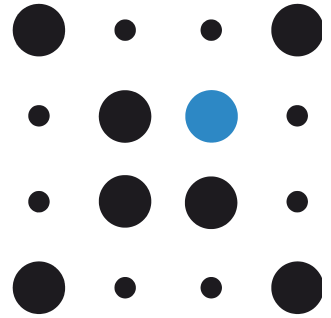
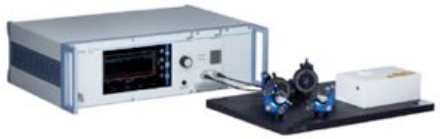
qutools



Henning Weier

qutools GmbH

- Spin-off from LMU Munich (2005)
- Privately owned
- Employees: 10 (hiring!)
- Munich, Germany



Entanglement Demonstrator

Time Tagger 81 ps Resolution

Time Tagger 1 ps Resolution

Science Kit for Quantum Optics

Interferometric Tape Measure

2006: quED

2009: quTAU

2016: quTAG

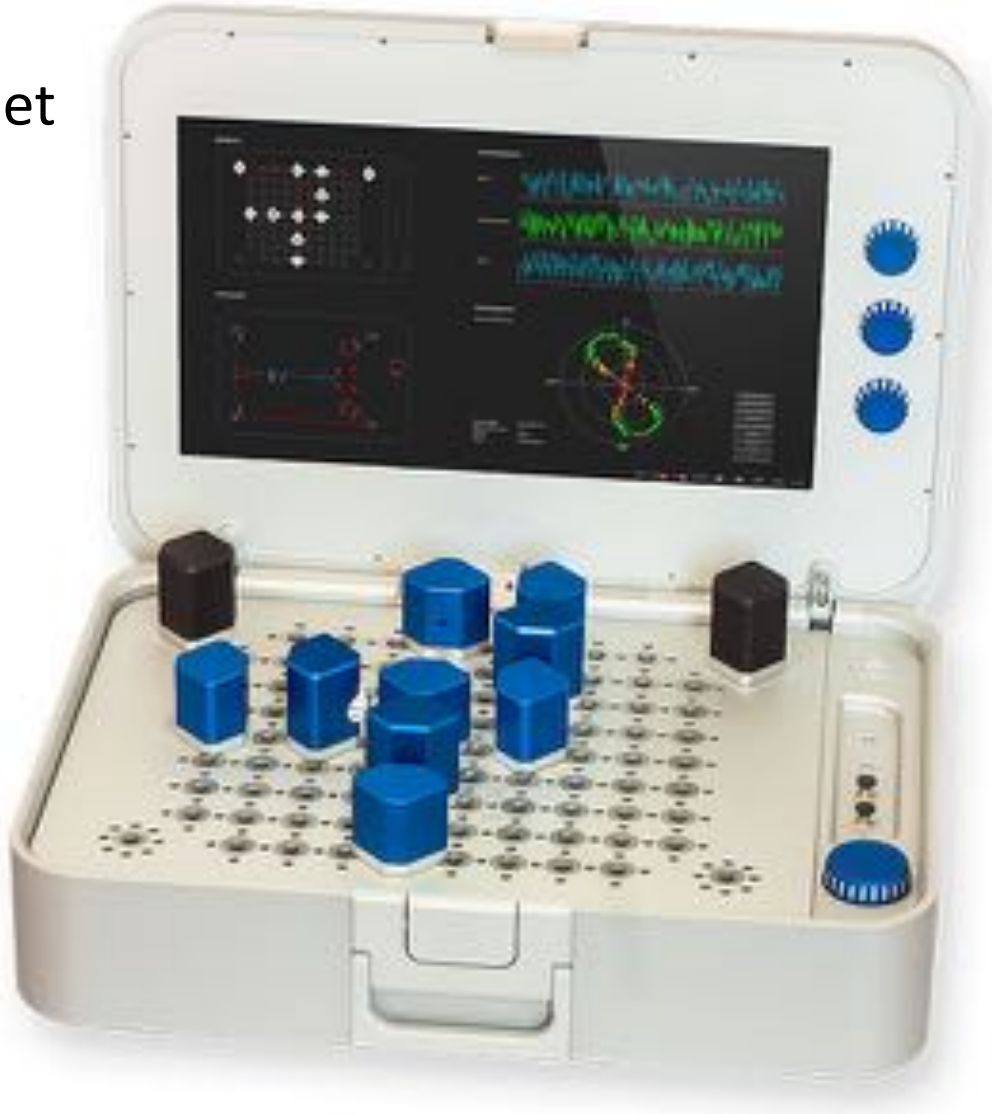
2018: Quanten-koffer

2019: quDIS

Our company

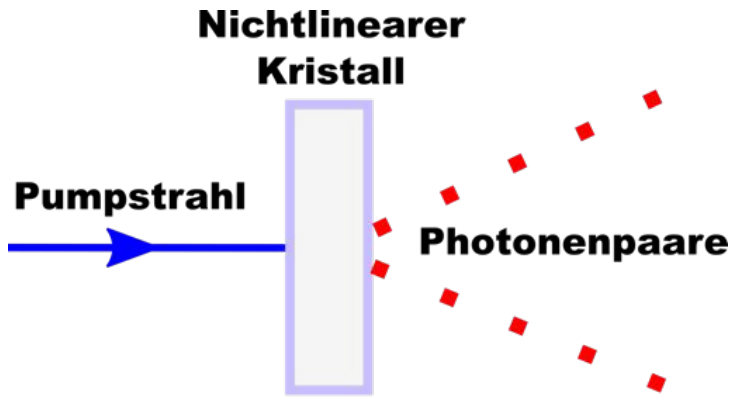
Quantenkoffer: Quantenphysik be-greifen

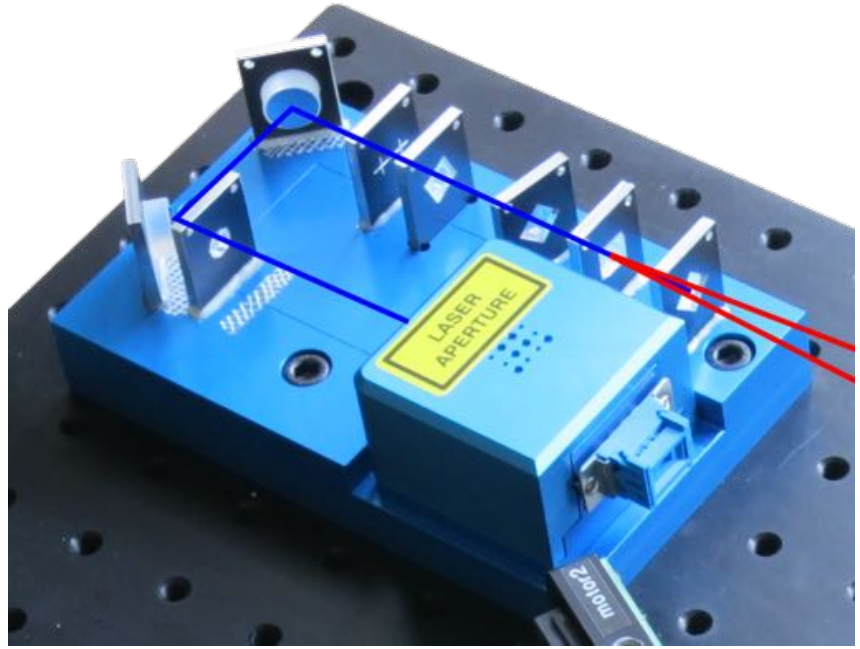
- Quantenphysik wird als „kontra-intuitiv“ bezeichnet
- Phänomenologischer, spielerischer Ansatz
- Hands-on



quED: (Entangled) Photon Pair Source

- SPDC source as source of heralded single photons
- One arm used as trigger
- Coincidences only evaluate the interesting events





http://www.qutools.com/quED/

Is it a Wave? Is it a Particle?

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Waves explain:

- Refraction
- Diffraction
- Interference

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quED-MI: Is it a Wave?

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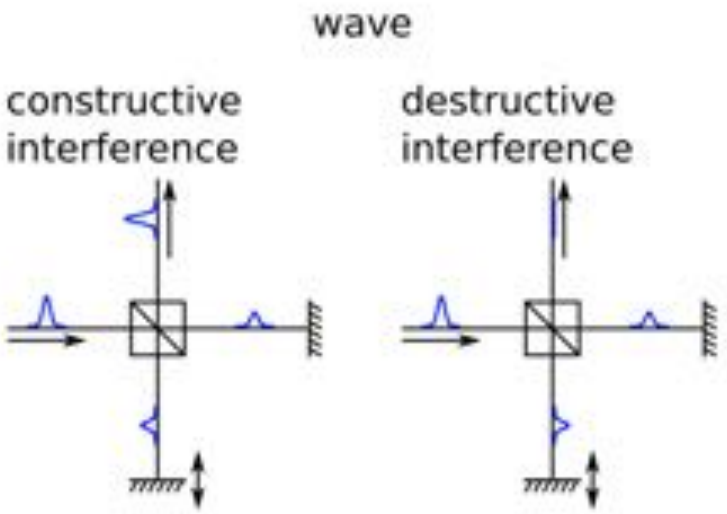

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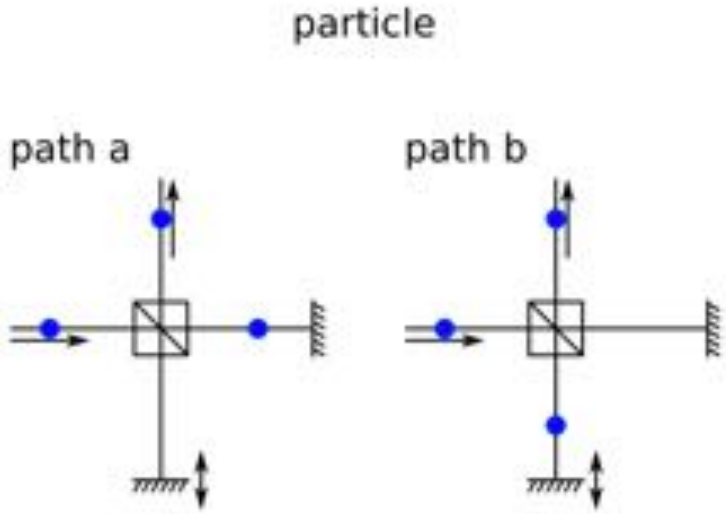

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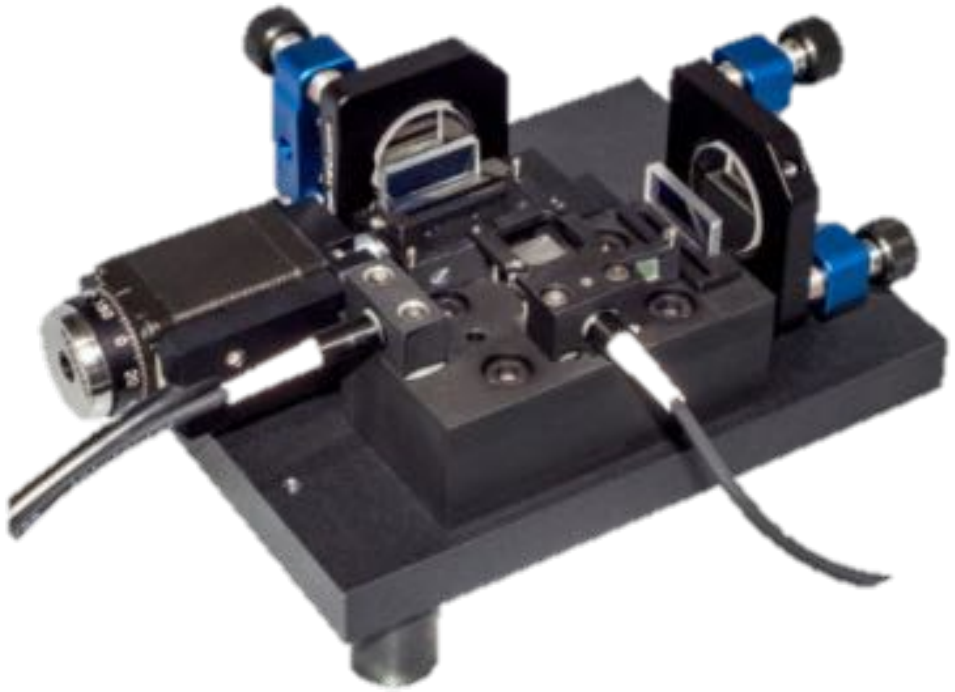

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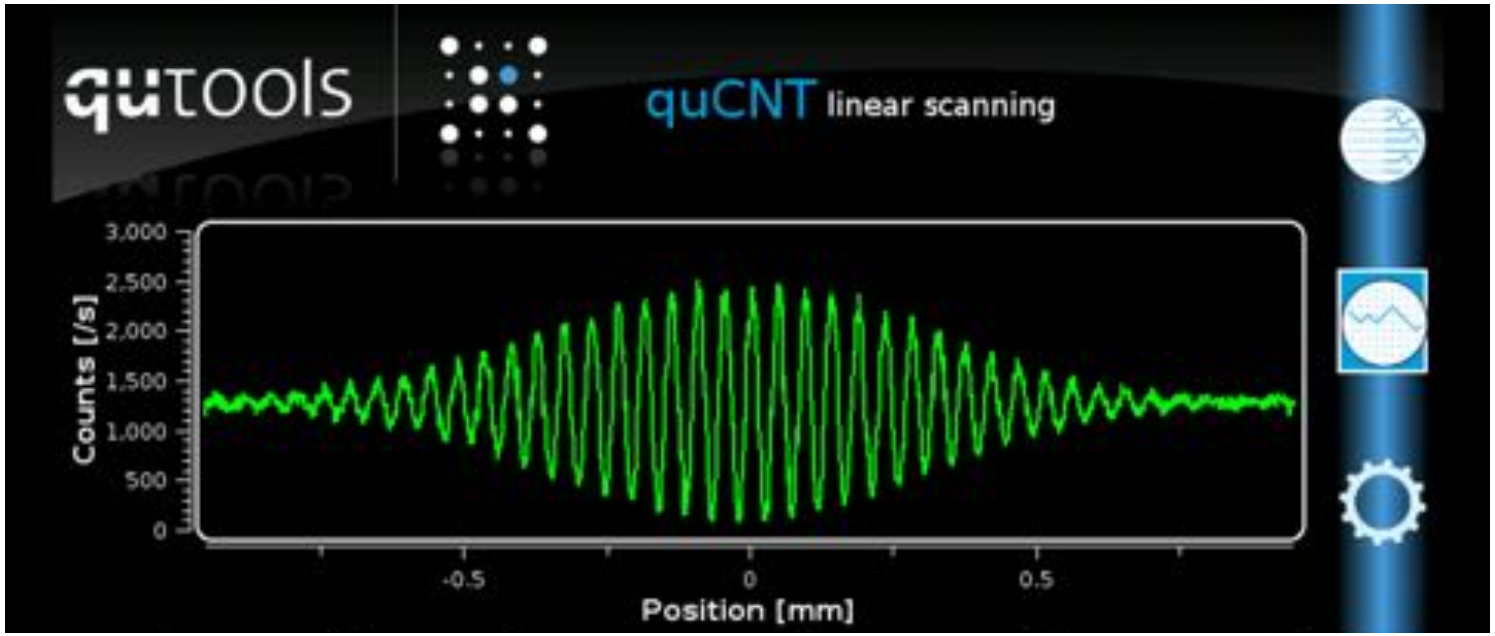

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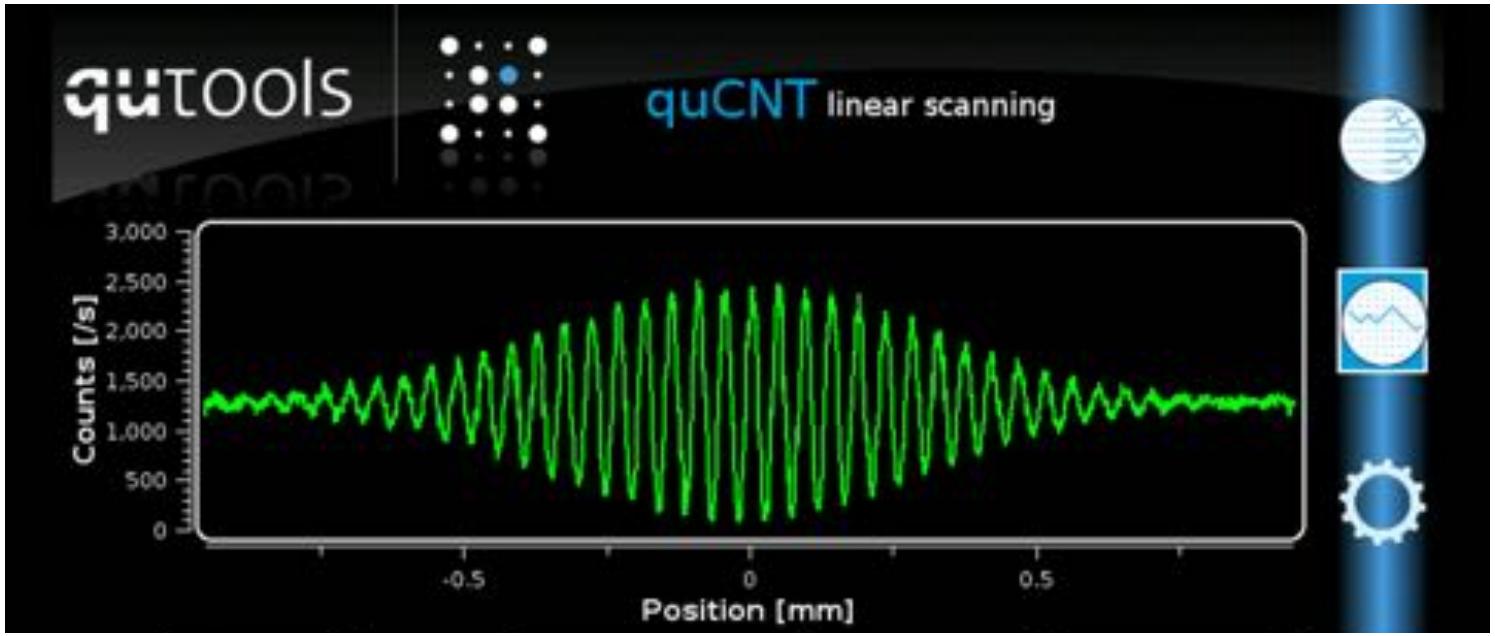

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quED-HBT: Is it a Particle?

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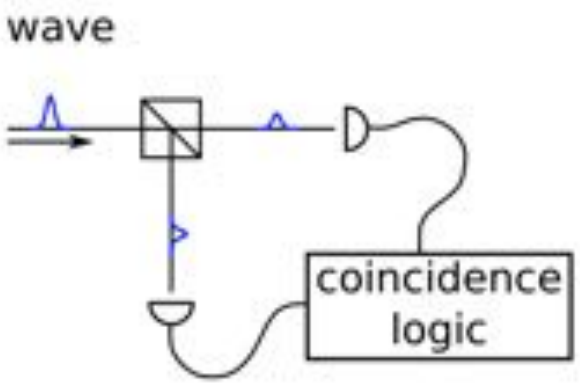

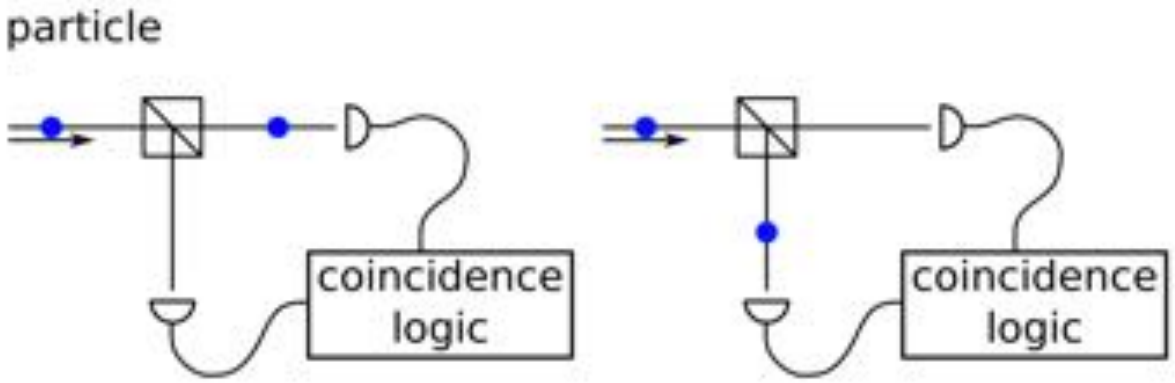

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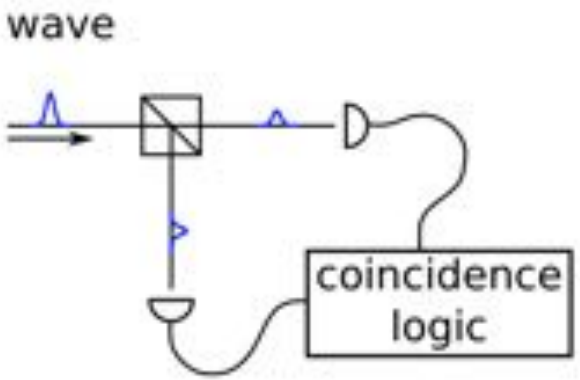
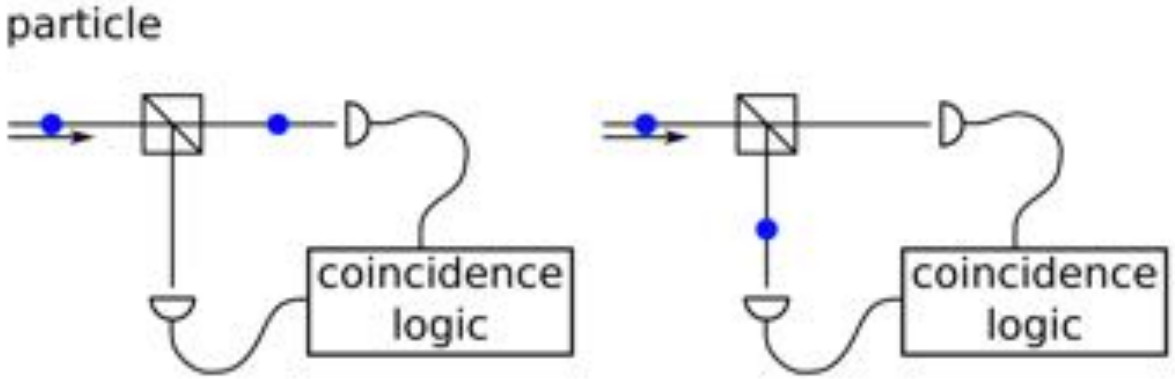
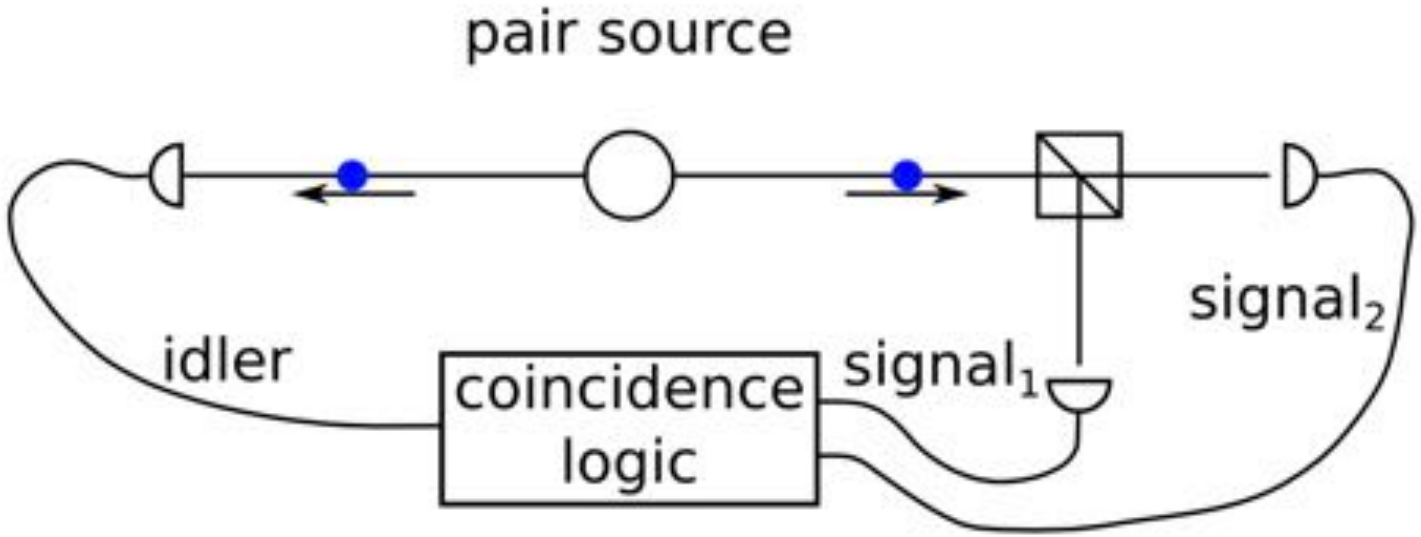




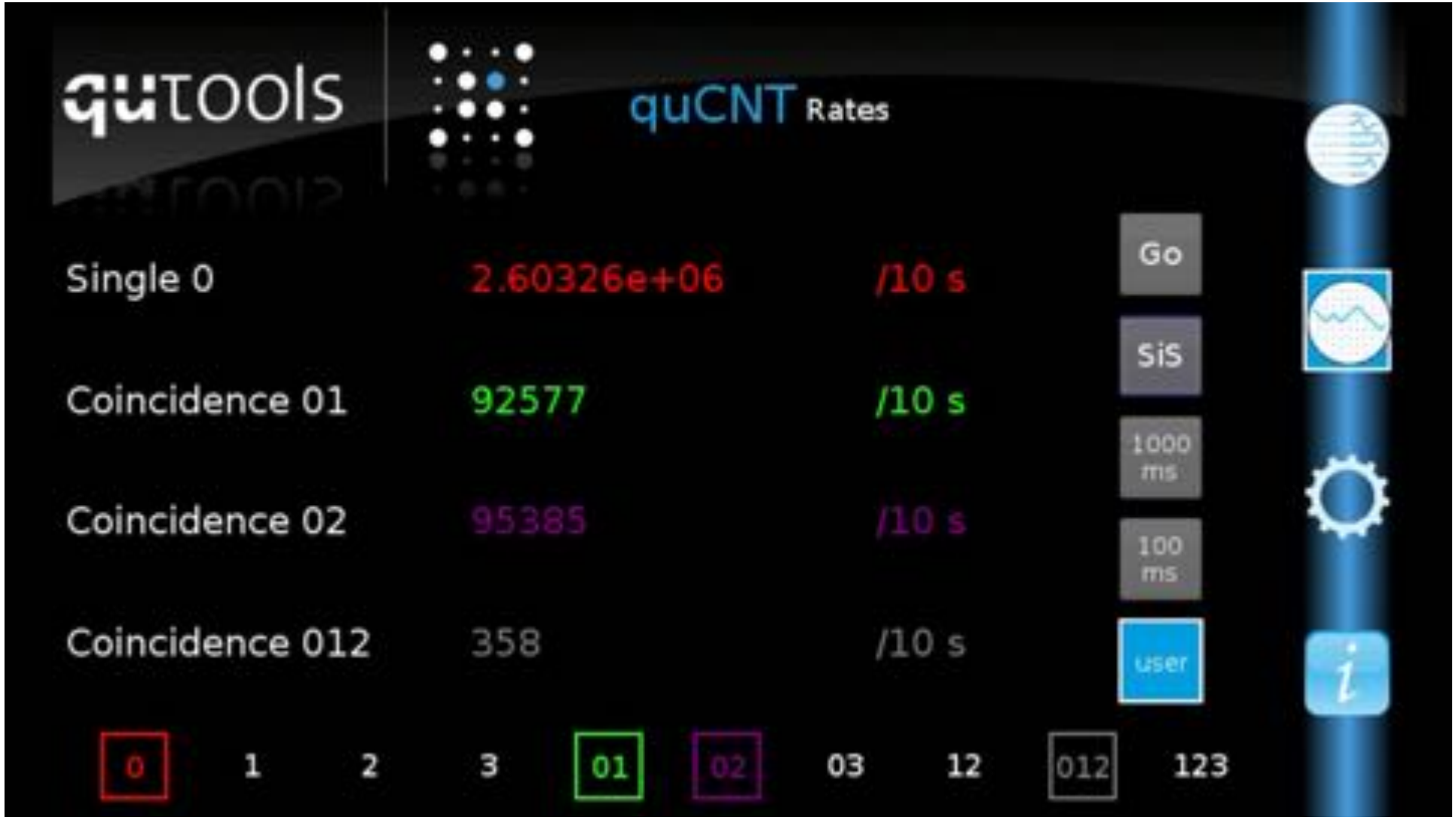
Indivisible (single) particles → no coincidences

quED-HBT: Is it a Particle?



Indivisible (heralded single) particles → no 3-fold coincidences

quED-HBT: Is it a Particle?



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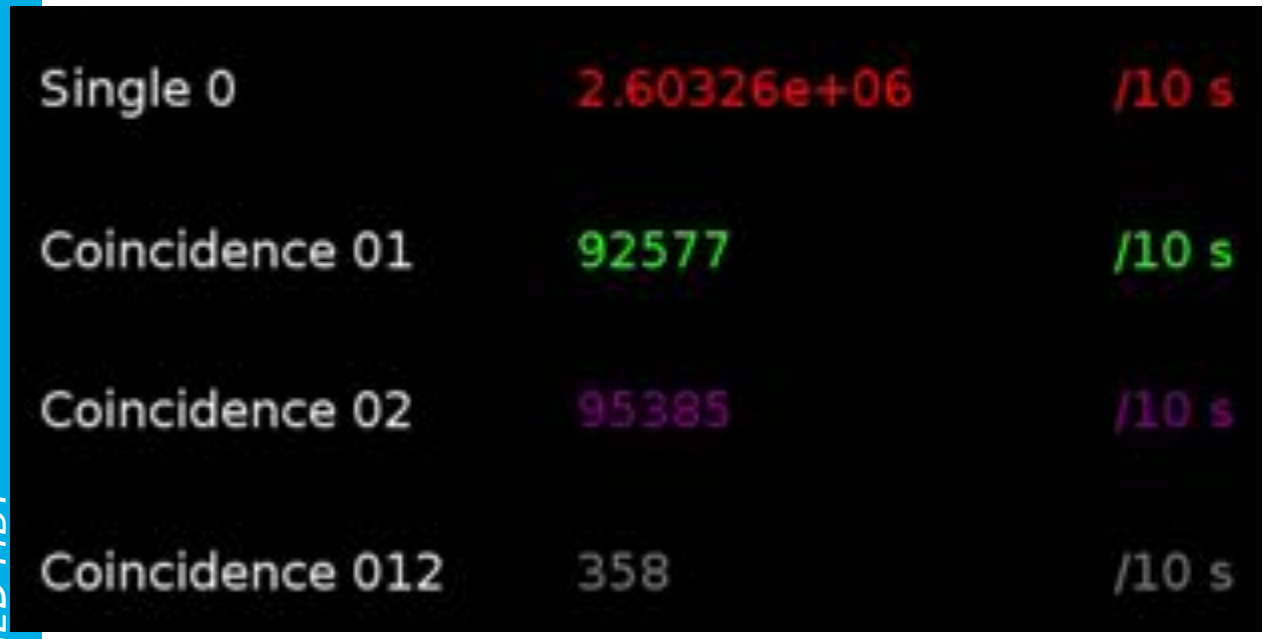

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Hanbury Brown Twiss Experiment

$$g_h^{(2)}(0) = \frac{C_{012} \cdot S_0}{C_{01} \cdot C_{02}}$$

- $g_H^{(2)}(\tau=0) = 0.11$
- < 0.5: “Heralded single photon source”

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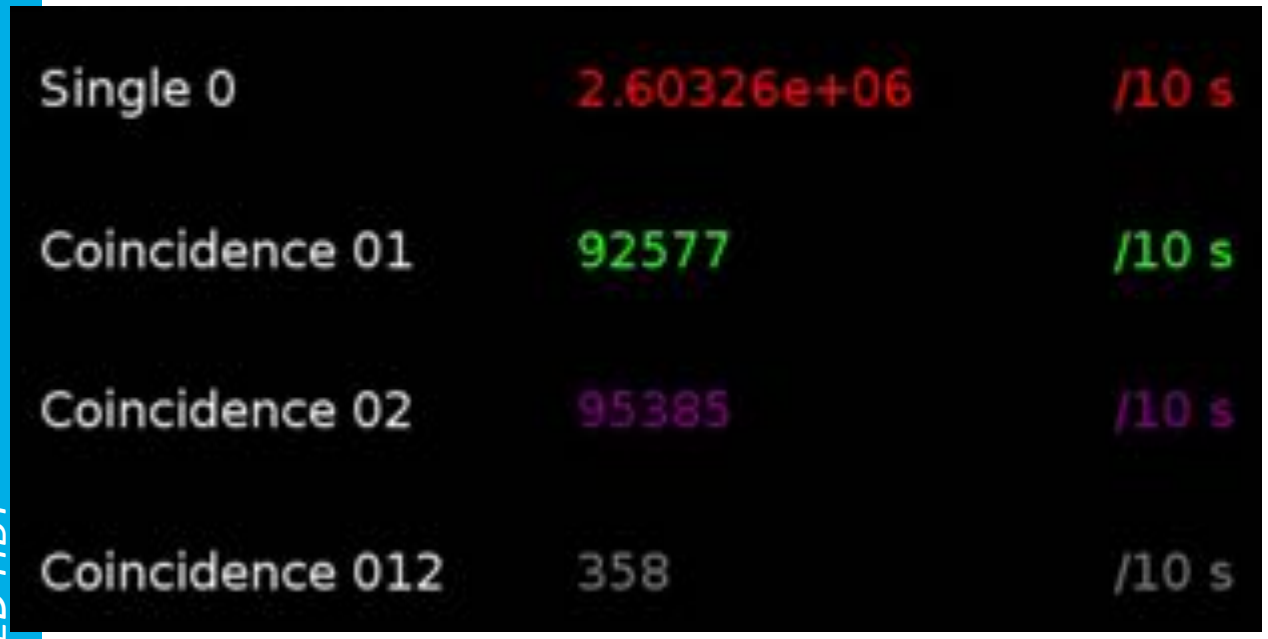

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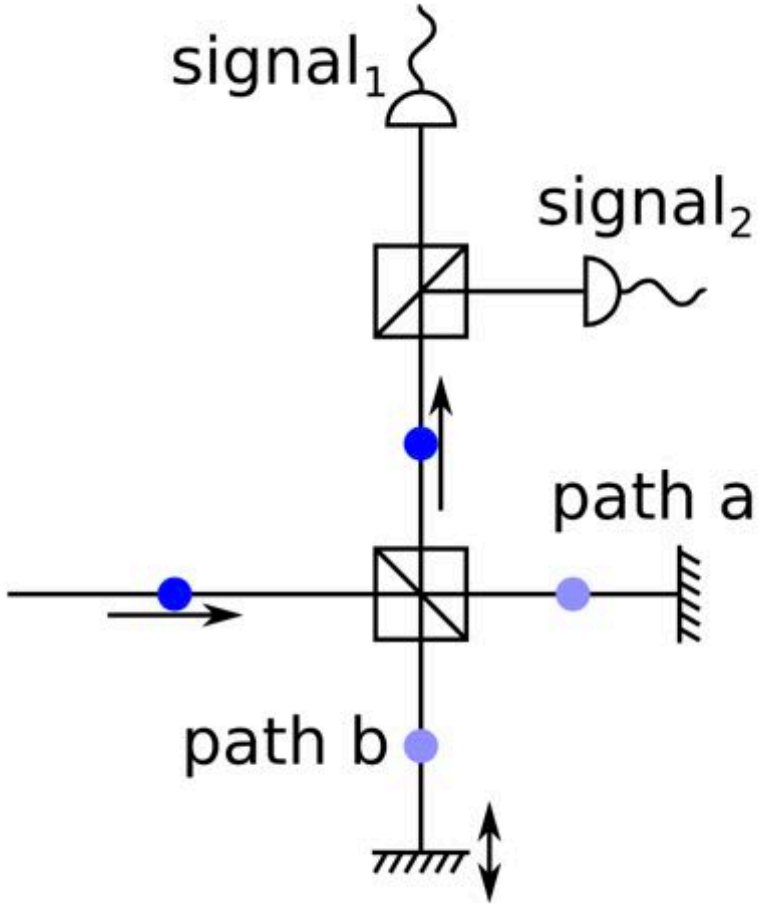
quED-MI + quED-HBT: Is it something else?

Combine both setups:



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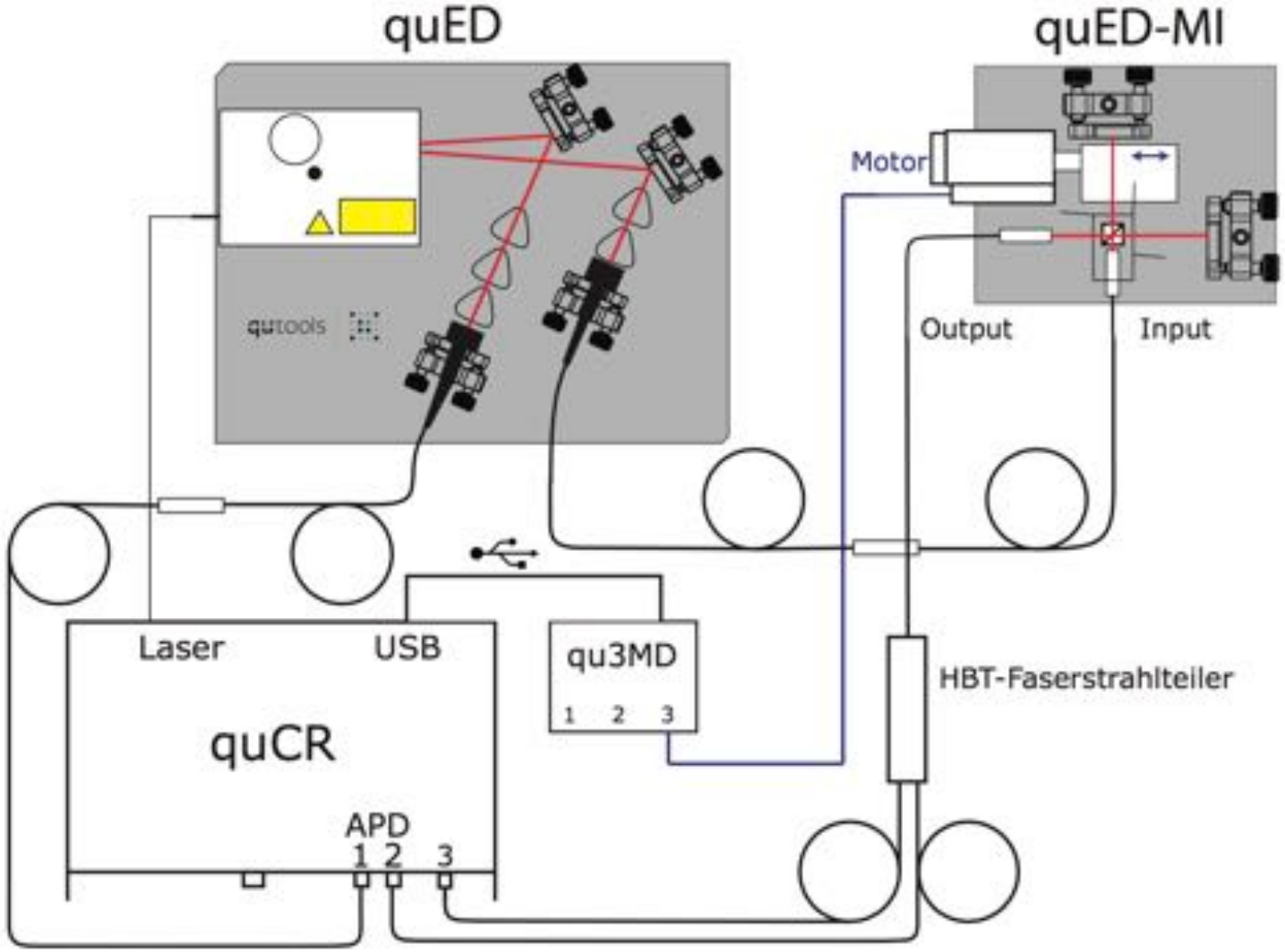
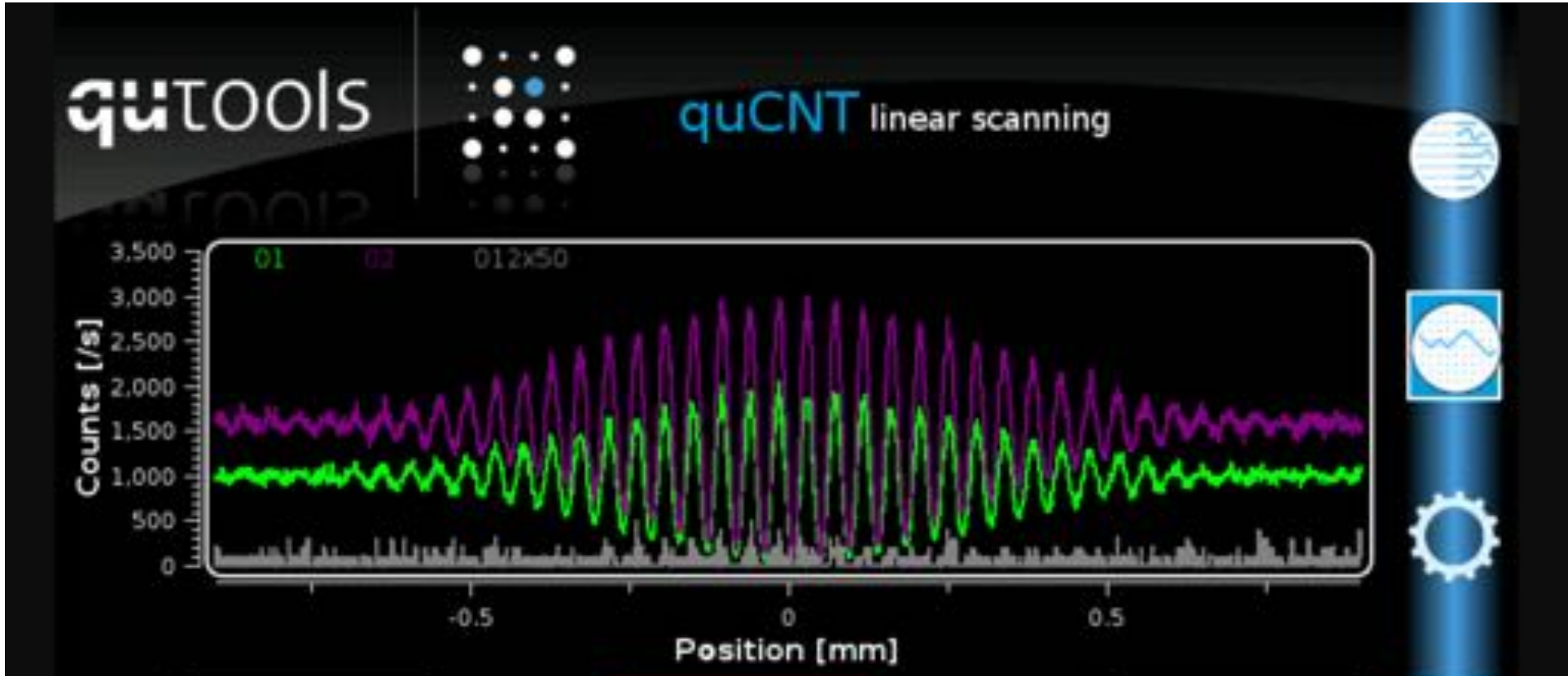


quED-MI + quED-HBT: Is it something else?

Combine both setups:

- Interference
- Particle-like behaviour



quED-MI + quED-HBT: Is it something else?

Combine both setups:

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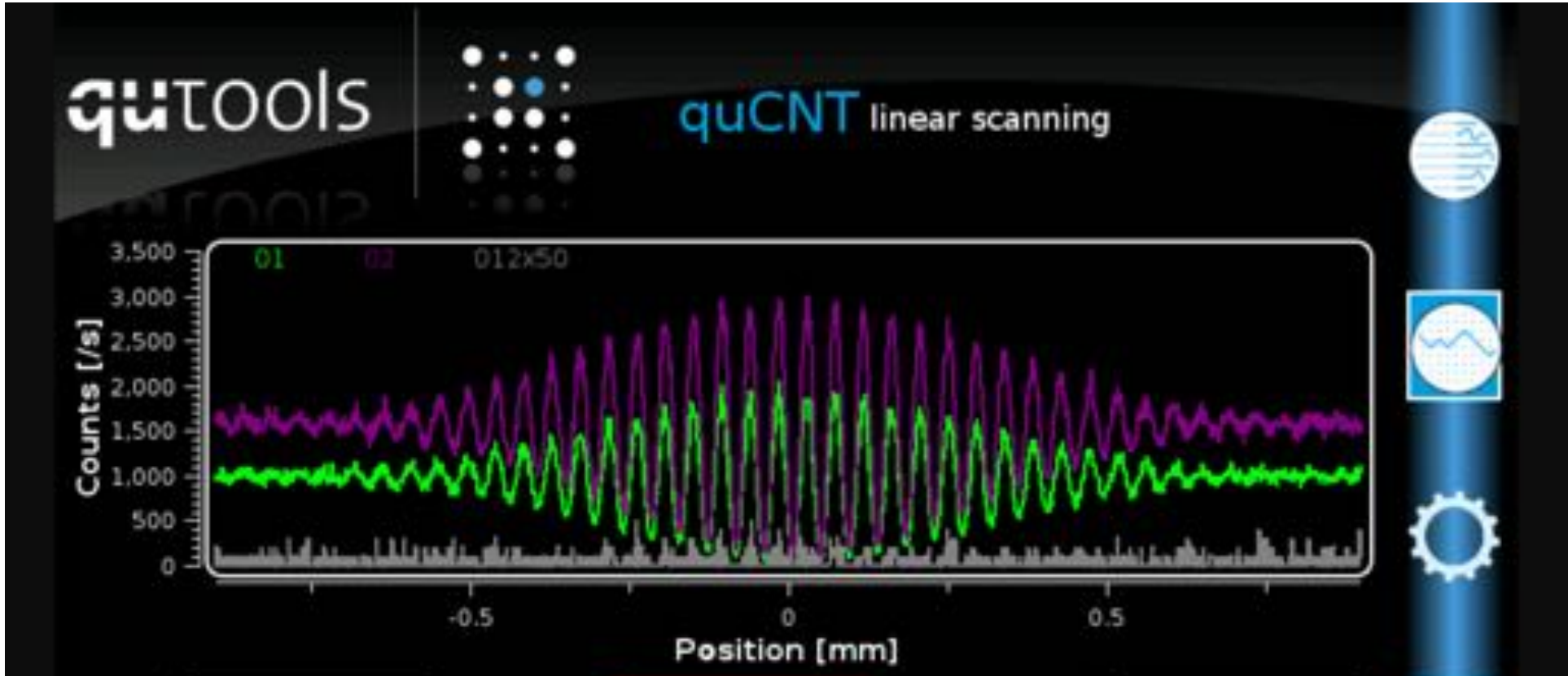
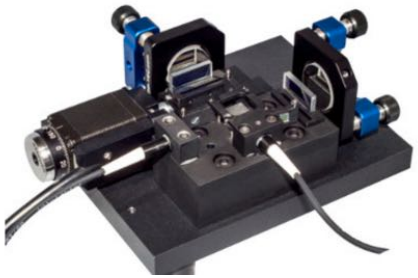
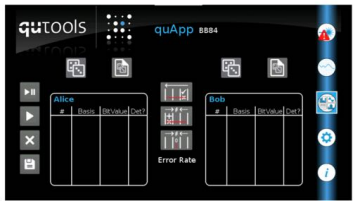


The quED and Its Add-Ons

quED	quED-MI	quED-HBT	quED-HOM	quED-QKD
				
Entanglement: Bell's Inequality	Wave Character of Photons	Particle Character of Photons: HBT	2-Photon Interference: Hong-Ou-Mandel	Quantum Key Distribution/ Cryptography

http://www.qutools.com/quED/

Quantenmobil

http://www.quantenkoffer.de

Vielen Dank für Ihre Aufmerksamkeit

https://www.qutools.com