

## Overview

Use methods with the DART SVP to generate consistent results for up to 96 samples at a time. Temperature profiling can be used to determine optimal thermal settings and custom methods can be designed to solve your unique experiment.

## Introduction

Making Direct Analysis in Real Time (DART) mass spectrometry quantitative requires repeatable sample positioning, accurate timing for analyte desorption, and control of experimental conditions such as gas temperature, which may be different for a series of experiments. As sampling methods for DART-MS have been developed over the past year, more significant control of the external automation hardware has been incorporated, resulting in more consistent and reliable operation during the entire experiment. An internal method system for the DART SVP has enabled more complex sample introduction and control of the DART ionization source, which is integrated with commercial LC-MS instruments, permitting the creation of novel experimental methods.

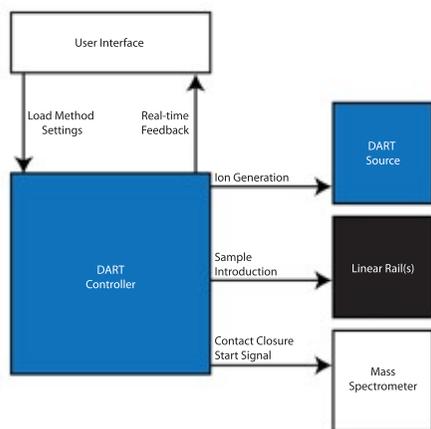


Figure 1 - Method Control Flow

The method is loaded on the DART Controller and runs until finished, even if the user interface goes into standby. It controls the DART source to set the ionization mode and heater temperature, the linear rails to present the sample, and the mass spectrometer to start the data file.

## Methods



Figure 2 - Method User Interface

Several methods come pre installed with the DART SVP software. These methods include:

- 12 DIP-it Temperature Profile
- 12 DIP-it Survey
- TLC Plate Scanner
- 10 Tablet Temperature Profile
- 10 Tablet Survey
- 1-D Transmission Temperature Range
- 1-D Transmission Temperature Profile
- 1-D Transmission Survey
- 3-D Imaging
- 3-D Glass Inserts
- X-Z Transmission Survey

These methods all have customizable parameters, such as exposure time; introduction speed; time between samples; and ionization mode. Multiple copies of the same method can be saved with different parameters.

## How it Works

An XML file on the SVP Controller web server contains a list of methods with their base command sets and edit able variables. User settings are stored in permanent memory, so they are not lost when a new software update is available (as of version 3.0). As new methods are developed, they are added to the latest version, or to a custom build of the software.

When a method is loaded, the user interface generates a command string and sends it to the web server. The controller parses the command set and breaks it into multiple action parts: initialization, shutdown, actions for each sample, and actions every X<sup>th</sup> sample. The actions are executed when the start command is sent and will run until finished, paused, stopped, or an error occurs.

## Sample Modules

Achieving optimal quantitative results using DART requires repeatable sample introduction and placement. The DART SVP system has a two dimensional automation system with snap in experiment modules. Up to 96 samples can be run in a single experiment.

Methods work in conjunction with experiment modules to accurately place the sample in the DART beam.



Figure 3 - Sample Modules

### Capacity:

- DIPit™ Holder - 12 Samples
- DAPit™ Tray - 48 Samples
- 1-D Transmission - 10 Samples
- X-Z Transmission - 96 Samples
- TLC Thin Plate - 10 Samples
- Tablet Carrier - 10 Samples (not pictured)
- Single Tip Pusher - 1 Sample (not pictured)

## Custom Methods

For novel experiments, unique methods can be written to meet specific goals. For example, the first transmission module and temperature range method was created for the FDA to analyze pesticides on the surface of fruits. They used polyethylene swabs to collect the sample and presented them to the DART with the transmission module. Certain pesticides presented themselves at different temperatures and the temperature range method allowed for that data to be collected in a single run.



Figure 4 - Transmission Module

## Results

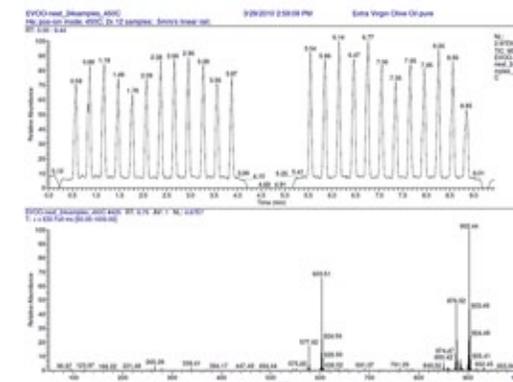


Figure 5 - Olive Oil Chromatogram + Spectra

The above data was collected while running the 12 DIP-it Survey method. Olive oil was applied to the end of the glass capillary DIP-it samplers and placed in the module.

The Temperature Profile method was used first to identify 450°C as the optimal temperature for this sample.

The method was run twice in less than 10 minutes and produced peaks that were evenly spaced and very comparable to each other.

## Conclusion

Methods are a convenient way to automate the DART sampling process and produce clean, repeatable results. The flexibility of the design allows for custom methods to be developed to meet the needs of unique applications. Snap in modules make it quick and easy to load prepared samples and can be custom designed to hold a variety of objects. Data produced using methods is both qualitative and quantitative.

