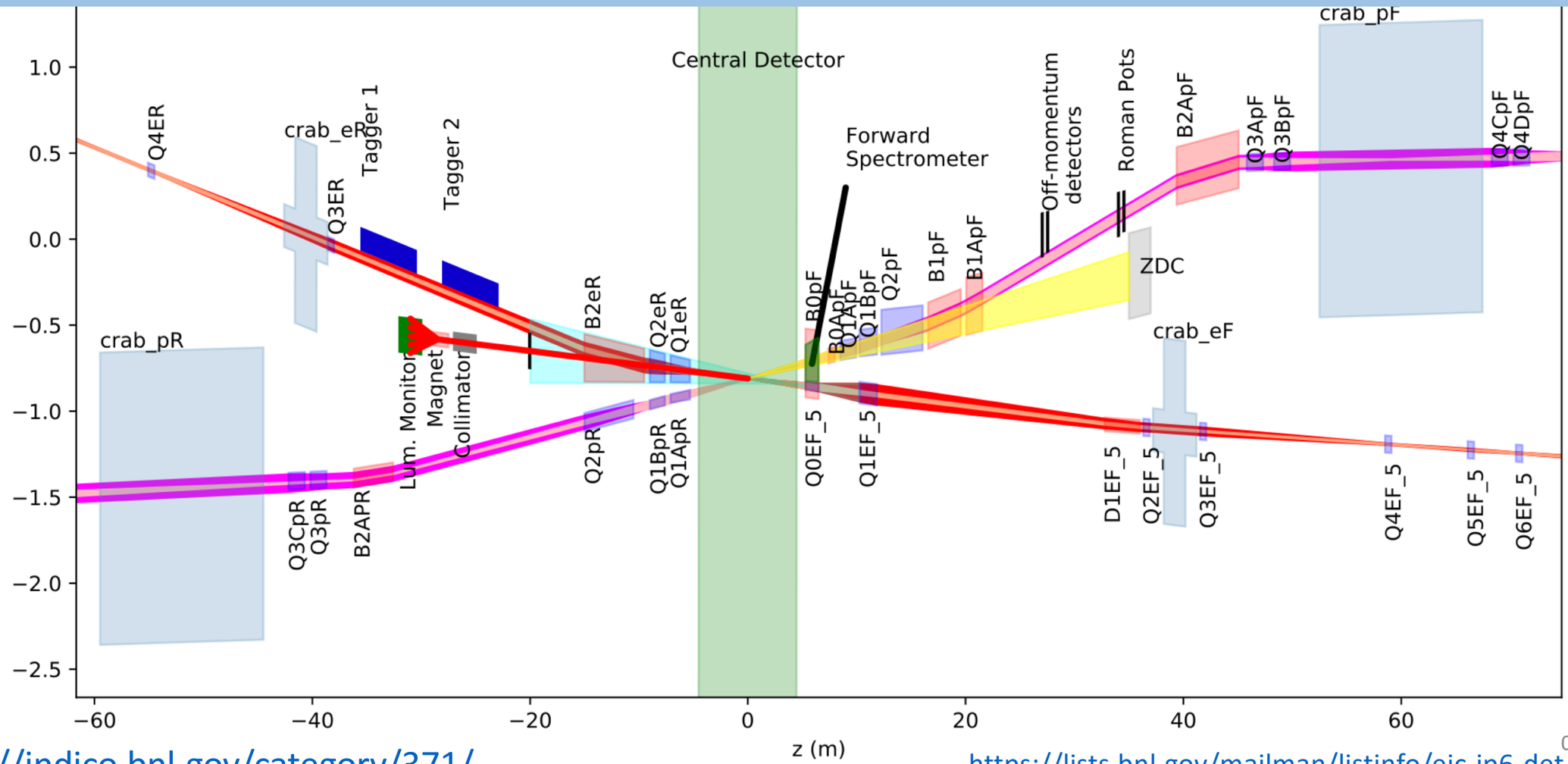
FarBackward Working Group:

Luminosity measurement and low-Q^2 tagging in ATHENA



https://indico.bnl.gov/category/371/

https://lists.bnl.gov/mailman/listinfo/eic-ip6-det-back-l (20)

FarBackward WG: next meetings etc.

On June 18th a short talk by KP on photoproduction taggers at the *Exclusive Physics* WG – first (great) outcome: Glasgow group confirms full dedication to the HIHS-like device

On June 23rd FarBackward baseline "follow-up" discussion + planning for Summer + start **planning for R&D**

---------- switching to summertime biweekly pace.

On July 7th (very) fast vs. full simulation needs and workplan + first (luminosity) data flow discussions

On July 21st we should **freeze** the luminosity detectors' setup + August 4th and 18th – series of updates on SR and designs of window + various detector components including results of new simulations

---------- switching back

On Sep 1st we are back to weekly pace and should finalize discussions about "detectors' and tunnel **infrastructure**" aspects and overall **costing** + start writing up for Proposal

Reminder of the three representatives of FarBackward WG to the ATHENA Proposal Group:

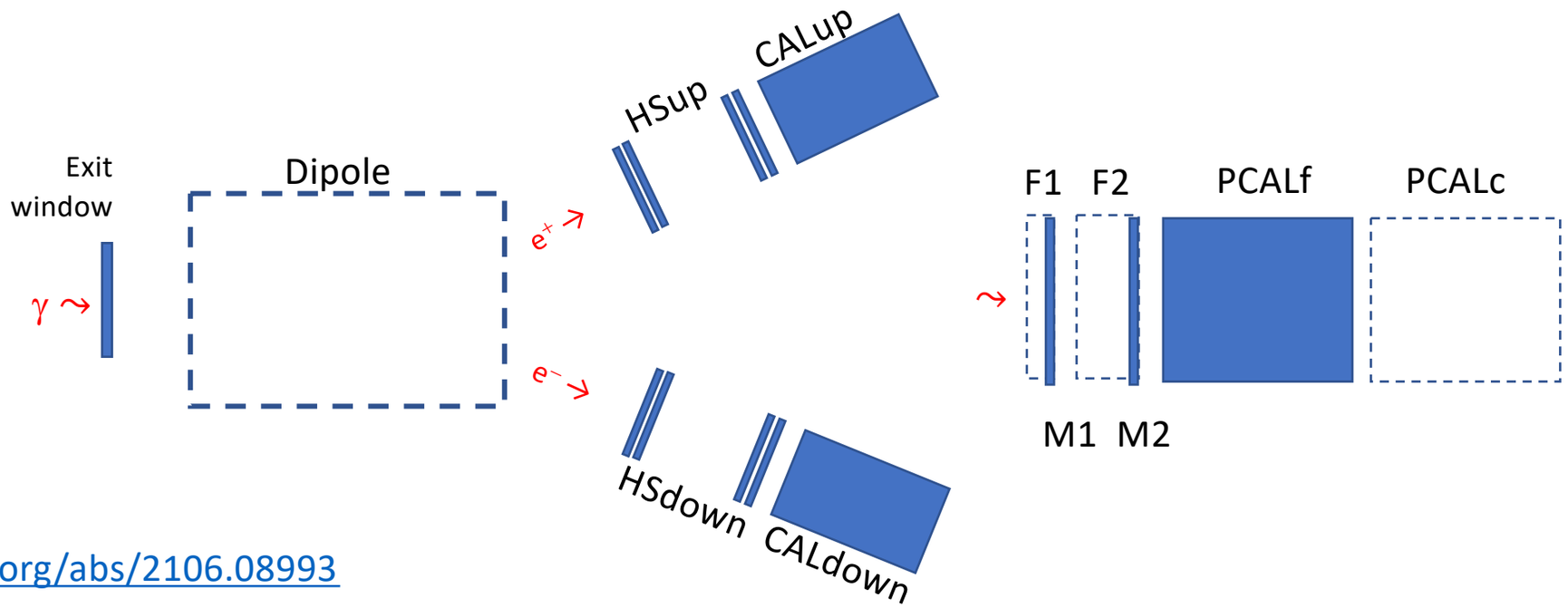
- Costing: Mariusz Przybycien (AGH) - Integration: Jaroslav Adam (BNL) - Editing: Krzysztof Piotrzkowski (AGH)

FarBackward WG: energy flow vs. conversion counting

EF formula: Average photon energy (per bunch) = Luminosity × $\int_{E_{min}} E_\gamma \, d\sigma \times A_\gamma \times (1 - CF^*)$

Note: geometrical $A_\gamma > 99\%$ and $CF^* = CF - \varepsilon$, where $CF \approx 4\%$ and $\varepsilon \ll CF$

CC formula: Photon conversion rate = Luminosity × $\Delta\sigma \times A_\gamma \times CF \times A_{selection} \times Corr_{pileup}$



https://arxiv.org/abs/2106.08993

FarBackward WG: data-driven CC calibrating w/ PCALc

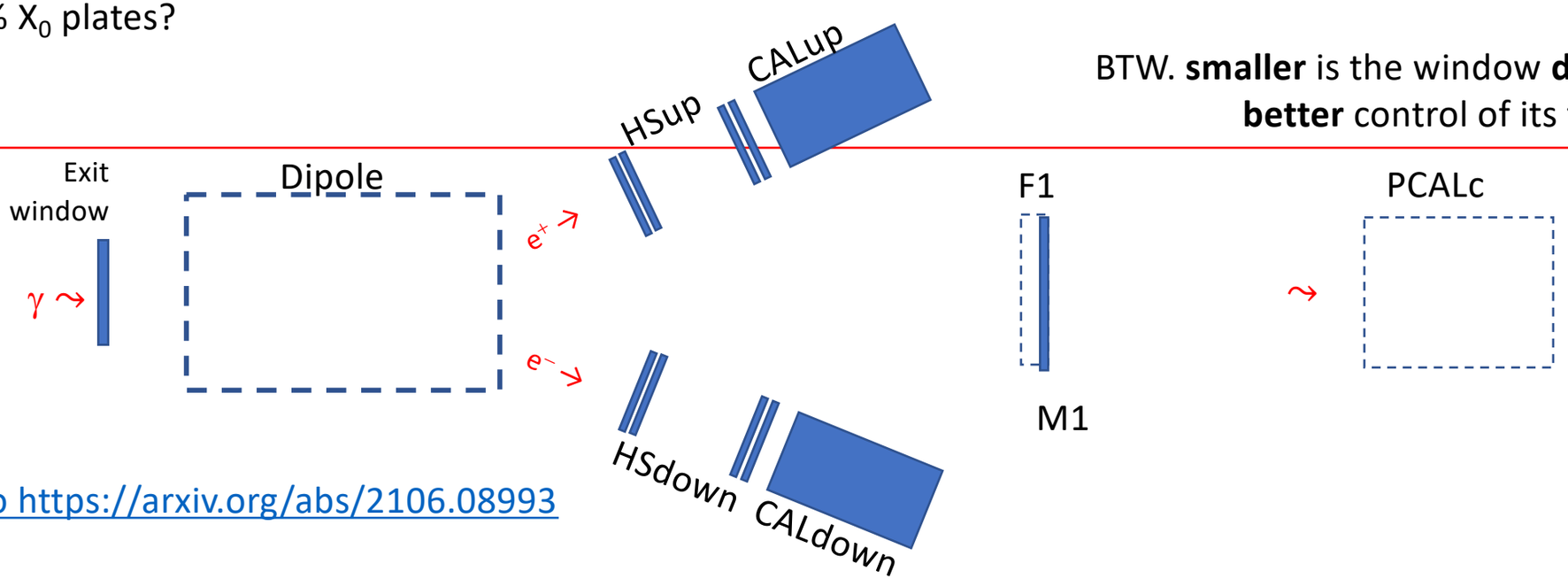
CC formula: Photon conversion rate = Luminosity × $\Delta\sigma$ × A_γ × CF × $A_{selection}$ × $Corr_{pileup}$

CF calibration with $\delta(CF) \ll 1\%$ is **very tricky**, but!

Using (very) low luminosity runs, one can select converted photons (using HS/CALup/down) and **measure** corresponding PCALc spectrum (+ check the total sum with ECAL) then: $\langle E_{\gamma,PCALc} \rangle = 9\ CF/14\ \langle E_{\gamma,spect} \rangle$!

Ex.: for CF=4%, the average PCALc energy is 2.6% of the tagged one – but one can use **"zero" vs. "non-zero" counts** as a measure of CF – 0.67 vs. $1.64*0.18+(0.18)^2$ (and it is pretty close to the EF method) – maybe one can x-check it with added 1/2/4% X_0 plates?

BTW. **smaller** is the window **diameter** – **better** control of its thickness!



[Addendum to https://arxiv.org/abs/2106.08993](https://arxiv.org/abs/2106.08993)

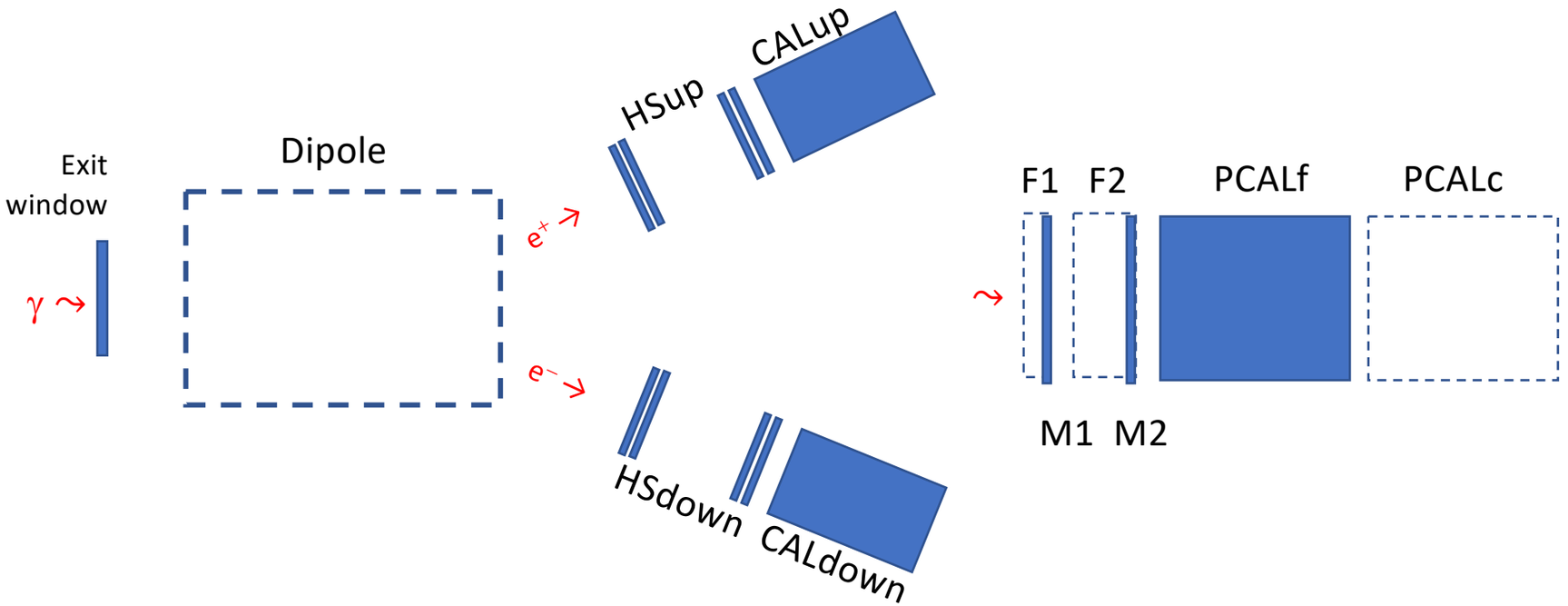
FarBackward WG: detector baseline for Proposal?

Who works on what (for Proposal)?

PCALf = **tungsten spaghetti calorimeter with fused silica + SiPMTs** ⇒ AGH UST

HSup + HSdown = **2 × up 10 planes of 1 mm square, straight scintillating fibers read out by SiPMTs** ⇒ INP Krakow

CALup + CALdown + PCALc + ECAL = **tungsten spaghetti calorimeters with Sci fibers** read out by SiPMTs? ⇒ BNL?

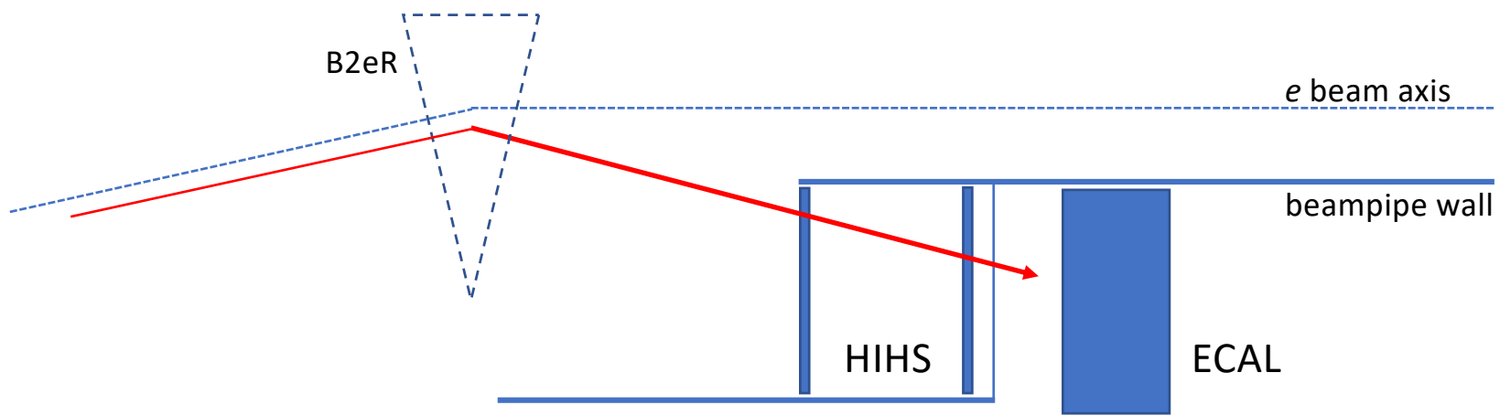


FarBackward WG: tagging

”HIHS-like” super-hodoscope = (horizontal) vertex detector ⇒ Glasgow

ECAL – spaghetti W/Sci? ⇒ BNL?

Note: tomorrow Exclusive WG will discuss “golden channels” and physics priorities



FarBackward WG: next steps

Need to plan (detector simulation) work in Summer

+

to start thinking about required R&D after the Proposal is sent out