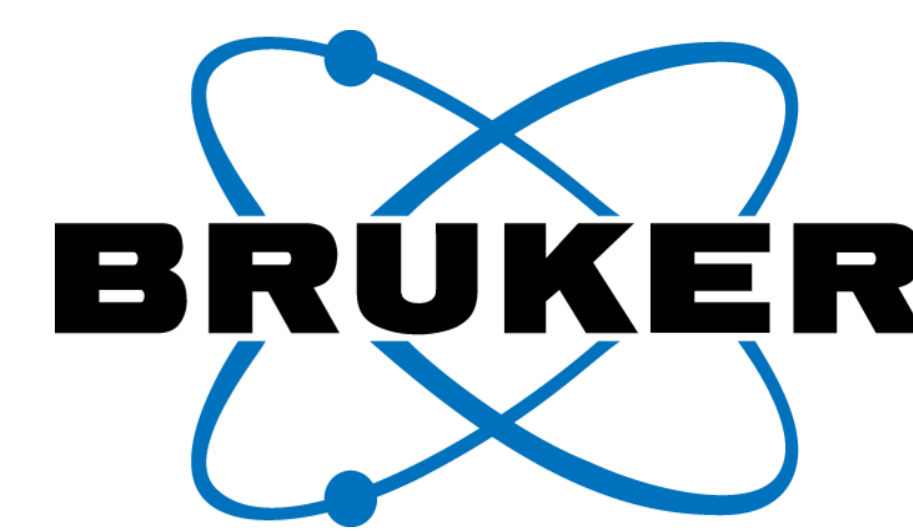


# Strategies for assessing and monitoring consistent quality in MALDI Imaging



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## Introduction

MALDI Imaging is an established method to access the spatial distribution of a wide range of analytes, directly from tissue sections. Running a cohort of MALDI Imaging experiments not only requires consistent and precise sample preparation, but also methods to monitor consistent data quality from the instrument side.

However, **quality control (QC)** tools to continuously monitor MALDI Imaging workflows and data are currently lacking.

Therefore, we propose a series of standard measurements and a future SW-platform to monitor the MALDI-QC data over time. Rigorous data quality assessment ultimately ensures reliable and interpretable MALDI Imaging results, paving the way for more robust applications of this powerful imaging technique in biological and clinical research.

## Methods

IntelliSlides uniformly coated with synthetic standard mixtures of analytes were used to continuously monitor the quality of MALDI imaging workflows on the timsTOF fleX MALDI-2 and neofleX (axial-TOF).

During the QC measurements, the following MALDI-QC parameters were monitored that were representative for the quality of a MALDI imaging experiment.

**timsTOF fleX MALDI-2:** Intensities, MALDI-2 boost, TIC, Oversampling Factors.

**neofleX:** Intensities, TIC, Oversampling Factors, Resolution, Accuracy, Isotopic Pattern.

To mimic incorrect settings and wear of instrument components (e.g., of the laser), instrument configurations are altered to identify deviations from previous measurements in the acquired data.

**timsTOF fleX MALDI-2:** Laserfocus, Global Attenuator of Laser, MALDI-2 Laser Power, Source Pressure.

**neofleX:** Laserfocus, Global Attenuator of Laser, HV Delta Pulsed Ion Extraction.

### a) Recurrent QC Sample



### b) Acquisition on instrument



### c) Monitor in TwinScape



FUTURE WORK

Fig. 1 Workflow principle: a) Recurrent QC Sample preparation b) Acquisition on MALDI instruments c) Monitoring in TwinScape software

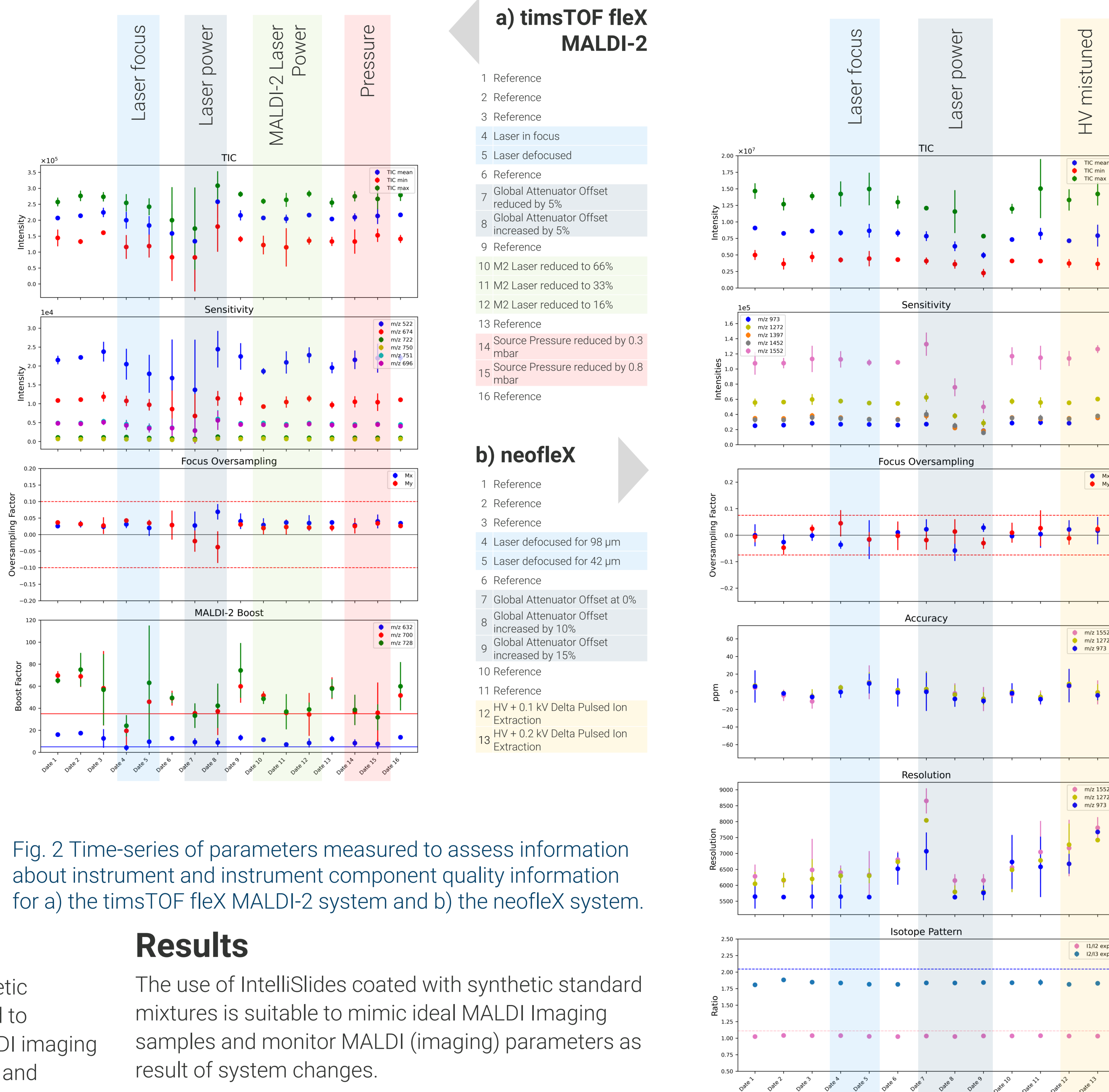


Fig. 2 Time-series of parameters measured to assess information about instrument and instrument component quality information for a) the timsTOF fleX MALDI-2 system and b) the neofleX system.

## Results

The use of IntelliSlides coated with synthetic standard mixtures is suitable to mimic ideal MALDI Imaging samples and monitor MALDI (imaging) parameters as result of system changes.

### timsTOF fleX MALDI-2 data

- Some parameters react on many types of changes, e.g., MALDI-2 boost
- Other parameters only changes for a small number of type of changes, e.g., TIC or Focus Oversampling

### neofleX data

- The laser power (global attenuator offset) influences TIC, Sensitivity and Resolution
- These three parameters serve as sensitive indicators for laser mistuning or laser problems
- Isotope pattern and Accuracy show less sensitive and more stable behavior independently of system alterations
- Focus Oversampling detects too high laser power or defocussing

Consequently, alterations of specific parameters can give an indication of changes in hardware components.

## Future Work

Having determined parameters for observation, the task of enabling easy monitoring of the acquired data by the means of a software remains. The logical choice here is the Bruker TwinScape platform which is already utilized by other instruments to store and assess QC data

## Conclusion

- IntelliSlides coated with synthetic standard mixtures of analytes can be used to mimic ideal MALDI Imaging samples and monitor MALDI Imaging parameters.
- The measured parameters show significant deviations for the altered system configurations and are therefore good indicators for incorrect system settings or instrument wear.

## Instrumentation and Methods