

## ***Interactive comment on “Increase of the particle hit rate in laser single particle mass spectrometer by pulse delayed extraction technology” by Ying Chen et al.***

### **Anonymous Referee #1**

Received and published: 3 July 2019

This paper quantifies the improvement in SPMS hit rate resulting from particle beam deflection inside the electric field. It proposes that using delayed extraction helps to solve this problem and the results look convincing. I recommend the publication of this paper in AMT after the following major and minor comments are addressed.

Major comments: I would be really interested in seeing a comparison is mass spectra collected in DC and DE mode. In the DC mode, the ions produced by the laser are accelerated into the ToF immediately, but under the DE mode, they hang around the extraction region for an extra 100 ns, during which ion-ion and ion-neutral reactions can take place. It is possible that that would produce somewhat different fragmentation

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patterns. I would appreciate if the authors gave some discussion of those possible effects.

Numerous English usage errors, especially with respect to article placement, inconsistent pluralization and subject-verb agreement. These usually don't inhibit understanding, but please have someone proofread it. I did not list them all.

Minor comments: p.2 lines 57-58: while high cost is a problem, I am not sure I agree that neutralizers are very inconvenient, especially compared to other aerosol instrumentation used routinely.

p.2 lines 59-60: I would also dispute that "most" instruments use Nd:YAG as the ionization source. There are quite a few prominent examples of the SPMS technology that use the excimer. In fact, there is a citation to Zelenyuk et al., (2006) paper in the same paragraph, which describes an excimer-based instrument. It seems like your solution is primarily useful for instruments in which the distance between the sizing and ionization regions is large (i.e. ATOFMS or SPLAT), but not PALMS (sizing and ionization in the same physical instrument region). Differences in instrument design should be clarified here.

p. 3, line 69: you used "impact rate" instead of "hit rate" here, please be consistent.

Section 3.1 reads as though it belongs in the "Instruments and methods", since no actual data is presented yet.

Figure 4: why is there so much scatter in the DC measurements?

p.6: for completeness, it would help to show the same glass slide experiment in the DE mode. The divergence in the case of DC potential is dramatic. If the extraction pulse is applied instead, is the width of the beam at the slide significantly closer to the "voltages off" condition?

p. 7-8, lines 223-225: I am not sure I follow what experiment the authors have in mind by pre-selecting particles based on charge. I suggest this be fleshed out a bit more or

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removed.

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