

# Saturation effect of secondary emission coefficient in MCP-based multipliers in mass-spectrometry

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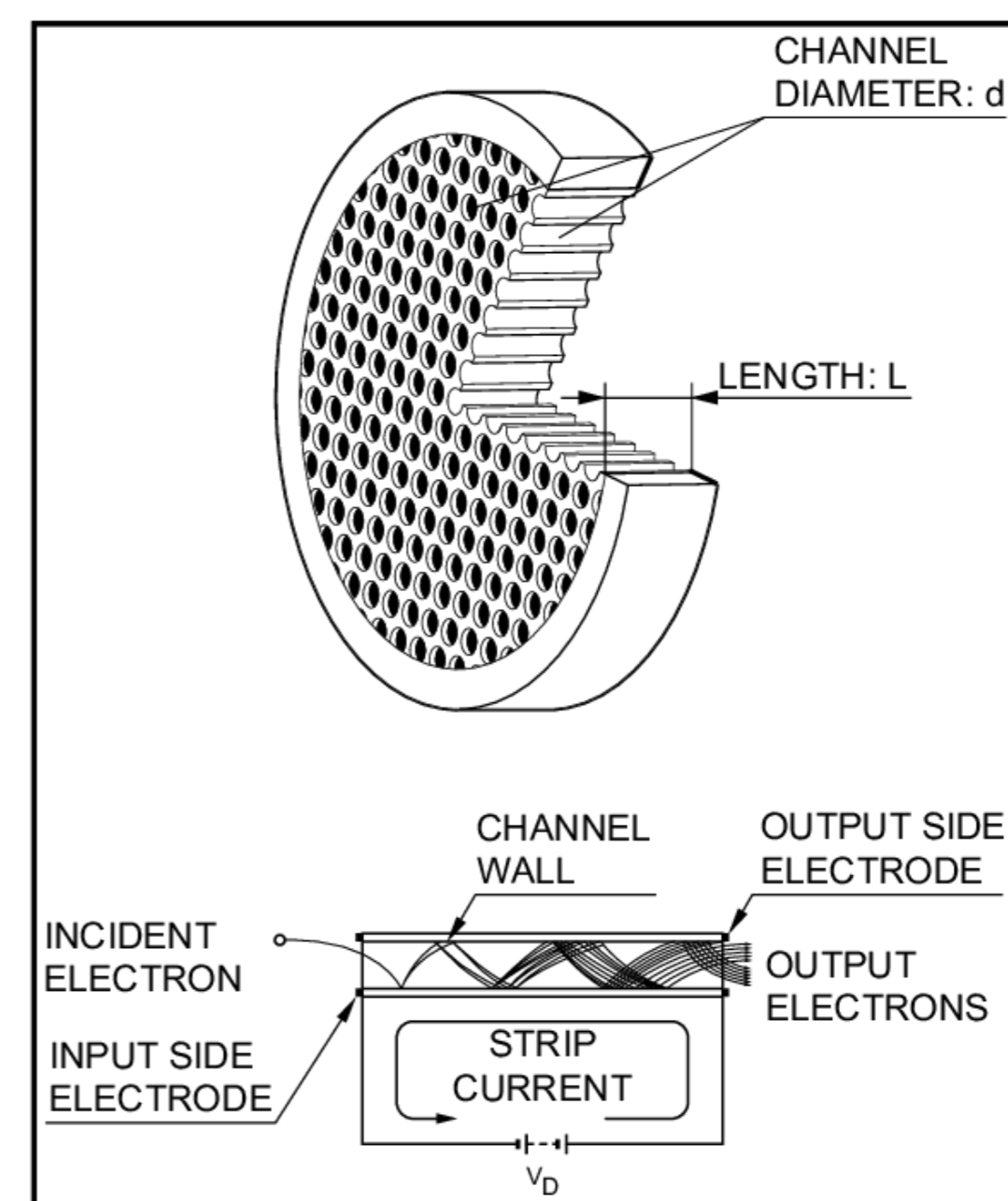
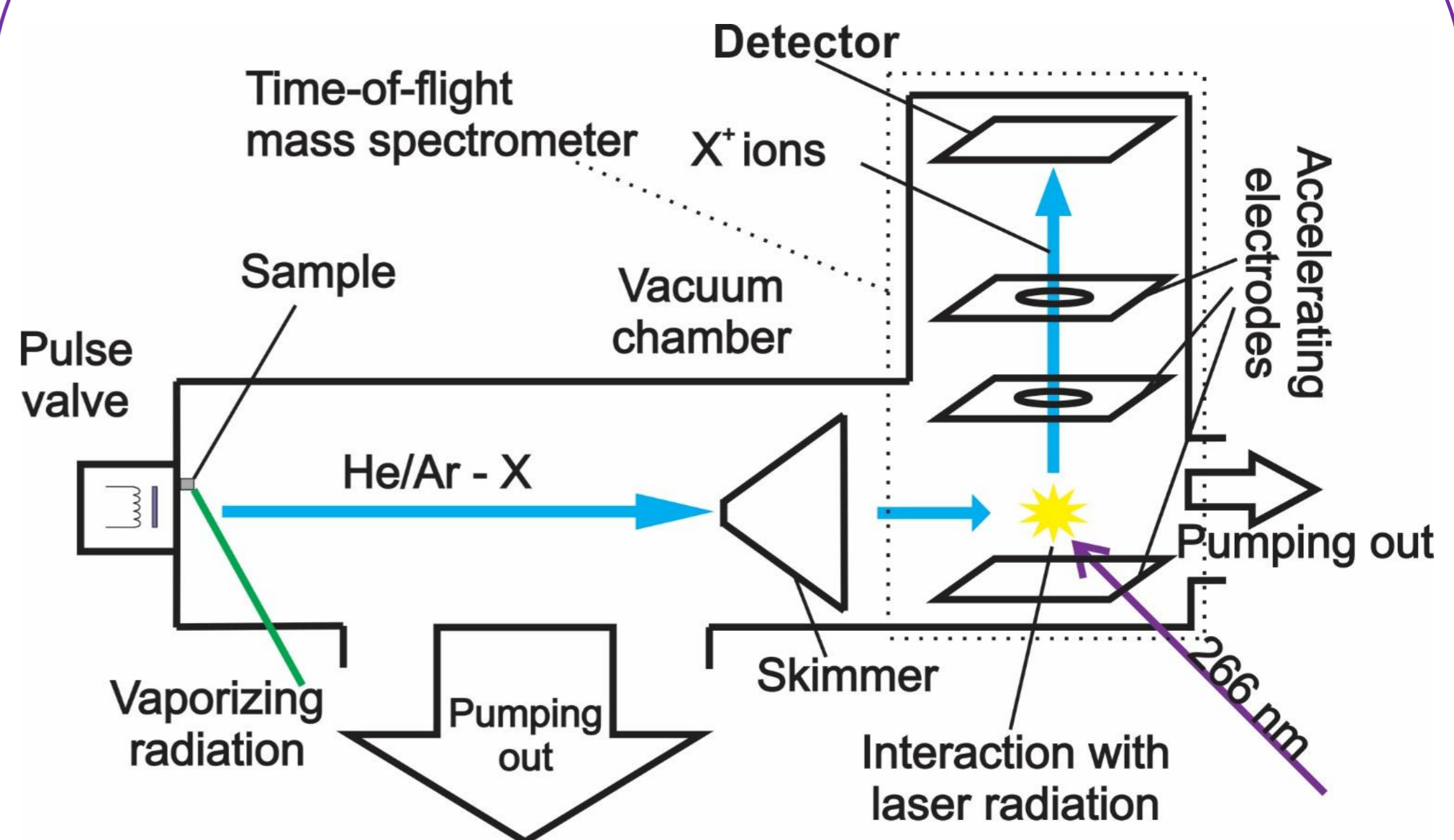
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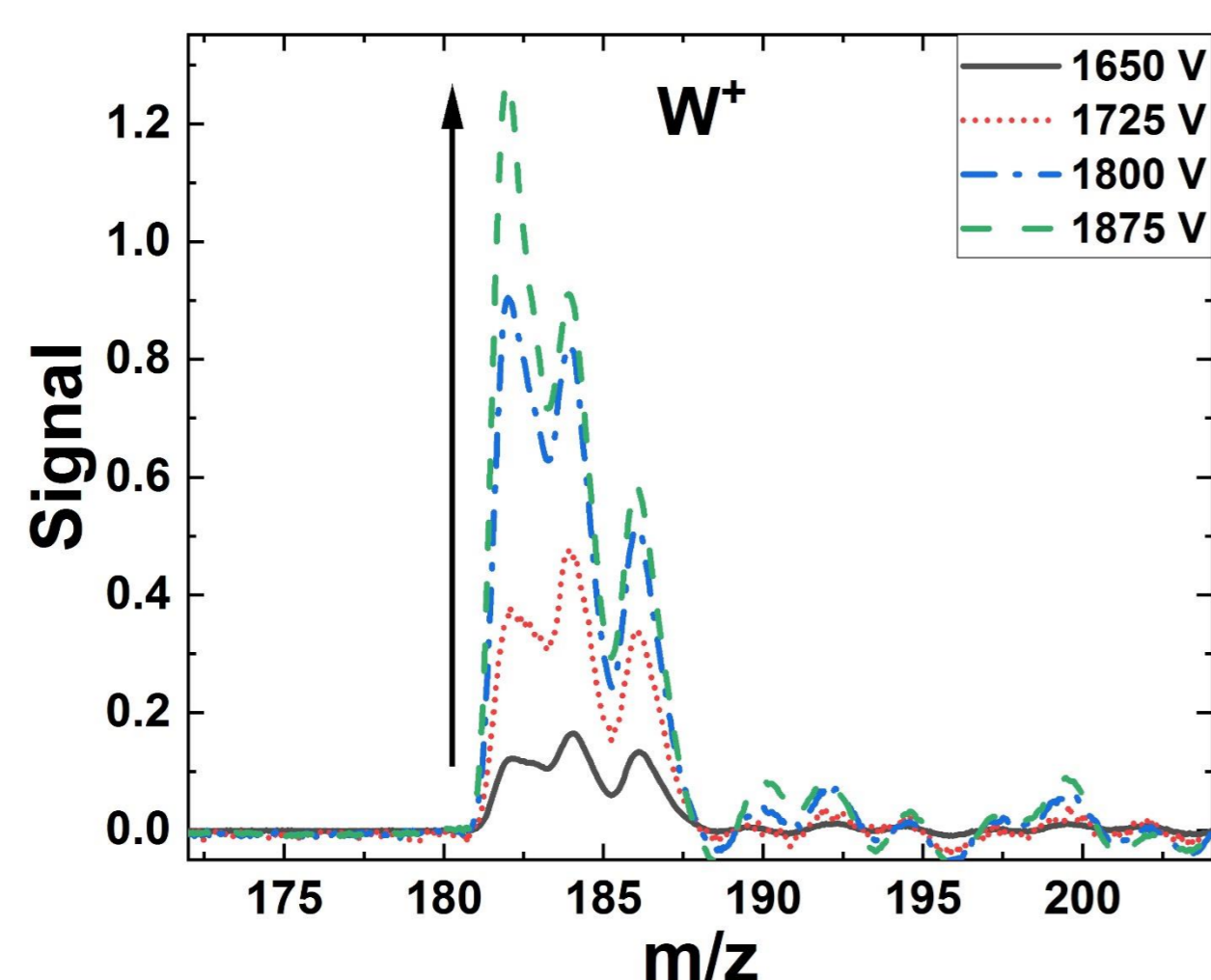
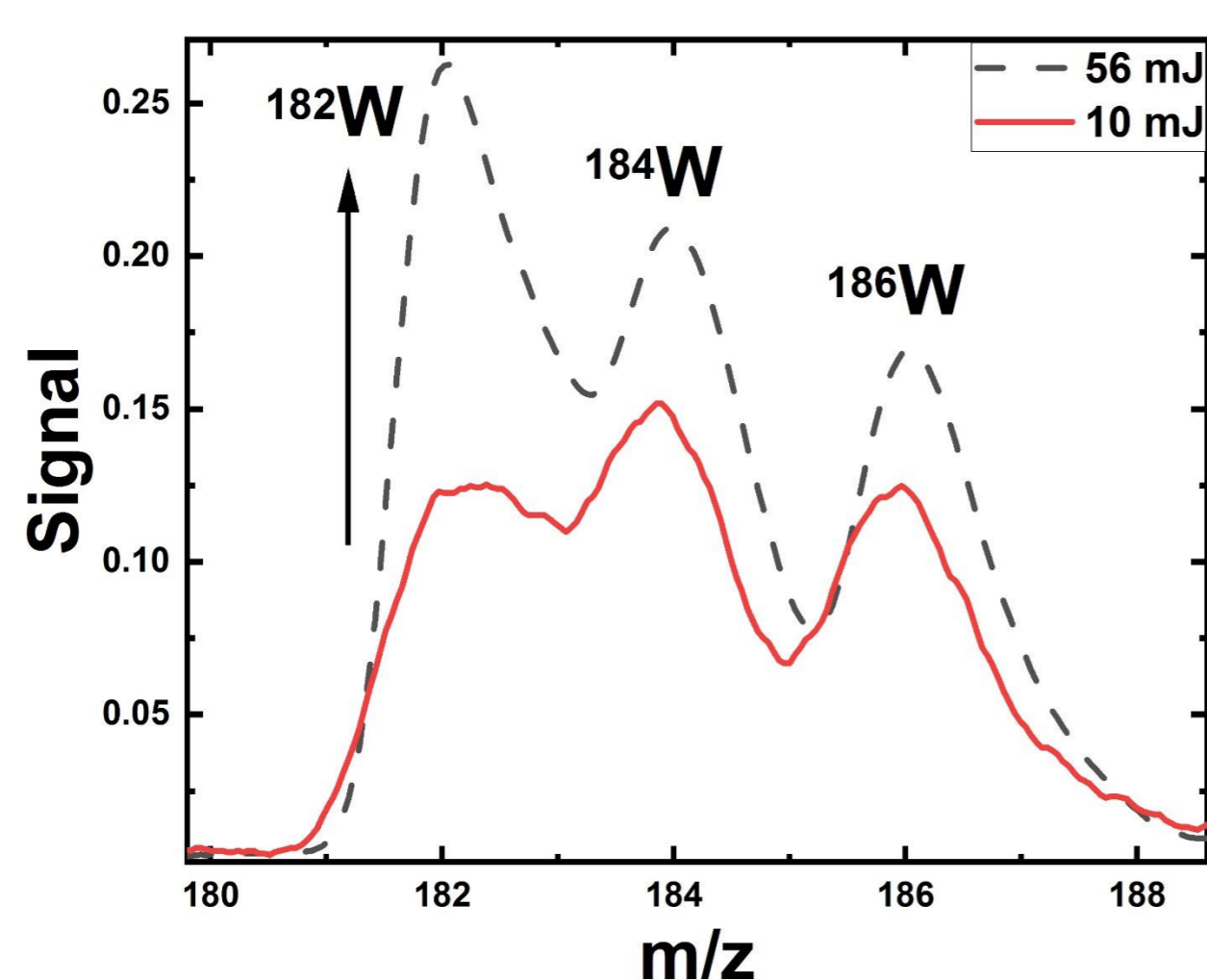
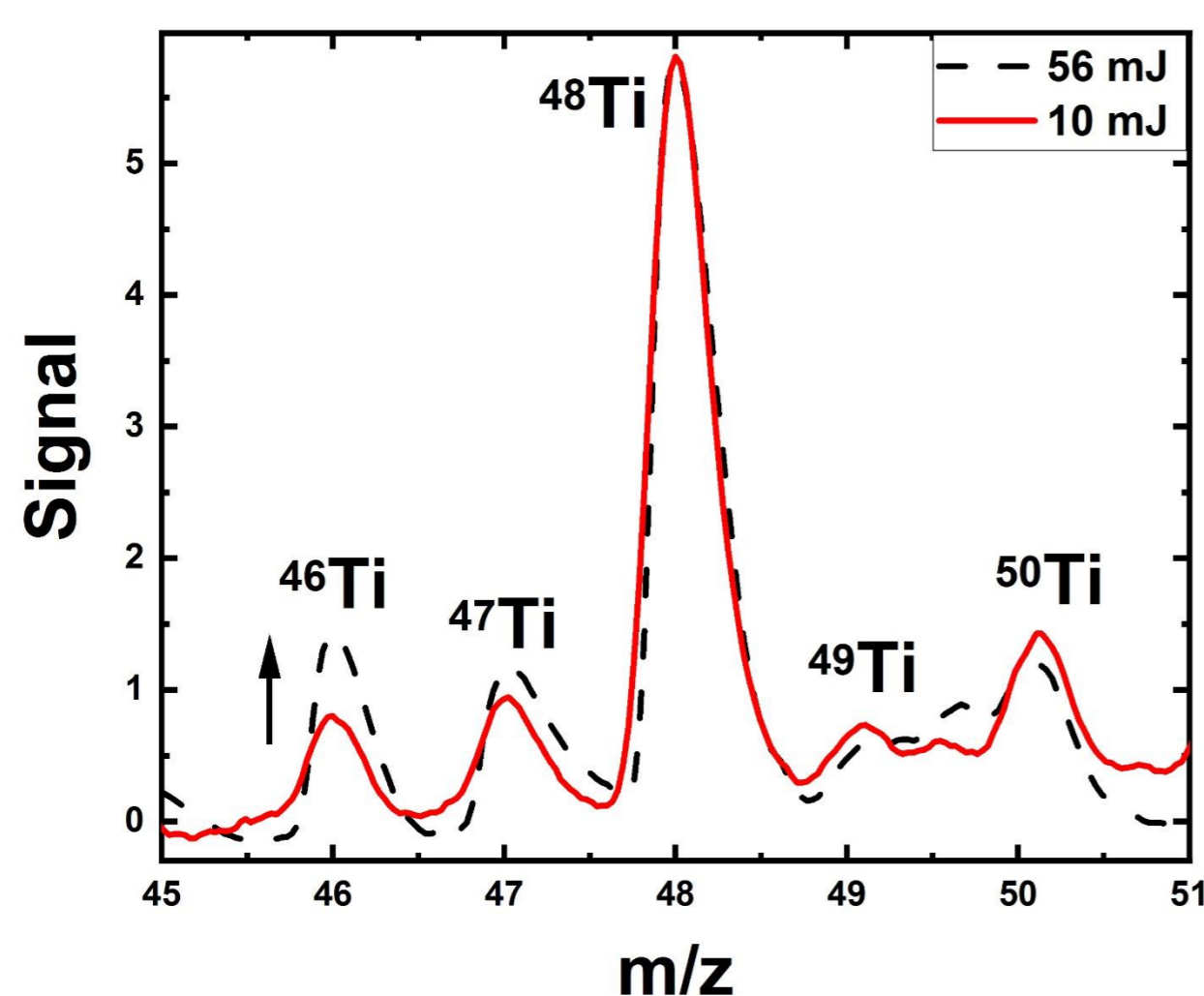
## Introduction

Time-of-flight mass spectrometry (TOF MS) [1] and its modification, the so-called velocity map imaging (VMI) method, are widely used in various chemical and photochemical experiments [2]. The most commonly used detector for these experimental methods, and in the case of VMI the only one, is a secondary electron multiplier based on microchannel plates (MCP). In particular, in the presented work, mass spectra of titanium and tungsten atoms were recorded using these methods. Mass spectra were obtained by two methods: photodissociation of tungsten hexacarbonyl molecules  $W(CO)_6$  and laser evaporation of tungsten metal and titanium monoxide and titanium dioxide. The isotopic peaks ratio in the mass spectra of titanium and tungsten atoms strongly differs from the values corresponding to their natural content.

## Experimental setup



## Results



## Conclusion

When time-of-flight ion mass spectra are detected with the MCP based secondary electron multiplier it has to be kept in mind that when the ion flux to the detector corresponds to about  $10^{-2}$  ions per channel distortions of the peaks ratio with close masses can occur. The need to control this effect is particularly relevant when using time-of-flight mass spectrometry in combination with molecular beam sampling.

## References

- [1] Wiley W. C., McLaren I. H. // Rev. Sci. Instrum. 1955. T. 26. №12. C. 1150-1157.
- [2] Eppink A. T. J. B., Parker D. H. // Rev. Sci. Instrum. 1997. T. 68. № 9. C. 3477-3484.
- [3] Hamamatsu Photonics // MCP (microchannel plate) and MCP assembly 2016.

## Acknowledges

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