# The ionio-illustrate package

Version 0.3.0

## 1. Introduction

This package implements a Cetz chart-like object for displaying mass spectrometric data in Typst documents. It allows for individually styled mass peaks, callouts, titles, and mass callipers.

## 2. Usage

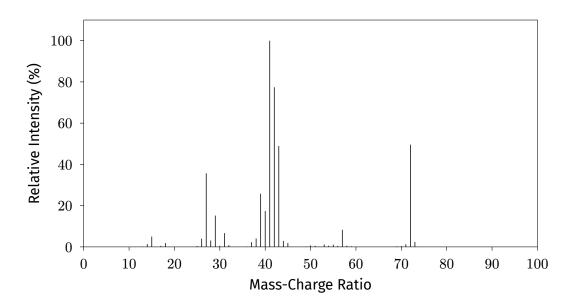
This is the minimal starting point:

```
#import "@preview/ionio-illustrate:0.3.0": *
#let data = csv("isobutelene_epoxide.csv")

#let ms = mass-spectrum(massspec, args: (
    size: (12,6),
    range: (0,100),
    ))

#figure((ms.display)())
```

The above code produces the following content:



It is important to note at this point that the syntax for interacting with mass spectrum objects will certainly change with the introduction of a native type system. This document will be updated to reflect this upon implementation of those changes.

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## 3. Documentation

This documentation is generated automatically for each package release, and is guaranteed to be an acurate representation of the API in the strictest of terms, but may lack the additional explanations and examples that make for a good documentation. For a more approachable documentation (at the cost of potentially incorrect descriptions due to oversight), please see the hand-written documentation in Section 4.

mass-spectrum()

## 3.1.1. mass-spectrum

Returns an object representing mass spectrum content.

#### 3.1.1.1. Parameters

```
mass-spectrum(
  args: dictionary,
  data1: array,
  data2: array
) -> dictionary none
```

#### args dictionary

Override default behaviour of the mass spectrum by overriding methods, or setting fields.

Default: (:)

## data1 array

The mass spectrum in the format of a 2D array, or an array of dictionarys. By default, the mass-charges ratios are in the first column, and the relative intensities are in the second column.

#### data2 array

similar format as data1, but to contain a second mass spectrum.

Default: none

## 4. Humanist Documentation

This documentation is hand-written, and therefore may sometimes be incorrect if it hasn't been updated to a recent API change (though hopefully those are few). If you see an issue in this documentation, please put in an issue or a pull request on the GitHub repository. That being said, a best effort is made to ensure that this section is useful.

## **4.1.** mass-spectrum()

The mass-spectrum() function takes two positional arguments:

- data (array or dictionary) This is a 2-dimensional array relating mass-charge ratios to their intensities. By default, the first column is the mass-charge ratio and the second column is the intensity.
- args (dictionary) This contains suplemental data that can be used to change the style of the mass spectrum, or to add additional content using provided functions (see Section 4.1.7).

The defaults for the args dictionary are shown below:

```
keys: (
    mz: 0,
    intensity: 1
),
size: (auto, 1),
range: (40, 400),
style: mass-spectrum-default-style,
labels: (
    x: [Mass-Charge Ratio],
    y: [Relative Intensity (%)]
),
linestyle: (this, idx)=>{},
plot-extras: (this)=>{},
```

## **4.1.1.** keys

The keys entry in the args positional argument is a dictionary that can be used to change which fields in the provided data array / dictionary are to be used to plot the mass spectrum. An example usage of this may be to store several mass spectra within a single datafile.

## i Info

Note that arrays are 0-index based.

```
#let ms = mass-spectrum(massspec, args: (
    keys: (
    mz: 0, // mass-charge is contained in the first column
    intensity: 1 // intensity is contained in the second column
    )
    )))
```

#### **4.1.2.** size

The keys entry in the args positional argument is a tuple specifying the size of the mass spectrum on the page, in Cetz units.

```
#let ms = mass-spectrum(massspec, args: (
    size: (12,6)
    ))
```

#### 4.1.3. range

The range entry in the args positional argument is a tuple specifying the min and the max of the mass-charge axis.

```
#let ms = mass-spectrum(massspec, args: (
   range: (0,100) // Show mass spectrum between 0 m/z and 100 m/z
))
```

#### **4.1.4.** style

The style entry in the args positional argument is a cetz style dictionary. This dictionary accepts 5 entrys, each affecting a different part of the mass spectrum plot:

- axes This is a style dictionary that is passed to <code>cetz.axes.scientific</code> after expansion. Please refer to the Cetz documentation for the subentries that are available (at the time of writing, these include tick, <code>frame</code>, and <code>label</code> among other things)
- callouts This is passed directly to cetz.draw.content after expansion. Please refer to the Cetz documentation for the subentries that are available (at the time of writing, these include stroke, fill, and frame, and padding)
- peaks This is the style passed to all peaks being drawn(overriden by the linestyle function). Internally, this is passed to cetz.draw.line. Please refer to the Cetz documentation for the subentries that are available (at the time of writing, this include stroke)
- title This is passed directly to cetz.draw.content after expansion. Please refer to the Cetz documentation for the subentries that are available (at the time of writing, these include stroke, fill, and frame, and padding)
- callipers This dictionary entry itself is a dictionary that takes line (which is passed directly to cetz.draw.line after expansion) which allows customisation of the calliper's lines, and content (which is passed directly to cetz.draw.content) which allows for customizing the content placed above the callipers.

#### **4.1.5.** labels

The labels entry in the args positional argument is a dictionary specifying the labels to be used on each axis.

```
#let ms = mass-spectrum(massspec, args: (
    labels: (
        x: [Mass-Charge Ratio],
        y: [Relative Intensity \[%\]]
    )
    ))
```

## Warning

Note that if you provide this entry, you must provide both child entries.

### 4.1.6. linestyle

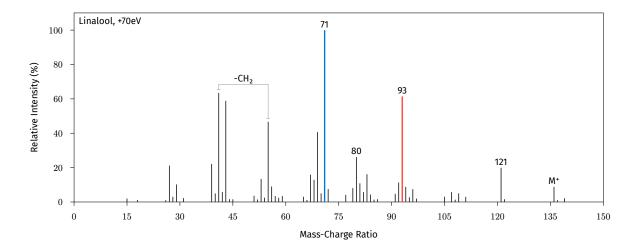
The linestyle entry in the args positional argument is a function taking two parameters: this (referring to the #ms object), and idx which is an integer representing the mass-charge ratio of the peak being drawn. Returning a cetz style dictionary will change the appearence of the peaks. This may be used to draw the reader's attention to a particular mass spectrum peak by colouring it in red, for example.

```
#let ms = mass-spectrum(massspec, args: (
    linestyle: (this, idx)=>{
        if idx in (41,) {return (stroke: red)}
     }
))
```

#### 4.1.7. plot-extras

The plot-extras entry in the args positional argument is a function taking one parameter, this, which refers to the #ms object. It can be used to add additional content to a mass spectrum using provided functions

```
Example
#let ms = mass-spectrum(massspec, args: (
  range: (0,150),
  plot-extras: (this) => {
    (this.callout-above)(136, content: MolecularIon())
    (this.callout-above)(121)
    (this.callout-above)(93)
    (this.callout-above)(80)
    (this.callout-above)(71)
    (this.callipers)(41, 55, content: [-CH#sub[2]])
    (this.title)([Linalool, +70eV])
 },
 linestyle: (this, mz)=>{
   if mz in (93,) { return (stroke: red) }
    if mz in (71,) { return (stroke: blue) }
))
#(ms.display)()
```



## 4.2. Method functions

This section briefly outlines method functions and where/why they might be used.

## 4.2.1. Display function(s)

These are the functions that will render the mass spectrum. For the moment there is only one, though as there are several desirable ways to render a mass spectrum, I envision adding more functions to this.

## Warning

Display functions **must not** be called within the context of a plot-extras(this) function.

#### **4.2.1.1.** #ms.display()

The #ms.display method is used to place a mass spectrum within a document. It can be called several times.

## 4.2.2. plot-extras Functions

#### Warning

The behaviour of plot-extra functions is **undefined** when called outside of the context of a plot-extras(this) function.

#### **4.2.2.1.** #ms.title(content)

The #ms.title method allows the addition of a title to a mass spectrum.

It takes one positional argument, content (content or string).

## **4.2.2.2.** #ms.callout-above(mz, content: [], y-offset)

The #ms.callout-above method places a callout slightly above the intensity peak for a given mass-charge ratio.

It takes one positional argument mz (integer, float, or string) and two named arguments, content (content, string, or none) to be displayed above the mass peak, and y-offset (length), which is the distance above the mass peak at which the content is displayed.

- If content is none, the default value is that which is provided as mz.
- If height is none, the default value is 0.3em.
- If mz is outside of the mass spectrums rang x-axis range, it will not be shown

## **4.2.2.3.** #ms.callipers(mz1, mz2, content: none, height: none)

The #ms.callipers method places a mass callipers between two mass spectrum peaks, along with any desired content centered above the callipers.

It takes two positional arguments mz1 and mz2 (either of which are integer, float, or string) which represent the start and end of the callipers respectively, and two named arguments, content (content, string, or none) which is displayed centered above the callipers, and height (length), which is the distance at which the content floats above the mass peak.

- If content is none, the default value is to display the negative absolute difference between mz1 and mz2.
- If height is none, the default value is 0.3em.



## Warning

The behaviour is **undefined** when either mz1 or mz2 are outside the x-axis range.

- If height is not specified, it is set automatically to a few units above the most intense peak.
- If content is not specified, it is set automatically to represent the loss of mass between the specified peaks.