

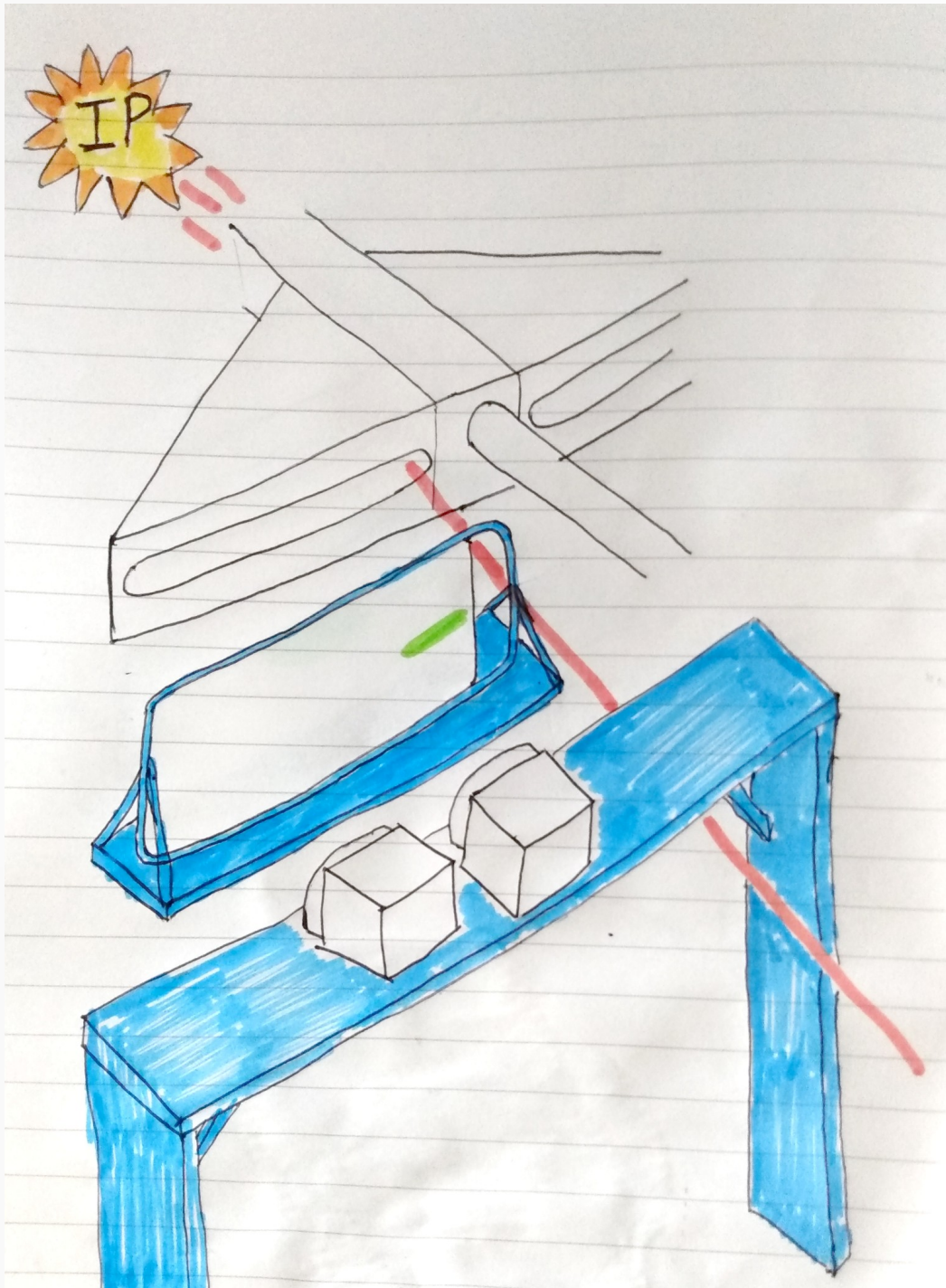
Scintillation Screen Test-Beam Requirements and Opportunities

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The logo for the LUXE experiment, featuring the word "LUXE" in a bold, blue, sans-serif font. The letter "X" is stylized with a white starburst or spark-like graphic in the center.



- We are ordering Screen & cameras now so delivery in coming months
- Software & hardware expected to be very simple. Standard optical camera images a passive Scintillating material.
- Beam tests still prove useful to make sure triggering, timing & cabling is functional.
 - Can therefore add the screen & camera parasitically to other detector TB campaigns at DESY – in fact the detector is designed to be used in conjunction with Cherenkov detector to measure the same e^- spectrum

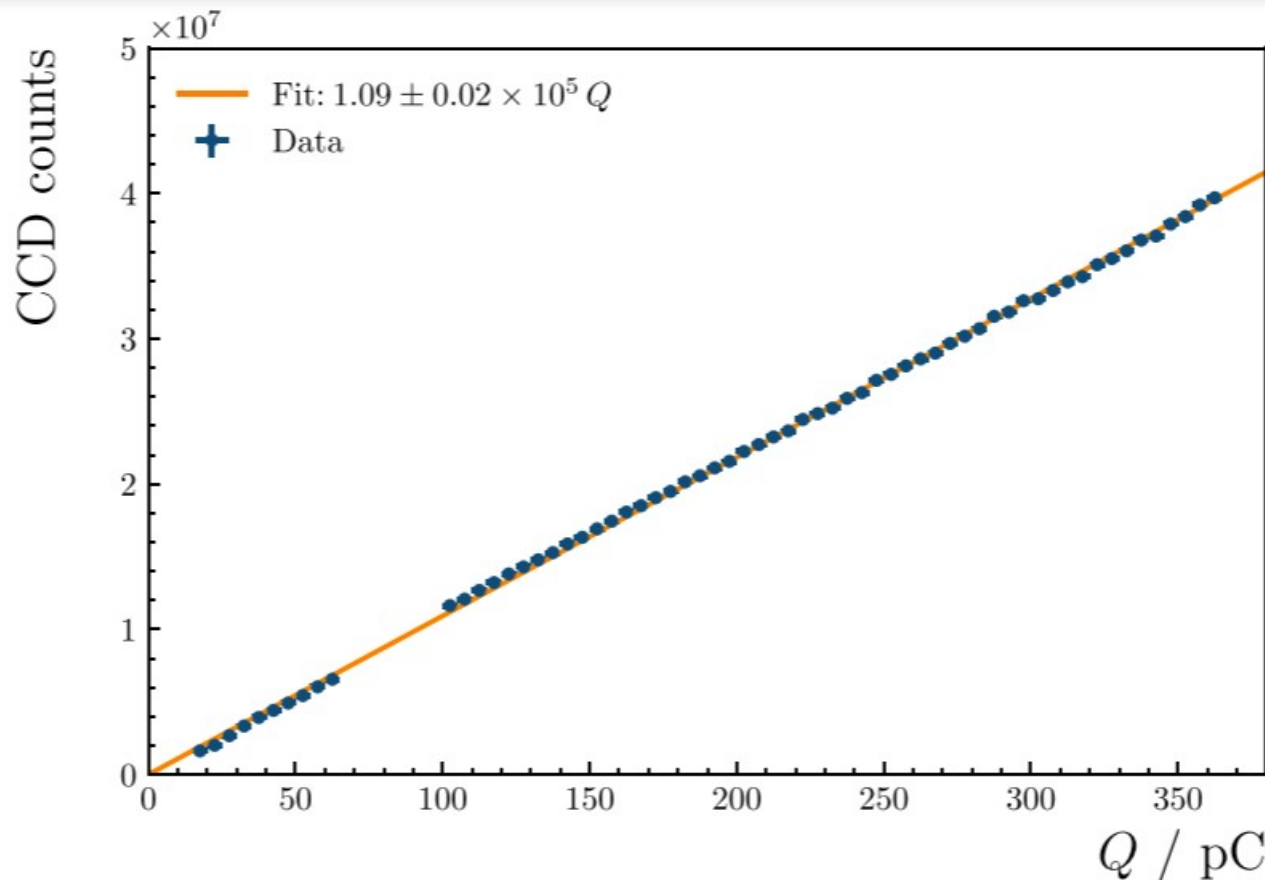


Fig. 9. Scintillator response to incident electron beam charge (points) fitted with a linear function. The response is given in CCD counts, corrected to a gain of 250 and a gate width of 500 μs measured 200 μs after the bunch is incident upon the scintillator. The data are binned by charge in 5 pC bins.

1. J. Bauche et al., “A magnetic spectrometer to measure electron bunches accelerated at AWAKE”, *Nuclear Inst. and Methods in Physics Research, A*, Volume 940, 1 October 2019, Pages 103-108

- We also essentially need to re-create this Calibration curve (AWAKE)¹
- Left plot completed at CLEAR – an option.
- Expect at LUXE maximum of few-10 pC/mm² (few-10⁸)
- And a dynamic range $\sim 10^4$ in camera
- So ideally we test e.g. 5 fC to 50 pC
- Not sure if this is feasible but more important is we reach the higher limit to ensure linearity / watch radiation hardness

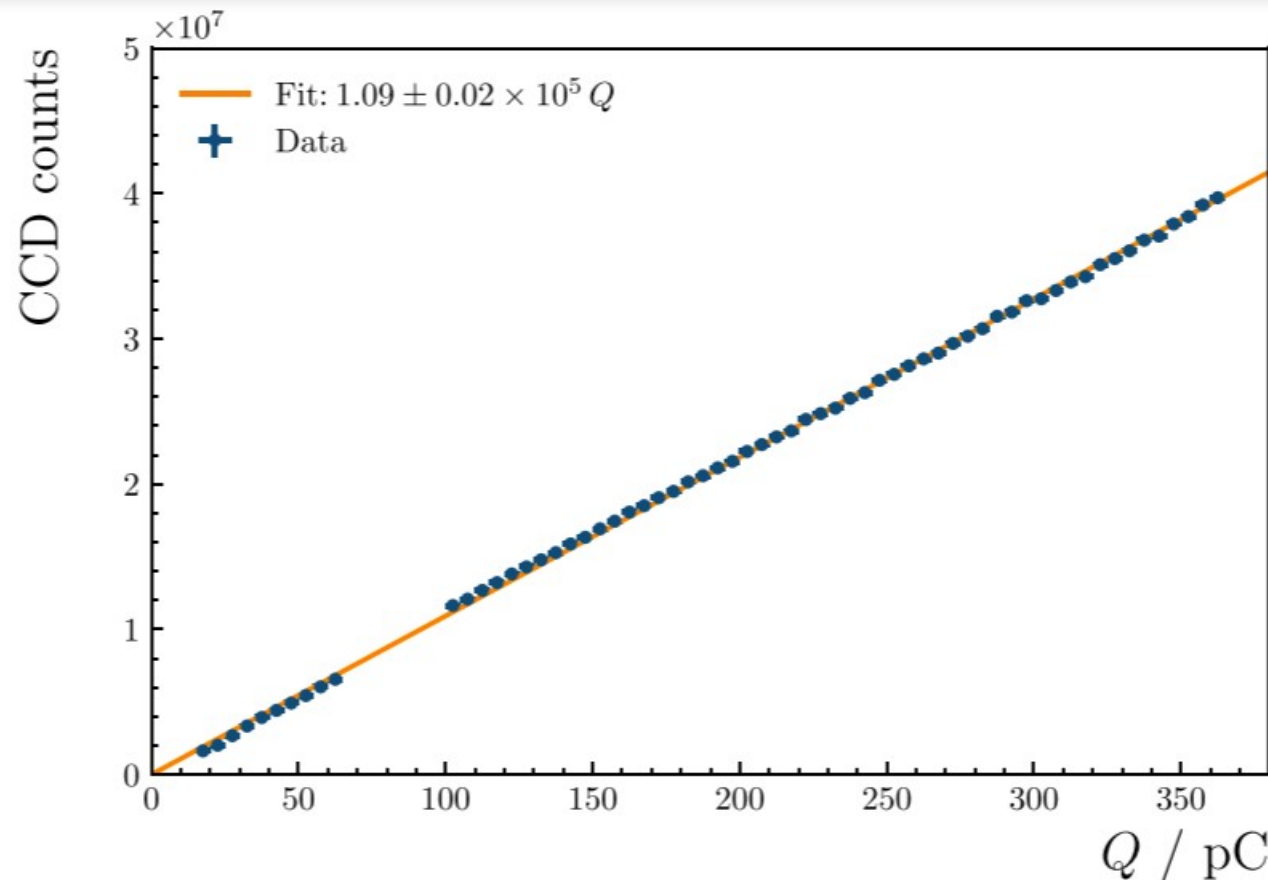


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- Creating the calibration curve now (2021) makes no sense. Should do closer to LUXE start so we are 100% sure of our set-up.
- Using a continuous current TB not appropriate. The screen requires time to emit & relax from bunch to bunch
- Using GeV e^- is ideal too, as we try to measure 1 GeV \rightarrow 15 GeV e^- with the screen, but likely we can take the energy deposition as flat with increasing E at these quantities

Summary:

- Can easily add parasitically to TB attempts of other detectors this year. In fact, at some point a check of the Scint. & Cherenkov set-up should be attempted before LUXE start, just not necessarily this year.
- Relatively high-population e^- bunch Test-Beam required for light-curve calibration, but not until 2022/2023.