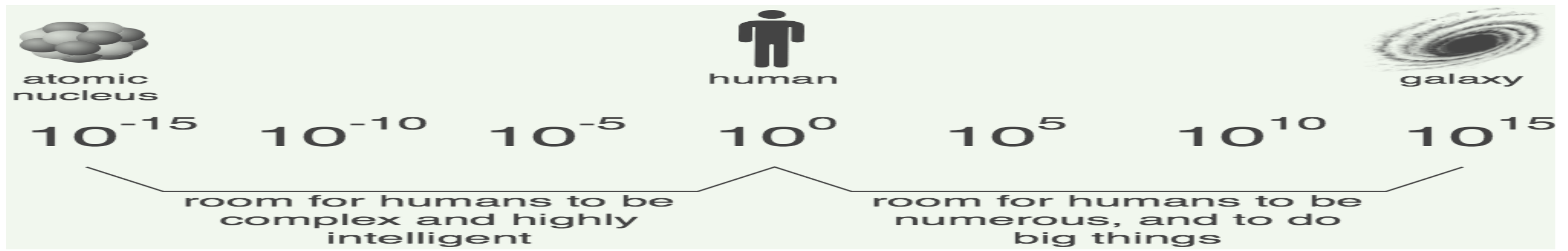


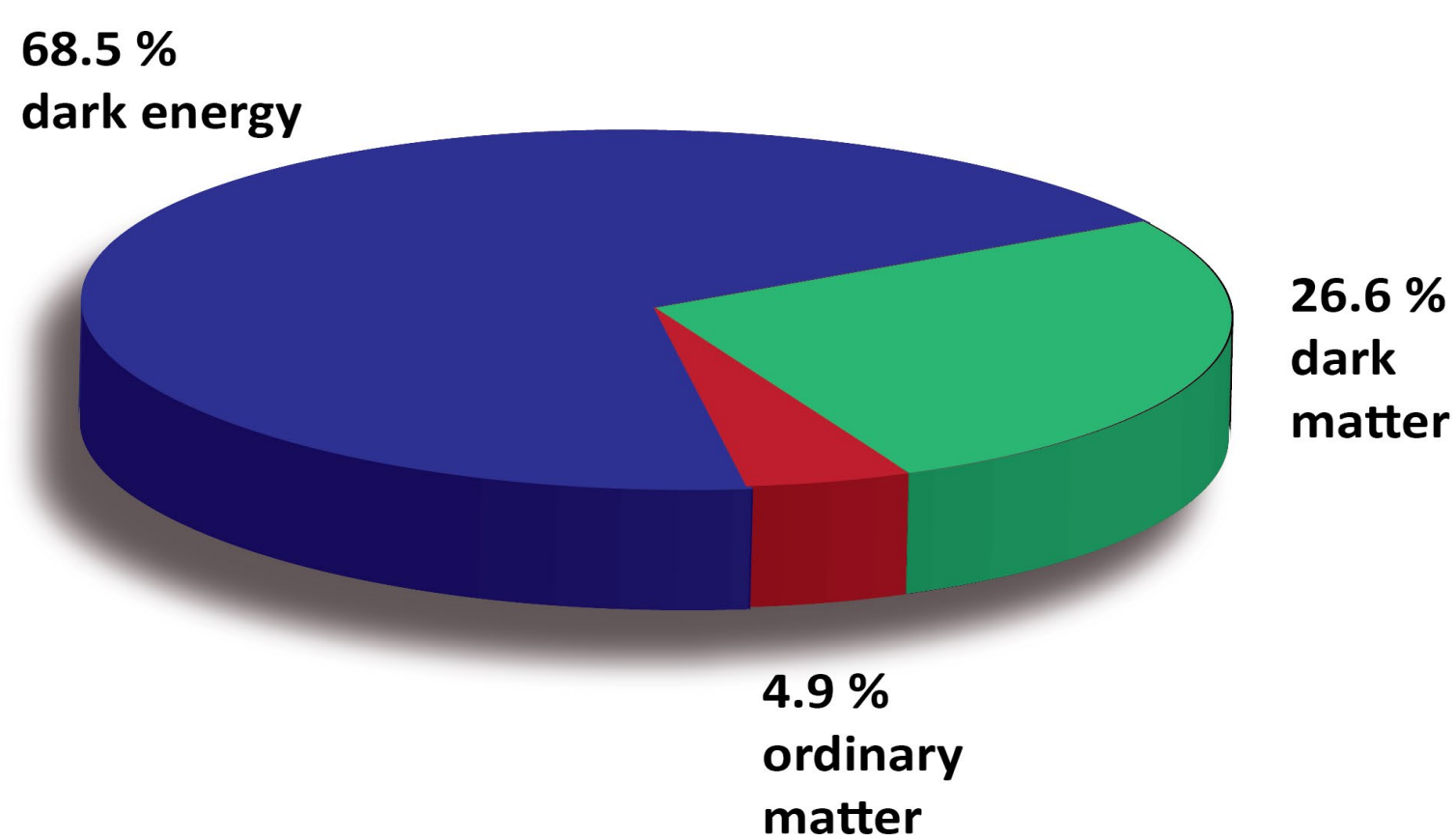
# Jefferson Eta Factory Experiment in Hall D

## Challenges in Physics:



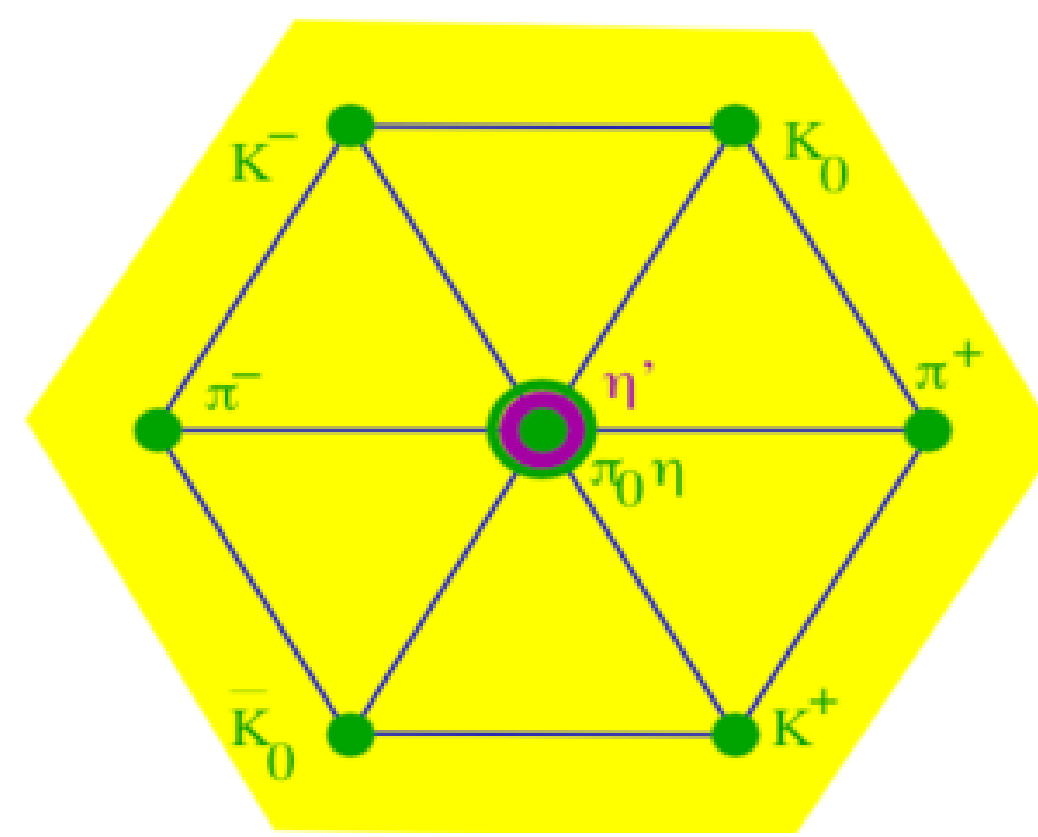
### Confinement QCD

- Why there is no free quarks exist in nature?
- Where does the mass of visible matter come from?



### New physics Beyond the Standard Model (BSM)

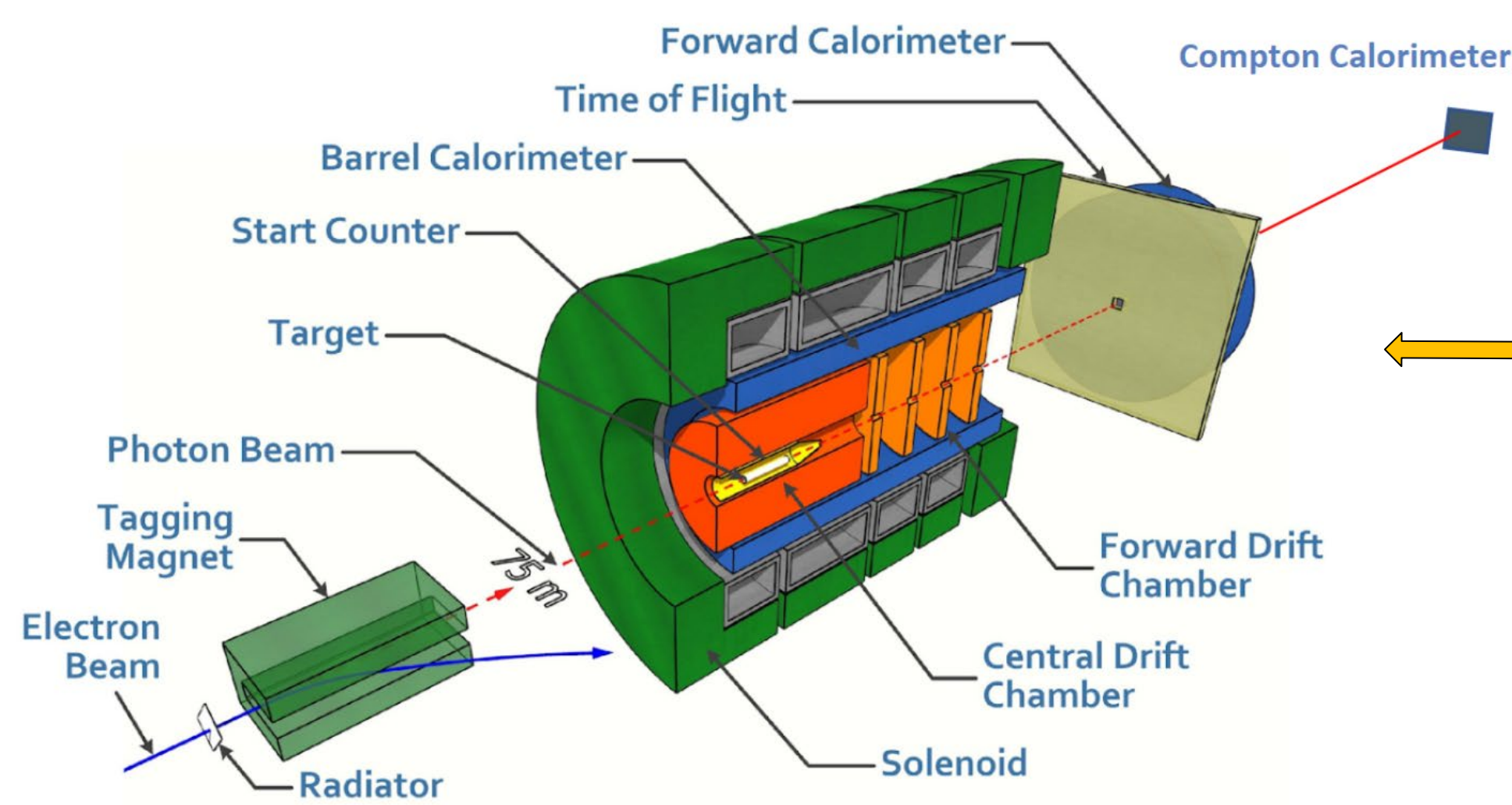
- Are there new sources of CP violation explaining the observed asymmetry of matter and antimatter in Universe?
- What is the nature of dark matter?



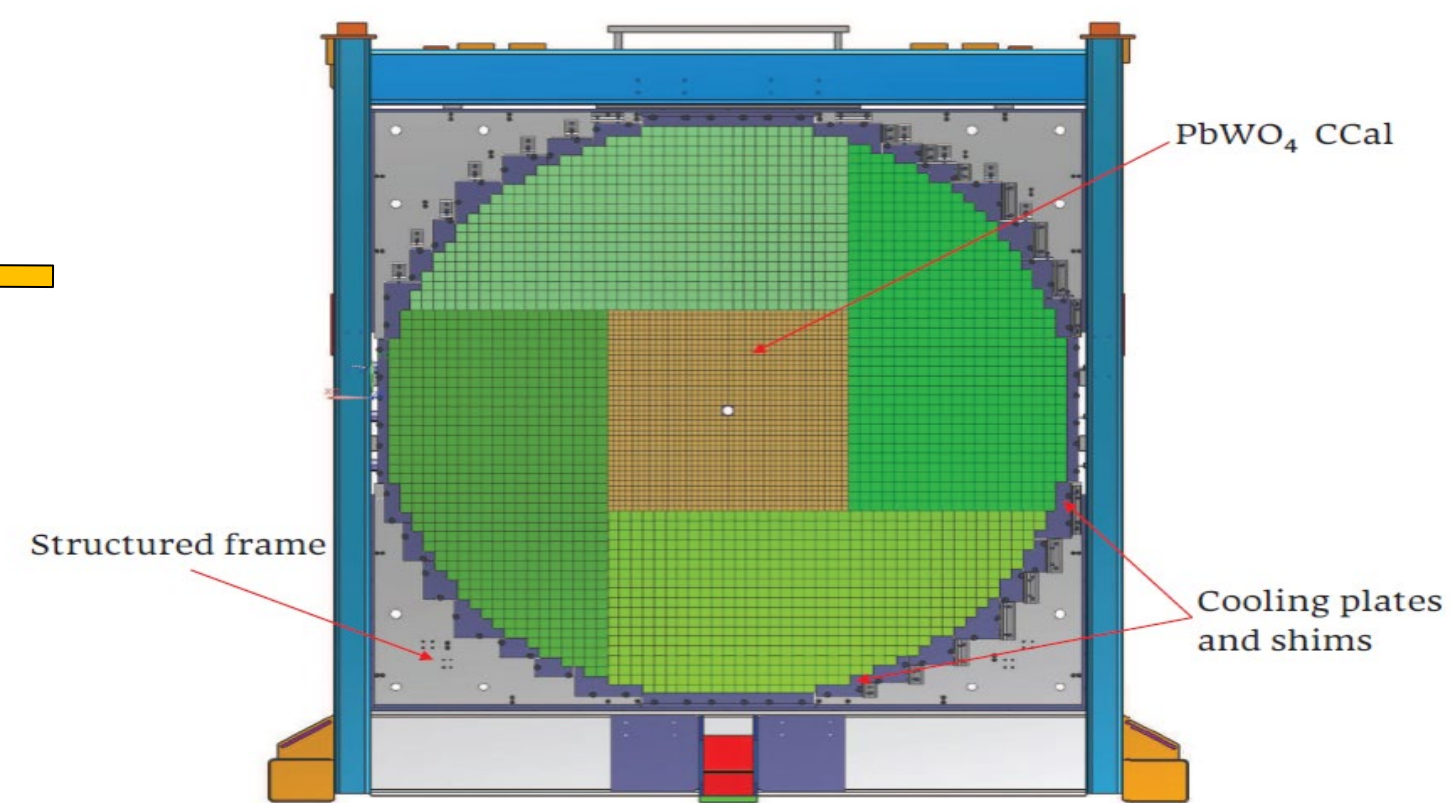
$\eta$  and  $\eta'$  decays provide sensitive probes to explore both confinement QCD and new BSM physics.

## JLab Eta Factory (JEF) Experiment:

The JEF experiment will measure various  $\eta/\eta'$  decays which emphasize on rare neutral mode.



### Forward Calorimeter Upgrade



### Uniqueness of JEF Experiment

Compare with all other  $\eta/\eta'$  experiments in the world, the JEF experiment has two orders of magnitude background suppression in the rare neutral decay mode of  $\eta/\eta'$ .

### Main JEF Physics Objectives:

- Search for sub-GeV hidden bosons.
- Directly constrain C-violating and P-conserving new Physics.
- Precision tests of low-energy QCD.
- Improve the quark mass ratio via Dalitz distributions of  $\eta \rightarrow 3\pi$

### Experimental sensitivity

