Dark Sectors at future colliders

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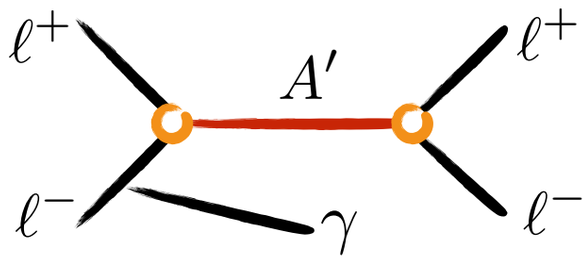
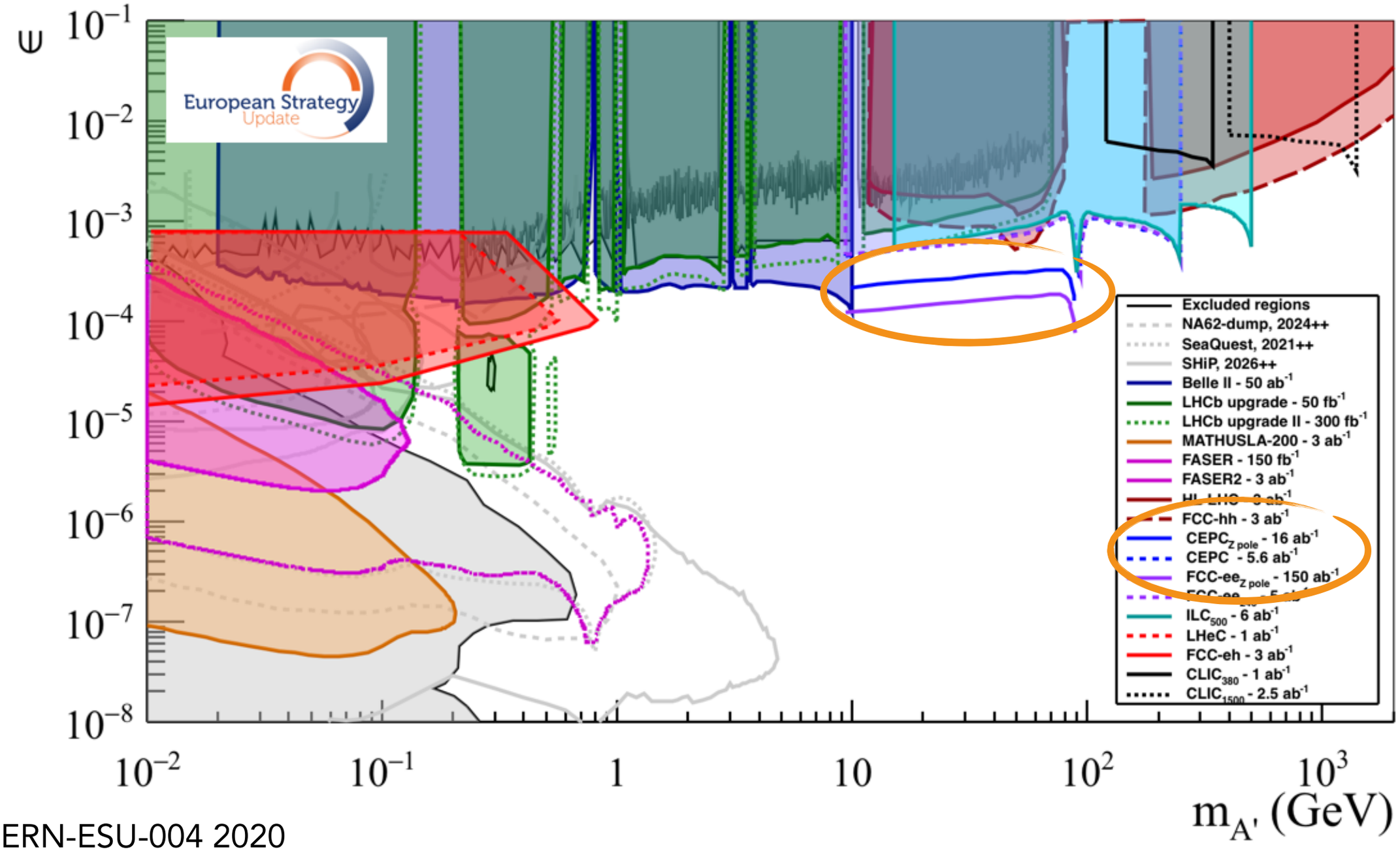
Probing the dark photon portal

$$\mathcal{L} = -\frac{\epsilon}{2c_W} F'_{\mu\nu} B^{\mu\nu}$$



$$\sigma(A') \propto \epsilon^2$$



Probing the dark photon portal

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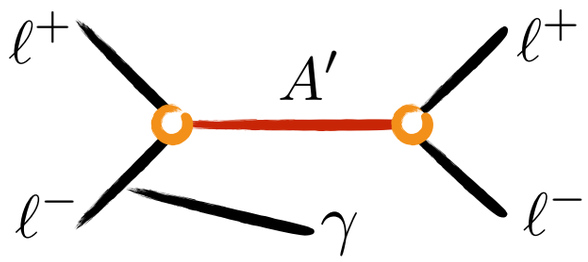

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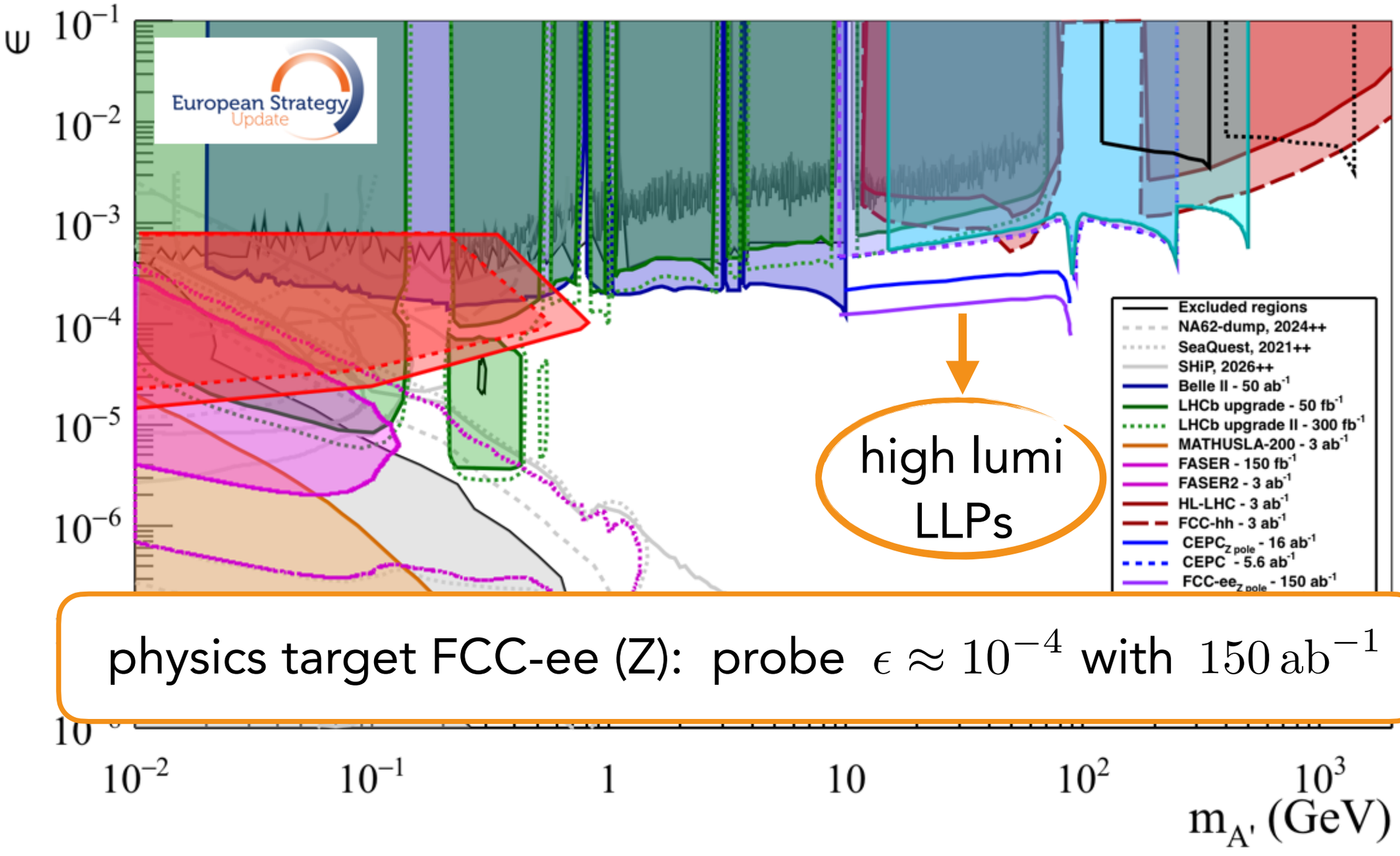
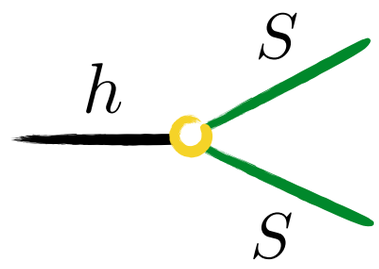


physics target FCC-ee (Z): probe $\epsilon \approx 10^{-4}$ with $150\,\mathrm{ab}^{-1}$

Probing the scalar portal

$$\mathcal{L} = \lambda_{HS} H^\dagger H \, SS$$



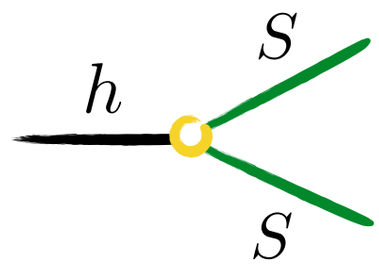
$$\mathcal{B}(h \to SS) \propto \lambda_{HS}^2$$

FCC-ee: invisible Higgs decays

physics target FCC-ee (240): probe $\lambda_{HS} \approx 10^{-3}$ with $5\,\mathrm{ab}^{-1}$

Probing the scalar portal

$$\mathcal{L} = \lambda_{HS} H^\dagger H \, SS$$

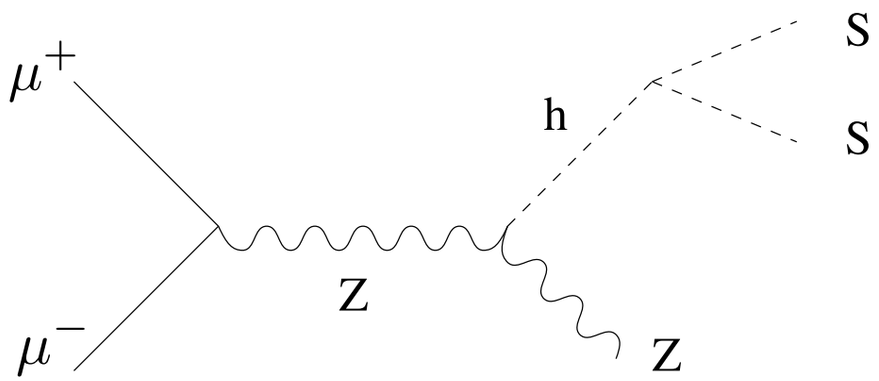


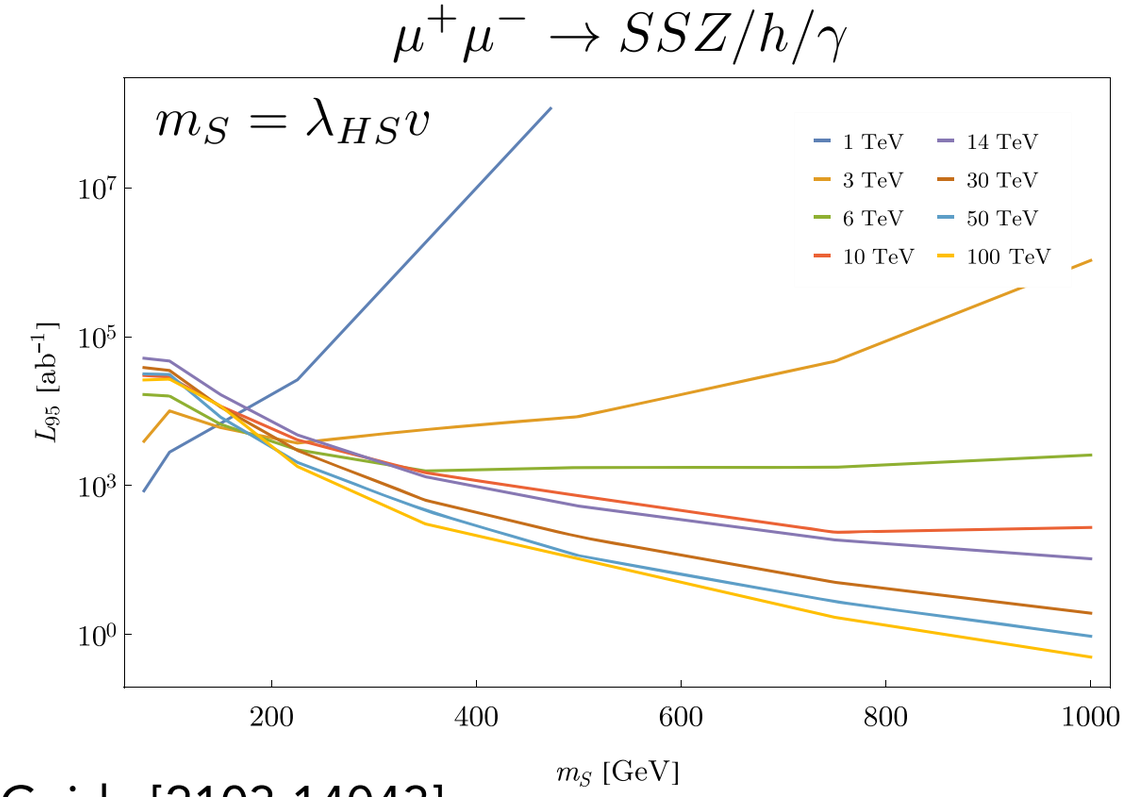
$$\mathcal{B}(h \to SS) \propto \lambda_{HS}^2$$

FCC-ee: invisible Higgs decays

physics target FCC-ee (240): probe $\lambda_{HS} \approx 10^{-3}$ with $5\,\mathrm{ab}^{-1}$

Muon collider:





Muon Smasher's Guide [2103.14043]

Dark sectors at future colliders

- dark sector searches rely on (displaced) vertices and missing energy
- benefit from precision and high luminosity
- FCC-ee and muon collider offer alternative search options

Implications for dark matter are model-dependent:

- perform broad searches at colliders
- exploit complementary with flavor and fixed-target experiments, direct detection and astro(particle) physics