Supplementary Material

Discussion of soft-landing yields

Although we are aware of the importance of high yields for any preparative mass spectrometry experiment, the work presented was not primary focused in this direction and no attempt to fully optimize soft landing yields was performed. The term soft-landing yield (or efficiency) has been used in different ways in ion deposition experiments. Here we define it as a ratio of the amount of landed material, as determined by a suitable analytical technique, divided by the amount that was used in the ion source (in case of the electrospray this is simply the product of the volume sprayed and the concentration of the solution supplied). As we discussed in the main text the yields determined on very different soft-landing instruments were typically on the order of 1 % (references 10, 26, 30, 41, 42). Only two of them report significantly higher soft-landing yields for some analytes (reference 42 reported yields between 2 and 6% without mass selection and reference 10 reported yields between 0.5 and 5 % with mass selection). Both these results were obtained on instruments with linear design, thus it could be argued that line-of-sight deposition of neutral and charged droplets could contribute to higher yields (although to the best of our knowledge the line-of-sight deposition on linear soft landing instruments with electrospray ion sources has not been quantified) . It is important to point out that majority of losses during an electrospray soft-landing experiment occur at the beginning of the process when analyte is ionized, desolvated and transported into the vacuum. This indicates that higher soft-landing yields might be obtained simply by lowering the denominator of the ratio defining soft-landing yield. It is possible to enhance efficiency of the electrospray type ion sources if low flow rates and low concentrations are used. For instance, the reports in references 41 and 42 compare soft-landing yields achieved on the same instrument after the lab fabricated stainless steel electrospray needle was replaced by a commercial PicoTip emitter of much smaller dimensions and better quality. The improvement of yields just due to changing the spray needle was a factor of approximately 5. Thus, we are convinced that yields above 10% are likely possible for compounds with high ionization efficiencies if nanospray ion sources with known high ionization efficiencies are used and only small amounts of analyte are processed. However, such an experimental arrangement is hardly useful for some practical applications of soft-landing, where the total quantity of material landed is more important than the efficiency with which this is accomplished.

Figure S1 Typical DC potentials used in this experiment for trapping and landing

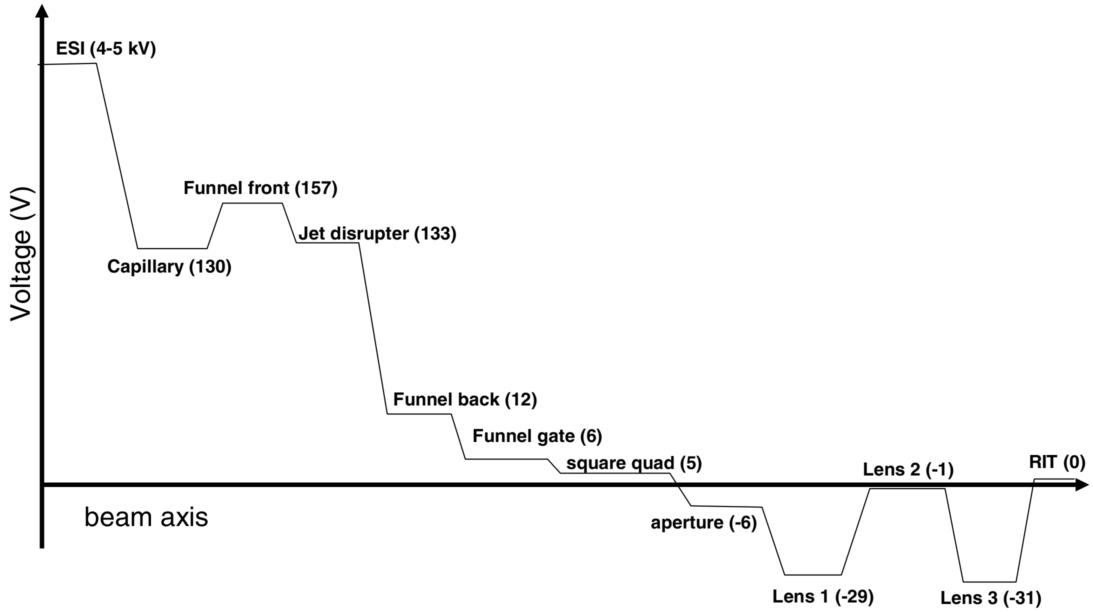

Figure S2 Image of soft landed angiotensin onto an Au/F-SAM surface

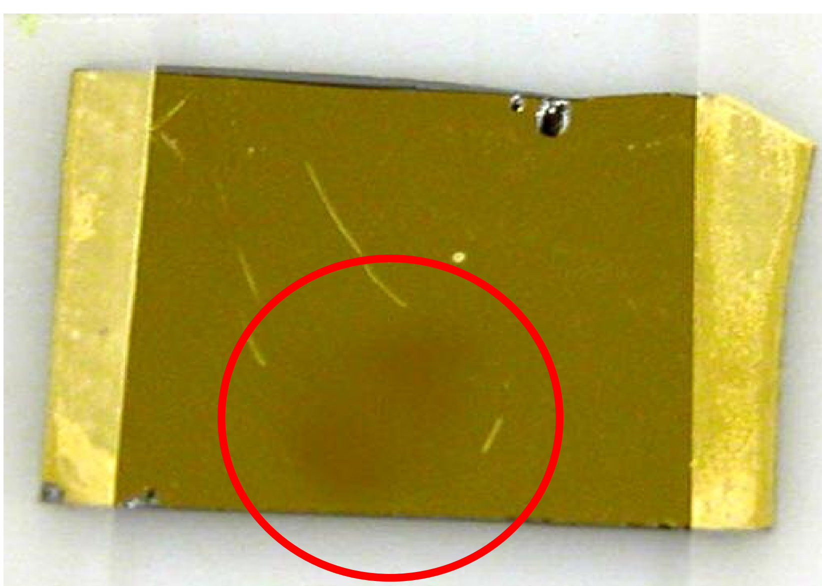

Figure S3

Development of signal intensity in time for three forms of molecular ion during DESI-MS analysis. A) 428Th, $[M+3H^{+}]^{3+}$, B) 641Th $[M+2H^{+}]^{2+}$ and C) 1282Th $[M+H^{+}]^{+}$.

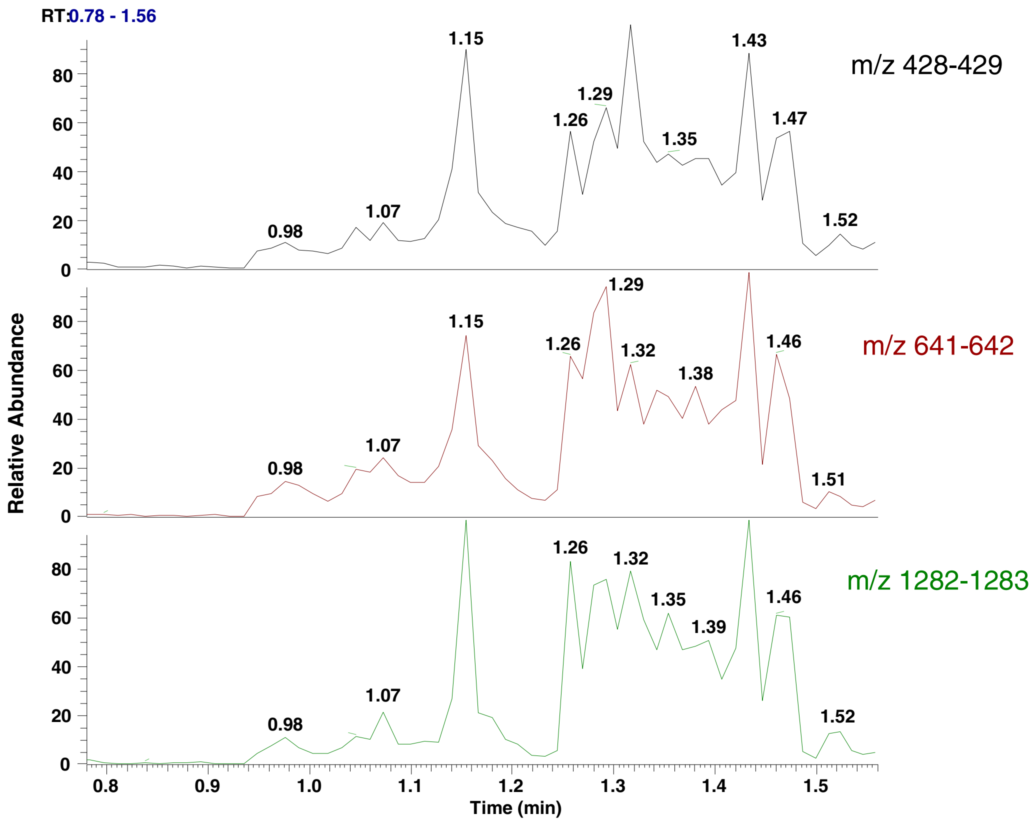

Figure S4

(top) Ion current at landing surface as function of surface potential with RF of 232 $V_{0\text{-}p}$ and 691 $V_{0\text{-}p}$. (bottom left) Data fitted to Gaussians

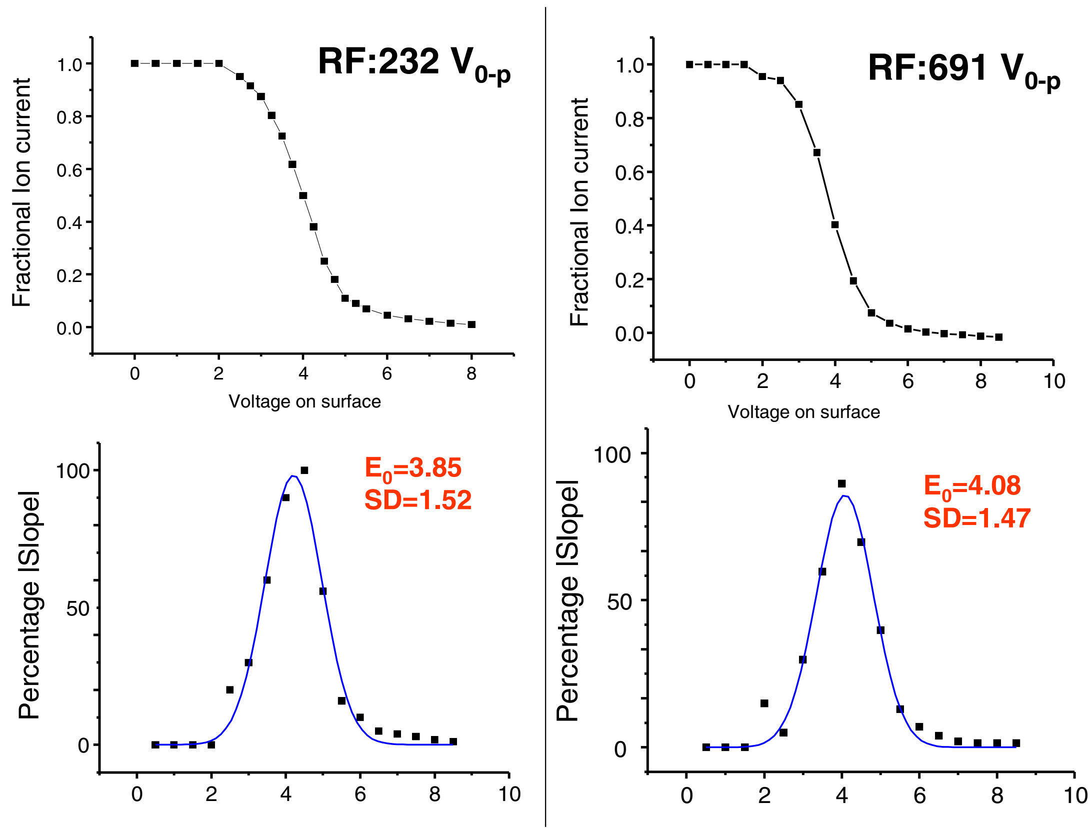

Figure S5

(a) Mass spectrum obtained from a mixture of pyridine and serine using the square quad in the RF-only mode; (b) Isolation of the pyridine peak with RF/DC applied to the square quad; (c) Isolation of a background peak with RF/DC; (d) Isolation of serine peak with RF/DC

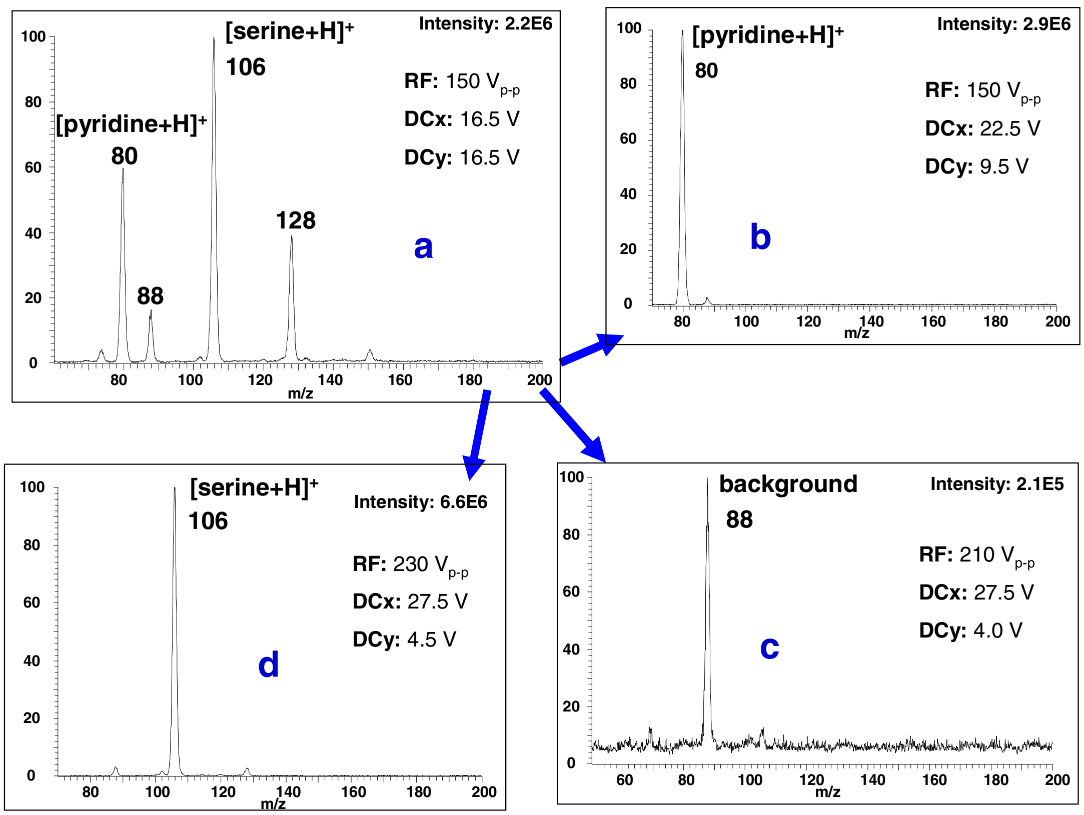

Figure S6

Nanospray mass spectrum of (top) blank rinse and (bottom) surface rinse after landing arginine with mass selection by the square quad

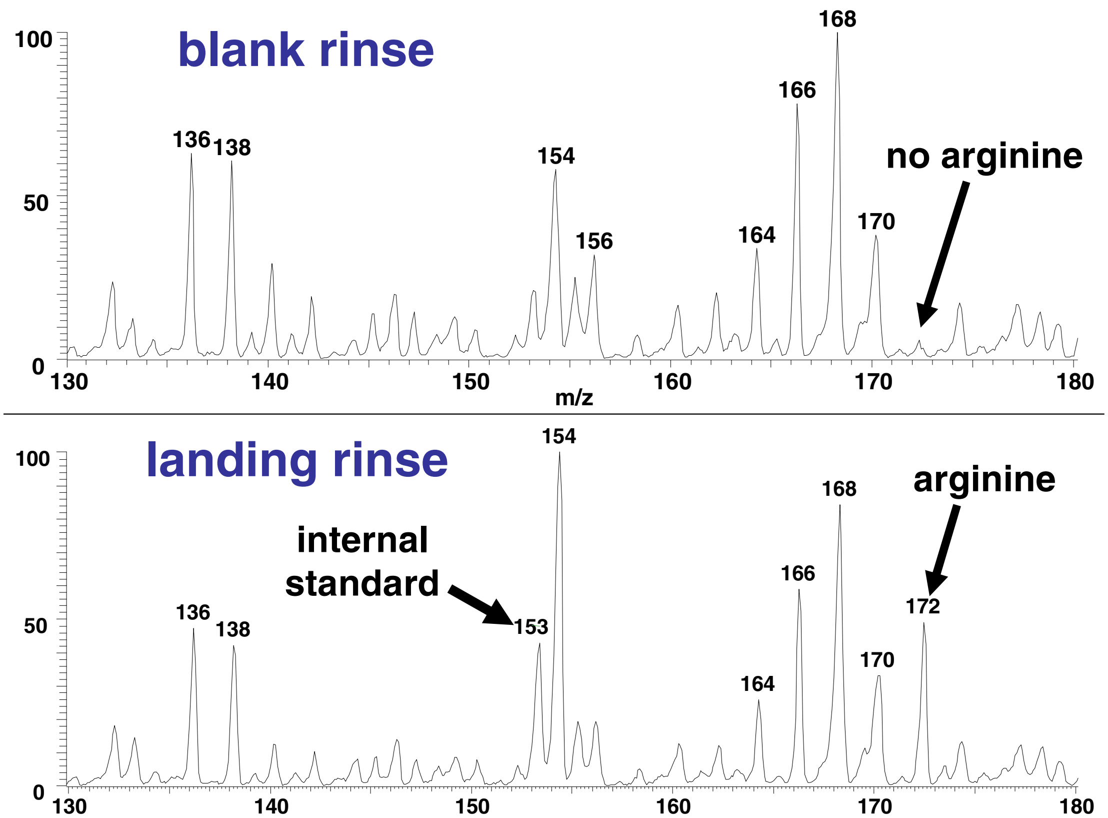

Figure S7

Stability diagram of the bent square quadrupole using m/z 175