



FREQUENTLY ASKED QUESTIONS

What does Sage Analytics make?

Sage Analytics develops hardware and software solutions to provide instantaneous, accurate measurements of potency in cannabis products. Importantly, we designed these solutions to be operated by non-technical personnel allowing anyone to make accurate cannabis potency measurements. The two flagship devices recently introduced into the market by Sage are called **The Profiler II™ (Humboldt Special Edition) & The Beacon™**.

What type of technology does Sage Analytics use in their devices?

The technology used is called Near-infrared spectroscopy (NIR). NIR is the measurement of light at the very edge of the red spectrum that our eyes can see and slightly beyond. Light in this region of the spectrum interacts with the chemical bonds in molecules. By measuring the light intensity returned from the samples at each point in the spectrum, characteristic fingerprints can be measured quickly and accurately. NIR can be used to monitor both chemical and physical properties. Diving deeper into the science, the NIR spectral region from approximately 700 to 2500 nm corresponds to overtones and combination bands of molecular vibrational absorption. The functional groups probed by NIR are predominantly those containing hydrogen bonds (O-H, N-H, C-H, S-H). Compared to midinfrared spectroscopy, where fundamental absorptions arise, NIR can be used to measure thick samples with high water content, and its allowance for diffuse scattering permits its use in both transmission and reflectance geometries, vastly simplifying sample preparation and measurement.

What is potency, and what does it mean?

Potency, in the traditional pharmaceutical sense, means the amount of active ingredient in a product. Cannabis potency, in most strains, is driven by tetrahydrocannabinolic acid, (THCA) and tetrahydrocannabinol (THC), which are its primary and most prevalent psychoactive compounds, respectively. In flowering products, the THCA content is generally around 10 to 25% by weight, but can reach the low 30% region. In hash and extracted oils, THCA/THC content can be much higher, up to 80% or more by weight.

The second main elements of cannabis potency are cannabidiolic acid (CBDA) and cannabidiol (CBD), the latter of which does not provide the psychoactive stimulation of THC but, rather, physiological relaxation associated with therapeutic usage of cannabis (anxiety relief, muscle relaxation, among others). CBDA and CBD in flowers are typically present in much smaller concentrations, less than 10% by weight and usually closer to 1 or 2%, unless the strain has been cultivated to maximize the CBDA/CBD content. A third constituent of potency is cannabinol, CBN, which is a very weak psychoactive compound and, importantly, a natural breakdown product of THC that occurs over time. In extremely fresh product, CBN is typically at or near 0, but this percentage increases as the product slowly degrades over time. As such, CBN can be a useful indicator of the product freshness.

Why is it important to measure potency?

When you buy a pharmaceutical product, the amount of active ingredient (hence, potency) is required to be on the packaging label, ensuring that the recommended dosage is delivered. The United States Food and Drug Administration (FDA) keeps strict guidelines and procedures in place for all aspects of drug manufacturing, packaging, and dispensing, so patients and physicians can be 100% positive that the prescribed product contains the correct potency. While cannabis legislation is evolving in multiple states, the testing requirements drafted to date are much less stringent than those mandated for pharmaceuticals, and vary among states where either medical or recreational marijuana has been legalized. Thus, consumers cannot be 100% sure of the effect of their cannabis product until after they ingest it, which can have some obvious unintended consequences. It is critical to measure potency in all dispensed

products so consumers can be sure of what they are buying, its likely effects, and how much of a dose is necessary to achieve the desired effects.

Which cannabinoids can the Sage systems measure?

Currently, they can measure Total THC-A, Delta 9 THC, Total THC, Total Potential THC, CBD-A, CBD, Total CBD & Total Potential CBD. For a detailed explanation on what each of these different measurements are, please refer to the “What do my Test Results Mean” document.

What types of cannabis products can it test?

It can test both cured flower and concentrates (i.e. wax, shatter, crumble etc..). The concentrates should be uncut and in the pure form. It can't be cut with any type of oil or solvent because that will interfere with the NIR reading.

Can it test edibles?

No, we can't test edibles because there are too many other ingredients in the mix (sugar, flower, salt etc..) and the device is designed to measure only cannabis. You still must send it out to a 3rd party testing lab to get your edibles in their final form tested.

Can the device measure Terpenes?

Although terpenes have evolved into a hot topic in cannabis analysis, The Profiler II and Beacon products do not currently evaluate terpene concentration. The reason is because NIR has a detection limitation of 2% or greater and most Terpene measurements fall below the 2% range.

Does it test for Pesticides, Molds or Residual Solvents?

No, we can only test for potency. While we could develop such a “Wonder Box” it would cost about 10X what a profiler cost today. Disposable tests will soon be available to detect molds and pesticides in the sub \$10 per test range. The Luminary tests potency in less than 10 seconds for pennies per test.

The type of technology we use, NIR spectroscopy, has a detection threshold of 2% or above. Contaminants like mold, pesticides, and fungus are usually way below the 2% detection limit in the parts per million (PPM) and cannot be reliably detected via the techniques we currently employ; therefore, at this time, Sage Analytics is focused on measuring the potency of cannabis.

Is there anything on the market that I can buy that measures for everything?

No, that's called a God Box and it doesn't exist. You still must send out to a 3rd party testing lab to get terpenes, molds, pesticides, residual solvent testing and edibles done.

Is the Profiler II / Beacon a state certified device?

No, you cannot certify devices. Only labs can be certified. If our device is used in a lab that is a state certified lab, then it is considered to be part of their certification process and is considered acceptable technology for use in determining potency. The Luminary and the Beacon were "trained" utilizing samples from labs that were either state or otherwise certified. Each state has their own certification and we have not sought approval from each individual state. If your state requires you to test, you must still send to a state certified lab.

Can I just use this to test the potency of my product and not send out to the Lab anymore?

No, you will still have to send out your minimum sample requirement to a 3rd party, state certified lab in order to be compliant with the state. The state will not allow self-testing. But, you can use our device to test all your product before you send it out to the lab, so you can basically cherry pick which product you want to have the official seal of approval on.

Why are my potency testing results different than what the Lab I use indicates?

The lab tested a bud or a couple of buds, but not the bud you just tested. Natural variation causes a huge difference in potency between different plants, between different buds, the same plant and even within the same bud. On top of this

natural variation, there is very little standardization in how different labs produce their result. The labs use different measurement technologies, different techniques to obtain the measurement, and have their own margin of error in their test result. Combining these two factors (natural variation and lack of laboratory standardization) means that it is much more likely that your result will differ.

I've tested the same sample three times in a row and I got slightly different readings each time. Why?

The Luminary measures an optical signal then converts this into a potency value. The light that reflects off the sample has some randomness to it, which causes very slight differences that may result in different potency readings. Furthermore, there is a margin of error in the predicted value, which is on the order of +/-1-2% of the measured value.

I measured a whole bud and got one reading and then I turned it over and measured it again and got a completely different reading...why?

Cannabis is a natural product, and nature has a lot of variety, as per the description above. Additionally, if the sample moved between measurements (from bumps on the table, vibrations, or a breeze) then the readings will be different since it would be measuring a different region of the bud.

How do bud samples need to be prepared?

It is strongly recommended that the samples be homogenized via grinding to reduce potential measurement errors. Cannabis trichomes contain the highest proportion of cannabinoids, contrasted with other portions of the plant like the leaf, seed, and stalk. If an area of high trichome concentration on the flower is preferentially evaluated using NIR light, measurement errors can occur. Likewise, errors in the analysis can occur if stems or other regions of the plant are evaluated, that do not contain any, or have distinctly low cannabinoid contents.

Can I measure whole buds or do I need to grind the bud?

Since the cannabinoid density varies considerably across buds, it is always recommended to grind the bud for a more representative reading of the sample.

Can I measure buds that are still on the plant?

No, you need to cure them so that the moisture level is less than 7% to get the most accurate reading.

How long does it take to do a test?

Each test takes less than 10 seconds. It is super user friendly and intuitive to use, so you don't need a highly skilled person to run the device.

Does it destroy the sample after the test?

No, that's the beauty of NIR. It's only using light to measure down to the molecular level of the sample, so you can safely smoke it or ingest it immediately after testing.

If I test a sample, can I ingest it afterwards?

The machine doesn't alter the sample in any way and is safe to consume, so what you do with it after you measure it is your decision.

Do room lights, grow lights, or sunlight interfere with the measurement?

Since the samples are inserted into a small, dark sample chamber on the device, ambient light is blocked from interfering.

How much of a sample should I use to obtain the most accurate reading?

For bud (cured flower) about ½ gram. The ground product should loosely fill the bud holder, coming all the way to the top, then compressed by fully inserting the cap. Overfilling isn't a problem, but under filling will lead to errors.

For concentrates that use the disposable sample holders about 100 milligrams for solid concentrate and about 100 micrometers for liquid concentrates, which is about the size of the pad of your pinky finger.

How can I tell if I properly filled the disposable sample cell?

The round dimple in the center of the sample holder must be completely full, leaving no space around this dimple, and devoid of bubbles or other gaps that would allow light to pass through without hitting the sample. The sample holder should not be overfilled, causing the sample holder to bulge. If you notice a bubble, or an uneven distribution of the sample in the dimple, flip the cell over on your counter, and press down on the silver circle. This may correct the sample filling issues. If not, add more sample until you achieve an even distribution, or the bubble is removed.

I put something other than cannabis on the machine just to see what it would do and it gave me a potency measurement reading.

The Luminary is a cannabis potency profiler, not a cannabis detector. Many plants and herbs have chemical profiles very similar to cannabis, and may generate false potency readings.

What is the highest level of potency that has been tested by your product? The data sheet seems to only show numbers in the 80% range.

Our bud model goes to 30%, because we have very few samples that are reliably above 30% making this the highest reliable bud output. We limit ourselves to answers we know we can have the utmost confidence in.

*****Extracts have several types, each with their own upper limit of what's reasonable/encountered.***

The highest to date is 99.9% isolate but only the new implemented software/model update will allow its measurement.

Do I have to use the disposable sample cell for extracts or can I just place it directly on the measurement window? Will I get a different reading?

Yes, you must use the disposable sample holder. Placing samples other than bud on the window will lead to erroneous measurements.

Can I use the disposable sample cell for dry bud as well?

No, the dry bud must be placed in the bud holder. The disposable sample cell is for all products other than bud.

I took a measurement on the window with nothing on it and it gave me measurement data?

Don't do that. You will get wonky results that are meaningless. The instrument is trying in vain to make a calculation from light reflecting off the roof of the sample cover. If you need the 20-minute scientific reason for this feel very free to call us. 650-492-8500 x 2

I put oregano on the unit and it gave me THC results?

Don't waste your time and get frustrated. The Luminary isn't a materials detection tool. We have trained it to profile the potency of cannabis and not be a drug sniffing dog.

How are the Profiler II and Beacon products different than other cannabis potency testing methods?

Cannabis testing laboratories typically receive samples to process and measure using standard analytical techniques like liquid chromatography (LC), gas chromatography (GC), and mass spectrometry (MS), among others. Samples are

typically dissolved into solvents like methanol or chloroform (LC), or combusted during the measurement (GC), both of which destroy the original sample. The lab compares the measurement of the unknown samples with those of synthetic, commercially available standards. The lab then provides the potency values over several days.

The Sage Analytics potency profiling devices are different because: 1) we provide systems that let anyone accurately measure their own samples on site, without having to send them anywhere, 2) the samples are measured intact using only light, without destroying them or altering them in any way, and 3) the results are provided within seconds. In general, the use of light for evaluating sample characteristics (called spectroscopy) provides a non-destructive, rapid, and environmentally-friendly method for measuring cannabinoid potency, without requiring hazardous solvents, compressed gases, time consuming sample preparation protocols, or skilled technical researchers to develop methods, troubleshoot problems, or analyze the data, thereby reducing experimental costs and the use of consumables.

How do optical measurements compare with analytical techniques like GC or LC?

GC and LC have been in use for decades as standard analytical measurement techniques. Both techniques can be incredibly accurate, but require skilled, trained operators to add the appropriate art to the method development, troubleshooting, and data analysis. Unfortunately, these techniques can also provide erroneous results when not utilized properly, and there are a number of potential stumbling blocks to their use—even university labs full of PhDs can make consistent missteps that produce the wrong outputs. These techniques also require the sample to be destroyed, tens of minutes to generate a result, and extensive machine calibration and cleaning.

Optical measurement techniques like spectroscopy have advantages and disadvantages compared with GC and LC. The hallmark advantages are convenience, simplicity, and speed, as the measurements literally just require light to be shone onto the sample, where results can be deduced in seconds. And since it is shining light on the intact sample, the sample is not altered in any way and can be used or sold afterwards, as the case may be. When used correctly, these techniques can also be just as accurate as GC and LC. The primary disadvantage of optical measurement techniques is that they cannot measure

absolutely everything—some materials and chemicals just don't comply, or are not in high enough concentration to be measured. In the case of cannabis potency, THCA/THC and CBDA/CBD can be accurately measured optically, as well as other relevant parameters such as moisture.

It is important to note that chromatography techniques are considered primary analytical methods, meaning they directly quantify the sample of interest. While some applications of spectroscopy can be considered primary measurement methods, in the case of the Luminary Profiler and Beacon products, data from a standard method is combined with the spectral data to develop models capable of accurately predicting cannabinoid potencies. Since the models rely on diligently produced reference data sets, the Luminary and Beacon products are considered secondary measurement tools.

How do I know its accurate?

It's accurate. Compared to a lab it is very accurate and consistent. We have tested hundreds of thousands of samples as part of our development process. We have made massive investments in science, engineering, and testing with only the best ISO certified and compliant labs to insure reliability and precise performance.

Can you explain more about the "primary / secondary" measurement tools? and using "spectral data to develop models capable of accurately predicting cannabinoid potencies."

"A primary instrument is a scientific instrument, which by its physical characteristics is accurate and is not calibrated against anything else. A primary instrument must be able to be exactly duplicated anywhere, anytime with identical results".

"Secondary instruments must be calibrated against a primary standard. " See https://en.wikipedia.org/wiki/Primary_instrument for more info.

In the case of the Luminary, the models that run the device are calibrated to ISO certified HPLC potency standards from registered lab partners. This is the aspect of the Luminary that makes it different and easier to operate since it doesn't require the constant aid of a qualified scientist to provide viable results through the destruction of samples and reference liquids.

How much does the Beacon and/or Humboldt Profiler cost?

They both are the same price \$24,999, but we do offer financing, leasing and rental options as well. No matter what your budget, we have a solution to make owning a unit easy on your wallet.

What are the differences between the Beacon & The Profiler II?

The main difference is aesthetics. They both use the exact same technology (NIR Spectroscopy) and function identically, but the Beacon only weighs 4.2 lbs. and the touchscreen is integrated, whereas the Profiler II is around 10 lbs. and has a separate touchscreen tablet. The Beacon is more of a desktop unit, a bit sleeker and sexier and made for a dispensary environment, whereas the Profiler II is more of a bench top unit and made for more industrial/commercial environments such as labs, grow houses or extract processing facilities.

How much do Luminary Profiler and Beacon products weigh?

- Luminary Profiler Humboldt Edition: 4.5 kg / 10 lb
- Beacon: 1.9 kg / 4.2 lb

Is it truly mobile?

Yes, both devices are small enough and lightweight enough that you can easily transport them wherever you go. You do need a power source though, but you don't need to have wi-fi because it's built into the device. If you're in a remote area that doesn't have wi-fi, you will still be able to test samples.

Could I use this device as a mobile testing service?

Absolutely! We have several customers that have opened mobile testing services around the country. You could take the device to dispensaries, grow operations and processors and test their product right on the spot.

Does it come with the label printer or is that extra?

The price of the unit includes the label printer, a roll of CannaMetric labels, a sleeve of 100 disposable sample cells, calibration pucks, plus a sample prep

accessory kit.

Is there any way I can try the device before I buy it?

Yes, we have a 7-day evaluation period that allows you to test the unit out for 7 days for \$2,800. If you decide you want to keep it, great, if not, just return it within the 7 day evaluation period in the exact same condition as you received it and we will refund your deposit.

What is the annual maintenance & support program and why does it cost an additional \$1,195 a year?

See separate document entitled Science Service & Support Subscription for full details

Do you have references that I can call that have purchased your device?

Yes, we will e-mail you a reference list.