ASTON IMPACT
QUICK START GUIDE

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Revision History

Revision	ECO	Change Log	Author
A	ECO-001XX	No Content Changes	Vinay Kulkarni

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1. QUICK START GUIDE

1.1. Physical connections and power On

For more information about connection, see Physical Overview section.

- Connect the analyte inlet port to the process supply line.
- Connect the exhaust port to the process exhaust vent line.

WARNING! If the exhaust is not connected properly, it can cause harmful and hazardous substance leakage into the environment.

- Before Aston Impact is powered on, ensure that the electrical requirements and environmental regulations are met.

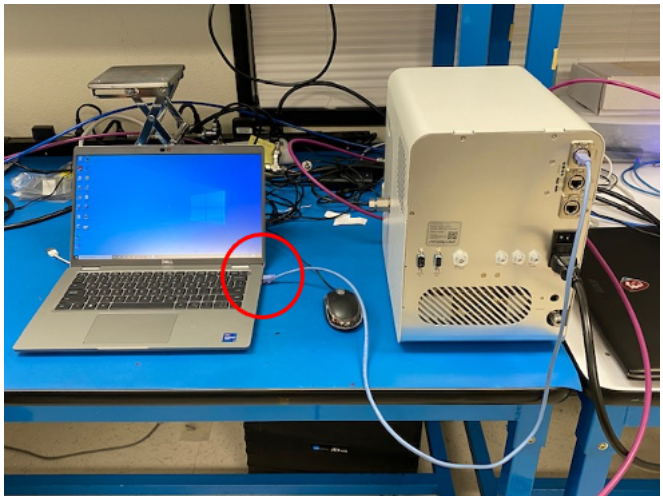
1.2. Cabling

- Connect the AC line input to Aston Impact. It is necessary that the users have easy access to the rear side of the Aston Impact, where the power inlet is located. This is necessary whether the Aston Impact is installed inside an enclosure or not and will allow easy and quick disconnection of power to the unit if necessary.
- Connect an Ethernet cable to the Ethernet connector on the rear panel.

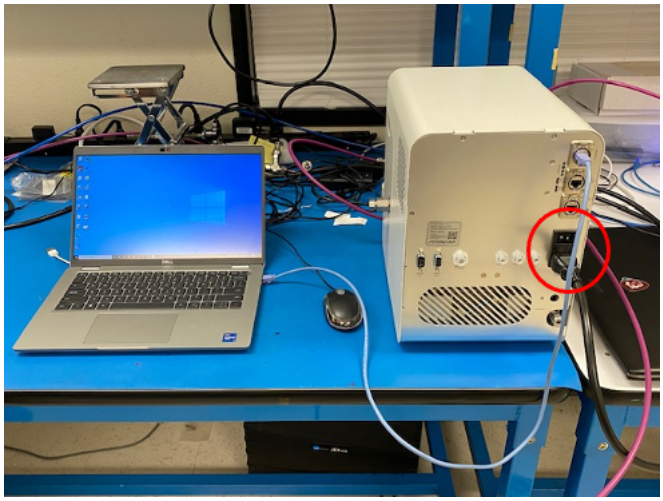
MANDATORY: The main supply must have a correctly installed protective earth (ground) conductor and must be installed and checked by a qualified electrician before the Aston Impact system is powered on. Ensure that the protective earth ground integrity is maintained.

WARNING! Interruption of the protective earth ground conductor inside or outside the Aston Impact system, or disconnection of the protective earth conductor terminal is likely to cause electrical shocks or other damages.

- Connect the other side of the ethernet cable to the computer



- Press the On/Off switch on the rear panel to power on the system.

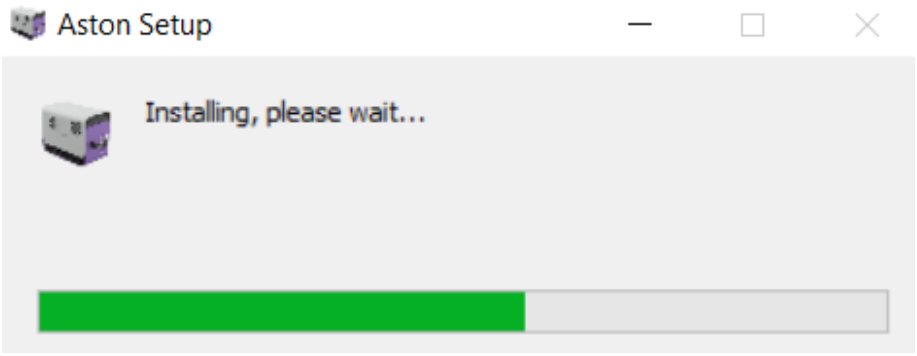


1.3. Communicating with Aston Impact

1.3.1. Procedure to Install Aston Impact on Windows OS

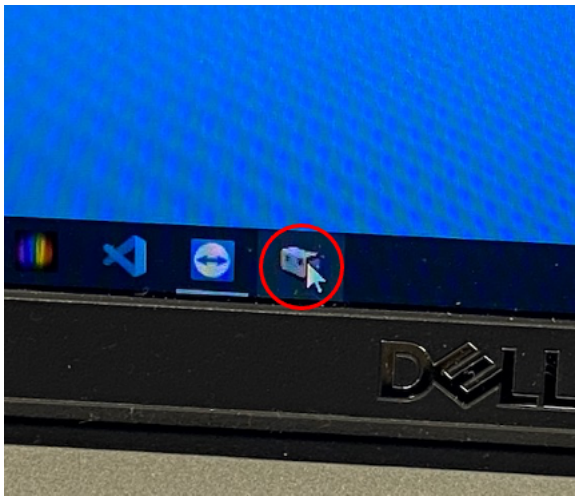
1. Download the Client Application from HERE

2. Double click on the downloaded exe file and follow the steps to install the application.

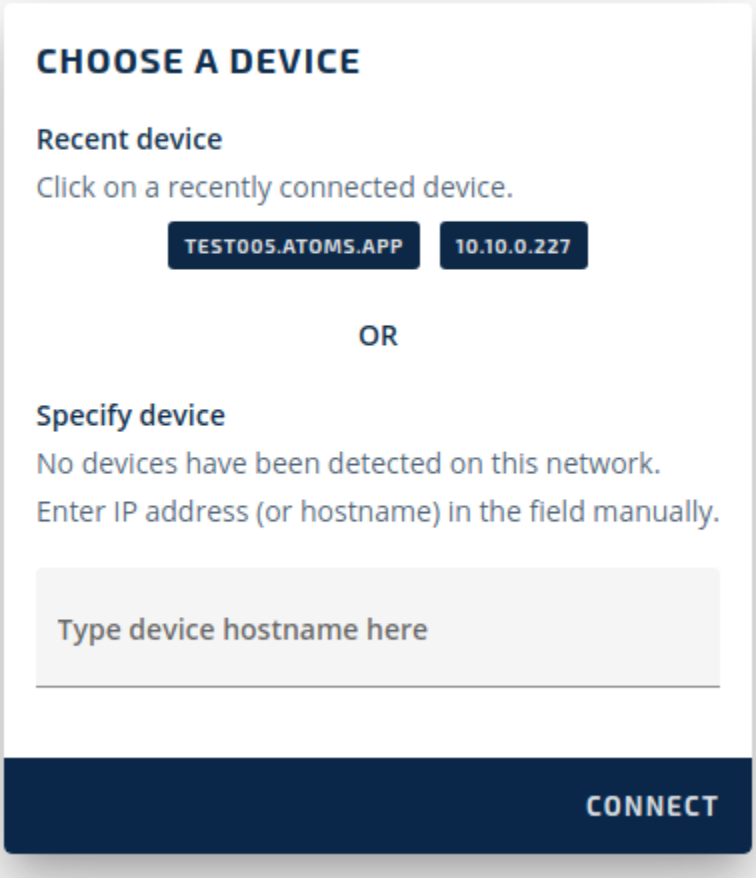


After Installation of the application, Aston Impact icon will appear on Desktop/Taskbar

3. Click on the **Aston Impact** Icon



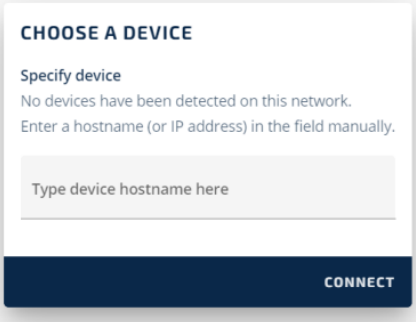
Upon clicking on the Aston Impact icon Aston Impact user interface is launched and would prompt to choose a device.



4. You can access the UI after entering the device hostname or IP address and click connect.
   Aston Impact Dashboard will be launched.

1.3.2. Procedure to Install Aston Impact on Ubuntu

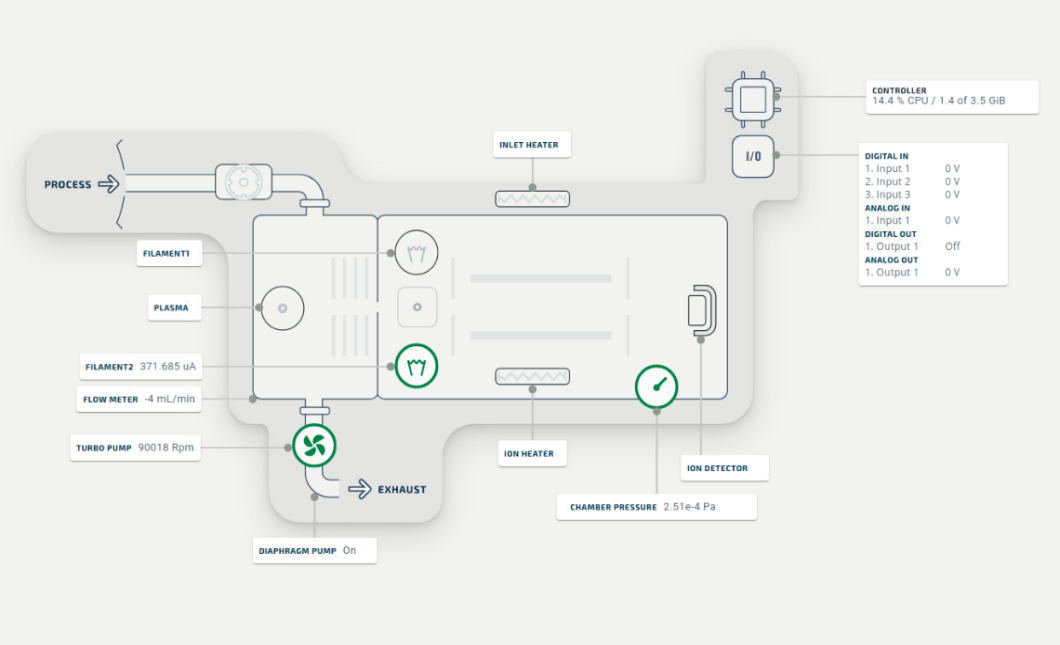
1. Download the Client Application from HERE
2. Double click on the downloaded file and install the application
3. You can access the UI after entering the device hostname or IP address and click connect.
   Aston Impact Dashboard will be launched



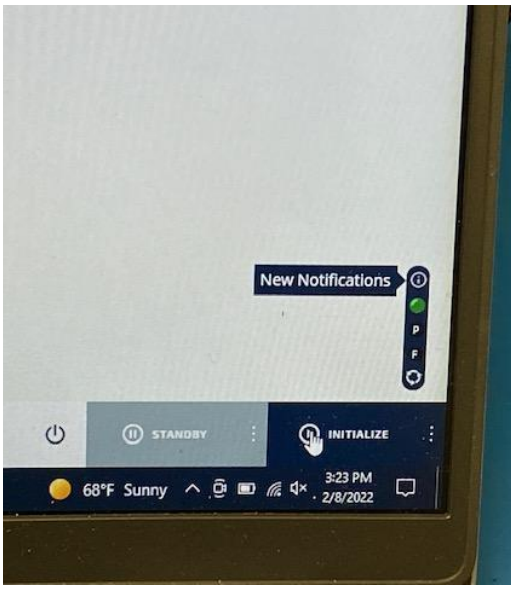
NOTE

For a detailed guide to configuring the Aston Impact through the user interface for a custom application environment.

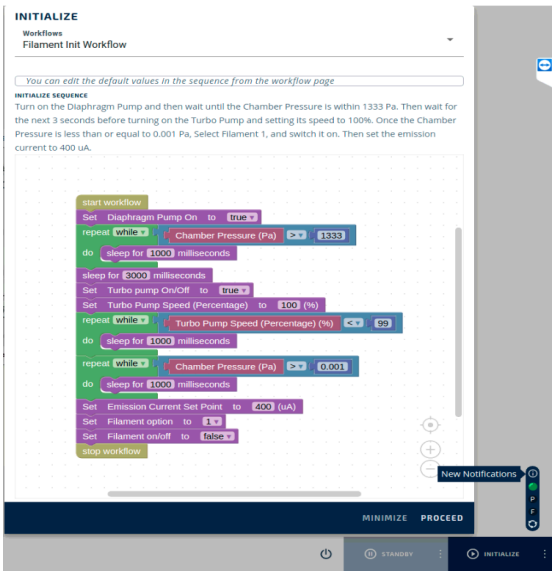
After connecting to the system, the dashboard appears as follows.



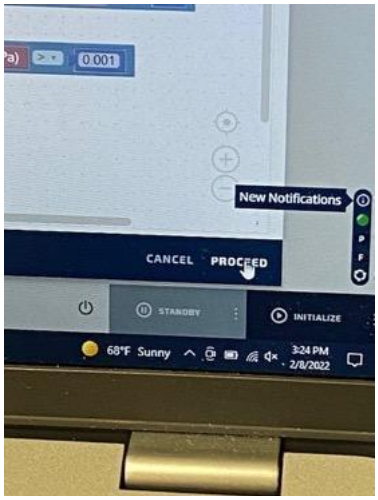
4. Click on **INITIALIZE**



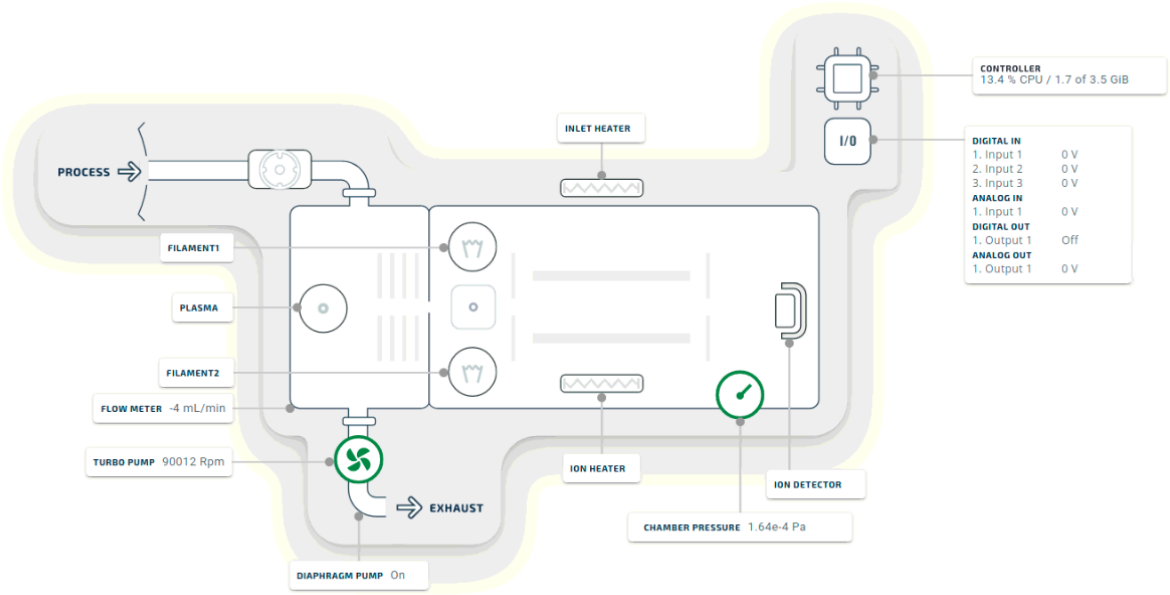
Initialization window is opened



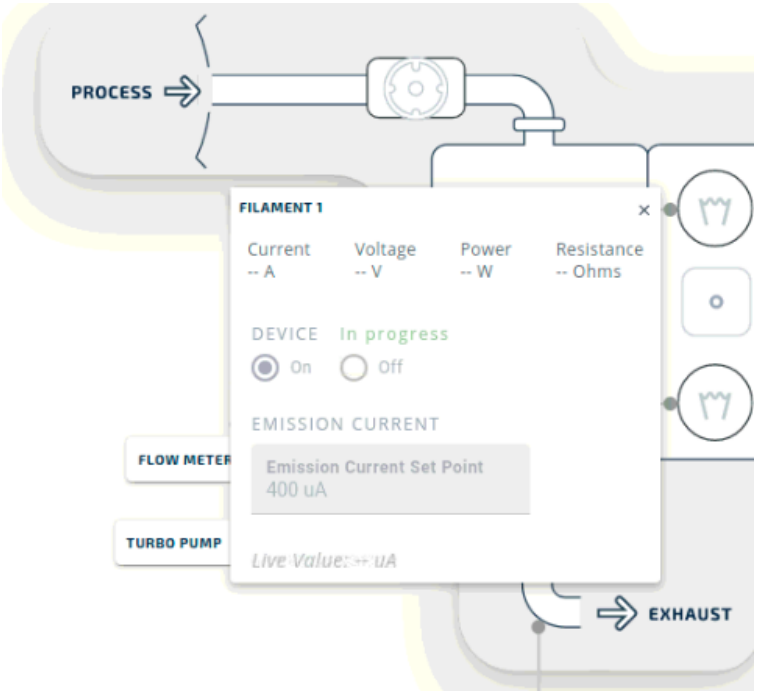
5. Click on **PROCEED.**



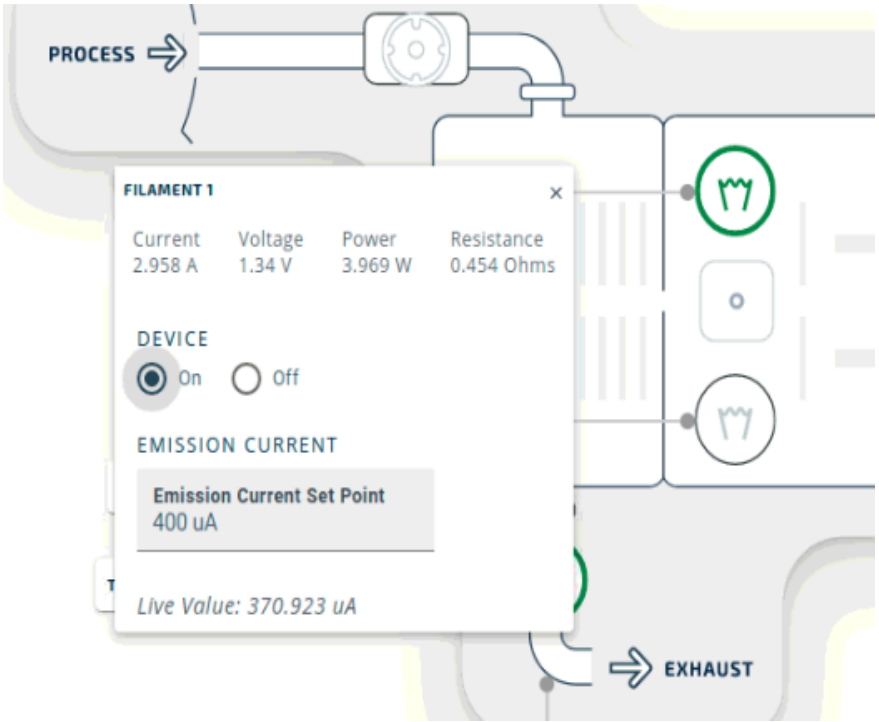
6. Wait until TURBO PUMP reaches about 90000 RPM and QUAD PRESSURE reaches about 1.5 x 10^{-4} Pa range



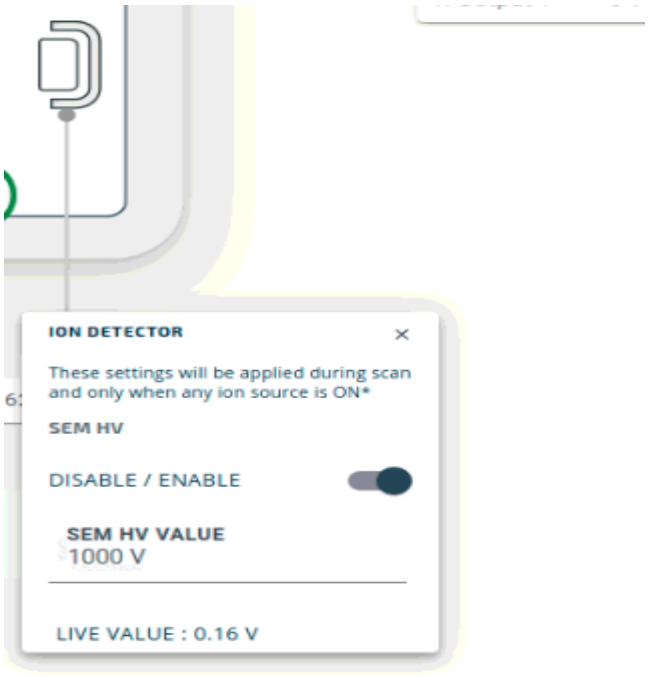
7. Click on **FILAMENT1**



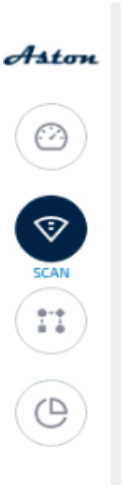
8. Turn on **DEVICE** (filament 1)
9. Wait until the DEVICE (filament 1) is on.



10. Click on **ION DETECTOR**, Click on **DISABLE / ENABLE** to enable / disable SEM. If enabled set the required voltage

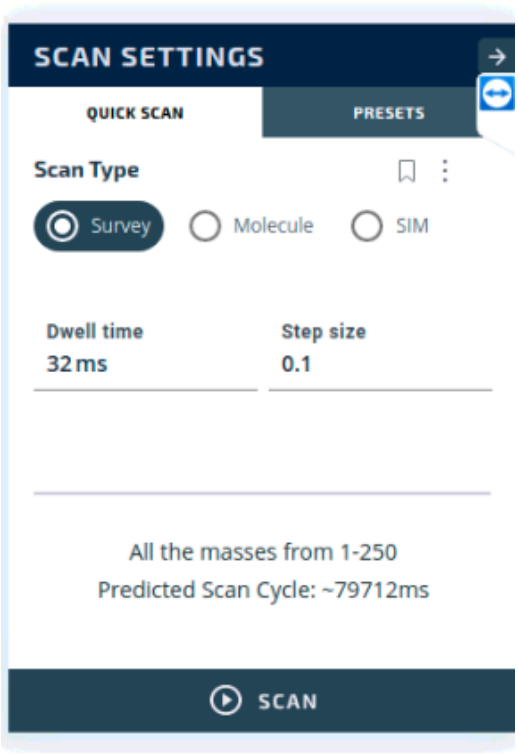


11. Click on **SCAN** icon

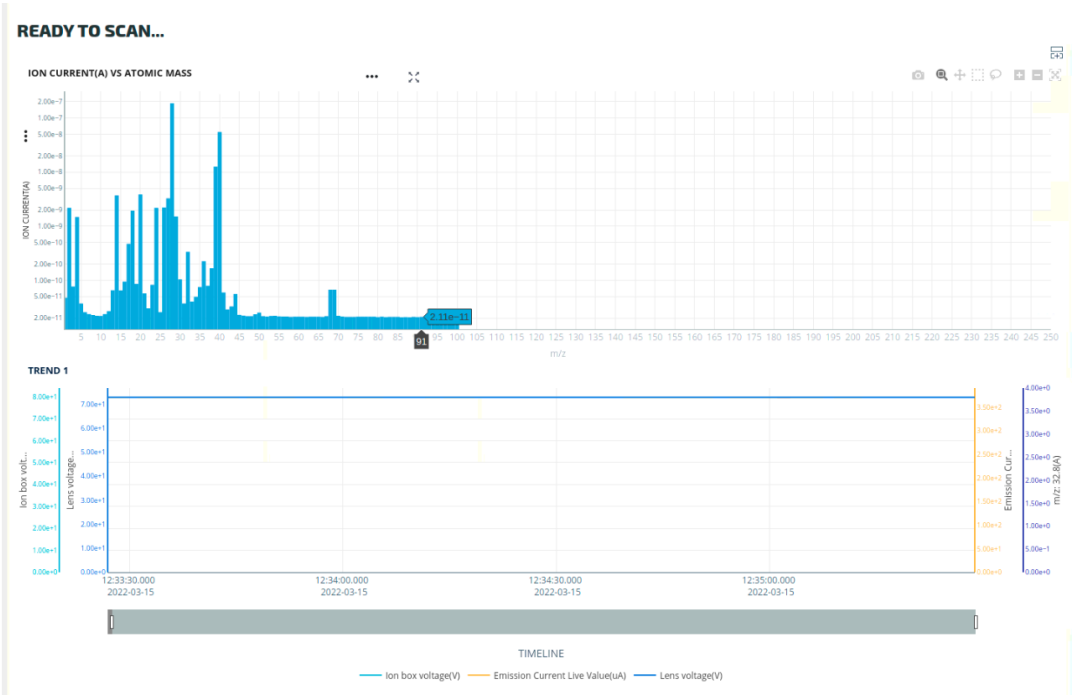


12. Choose **SCAN SETTING** of Survey (scan 1-300) or **SIM** (scan in a selected range or single point)

    - Click on **SCAN**



spectrum appears on the screen.



1.4. Modbus

Aston Impact supports communication through Modbus. Please refer to Aston Modbus programming guide to interface Aston through Modbus.

1.5. Validate calibration of Aston Impact

Aston Impact is supposed to identify all gasses including any harmful or corrosive ones. To increase the accuracy of the readings, we recommend checking the system calibration regularly (depending on the usage of the system) before long-term runs.

Aston Impact is factory calibrated using standard gas mixtures as well as PFTBA to cover the full mass range using the same procedures detailed in the Mass Axis Calibration document. As the mass spectrometer sensor and vacuum chamber get exposed to a variety of gasses, some of them more reactive than others with surfaces, slight changes in electrode voltages may lead to shifts in peak locations. This effect is greatly mitigated by keeping the vacuum chamber and the sensor heated up to 250 °C to minimize surface adsorption. It is however recommended to verify the calibration according to a user-settable preventive maintenance schedule which depends on the usage of the instrument. This verification is particularly important ahead of long process runs to ensure that data is collected using optimum instrument performance.

The calibration verification can be achieved, using any available gas e.g., Argon or gas mixture, by performing a survey scan and verifying the location of the relevant peaks to be within +/- 0.1 amu. If the peaks are slightly shifted to the left or to the right, running the Auto MAC (Mass) function may be the fastest method to re-align the peaks. Manual calibration, stepping through Resonant Frequency, Resolution Tuning, and Mass Axis Correction may also be considered.

1.6. Aston Impact usage scenarios

This section details typical usage scenarios for Aston Impact and provides guidance on how to realize these use-cases.

Table 5. Usage scenarios

USE CASE	GUIDANCE
DATA ACQUISITION	1. Data acquisition can be started from the **Scan** page. 2. Users can trigger data acquisition by selecting a scan or workflow Presets from the dashboard footer and clicking start. 3. Workflows and scan properties can also be customized and run from their respective pages accessible from the **workflow menu bar**.
COLLECTING ACQUIRED DATA	1. Acquired data can be exported out of the system from **Reports**. 2. **Scan report** has the ion current data from the acquisition. 3. Other parameters monitored in the system are recorded in Dashboard reports.
CALIBRATION	The Aston Impact calibration process primarily involves: 1. RF resonant frequency search 2. Resolution/Sensitivity tuning 3. Mass axis correction These features are accessed from the **Calibration section** in the footer of the dashboard page.

2. ABBREVIATIONS

A	Amperes (current)
Amu	Atomic Mass Unit
BSD	Berkeley Software Distribution
CLI	Command Line Interface
COMM	Communication Port
CTS	Clear to Send
Da	Dalton
dB	Decibel
DB	Database
DC	Direct current
DHCP	Dynamic Host Configuration Protocol
DNS	Domain Name System
EI	Electron Ionization
EHS	Environmental Health and Safety
eV	Electron volt
GND	Ground
GPL	General Public License
HTTPS	Hypertext Transfer Protocol Secure
Hz	Hertz (frequency)
IP	Internet Protocol
IPv4	Internet Protocol version 4
I2C	Inter Integrated Circuit Communications
JPEG	Joint Photographic Experts Group
JSON	JavaScript Object Notation
LED	Light emitting diode
m/z	Mass to charge
Nmtui	NetworkManager Text User Interface
PC	Personal Computer
PDF	Portable Document Format
pF	Picofarads
PNG	Portable Network Graphics
RF	Radio Frequency
RPM	Revolutions per Minute
RS-232	Recommended Standard no. 232
RTS	Request to Send
RX	Receive
SoC	System on a Chip
SSH	Secure Shell
SSL	Secure Sockets Layer
SVG	Scalable Vector Graphics

Th	Thomson
TLS	Transport layer security
TTL	Transistor-Transistor Logic
TX	Transmit
U	Unified Atomic Mass Unit
USB	Universal Serial Bus
UI	User Interface
URL	Uniform Resource Locator
V	Volts (voltage)
W	Watts (power)

3. QUICK ACCESS TO ASTON IMPACT FILES

Quick Links to Aston Impact Source Files	
1	Atonarp knowledge base
2	Aston Impact Windows client application
3	Aston Impact Ubuntu client application

4. GLOSSARY

Ambient Temperature

Ambient temperature is the temperature of the air surrounding a component.

Analyte

Analyte is a substance whose chemical constituents are being identified and measured.

Annotate

Annotate is technique to describe or add additional comments, notes, explanations, or other types of remarks to a plot.

Aston Impact

Aston Impact uses mass spectrometry to quantify the composition of constituents in a gas blend by measuring the mass to charge ratio of the ions generated from the blend.

Aston Impact configuration

Aston Impact configuration sets the mass spectrometer properties.

Aston Impact manager

A middleware layer of the Aston Impact software stack.

Background scan

A background scan measures the contribution of ion leakages and environment to the generated spectrum.

Baud

Baud is a component that determines the speed of communication over a data channel.

Blend

Blend is a mixture of different analyte molecules. Known blends are used for calibrating the Aston Impact.

Calorific value

The amount of energy produced by the complete combustion of a specified quantity of material or fuel.

Compliance

Following certain accepted standard

Dashboard

Dashboard is the primary page for the user to interact with and monitor the Aston Impact.

Detector

Detector is a component in the mass spectrometer which generates an electronic signal proportional to the number of ions striking it.

DHCP server

DHCP server is a network server that automatically assigns an IP addresses and other network configuration parameters to a device on a network so it can communicate with other IP networks. It relies on the standard protocol known as Dynamic Host Configuration Protocol (DHCP).

Ethernet

A system for connecting computer systems to form a local area network, to transmit the data bits containing any sort of information.

Faraday cup

Faraday cup is a component in the mass spectrometer, also known as Detector.

Filter

Filter is a process which removes or separates unwanted components. The Aston Impact requires one filter at the inlet to keep out undesired contamination.
Initialize

Bring the system into a state ready for data acquisition.

Ion Current

An ion current is the rate of flow of electrical charge associated with the flow of ions into the ion detector (electrometer/collector).

Ion source

Ion source is a component in the mass spectrometer where ionization of the analyte takes place by electron bombardment.

Ionization

Ionization is a technique used in mass spectrometer to ionize the analyte.

Mass Filter

Mass filter separates ions according to their mass-to-charge ratio (m/z).

Mass spectrometer

Mass spectrometer is an analytical technique that ionizes a sample based on their mass-to-charge ratio of the ions generated from the sample.

Molecules

A molecule is an electrically neutral group of two or more atoms held together by chemical bonds. Molecules are distinguished from ions by their lack of electrical charge.

Quadrupole

Quadrupole is a type of mass filter used in mass spectrometry. It consists of four cylindrical rods mounted in a ceramic collar. Every pair of opposing rods is electrically shorted, and a radio frequency (RF) voltage with a DC offset voltage is applied between one pair of rods and the other. The magnitude of the RF voltage determines the mass-to-charge ratio of the ions that pass through the mass filter and reach the detector. The ratio of DC-to-RF voltage determines the resolution (widths of the mass peaks).

RF to DC ratio

Ratio of the RF (AC) voltage to the DC voltage applied to the quadrupoles of a mass filter. The RF-DC ratio determines the resolution (inverse to sensitivity) of the peaks in a mass spectrum.

Scan

Each sequence of processing the ions in the mass filter followed by analysis of the ions in the detector is called a scan.

Scan configuration

Scan configuration provides options to configure the masses scanned, the number of scans run, trade- off between speed and accuracy.

Scan report

Record of all scans performed on the system. This includes system settings, mole fractions, and ion currents for all masses that are scanned.

Spectrum

Distribution of ion currents corresponding to ion fragment masses of interest.

Standby

Put the system in a state not ready for scan so that it can then be shutdown. Also required before certain features in the Aston Impact software can be used.

Workflow

Workflows allow the user to sequence scan events with unique scan properties and control valves alongside running scans in the sequence.

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