Performance assessment of Bruker's Alpha II FTIR, Scatr's Series One, Spectra Plasmonics' Amplifi ID, and Waters' RADIAN ASAP

v1 (April 2026)

Undertaken by Ontario's Drug Checking Community, the provincial expansion of **Toronto's Drug Checking Service**

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Acknowledgements: We acknowledge the members of our communities that have lost their lives – both in the ongoing toxic drug supply crisis and long before.

We acknowledge that racialized communities and survivors of colonization are disproportionately impacted by the toxic drug supply crisis.

We acknowledge that we operate on Indigenous land, which is home to many diverse First Nations, Inuit, and Métis peoples. Our program is coordinated from Toronto, which is the traditional territory of many nations including the Mississaugas of the Credit, the Anishnabeg, the Chippewa, the Haudenosaunee, and the Wendat peoples.

We know that many of the samples we check are linked to fatal or non-fatal overdose, as well as adverse health events – we acknowledge the people and pain behind the data we share.

We acknowledge that our work is only possible – and we only have access to this data – because people who use drugs donate their drugs to our program in an effort to reduce the harms associated with using unregulated substances and facilitate community-led drug market monitoring and education. We are incredibly fortunate to be trusted by people who use drugs throughout Ontario.

We acknowledge our collection sites, past and present, which are community agencies that are deeply committed to bettering the lives of people who use drugs and truly understand what it means to

provide care and reduce harm. All samples included in this performance assessment were collected by supervised consumption sites, including:

- Casey House (Toronto)
- Fourcast Consumption and Treatment Service (Peterborough)
- Integrated Care Hub (Kingston)
- Parkdale Queen West Community Health Centre: Parkdale and Queen West sites (Toronto)
- Regent Park Community Health Centre (Toronto)
- South Riverdale Community Health Centre: KeepSix and Moss Park sites (Toronto)
- Street Health (Toronto)
- The Neighbourhood Group: Kensington Market Overdose Prevention Site (Toronto)
- The Works at Toronto Public Health (Toronto)
- Toronto Shelter and Support Services: Harm Reduction Unit (Toronto)

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Other relevant resources:

- British Columbia Centre on Substance Use (BCCSU). **New drug checking instruments in Canada: A summary of drug checking technology developments**. 2024.
- Canadian Drug Agency. **Health technology review: Drug-checking technologies to detect compositions of unregulated substance samples**. Canadian Journal of Health Technologies. 2026 January;6(1).
- Ontario's Drug Checking Community. **Onsite drug checking technology purchase and partnership considerations**. 2023.
- Ontario's Drug Checking Community. Performance assessments of **benzodiazepine**, **fentanyl**, **medetomidine**, **nitazene**, **xylazine** test strips. 2026.

We are committed to ensuring our public health and safety program adds value to the communities it serves. If you have any questions, comments, or feedback about this resource or our program, please contact hello@drugchecking.community.

Contents

Summary of our findings

1	Bruker's Alpha II FTIR, Scatr's Series One, Spectra Plasmonics' Amplifi ID (point-of-care scans *and* reachback), and Waters' RADIAN ASAP **frequently missed the fentanyl-related drugs, nitazene opioids, veterinary tranquilizers, and benzodiazepine-related drugs** present in the samples included in this performance assessment. However, they almost **always detected the stimulants, psychedelics, and dissociatives** present in the samples.
2	Scatr's Series One and Spectra Plasmonics' Amplifi ID **reported false positives for fentanyl-related drugs** in samples expected to be a benzodiazepine-related drug, cocaine, ketamine, MDMA, methamphetamine, or fentanyl. In addition, Spectra Plasmonics' Amplifi ID **reported false positives for nitazene opioids, veterinary tranquilizers, and/or benzodiazepine-related drugs** in samples expected to be cocaine, ketamine, MDMA, methamphetamine, or fentanyl.
3	Spectra Plasmonics' Amplifi ID, in particular, as well as Scatr's Series One **had difficulty correctly naming the fentanyl- and/or benzodiazepine-related drugs present in the samples**.
4	Bruker's Alpha II FTIR, Scatr's Series One, Spectra Plasmonics' Amplifi ID (point-of-care scans *and* reachback), and Waters' RADIAN ASAP **rarely detected all drugs present in samples expected to be fentanyl or a benzodiazepine-related drug**. However, they **often detected all drugs present in samples expected to be cocaine, ketamine, MDMA, or methamphetamine** (Bruker's Alpha II FTIR essentially always did).
5	We **confirmed the clearly defined and understood limit of detection for Bruker's Alpha II FTIR being around 5%**, though para-fluorofentanyl was consistently detected above 1.2%.
6	Fentanyl was not consistently detected below 3% by Waters' RADIAN ASAP and below 1% by Scatr's Series One or Spectra Plasmonics' Amplifi ID (point-of-care scans). **Several drugs from various classes found in the samples were not consistently detected by any of the assessed technologies at concentrations below 5%**.
7	Bruker's Alpha II FTIR, Spectra Plasmonics' Amplifi ID (bulk scan), and Waters' RADIAN ASAP **almost always replicated the result it reported**. Scatr's Series One and Spectra Plasmonics' Amplifi ID (trace scan) did most of the time.

A note to service providers: **Bruker's Alpha II FTIR, Scatr's Series One, Spectra Plasmonics' Amplifi ID, and Waters' RADIAN ASAP should always be paired with test strip(s)**. Test strips can detect drugs (or classes of drugs) that are missed by these technologies – and can effectively correct false positives. Using test strips in combination with Bruker's Alpha II FTIR is already a well-established practice followed by community drug checkers throughout North America.

About Ontario's Drug Checking Community

Ontario's Drug Checking Community is a national authority and primary source of timely and comprehensive data on Canada's unregulated drug supply.

This public health and safety program, which is the provincial expansion of **Toronto's Drug Checking Service**, analyzes samples of drugs and used drug equipment donated by people who use drugs with **gold standard mass spectrometry technologies**. Technologies used and methods developed from checking tens of thousands of the most complex samples are the best currently available to communities in Ontario for checking unregulated opioids. This is critical because the contamination and unpredictability of the unregulated opioid (and, specifically, fentanyl) supply continues to be the primary driver of fatal and non-fatal drug poisoning, among other harms.

The **program's findings** are translated and publicly available to prevent drug-related harm and inform evidence-based responses to the ongoing toxic opioid supply crisis, which include prevention, harm reduction, treatment and recovery, and community safety efforts.

The program, which has been operating since 2019, is made up of a group of members, including collection sites, analysis sites, and a small central operating team. Collection sites are community agencies throughout the province that collect drug and used drug equipment samples for analysis offsite and educate on the unregulated drug supply, as part of the services they offer to people who use drugs. Analysis sites are currently the clinical laboratories at the **Centre for Addiction and Mental Health** and **St. Michael's Hospital, a site of Unity Health Toronto**, in Toronto that analyze samples using gold standard instrumentation and methodologies and report analysis results. The program's central operating team is responsible for the overall design, management, and sustainability of the program, as well as conducting and publicly disseminating unregulated drug market monitoring and drug education. The program's central operating team also operates a small laboratory with portable drug checking tools and technologies from within the Drug Checking Unit at Unity Health Toronto.

Ontario's Drug Checking Community:

- Relies on sample donations by people who use drugs throughout the province
- Is funded almost entirely by **Health Canada's Substance Use and Addictions Program**
- Operates by way of exemptions from **Canada's Controlled Drugs and Substances Act**, which are overseen by **Health Canada's Office of Controlled Substances**

We are incredibly fortunate for the trust, leadership, and support of these groups.

About this resource

The purpose of this resource is to share results from a performance assessment conducted by Ontario's Drug Checking Community of technologies available for sale and marketed for analyzing unregulated (or "street") drugs in Canada by **Bruker**, **Scatr**, **Spectra Plasmonics**, and **Waters**.

This resource was written for a general audience, meaning we simplified technical terms and scientific language where possible to ensure clarity and accessibility for all readers.

This is the first of a series of related resources. We intend for future resources to include:

- Detailed and lay limitations associated with each assessed technology (similar to **our program's Service and technology limitations**)
- Practical guidance for service providers actively using or intending to use the assessed technologies (for example, tailored instructions for coupling a technology with test strips)
- Recommendations for technology developers
- Guidance for assessing the performance of tools and technologies used for community drug checking

We welcome the opportunity to collaborate with community agencies, technology developers, funders, and regulators on additional resources that would be valuable.

Our motivation

A variety of tools and technologies are used for community drug checking, including test strips, portable and laboratory-based instrumentation. All tools and technologies have trade-offs in terms of ease of use, quality of results, turnaround times for results, and cost. **All tools and technologies have limitations**.

The extent of those limitations varies and are generally most significant when checking drugs expected to be (i.e., got or bought as) fentanyl or other opioids. This is because:

1. The unregulated opioid supply is constantly changing with "new" and rare drugs increasingly presenting. Libraries associated with many drug checking tools and technologies cannot keep up.
2. Opioid samples tend to be complex mixtures of many substances, which can be very challenging for drug checking tools and technologies to break apart.
3. Many of the drugs present in opioid samples (and most likely to contribute to overdose or other harms) are in trace amounts, too small for many drug checking tools and technologies to detect.
4. Many drugs present in opioid samples (and most likely to contribute to overdose or other harms) are chemically similar, making them difficult for drug checking tools and technologies to differentiate (e.g., fentanyl and carfentanil).

It is critical that service providers understand that all drug checking tools and technologies have limitations, understand what the limitations of the tools and technologies they use (or intend to use) are, and can clearly communicate those limitations to service users.

Observing gaps in this understanding and the information available to our community, our public health and safety program assesses and publicly shares findings on the performance of tools and technologies used for community drug checking. This work is in line with our commitment to:

- Ensuring service user safety
- Supporting community agencies to deliver the best possible drug checking service
- Accurate monitoring of the unregulated drug supply and education on drug market trends
- Addressing inequities experienced by people who use drugs in our health and social systems

In addition to these commitments, we are ideally positioned to lead this work because:

- We have access to drug samples donated daily by people who use drugs throughout Ontario that represent some of what is circulating in the unregulated drug supply
- We have access to gold standard mass spectrometry technologies, including gas chromatography-mass spectrometers (GC-MS) and liquid chromatography-high resolution mass spectrometers (LC-

HR-MS), which analyze samples daily and are the best currently available to communities in Ontario for checking unregulated opioids

- Sample analysis is led by technical teams at the clinical laboratories of the Centre for Addiction and Mental Health and St. Michael's Hospital, who are experts in toxicology, quality management, and the application of mass spectrometry for clinical care and drug checking. These teams have analyzed tens of thousands of the most complex drug samples as part of our program.
- We have substantial experience comparing and translating results from a variety of tools and technologies used for community drug checking
- We have no for-profit interests or conflicts of interest in the field of community drug checking and are not committed to using particular tools and/or technologies

Technologies assessed

Four technologies available for sale and marketed for analyzing unregulated (i.e., street) drugs in Canada were included in this performance assessment. These four technologies were purchased by the program's central operating team or an analysis site member, or were borrowed from a collection site member of our program.

While technology developers may have been aware that we were undertaking this performance assessment, they were in no way involved in its initiation, design, or execution. Results are made available to technology developers at the same time they are made available to the public. Once results are publicly available, we offer technology developers an opportunity to meet to ask questions and provide feedback. This is consistent with all performance assessments we initiate, such as **our performance assessments of various test strips** available for sale and marketed for harm reduction in Canada.

If technology developers wish for us to compare results reported by their tool or technology to those determined by our gold standard technologies and methodologies, they may purchase confirmatory testing services from us. If technology developers wish for us to assess the performance of their tool or technology for their purposes, they may purchase performance assessment services from us. All funds raised from confirmatory testing services and tool or technology developer-initiated performance assessments are re-invested in the operation of our public health and safety program.

Note that the four technologies included in this performance assessment have not been assessed by Health Canada to determine their safety, effectiveness, or quality for the purpose of drug checking.

1. **Bruker's Alpha II FTIR**: **Bruker's Alpha II Fourier transform infrared spectrometer (FTIR)** is a portable, non-destructive technology marketed for the analysis of many materials, including unregulated substances, specifically by law enforcement, border control, and other government institutions. Bruker's Alpha II FTIR uses infrared spectroscopy to analyze drug samples without any sample preparation. It requires a drug sample to be loaded directly onto a diamond crystal on the instrument's stage and for pressure to be applied to the sample with an anvil. Samples on blotter paper require a methanol extraction. Bruker's spectroscopy software, OPUS, is used to visualize sample analysis and present results. Analysis generally takes 5 – 10 minutes. Results are qualitative and include a list of substances (drugs and non-drug fillers) detected by the instrument. Some information about whether there is more or less of a substance compared to other substances detected (i.e., semi-quantified results) may be understood, specifically from OPUS' mixture analysis feature. At the time of this performance assessment, the libraries typically used for community drug checking with Bruker's Alpha II FTIR contained thousands of substances, including opioids,

depressants, psychedelics, stimulants, non-drug fillers, and others. A trained technician is required to interpret and report results.

Since 2018, Bruker's Alpha II FTIR has been used extensively for harm reduction and community drug checking in Canada, primarily under the leadership of the **British Columbia Centre on Substance Use (BCCSU)** and their provincial **Drug Checking Program**. The BCCSU Drug Checking Program has analyzed well over 150,000 samples using Bruker's Alpha II FTIR. The program has **extensively researched** its use for community drug checking, and developed a related **training program**, as well as **technician manuals and guidelines**. It is by way of this research – and the research of others across the drug checking community globally – that limitations of Bruker's Alpha II FTIR for harm reduction and community drug checking are clearly defined and understood. For example, that **the limit of detection (i.e., the lowest concentration (or amount) of a substance that is consistently detected with confidence) for Bruker's Alpha II FTIR is around 5%**. This means substances that account for less than 5% of the sample are likely to be missed by the instrument. For this reason, those offering community drug checking always pair Bruker's Alpha II FTIR with test strips, which are more likely to detect certain drugs (or classes of drugs) in trace amounts.

2. **Scatr's Series One**: **Scatr's Series One** is a portable, non-destructive technology explicitly marketed for harm reduction and community drug checking. It was included in (and was the winner of) **Health Canada's Drug Checking Technology Challenge**, which took place between 2019 and 2021. Scatr's Series One uses a combination of Raman and near-infrared spectroscopy to analyze drug samples without any sample preparation. It requires a drug sample to be loaded directly into a Scatr chip, which is then inserted into the instrument. Liquids, blotter, and pharmaceutical-grade medications are not eligible for analysis. Scatr's software is used for data collection, to visualize sample analysis, and to present results. There are three scan options to choose from: quick, standard, and detailed, with "detailed" results reported in less than 20 minutes. Results are qualitative and include a list of substances (drugs and non-drug fillers) detected by the instrument. Some information about whether there is more or less of a substance compared to other substances detected (i.e., semi-quantified results) may be understood, specifically from the "signal strength" presented alongside each substance found. At the time of this performance assessment, the library for Scatr's Series One contained over 100 substances, including opioids, depressants, psychedelics, stimulants, non-drug fillers, and others. Scatr's software reports results automatically, though some interpretation of results may be done manually using the prediction and chart functionalities.

   Scatr's Series One is currently being used for community drug checking by organizations within Ontario, and elsewhere, primarily by way of **a research project led by Western University**.

3. **Spectra Plasmonics' Amplifi ID**: Spectra Plasmonics' Amplifi ID is a portable destructive or non-destructive technology explicitly marketed for harm reduction and community drug checking. It was included in (and was a finalist of) Health Canada's Drug Checking Technology Challenge, which took place between 2019 and 2021. Spectra Plasmonics' Amplifi ID uses a combination of Raman spectroscopy and surface-enhanced Raman spectroscopy (SERS). There are two scan modes to choose from: bulk and/or trace, with both results reported in less than 10 minutes. Bulk analysis is performed by placing the sample in a translucent bag and then securing that bag onto the sensing platform of the instrument. This mode is non-destructive but may only detect substances that account for more than approximately 5% of the sample. Substances that account for less than 5% of the sample may be detected using the trace scan mode, which involves adding about 5 mg of a sample to a small amount of alcohol to create a solution, and then dropping the solution onto a cartridge for analysis by the instrument. Liquids are not eligible for bulk analysis but are eligible for trace analysis. Spectra Plasmonics' software is used for data collection, to visualize sample analysis, and to present results. Results are qualitative and include a list of substances (drugs and non-drug fillers) detected by the instrument. However, a substance detected by the trace scan but not the bulk scan may imply it accounts for less than 5% of the sample, meaning some information about whether there is more or less of a substance compared to other substances detected (i.e., semi-quantified results) may be understood. At the time of this performance assessment, the library for Spectra Plasmonics' Amplifi ID contained over 80 substances, including opioids, depressants, psychedelics, stimulants, non-drug fillers, and others. Spectra's software reports results automatically, though some interpretation of results may be done manually using the displayed spectrum.

   Spectra Plasmonics offers **a "reachback" service**, which allows those using their Amplifi ID to request remote technical support related to the analysis of a sample. Reachback for a sample can be requested in Spectra's software. Spectra Plasmonics commits to responding to reachback requests within 24 – 48 hours. The reachback service may (and is likely to, in our experience) result in modifications to the result originally reported by the Amplifi ID. While we did not request reachback for any of the 228 samples included in this performance assessment, Spectra Plasmonics provided the service for over 70 samples. This led us to believe that the provision of reachback services is common. To ensure this performance assessment was as relevant as possible, we included both original (i.e., point-of-care scans) and reachback results when measuring accuracy and limit of detection.

   Spectra Plasmonics' Amplifi ID is currently being used for community drug checking **by organizations within Ontario**, and elsewhere.

4. **Waters' Radian ASAP**: Waters' Rapid Direct Analysis Atmospheric Solids Analysis Probe (RADIAN ASAP) is a compact destructive technology marketed for the analysis of many materials, including unregulated substances, specifically by harm reduction teams and others. Waters' RADIAN ASAP uses mass spectrometry to analyze drug samples with minimal sample preparation. It requires a glass capillary to be dipped in a drug sample dissolved in methanol and inserted into the heated source of the mass spectrometer. Since the sample is introduced directly into the instrument, chromatographic separation used by gas chromatography- and liquid chromatography-mass spectrometry is eliminated, meaning analysis is faster (typically less than one minute). Waters' RADIAN ASAP requires a nitrogen supply, potentially making it more suitable for a laboratory setting, though it has been used by community drug checking programs, such as **Energy Control** in Spain. Waters' software, LiveID 2.0, is used to visualize sample analysis and present results. Results are qualitative and include a list of drugs detected by the instrument. A library match score is also reported for each drug detected. At the time of this performance assessment, the library for Waters' RADIAN ASAP contained 79 drugs (and we added 10 more using reference standards), including opioids, depressants, psychedelics, stimulants, and others. Waters' software reports results automatically based on a user-defined setting for the library match score. For this performance assessment, a match factor of greater than or equal to 900 was used as the reporting cut-off to increase confidence in detections. A lower cut-off score of 850 can be used but this can result in false positives and require more manual interpretation from a trained analyst. For the purposes of this performance assessment, Waters' RADIAN ASAP was operated as if it were being used in the community by someone with minimal training.

Our process

Samples

This performance assessment included 228 samples of unregulated (or "street") drugs that were collected as part of our provincial public health and safety program. Samples were collected in Toronto (95%), Kingston (4%), or Peterborough (1%) between August 2024 and April 2025. The composition of those samples reflected the drugs that our service users were using at the time, and some of what was circulating in Ontario's unregulated drug supply at that time. Samples were expected to be (i.e., got or bought as) fentanyl (52%), a benzodiazepine-related drug (11%), methamphetamine (10%), cocaine (9%), ketamine (9%), or MDMA (9%).

Performance measurements

To assess the performance of Bruker's Alpha II FTIR, Scatr's Series One, Spectra Plasmonics' Amplifi ID, and Waters' Radian ASAP, we measured three key parameters:

1. **Accuracy**, meaning the ability of each technology to report the same results as the reference method(s) they were being compared to
2. **Limit of detection**, meaning the ability of each technology to detect specific drugs at concentrations found in the unregulated fentanyl supply and detected by the reference method
3. **Reproducibility**, meaning the ability of each technology to replicate the results it reported

Of the 228 samples included in this performance assessment, 217 were used to measure accuracy (i.e., accuracy samples) and 11 to measure reproducibility (i.e., reproducibility samples). Of the 217 accuracy samples, 114 were used to measure limit of detection (i.e., limit of detection samples).

Reference methods

To assess the performance of Bruker's Alpha II FTIR, Scatr's Series One, Spectra Plasmonics' Amplifi ID, and Waters' Radian ASAP, we used:

1. **Agilent's 6890N gas chromatograph and 5975 series mass selective detector (GC-MS)**, with methods developed and validated by technical experts in the clinical laboratory at St. Michael's Hospital, a site of Unity Health Toronto. GC-MS is considered **a gold standard for drug analysis**, and is used in specialized clinical and forensic settings to analyze drugs and biological specimens, such as blood and urine. GC-MS separates the substances in a sample and determines what they are based on their unique mass spectral properties (signature fingerprint) and chromatographic retention

time. **GC-MS has high sensitivity, the ability to separate complex mixtures, and exceptional specificity provided by electron impact (EI) ionization**. This "hard" technique produces consistent and reproducible fragmentation, allowing for reliable identification via standardized, comprehensive spectral libraries (such as the National Institute of Standards and Technology (NIST)).

Since 2019, St. Michael's Hospital's clinical laboratory GC-MS has been used to analyze thousands of unregulated drug and used drug equipment samples collected by Toronto's Drug Checking Service and Ontario's Drug Checking Community. The value this extensively validated GC-MS method brings to this performance assessment is its comprehensive commercial and in-house developed and validated libraries (containing thousands of substances) used to detect rare and "new" drugs, as well as its ability to detect drugs in very trace amounts, break apart the most complex drug mixtures, and differentiate between chemically similar drugs.

2. **ThermoFisher's Q-Exactive Orbitrap liquid chromatography-high resolution mass spectrometer (LC-HR-MS)**, with methods developed and validated by technical experts in the clinical laboratory at the Centre for Addiction and Mental Health (CAMH). LC-HR-MS is considered **a versatile and powerful technology for chemical analysis**, and is used in specialized clinical and forensic settings to analyze biological specimens, such as blood and urine. LC-HR-MS separates the substances in a sample and determines what they are based on their unique exact mass and spectral properties (signature fingerprint) and chromatographic retention time. Since 2019, CAMH's clinical laboratory LC-HR-MS has been used to analyze thousands of unregulated drug and used drug equipment samples collected by Toronto's Drug Checking Service and Ontario's Drug Checking Community. The values Oribtrap LC-HR-MS bring to this performance assessment are abundant, and include its extensive in-house developed and validated libraries (containing hundreds of substances) to detect rare and "new" drugs; ability to perform retrospective analysis of suspected or unknown compounds; ability to detect drugs in very trace amounts, break apart the most complex drug mixtures, and differentiate between chemically similar drugs; and, importantly, its ability to determine precise information on the concentration (or amount) of certain drugs found in a sample by applying a multiplex quantification method developed by the CAMH team. This quantification method allows us to measure limit of detection.

Reference result

GC-MS and/or LC-HR-MS results reported by technical experts at St. Michael's Hospital or CAMH, who were following methodologies specifically developed and validated for analyzing unregulated drug samples for community drug checking, are considered the "reference result" for this performance assessment. It is the reference result that results reported by Bruker's Alpha II FTIR, Scatr's Series One,

Spectra Plasmonics' Amplifi ID, and Waters' Radian ASAP are compared to when measuring accuracy and limit of detection.

For the 114 accuracy samples that were expected to be fentanyl, the reference result consists of drugs reported by both GC-MS and LC-HR-MS. For the remaining 103 accuracy samples that were expected to be a benzodiazepine-related drug, cocaine, ketamine, MDMA, or methamphetamine, the reference result consists of drugs reported by GC-MS only. Given time and resource constraints, these samples were not analyzed using LC-HR-MS.

To determine the accuracy of the results reported as part of the reproducibility component of this performance assessment, GC-MS results were the reference result, as these samples were not analyzed by LC-HR-MS.

The precise concentrations of specified drugs determined using the LC-HR-MS were the reference result for the 114 limit of detection samples.

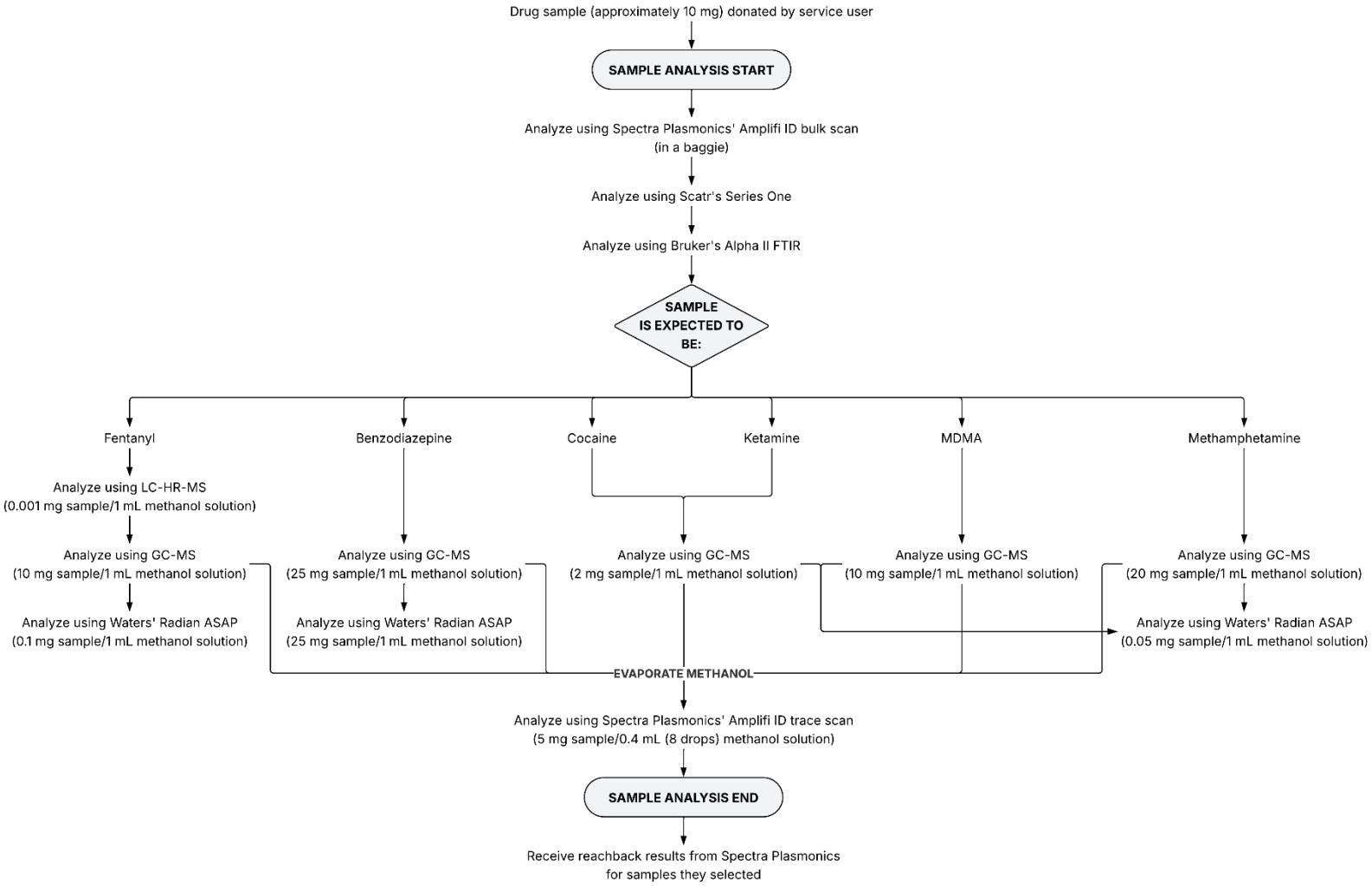
The following were excluded from this performance assessment and therefore the reference result:

1. Inactive precursors and metabolites detected by GC-MS or LC-HR-MS
2. Non-noteworthy drugs detected by GC-MS or LC-HR-MS with a relative peak area composition of 2% or less (i.e., what we consider trace components). We define "noteworthy drugs" as drugs that (i) are linked to overdose or other adverse effects, (ii) are highly potent or related to highly potent drugs, or (iii) may not be desired by some service users. For example, fentanyl-related drugs, nitazene opioids, benzodiazepine-related drugs, veterinary tranquilizers are noteworthy drugs. Examples of non-noteworthy drugs detected at less than 2% relative peak area composition that were excluded include cocaine, lidocaine, MDA.
3. Non-drug fillers, such as dimethyl sulfone (MSM) and sugars
4. Binding agents, such as cellulose

Sample analysis process

The 217 accuracy samples (114 of which were also limit of detection samples) were analyzed following the process below (Flow chart 1). The only deviation from this process for reproducibility samples was that samples expected to be fentanyl were not analyzed using LC-HR-MS.

Flow chart 1. Sample analysis process



Our findings

Accuracy

Measuring accuracy involved determining the abilities of Bruker's Alpha II FTIR, Scatr's Series One, Spectra Plasmonics' Amplifi ID (point-of-care scans *and* reachback), and Waters' RADIAN ASAP to report the same results as the reference method(s) they were being compared to. Measurements of accuracy include individual drug detections, individual drug misses, reporting false positives, correctly naming fentanyl- and benzodiazepine-related drugs, and perfectly reporting the reference result.

The accuracy component of this performance assessment included 217 samples. Of those 217 accuracy samples, 114 were expected to be fentanyl, 23 a benzodiazepine-related drug, 20 cocaine, 20 ketamine, 20 MDMA, and 20 methamphetamine.

Individual drug detections

Context: Across the 217 accuracy samples, 28 unique drugs were detected by the reference method(s) and included in the reference results. Providing a drug was found by the reference method(s) in at least 5 accuracy samples, it was included in this component of our assessment. Of those 28 drugs, 16 were detected in at least 5 samples. Of those 16 drugs, 11 are classified by our program as "noteworthy".[1] Importantly, they were 11 of the top 12 noteworthy drugs[1] (of 47) detected in over 3,500 samples checked by Ontario's Drug Checking Community between August 2024 and April 2025 (when the 217 accuracy samples were collected). The remaining 5 drugs were the top 5 non-noteworthy drugs (of 118) detected in those 3,500+ samples. In March 2026, just before this performance assessment was shared publicly, the 16 drugs found in at least 5 accuracy samples by the reference method(s) were 11 of the top 14 noteworthy drugs[1] (of 29) and 5 of the top 10 non-noteworthy drugs (of 40) detected in over 350 samples checked by Ontario's Drug Checking Community. It is therefore tremendously important to assess whether the technologies included in this performance assessment can detect the 16 drugs included in Table 1 below.

What we assessed: We measured how often 16 individual drugs included in the reference results were correctly detected by Bruker's Alpha II FTIR, Scatr's Series One, Spectra Plasmonics' Amplifi ID (point-of-care scans *and* reachback), and Waters' RADIAN ASAP.

Steps to calculate: The 16 drugs found in at least 5 accuracy samples (and the number of detections made by our reference method(s)) are listed in column 1 of Table 1, each occupying their own row. Each of the remaining 5 columns is occupied by one of the technologies assessed. For each individual drug detected by the reference method(s), we determined how many were correctly detected by the technologies assessed. We then divided the number of correct detections made by each technology by the number of detections made by the reference method(s). Correct detections are presented as a percentage.

Detections are colour-coded: Green means 85% or more of the detections were correctly made, yellow means between 50% and 84% of the detections were correctly made, and red means less than 50% of the detections were correctly made.

An example to assist with understanding Table 1: Fentanyl was detected by the reference methods in 77 of the 217 accuracy samples. Bruker's Alpha II FTIR detected fentanyl in 18 (or 23%) of those 77 samples.

Table 1. Individual drug detections

	Drug detected by reference method(s) (# of detections)	**% (#) of reference DETECTIONS CORRECTLY MADE by:**				
		Bruker's Alpha II FTIR	**Scatr's Series One**	**Spectra Plasmonics' Amplifi ID: point-of-care scans**	**Spectra Plasmonics' Amplifi ID: reachback**	**Waters' RADIAN ASAP**
High-potency opioids						
1	Fentanyl* (77)	23% (18)	77% (59)	84% (65)	91% (70)	17% (13)
2	Ortho-methylfentanyl* (42)	12% (5)	0% (0)	0% (0)	0% (0)	45% (19)
3	Para-fluorofentanyl* (33)	42% (14)	0% (0)	64% (21)	61% (20)	12% (4)
4	Protodesnitazene* (13)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)

Veterinary tranquilizers						
5	Xylazine* (40)	13% (5)	0% (0)	35% (14)	35% (14)	18% (7)
6	Medetomidine* (39)	5% (2)	5% (2)	18% (7)	13% (5)	13% (5)
Benzodiazepine-related drugs						
7	Bromazolam* (31)	19% (6)	6% (2)	48% (15)	55% (17)	23% (7)
8	Desalkylgidazepam* (9)	22% (2)	0% (0)	0% (0)	0% (0)	67% (6)
9	Ethylbromazolam* (8)	0% (0)	0% (0)	0% (0)	0% (0)	13% (1)
10	Alprazolam* (6)	0% (0)	0% (0)	17% (1)	17% (1)	100% (6)
Other noteworthy drugs[1]						
11	Phenacetin* (9)	33% (3)	11% (1)	11% (1)	22% (2)	22% (2)
Stimulants, psychedelics, dissociatives						
12	Caffeine (113)	98% (111)	78% (88)	62% (70)	68% (77)	96% (109)
13	Ketamine (23)	91% (21)	91% (21)	87% (20)	87% (20)	87% (20)
14	Cocaine (21)	95% (20)	95% (20)	95% (20)	95% (20)	95% (20)
15	MDMA (21)	95% (20)	95% (20)	95% (20)	95% (20)	95% (20)
16	Methamphetamine (21)	100% (21)	95% (20)	100% (21)	95% (20)	100% (21)

[1] "Noteworthy drugs" are drugs that (i) are linked to overdose or other adverse effects, (ii) are highly potent or related to highly potent drugs, or (iii) may not be desired by some service users

* Noteworthy drug

Individual drug misses

Context: Across the 217 accuracy samples, 28 unique drugs were detected by the reference method(s) and included in the reference results. Providing a drug was found by the reference method(s) in at least 5 accuracy samples, it was included in this component of our assessment. Of those 28 drugs, 16 were detected in at least 5 samples. Of those 16 drugs, 11 are classified by our program as "noteworthy".[1] Importantly, they were 11 of the top 12 noteworthy drugs[1] (of 47) detected in over 3,500 samples checked by Ontario's Drug Checking Community between August 2024 and April 2025 (when the 217 accuracy samples were collected). The remaining 5 drugs were the top 5 non-noteworthy drugs (of 118) detected in those 3,500+ samples. In March 2026, just before this performance assessment was shared publicly, the 16 drugs found in at least 5 accuracy samples by the reference method(s) were 11 of the top 14 noteworthy drugs[1] (of 29) and 5 of the top 10 non-noteworthy drugs (of 40) detected in over 350 samples checked by Ontario's Drug Checking Community. It is therefore tremendously important to assess whether the technologies included in this performance assessment can detect the 16 drugs included in Table 2 below.

It is important for drug checking service providers and service users to understand that **a substance being part of a technology's library does not guarantee that substance will be detected**. A technology may miss a substance included in their library for many reasons, such as (i) the substance is below the instrument's limit of detection (meaning it is present in an amount that is lower than the instrument can detect), (ii) there may be too many substances in a sample, preventing the technology from being able to detect them all; (iii) other technological limitations.

What we assessed: We measured how often 16 individual drugs included in the reference results were missed by Bruker's Alpha II FTIR, Scatr's Series One, Spectra Plasmonics' Amplifi ID (point-of-care scans *and* reachback), and Waters' RADIAN ASAP.

Steps to calculate: The 16 drugs found in at least 5 accuracy samples (and the number of detections made by our reference method(s)) are listed in column 1 of Table 2, each occupying their own row. Each of the remaining 5 columns is occupied by one of the technologies assessed. For each individual drug detected by our reference method(s), we determined how many were missed by the technologies assessed. We then divided the number of missed detections by each technology by the number of detections made by the reference method(s). Missed detections are presented as a percentage.

Detections are colour-coded: Green means 15% or less of the detections were missed, yellow means between 16% and 50% of the detections were missed, and red means more than 50% of the detections were missed.

An example to assist with understanding Table 2: Fentanyl was detected by the reference methods in 77 of the 217 accuracy samples. Bruker's Alpha II FTIR missed fentanyl in 59 (or 77%) of those 77 samples.

Table 2. Individual drug misses

	Drug detected by reference method(s) (# of detections)	% (#) of reference DETECTIONS MISSED by:				
		Bruker's Alpha II FTIR	Scatr's Series One	Spectra Plasmonics' Amplifi ID: point-of-care scans	Spectra Plasmonics' Amplifi ID: reachback	Waters' RADIAN ASAP
High-potency opioids						
1	Fentanyl* (77)	77% (59)	23% (18)	16% (12)	9% (7)	83% (64)
2	Ortho-methylfentanyl* (42)	88% (37)	100% (42)	100% (42)	100% (42)	55% (23)
3	Para-fluorofentanyl* (33)	58% (19)	100% (33)	36% (12)	39% (13)	88% (29)
4	Protodesnitazene* (13)	100% (13)	100% (13)	100% (13)	100% (13)	100% (13)
Veterinary tranquilizers						
5	Xylazine* (40)	88% (35)	100% (40)	65% (26)	65% (26)	83% (33)
6	Medetomidine* (39)	95% (37)	95% (37)	82% (32)	87% (34)	87% (34)
Benzodiazepine-related drugs						
7	Bromazolam* (31)	81% (25)	94% (29)	52% (16)	45% (14)	77% (24)
8	Desalkylgidazepam* (9)	78% (7)	100% (9)	100% (9)	100% (9)	33% (3)

9	Ethylbromazolam* (8)	100% (8)	100% (8)	100% (8)	100% (8)	88% (7)
10	Alprazolam* (6)	100% (6)	100% (6)	83% (5)	83% (5)	0% (0)
Other noteworthy drugs[1]						
11	Phenacetin* (9)	67% (6)	89% (8)	89% (8)	78% (7)	78% (7)
Stimulants, psychedelics, dissociatives						
12	Caffeine (113)	2% (2)	22% (25)	38% (43)	32% (36)	4% (4)
13	Ketamine (23)	9% (2)	9% (2)	13% (3)	13% (3)	13% (3)
14	Cocaine (21)	5% (1)	5% (1)	5% (1)	5% (1)	5% (1)
15	MDMA (21)	5% (1)	5% (1)	5% (1)	5% (1)	5% (1)
16	Methamphetamine (21)	0% (0)	5% (1)	0% (0)	5% (1)	0% (0)

[1] "Noteworthy drugs" are drugs that (i) are linked to overdose or other adverse effects, (ii) are highly potent or related to highly potent drugs, or (iii) may not be desired by some service users

* Noteworthy drug

False positives

Context: A false positive means a technology reported a substance as being present in a sample when it was not. In the context of community drug checking, false positives are problematic and can be harmful. The extent of those depends on which substance was incorrectly reported, and in which expected drug. False positives for fentanyl or other high-potency opioids, like nitazenes, in samples that are not expected to be an opioid (such as samples expected to be a benzodiazepine-related drug, cocaine, ketamine, MDMA, or methamphetamine) are especially problematic. They misinform individuals accessing drug checking services, potentially leading to a misunderstanding about the drugs they use and unnecessary behaviour changes. Additionally, they create harmful and inaccurate information about the unregulated drug supply. Specifically, they take attention away from the population of people at highest risk of fatal

or non-fatal drug poisoning and other harms (i.e., people who choose to use unregulated opioids). In fact, it is **incredibly uncommon for drug checking programs to find fentanyl in samples that are not expected to be an opioid**. Between October 2019 and March 2026, Toronto's Drug Checking Service analyzed 8,321 drug samples that were not expected to be an opioid. Fentanyl or another high-potency opioid was detected in only 12 or 0.1% of those 8,321 samples. Reporting false positives in samples that are expected to be fentanyl or other opioids is also problematic for individuals and drug market monitoring purposes.

What we assessed: We measured how often Bruker's Alpha II FTIR, Scatr's Series One, Spectra Plasmonics' Amplifi ID (point-of-care scans *and* reachback), and Waters' RADIAN ASAP incorrectly reported a drug as being present in a sample when it was not detected by the reference method(s).

Steps to calculate: For each of the 217 accuracy samples, we compared the drugs detected by each technology assessed to the drugs detected by the reference method(s). If a drug was detected by an assessed technology but was not detected by the reference method(s), that detection was considered a false positive. The technologies assessed are listed in column 1 of Table 3, each occupying their own parent row. Column 2 describes the false positives reported by each technology, grouping them by the drug or class of drugs that were incorrectly detected.

Table 3. False positives

Assessed technology	False positives reported
Bruker's Alpha II FTIR	**No false positives reported**
Scatr's Series One	**Reported false positives for fentanyl** in: • 10% (2) of the 20 ketamine samples • 10% (2) of the 20 methamphetamine samples • 5% (1) of the 20 cocaine samples • 5% (1) of the 20 MDMA samples • 4% (5) of the 114 fentanyl samples • As well as remifentanil in 4% (1) of the 23 benzodiazepine-related drug samples

	Reported false positives for xylazine in 1% (1) of the 114 fentanyl samples
	Reported false positives for diphenhydramine (Benadryl) in 25% (5) of the 20 cocaine samples
Spectra Plasmonics' Amplifi ID (point-of-care scans)[1]	**Reported false positives for fentanyl-related drugs**, including: • Fentalog (undifferentiated) in 10% (2) of the 20 cocaine samples • Fentanyl in 9% (2) of the 23 benzodiazepine-related drug samples • Fentalog (undifferentiated) in 5% (1) of the 20 ketamine samples • Fentanyl in 5% (1) of the 20 methamphetamine samples • Fentanyl, fluorofentanyl, and/or fentalog (undifferentiated) in 4% (5) of the 114 fentanyl samples
	Reported false positives for nitazene opioids, including: • Metonitazene in 10% (2) of the 20 MDMA samples • Etonitazene in 5% (1) of the 20 methamphetamine samples • Metonitazene in 2% (2) of the 114 fentanyl samples
	Reported false positives for veterinary tranquilizers, including: • Medetomidine in 5% (1) of the 20 MDMA samples • Xylazine in 5% (1) of the 20 MDMA samples • Medetomidine in 1% (1) of the 114 fentanyl samples • Xylazine in 2% (2) of the fentanyl samples
	Reported false positives for benzodiazepine-related drugs, including: • Bromazolam in 20% (4) of the 20 cocaine samples • Bromazolam (2) or etizolam (1) in 15% of the 20 MDMA samples • Flualprazolam (2) or benzodiazepine (undifferentiated) (1) in 15% of the 20 ketamine samples • Alprazolam, bromazolam, etizolam, flualprazolam, and/or benzodiazepine (undifferentiated) in 18% (20) of the 114 fentanyl samples
	Reported false positives for cocaine in 9% (2) of the 23 benzodiazepine-related drug samples

Spectra Plasmonics' Amplifi ID (reachback)	**Reported false positives for fentanyl-related drugs**, including: • Fentalog (undifferentiated) in 5% (1) of the 20 cocaine samples • Fentanyl in 4% (1) of the 23 benzodiazepine-related drug samples • Fentanyl, fluorofentanyl, and/or fentalog (undifferentiated) in 7% (8) of the 114 fentanyl samples
	Reported false positives for veterinary tranquilizers, including: • Medetomidine in 1% (1) of the 114 fentanyl samples • Xylazine in 1% (1) of the 114 fentanyl samples
	Reported false positives for benzodiazepine-related drugs, including bromazolam, flualprazolam, and/or benzodiazepine (undifferentiated) in 11% (13) of the 114 fentanyl samples
	Reported false positives for methamphetamine in 9% (2) of the 23 benzodiazepine-related drug samples
	Reported false positives for cocaine in 4% (1) of the 23 benzodiazepine-related drug samples
Waters' Radian ASAP[2]	**Reported false positives for MDA** in 100% (20) of the 20 MDMA samples
	Reported false positives for amphetamine in 95% (19) of the 20 methamphetamine samples

[1] Spectra Plasmonics' reachback service often corrected false positives reported by their point-of-case scans, however, not in all cases and in some cases additional false positives were reported by the reachback service

[2] The false positives reported by Waters' Radian ASAP are associated with our decision to use a library match score equal to or greater than 900. A higher library match score could have been used but would have resulted in false negatives (i.e., drugs being missed). We used a library match score equal to or greater than 900 in an attempt to limit the number of false positives *and* false negatives.

Correctly naming fentanyl- and benzodiazepine-related drugs

Context: A variety of fentanyl- and benzodiazepine-related drugs were detected by the reference method(s) and included in the reference results for this performance assessment (fentanyl, para-fluorofentanyl, ortho-methylfentanyl, alprazolam, bromazolam, delorazepam, desalkylgidazepam, deschloroetizolam, diazepam, ethylbromazolam, etizolam, flubromazepam, lorazepam, nordiazepam, oxazepam, and

phenazolam). Many of the fentanyl- or benzodiazepine-related drugs are chemically very similar, making them difficult for drug checking technologies to tell apart. In the context of community drug checking, a technology incorrectly naming the fentanyl- and/or benzodiazepine-related drug(s) found in a sample can be problematic. The extent of that depends on which drug was incorrectly named, and in which expected drug. Incorrectly naming fentanyl- or benzodiazepine-related drug(s) misinforms individuals accessing drug checking services, potentially leading to a misunderstanding about the drugs they use and unnecessary behaviour changes. Additionally, incorrectly naming fentanyl- or benzodiazepine-related drug(s) creates inaccurate information about the unregulated drug supply. Drugs that are chemically very similar may have very different strengths and effects.

What we assessed: We measured how often Bruker's Alpha II FTIR, Scatr's Series One, Spectra Plasmonics' Amplifi ID (point-of-care scans *and* reachback), and Waters' RADIAN ASAP correctly named the specific fentanyl- or benzodiazepine-related drug(s) they detected.

Steps to calculate: For each of the 114 accuracy samples expected to be fentanyl, we compared the fentanyl-related drug(s) detected by each technology assessed to the fentanyl-related drug(s) detected by the reference method. If a fentanyl-related drug detected in a sample by an assessed technology exactly matched the fentanyl-related drug detected in that sample by the reference method, we considered that drug as being correctly named by the technology. We then divided the number of correctly named fentanyl-related drug detections by the total number of fentanyl-related drug detections made by an assessed technology and presented correctly named detections as a percentage. We followed this same process for benzodiazepine-related drugs detected in each of the 114 accuracy samples expected to be fentanyl, as well as in each of the 23 accuracy samples expected to be a benzodiazepine-related drug. The technologies assessed are listed in column 1 of Table 4, each occupying their own parent row. Column 2 describes the correctly named fentanyl- and benzodiazepine-related drug detections by each technology.

Sometimes, our technician could not confirm which fentanyl-related drug(s) were present using Bruker's Alpha II FTIR. In those samples, a "fentanyl-related drug" was reported. Sometimes, Spectra Plasmonics' Amplifi ID (point-of-care scans *and* reachback) reported "fentalog [undifferentiated]"or "benzodiazepine [undifferentiated]", rather than naming the specific drug. If "fentanyl-related drug", "fentalog [undifferentiated]", or "benzodiazepine [undifferentiated]" was reported by an assessed technology in a sample that contained a fentanyl- or benzodiazepine-related drug according to the reference result, we counted that as a correct naming.

An example to assist with understanding Table 4: Bruker's Alpha II FTIR made 48 fentanyl-related drug detections that were also made by the reference method. For all of those 48 detections, Bruker's Alpha II FTIR correctly named the fentanyl-related drug detected by the reference method.

Table 4. Correctly naming fentanyl- and benzodiazepine-related drugs

Assessed technology	Fentanyl- and benzodiazepine-related drugs correctly named
Bruker's Alpha II FTIR	100% (48)[1] of the 48 fentanyl-related drug detections were correctly named
	100% (13) of the 13 benzodiazepine-related drug detections were correctly named
Scatr's Series One	71% (59) of the 83 fentanyl-related drug detections were correctly named
	100% (5) of the 5 benzodiazepine-related drug detections were correctly named
Spectra Plasmonics' Amplifi ID (point-of-care scans)	76% (91)[2] of the 120 fentanyl-related drug detections were correctly named
	50% (27)[3] of the 54 benzodiazepine-related drug detections were correctly named
Spectra Plasmonics' Amplifi ID (reachback)	76% (91)[4] of the 119 fentanyl-related drug detections were correctly named
	62% (31)[5] of the 50 benzodiazepine-related drug detections were correctly named
Waters' Radian ASAP	100% (36) of the 36 fentanyl-related drug detections were correctly named
	100% (31) of the 31 benzodiazepine-related drug detections were correctly named

[1] In 11 samples, our technician could not confirm which fentanyl-related drug(s) were present using Bruker's Alpha II FTIR, so a "fentanyl-related drug" was reported

[2] In 5 samples, Spectra Plasmonics' Amplifi ID (point-of-care scans) reported "fentalog [undifferentiated]" rather than naming the specific fentanyl-related drug(s) found

[3] In 9 samples, Spectra Plasmonics' Amplifi ID (point-of-care scans) reported "benzodiazepine [undifferentiated]" rather than naming the specific benzodiazepine-related drug(s) found

[4] In 2 samples, Spectra Plasmonics' Amplifi ID (reachback) reported "fentalog [undifferentiated]" rather than naming the specific fentanyl-related drug(s) found

[5] In 11 samples, Spectra Plasmonics' Amplifi ID (reachback) reported "benzodiazepine [undifferentiated]" rather than naming the specific benzodiazepine-related drug(s) found

Perfectly reporting the reference result

What we assessed: We measured how often Bruker's Alpha II FTIR, Scatr's Series One, Spectra Plasmonics' Amplifi ID (point-of-care scans *and* reachback), and Waters' RADIAN ASAP reported the reference result perfectly (i.e., a perfect match) for each of the 217 accuracy samples. We presented perfect matches by expected drug and as a proportion of all 217 samples.

Steps to calculate: We separated each of the 217 accuracy samples by their expected drug. The 6 expected drugs (and the number of samples), as well as all expected drugs collectively, are listed in column 1 of Table 5, each occupying their own row. Each of the remaining 5 columns is occupied by one of the technologies assessed. For each (and all) expected drugs, we determined how many samples each technology reported the exact same result as the reference method(s) (known as the reference result). If the assessed technology reported the reference result exactly, we counted that result as a perfect match.

For example:

1. The reference result reported by the reference methods for one of the 114 expected fentanyl samples was caffeine, fentanyl, and xylazine. Each of the technologies assessed reported caffeine and fentanyl as the only drugs found in that sample. Each of the technologies assessed missed xylazine, meaning none of the technologies perfectly reported the reference result for that sample.
2. The reference result reported by the reference methods for another one of the 114 expected fentanyl samples was caffeine and fentanyl. Bruker's Alpha II FTIR and Scatr's Series One reported caffeine and fentanyl as the only drugs found in that sample – each technology reported a perfect match. For that same sample, Spectra Plasmonics' Amplifi ID (point-of-care scans *and* reachback) reported fentanyl as

the only drug found and Waters' RADIAN ASAP reported caffeine as the only drug found – none of those results would be counted as a perfect match.

3. The reference result reported by the reference method for one of the 20 expected ketamine samples was ketamine. Each of the technologies assessed reported ketamine as the only drug found in that sample. Each result reported by each technology assessed was counted as a perfect match.

We then divided the number of perfect matches reported by each technology by the number of samples and presented perfect matches as a percentage.

Perfect matches are colour-coded: Green means 85% or more of the results reported matched the reference result, yellow means between 50% and 84% of the results reported matched the reference result, and red means less than 50% of the results reported matched the reference result.

Examples to assist with understanding Table 5:

1. Bruker's Alpha II FTIR reported the reference result perfectly for 45% (or 98) of the 217 accuracy samples.
2. Bruker's Alpha II FTIR reported the reference result perfectly for 13% (or 15) of the 114 accuracy samples that were expected to be fentanyl.
3. Bruker's Alpha II FTIR reported the reference result perfectly for 100% (or 20) of the 20 accuracy samples that were expected to be cocaine.

Table 5. Perfectly reporting the reference result

Expected drug (# of samples)	% (#) of perfectly reported reference results by:				
	Bruker's Alpha II FTIR	**Scatr's Series One**	**Spectra Plasmonics' Amplifi ID: point-of-care scans**	**Spectra Plasmonics' Amplifi ID: reachback**	**Waters' RADIAN ASAP**
Fentanyl (114)	13% (15)[1]	5% (6)	11% (13)[1]	11% (13)[1]	8% (9)
Benzodiazepine-related drug (23)	17% (4)	0% (0)	9% (2)[2]	17% (4)[2]	57% (13)
Cocaine (20)	100% (20)	60% (12)	70% (14)	95% (19)	95% (19)
Ketamine (20)	100% (20)	80% (16)	70% (14)	85% (17)	95% (19)
MDMA (20)	100% (20)	95% (19)	65% (13)	100% (20)	0% (0)
Methamphetamine (20)	95% (19)	80% (16)	85% (17)	90% (18)	5% (1)
All (217)	**45% (98)**	**32% (69)**	**34% (73)**	**42% (91)**	**28% (61)**

[1] In 11 expected fentanyl samples, our technician could not confirm which fentanyl-related drug(s) were present using Bruker's Alpha II FTIR. In those samples, a "fentanyl-related drug" was reported. In 13 expected fentanyl samples, Spectra Plasmonics' Amplifi ID (point-of-care scans and/or reachback) reported "fentalog [undifferentiated]"and/or "benzodiazepine [undifferentiated]". If "fentanyl-related" or "fentalog [undifferentiated]" was reported and at least one fentanyl-related drug was found in the sample by the reference method(s), we counted that as a match. If "benzodiazepine [undifferentiated]" was reported and at least one benzodiazepine-related drug was found in the sample by the reference method(s), we counted that as a match.

[2] In 7 expected benzodiazepine-drug samples, Spectra Plasmonics' Amplifi ID (point-of-care scans and/or reachback) reported "benzodiazepine [undifferentiated]". If "benzodiazepine [undifferentiated]" was reported and at least one benzodiazepine-related drug was found in the sample by the reference method(s), we counted that as a match.

Limit of detection

A technology's limit of detection is the lowest concentration (or amount) of a drug that is consistently detected with confidence.

The limit of detection component of this performance assessment included 114 samples expected to be fentanyl. The reference method was the liquid chromatography-high resolution mass spectrometer (LC-HR-MS). Applying a quantification method during analysis using LC-HR-MS allows us to report the precise concentration of specified drugs in a sample. In these 114 samples, we determined the precise concentration of fentanyl in 76 samples, para-fluorofentanyl in 32 samples, ortho-methylfentanyl in 42 samples, medetomidine in 36 samples, xylazine in 39 samples, bromazolam in 25 samples, and caffeine in 112 samples.

We measured whether fentanyl, para-fluorofentanyl, ortho-methylfentanyl, medetomidine, xylazine, bromazolam, or caffeine were detected by Bruker's Alpha II FTIR, Scatr's Series One, Spectra Plasmonics' Amplifi ID (point-of-care scans *and* reachback), and Waters' RADIAN ASAP at each concentration detected by the reference method.

We considered a technology having "consistently detected" a drug if at least 80% of the reference detections were made within a single percentage point bucket (e.g., 1.00 – 1.99%).

Fentanyl

Context: Between August 2024 and April 2025 (when the 114 limit of detection samples were collected), 73% (998) of the 1,372 drug samples expected to be (i.e., got or bought as) fentanyl and checked by Toronto's Drug Checking Service contained fentanyl. The concentration (or amount) of fentanyl was quantified in 86% (863) of those 998 samples. The median concentration of fentanyl across those 863 samples was 1.5%. In March 2026, just before this performance assessment was shared publicly, 66% (78) of the 118 drug samples expected to be fentanyl and checked by Toronto's Drug Checking Service contained fentanyl. The concentration of fentanyl was quantified in 74% (58) of those 78 samples. The median concentration of fentanyl across those 58 samples was 0.8%. It is therefore tremendously important to assess whether the technologies included in this performance assessment can detect fentanyl at concentrations around 1%.

What we assessed: We measured whether fentanyl was detected by Bruker's Alpha II FTIR, Scatr's Series One, Spectra Plasmonics' Amplifi ID (point-of-care scans *and* reachback), and Waters' RADIAN ASAP at each concentration detected by the reference method.

Steps to calculate: The precise concentration of fentanyl reported by the reference method in each of 76 samples is listed in column 1 of Table 6 – each sample occupying its own row. Each of the remaining 5 columns is occupied by one of the technologies assessed. For each concentration detected by our reference method, we determined whether fentanyl was detected by the technologies assessed.

Detections are colour-coded: Detections made are green, detections missed are red.

An example to assist with understanding Table 6: The reference method reported that fentanyl accounted for 0.09% of one sample expected to be fentanyl. Bruker's Alpha II, Scatr's Series One, and Waters' Radian ASAP did not detect fentanyl in that sample. Spectra Plasmonics' Amplifi ID (point-of-care scans *and* reachback) did detect fentanyl in that sample.

Table 6. Fentanyl limit of detection

% concentration of fentanyl detected by reference method	Reference detections by:				
	Bruker's Alpha II FTIR	Scatr's Series One	Spectra Plasmonics' Amplifi ID: point-of-care scans	Spectra Plasmonics' Amplifi ID: reachback	Waters' RADIAN ASAP
0.09%	Not detected	Not detected	Detected	Detected	Not detected
0.10%	Not detected	Detected	Detected	Detected	Not detected
0.11%	Not detected	Detected	Not detected	Detected	Not detected
0.11%	Not detected	Detected	n/a[1]	Detected	Not detected
0.12%	n/a[1]	Detected	Detected	Detected	Not detected
0.14%	Not detected	Detected	Detected	Detected	Not detected

0.14%	Not detected	Not detected	Detected	Detected	Not detected
0.15%	Not detected	Detected	n/a[1]	n/a[1]	Not detected
0.18%	Not detected	Detected	Detected	Detected	Not detected
0.20%	Not detected	Not detected	Not detected	Not detected	Not detected
0.21%	Not detected	Not detected	Detected	Detected	Not detected
0.21%	Not detected	Detected	Detected	Detected	Not detected
0.21%	Not detected	Detected	Not detected	Not detected	Not detected
0.23%	Not detected	Detected	Detected	Detected	Not detected
0.25%	Not detected	Not detected	Detected	Detected	Not detected
0.26%	Not detected	Not detected	Detected	Detected	Not detected
0.28%	Not detected	Not detected	Detected	Detected	Not detected
0.30%	Not detected	Detected	Not detected	Detected	Not detected
0.30%	Not detected	Detected	Detected	Detected	Not detected
0.37%	Not detected	Detected	Detected	Detected	Not detected
0.39%	Not detected	Detected	Detected	Detected	Not detected
0.42%	Not detected	Detected	Detected	Detected	Not detected
0.45%	Not detected	Detected	Detected	Detected	Not detected
0.46%	Not detected	Not detected	Detected	Detected	Not detected
0.46%	Not detected	Detected	Not detected	Detected	Not detected
0.49%	Not detected	Detected	Detected	Detected	Not detected

0.51%	Not detected	Detected	Not detected	Not detected	Not detected
0.51%	Not detected	Detected	Detected	Detected	Not detected
0.53%	Not detected	Not detected	Detected	Detected	Not detected
0.55%	Not detected	Detected	Detected	Detected	Not detected
0.67%	Not detected	Detected	Detected	Detected	Not detected
0.68%	Not detected	Not detected	Not detected	Detected	Not detected
0.70%	Detected	Detected	Detected	Detected	Not detected
0.73%	Not detected	Not detected	Not detected	Not detected	Not detected
0.75%	Not detected	Detected	Detected	Detected	Not detected
0.95%	Not detected	Detected	Detected	Detected	Not detected
1.09%	Not detected	Detected	Detected	Detected	Detected
1.12%	Not detected	Not detected	Detected	Detected	Not detected
1.13%	Not detected	Not detected	Detected	Detected	Not detected
1.13%	n/a[1]	Detected	Detected	Detected	Not detected
1.14%	Not detected	Detected	Detected	Detected	Not detected
1.20%	Not detected	Not detected	Detected	Detected	Not detected
1.22%	Not detected	Detected	Not detected	Not detected	Not detected
1.29%	Not detected	Detected	Detected	Detected	Not detected
1.38%	Not detected	Detected	Detected	Detected	Detected
1.42%	Not detected	Detected	Detected	Detected	Not detected

1.45%	Not detected	Detected	Detected	Detected	Not detected
1.51%	Not detected	Detected	Detected	Detected	Not detected
1.55%	n/a[1]	Detected	Detected	Detected	Not detected
1.60%	Not detected	Detected	Detected	Detected	Not detected
1.62%	Detected	Detected	Detected	Detected	Not detected
1.72%	n/a[1]	Detected	Detected	Detected	Not detected
1.78%	Detected	Not detected	Detected	Detected	Not detected
1.87%	Not detected	Detected	Detected	Detected	Not detected
1.87%	Detected	Detected	Detected	Detected	Not detected
1.87%	Not detected	Detected	Detected	Detected	Not detected
2.00%	n/a[1]	Detected	Detected	Detected	Not detected
2.02%	n/a[1]	Detected	Detected	Detected	Not detected
2.04%	Detected	Detected	Detected	Detected	Not detected
2.05%	n/a[1]	Detected	Detected	Detected	Not detected
2.12%	Not detected	Detected	Detected	Detected	Not detected
2.14%	Detected	Detected	Detected	Detected	Not detected
2.15%	Detected	Detected	Detected	Detected	Not detected
2.38%	Detected	Detected	Not detected	Not detected	Detected
3.28%	Detected	Detected	Detected	Detected	Detected
3.40%	Not detected	Detected	Detected	Detected	Not detected

3.83%	Detected	Detected	Detected	Detected	Detected
4.13%	Detected	Detected	Detected	Detected	Detected
4.16%	n/a[1]	Detected	Detected	Detected	Detected
4.67%	Detected	Not detected	Detected	Detected	Detected
5.65%	Detected	Detected	Detected	Detected	Not detected
6.35%	Detected	Detected	Detected	Detected	Detected
7.43%	Detected	Detected	Detected	Detected	Detected
8.65%	Detected	Detected	Detected	Detected	Detected
28.98%	Detected	Not detected	Detected	n/a[1]	Detected
29.47%	Detected	Detected	Detected	n/a[1]	Detected

[1] A fentanyl-related drug was detected by the technology but could not be explicitly named, meaning the detection was not applicable

Para-fluorofentanyl

Context: Between August 2024 and April 2025 (when the 114 limit of detection samples were collected), 36% (498) of the 1,372 drug samples expected to be (i.e., got or bought as) fentanyl and checked by Toronto's Drug Checking Service contained para-fluorofentanyl. The concentration (or amount) of para-fluorofentanyl was quantified in 78% (387) of those 498 samples. The median concentration of para-fluorofentanyl across those 387 samples was 1.6%. In March 2026, just before this performance assessment was shared publicly, 62% (73) of the 118 drug samples expected to be fentanyl and checked by Toronto's Drug Checking Service contained para-fluorofentanyl. The concentration of para-fluorofentanyl was quantified in 79% (58) of those 73 samples. The median concentration of para-fluorofentanyl across those 58 samples was 2.9%. It is therefore tremendously important to assess whether the technologies included in this performance assessment can detect para-fluorofentanyl at concentrations around 1%.

What we assessed: We measured whether para-fluorofentanyl was detected by Bruker's Alpha II FTIR, Scatr's Series One, Spectra Plasmonics' Amplifi ID (point-of-care scans *and* reachback), and Waters' RADIAN ASAP at each concentration detected by the reference method.

Steps to calculate: The precise concentration of para-fluorofentanyl reported by the reference method in each of 32 samples is listed in column 1 of Table 7 – each sample occupying its own row. Each of the remaining 5 columns is occupied by one of the technologies assessed. For each concentration detected by our reference method, we determined whether para-fluorofentanyl was detected by the technologies assessed.

Detections are colour-coded: Detections made are green, detections missed are red.

An example to assist with understanding Table 7: The reference method reported that para-fluorofentanyl accounted for 0.06% of one sample expected to be fentanyl. None of the assessed technologies detected para-fluorofentanyl in that sample.

Table 7. Para-fluorofentanyl limit of detection

% concentration of para-fluorofentanyl detected by reference method	Reference detections by:				
	Bruker's Alpha II FTIR	Scatr's Series One	Spectra Plasmonics' Amplifi ID: point-of-care scans	Spectra Plasmonics' Amplifi ID: reachback	Waters' RADIAN ASAP
0.06%	Not detected	Not detected	Not detected	Not detected	Not detected
0.06%	Not detected	Not detected	Not detected	Not detected	Not detected
0.06%	Not detected	Not detected	Not detected	n/a[1]	Not detected
0.07%	Not detected	Not detected	Not detected	Not detected	Not detected
0.10%	Not detected	Not detected	n/a[1]	Not detected	Not detected
0.12%	Not detected	Not detected	Not detected	Not detected	Not detected

0.16%	n/a[1]	Not detected	Not detected	Not detected	Not detected
0.17%	n/a[1]	Not detected	Not detected	Not detected	Not detected
0.19%	Not detected	Not detected	Not detected	Not detected	Not detected
0.20%	Detected	Not detected	Detected	Detected	Not detected
0.22%	Not detected	Not detected	Not detected	Not detected	Not detected
0.22%	Not detected	Not detected	Detected	Detected	Not detected
0.23%	Not detected	Not detected	Detected	Detected	Not detected
0.24%	Not detected	Not detected	Detected	Detected	Not detected
0.25%	Not detected	Not detected	Detected	Detected	Not detected
0.45%	Not detected	Not detected	Detected	Not detected	Not detected
0.49%	Not detected	Not detected	Detected	Detected	Not detected
0.56%	Not detected	Not detected	Detected	Detected	Not detected
1.04%	Not detected	Not detected	Detected	Detected	Not detected
1.22%	Detected	Not detected	Detected	Detected	Not detected
1.22%	Detected	Not detected	Detected	Detected	Not detected
1.47%	Detected	Not detected	Detected	Detected	Not detected
1.62%	Detected	Not detected	Detected	Detected	Not detected
2.08%	Detected	Not detected	Detected	Detected	Not detected
2.23%	Detected	Not detected	Detected	Detected	Not detected
2.33%	Detected	Not detected	Detected	Detected	Not detected

2.71%	Detected	Not detected	Detected	Detected	Not detected
3.08%	Detected	Not detected	Detected	Detected	Detected
3.22%	Detected	Not detected	Detected	Detected	Not detected
6.42%	Detected	Not detected	Detected	Detected	Detected
8.57%	Detected	Not detected	Detected	Detected	Detected
12.92%	Detected	Not detected	n/a[1]	n/a[1]	Detected

[1] A fentanyl-related drug was detected by the technology but could not be explicitly named, meaning the detection was not applicable

Ortho-methylfentanyl

Context: Between August 2024 and April 2025 (when the 114 limit of detection samples were collected), 39% (531) of the 1,372 drug samples expected to be (i.e., got or bought as) fentanyl and checked by Toronto's Drug Checking Service contained ortho-methylfentanyl. The concentration (or amount) of ortho-methylfentanyl was quantified in 63% (337) of those 531 samples. The median concentration of ortho-methylfentanyl across those 337 samples was 2.3%. In March 2026, just before this performance assessment was shared publicly, 8% (10) of the 118 drug samples expected to be fentanyl and checked by Toronto's Drug Checking Service contained ortho-methylfentanyl. The concentration of ortho-methylfentanyl was quantified in 90% (9) of those 10 samples. The median concentration of ortho-methylfentanyl across those 9 samples was 4.3%. It is therefore tremendously important to assess whether the technologies included in this performance assessment can detect ortho-methylfentanyl at concentrations around 1%.

What we assessed: We measured whether ortho-methylfentanyl was detected by Bruker's Alpha II FTIR, Scatr's Series One, Spectra Plasmonics' Amplifi ID (point-of-care scans *and* reachback), and Waters' RADIAN ASAP at each concentration detected by the reference method.

Steps to calculate: The precise concentration of ortho-methylfentanyl reported by the reference method in each of 42 samples is listed in column 1 of Table 8 – each sample occupying its own row. Each of the remaining 5 columns is occupied by one of the technologies assessed. For each concentration detected by our reference method, we determined whether ortho-methylfentanyl was detected by the technologies assessed.

Detections are colour-coded: Detections made are green, detections missed are red.

An example to assist with understanding Table 8: The reference method reported that ortho-methylfentanyl accounted for 0.06% of one sample expected to be fentanyl. None of the assessed technologies detected ortho-methylfentanyl in that sample.

Table 8. Ortho-methylfentanyl limit of detection

% concentration of ortho-methylfentanyl detected by reference method	Reference detections by:				
	Bruker's Alpha II FTIR	Scatr's Series One	Spectra Plasmonics' Amplifi ID: point-of-care scans	Spectra Plasmonics' Amplifi ID: reachback	Waters' RADIAN ASAP
0.06%	Not detected	Not detected	Not detected	Not detected	Not detected
0.08%	Not detected	Not detected	n/a[1]	Not detected	Not detected
0.13%	Not detected	Not detected	Not detected	Not detected	Not detected
0.22%	Not detected	Not detected	Not detected	Not detected	Not detected
0.23%	Not detected	Not detected	n/a[1]	Not detected	Not detected
0.24%	Not detected	Not detected	Not detected	Not detected	Not detected
0.25%	Not detected	Not detected	Not detected	Not detected	Not detected
0.34%	Not detected	Not detected	Not detected	Not detected	Not detected
0.50%	Not detected	Not detected	Not detected	Not detected	Not detected

0.52%	Not detected	Not detected	Not detected	Not detected	Not detected
0.64%	Not detected	Not detected	Not detected	Not detected	Not detected
0.65%	Not detected	Not detected	Not detected	Not detected	Not detected
0.76%	Not detected	Not detected	Not detected	Not detected	Not detected
0.83%	n/a[1]	Not detected	Not detected	Not detected	Not detected
0.99%	n/a[1]	Not detected	Not detected	Not detected	Not detected
1.59%	Not detected	Not detected	Not detected	Not detected	Not detected
1.80%	Not detected	Not detected	Not detected	Not detected	Detected
1.89%	Not detected	Not detected	Not detected	Not detected	Not detected
1.96%	Not detected	Not detected	Not detected	Not detected	Not detected
2.04%	Not detected	Not detected	Not detected	Not detected	Not detected
2.86%	Not detected	Not detected	Not detected	Not detected	Detected
3.05%	Not detected	Not detected	Not detected	Not detected	Not detected
3.91%	n/a[1]	Not detected	Not detected	Not detected	Detected
4.40%	n/a[1]	Not detected	Not detected	Not detected	Detected
4.56%	Not detected	Not detected	Not detected	Not detected	Detected
4.58%	Not detected	Not detected	Not detected	Not detected	Not detected
4.78%	n/a[1]	Not detected	Not detected	Not detected	Not detected
5.10%	Not detected	Not detected	Not detected	Not detected	Detected
5.50%	Detected	Not detected	Not detected	Not detected	Detected

5.58%	n/a[1]	Not detected	Not detected	Not detected	Not detected
5.68%	Not detected	Not detected	n/a[1]	Not detected	Detected
5.86%	Not detected	Not detected	Not detected	Not detected	Detected
5.97%	Not detected	Not detected	Not detected	Not detected	Detected
6.31%	Not detected	Not detected	Not detected	Not detected	Detected
6.33%	Not detected	Not detected	Not detected	Not detected	Detected
6.39%	Not detected	Not detected	Not detected	Not detected	Detected
6.49%	Not detected	Not detected	Not detected	Not detected	Detected
6.50%	Not detected	Not detected	Not detected	Not detected	Detected
8.30%	Detected	Not detected	Not detected	Not detected	Detected
12.68%	Detected	Not detected	Not detected	Not detected	Detected
20.70%	Detected	Not detected	n/a[1]	n/a[1]	Detected
22.46%	Detected	Not detected	Not detected	Not detected	Detected

[1] A fentanyl-related drug was detected by the technology but could not be explicitly named, meaning the detection was not applicable

Medetomidine

Context: Between August 2024 and April 2025 (when the 114 limit of detection samples were collected), 28% (381) of the 1,372 drug samples expected to be (i.e., got or bought as) fentanyl and checked by Toronto's Drug Checking Service contained medetomidine. The concentration (or amount) of medetomidine was quantified in 73% (277) of those 381 samples. The median concentration of medetomidine across those 277 samples was 0.4%. In March 2026, just before this performance assessment was shared publicly, 78% (92) of the 118 drug samples expected to be fentanyl and checked by Toronto's Drug Checking Service contained medetomidine. The concentration of

medetomidine was quantified in 85% (78) of those 92 samples. The median concentration of medetomidine across those 78 samples was 1.2%. It is therefore tremendously important to assess whether the technologies included in this performance assessment can detect medetomidine at concentrations around 1%.

What we assessed: We measured whether medetomidine was detected by Bruker's Alpha II FTIR, Scatr's Series One, Spectra Plasmonics' Amplifi ID (point-of-care scans *and* reachback), and Waters' RADIAN ASAP at each concentration detected by the reference method.

Steps to calculate: The precise concentration of medetomidine reported by the reference method in each of 36 samples is listed in column 1 of Table 9 – each sample occupying its own row. Each of the remaining 5 columns is occupied by one of the technologies assessed. For each concentration detected by our reference method, we determined whether medetomidine was detected by the technologies assessed.

Detections are colour-coded: Detections made are green, detections missed are red.

An example to assist with understanding Table 9: The reference method reported that medetomidine accounted for 0.05% of one sample expected to be fentanyl. None of the assessed technologies detected medetomidine in that sample.

Table 9. Medetomidine limit of detection

% concentration of medetomidine detected by reference method	Reference detections by:				
	Bruker's Alpha II FTIR	Scatr's Series One	Spectra Plasmonics' Amplifi ID: point-of-care scans	Spectra Plasmonics' Amplifi ID: reachback	Waters' RADIAN ASAP
0.05%	Not detected	Not detected	Not detected	Not detected	Not detected
0.07%	Not detected	Not detected	Not detected	Not detected	Not detected
0.07%	Not detected	Not detected	Not detected	Not detected	Not detected
0.07%	Not detected	Not detected	Not detected	Not detected	Not detected

0.08%	Not detected	Not detected	Not detected	Not detected	Not detected
0.08%	Not detected	Not detected	Not detected	Not detected	Not detected
0.08%	Not detected	Not detected	Not detected	Not detected	Not detected
0.09%	Not detected	Not detected	Not detected	Not detected	Not detected
0.10%	Not detected	Not detected	Not detected	Not detected	Not detected
0.11%	Not detected	Not detected	Not detected	Not detected	Not detected
0.11%	Not detected	Not detected	Not detected	Not detected	Not detected
0.13%	Not detected	Not detected	Not detected	Not detected	Not detected
0.13%	Not detected	Not detected	Not detected	Not detected	Not detected
0.14%	Not detected	Not detected	Not detected	Not detected	Not detected
0.15%	Not detected	Not detected	Not detected	Not detected	Not detected
0.15%	Not detected	Not detected	Not detected	Not detected	Not detected
0.16%	Not detected	Not detected	Detected	Detected	Not detected
0.18%	Not detected	Not detected	Not detected	Not detected	Not detected
0.25%	Not detected	Not detected	Not detected	Not detected	Not detected
0.28%	Not detected	Not detected	Not detected	Not detected	Not detected
0.38%	Not detected	Not detected	Not detected	Not detected	Not detected
0.39%	Not detected	Not detected	Not detected	Not detected	Not detected
0.43%	Not detected	Not detected	Detected	Not detected	Not detected
0.44%	Not detected	Not detected	Detected	Not detected	Not detected

0.47%	Not detected	Not detected	Not detected	Not detected	Detected
0.58%	Not detected	Not detected	Not detected	Not detected	Not detected
0.65%	Not detected	Not detected	Not detected	Not detected	Not detected
0.70%	Not detected	Not detected	Detected	Detected	Not detected
0.80%	Not detected	Not detected	Not detected	Not detected	Not detected
1.01%	Not detected	Detected	Not detected	Not detected	Detected
1.12%	Not detected	Not detected	Not detected	Not detected	Not detected
1.18%	Not detected	Not detected	Detected	Detected	Not detected
2.53%	Not detected	Not detected	Not detected	Not detected	Not detected
4.43%	Not detected	Not detected	Not detected	Not detected	Detected
7.25%	Detected	Detected	Detected	Detected	Detected
8.11%	Detected	Not detected	Detected	Detected	Detected

Xylazine

Context: Between August 2024 and April 2025 (when the 114 limit of detection samples were collected), 27% (375) of the 1,372 drug samples expected to be (i.e., got or bought as) fentanyl and checked by Toronto's Drug Checking Service contained xylazine. The concentration (or amount) of xylazine was quantified in 85% (319) of those 375 samples. The median concentration of xylazine across those 319 samples was 0.6%. In March 2026, just before this performance assessment was shared publicly, 6% (7) of the 118 drug samples expected to be fentanyl and checked by Toronto's Drug Checking Service contained xylazine. The concentration of xylazine was quantified in 100% (7) of those 7 samples. The median concentration of xylazine across those 7 samples was 1.3%. It is therefore tremendously important to assess whether the technologies included in this performance assessment can detect xylazine at concentrations around 1%.

What we assessed: We measured whether xylazine was detected by Bruker's Alpha II FTIR, Scatr's Series One, Spectra Plasmonics' Amplifi ID (point-of-care scans *and* reachback), and Waters' RADIAN ASAP at each concentration detected by the reference method.

Steps to calculate: The precise concentration of xylazine reported by the reference method in each of 39 samples is listed in column 1 of Table 10 – each sample occupying its own row. Each of the remaining 5 columns is occupied by one of the technologies assessed. For each concentration detected by our reference method, we determined whether xylazine was detected by the technologies assessed.

Detections are colour-coded: Detections made are green, detections missed are red.

An example to assist with understanding Table 10: The reference method reported that xylazine accounted for 0.06% of one sample expected to be fentanyl. None of the assessed technologies detected xylazine in that sample.

Table 10. Xylazine limit of detection

% concentration of xylazine detected by reference method	Reference detections by:				
	Bruker's Alpha II FTIR	Scatr's Series One	Spectra Plasmonics' Amplifi ID: point-of-care scans	Spectra Plasmonics' Amplifi ID: reachback	Waters' RADIAN ASAP
0.06%	Not detected	Not detected	Not detected	Not detected	Not detected
0.06%	Not detected	Not detected	Not detected	Not detected	Not detected
0.08%	Not detected	Not detected	Not detected	Not detected	Not detected
0.08%	Not detected	Not detected	Not detected	Not detected	Not detected
0.09%	Not detected	Not detected	Not detected	Not detected	Not detected
0.12%	Not detected	Not detected	Not detected	Not detected	Not detected
0.14%	Not detected	Not detected	Not detected	Not detected	Not detected

0.14%	Not detected	Not detected	Not detected	Not detected	Not detected
0.15%	Not detected	Not detected	Not detected	Not detected	Not detected
0.17%	Not detected	Not detected	Not detected	Not detected	Not detected
0.19%	Not detected	Not detected	Not detected	Not detected	Not detected
0.20%	Not detected	Not detected	Not detected	Not detected	Not detected
0.23%	Not detected	Not detected	Not detected	Not detected	Not detected
0.24%	Not detected	Not detected	Not detected	Not detected	Not detected
0.26%	Not detected	Not detected	Not detected	Not detected	Not detected
0.27%	Not detected	Not detected	Detected	Detected	Not detected
0.28%	Not detected	Not detected	Not detected	Not detected	Not detected
0.29%	Not detected	Not detected	Not detected	Not detected	Not detected
0.29%	Not detected	Not detected	Not detected	Not detected	Not detected
0.31%	Not detected	Not detected	Detected	Detected	Not detected
0.32%	Not detected	Not detected	Not detected	Not detected	Not detected
0.34%	Not detected	Not detected	Detected	Detected	Not detected
0.38%	Not detected	Not detected	Not detected	Not detected	Not detected
0.38%	Not detected	Not detected	Not detected	Not detected	Not detected
0.54%	Not detected	Not detected	Not detected	Not detected	Detected
0.63%	Not detected	Not detected	Detected	Detected	Not detected
0.71%	Not detected	Not detected	Detected	Detected	Not detected

1.05%	Not detected	Not detected	Detected	Detected	Not detected
1.07%	Not detected	Not detected	Detected	Detected	Not detected
1.26%	Not detected	Not detected	Not detected	Not detected	Not detected
1.28%	Not detected	Not detected	Not detected	Not detected	Not detected
1.32%	Not detected	Not detected	Detected	Detected	Not detected
1.35%	Not detected	Not detected	Not detected	Not detected	Not detected
2.32%	Detected	Not detected	Detected	Detected	Detected
4.61%	Detected	Not detected	Detected	Detected	Detected
5.04%	Not detected	Not detected	Detected	Detected	Detected
6.00%	Detected	Not detected	Detected	Detected	Detected
7.64%	Detected	Not detected	Detected	Detected	Detected
8.85%	Detected	Not detected	Detected	Detected	Detected

Bromazolam

Context: Between August 2024 and April 2025 (when the 114 limit of detection samples were collected), 24% (325) of the 1,372 drug samples expected to be (i.e., got or bought as) fentanyl and checked by Toronto's Drug Checking Service contained bromazolam. The concentration (or amount) of bromazolam was quantified in 89% (292) of those 325 samples. The median concentration of bromazolam across those 292 samples was 1.6%. In March 2026, just before this performance assessment was shared publicly, 5% (6) of the 118 drug samples expected to be fentanyl and checked by Toronto's Drug Checking Service contained bromazolam. The concentration of bromazolam was quantified in 100% (6) of those 6 samples. The median concentration of bromazolam across those 6 samples was 0.9%. It is therefore tremendously important to assess whether the technologies included in this performance assessment can detect bromazolam at concentrations around 1%.

What we assessed: We measured whether bromazolam was detected by Bruker's Alpha II FTIR, Scatr's Series One, Spectra Plasmonics' Amplifi ID (point-of-care scans *and* reachback), and Waters' RADIAN ASAP at each concentration detected by the reference method.

Steps to calculate: The precise concentration of bromazolam reported by the reference method in each of 25 samples is listed in column 1 of Table 11 – each sample occupying its own row. Each of the remaining 5 columns is occupied by one of the technologies assessed. For each concentration detected by our reference method, we determined whether bromazolam was detected by the technologies assessed.

Detections are colour-coded: Detections made are green, detections missed are red.

An example to assist with understanding Table 11: The reference method reported that bromazolam accounted for 0.13% of one sample expected to be fentanyl. None of the assessed technologies detected bromazolam in that sample.

Table 11. Bromazolam limit of detection

% concentration of bromazolam detected by reference method	Reference detections by:				
	Bruker's Alpha II FTIR	Scatr's Series One	Spectra Plasmonics' Amplifi ID: point-of-care scans	Spectra Plasmonics' Amplifi ID: reachback	Waters' RADIAN ASAP
0.13%	Not detected	Not detected	Not detected	Not detected	Not detected
0.36%	Not detected	Not detected	Detected	Detected	Not detected
0.64%	Not detected	Not detected	Not detected	Not detected	Not detected
0.71%	Not detected	Not detected	n/a[1]	n/a[1]	Not detected
0.73%	Not detected	Not detected	Not detected	Not detected	Not detected
0.75%	Not detected	Not detected	Not detected	Not detected	Not detected

0.94%	Not detected	Not detected	Detected	Detected	Not detected
0.94%	Not detected	Not detected	Detected	Detected	Not detected
1.00%	Not detected	Not detected	Detected	Detected	Not detected
1.09%	Not detected	Not detected	Detected	Detected	Not detected
1.16%	Not detected	Not detected	Detected	Detected	Not detected
1.16%	Not detected	Not detected	Detected	Detected	Not detected
1.21%	Not detected	Not detected	n/a[1]	n/a[1]	Not detected
1.41%	Not detected	Not detected	Not detected	Not detected	Not detected
1.43%	Not detected	Not detected	Not detected	Not detected	Not detected
1.69%	Not detected	Not detected	Not detected	Not detected	Not detected
1.78%	Not detected	Not detected	Not detected	Detected	Not detected
2.20%	Not detected	Not detected	n/a[1]	n/a[1]	Not detected
2.44%	Not detected	Not detected	n/a[1]	n/a[1]	Not detected
2.79%	Not detected	Not detected	Not detected	Not detected	Not detected
2.98%	Not detected	Not detected	Not detected	Not detected	Not detected
3.11%	Not detected	Not detected	Not detected	Not detected	Not detected
3.31%	Not detected	Not detected	Detected	Detected	Not detected
3.56%	Not detected	Not detected	Detected	Detected	Not detected
6.52%	Detected	Detected	Detected	Detected	Detected

[1] A benzodiazepine-related drug was detected by the technology but could not be explicitly named, meaning the detection was not applicable

Caffeine

Context: Between August 2024 and April 2025 (when the 114 limit of detection samples were collected), 94% (1,286) of the 1,372 drug samples expected to be (i.e., got or bought as) fentanyl and checked by Toronto's Drug Checking Service contained caffeine. The concentration (or amount) of caffeine was quantified in 91% (1,165) of those 1,286 samples. The median concentration of caffeine across those 1,165 samples was 20.7%. In March 2026, just before this performance assessment was shared publicly, 87% (103) of the 118 drug samples expected to be fentanyl and checked by Toronto's Drug Checking Service contained caffeine. The concentration of caffeine was quantified in 87% (90) of those 103 samples. The median concentration of caffeine across those 90 samples was 17.4%. Given its prevalence, it is therefore tremendously important to assess at which concentrations the technologies included in this performance assessment can detect caffeine.

What we assessed: We measured whether caffeine was detected by Bruker's Alpha II FTIR, Scatr's Series One, Spectra Plasmonics' Amplifi ID (point-of-care scans *and* reachback), and Waters' RADIAN ASAP at each concentration detected by the reference method.

Steps to calculate: The precise concentration of caffeine reported by the reference method in each of 112 samples is listed in column 1 of Table 12 – each sample occupying its own row. Each of the remaining 5 columns is occupied by one of the technologies assessed. For each concentration detected by our reference method, we determined whether caffeine was detected by the technologies assessed.

Detections are colour-coded: Detections made are green, detections missed are red.

An example to assist with understanding Table 12: The reference method reported that caffeine accounted for 2.95% of one sample expected to be fentanyl. Only Waters' Radian ASAP detected caffeine in that sample.

Table 12. Caffeine limit of detection

% concentration of caffeine detected by reference method	Reference detections by:				
	Bruker's Alpha II FTIR	Scatr's Series One	Spectra Plasmonics' Amplifi ID: point-of-care scans	Spectra Plasmonics' Amplifi ID: reachback	Waters' RADIAN ASAP
2.95%	Not detected	Not detected	Not detected	Not detected	Detected
3.09%	Detected	Not detected	Not detected	Not detected	Detected
3.94%	Detected	Not detected	Not detected	Not detected	Detected
3.99%	Detected	Not detected	Not detected	Not detected	Detected
4.25%	Detected	Not detected	Not detected	Not detected	Detected
4.46%	Detected	Not detected	Not detected	Not detected	Detected
5.18%	Detected	Not detected	Not detected	Not detected	Detected
5.23%	Detected	Detected	Not detected	Not detected	Detected
5.67%	Detected	Not detected	Not detected	Not detected	Detected
6.33%	Detected	Not detected	Not detected	Not detected	Detected
6.56%	Detected	Not detected	Not detected	Not detected	Detected
7.59%	Detected	Detected	Not detected	Not detected	Detected
8.05%	Detected	Detected	Not detected	Not detected	Detected
9.60%	Detected	Not detected	Not detected	Not detected	Detected
10.30%	Detected	Not detected	Not detected	Not detected	Detected
10.96%	Detected	Detected	Detected	Detected	Detected

11.66%	Detected	Not detected	Detected	Detected	Detected
13.23%	Detected	Not detected	Not detected	Not detected	Detected
13.30%	Detected	Not detected	Detected	Detected	Detected
13.39%	Detected	Detected	Not detected	Detected	Detected
15.62%	Detected	Detected	Not detected	Not detected	Detected
15.91%	Detected	Detected	Detected	Detected	Detected
16.27%	Detected	Detected	Detected	Detected	Detected
16.37%	Detected	Not detected	Not detected	Not detected	Detected
16.52%	Detected	Detected	Not detected	Not detected	Detected
16.86%	Detected	Not detected	Not detected	Not detected	Detected
17.04%	Detected	Detected	Not detected	Not detected	Detected
17.27%	Detected	Detected	Detected	Detected	Detected
17.44%	Detected	Detected	Not detected	Not detected	Detected
17.87%	Detected	Detected	Detected	Detected	Detected
18.07%	Detected	Detected	Not detected	Not detected	Detected
18.28%	Detected	Detected	Not detected	Not detected	Detected
18.29%	Detected	Detected	Not detected	Not detected	Detected
18.38%	Detected	Detected	Not detected	Not detected	Detected
18.51%	Detected	Detected	Detected	Detected	Detected
18.68%	Detected	Detected	Not detected	Detected	Detected

20.00%	Detected	Detected	Detected	Detected	Detected
20.10%	Detected	Not detected	Not detected	Not detected	Detected
20.12%	Detected	Detected	Detected	Detected	Detected
20.31%	Detected	Detected	Not detected	Detected	Detected
20.43%	Detected	Detected	Detected	Detected	Detected
20.93%	Detected	Detected	Not detected	Not detected	Detected
21.38%	Detected	Detected	Detected	Detected	Detected
21.42%	Detected	Not detected	Detected	Detected	Detected
22.17%	Detected	Detected	Not detected	Detected	Detected
22.37%	Detected	Detected	Not detected	Not detected	Detected
22.44%	Detected	Detected	Detected	Detected	Detected
22.89%	Detected	Detected	Not detected	Not detected	Detected
22.91%	Detected	Detected	Detected	Detected	Detected
23.17%	Detected	Detected	Detected	Detected	Detected
23.34%	Detected	Detected	Detected	Detected	Detected
23.63%	Detected	Detected	Detected	Detected	Detected
23.76%	Detected	Detected	Detected	Detected	Detected
23.78%	Detected	Detected	Detected	Detected	Detected
23.94%	Detected	Detected	Detected	Detected	Detected
23.98%	Detected	Detected	Detected	Detected	Detected

24.36%	Detected	Detected	Detected	Detected	Detected
24.36%	Detected	Detected	Detected	Detected	Detected
26.34%	Detected	Detected	Not detected	Not detected	Detected
26.66%	Detected	Detected	Detected	Detected	Detected
26.87%	Detected	Detected	Detected	Detected	Detected
26.90%	Detected	Detected	Detected	Detected	Detected
26.98%	Detected	Detected	Detected	Detected	Detected
26.99%	Detected	Detected	Detected	Detected	Detected
27.88%	Detected	Detected	Detected	Detected	Detected
28.63%	Detected	Detected	Detected	Detected	Detected
29.03%	Detected	Detected	Detected	Detected	Detected
29.09%	Detected	Detected	Not detected	Not detected	Detected
29.19%	Detected	Detected	Detected	Detected	Detected
29.33%	Detected	Detected	Detected	Detected	Detected
29.39%	Detected	Detected	Detected	Detected	Detected
30.76%	Detected	Detected	Detected	Detected	Detected
30.81%	Detected	Detected	Detected	Not detected	Detected
31.48%	Detected	Detected	Not detected	Detected	Detected
31.55%	Detected	Not detected	Not detected	Not detected	Detected
31.95%	Detected	Detected	Detected	Detected	Detected

32.66%	Detected	Detected	Detected	Detected	Detected
33.25%	Detected	Detected	Detected	Detected	Detected
33.69%	Detected	Detected	Detected	Detected	Detected
33.80%	Detected	Detected	Detected	Detected	Detected
34.05%	Detected	Detected	Detected	Detected	Detected
34.08%	Detected	Detected	Detected	Detected	Detected
34.18%	Detected	Detected	Detected	Detected	Detected
34.33%	Detected	Detected	Detected	Detected	Detected
34.35%	Detected	Detected	Detected	Detected	Detected
34.91%	Detected	Detected	Detected	Detected	Detected
35.03%	Detected	Detected	Detected	Detected	Detected
35.36%	Detected	Detected	Detected	Detected	Detected
35.67%	Detected	Detected	Detected	Detected	Detected
37.16%	Detected	Detected	Detected	Detected	Detected
37.25%	Detected	Detected	Detected	Detected	Detected
37.45%	Detected	Detected	Detected	Detected	Detected
37.71%	Detected	Detected	Detected	Detected	Detected
37.83%	Detected	Detected	Detected	Detected	Detected
39.02%	Detected	Detected	Not detected	Detected	Detected
41.11%	Detected	Detected	Detected	Detected	Detected

42.47%	Detected	Detected	Detected	Detected	Detected
44.69%	Detected	Detected	Detected	Detected	Detected
46.70%	Detected	Not detected	Detected	Detected	Detected
47.57%	Detected	Detected	Detected	Detected	Detected
48.57%	Detected	Detected	Detected	Detected	Detected
50.82%	Detected	Detected	Detected	Detected	Detected
51.12%	Detected	Detected	Detected	Detected	Detected
52.90%	Detected	Detected	Detected	Detected	Detected
53.60%	Detected	Detected	Detected	Detected	Detected
54.51%	Detected	Detected	Detected	Detected	Detected
56.66%	Detected	Detected	Detected	Detected	Detected
57.22%	Detected	Detected	Detected	Detected	Detected

Reproducibility

Measuring reproducibility involved determining the abilities of Bruker's Alpha II FTIR, Scatr's Series One, Spectra Plasmonics' Amplifi ID (point-of-care scans *and* reachback), and Waters' RADIAN ASAP to replicate the results it reported.

The reproducibility component of this performance assessment included 11 samples. Of those 11 samples, 5 were expected to be fentanyl, 2 methamphetamine, 1 alprazolam (Xanax), 1 cocaine, 1 ketamine, and 1 MDMA.

Reproducibility rate

What we assessed: The reproducibility component of this performance assessment took place over 3 days. On each of those 3 days, each of the 11 reproducibility samples was analyzed 3 times by each of the technologies assessed. For Spectra Plasmonics' Amplifi ID, each sample was analyzed by the bulk *and* trace scans (reachback is not included in this component of our assessment). Results for each of the 9 analyses were compared to one another to measure how often Bruker's Alpha II FTIR, Scatr's Series One, Spectra Plasmonics' Amplifi ID (bulk *and* trace scans), and Waters' RADIAN ASAP replicated the results it reported.

Steps to calculate: Each of the 11 reproducibility samples, as well as all reproducibility samples collectively, are listed in column 1 of Table 13, each occupying their own row. Each of the remaining 5 columns is occupied by one of the technologies assessed. For each reproducibility sample, we determined the most common result reported by each technology. We then determined how often the most common result was reported for each sample by each assessed technology. For each sample and each technology, the number of most commonly reported results was divided by the total number of analyses (9) to determine the reproducibility rate, which is reported as a percentage. For the last row of Table 13, we calculated the average reproducibility rate across the 11 samples for each assessed technology.

Reproducibility rates are colour-coded: Green means the most common result was reported across 85% or more of the 9 analyses, yellow means the most common result was reported across 50% to 84% of the 9 analyses, and red means the most common result was reported across less than 50% of the 9 analyses.

An example to assist with understanding Table 13: The most common result reported by Bruker's Alpha II FTIR for the sample expected to be cocaine was cocaine + phenacetin. Of the 9 analyses of the cocaine sample by Bruker's Alpha II FTIR, cocaine + phenacetin was detected 6 times. Dividing 6 by 9 equals a reproducibility rate of 67% for expected cocaine by Bruker's Alpha II FTIR.

Table 13. Reproducibility rate

Samples by expected drug	% of results that were replicated by:				
	Bruker's Alpha II FTIR	Scatr's Series One	Spectra Plasmonics' Amplifi ID: bulk scan	Spectra Plasmonics' Amplifi ID: trace scan	Waters' RADIAN ASAP
Alprazolam	100%	56%	100%	100%	100%
Cocaine	67%	33%	100%	100%	100%
Fentanyl1	100%	100%	89%	89%	56%
Fentanyl2	100%	100%	100%	56%	56%
Fentanyl3	100%	33%	67%	44%	100%
Fentanyl4	100%	67%	100%	100%	89%
Fentanyl5	100%	100%	89%	56%	100%
Ketamine	100%	100%	100%	33%	100%
MDMA	100%	100%	100%	33%	100%
Methamphetamine1	100%	67%	100%	33%	100%
Methamphetamine2	100%	100%	100%	100%	100%
All	**97%**	**78%**	**95%**	**68%**	**91%**

Reproducing the reference result

What we assessed: The reproducibility component of this performance assessment took place over 3 days. On each of those 3 days, each of the 11 reproducibility samples was analyzed 3 times by each of the technologies assessed. For Spectra Plasmonics' Amplifi ID, each sample

was analyzed by the bulk *and* trace scans (reachback is not included in this component of our assessment). We measured how often the assessed technologies replicated the results it reported. We did this by determining the most common result reported by each technology for each reproducibility sample and then dividing the number of most commonly reported results by the 9 analyses. However, the most common result reported is not necessarily the correct result.

We therefore then measured how often Bruker's Alpha II FTIR, Scatr's Series One, Spectra Plasmonics' Amplifi ID (point-of-care scans), and Waters' RADIAN ASAP reported the reference result perfectly (i.e., a perfect match) across the 9 analyses for each reproducibility sample. For this component of measuring reproducibility, we combined results reported by Spectra Plasmonics' Amplifi ID bulk and trace scans for a single Spectra Plasmonics' Amplifi ID (point-of-care scans) result.

Steps to calculate: Each of the 11 reproducibility samples, as well as all reproducibility samples collectively, are listed in column 1 of Table 14, each occupying their own row. Each of the remaining 4 columns is occupied by one of the technologies assessed. For each reproducibility sample, we determined how often the result reported by each technology matched the reference result. If the result reported by the assessed technology matched the reference result exactly, we counted that result as a perfect match. We then divided the number of perfect matches by the total number of analyses (9) to determine how often the reference result was reproduced. The rate at which the reference result was reproduced is reported as a percentage. For the last row of Table 14, we calculated the average rate at which the reference result was reproduced across the 11 samples for each assessed technology.

Perfect matches are colour-coded: Green means the reference result was reproduced across 85% or more of the 9 analyses, yellow means the reference result was reproduced across 50% to 84% of the 9 analyses, and red means the reference result was reproduced across less than 50% of the 9 analyses.

An example to assist with understanding Table 14: The reference result for the reproducibility sample expected to be alprazolam was alprazolam. Bruker's Alpha II FTIR did not detect any drugs across any of the 9 reproducibility analyses of the alprazolam sample, meaning there were no perfect matches. Scatr's Series One did not detect any drugs in 6 of the 9 reproducibility analyses of the alprazolam sample and reported hydromorphone in the other 3, meaning there were no perfect matches. Spectra Plasmonics' Amplifi ID (point-of-care scans) did not report any drugs in 3 of the 9 reproducibility analyses of the alprazolam sample and reported bromazolam in the other 6, meaning

there were no perfect matches. Waters' Radian ASAP reported alprazolam as the only drug present in each of the 9 reproducibility analyses of the alprazolam sample, meaning it reproduced the reference result 100% of the time.

Table 14. Reproducing the reference result

Samples by expected drug	% of perfectly reported reference results by:			
	Bruker's Alpha II FTIR	**Scatr's Series One**	**Spectra Plasmonics' Amplifi ID: point-of-care scans**	**Waters' RADIAN ASAP**
Alprazolam	0%	0%	0%	100%
Cocaine	67%	67%	0%	100%
Fentanyl1	0%	0%	0%	22%
Fentanyl2	0%	0%	0%	0%
Fentanyl3	0%	0%	0%	0%
Fentanyl4	0%	0%	0%	0%
Fentanyl5	0%	0%	0%	0%
Ketamine	100%	100%	33%	100%
MDMA	100%	100%	44%	0%
Methamphetamine1	100%	0%	33%	0%
Methamphetamine2	100%	100%	100%	0%
All	**42%**	**33%**	**19%**	**29%**

We are committed to ensuring our public health and safety program adds value to the communities it serves. If you have any questions, comments, or feedback about this resource or our program, please contact hello@drugchecking.community.

Ontario's Drug Checking Community. Performance assessment of Bruker's Alpha II FTIR, Scatr's Series One, Spectra Plasmonics' Amplifi ID, and Waters' RADIAN ASAP. 2026 April.
Available at: **www.drugchecking.community/resource/performance-assessment/**.