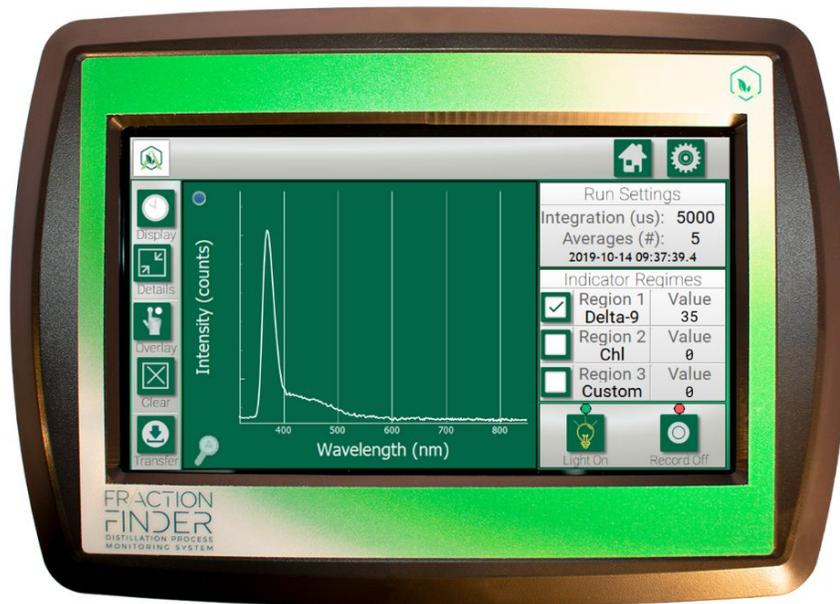




FRACTION FINDER

GUIDE FOR WIPED FILM EVAPORATION



Overview

The Fraction Finder detects the presence of distillation molecules via induced fluorescence. While many molecules can show fluorescence simultaneously, looking at the wavelength of the fluorescence peaks helps inform the distillation operator what molecule is being detected.

Purpose of using the Fraction Finder for WFE:

- **Parameter Feedback** - WFE parameters and setpoints are not adjusted often; however, they might be adjusted when first setting up the WFE, when changing source material, when the seasons change, or when changing pre-processing methods. The Fraction Finder's readings can provide parameter feedback for temperature and wiper speed.
- **In-Line Quality Assurance** - The Fraction Finder's readings can provide quality assurance and indicate oddities. Users can recognize in real-time if there is "undesirables" in their line. This is especially useful if there is no in-house HPLC.
- **High Efficiency** - The Fraction Finder's readings can indicate if cannabinoids are being rejected in the residue stream; this information can be used to adjust parameters in order to minimize rejected cannabinoids, therefore, optimizing efficiency. **For this benefit, operate with **two** Fraction Finders. See "Installation" section for more.*

The relevant molecules that the Fraction Finder can detect during WFE, and their respective peak positions are:

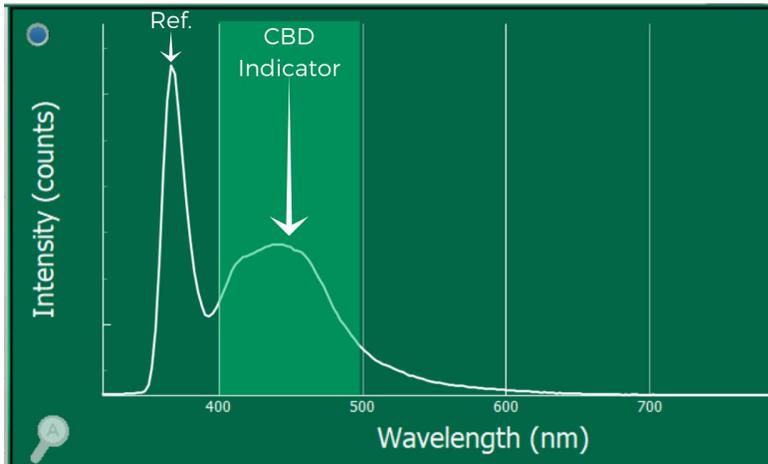
- **Reference Light @ 360-370 nm**
 - The Reference/Excitation peak is from the sensor device and is not indicative of any distillation fractions or molecules.
- **Δ^9 -THC @ 450-470 nm**
- **CBD Indicator @ 460 nm**
 - CBD and THC fluoresce at similar wavelengths, but have different waveforms. See "Screenshots" section for more.
- **Degraded THC/Cannabinoids @ 490 nm**
- **Chlorophyll**; may show 1 or 2 peaks @ 680 nm and 710 nm
- **Lipids @ 530-630 nm**
 - Lipids aren't one chemical, but a class of chemicals. For the purpose of this document, a lipid that exhibits fluorescence at 535 nm is shown.
- **"Fool's Gold" @ 420 nm**
 - "Fool's Gold" is a colloquial term for a chemical component commonly seen during distillation which is golden in color and looks like a desirable cannabinoid. The molecular species that is "Fool's Gold" is currently unknown.

Cannabinoids: Screenshots

CBD Indicator

Wavelength: 460 nm

Waveform: Sharp



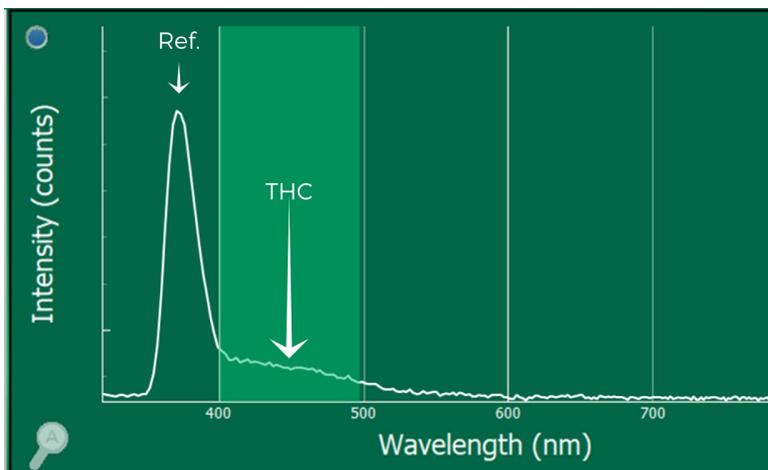
TIP: Wiped film evaporation of hemp oil with the goal of producing CBD-dominant distillate is becoming increasingly popular. The Fraction Finder can provide an indication of when CBD is passing through.

The CBD Indicator appears as a sharp peak, differing in waveform from the Delta-9 THC peak.

Delta-9 THC

Wavelength: 450-470 nm

Waveform: Broad

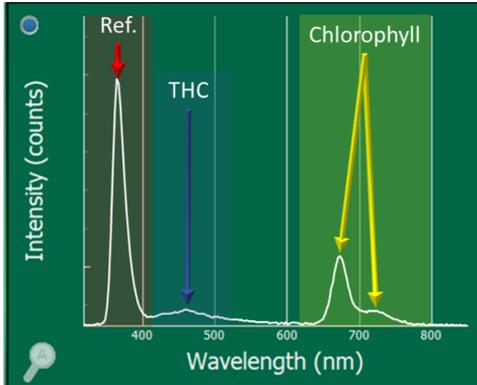


TIP: Similarly to CBD, Delta-9 THC is considered a “desirable”. During wiped film evaporation of Delta-9 THC, the Fraction Finder can assist operators in collecting the most amount of this molecule as possible by indicating when it is passing through.

As you will learn on the next page, other molecules can fluoresce at the same time that the main cannabinoid fluoresces. This is when parameter feedback is most relevant. For these examples, we use THC as the desired cannabinoid.

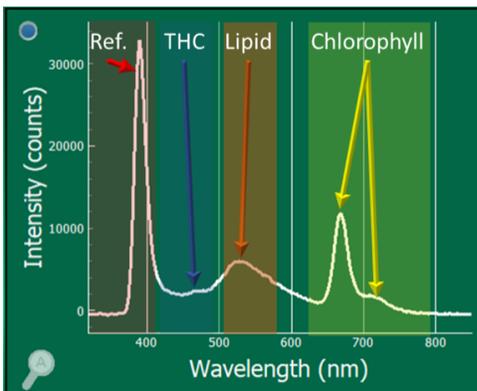
Undesirables: Screenshots

THC and Chlorophyll



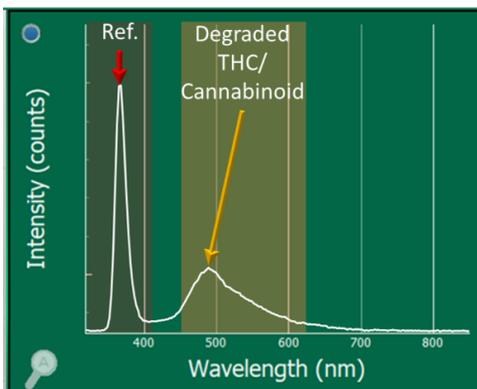
TIP: If a WFE operator sees the Chlorophyll signal, s/he should perform a carbon scrub (or other chlorophyll remediation) before starting distillation or on the distilled product. If Chlorophyll is detected on the distillate line of the cannabis refining pass, wiper speed should likely be increased or WFE internal chamber temperature decreased.

THC, Chlorophyll, and Lipid



TIP: If a WFE operator sees the signal for Lipid (a peak that is centered between 530-620 nm), this indicates that their lipids removal is not removing all the fats.

Degraded Cannabinoids



TIP: Degraded THC/cannabinoids are typically considered “undesirables” and should not be collected.

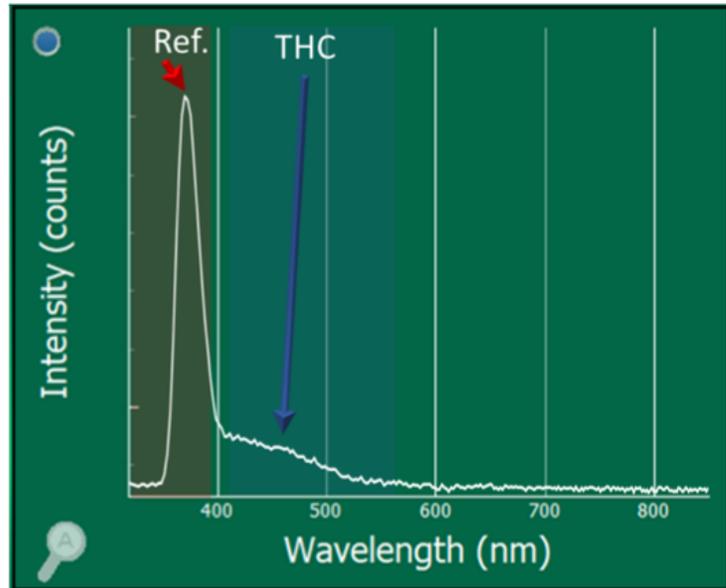
Terpene Stripping Pass: What to Expect

The relatively low-temperature terpene-stripping pass is typically performed before trying to distill the desired cannabinoid. During this pass of a WFE, the temperature is intentionally set slightly lower than the boiling point of the desired cannabinoid, so that only terpenes, degraded terpenes, residual solvents, and other undesirables boil off. In this example, it is assumed this is a Δ^9 -THC distillation.

Residue Side (Crude without Terpenes)

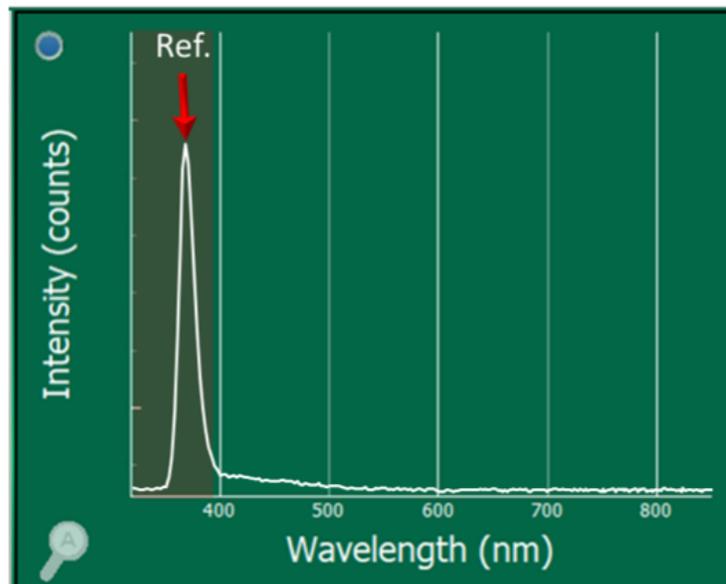
This side should not have terpenes, degraded terpenes, etc. What is left is all the molecular species from the crude, and as such, the majority of the spectra will be cannabinoids, degraded cannabinoids, and chlorophyll/lipids if they were present in the crude material. The THC signal should be very low in intensity. A labeled example of what to expect from the Fraction Finder is given.

WARNING – if the fluid coming out the residue side is either very low flow or very dark the chemical analyzer/sensor may not be able to detect the chemicals flowing through the sensor.



Distillate Side (Terpene Enriched Effluent)

This side should have only terpenes, degraded terpenes, etc... This line may also contain some "Fool's Gold" at 410 nm if it is present in the crude; it should be ejected with the terpenes as it is typically not wanted in the final product. As the Fraction Finder is insensitive to the majority of solvents and terpenes, only the reference peak will likely be observed. A labeled example of what to expect from the Fraction Finder is given.



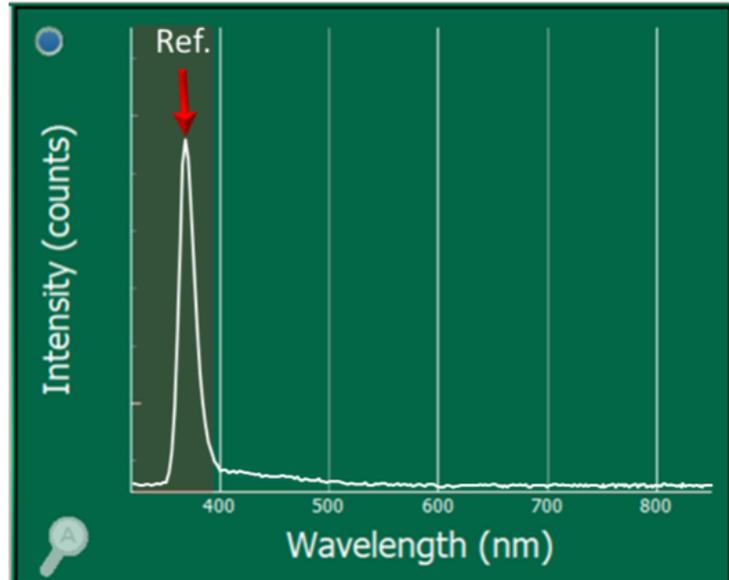
Cannabis Refining Pass: What to Expect

The relatively high-temperature cannabinoid refining pass is typically performed after a terpene stripping pass. Only the desired cannabinoids are distilled while all other molecular components get rejected to the residue side of the WFE. In this example, it is assumed this is a Δ^9 -THC distillation.

Residue Side (Waste Effluent)

This side should have everything but the desired cannabinoid. While during SPD, this would typically include a lot of degraded cannabinoids, the heating time for the crude in WFE is low enough that it is atypical to see a significant presence of degraded cannabinoids. A labeled example of what to expect from the Fraction Finder is given.

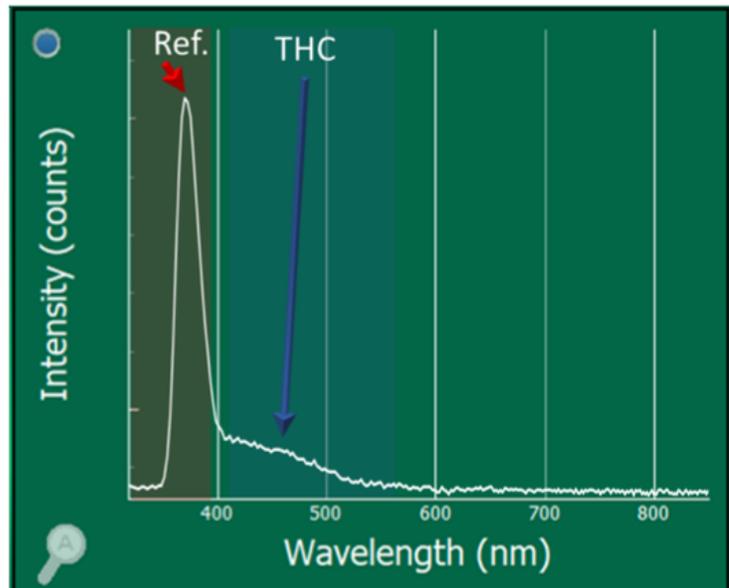
NOTE – If there is a (small) bump at 490-510 nm, that is OK – it is the chemical signature associated with degraded cannabinoids.



Distillate Side (Desired Product Effluent)

This side should have just the desired cannabinoid. A labeled example of what to expect from the Fraction Finder is given. If Chlorophyll is detected on the distillate line of the cannabis refining pass, wiper speed should likely be increased or WFE internal chamber temperature decreased.

NOTE – The spectra used here is representative and used here for learning purposes. THC intensity should not be analyzed, as intensities will vary. On the distillate side of the cannabis refining pass, the THC signal will be intense (more intense than it was during the terp strip).



Parts

- Fraction Finder Display
- Fraction Finder Optical Sensor (size 29)
- Light-Blocking Tape
- Sensor Cable
- Power Supply
- Adapter Kit
 - If Root Sciences/VTA, Prescott, Pope, or similar-style WFE:
 - WFE Jar Adapter and Mount
 - If PurePath:
 - Pure Path Rodaviss Adapter, Cap, and Rings
 - (optional) Pure Path Mounting Kit for display
 - If ChemTech KDT10 or metal WFE:
 - 1.5" or 2" Sanitary Flange Sight Glass

Operation Styles

Users can select if they would like to operate with 1 or 2 Fraction Finder systems.

Operating with 1 Fraction Finder	Operating with 2 Fraction Finders
<p>If operating with 1 Fraction Finder, Arometrix recommends that users:</p> <ul style="list-style-type: none"> ● Install the sensor → on the residue line during terpene stripping pass ● Swap the sensor → to the distillate line during cannabis refining pass 	<p>If operating with 2 Fraction Finders, Arometrix recommends that users:</p> <ul style="list-style-type: none"> ● Install the sensor → on the residue line during both passes ● Install the sensor → on the distillate line during both passes
<p><i>Note: If you select to operate with ONE Fraction Finder, please disregard the "Terpene Stripping Pass - Distillate Side" and "Cannabis Refining Pass - Residue Side" sections; they will not be relevant.</i></p>	<p><i>Note: The added value of operating with TWO Fraction Finders is the "High Efficiency" bullet point mentioned in the "Overview", as users can additionally monitor for cannabinoid rejection.</i></p>



Arometrix, Inc.
 (240) 492-6556
sales@arometrix.com
arometrix.com