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New DHA-DHAX Methods Using Hydrogen

A report (A New DHA (above ambient start) Method, 01/12/2000) was issued describing the conditions for an optimum method for the analysis of gasoline range petroleum samples. That method employed helium carrier gas, while this current work provides optimized DHA and DHAX methods using hydrogen carrier gas.

A new J&W DB-Petro 100m x 0.25mm ID, 0.5µm polydimethylsiloxane liquid phase, was previously setup with a 3.5m x 0.25mm 1.0 DB-5 precolumn as prescribed for the DHAX method, and was reported earlier showing excellent conformity to the DHAX method. Hydrogen carrier gas flow rate was studied to establish the optimum practical flow rate for obtaining the required component separations. It was found that a pressure of **40psig** giving a measured column outlet flow rate of **4.6 cm^3/min**. was the maximum usable without significant loss of column efficiency. Since the analyses were faster than when using helium, the column oven temperature profiles has to be re-established. The oven temperature program was established at:

DHA Method
7.5 min. @ 30ºC to 48ºC @ 14.0º/min. & 25 min. @ 48ºC to 200ºC @ 2.7º/min.

DHAX Method
5.0 min. @ 5ºC to 50ºC @ 7.6º/min. & 33 min. @ 50ºC to 200ºC @ 2.7º/min.

The sample used for this evaluation is PONA-VI - a synthetic gasoline, blended with various gasoline feed stocks and other added components.

Results

The DHA analysis is shown by the attached Figures One through Eight, while the DHAX analysis is shown in Figures Nine through Sixteen. The chromatograms are divided into normal hydrocarbon to normal hydrocarbon segments for convenience and since the method uses retention indices for identification purposes.

Original DHAX through C_{14} using Helium @ 43psig: 175 minutes.
New DHAX through C_{14} using Helium @ 66psig: 125 minutes.
New DHAX through C_{14} using Hydrogen @ 40psig: 88 minutes.

Figure One – DHA Method from C_1 to C_5 Segment

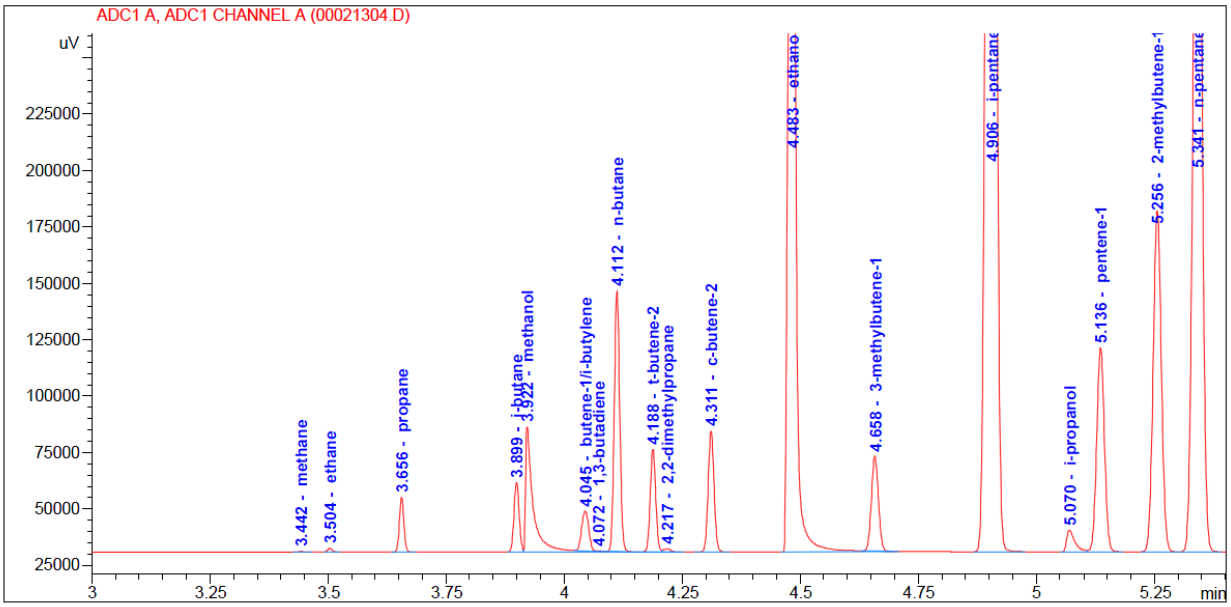

Figure Two – DHA Method from C_5 to C_6 Segment

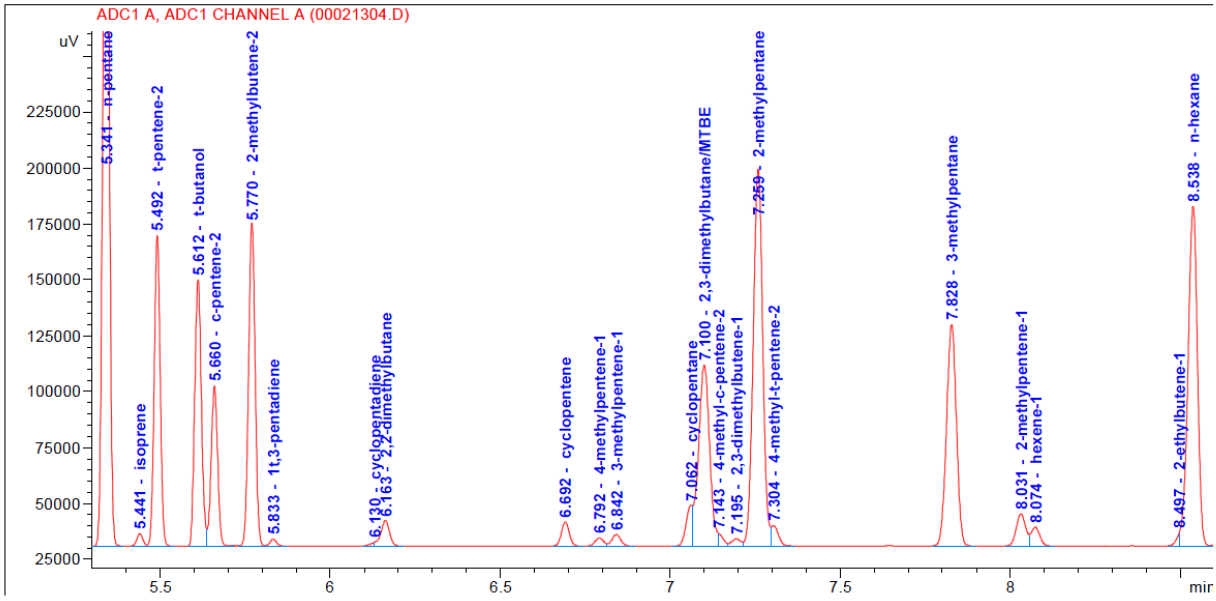

Figure Three – DHA Method from C_6 to C_7 Segment

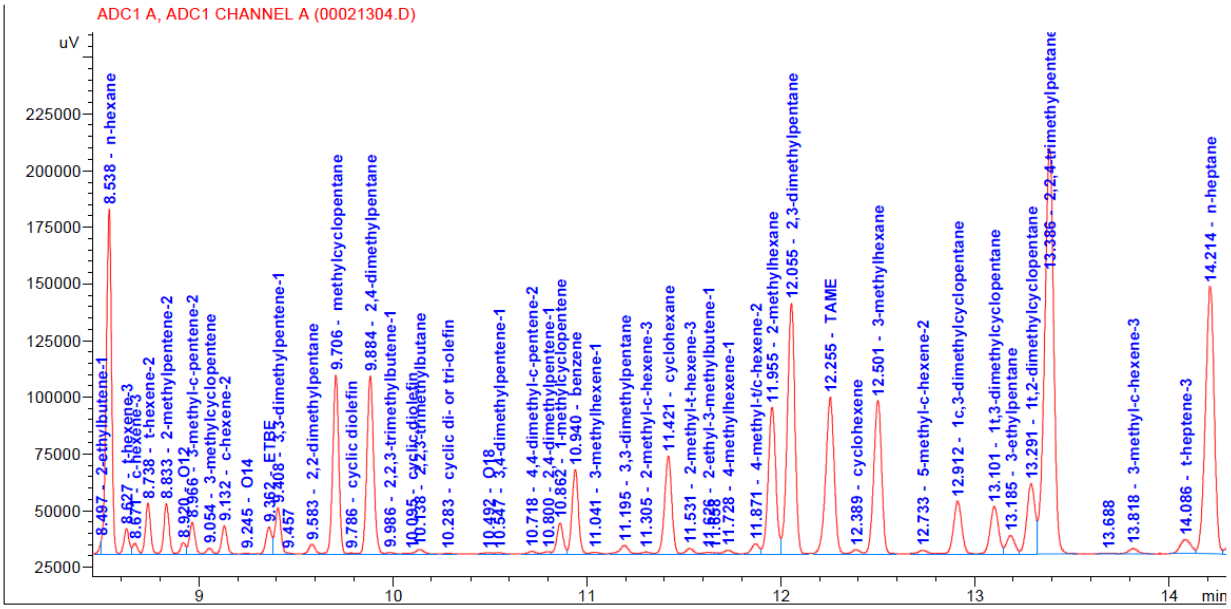

Figure Four – DHA Method from C_7 to C_8 Segment

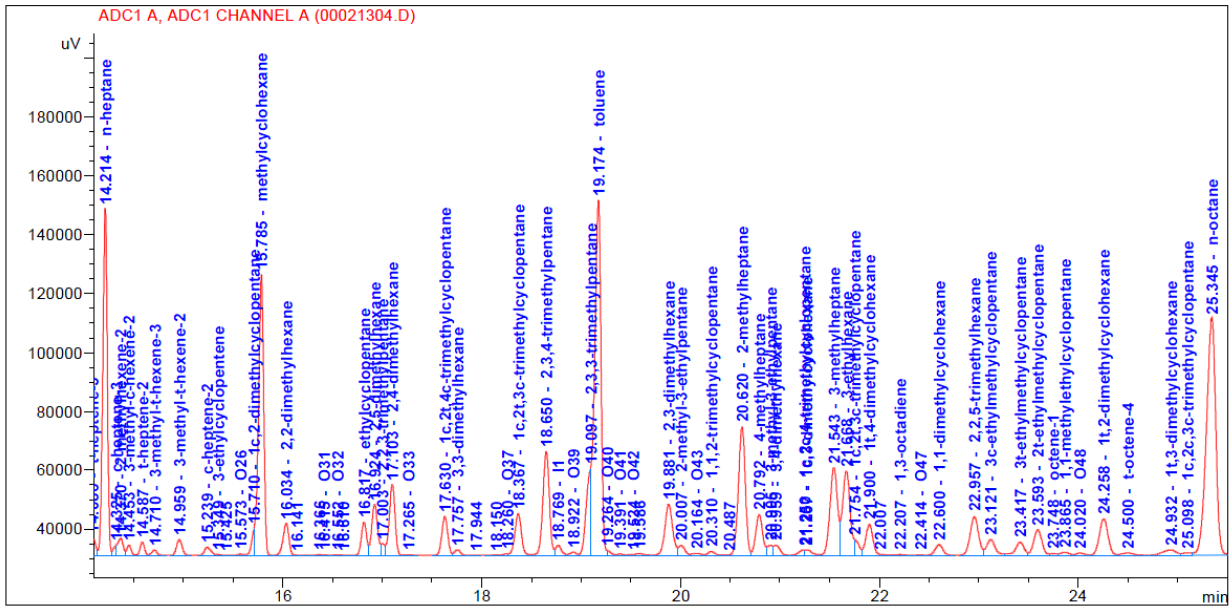

Figure Five – DHA Method from C_8 to C_9 Segment

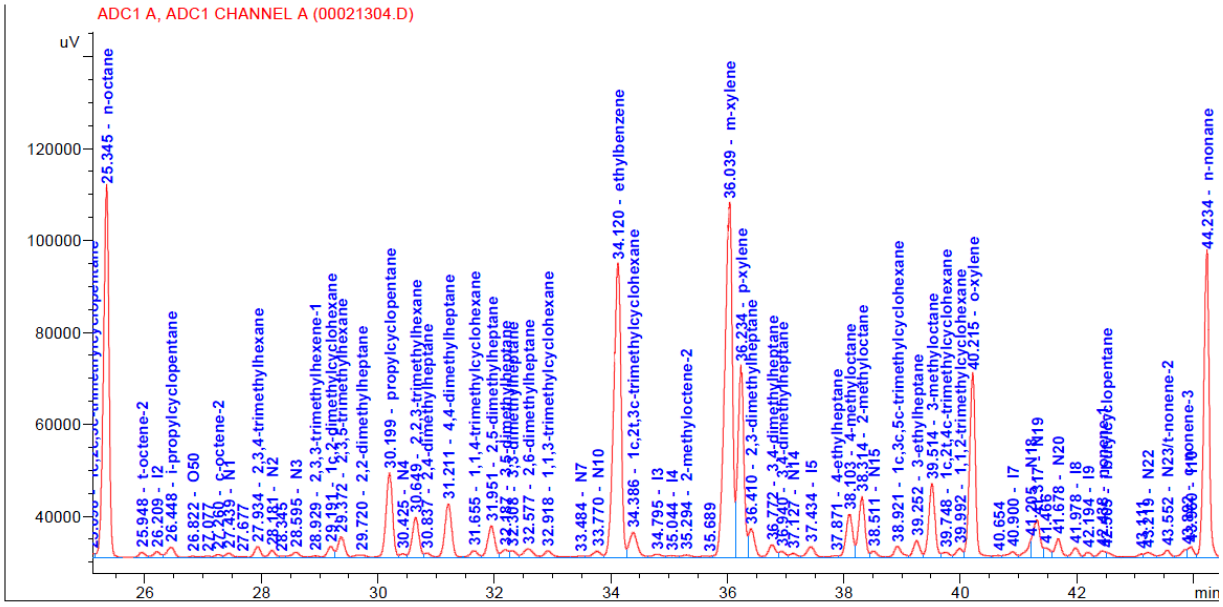

Figure Six – DHA Method from C_9 to C_{10} Segment

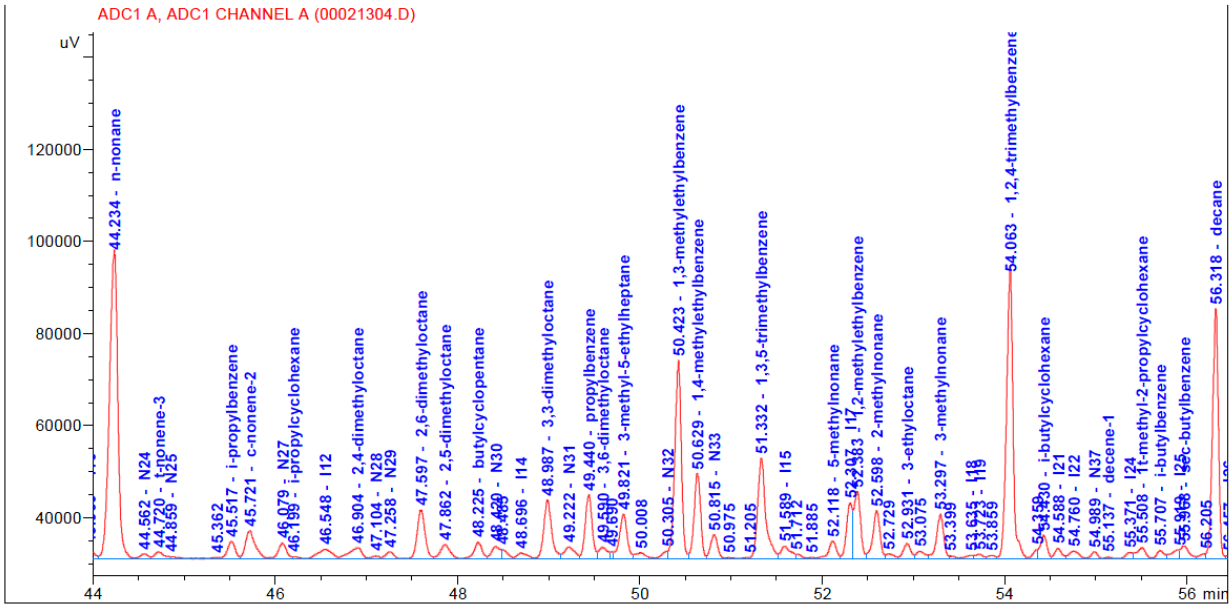

Figure Seven – DHA Method from C_{10} to C_{11} Segment

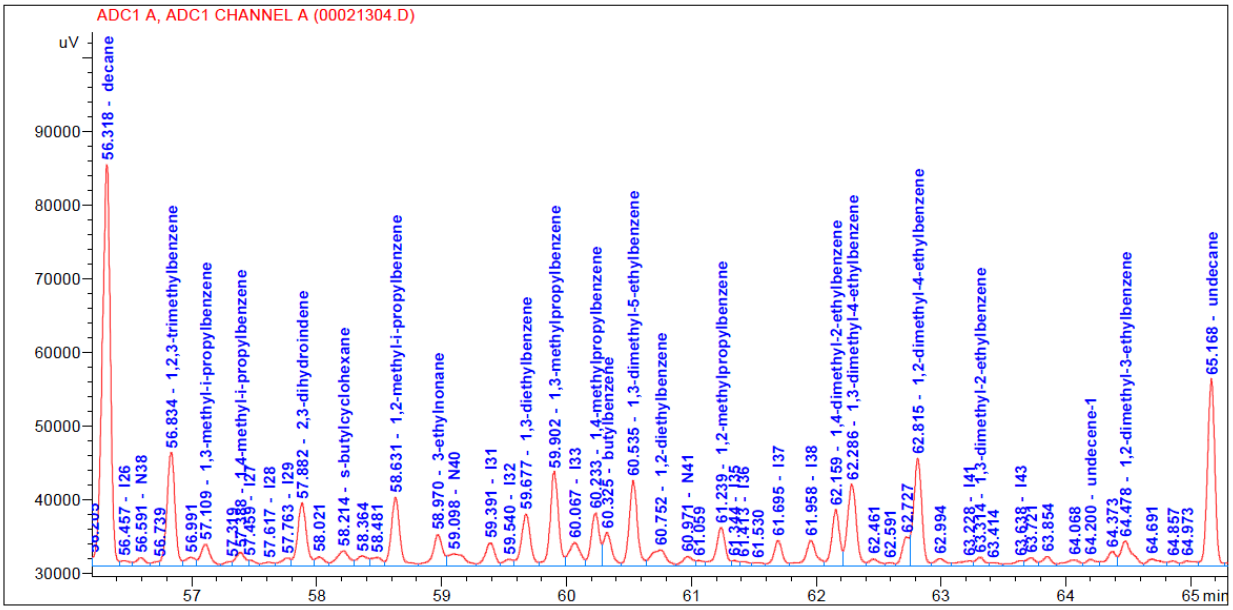

Figure Eight – DHA Method from C_{11} to C_{14} Segment

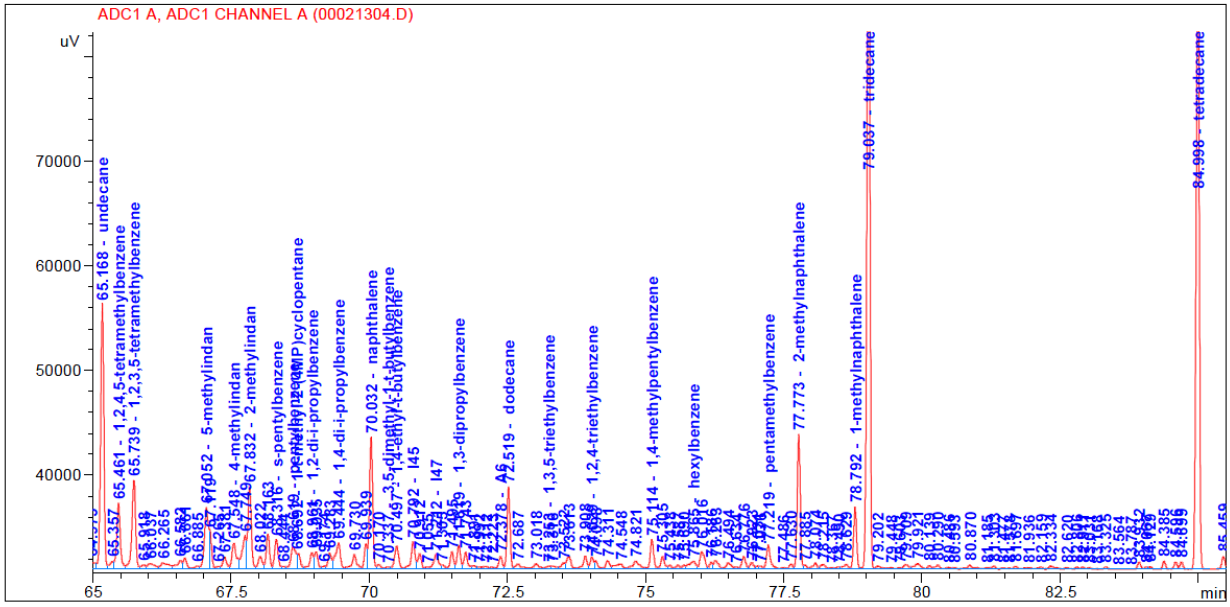

Figure Nine – DHAX Method from C_1 to C_5 Segment

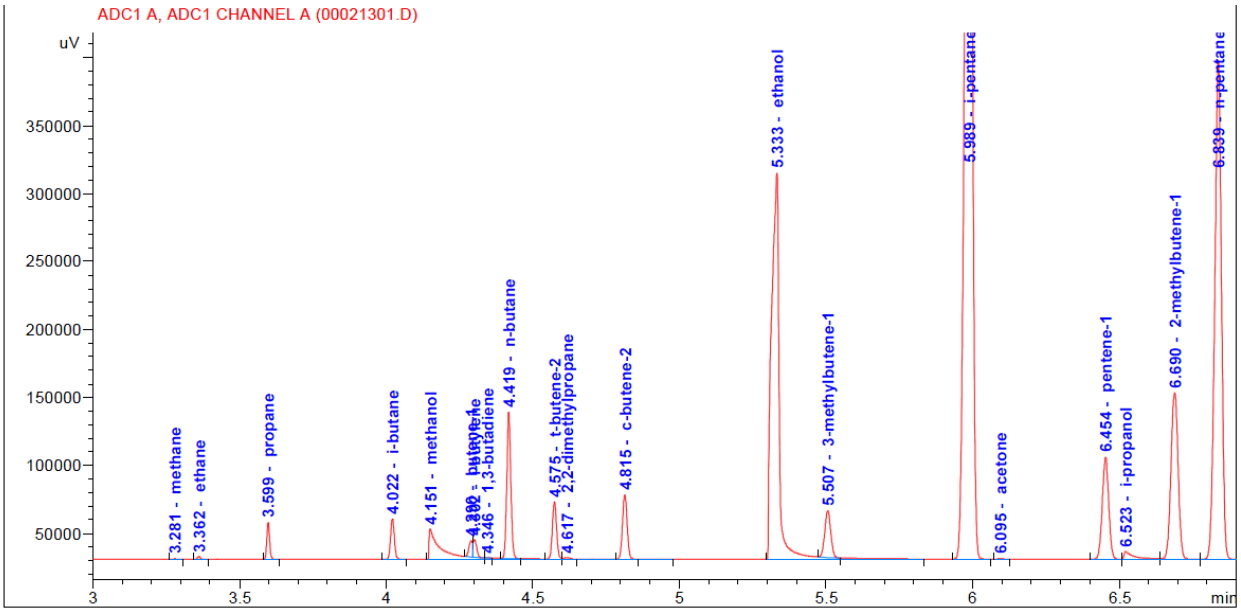

Figure Ten – DHAX Method from C_5 to C_6 Segment

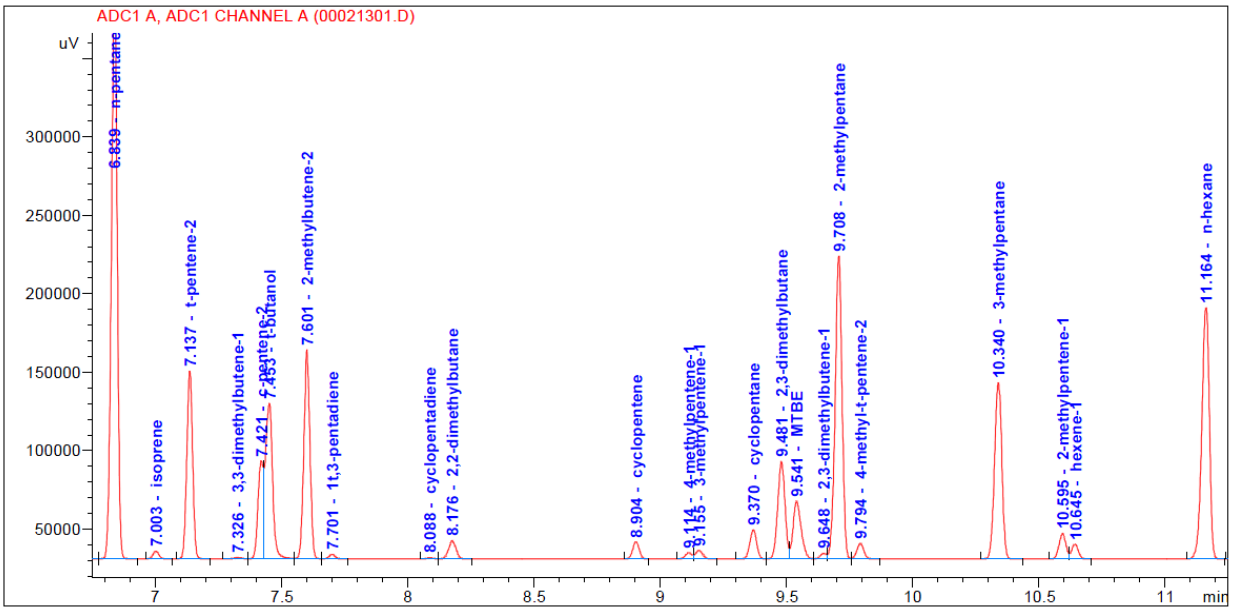

Figure Eleven – DHAX Method from C_6 to C_7 Segment

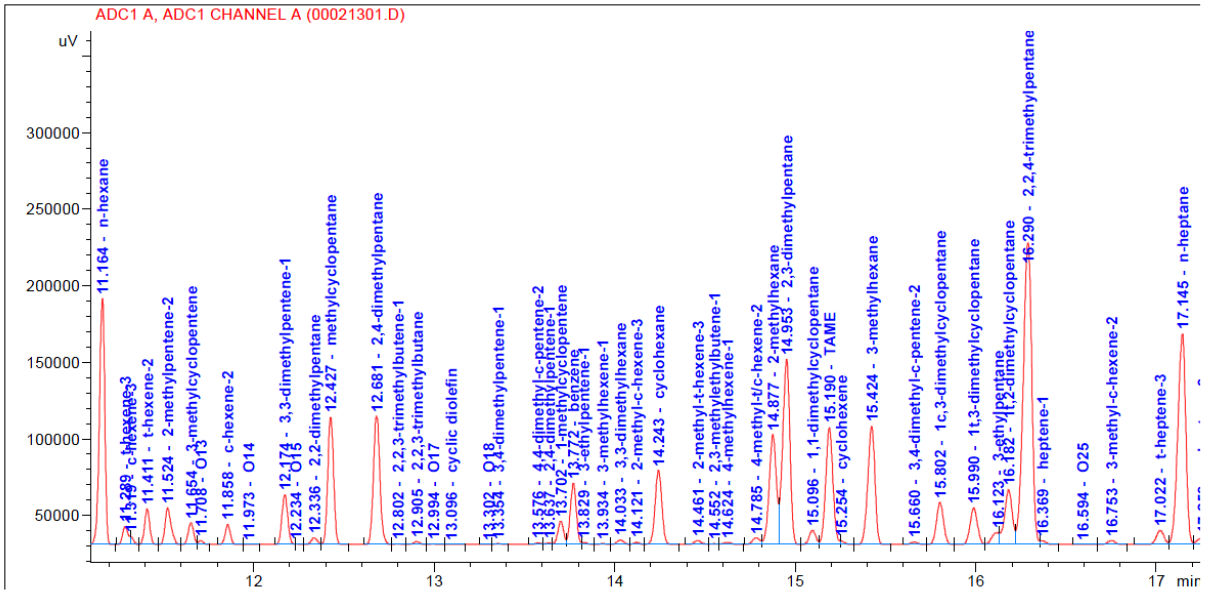

Figure Twelve – DHAX Method from C_7 to C_8 Segment

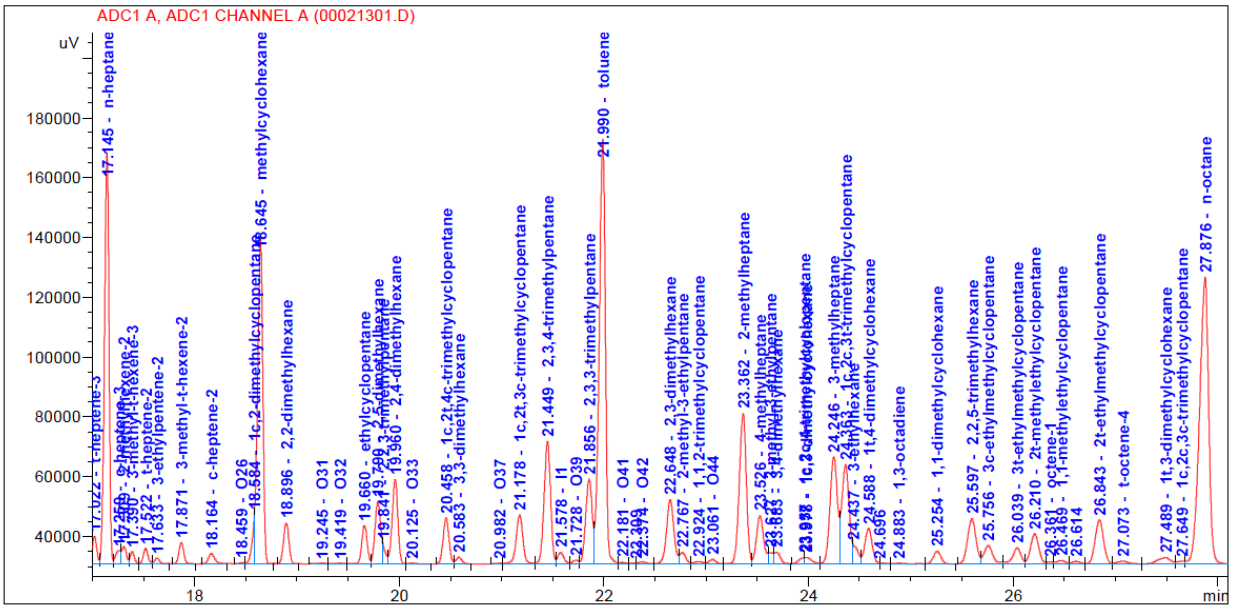

Figure Thirteen – DHAX Method from C_8 to C_9 Segment

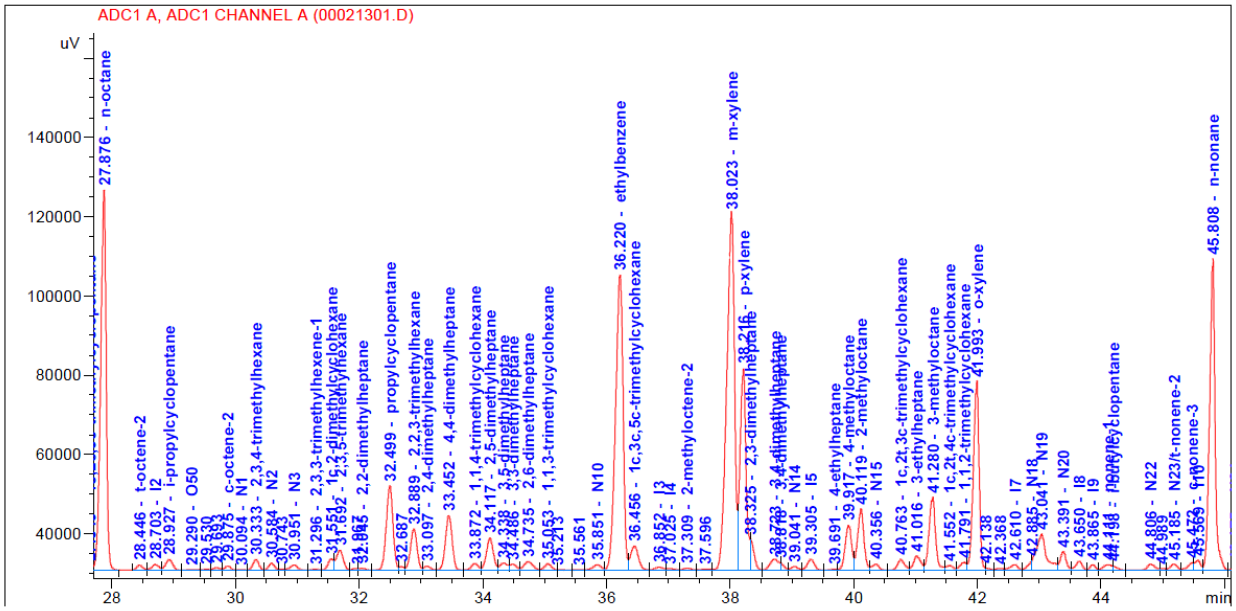

Figure Fourteen – DHAX Method from C_9 to C_{10} Segment

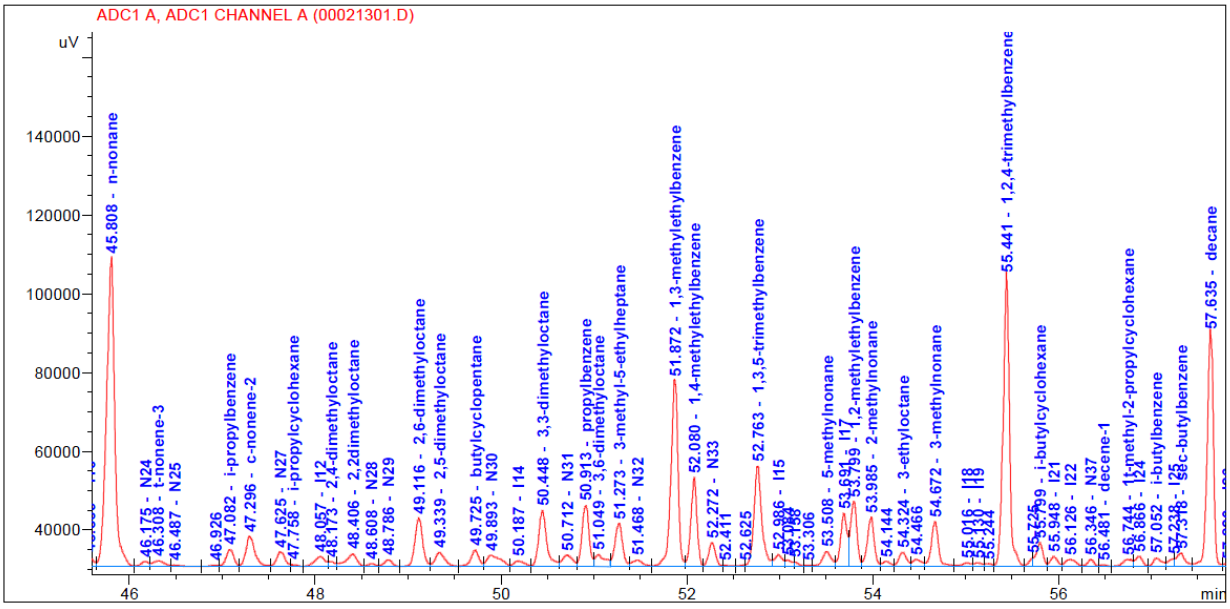

Figure Fifteen – DHAX Method from C_{10} to C_{11} Segment

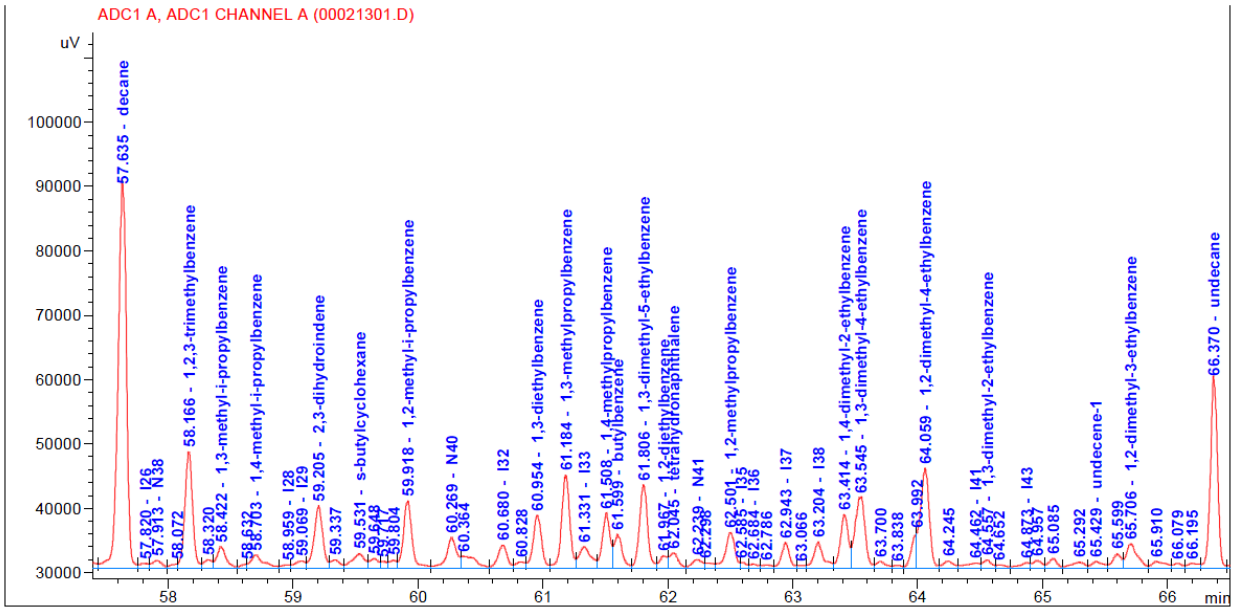

Figure Sixteen – DHAX Method from C_{11} to C_{14} Segment