

W07 Applications, Implementation, and the Future of Direct Analysis in Real-Time Mass Spectrometry (DART®-MS) in Forensic Laboratories

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Learning Overview: The goals of this presentation are to inform attendees of: (1) the fundamentals of how DART®-MS operates; (2) the current applications of DART®-MS in forensic laboratories; (3) what the practical considerations for implementation of DART®-MS are, including site planning, validation, testifying, and designing a workflow; (4) resources available to assist in the implementation process; and (5) the current state of research in the field of DART®-MS.

Impact on the Forensic Science Community: This workshop will impact the forensic science community by providing practitioners, laboratory managers, and legal personnel with the necessary information to understand the strengths, weaknesses, and capabilities of ambient mass spectrometry systems, specifically DART®-MS. This information is crucial for the laboratories that currently use the technology and for laboratories that are considering implementation of this technology.

The aim of this workshop is to provide the necessary information to understand or expand current knowledge of DART®-MS while providing perspectives that will allow attendees to develop strategies for implementation, validation, and the ability to confidently testify. DART®-MS is one of many existing Ambient Ionization Mass Spectrometry (AIMS) technologies and is one of the few that have been successfully applied to forensic science. The ability of the technique to analyze a wide array of samples in a matter of seconds with little-to-no sample preparation makes DART®-MS ideally suited for forensic disciplines such as drug chemistry, toxicology, and trace evidence.

In the forensic science community, DART®-MS has been utilized for over a decade with much of the use coming from the screening of samples for the presence of drugs. DART®-MS has been shown to be a powerful tool for the analysis of a range of drug classes and sample forms (i.e., powders, pills, etc.) that include illicit and pharmaceutical-grade materials. Other areas where DART®-MS has been deployed include inks, explosives, lotions, lubricants, paints, and general unknowns. The technology has also been applied to more unique forensic applications, such as speciation of woods and analysis of cosmetics. This workshop will provide the practitioner viewpoint on many of these applications. There is also a large, and diverse, body of ongoing research that is related to existing and new forensic applications. These efforts are focused on topics including instrument modifications for more repeatable analyses, understanding ion chemistries, coupling with miniature mass spectrometers for screening purposes, developing new data treatment methods allowing for chemometrics, and even 2D chemical imaging. These and other efforts will be discussed.

With the implementation of any new technology, such as DART®-MS, practitioners have to be familiar with the fundamentals. They must also be able to validate the instrumentation and be prepared to defend their analyses in court. This workshop will aim to address these needs by providing attendees with considerations for implementation as well as validation and defending the technology during testimony. The goal of this workshop is to provide current, new, and potential users of DART®-MS, or any AIMS technique, with important information from implementation through the future of the technology.

DART®-MS, Mass Spectrometry, Implementation