

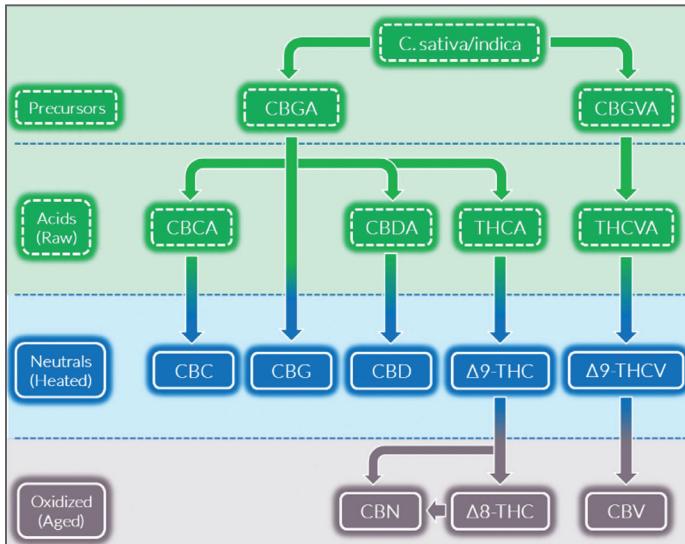
# APPLICATION NOTE 1.0

## Ultrafast Total Potency Analysis of Cannabinoids in Decarboxylated Oil Extracts Using G908



### INTRODUCTION

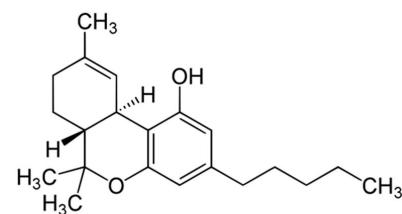
With the legalization of cannabis for medical and recreational use in an increasing number of states, accurate analysis of cannabinoids is an important measurement. More than 60 cannabinoid species, divided into 10 distinct subgroups, have been isolated from cannabis and identified<sup>1</sup>. Of these, the neutral compounds Δ-9 tetrahydrocannabinol (THC) and cannabidiol (CBD) shown in figure 1 are the most important as these are used for determining product total potency which is usually measured as percent dry weight. In addition, the ratio of THC:CBD can determine the end usage of products as well as pricing and associated state tax revenue. Quantifying other cannabinoids including THCV, CBG, CBC and CBN that may be present, is also important. The presence of a significant amount of CBN, for example, can indicate product degradation due to improper storage or aging.



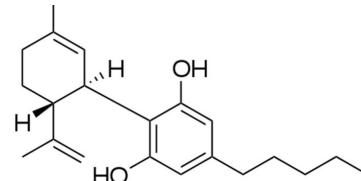
**Figure 1. Cannabinoid species commonly found in *C. sativa* and *C. indica* strains**

Cannabinoids can be quantitatively analyzed using LC, LC-MS, GC or GC-MS<sup>2,3</sup>. While acidic precursors such as tetrahydrocannabinolic acid (THCA) and cannabidiolic acid (CBDA) require decarboxylation prior to GC analysis, making LC or derivatization the best means for analyzing these two compounds in

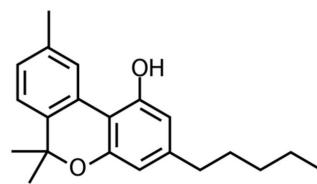
fresh extracts, decarboxylated oils and other products, containing only neutral cannabinoids, make up a significant percentage of product and a simple, rapid on-site analysis of these for quality control and product development purposes is advantageous for extractors and manufacturers. As cannabinoids are aromatic ring containing compounds (Fig.2), optimum component separation by GC is achieved using capillary columns that also contain an aromatic element such as phenyl as a constituent of the stationary phase<sup>4</sup>. The use of an autosampler also improves analytical accuracy and precision and enables users to operate the G908 analyzer largely unattended.



Tetrahydrocannabinol (THC)



Cannabidiol (CBD)



Cannabinol (CBN)

**Figure 2. Major aromatic cannabinoid species present in cannabis**

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### METHODOLOGY

A G908 GC-HPMS analyzer fitted with a HTA-2800 autosampler was used for this work. A series of calibration standards and several decarboxylated THC and CBD containing oil extract product samples were analyzed using the following test conditions:

Inlet: S/SL 320oC (5:1 Split)  
Detector: FID 350oC  
Inj. Vol.: 1ul  
Carrier: H<sub>2</sub> 7 psi  
Column: MXT-35, 8m, 0.25mm, 0.5um df  
Conditions: Initial 200oC 10s, 310oC @1.4oC/s, hold 41s.  
Sample: Mixed individual cannabinoid standards (1-100ug/ml) (Restek Corp.)

### RESULTS & DISCUSSION

Results showed that the G908 analyzer detected and quantified the 6 neutral cannabinoids being tested for (CBC, CBD, Δ-8-THC, Δ-9-THC, CBG and CBN) within 130 seconds with a high degree retention time (RSD <0.05%) precision being demonstrated by this system. Overlays of the calibration standard chromatograms (Figure 3) confirmed that all components were correctly identified and well resolved. The six level, three replicate calibration (Figure 4) showed linear responses for all analytes over the concentration range.

Duplicate injections of decarboxylated oil extract samples containing neutral cannabinoid species, with either high CBD or THC content, showed reproducible results (Figure 5). These results confirmed that the G908 analyzer automatically injected, identified and quantified all the required cannabinoid species present in decarboxylated oil extracts within 130 seconds.

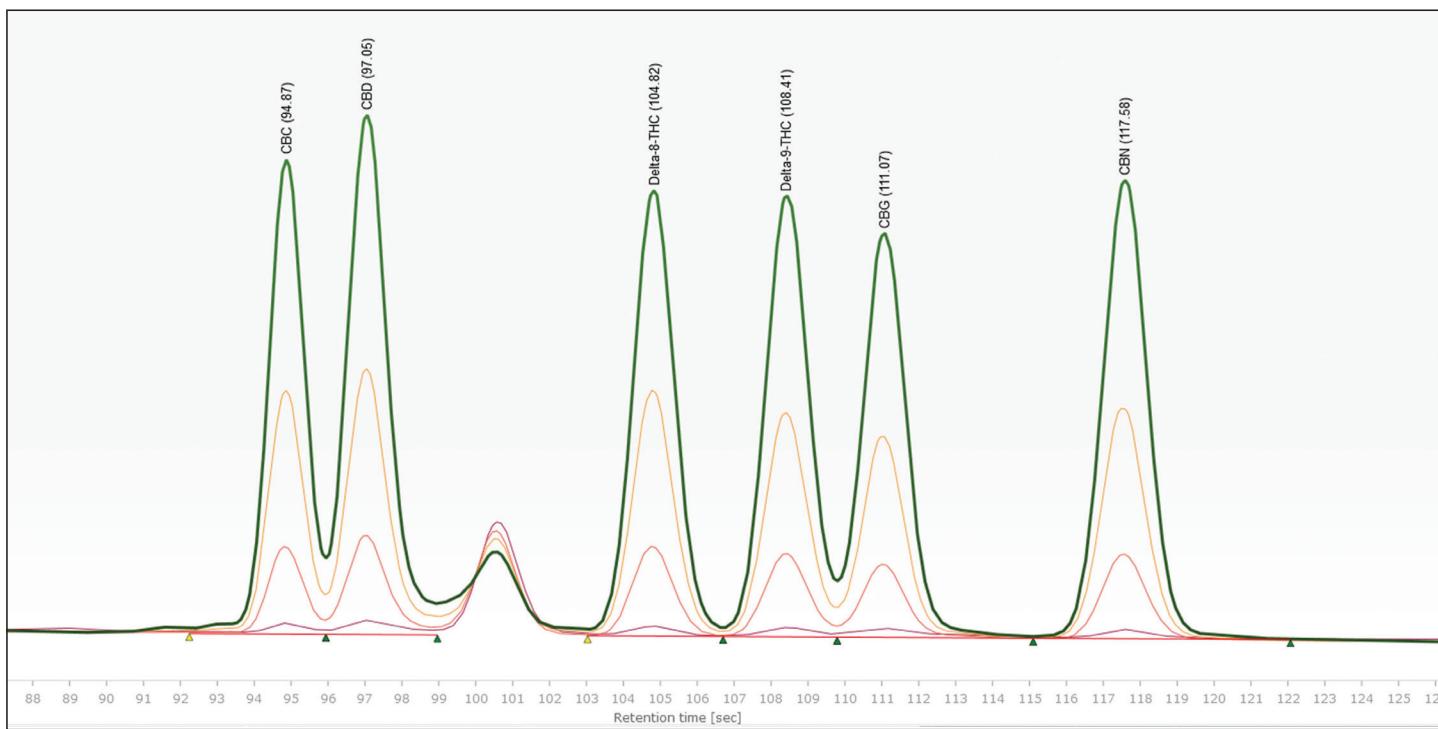


Figure 3. GC FID traces of 1, 10, 25 & 50ppm calibration standards containing, CBC, CBD, Δ-8-THC, Δ-9-THC, CBG & CBN

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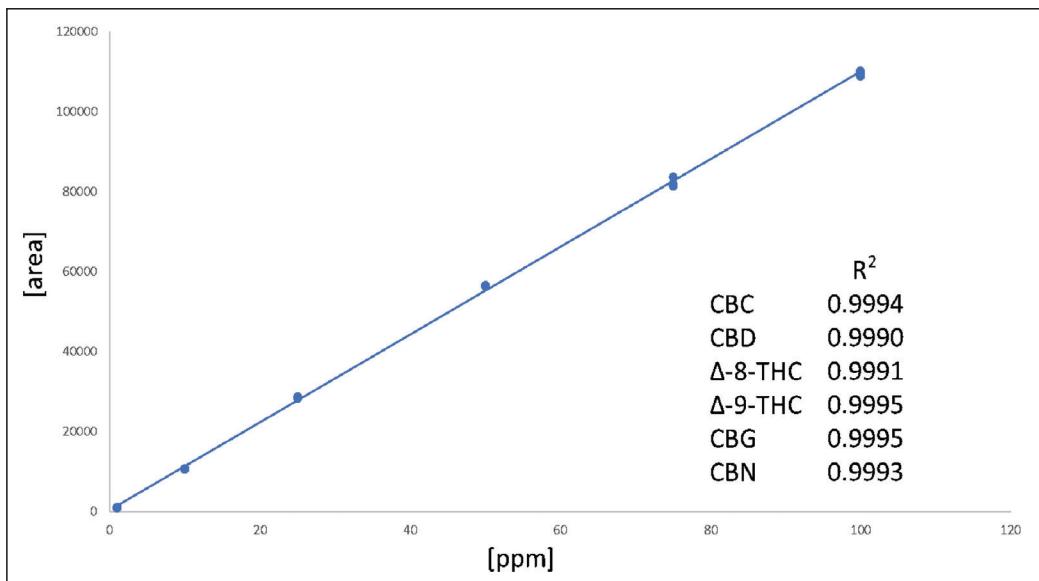


Figure 4. Calibration results ( $\Delta$ -9-THC curve shown) for 6 neutral cannabinoid species on the G908 analyzer

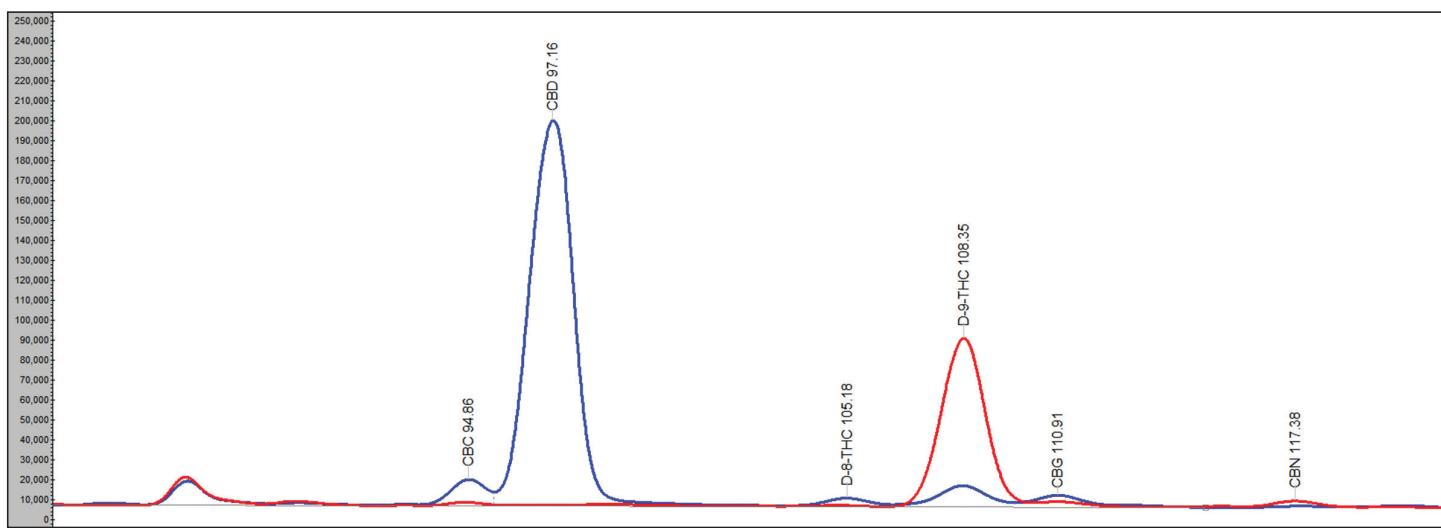


Figure 5. DI njections of high CBD (—) and high  $\Delta$ -9-THC (—) decarboxylated oil extracts

### References:

1. Rudolph Brenneisen (2007) Chemistry and Analysis of Phytocannabinoids and other Cannabis Constituents p.17-49 *Forensic Science and Medicine: Marijuana and the Cannabinoids*. Edited by M.A. ElSohly, Humana Press Inc., Totowa NJ.
2. Timothy D Ruppel & Nathaniel Kuffel Cannabis Analysis: Potency Testing, Identification and Quantification of THC and CBD by GC/FID and GC/MS. Application Note Perkin Elmer Inc. Waltham MA.
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4. Jack Cochran. Don't Overestimate Cannabidiol during Medical Cannabis Potency Testing by Gas Chromatography. Application Note #FFAR1954-UNV Restek Corp, Bellefonte PA.

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