

March 21, 2014

Arthur Han  
**EPIC JUICE LLC**  
2111 West Crescent Avenue, Unit A  
Anaheim, California 92801

RE: GC/MS Analysis of Vaping Liquids  
Purchase Order Nos. Credit Card, SEAL Job No. 72636

Dear Mr. Han:

Ten (10) vaping liquids were submitted for analysis by Gas Chromatography/Mass Spectrometry (GC/MS) in order to characterize the volatile organic compounds in the liquids.

#### GAS CHROMATOGRAPHY/MASS SPECTROMETRY (GC/MS)

A gas chromatograph (GC) operates by injecting the sample (analyte) mixture into a long capillary tube or column via a heated injector that volatilizes the sample. The column is placed in an oven and the temperature is ramped. Helium flowing through the column carries the analyte through. As the gas flows, the different molecules in the analyte flow at different speeds through the column and reach the detector at different times.

A chromatogram, then, is the signal strength from the detector plotted against the retention time (the time required for the molecules to reach the detector). Using a mass spectrometer (MS) as a GC detector, the component molecules are bombarded by a stream of high-energy electrons, converting some of the molecules to ions. The ions are accelerated in an electric field. The accelerated ions enter the mass analyzer where the ions are separated according to their mass-to-charge ( $m/z$ ) ratios. Finally, the number of ions with a particular mass-to-charge ratio is counted. The result is a mass spectrum of the number of particles detected as a function of mass-to-charge ratio. The primary advantage of utilizing a mass spectrometer is that a mass spectrum can be a unique chemical "fingerprint" allowing unknown compounds to be identified or characterized into a chemical class.

The GC chromatograms and compound tables are attached for your review.

In these chromatogram Figures, the X-axis (marked in minutes) shows the retention times (RT) of the different volatile organic components of the sample.

The compound tables show a list of tentatively identified volatile organic compounds for the liquids.

## DISCUSSION

A methylene chloride solvent dilution was made for each sample. No calibration curves were prepared and no attempt was made to correct for response factor differences between species that are structurally/functionally different.


Compound identities were determined with the help of the NIST mass spectral databases. Isomers of many organic species produce very similar mass spectra and so cannot be assigned.

The compound listed may not necessarily be the “true” match of the compound detected, but at least places it within a chemical class. (i.e. the compound may not exactly be “Phenol, 2-methoxy-4-methyl, but it is likely in the Phenol family). For spectra in which the NIST libraries do not have a good or exact reference spectrum, the peak identities usually are interpreted based on the MS knowledge of the analyst or the compound identity will be termed as “similar to a certain potential candidate.”

If you have any questions regarding this analysis, or require further assistance, please do not hesitate to contact me.

Sincerely,

SEAL Laboratories  
A Division of Evans Analytical Group, LLC



Dawn Caron  
Member Technical Staff, Chemistry

## Chromatogram Plot

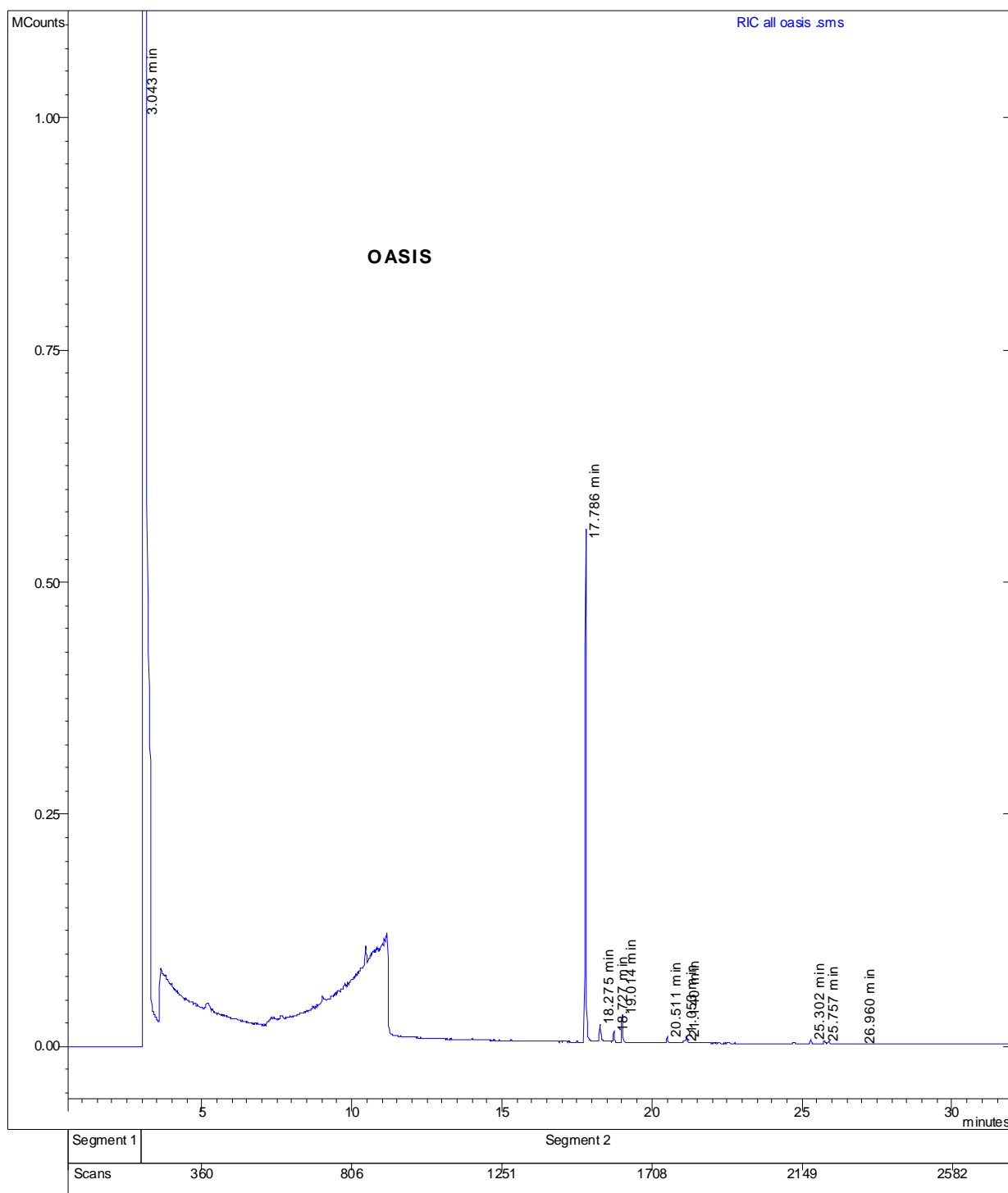
File: d:\data\misc\epicjuice\oasis .sms

Sample: Oasis 2 CH<sub>2</sub>Cl<sub>2</sub> 2b

Scan Range: 1 - 4313 Time Range: 0.00 - 49.90 min.

Operator: DC

Date: 3/7/14 12:27 PM



# GC/MS Sample Report

72636 Epic Juice

Sample Name: **Oasis**

Compound Name	RT	Quan Ions
Propylene glycol	3.040	59
Glycerin <sup>1</sup>	11.402	61
Nicotine	17.785	84
Nicotine	18.120	84
Coumarin	18.731	148
Vanillin	19.017	151
Ethyl Vanillin	20.515	137
Propyl 2-ethylbutanoate <sup>2</sup>	21.053	99
Nicotyrine <sup>2</sup>	21.148	158
Citrate, triethyl	25.307	157
Benzenemethanol, 3,4-dimethoxy-,acetate <sup>2</sup>	25.764	151
Veratraldehyde propylene glycol acetal <sup>2</sup>	27.102	223

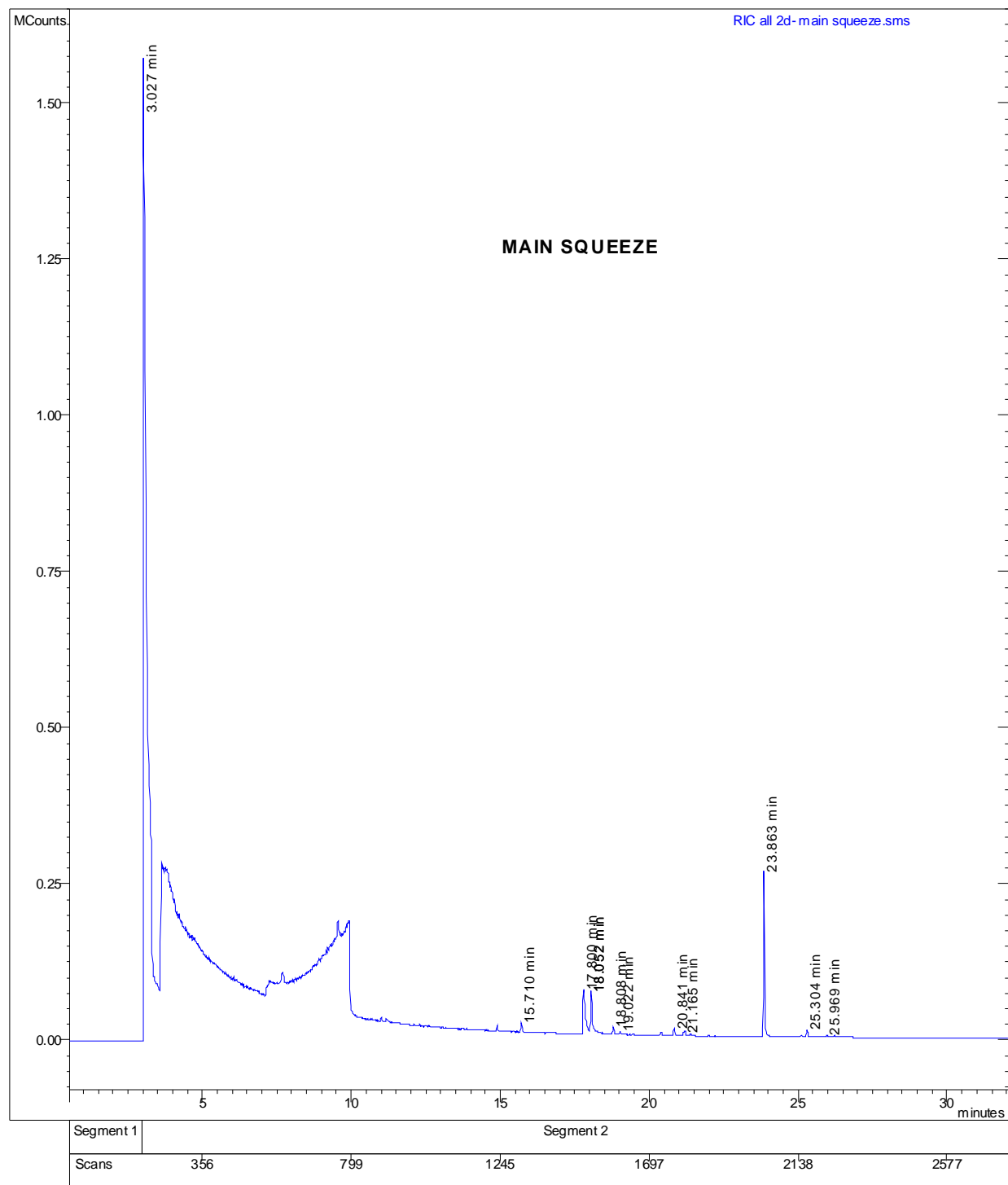
<sup>1</sup>Not included in quant.

<sup>2</sup> Similar to a certain potential candidate based on best MS library search.

## Chromatogram Plot

File: d:\data\misc\epicjuice\epic2\2d- main squeeze.sms  
Sample: 2d- Main Squeeze  
Scan Range: 1 - 3276 Time Range: 0.00 - 37.99 min.

Operator: DC  
Date: 3/18/14 3:11 PM



# GC/MS Sample Report

72636 Epic Juice

Sample Name: **Main Squeeze**

Compound Name	RT	Quan Ions
Propylene glycol	3.027	59
Glycerin <sup>1</sup>	11.052	61
Citral	15.710	69
Nicotine	17.800	84
Nicotine	18.052	84
Methyl cinnamate	18.808	131
Vanillin	19.022	151
Decalactone <sup>2</sup>	20.841	85
Nicotyrine <sup>2</sup>	21.165	158
Dimethyldodecanamide <sup>2</sup>	23.863	87
Ethyl citrate	25.304	157
Citral	25.969	69

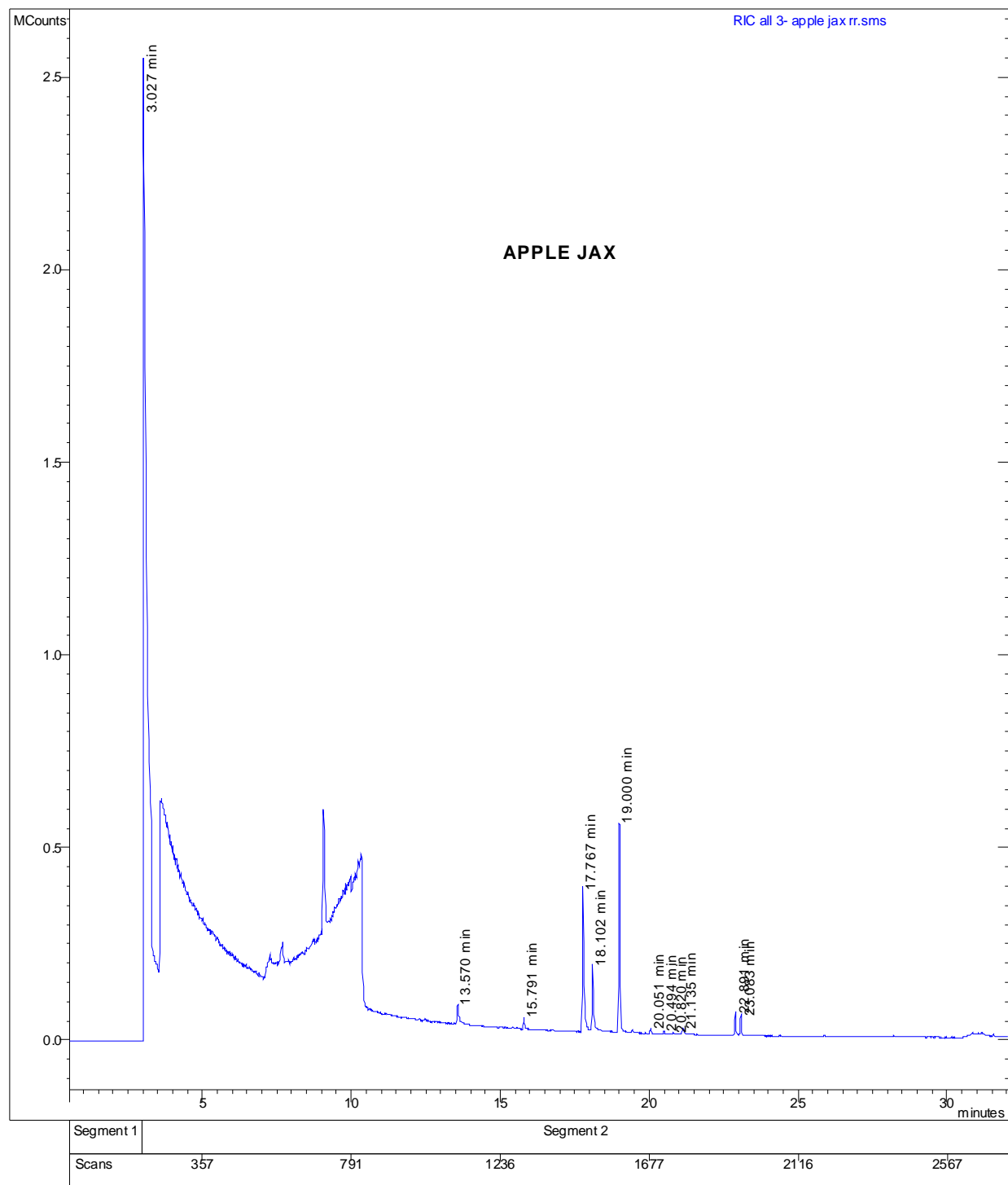
<sup>1</sup>Not included in quant.

<sup>2</sup>Similar to a certain potential candidate based on best MS library search.

## Chromatogram Plot

File: d:\data\misc\epicjuice\epic2\3- apple jax rr.sms  
Sample: 3- Apple Jax RR  
Scan Range: 1 - 3291 Time Range: 0.00 - 37.98 min.

Operator: DC  
Date: 3/20/14 10:55 AM



# GC/MS Sample Report

72636 Epic Juice

Sample Name: **Apple Jax**

Compound Name	RT	Quan Ions
Propylene glycol	3.027	59
Glycerin <sup>1</sup>	10.257	61
Ethyl Maltol	13.570	140
Cinnamaldehyde	15.791	131
Nicotine	17.767	84
Nicotine	18.102	84
Vanillin	19.000	151
Coumarin	20.051	118
Ethyl Vanillin	20.494	137
.delta.-undecalactone (Peach aldehyde) <sup>2</sup>	20.820	85
Nicotyrine <sup>2</sup>	21.135	158
Phenethyl cinnamate <sup>2</sup>	22.891	104
Phenethyl cinnamate <sup>2</sup>	23.083	104

<sup>1</sup>Not included in quant.

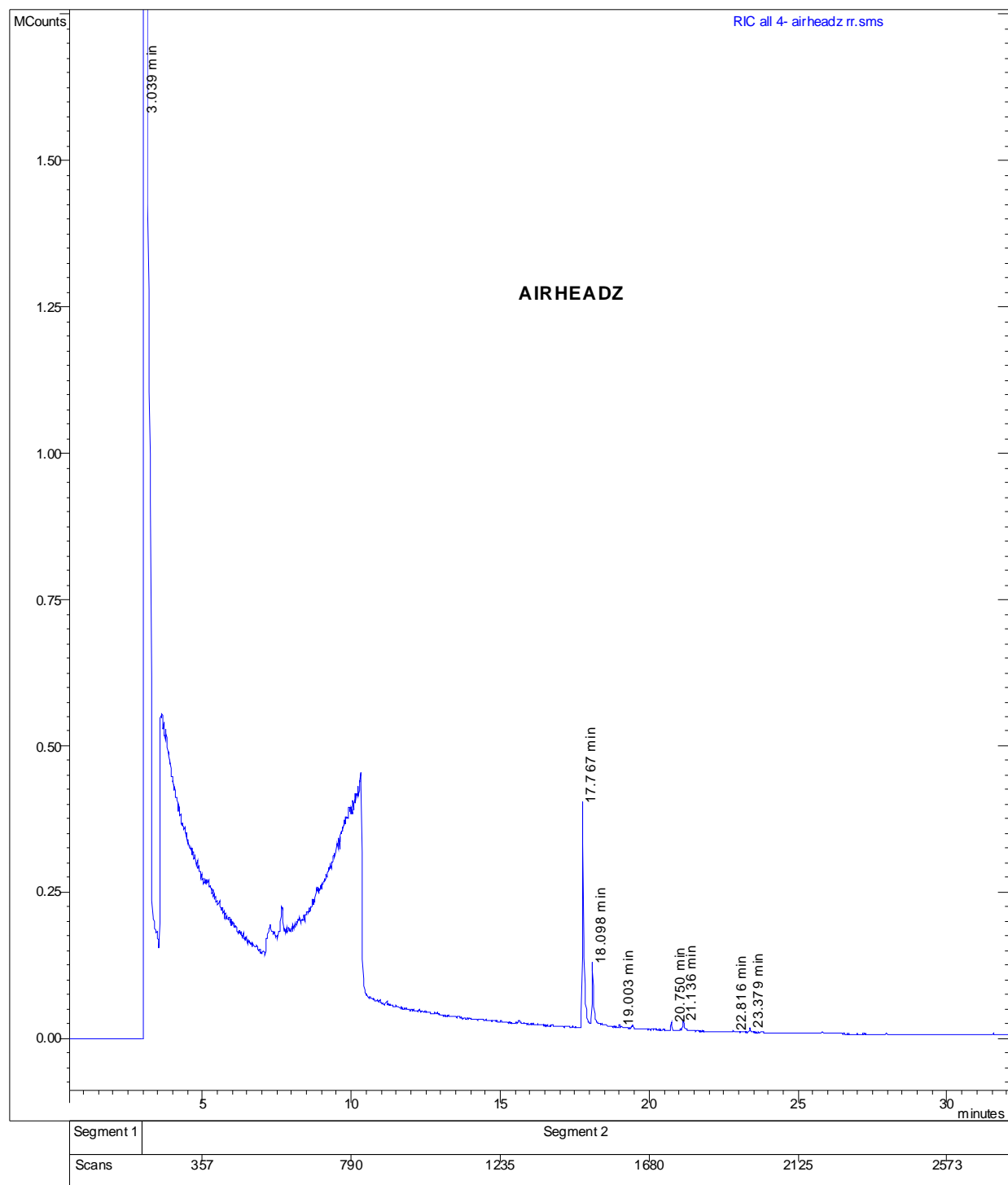
<sup>2</sup> Similar to a certain potential candidate based on best MS library search.



## Chromatogram Plot

File: d:\data\misc\epicjuice\epic2\4- airheadz rr.sms  
Sample: 4- Airheadz RR  
Scan Range: 1 - 3288 Time Range: 0.00 - 37.99 min.

Operator: DC  
Date: 3/20/14 11:48 AM



# GC/MS Sample Report

72636 Epic Juice

Sample Name: **Airheadz**

Compound Name	RT	Quan Ions
Propylene glycol	3.039	59
Glycerin <sup>1</sup>	10.330	61
Nicotine	17.767	84
Nicotine	18.098	84
Vanillin	19.003	151
Cyclamen aldehyde	20.750	133
Nicotyrine <sup>2</sup>	21.136	158
4-(p-Hydroxyphenyl)-2-butanone (Raspberry ketone) <sup>2</sup>	22.816	107
.delta.-undecalactone (Peach aldehyde) <sup>2</sup>	23.379	85

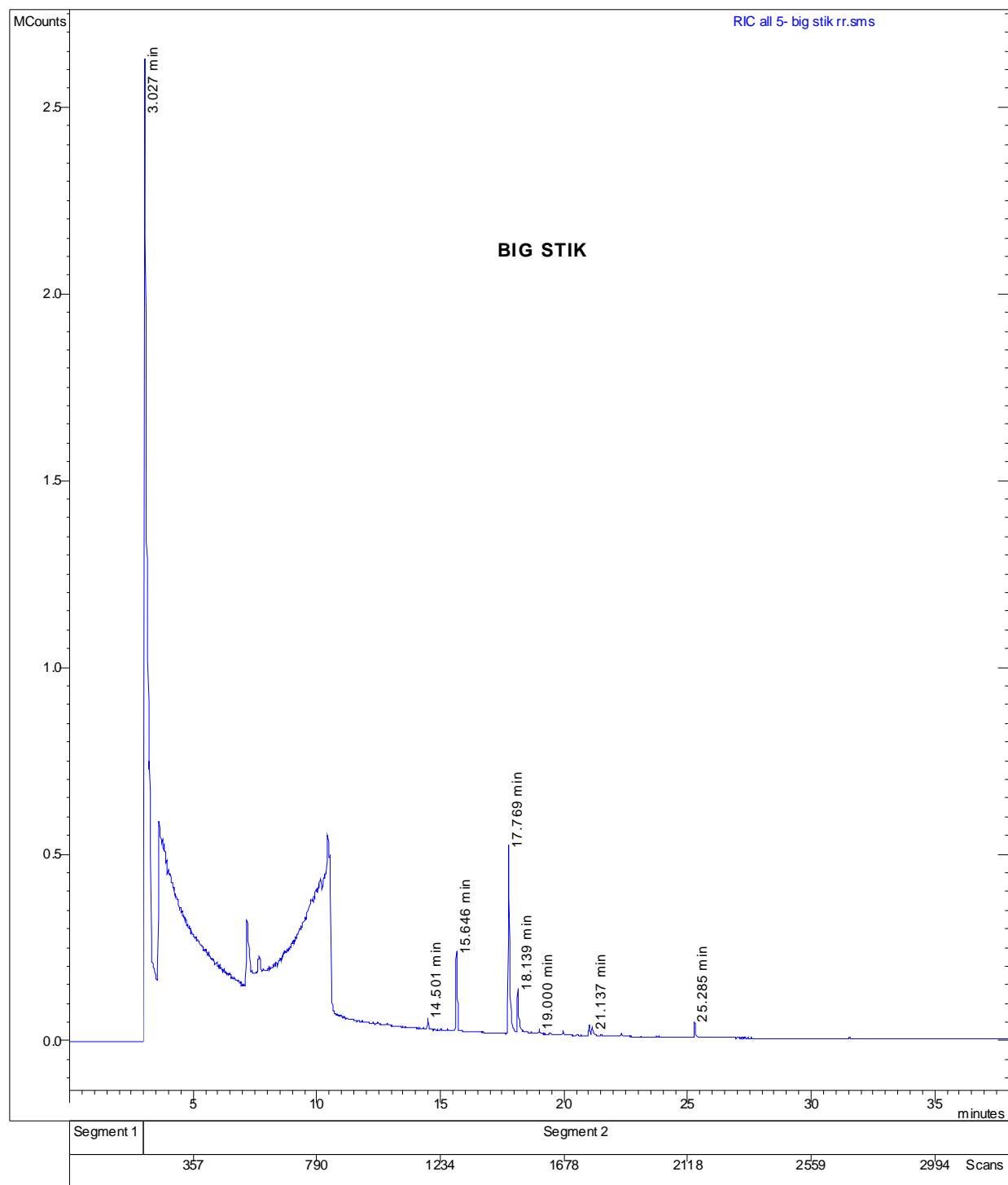
<sup>1</sup>Not included in quant.

<sup>2</sup>Similar to a certain potential candidate based on best MS library search.

## Chromatogram Plot

File: d:\data\misc\epicjuice\epic2\5- big stik rr.sms  
Sample: 5- Big Stik RR  
Scan Range: 1 - 3257 Time Range: 0.00 - 37.98 min.

Operator: DC  
Date: 3/20/14 12:41 PM



# GC/MS Sample Report

72636 Epic Juice

Sample Name: **Big Stik**

Compound Name	RT	Quan Ions
Propylene glycol	3.027	59
Glycerin <sup>1</sup>	10.179	61
Acetophenone <sup>2</sup>	14.501	135
Benzaldehyde PG acetal	15.646	163
Nicotine	17.769	84
Nicotine	18.139	84
Vanillin	19.000	151
Nicotyrine <sup>2</sup>	21.137	158
Ethyl Citrate	25.285	157

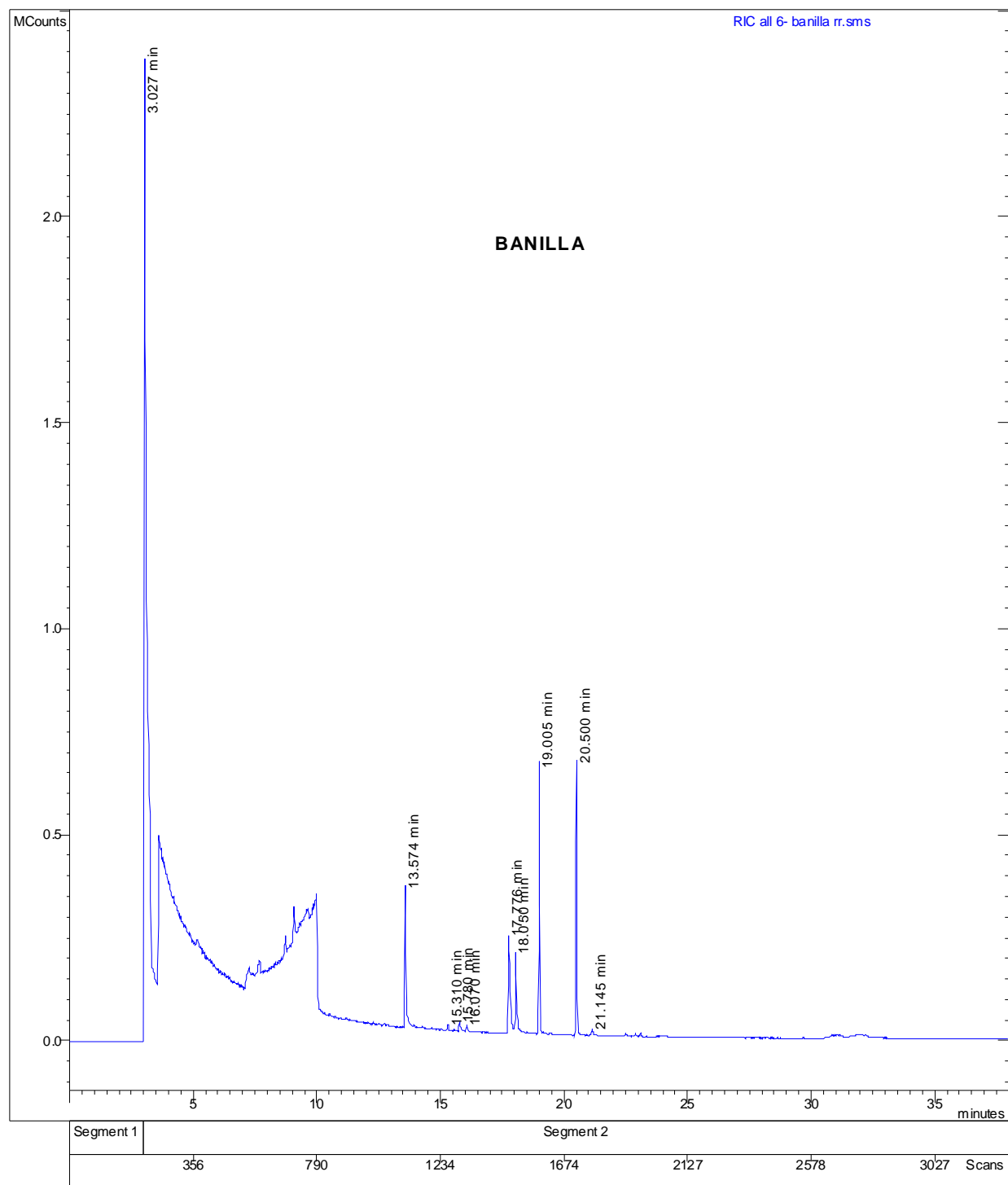
<sup>1</sup>Not included in quant.

<sup>2</sup> Similar to a certain potential candidate based on best MS library search.

## Chromatogram Plot

File: d:\data\misc\epicjuice\epic2\6- banilla rr.sms  
Sample: 6- Banilla RR  
Scan Range: 1 - 3290 Time Range: 0.00 - 37.99 min.

Operator: DC  
Date: 3/20/14 1:23 PM



# GC/MS Sample Report

72636 Epic Juice

Sample Name: **Banilla**

Compound Name	RT	Quan Ions
Propylene glycol	3.027	59
Glycerin <sup>1</sup>	11.221	61
Ethyl maltol	13.574	140
Anisaldehyde	15.310	135
5-Thiazoleethanol, 4-methyl-	15.780	112
Benzenemethanol, 4-methoxy- (Anise alcohol) <sup>2</sup>	16.070	109
Nicotine	17.776	84
Nicotine	18.050	84
Vanillin	19.005	151
Ethyl Vanillin	20.500	137
Nicotyrine <sup>2</sup>	21.145	158

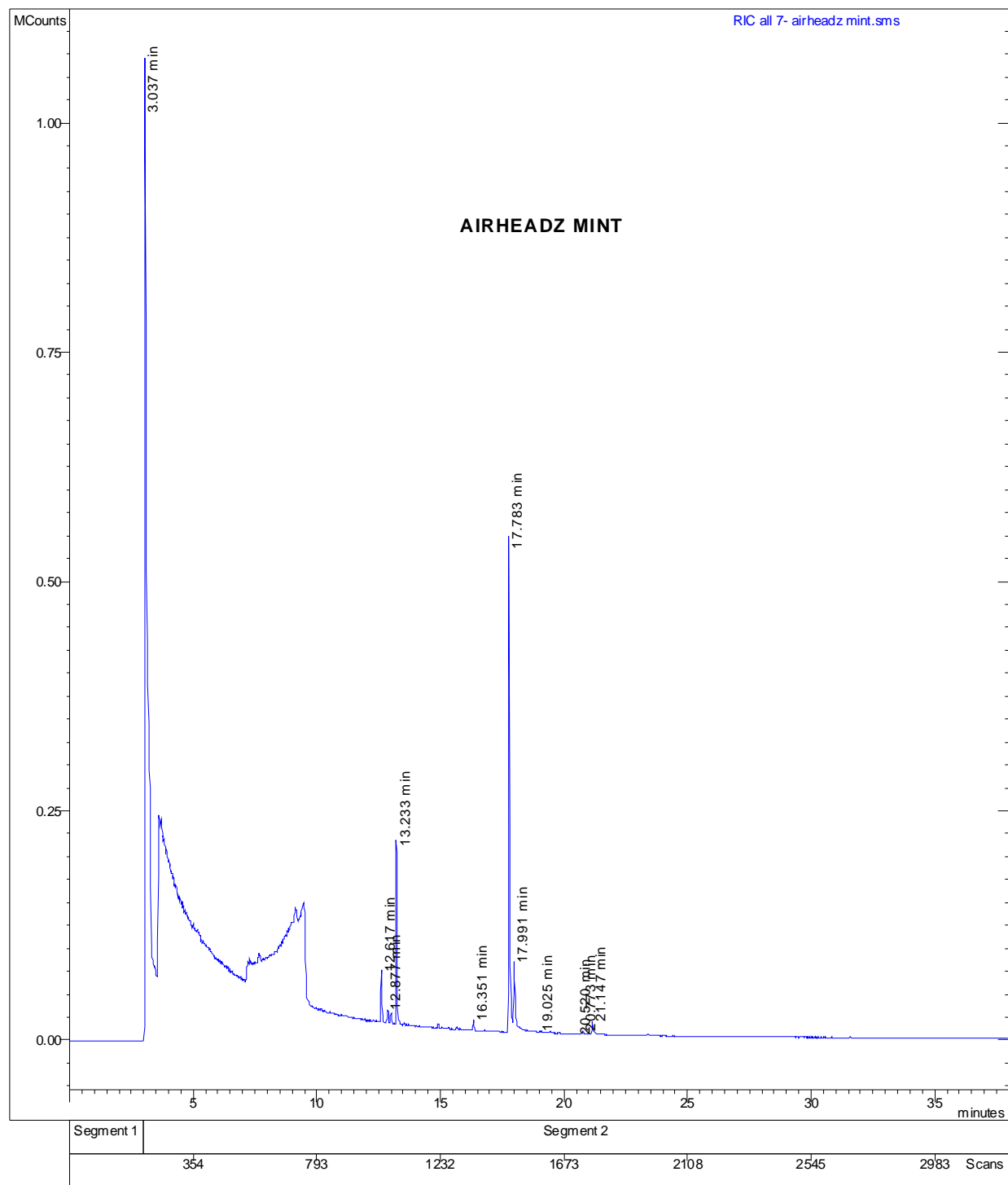
<sup>1</sup>Not included in quant.

<sup>2</sup> Similar to a certain potential candidate based on best MS library search.

## Chromatogram Plot

File: d:\data\misc\epicjuice\epic2\7- airheadz mint.sms  
Sample: 7- Airheadz Mint  
Scan Range: 1 - 3244 Time Range: 0.00 - 37.99 min.

Operator: DC  
Date: 3/18/14 6:35 PM



# GC/MS Sample Report

72636 Epic Juice

Sample Name: **Airheadz Mint**

Compound Name	RT	Quan Ions
Propylene glycol	3.037	59
Glycerin <sup>1</sup>	11.205	61
Menthone	12.617	112
Menthone	12.877	112
Menthol	13.233	81
Menthol	16.351	95
Nicotine	17.783	84
Nicotine	17.991	84
Vanillin	19.025	151
Ethyl Vanillin	20.520	137
Cyclamen aldehyde	20.773	133
Nicotyrine <sup>2</sup>	21.147	158

<sup>1</sup>Not included in quant.

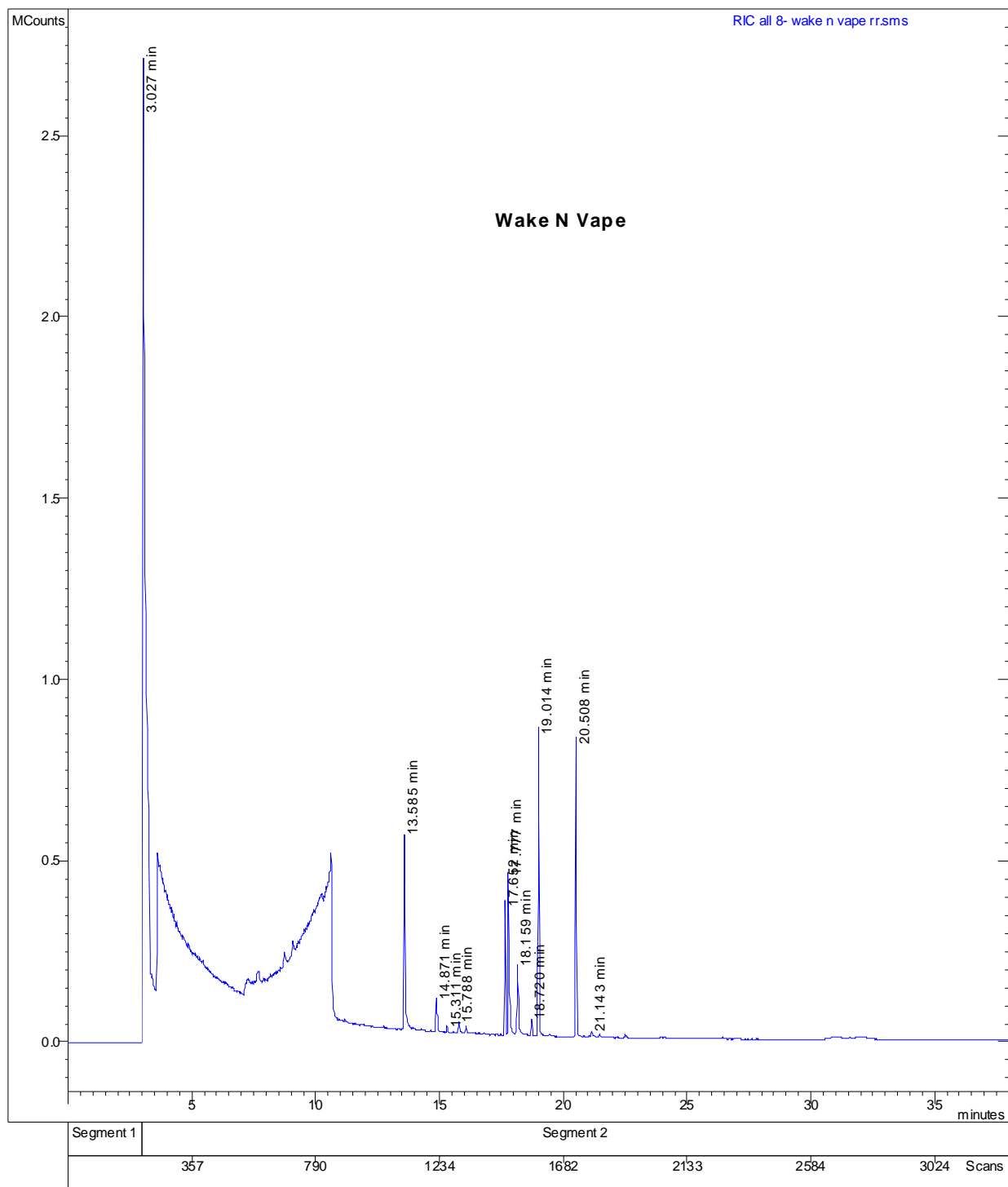
<sup>2</sup>Similar to a certain potential candidate based on best MS library search.



## Chromatogram Plot

File: d:\data\misc\epicjuice\epic2\8- wake n vape rr.sms  
Sample: 8- Wake N Vape RR  
Scan Range: 1 - 3283 Time Range: 0.00 - 37.98 min.

Operator: DC  
Date: 3/20/14 3:29 PM



# GC/MS Sample Report

72636 Epic Juice

Sample Name: **Wake N Vape**

Compound Name	RT	Quan Ions
Propylene glycol	3.027	59
Glycerin <sup>1</sup>	11.156	61
Ethyl maltol	13.585	140
Acetin	14.871	43
Anisaldehyde	15.311	135
5-Thiazoleethanol, 4-methyl-	15.788	112
Acetin	17.652	43
Nicotine	17.777	84
Nicotine	18.159	84
Hydrocoumarin	18.720	148
Vanillin	19.014	151
Ethyl Vanillin	20.508	137
Nicotyrine <sup>2</sup>	21.143	158

<sup>1</sup>Not included in quant.

<sup>2</sup>Similar to a certain potential candidate based on best MS library search.

## Chromatogram Plot

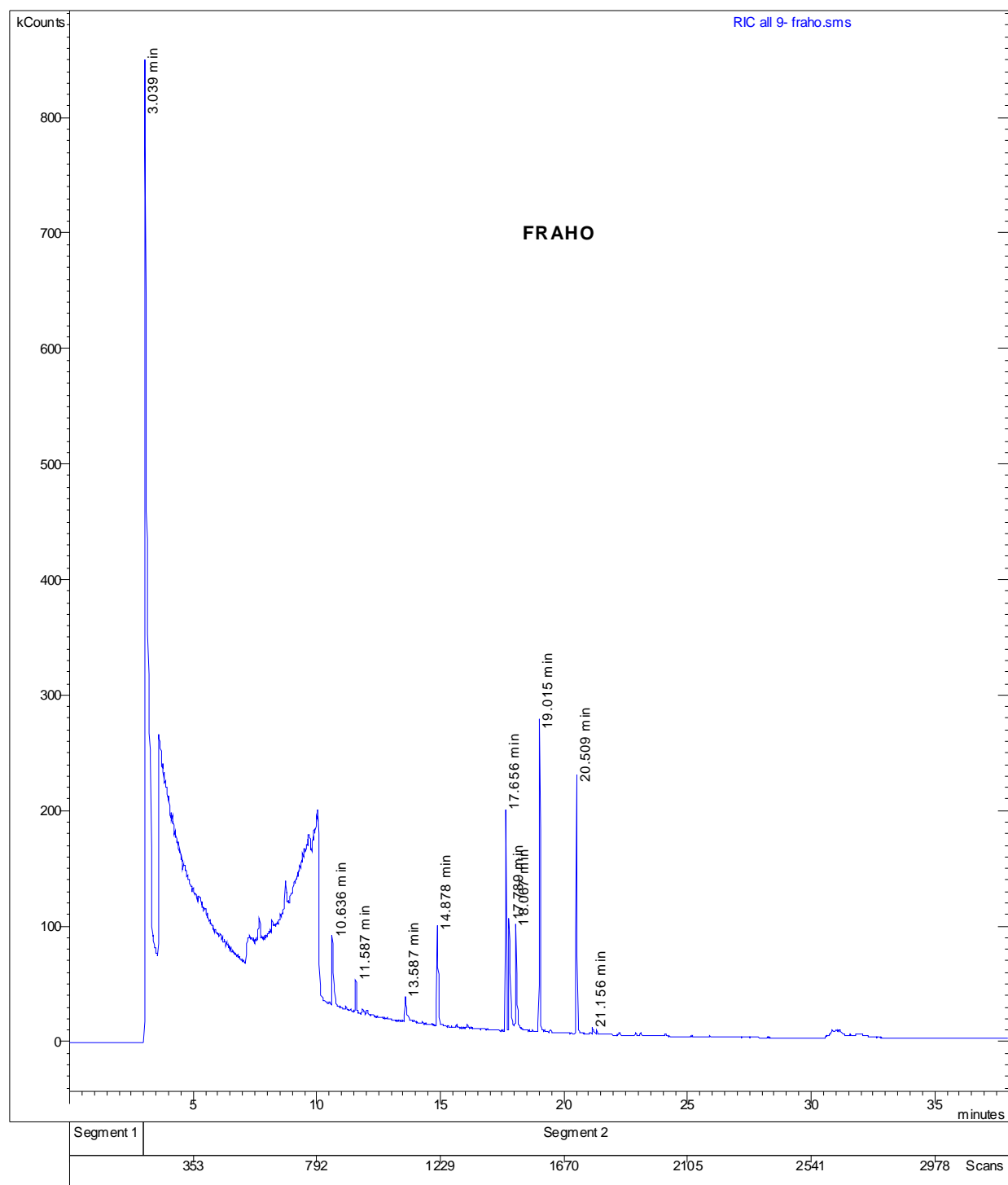
File: d:\data\misc\epicjuice\epic2\9- fraho.sms

Sample: 9- Fraho

Scan Range: 1 - 3239 Time Range: 0.00 - 37.98 min.

Operator: DC

Date: 3/18/14 7:59 PM



# GC/MS Sample Report

72636 Epic Juice

Sample Name: **FRAHO**

Compound Name	RT	Quan Ions
Propylene glycol	3.039	59
Acetin	10.636	43
Glycerin <sup>1</sup>	11.070	61
Isophorone <sup>2</sup>	11.587	82
Ethyl maltol	13.587	140
Acetin	14.878	43
Acetin	17.656	43
Nicotine	17.789	84
Nicotine	18.067	84
Vanillin	19.015	151
Ethyl Vanillin	20.209	137
Nicotyrine <sup>2</sup>	21.156	158

<sup>1</sup>Not included in quant.

<sup>2</sup>Similar to a certain potential candidate based on best MS library search.

## Chromatogram Plot

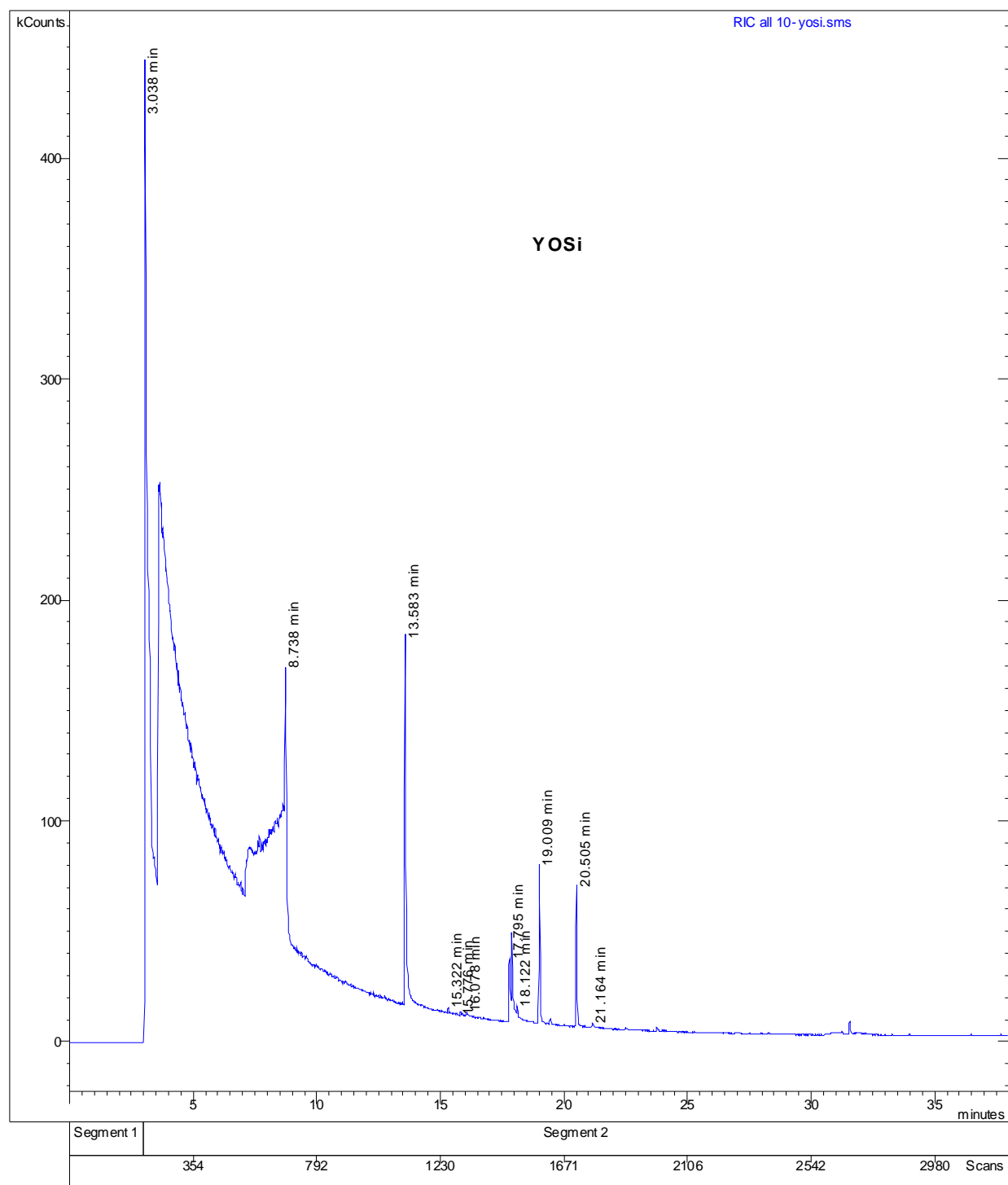
File: d:\data\misc\lepicjuice\lepic2\10- yosi.sms

Sample: 10- YOSi

Scan Range: 1 - 3241 Time Range: 0.00 - 37.99 min.

Operator: DC

Date: 3/18/14 8:41 PM



# GC/MS Sample Report

72636 Epic Juice

Sample Name: YOSi

Compound Name	RT	Quan Ions
Propylene glycol	3.038	59
Corylone	8.738	112
Glycerin <sup>1</sup>	11.138	61
Ethyl maltol	13.583	140
Anisaldehyde	15.322	135
5-Thiazoleethanol, 4-methyl-	15.776	112
Benzenemethanol, 4-methoxy- (Anise alcohol) <sup>2</sup>	16.078	108
Nicotine	17.795	84
Nicotine	18.122	85
Vanillin	19.009	151
Ethyl Vanillin	20.505	137
Nicotyrine <sup>2</sup>	21.164	158

<sup>1</sup>Not included in quant.

<sup>2</sup>Similar to a certain potential candidate based on best MS library search.