Dark matter from dark photons: from Snowmass to the EOSC

Snowmass
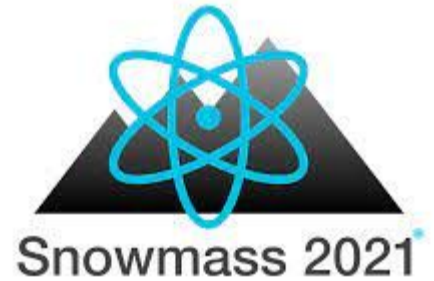
[...] an opportunity for the entire particle physics community to come together to identify and document a scientific vision for the future of particle physics in the U.S and its international partners. [...]
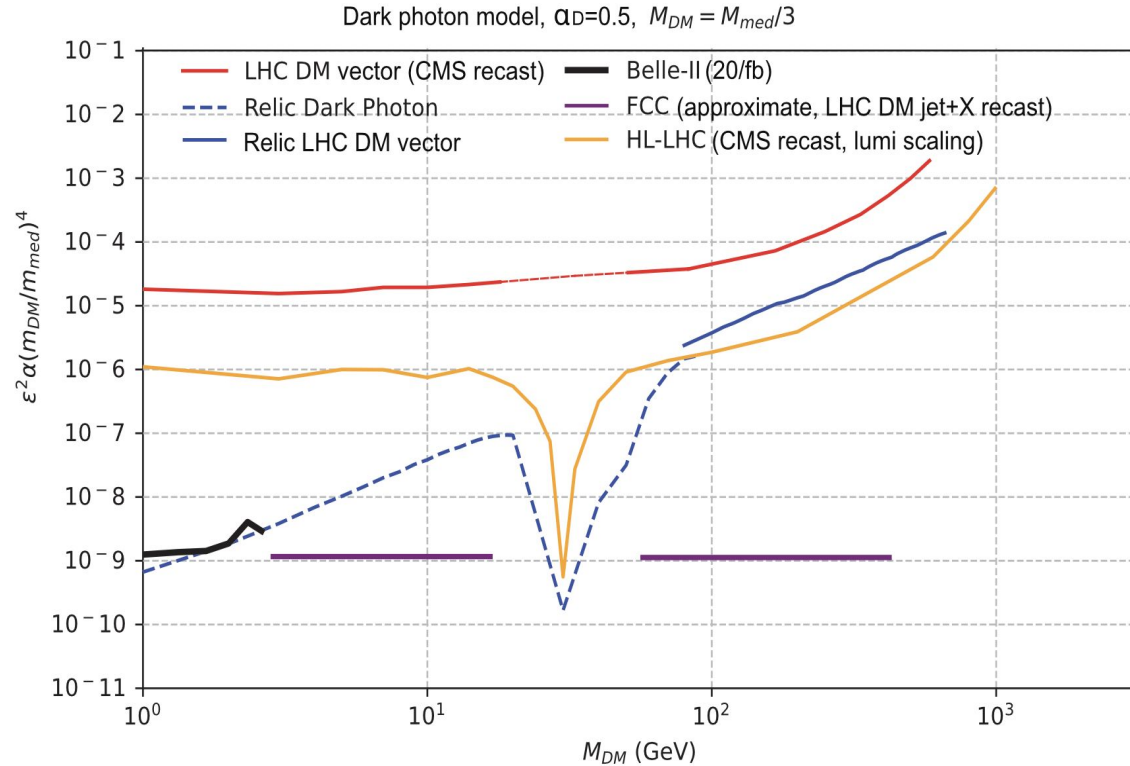
Goal of this Erasmus+ project

1) Make plots that:

● Highlight the complementary sensitivity to DM masses from colliders and accelerators

● Show the need for new experiments / colliders that could lead to future discovery

2) Make a start to implement the software used for these plots in the ESCAPE Virtual Research Environment
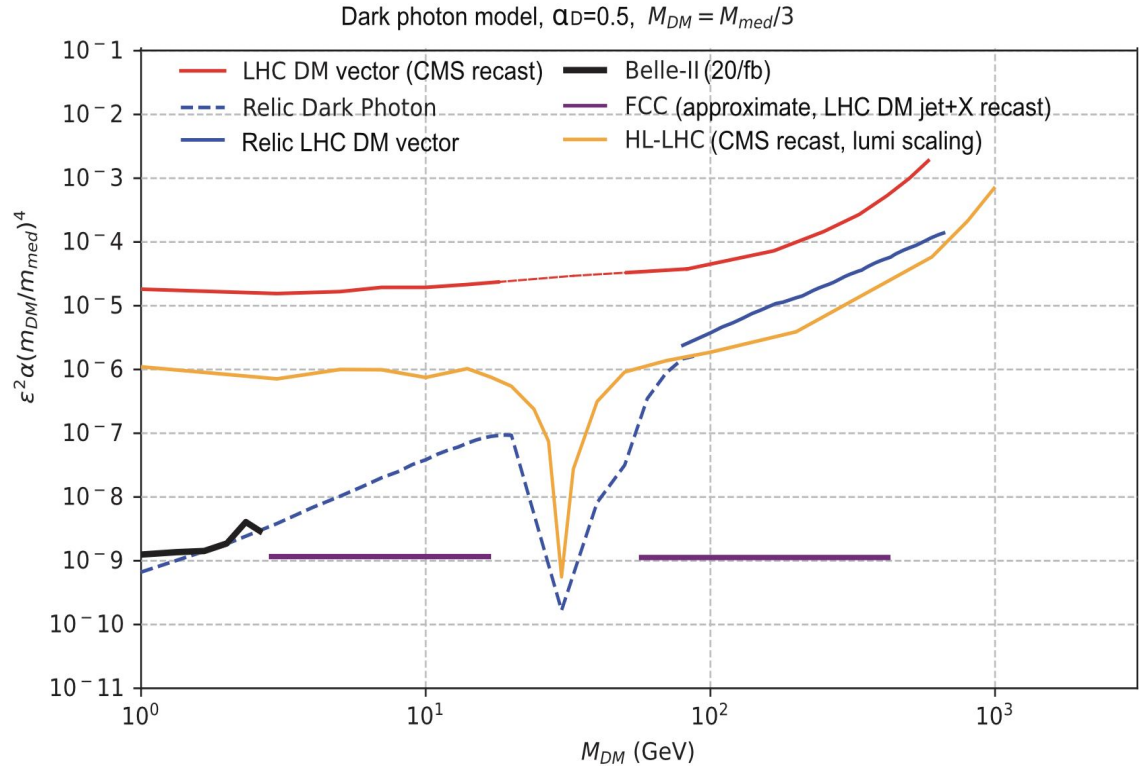
How do we get to this plot ?

- Projections from collider search

- Monte Carlo generator for signal events (MadGraph5)

- Fast detector simulation (Delphes)

- Analysis software (MadAnalysis)

- All put in a CERN SWAN Jupyter Notebook

Dark photon model, α_D=0.5, $M_{DM} = M_{med}/3$

More details about this plot

$$y = \varepsilon^2 \alpha (m_{DM}/m_{MED})^4$$

$$\alpha_{DM} = \frac{g_{DM}^2}{4\pi}$$

Dark photon model, $\alpha_D = 0.5$, $M_{DM} = M_{med}/3$

Legend:
- LHC DM vector (CMS recast)
- Relic Dark Photon
- Relic LHC DM vector
- Belle-II (20/fb)
- FCC (approximate, LHC DM jet+X recast)
- HL-LHC (CMS recast, lumi scaling)

Axes: $\varepsilon^2 \alpha (m_{DM}/m_{med})^4$ vs M_{DM} (GeV)

What are the next steps?

- Put the data and software as is on the Virtual Research Environment
  - Discuss on how to put the software packages natively on the software catalogue
- Hopefully, discover DM in the next 10 years!

Thank you for your attention :)