

**Brainstorming discussion :
Interests and priorities for future
collaboration on theory/
phenomenology/physics analysis**

Pyungwon Ko (KIAS)

Korean activities

- Flavor physics and CP violation : quark & leptons, especially neutrinos (and connection with colliders)
- QCD : NRQCD, SCET, ChPT, etc.
- BSM : SUSY, extra dim, composite models, etc.
- Axion physics
- DM physics : (non)SUSY, Higgs portal, SIMP, etc.

Some Thoughts

- Appraisal of local gauge symmetry : well tested in the SM, and could be relevant to DM physics
- Scale symmetry (?) : probably the only way to understand the origin of mass (especially the masses of scalar bosons and Dirac fermions)
- Pure gauge singlet (?) : all the known particles carry some gauge charges, and no singlet particle found yet in Nature
- Why is there no higher dim representation of gauge group for matter fields ? And why no scalars found other than H?

And of course a lot of questions you can ask !

Near Future

- Test SM as many ways as possible : measurements of Higgs self couplings, Yukawa couplings, etc. (need improved understanding of PQCD)
- Cover the WIMP parameter space from LHC, DM (in)direct detection as much as possible
- New particles around EW scale accessible at the LHC ? (SUSY, extra dim, new scalars/fermions/vectors, etc.)
- Connection between particle physics & cosmology (collider vs. gravitational wave, for example)

Far Future

- Complete (or better) understanding of neutrinos (Majorana vs. Dirac, CP phase, mass ordering, sterile neutrino, etc.)
- What would be the new or interesting energy scale, if nothing is found at the HL LHC ?
- Axion/axion-like particle search
- DE, DR, DM interactions (data vs. theory) ?