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A NOVEL STAGE FOR RAPID RANDOM ACCESS SAMPLING OF SPOTS ON MALDI TARGETS

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Traditionally x-y stages have been employed in MALDI mass spectrometers to position the target. The demands of high throughput proteomics and chemically activated surfaces with associated small spot sizes and high spot population of targets has steadily increased the demand on x-y stages which have become a very expensive component in instruments that place high demands of speed and accuracy (e.g., TOF-TOF). Simultaneous linear positioning on two axes is not a trivial task and is essentially an intensively "stop-start" process requiring considerable sophistication in the mechatronics to achieve speed and repeatability.

We have investigated alternative ways of addressing the two-dimensional surface of a MALDI target and opted for an r, θ (polar) paradigm instead of the x,y (Cartesian) paradigm. Our hypothesis is that it is technologically easier to locate position on a *constantly spinning* target (θ) via registration of the rotation ($t = \theta = 0$) and accurate measurement of time ($\theta = \text{constant} \times t$). The approach requires linear actuation (stop-start) in only one dimension (r) instead of 2 (x,y). Actuation in r can take the form of linear movement of the rotating stage or, for some MALDI TOF systems, very simple linear movement of the laser beam, for example, via a mirror-galvanometer.

At rotational speeds of around 10 Hz the jitter in laser timing translates to sub-micron position variance for the cheapest lasers currently deployed in MALDI MS. This means that higher speeds are possible unless errors in other parts of the system are much greater than the jitter in the laser.

We have constructed a rudimentary spinning probe to test the hypothesis initially in terms of the θ coordinate. Initial results based on optical registration of laser shots and with actual samples on a prototype orthogonal acceleration MALDI TOFMS will be presented along with proposed applications of the device in areas such as TOF-TOF, LC MALDI and imaging.