High-speed MALDI-2 on a timsTOF fleX: An overview of applications

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Matrix-assisted laser desorption/ionization mass spectrometry imaging, or MALDI-MSI, has proven to be a valuable tool to study molecular distributions in tissue sections in a variety of application areas, ranging from clinical research to environmental sciences, and pharmaceutical industry. More recently, laser-induced post-ionization, or MALDI-2, has been coupled to MALDI-MSI, in order to boost ion yields enabling analysis at smaller pixel sizes. MALDI-2 also reduces ion suppression effects and results in a concomitant increase of molecular coverage in tissue analyses. While the first implementations of the MALDI-2 technology were limited in analysis speed, the current implementation on the Bruker Daltonics timsTOF fleX features a 1 kHz post-ionization laser, allowing MALDI-2-MSI at much higher acquisition speeds compared to other MALDI-2 solutions. The combination of MALDI-2 with the ion mobility separation (IMS) capabilities of the timsTOF fleX allow for unprecedented exploration of the biomolecular content of tissues, as we have demonstrated in a number of applications, ranging from the analysis of small molecules and various classes of lipids in rat brain, testis, bacterial cultures and flatworms, to the analysis of *N*-glycans from human cerebellum.