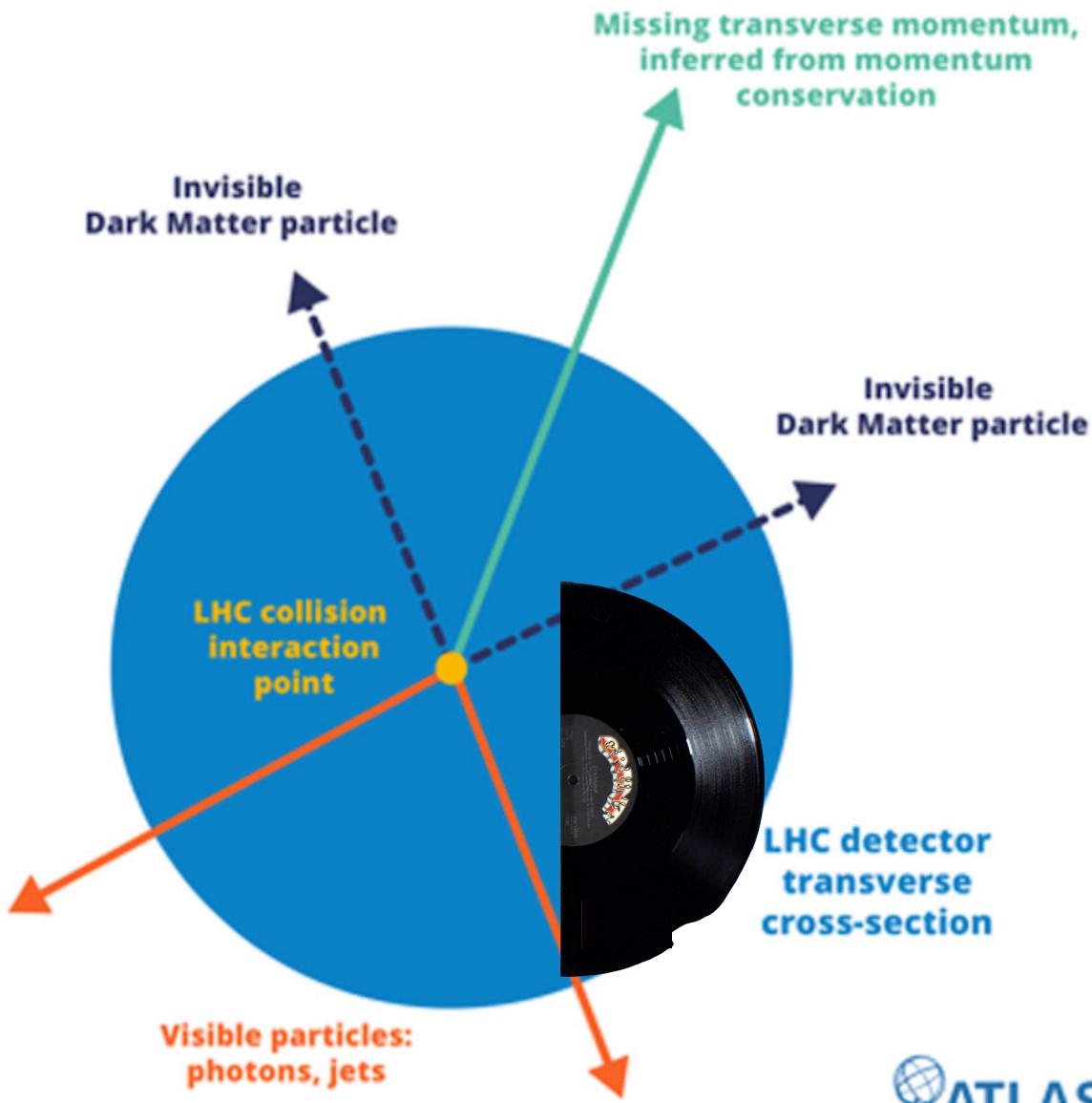


MET!



Let's imagine a system similar to L1Calo (not identical)

- Your firmware is going to receive input data from 7296 towers, 57 in eta and 64 in phi (see data.txt, 9 events)
- Each row of the input has:
 - A tower ID (just a number between 0 and 7295)
 - Whether the tower is an EM tower (if not it is a hadronic tower)
 - Phi for the tower
 - Eta for the tower
 - Energy for the tower in MeV
- Note that the input energies for hadronic towers have been found to be low, and all need to be scaled by a x1.25!
- Your goal: Output MET and MET phi for each event
 - Naively you want to find $\text{MET} = \sqrt{E_x^2 + E_y^2}$ where E_x and E_y are $\sum_i E_{xi}$ and $\sum_i E_{yi}$ but with hadronic towers scaled to the right energy and also $\phi_{\text{MET}} = \tan^{-1}(E_y/E_x)$

Some thoughts on your project

- You will need a bunch of trig functions and even exponentials to calculate Ex and Ey. Do you want to calculate this per event or have some LUT (lookup table)?
- How can you pipeline this? You do know the size of each event
- Maybe you can assume the inputs do not come in one tower at a time. We leave it to you decide how they arrive, as you are a firmware engineer but also a system engineer now

Project complication

- Uh oh! Some of the towers are noisy and bad and can't be trusted! To first order you can just mask and ignore them.
 - The list of bad towers is in `noisy_towers.txt`. There are 7 different example sets of noisy towers (not all the same size!). Assume these do not change per-event so you can load them as a LUT. See how this changes your MET calculation/answers but also your resource utilization and timing
 - FYI: of the 9 events in your input file, 3 of them should have no real MET, the others have varying amounts of MET
- Think about how to be more clever about dealing with noisy towers
 - Can you add an “average” per-tower quantity per event? Note that this “average” is not the same in each event! As before, how does this change your output but also your resource utilization and timing?