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Experimental 4D tracking of a single electron in IOTA

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We present the results of the first experiments on 4-dimensional phase-space tracking of a single electron in a storage ring, using a linear multi-anode photomultiplier tube for simultaneously measuring transverse coordinates and arrival times of synchrotron-radiation pulses. During the next few months, full 6D tracking will be implemented. This technology makes it possible to characterize the motion of a single particle, i.e. simultaneously tracking of amplitudes and phases for slow synchrotron oscillations and fast betatron oscillations. Complete tracking of a single particle enables the first direct measurements of dynamical properties, including invariants, amplitude-dependent tunes, and chaotic behavior.

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Footnotes

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Yes

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