

Supplementary material:

## Booster-microchannel plate (BMCP) detector for signal amplification in MALDI-TOF mass spectrometry for ions beyond $m/z$ 50 000

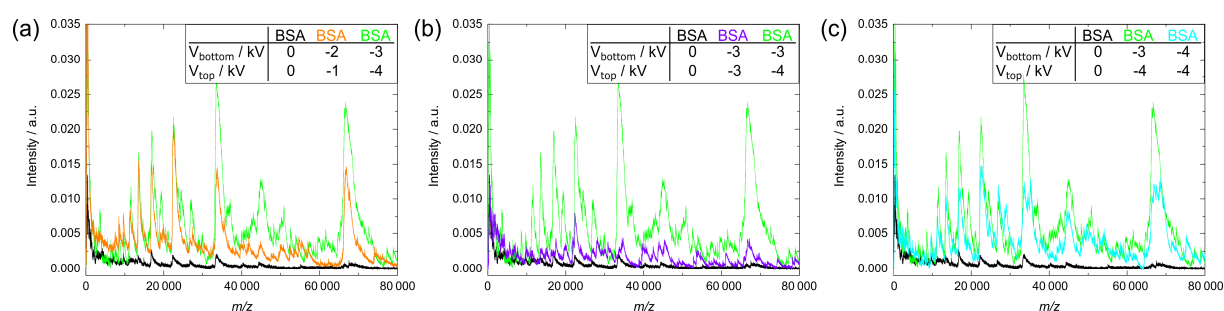
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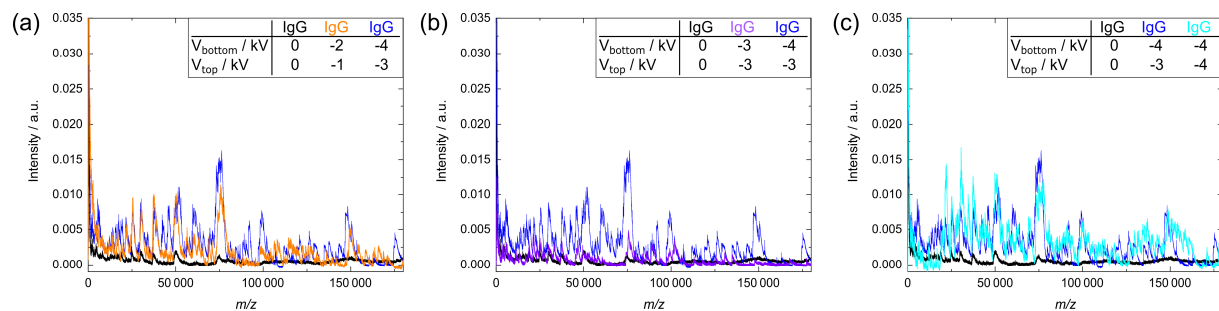
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### Mass spectra for intermediate booster electrode (BE) voltage settings

Selected mass spectra of BSA (Fig. S1) and of IgG (Fig. S2) are shown in the following, which were measured with the BMCP using the medium electrode distance. The presented mass spectra were taken for intermediate BE settings to visualize the signal intensity variation with applied BE voltages. A mass spectrum for the booster turned off (plotted in black) and one for the BE setting that generated the strongest signal intensity enhancement (Fig. S1: plotted in green for BSA, Fig. S2: plotted in blue for IgG) were added for comparison. For a voltage combination of -2 kV/-1 kV at the bottom/top BE, a local maximum of the amplification factor (AF) was observed for both proteins (Fig. S1(a), Fig. S2(a), plotted in orange). Moreover, using the same voltage at both BEs did not cause the strongest signal enhancement, which is exemplarily displayed for -3 kV (Fig. S1(b), Fig. S2(b), plotted in purple) and for -4 kV (Fig. S1(c), Fig. S2(c), plotted in cyan).



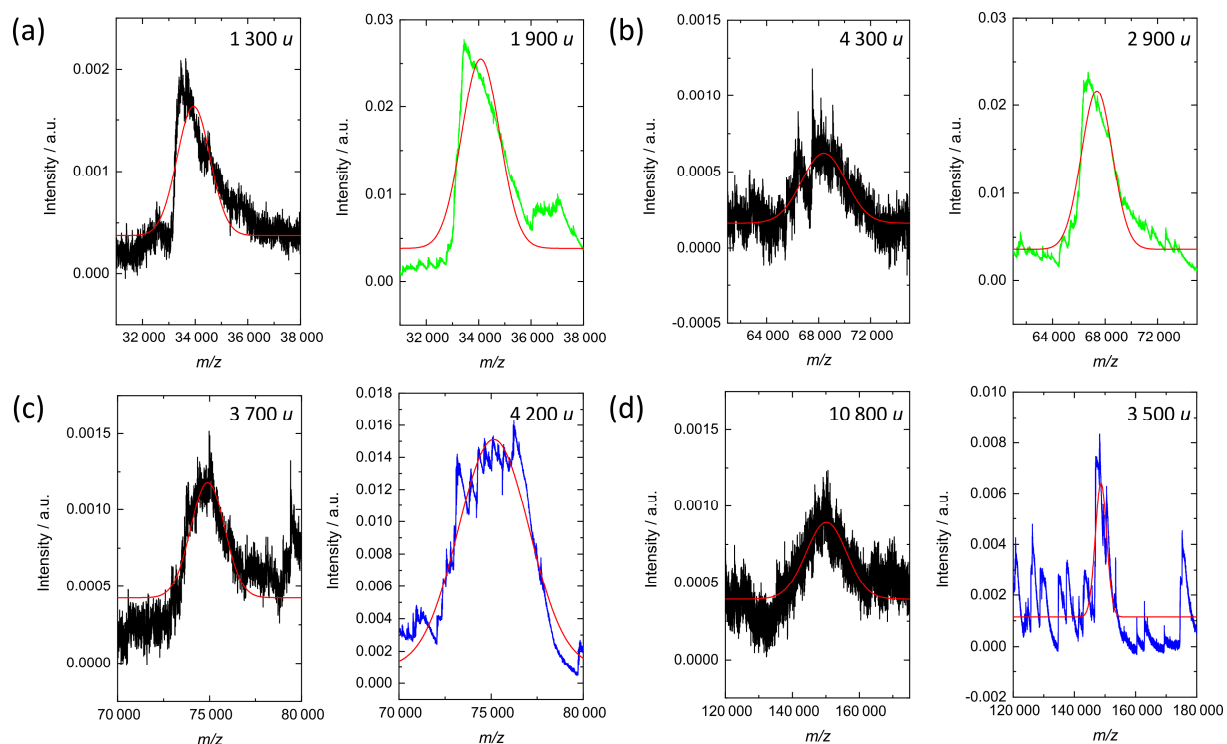
**Fig. S1** Comparison of single mass spectra of BSA measured with the booster turned off (plotted in black), with the BEs set to the voltages that yielded the largest signal amplification (plotted in green), and for intermediate BE settings. Selected mass spectra for a BE voltage combination of (a) -2 kV/-1 kV at bottom/top BE (plotted in orange), (b) of -3 kV/-3 kV at bottom/top BE (plotted in purple), and (c) of -4 kV/-4 kV at bottom/top BE (plotted in cyan) are shown.



**Fig. S2** Comparison of single mass spectra of IgG measured with the booster turned off (plotted in black), with the BEs set to the voltages that yielded the largest signal amplification (plotted in blue), and for intermediate BE settings. Selected mass spectra for a BE voltage combination of (a) -2 kV/-1 kV at bottom/top BE (plotted in orange), (b) of -3 kV/-3 kV at bottom/top BE (plotted in purple), and (c) of -4 kV/-4 kV at bottom/top BE (plotted in cyan) are shown.

### Change of the FWHM with BE voltage settings

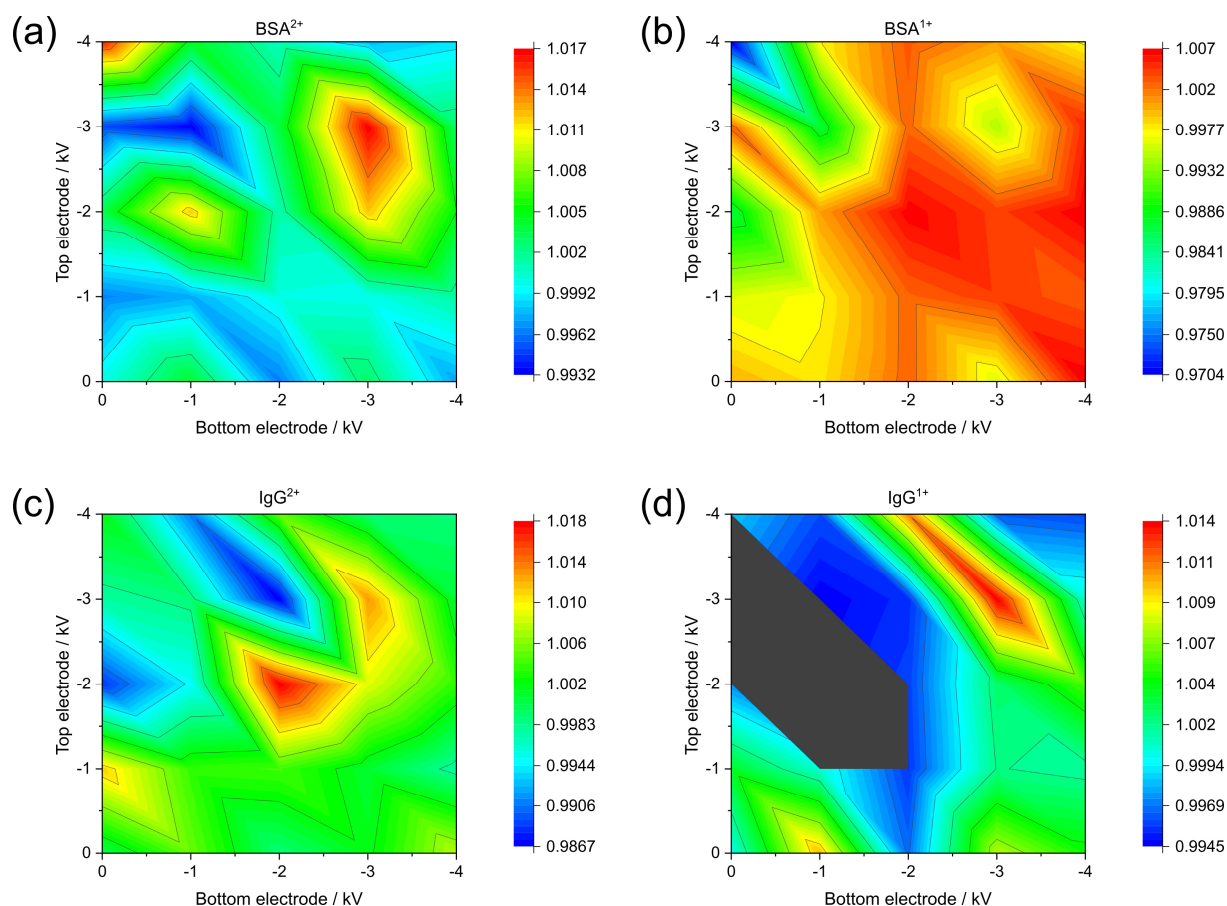
Detailed views of the peaks that appeared for singly and doubly charged BSA ions and for the peaks that were found for singly and doubly charged IgG ions are shown in Fig. S3 to visualize the variation of the FWHM with the change of the BE voltage settings.



**Fig. S3** Detailed views of the peaks that appeared for the measurement with the booster turned off were plotted in black. The peaks that were generated for the optimized BE voltage settings by (a) doubly and by (b) singly charged BSA ions are plotted in green. The peaks that were found for the optimized BE voltage settings for (c) doubly and for (d) singly charged IgG ions are plotted in blue.

### Variation of mass scale calibration with booster voltage

We found the following mean  $m/z$  values for the BMCP measurement using the medium BE distance:  $m/z$  33 695  $\pm$  0.6 % ( $\text{BSA}^{2+}$ ),  $m/z$  66 771  $\pm$  0.8 % ( $\text{BSA}^{1+}$ ) and  $m/z$  74 904  $\pm$  0.7 % ( $\text{IgG}^{2+}$ ),  $m/z$  149 600  $\pm$  0.6 %. The mean and standard deviations were calculated from all  $m/z$  values that appeared for one ion using all investigated BE voltage combinations. No significant modification of the mass scale calibration with the change of the BE voltage settings was observed as shown in Fig. S3.



**Fig. S4** The  $m/z$  values found for the booster turned off (0 kV at both BEs) were used to normalize the  $m/z$  values that were found for all other BE voltage settings (medium electrode configuration) for the following ions: (a)  $\text{BSA}^{2+}$ , (b)  $\text{BSA}^{1+}$ , (c)  $\text{IgG}^{2+}$ , and (d)  $\text{IgG}^{1+}$ . The observed  $m/z$  values vary less than 1% for all BE voltage settings.