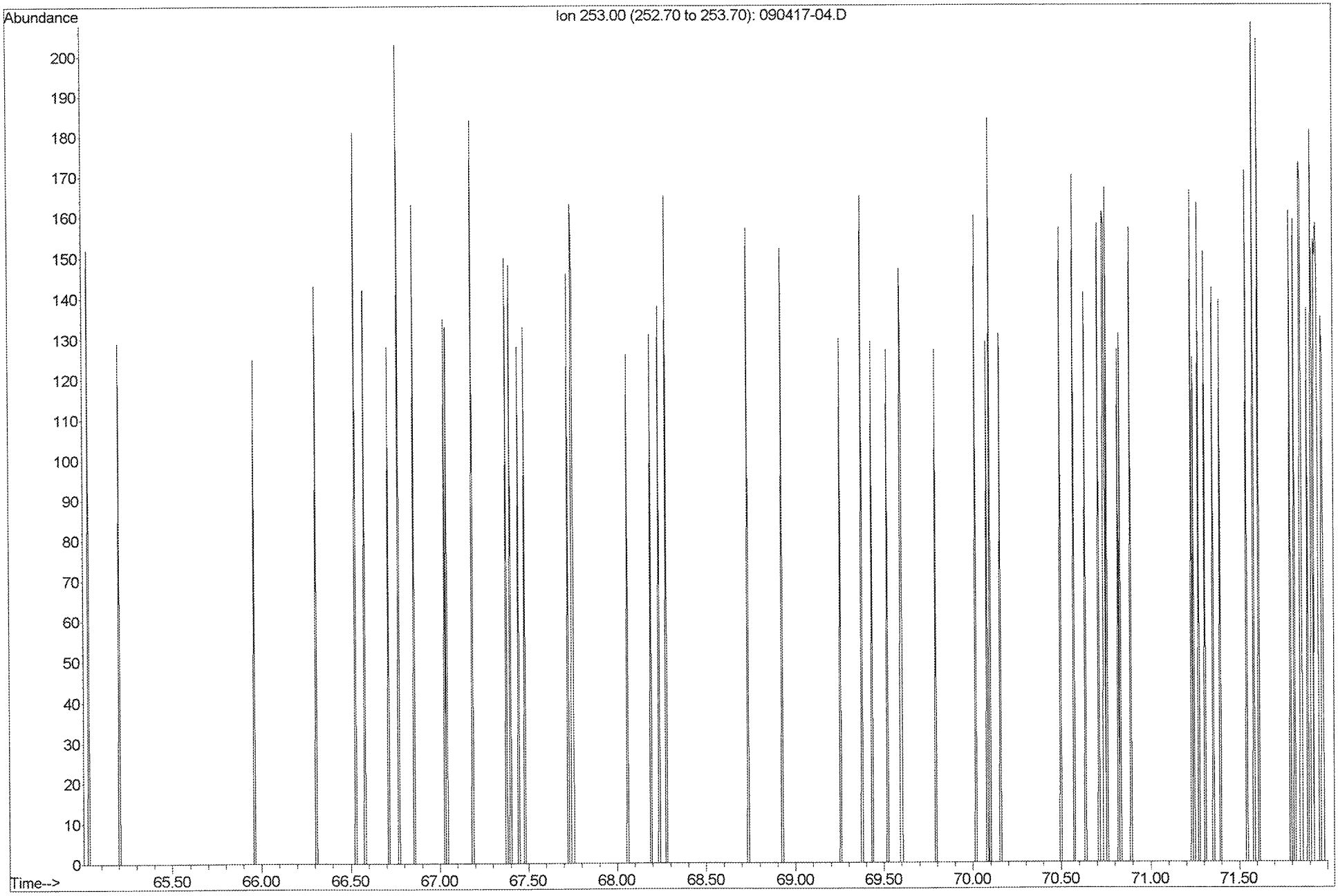
| Code | Identity | Elemental Composition |
|---|---|---|
| a | 20S, 5β $C_{27}$-Monoaromatic Sterane | $C_{27}H_{42}$ |
| b | 20S, dia $C_{27}$-Monoaromatic Sterane | $C_{27}H_{42}$ |
| c | 20R, 5β $C_{27}$-Monoaromatic Sterane + 20R $C_{27}$ dia MAS | $C_{27}H_{42}$ |
| d | 20S, 5α $C_{27}$-Monoaromatic Sterane | $C_{27}H_{42}$ |
| e | 20R, 5β $C_{28}$-Monoaromatic Sterane + 20S $C_{28}$ dia MAS | $C_{28}H_{44}$ |
| f | 20R, 5α $C_{27}$-Monoaromatic Sterane | $C_{27}H_{42}$ |
| g | 20S, 5α $C_{28}$-Monoaromatic Sterane | $C_{28}H_{44}$ |
| h | 20R, 5β $C_{28}$-Monoaromatic Sterane + 20R $C_{28}$ dia MAS | $C_{28}H_{44}$ |
| i | 20S, 5β $C_{29}$-Monoaromatic Sterane + 20S $C_{29}$ dia MAS | $C_{29}H_{46}$ |
| j | 20S, 5α $C_{29}$-Monoaromatic Sterane | $C_{29}H_{46}$ |
| k | 20R, 5α $C_{28}$-Monoaromatic Sterane | $C_{28}H_{44}$ |
| l | 20R, 5β $C_{29}$-Monoaromatic Sterane + 20R $C_{29}$ dia MAS | $C_{29}H_{46}$ |
| m | 20R, 5α $C_{29}$-Monoaromatic Sterane | $C_{29}H_{46}$ |

23733-1 [HH01-01-01-170901-21]
770mL->1mL



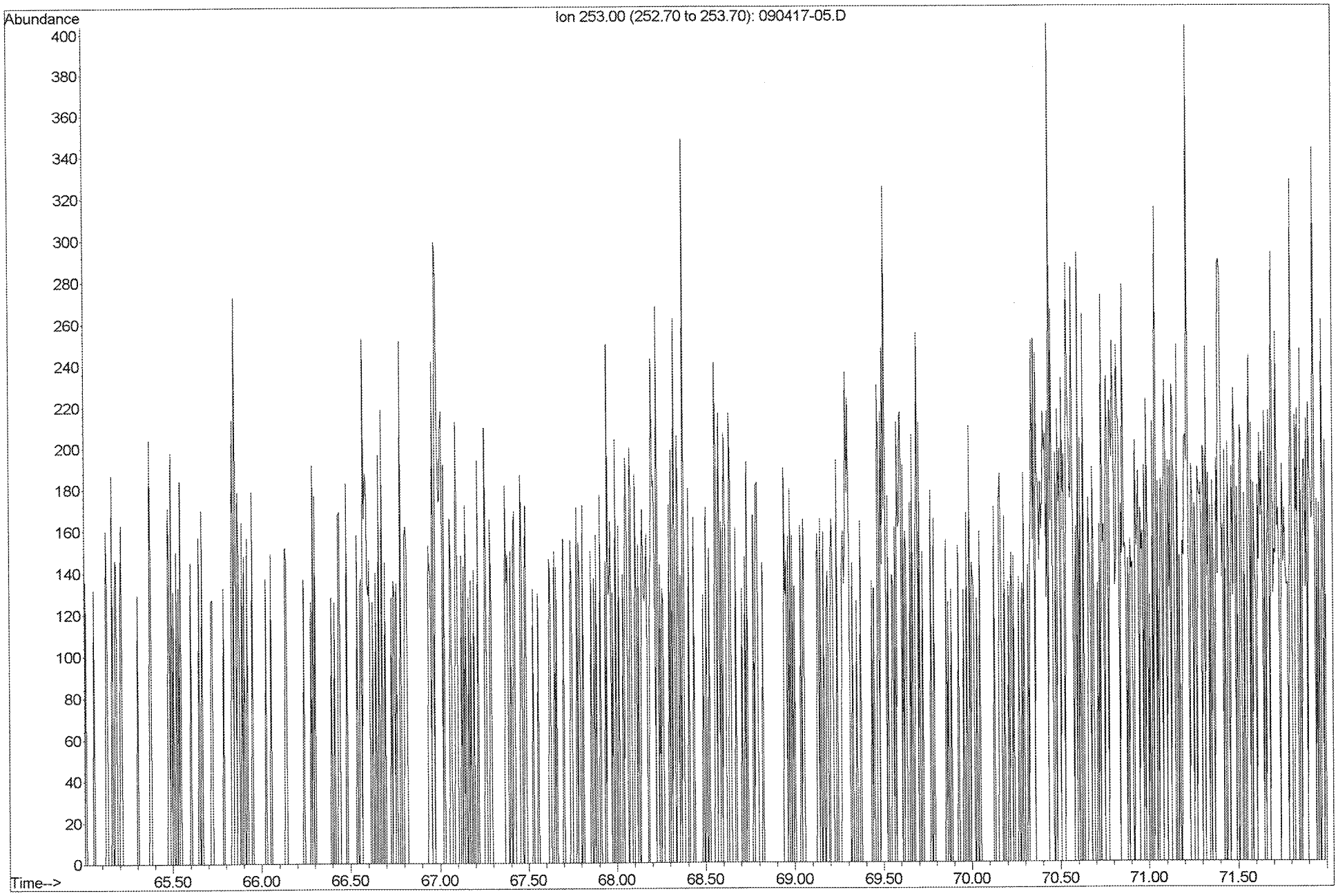

ED_004042_00000842-00099

23733-2 [HH01-01-02-170901-21]
950mL->1mL



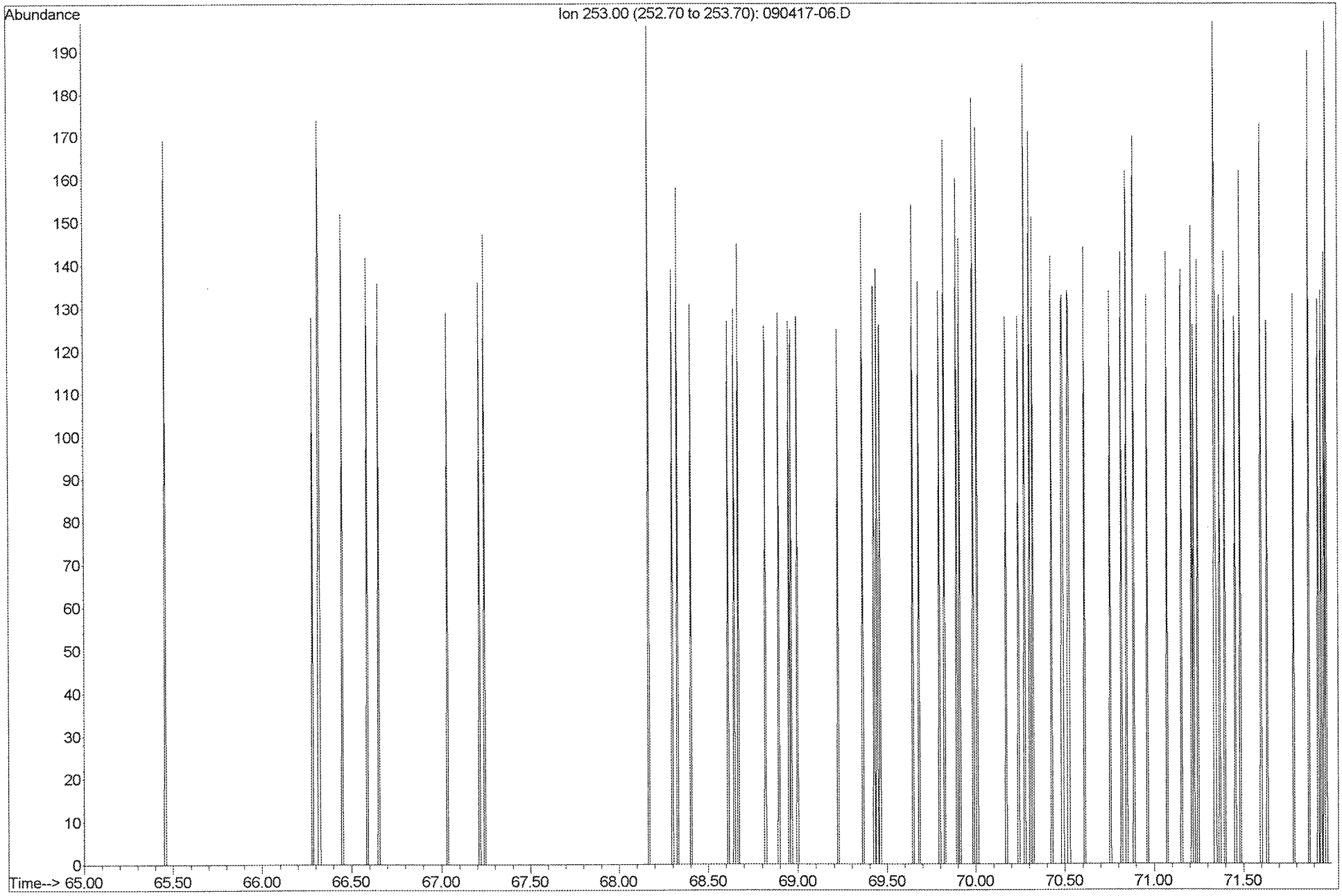

ED_004042_00000842-00100

23733-3 [HH01-01-03-170901-21]
910mL->1mL



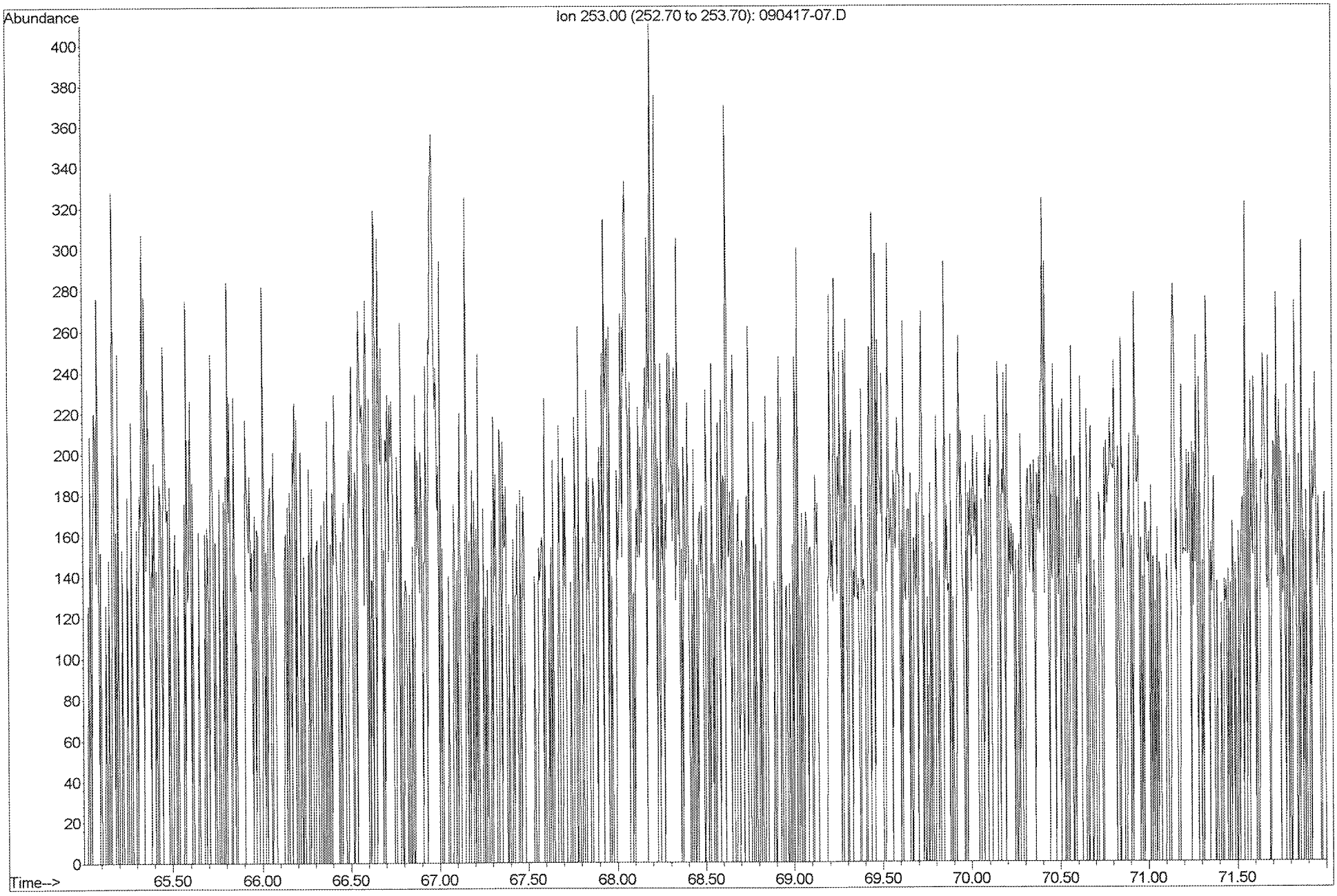

ED_004042_00000842-00101

23733-4 [HH01-01-03-170901-22]
870mL->1mL



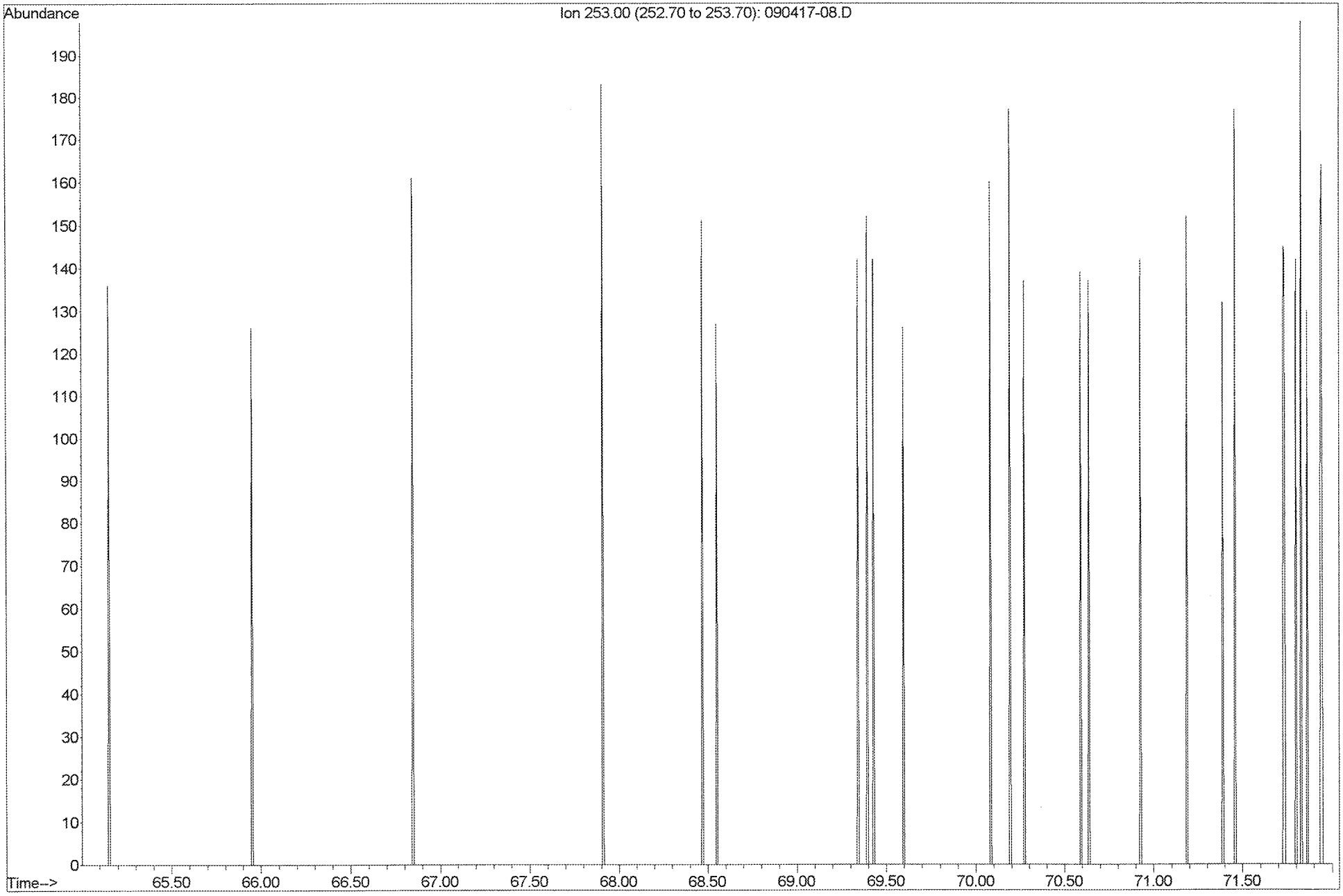

ED_004042_00000842-00102

23733-5 [HH01-01-04-170901-21]
910mL->1mL




ED_004042_00000842-00103

23733-6 [HH01-01-05-170901-21]
730mL->1mL

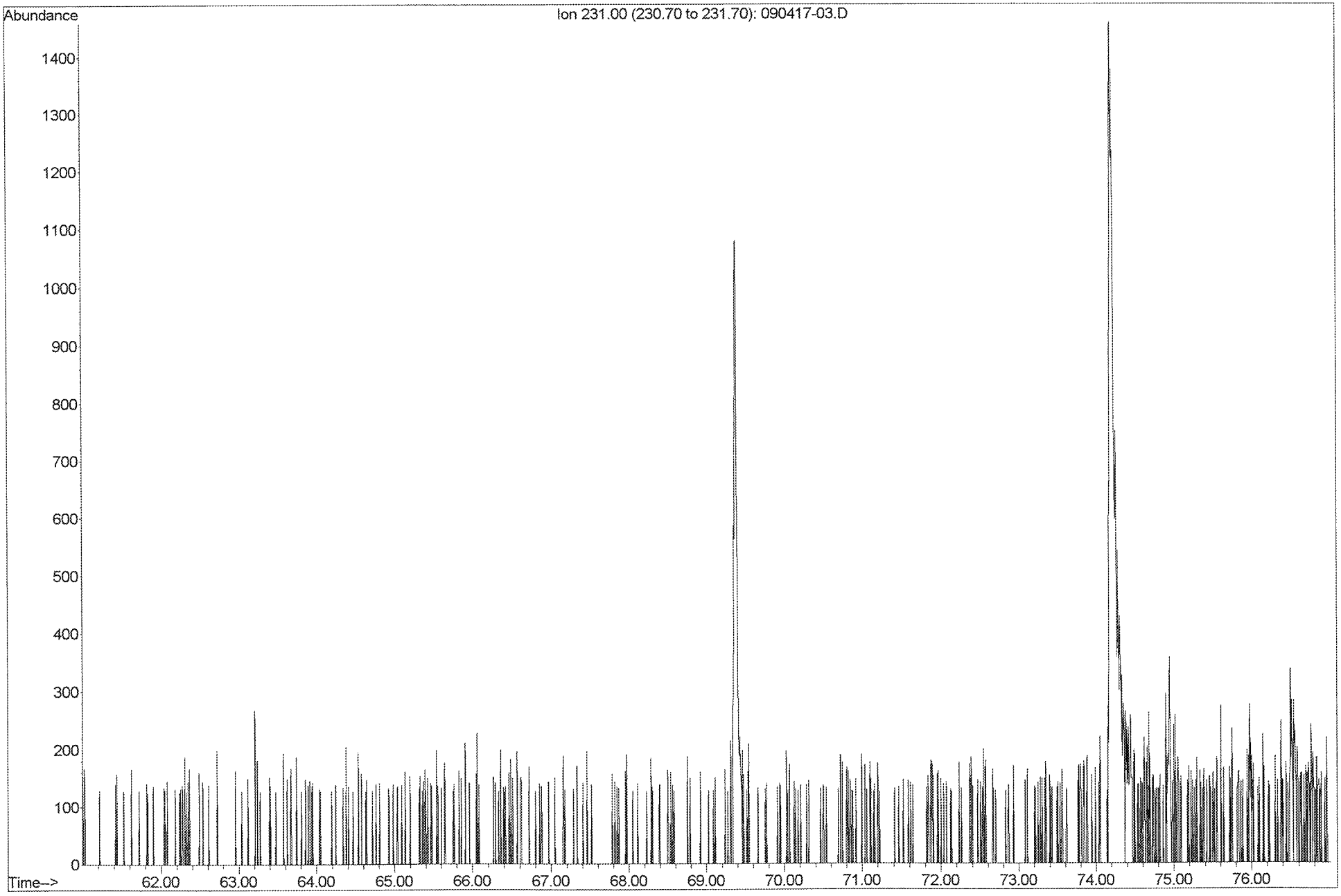



ED_004042_00000842-00104

Key for Triaromatic Steranes Identification (m/z 231 Mass Chromatogram)

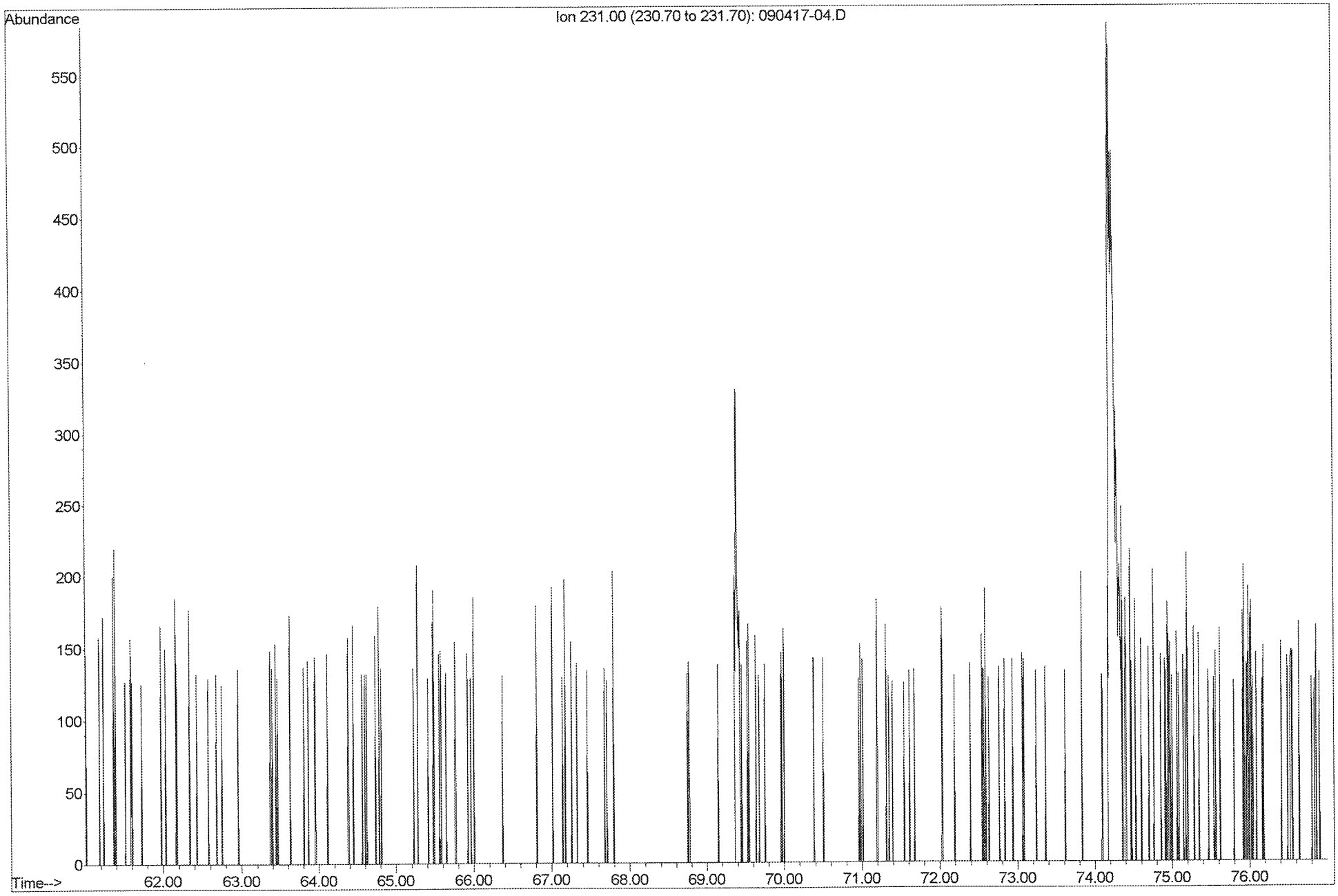
| Code | Identity | Elemental Composition |
|---|---|---|
| T1 | $C_{20}$ Triaromatic Sterane | $C_{20}H_{20}$ |
| T2 | $C_{21}$ Triaromatic Sterane | $C_{21}H_{22}$ |
| T3 | 20S $C_{26}$ Triaromatic Sterane | $C_{26}H_{32}$ |
| T4 | 20R $C_{26}$ + 20S $C_{27}$ Triaromatic Steranes | $C_{26}H_{32}$ + $C_{27}H_{34}$ |
| T5 | 20S $C_{28}$ Triaromatic Sterane | $C_{28}H_{36}$ |
| T6 | 20R $C_{27}$ Triaromatic Sterane | $C_{27}H_{34}$ |
| T7 | 20R $C_{28}$ Triaromatic Sterane | $C_{28}H_{36}$ |

23733-1 [HH01-01-01-170901-21]
770mL->1mL



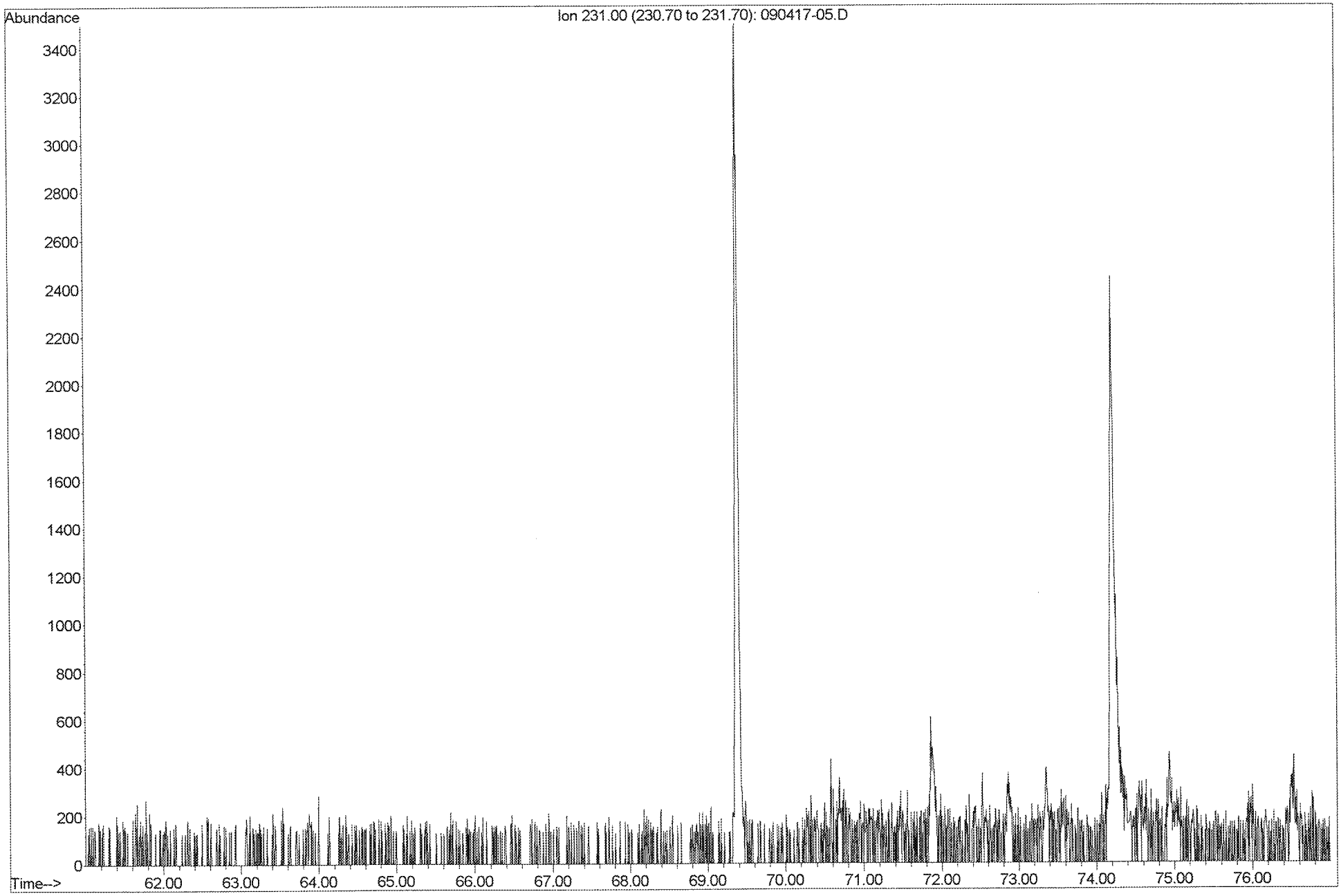

ED_004042_00000842-00106

23733-2 [HH01-01-02-170901-21]
950mL->1mL



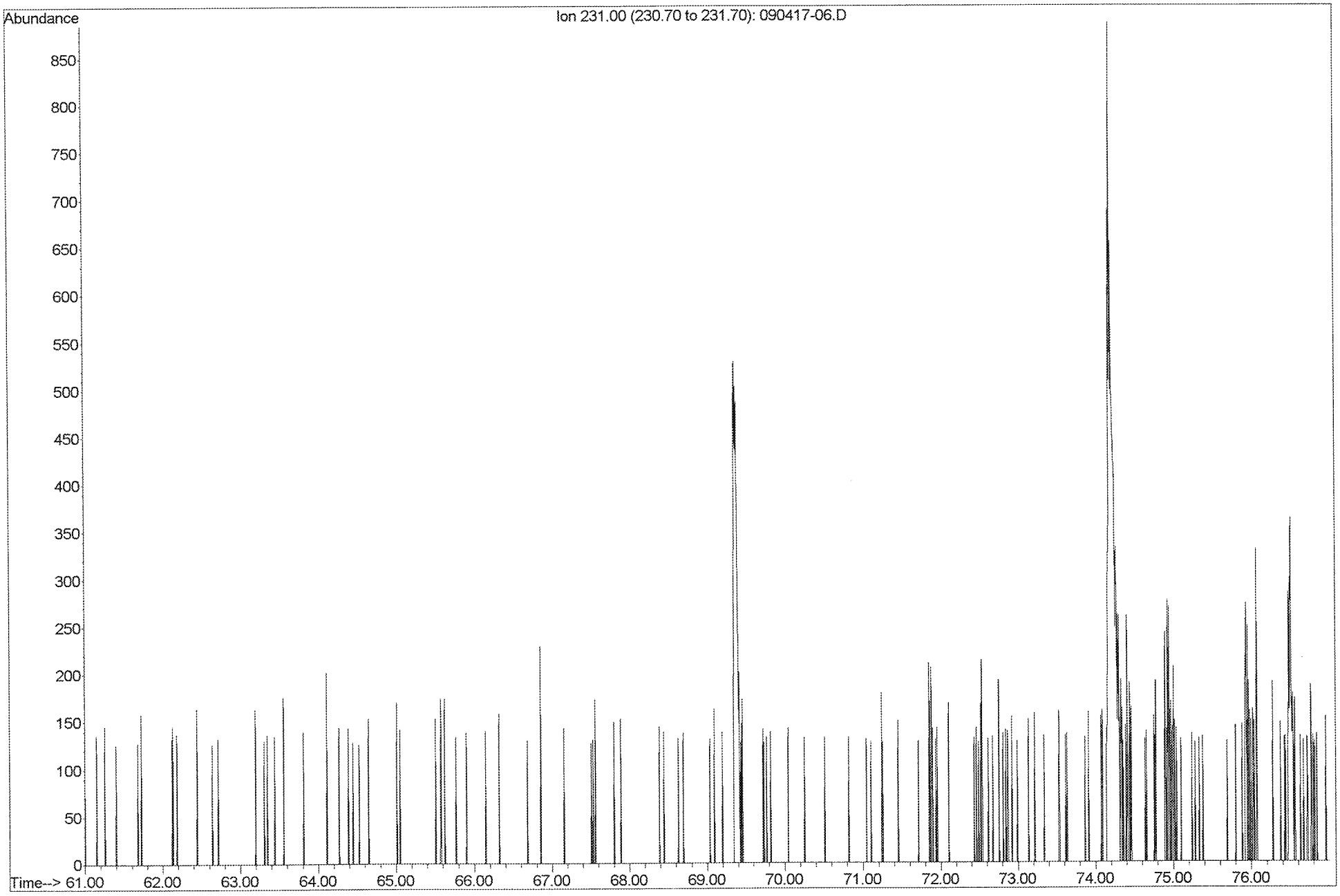

ED_004042_00000842-00107

23733-3 [HH01-01-03-170901-21]
910mL->1mL



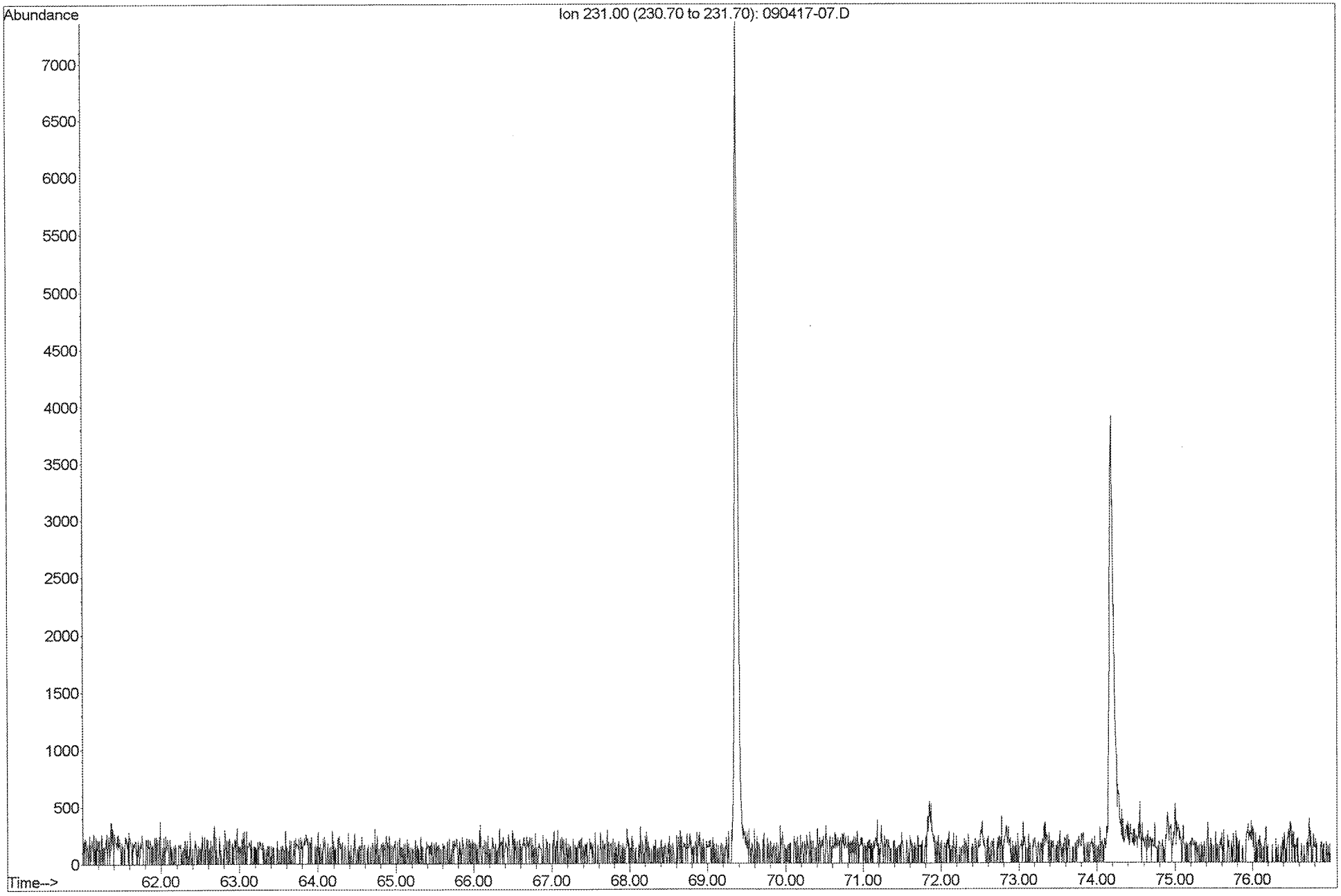

ED_004042_00000842-00108

23733-4 [HH01-01-03-170901-22]
870mL->1mL



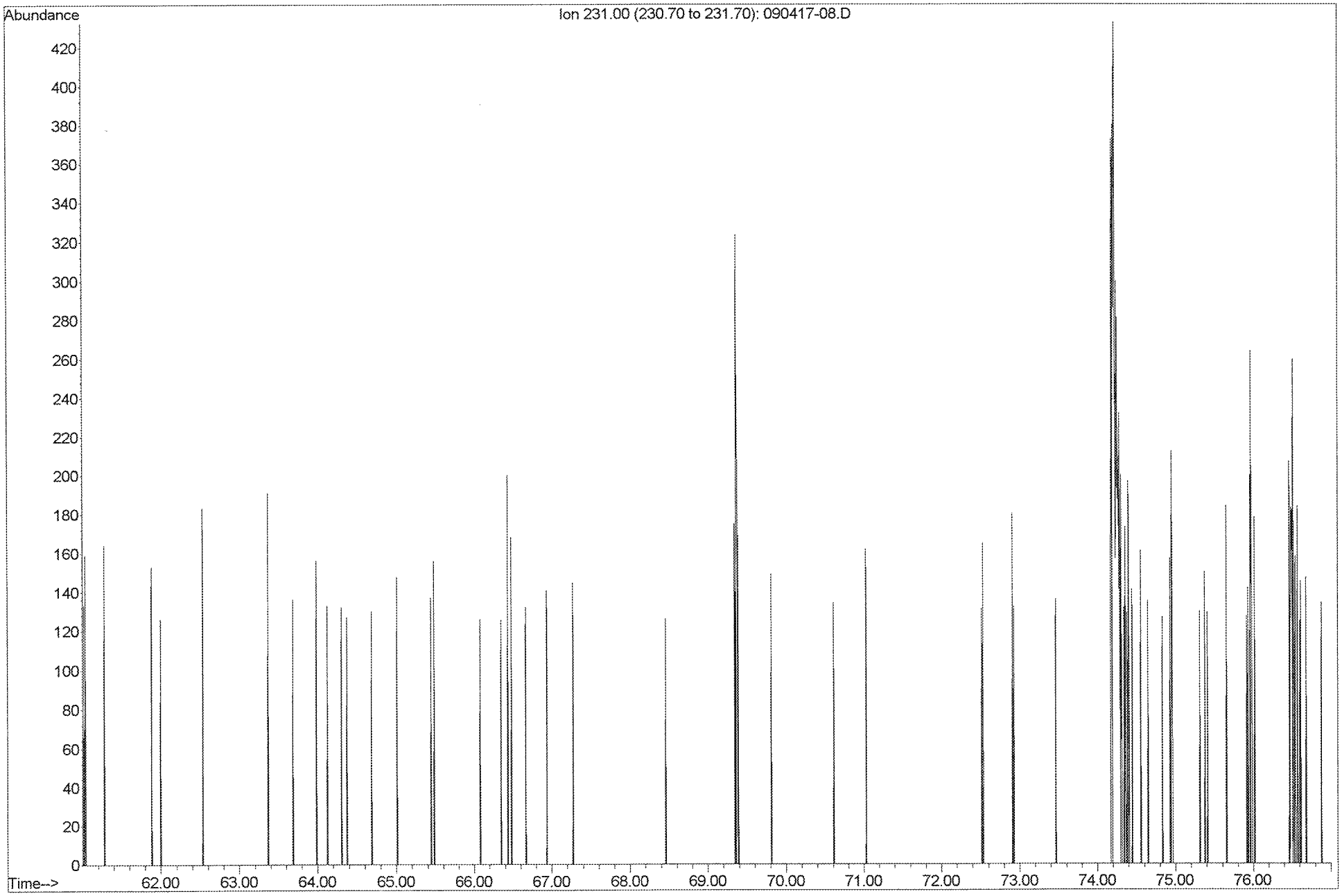

ED_004042_00000842-00109

23733-5 [HH01-01-04-170901-21]
910mL->1mL




ED_004042_00000842-00110

23733-6 [HH01-01-05-170901-21]
730mL->1mL




ED_004042_00000842-00111

Pace Analytical® Energy Services™

Key for Identifying Aromatic Hydrocarbons

| No | m/z | Abbreviation | Compound |
|---|---|---|---|
| 1 | 120 | AB | $C_3$-alkylbenzenes |
| 2 | 134 | | $C_4$-alkylbenzenes |
| 3 | 148 | | $C_5$-alkylbenzenes |
| 4 | 162 | | $C_6$-alkylbenzenes |
| 5 | 128 | NAPH | $C_0$-naphthalene |
| 6 | 142 | | $C_1$-naphthalenes |
| 7 | 156 | | $C_2$-naphthalenes |
| 8 | 170 | | $C_3$-naphthalenes |
| 9 | 184 | | $C_4$-naphthalenes |
| 10 | 166 | FL | $C_0$-fluorene |
| 11 | 180 | | $C_1$-fluorenes |
| 12 | 194 | | $C_2$-fluorenes |
| 13 | 208 | | $C_3$-fluorenes |
| 14 | 222 | | $C_4$-fluorenes |
| 15 | 154 | BP | $C_0$-biphenyl |
| 16 | 168 | | $C_1$-biphenyls + dibenzofuran |
| 17 | 182 | | $C_2$-biphenyls + C1 Dibenzofuran |
| 18 | 178 | PHEN | $C_0$-phenanthrene |
| 19 | 192 | | $C_1$-phenanthrenes |
| 20 | 206 | | $C_2$-phenanthrenes |
| 21 | 220 | | $C_3$-phenanthrenes |
| 22 | 234 | | $C_4$-phenanthrenes |
| 23 | 202 | PY | $C_0$-pyrene/fluoranthene |
| 24 | 216 | | $C_1$-pyrenes/fluoranthenes |
| 25 | 230 | | $C_2$-pyrenes/fluoranthenes |
| 26 | 244 | | $C_3$-pyrenes/fluoranthenes |
| 27 | 258 | | $C_4$-pyrenes/fluoranthenes |
| 28 | 228 | CHR | $C_0$-chrysene |
| 29 | 242 | | $C_1$-chrysenes |
| 30 | 256 | | $C_2$-chrysenes |
| 31 | 270 | | $C_3$-chrysenes |
| 32 | 284 | | $C_4$-chrysenes |
| 33 | 148 | BT | $C_1$-benzothiophenes |
| 34 | 162 | | $C_2$-benzothiophenes |
| 35 | 176 | | $C_3$-benzothiophenes |
| 36 | 190 | | $C_4$-benzothiophenes |
| 37 | 204 | | $C_5$-benzothiophenes |

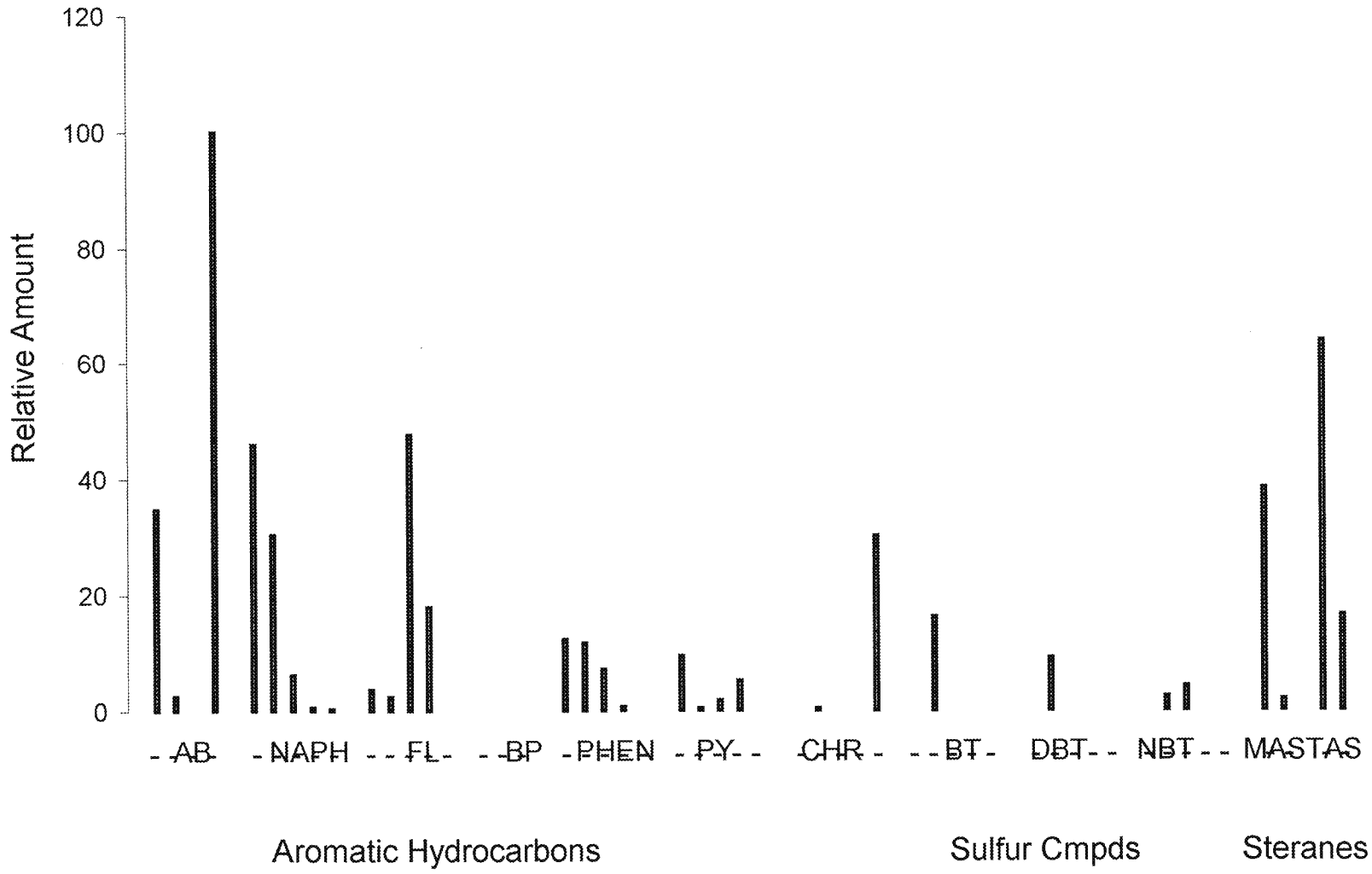
Pace Analytical® Energy Services™

Key for Identifying Aromatic Hydrocarbons – Cont.

| No | m/z | Abbreviation | Compound |
|---|---|---|---|
| 38 | 184 | DBT | $C_0$-dibenzothiophene |
| 39 | 198 | | $C_1$-dibenzothiophenes |
| 40 | 212 | | $C_2$-dibenzothiophenes |
| 41 | 226 | | $C_3$-dibenzothiophenes |
| 42 | 240 | | $C_4$-dibenzothiophenes |
| 43 | 234 | NBT | $C_0$-naphthobenzthiophene |
| 44 | 248 | | $C_1$-naphthobenzthiophenes |
| 45 | 262 | | $C_2$-naphthobenzthiophenes |
| 46 | 276 | | $C_3$-naphthobenzthiophenes |
| 47 | 290 | | $C_4$-naphthobenzthiophenes |
| 48 | 253 | MAS | Monoaromatic steranes |
| 49 | 267 | | Monoaromatic steranes |
| 50 | 239 | | Monoaromatic steranes |
| 51 | 231 | TAS | Triaromatic steranes |
| 52 | 245 | | Triaromatic steranes |

# Aromatic Hydrocarbon Distribution

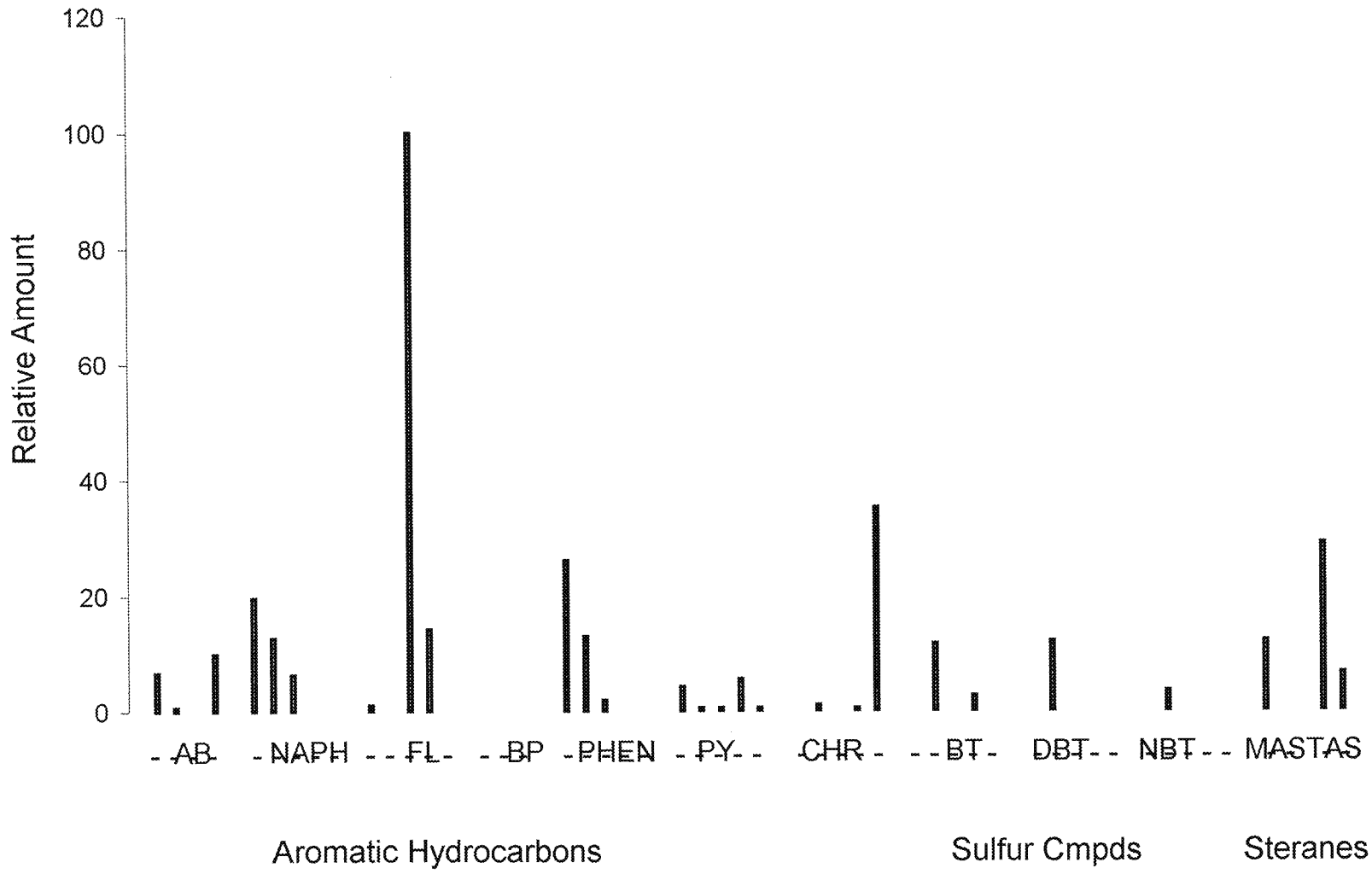
**23733-1 [HH01-01-01-170901-21]**




ED_004042_00000842-00114

# Aromatic Hydrocarbon Distribution

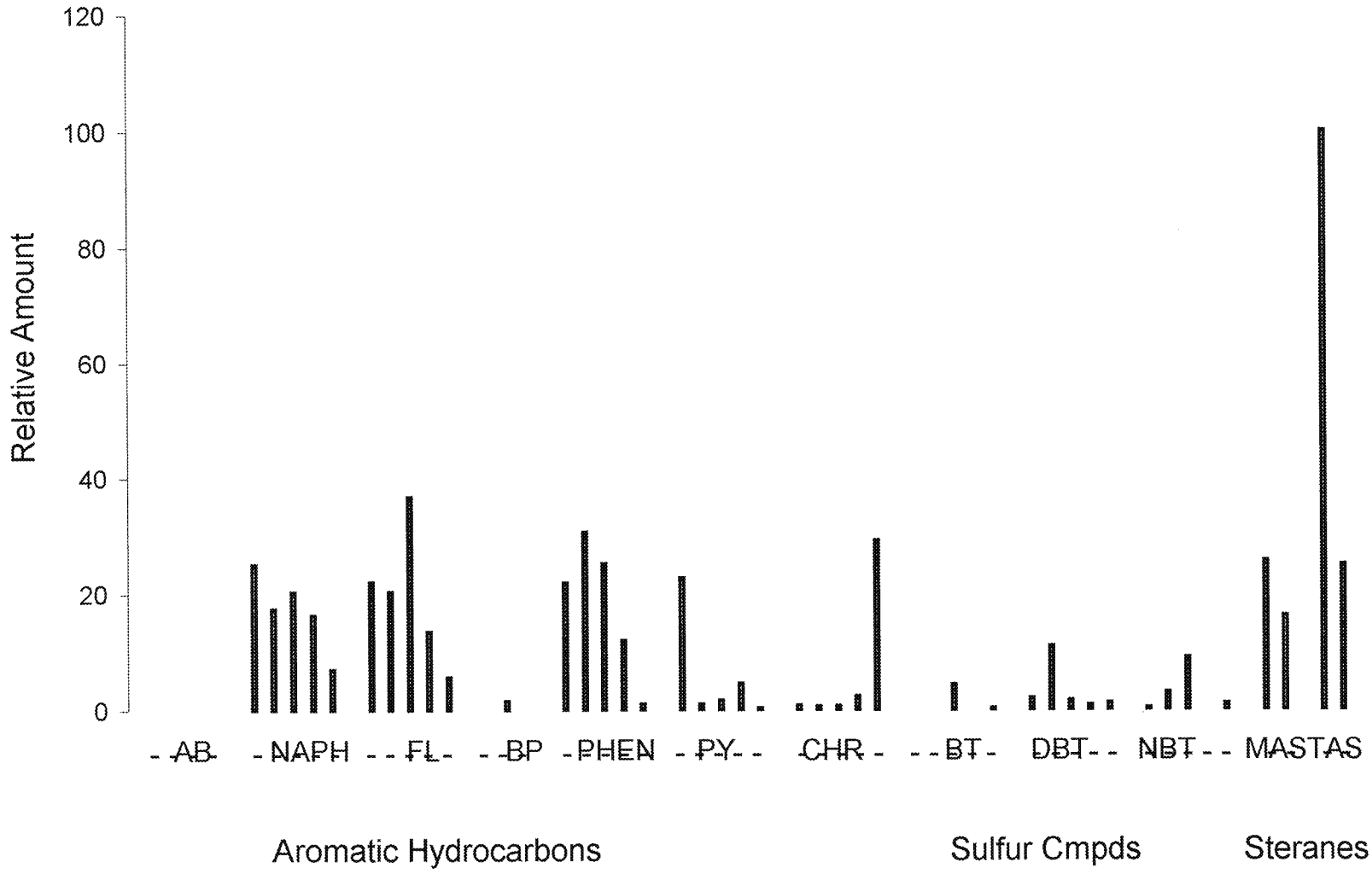
**23733-2 [HH01-01-02-170901-21]**




ED_004042_00000842-00115

# Aromatic Hydrocarbon Distribution

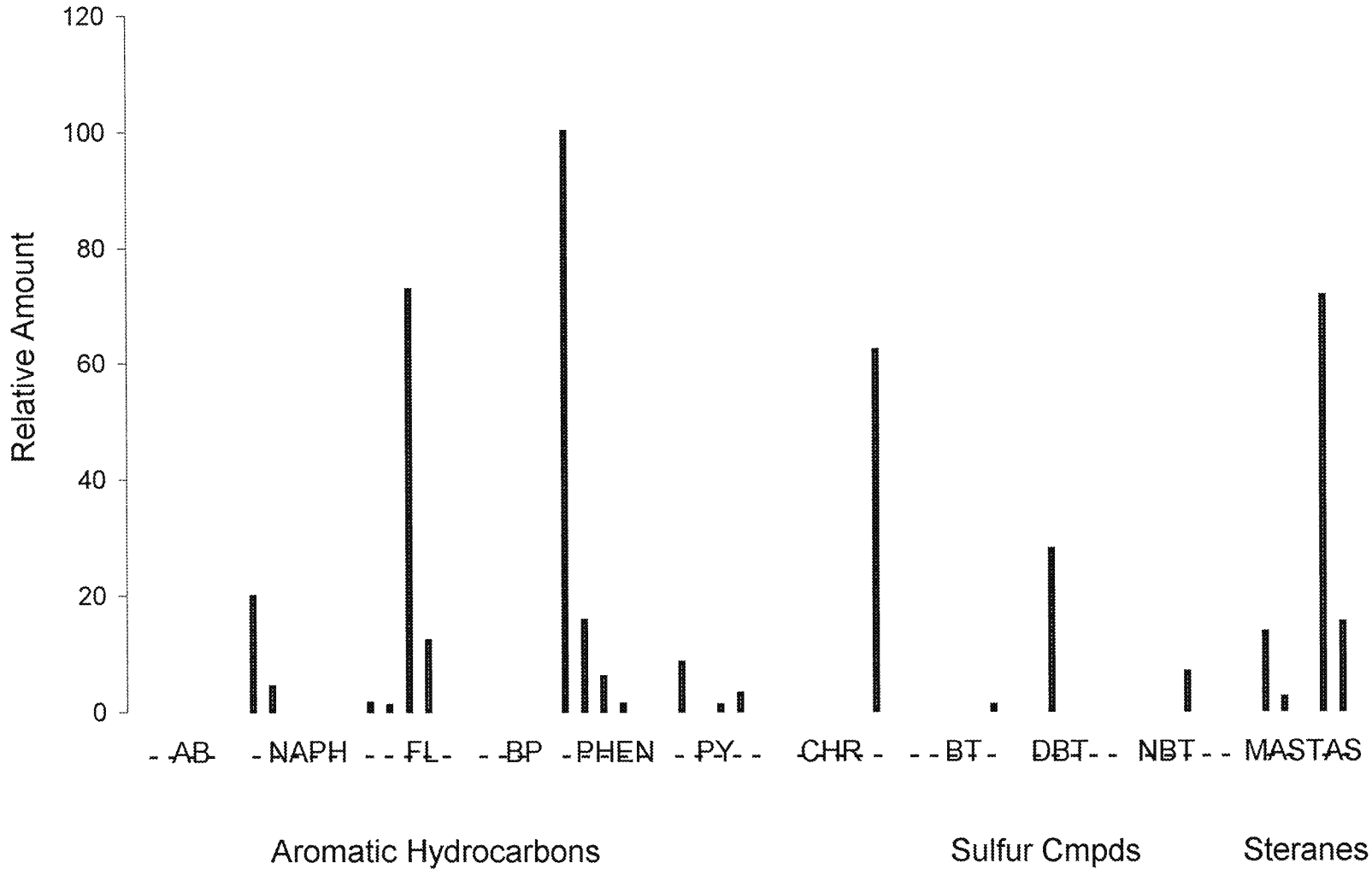
**23733-3 [HH01-01-03-170901-21]**




ED_004042_00000842-00116

# Aromatic Hydrocarbon Distribution

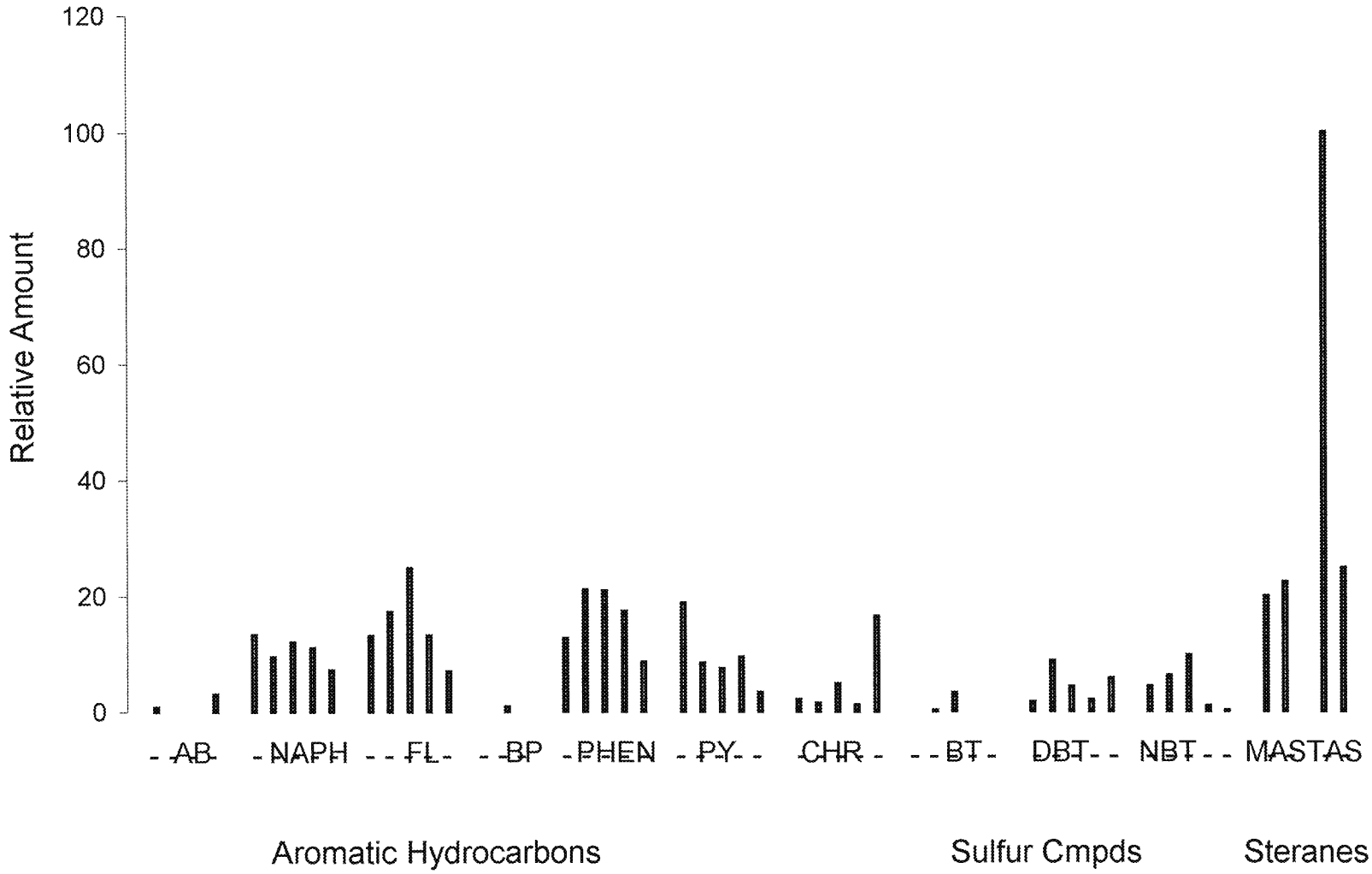
**23733-4 [HH01-01-03-170901-22]**




ED_004042_00000842-00117

# Aromatic Hydrocarbon Distribution

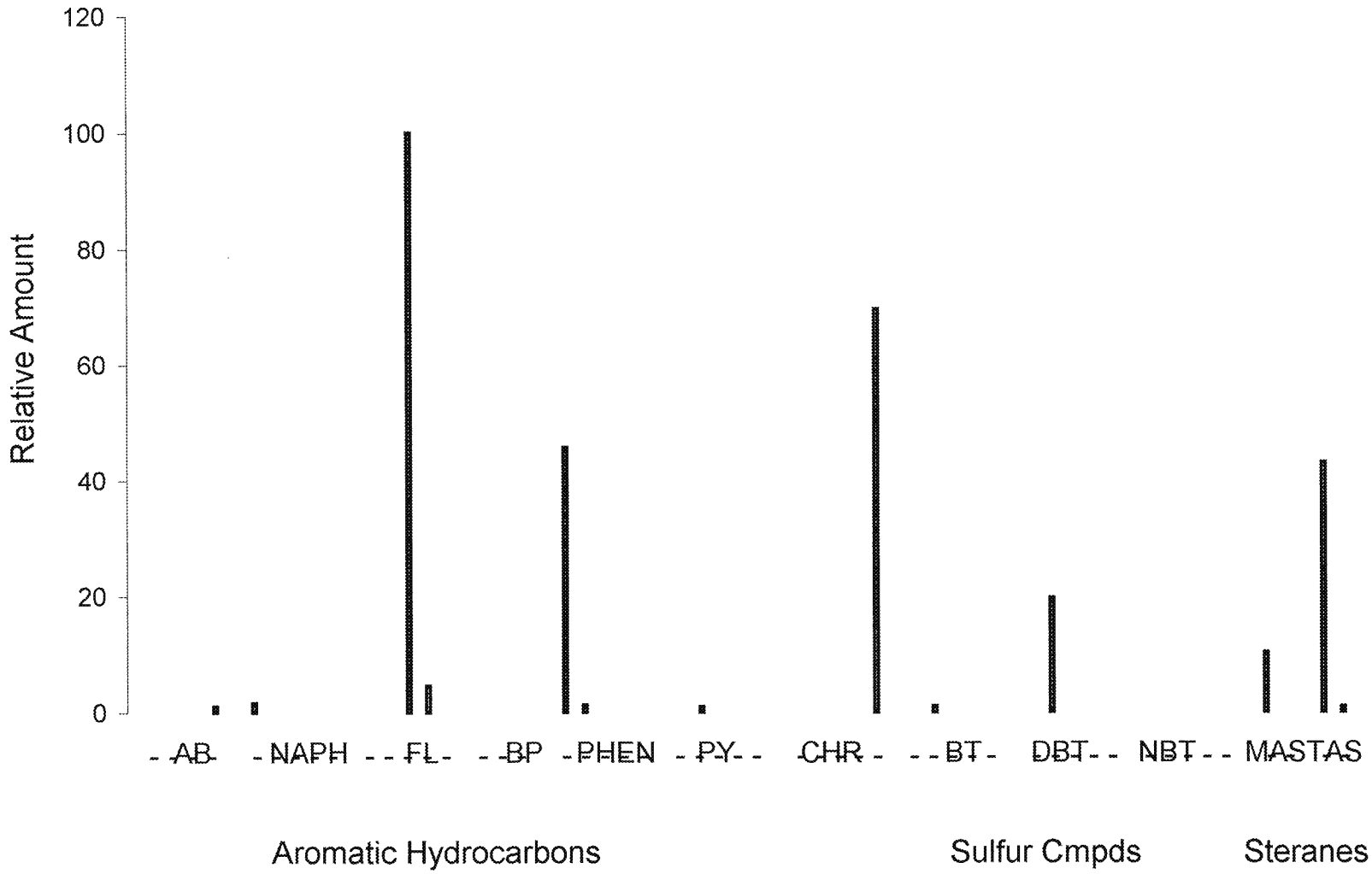
**23733-5 [HH01-01-04-170901-21]**




ED_004042_00000842-00118

# Aromatic Hydrocarbon Distribution

**23733-6 [HH01-01-05-170901-21]**




ED_004042_00000842-00119

23133

USEPA
DateShipped:
CarrierName:
AirbillNo:

CHAIN OF CUSTODY RECORD
Site #: 66666
Contact Name: Jeff Wright
Contact Phone: 225-278-8406

No: 6-090117-213229-0003
Cooler #:
Lab: Pace Energy Lab
Lab Phone: 412-209-8995

| Lab # | Sample # | Location | Analyses | Matrix | Sample Date | Sample Time | Numb Cont | Container | Preservative | Lab QC |
|---|---|---|---|---|---|---|---|---|---|---|
| | HH01-01-01-170901-21 | 1 | Naptha PIANO | Surface Water | 9/1/2017 | 17:36 | 2 | 40 ml VOA | HCl | |
| | HH01-01-01-170901-21 | 1 | Naphtha full scan | Surface Water | 9/1/2017 | 17:36 | 2 | 1 liter amber | 4 C | |
| | HH01-01-02-170901-21 | 2 | Naptha PIANO | Surface Water | 9/1/2017 | 18:20 | 2 | 40 ml VOA | HCl | |
| | HH01-01-02-170901-21 | 2 | Naphtha full scan | Surface Water | 9/1/2017 | 18:20 | 2 | 1 liter amber | 4 C | |
| | HH01-01-03-170901-21 | 3 | Naptha PIANO | Surface Water | 9/1/2017 | 19:25 | 2 | 40 ml VOA | HCl | |
| | HH01-01-03-170901-21 | 3 | Naphtha full scan | Surface Water | 9/1/2017 | 19:25 | 2 | 1 liter amber | 4 C | |
| | HH01-01-03-170901-22 | 3 | Naptha PIANO | Surface Water | 9/1/2017 | 19:25 | 2 | 40 ml VOA | HCl | |
| | HH01-01-03-170901-22 | 3 | Naphtha full scan | Surface Water | 9/1/2017 | 19:25 | 2 | 1 liter amber | 4 C | |
| | HH01-01-04-170901-21 | 4 | Naptha PIANO | Surface Water | 9/1/2017 | 20:00 | 2 | 40 ml VOA | HCl | |
| | HH01-01-04-170901-21 | 4 | Naphtha full scan | Surface Water | 9/1/2017 | 20:00 | 2 | 1 liter amber | 4 C | |
| | HH01-01-05-170901-21 | 5 | Naptha PIANO | Surface Water | 9/1/2017 | 20:40 | 2 | 40 ml VOA | HCl | |
| | HH01-01-05-170901-21 | 5 | Naphtha full scan | Surface Water | 9/1/2017 | 20:40 | 2 | 1 liter amber | 4 C | |
| | | | | | | | | | | |
| | | | | | | | | | | |
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| | | | | | | | | | | |

Special Instructions:

SAMPLES TRANSFERRED FROM
CHAIN OF CUSTODY #

| Items/Reason | Relinquished by (Signature and Organization) | Date/Time | Received by (Signature and Organization) | Date/Time | Sample Condition Upon Receipt |
|---|---|---|---|---|---|
| | | | Cwelch PAES | 9-3-17 0950 | |
| | | | | | |
| | | | | | |
| | | | | | |

ED_004042_00000842-00120

# Cooler Receipt Form

Client Name: Weston Project: Arkema Lab Work Order: _____

A. Shipping/Container Information (circle appropriate response)

Courier: FedEx UPS USPS Client (Other) Southwest Cargo Air bill Present: Yes No

Tracking Number: _____

Custody Seal on Cooler/Box Present: (Yes) No Seals Intact: (Yes) No

Cooler/Box Packing Material: Bubble Wrap Absorbent Foam Other _____

Type of Ice: (Wet) Blue None Ice Intact: Yes (Melted)

Cooler Temperature: 4.7 Radiation Screened: Yes (No) Chain of Custody Present: Yes No

Comments: _____

B. Laboratory Assignment/Log-in (check appropriate response)

| | YES | NO | N/A | Comment Reference non-Conformance |
|---|---|---|---|---|
| Chain of Custody properly filled out | ✓ | | | |
| Chain of Custody relinquished | | ✓ | | |
| Sampler Name & Signature on COC | | ✓ | | |
| Containers intact | ✓ | | | |
| Were samples in separate bags | ✓ | | | |
| Sample container labels match COC Sample name/date and time collected | ✓ | | | |
| Sufficient volume provided | ✓ | | | |
| PAES containers used | ✓ | | | |
| Are containers properly preserved for the requested testing? (as labeled) | ✓ | | | |
| If an unknown preservation state, were containers checked? Exception: VOA's coliform | | | ✓ | If yes, see pH form. |
| Was volume for dissolved testing field filtered, as noted on the COC? Was volume received in a preserved container? | | | ✓ | |

Comments: _____

Cooler contents examined/received by: RW Date: 9-5-17

Project Manager Review: _____ Date: _____

F-PAB-Q-009-rev.00, 20 Nov2014