



Calidus Performance

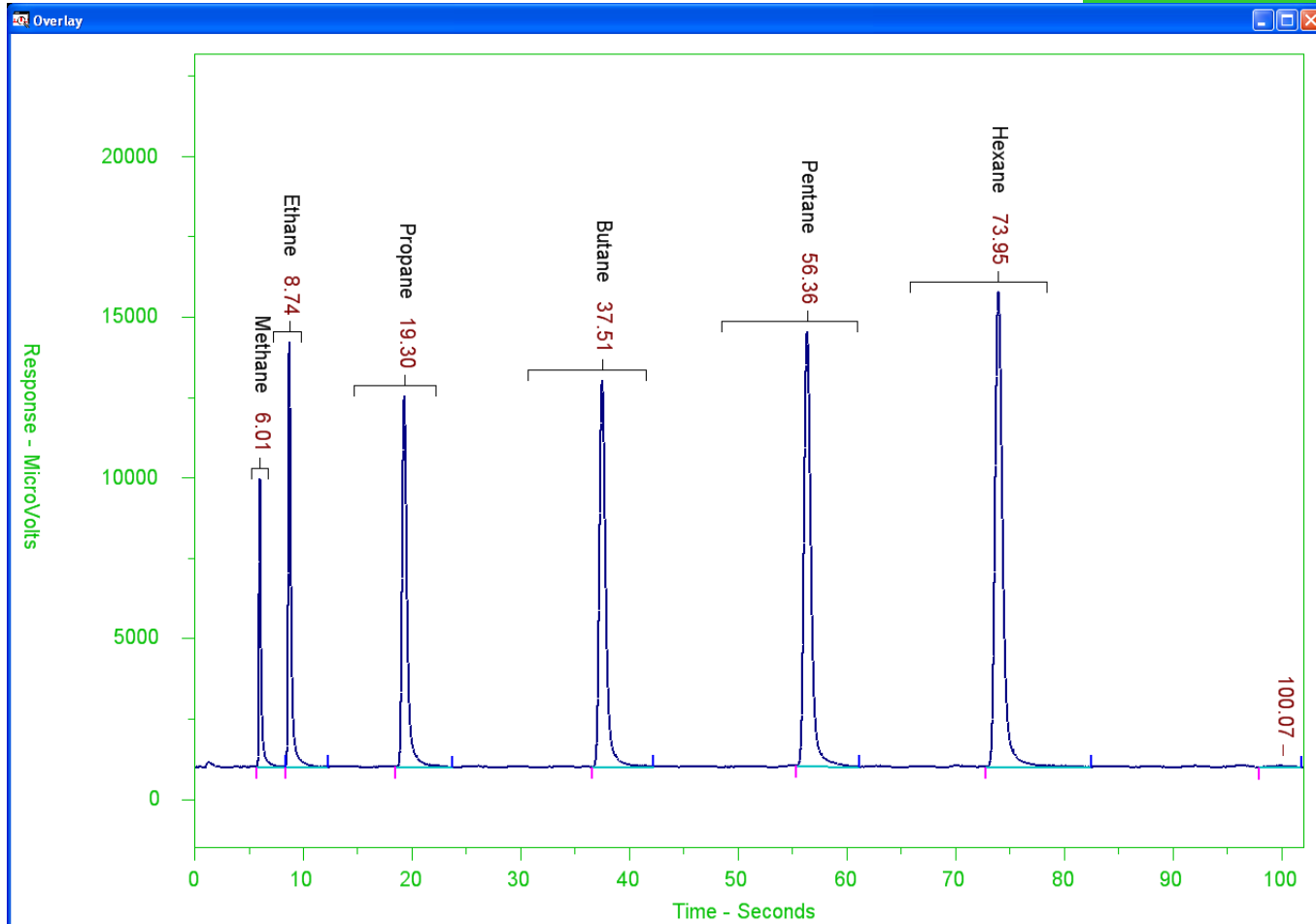




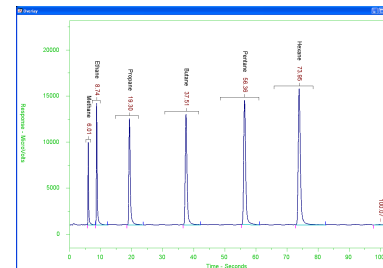
Methane through Hexane Repeatability Studies

3/14/2010

Methane through Hexane



Comments: Methane through Hexane



Chromatographic Conditions

- Sampling
 - 1000 ppm calibration standard bottle
 - Pressure regulated at the bottle
 - Sample shut off valve after the regulator
 - Restriction downstream of Valco rotary gas sample valve
 - Split injection at ~60 uL
- Column Module
 - Mxt-Alumina PLOT, 320 micron ID, 2 meters
 - Temperature Program
 - Initial T=35°C
 - Final T=200°C
 - Initial hold =5 seconds
 - Ramp rate @ 2°C/second
 - Final hold =20 seconds, 107 sec. total
- Detector Module = FID @ 150°C

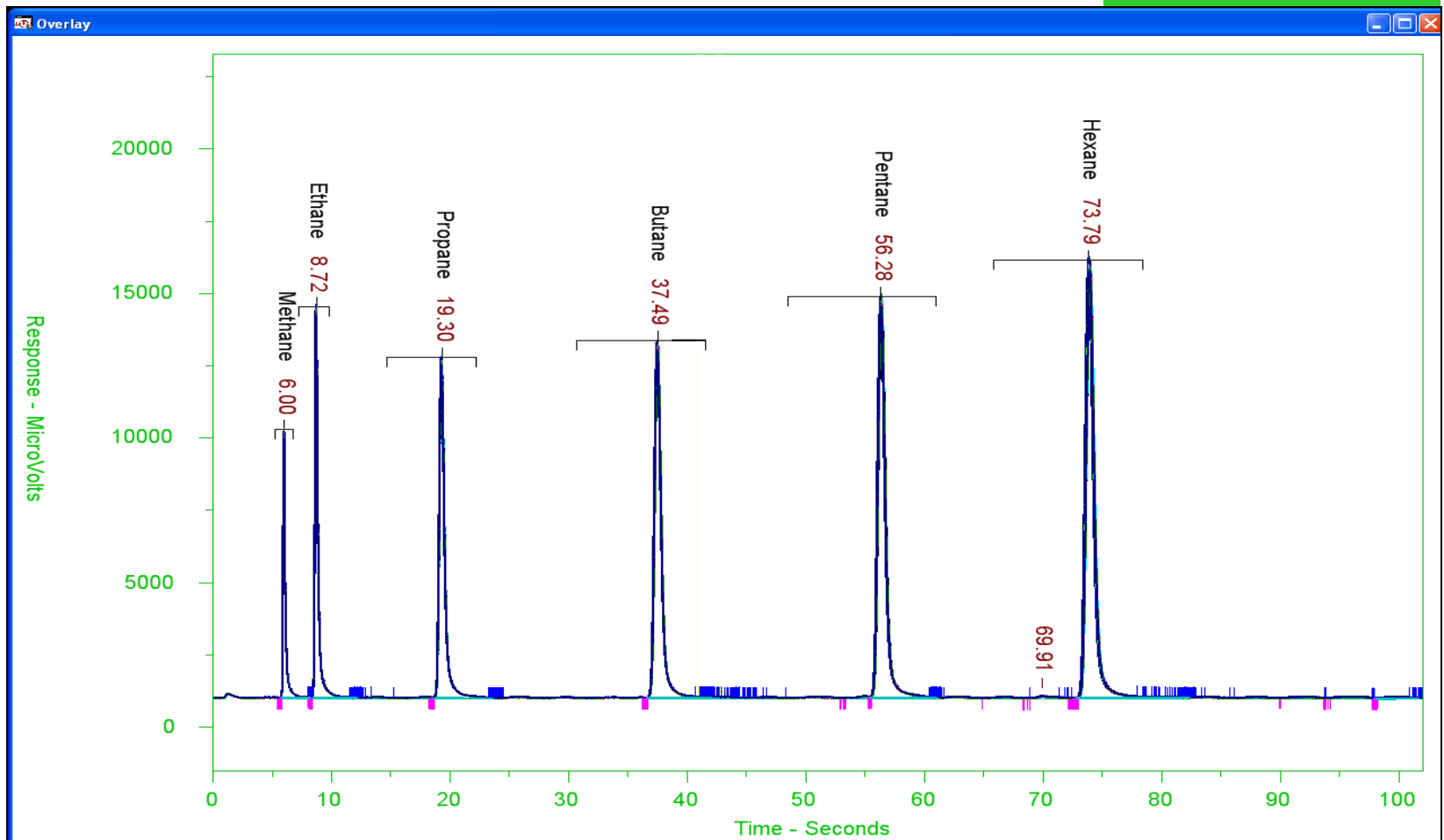
Comments on Chromatography

- Basic chromatogram
 - Peak shapes are great
 - Methane/ethane resolution is good
 - Signal to noise is good
 - Minimal baseline noise & drift for PTGC operation
 - Analysis speed is good ~ 3 min cycles
- Integration method
 - Wide retention windows chosen to
 - Insure all components integrated
 - No outliers would be rejected
 - This may have
 - Increased the area RSDs but
 - The prime goal was to get significant data on retention time RSDs
 - The method could be tuned for faster cycles.

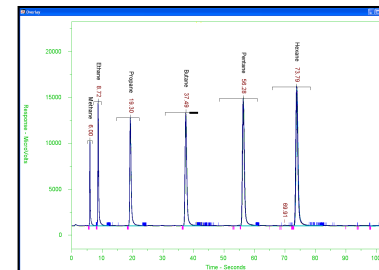


Methane through Hexane

100 Consecutive Runs Overlaid



Comments: Methane through Hexane 100 Consecutive Runs Overlaid



Retention times appear very repeatable.

Peak integration starts and stops show some variability and could be fine tuned.

Peak heights appear very repeatable.

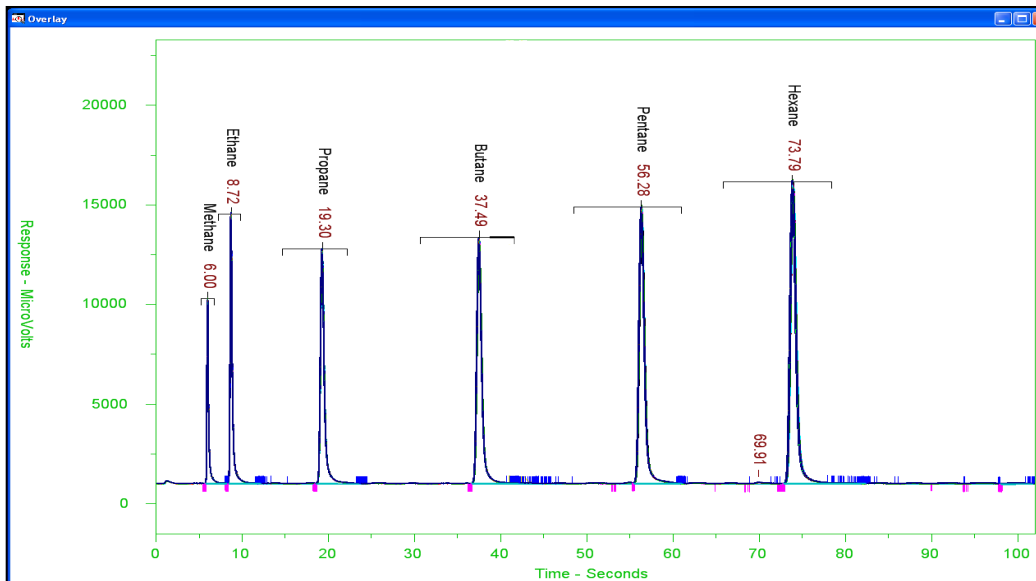
Statistics follow.



Methane through Hexane Summary

100 Run RT Statistics (no outliers rejected)

	Methane	Ethane	Propane	Butane	Pentane	Hexane	
Average	0.100218	0.145572	0.321795	0.625310101	0.939598	1.23237	
Std. Dev.	7.96E-05	0.000103	0.000137	0.000242224	0.000407	0.000812	AVG
%RSD	0.0794%	0.0705%	0.0427%	0.0387%	0.0433%	0.0659%	0.057%



100 Run Area Statistics (no outliers rejected)

	Methane	Ethane	Propane	Butane	Pentane	Hexane	
Average	2117.64	4253.89	6282.28	8363.68	10325.85	12459.9	
Std. Dev.	16.467	36.48464	51.6748	131.788542	96.32881	102.4173	AVG
%RSD	0.7776%	0.8577%	0.8225%	1.5757%	0.9329%	0.8220%	0.965%



Comments: Statistics

Methane through Hexane

Retention time repeatability is excellent at $< 0.06\%$.

Area repeatability is excellent at $< 1.0\%$.

No outliers were rejected even though simple t tests probably would have identified several to reject.

No processing was done such as retention time alignment.

Liquid sample valve or auto injector repeatability should be even better. That demonstration is coming soon.

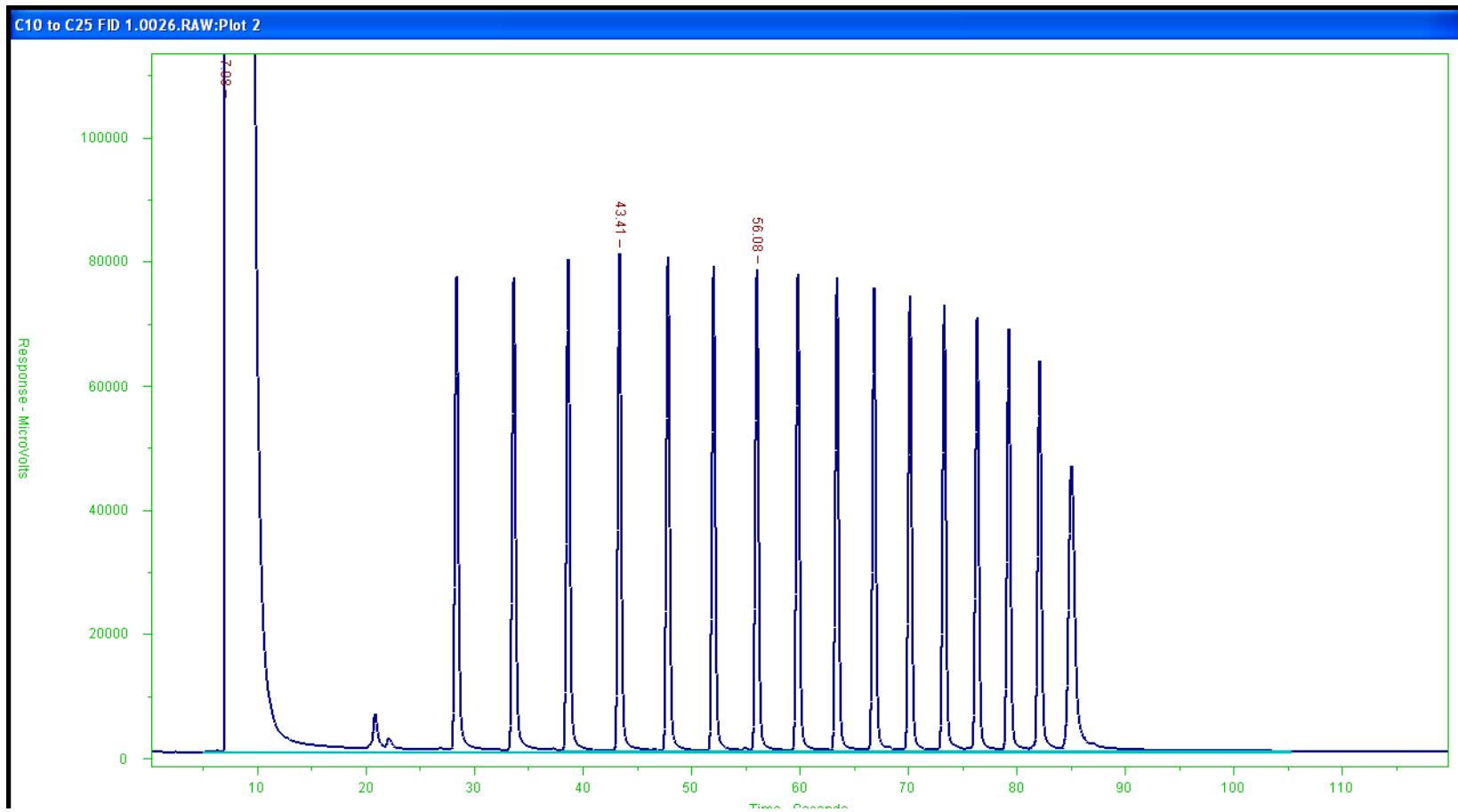




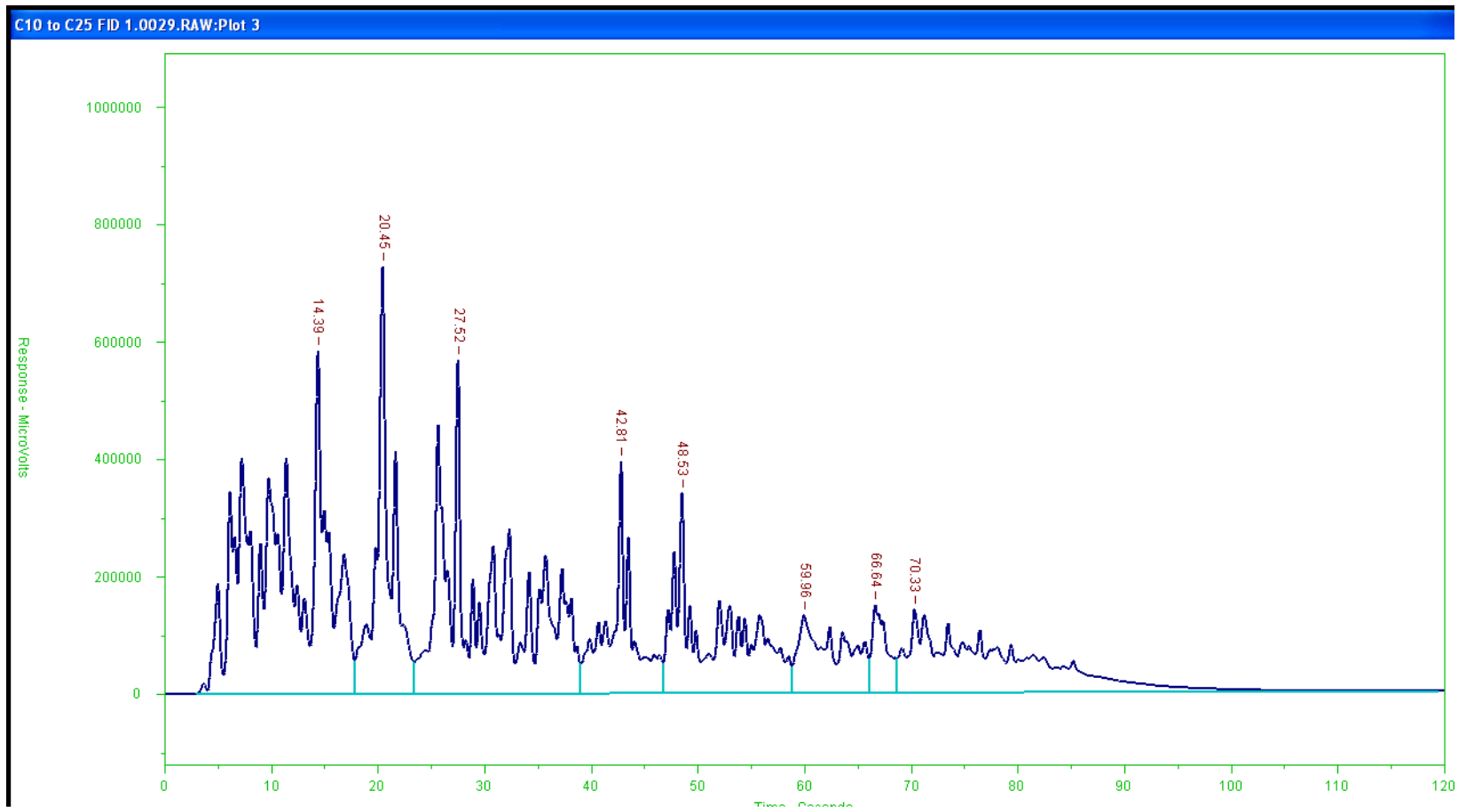
Diesel Range Organics

3/23/2010

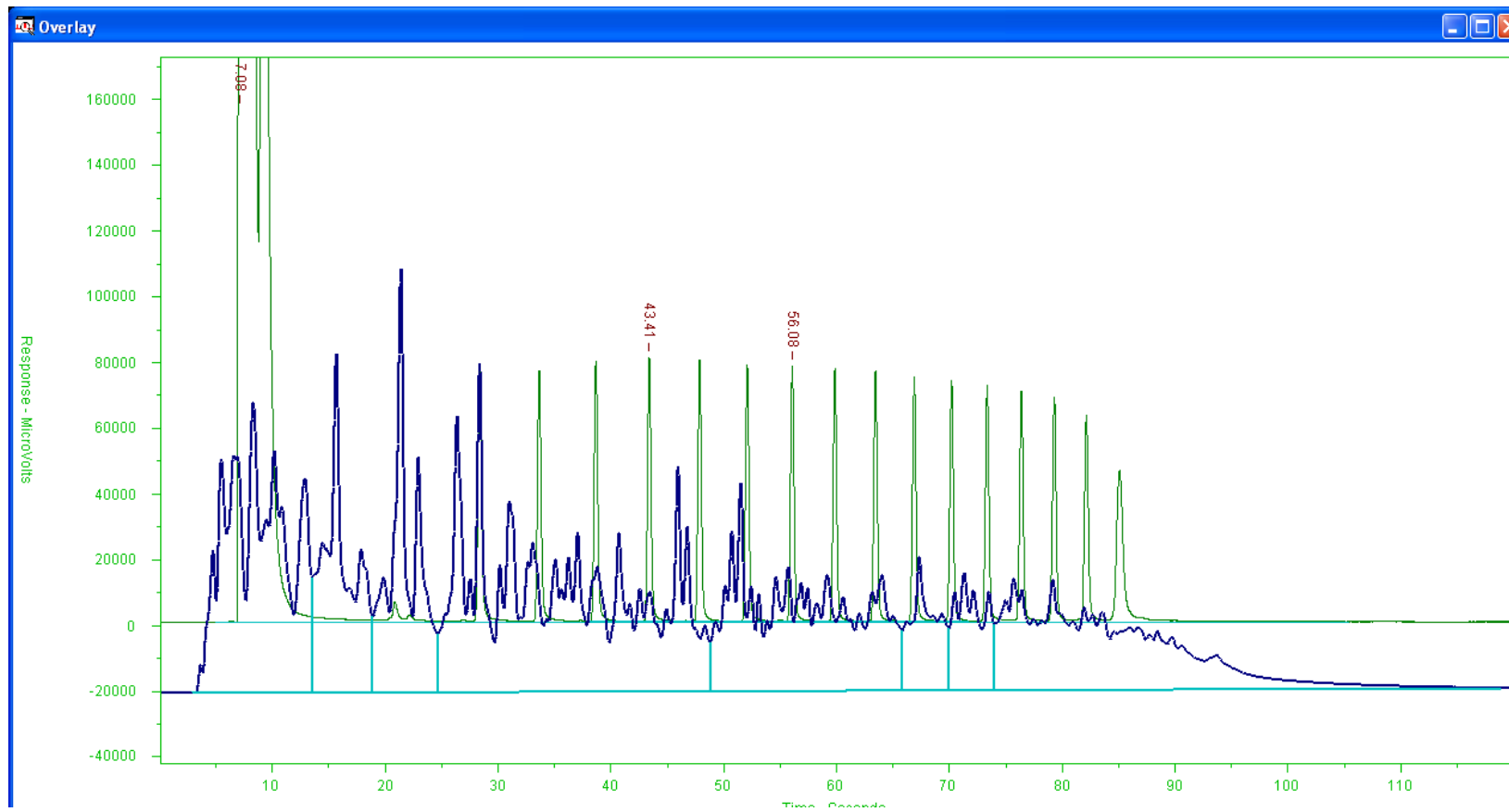
C₁₀-C₂₅ to Establish Carbon Number



Broad Boiling Range Hydrocarbons



Broad Boiling Range Hydrocarbons Overlaid C₁₀-C₂₅

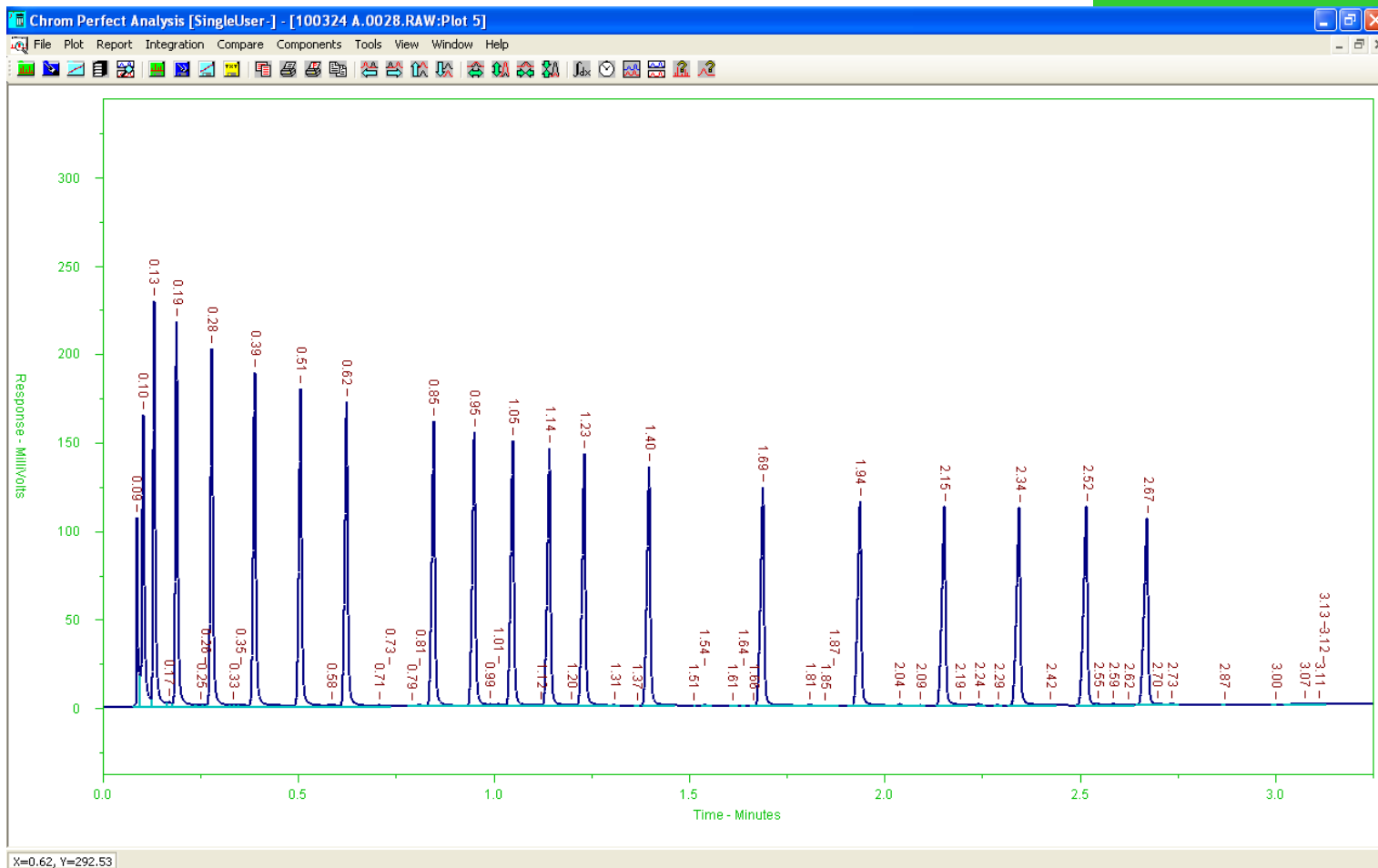




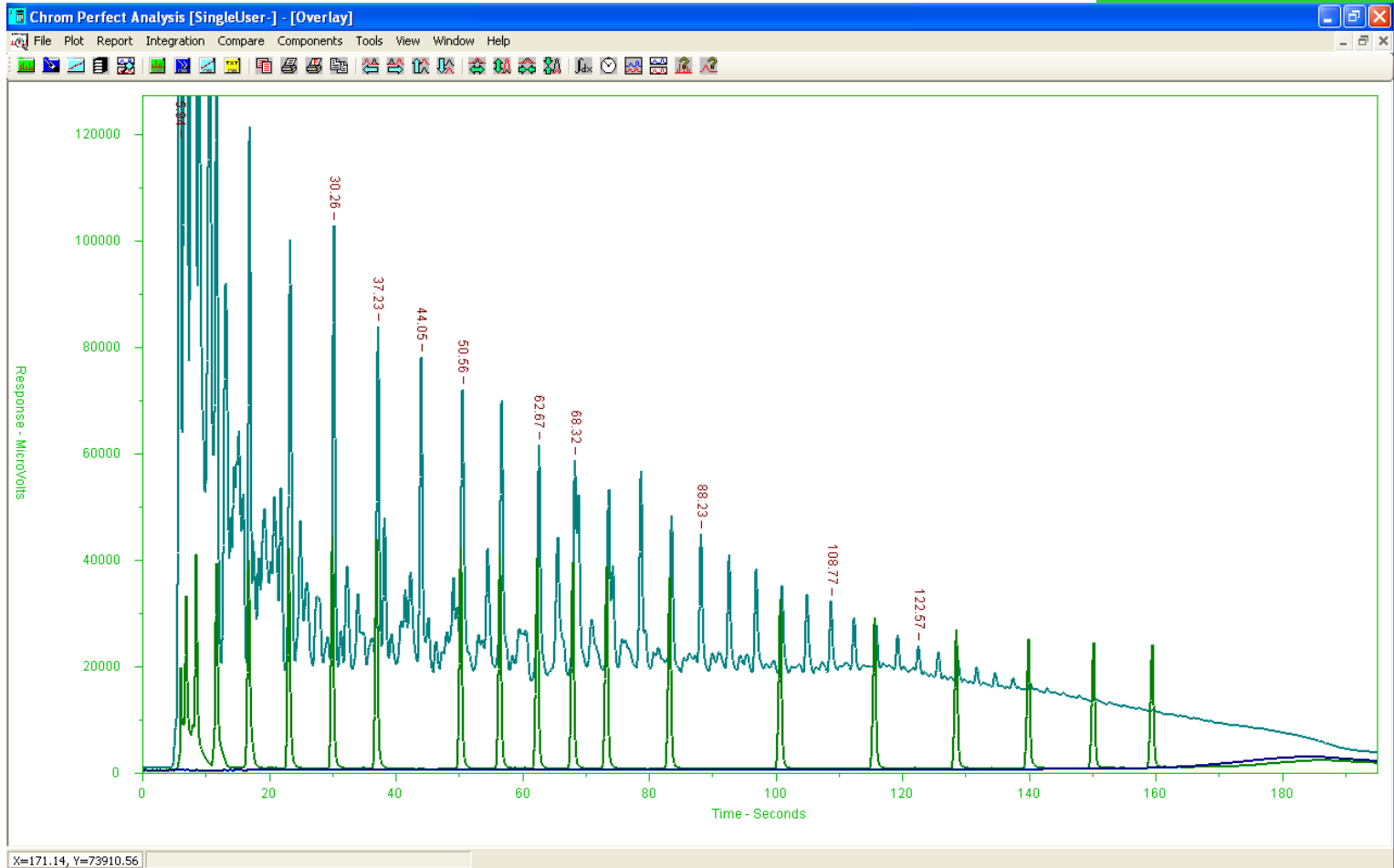
Work Done on Crude Evaluations

Through 4/2/2010

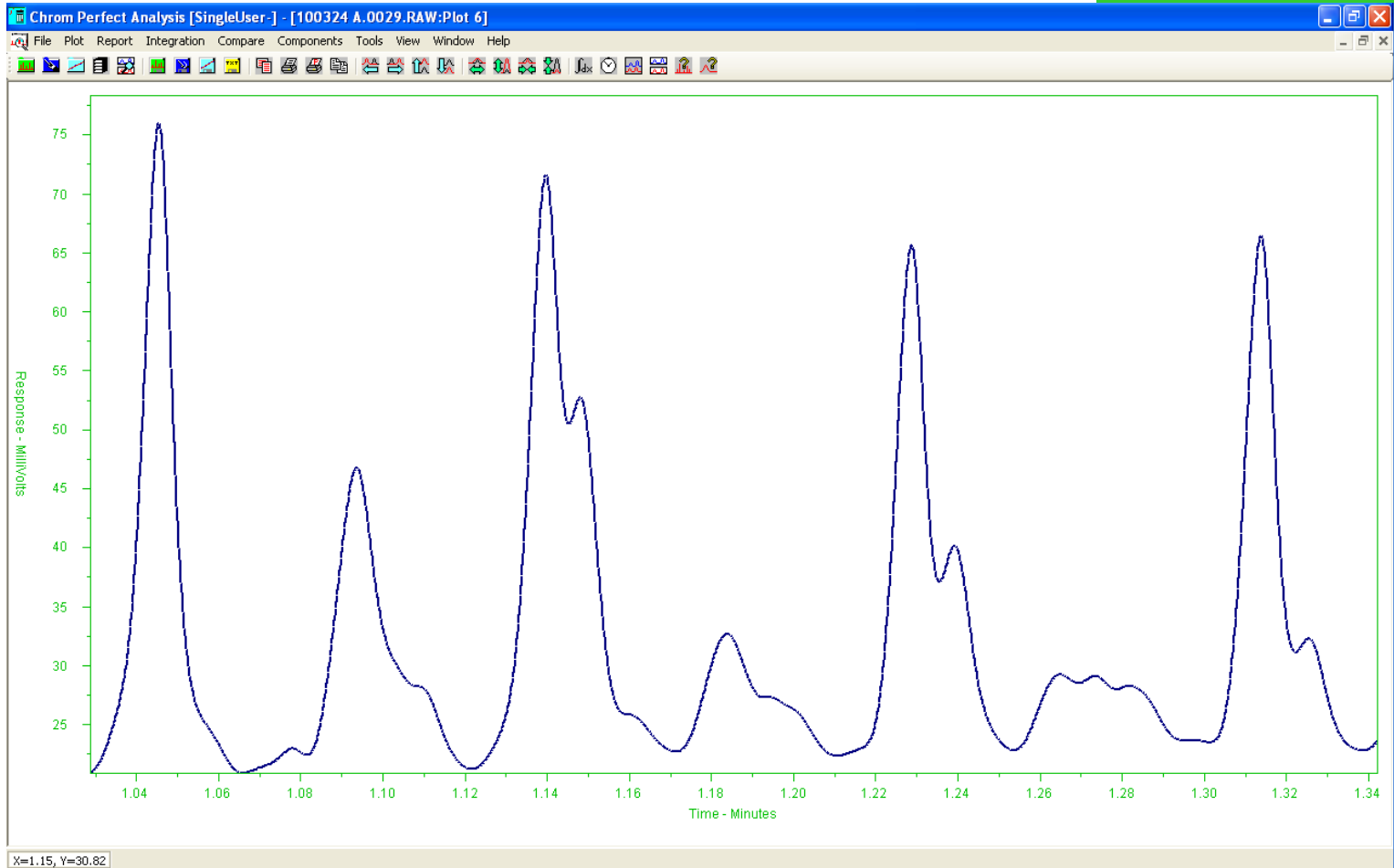
C₅ to C₄₄ to Establish Carbon Number



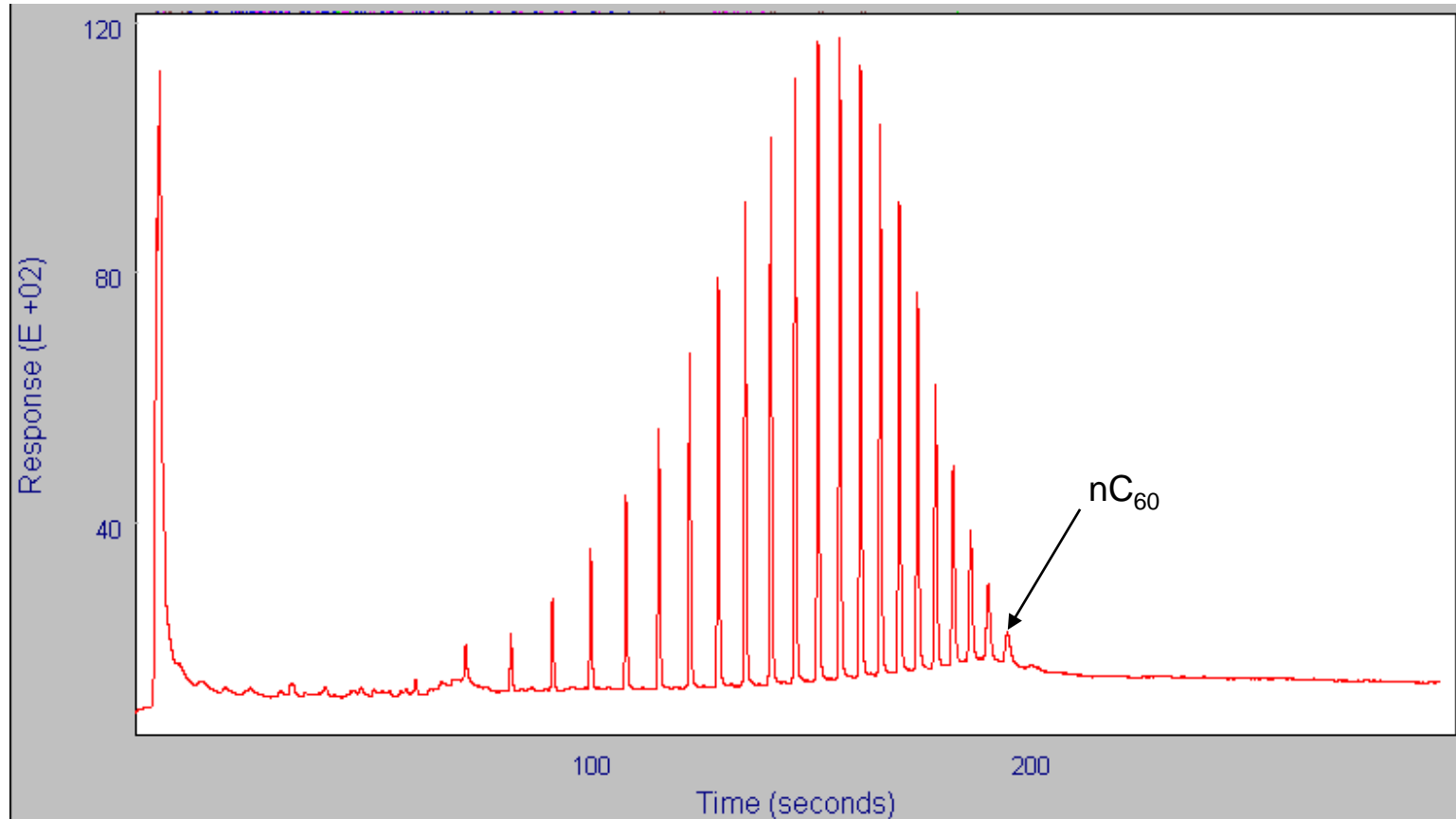
Typical Crude Overlaid C₅ to C₄₄



Resolution of Isoprenoids



Polywax Standard on Calidus



Calidus Performs over a Broad Range.

- Low boiler performance is excellent.
 - Methane to hexane resolution & repeatability meet the requirements.
 - Addition of thermal conductivity detector modules is coming soon to enable air component detection.
- Resolution and speed meet simulated distillation requirements.
 - GRO and DRO can be done with moderate conditions.
 - ASTM D-2887 can also be done at higher temperatures.
 - With appropriate sampling technique an n-C₅₀ endpoint can be done.
 - The polywax standard sample demonstrated n-C₆₀ in boiling range will be possible with more work.





Thanks for your interest in
Calidus. Call us if you have
questions.

Falcon Analytical

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