Proposed CLARA measurements to do at ESB before moving MZI to the tunnel

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Purpose

- scientific: demonstrate we can measure and interpret observables to distinguish types of radiation (chaotic vs. coherent; number state would require another source), in support of future measurements with electrons
- pedagogical: elucidate (to ourselves, maybe for a publication) the transition between chaotic and coherent types of light from different points of view

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Main observables to characterize radiation

- coherence length from delay scan
- complex shape of the coincidence rate vs. delay (dip, beating, …)
- normalized coincidence rate W_{12}
- distribution of photocount arrival times (simpler in beam-splitter mode, with one MZI arm blocked)

Proposed set of measurements

- at least 2 high-resolution delay scans (~1 h each), at very low and very high diode currents, to measure coherence length, shape of coincidence curve, MZI asymmetries
- normalized coincidence rate W_{12} vs. delay at low diode intensity (chaotic light) to characterize bunching of events
- photocount arrival time distribution with picosecond event timer (beam-splitter mode, one MZI arm blocked) at low and high diode currents, to test predictions for chaotic and coherent light

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Other considerations

- use the time at ESB to produce a complete set of measurements to understand the apparatus (alignment, vibrations, …) and test our procedures for characterizing light (observables, data analysis, …) in an easily accessible environment
- do not delay IOTA installation too much to reduce risks related to the accelerator
- (optional) purchase a parametric downconversion unit (25 k$) as source of number states

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