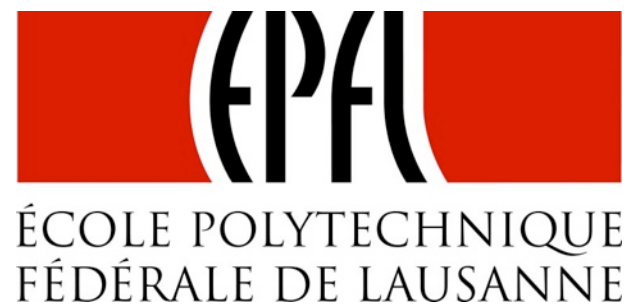
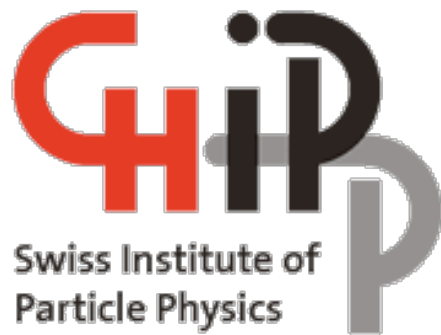


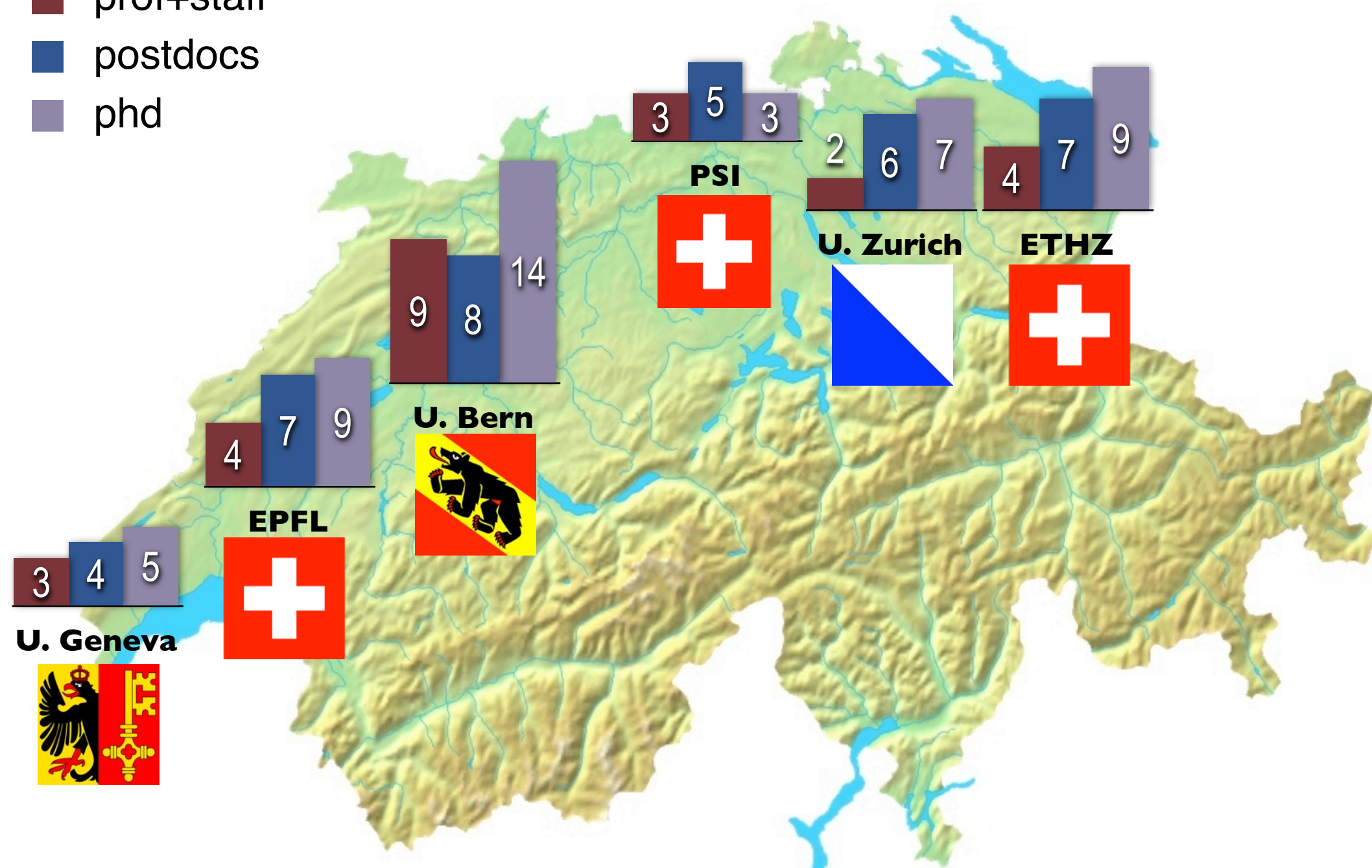
Swiss High-Energy Theory Activities

Sergey Sibiryakov
Institute of Physics,
EPFL



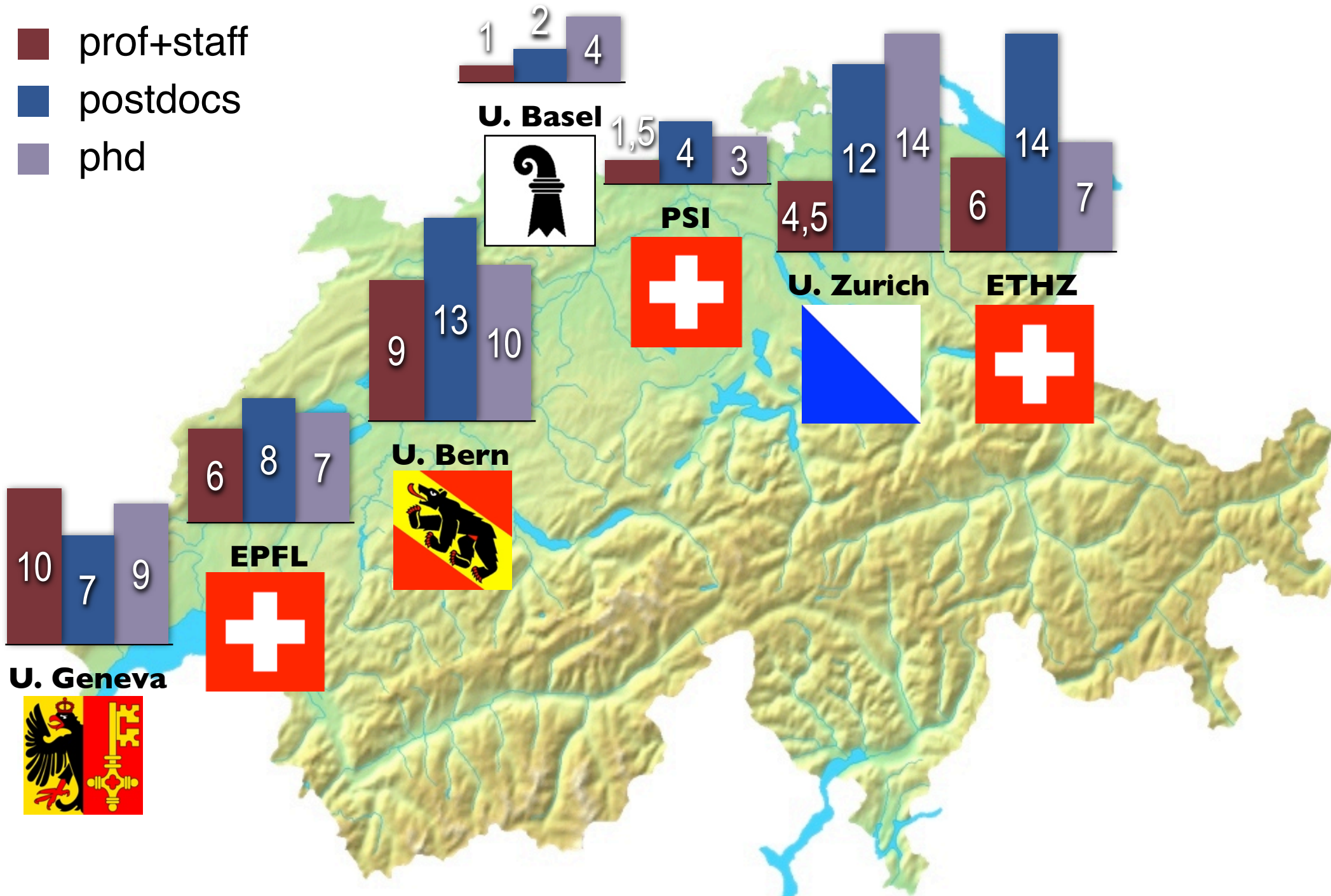
Swiss particle theory landscape: 2009

- prof+staff
- postdocs
- phd



Swiss particle theory landscape: 2016

- prof+staff
- postdocs
- phd



Theory Groups

| | prof+staff | postdocs | phd | master |
|--------------|--------------|-----------|-----------|-----------|
| Uni Geneva | 4+6 | 7 | 9 | 3 |
| EPF Lausanne | 2+4 | 8 | 7 | 8 |
| Uni Bern | 6+3 | 13 | 10 | 8 |
| Uni Basel | 0+1 | 2 | 4 | 1 |
| PSI | 0+1.5 | 4 | 3 | 1 |
| Uni Zurich | 2+2.5 | 12 | 14 | 3 |
| ETH Zurich | 3+3 | 14 | 7 | 6 |
| Total | 17+21 | 60 | 54 | 30 |

Theory @ Uni. Geneva

Cosmology, Astroparticle, Beyond SM, LHC, Math. physics

Full professors

- Durrer: CMB, early Universe, cosmic magnetic fields
- Maggiore: gravitational waves, cosmology of the primordial universe
- Mariño: mathematical aspects of QFT and strings, quantum gravity
- Riotto: particle and astroparticle physics, cosmology, physics at LHC

Other staff members

- Bonvin (SNSF prof., from 06/16): CMB, primordial magnetic fields
- Foffa: dark energy, gravitational waves
- Desjacques: large scale structure, galaxy redshift surveys
- Katz (6y. joint CERN): particle physics, BSM, dark matter
- Kunz: primordial universe, dark energy, galaxy surveys
- Sonner: string theory and holography, non-equilibrium physics

+ theoretical astrophysics @ ISDC: Neronov

High Energy Theory Group @ EPF Lausanne

QFT, String theory, Beyond SM, Cosmology,
Collider physics, Neutrinos

Full professors

- Rattazzi: **particle physics, quantum field theory, BSM, LHC and future colliders**
- Shaposhnikov: **inflationary cosmology, phase transitions, neutrino, particle physics**

Other staff members

- Contino (6y joint CERN): **collider physics, beyond SM, compositeness**
- Penedones: **string theory, conformal field theory, holography**
- SS (6y joint CERN): **QFT, gravity, early and late Universe**
- Vichi (SNSF prof., starting in fall 2016): **conformal field theory, BSM**

Institute for Theoretical Physics, Albert Einstein Center @ **Uni. Bern**

QCD, Lattice, ChPT, K and B mesons, SUSY, Strings, Gravity

Full professors

- Becher: **strong interactions, collider physics**
- Blau: **general relativity, string theory, quantum gravity, topological field theory**
- Colangelo: **chiral perturbation theory, phenomenology, lattice, new physics in precision experiments**
- Derendinger: **fundamental particle interactions, unified models, supersymmetry and supergravity**
- Laine: **thermal field theory, QCD, particle cosmology**
- Wiese: **strong interactions, strongly correlated systems**

Other staff members

- Greub: **heavy flavor in SM and beyond**
- Reffert (SNSF prof.): **string theory, supersymmetry, integrable models**
- Wenger: **lattice QCD, QFT on the lattice**

Particles and Cosmology Group @ Uni. Basel

Cosmology, Flavor, Neutrinos, Unified theories

Group leader

- Antusch (associate prof.)
- + theoretical astro-nuclear group: Thielemann

Theory Group @ PSI

QCD, Higgs physics, Flavor, SUSY, Collider physics

Permanent members

- Signer (joint Uni Zurich): perturbative QCD, quark physics, collider physics, flavor violating processes
- Spira: Higgs physics, supersymmetry, perturbative QCD, compositeness

Particle Theory Group @ Uni. Zurich

Precision QCD, Higgs physics, SUSY, BSM, effective theories

Full professors

- Gehrman: multiloop calculations in perturbative QCD, precision predictions for colliders
- Isidori: flavor physics, precision tests of SM, Higgs physics, SUSY, compositeness, effective field theories

Other staff members

- Grazzini: collider physics, QCD effects in W, Z and Higgs production, BSM
- Pozzorini (SNSF prof.): precision perturbative QCD for colliders
- Signer (joint PSI)

+ strong astrophysics and cosmology group: Jetzer, Lake, Mayer, Moore, Teyssier, Yoo, Saha, Stadel

Institute for Theoretical Physics @ ETH Zurich

Precision QCD, Higgs physics, Math. physics, Strings

Full professors

- Anastasiou: Higgs physics, precision QCD for colliders
- Beisert: QFT, mathematical physics, string theory, symmetries
- Gaberdiel: string theory, conformal field theory, dualities

Other staff members

- Del Duca: high-energy QCD amplitudes, multiloop calculations
- Gehrmann-De Ridder: QCD corrections to collider observables
- Lazopoulos: perturbative QCD, higher order QCD corrections, precision Higgs physics

+ strong mathematical physics group: Fröhlich, Graf

+ strong cosmology and astrophysics group: Refregier, Schawinski

ETH Institute for Theoretical Studies

“The ETH-ITS is an interdisciplinary center for theoretical sciences, and focuses on mathematics, theoretical physics, theoretical computer science and related fields. It hosts visiting scholars (senior fellows) spending up to a year at the Institute and postdocs (junior fellows) selected by a nomination procedure.”

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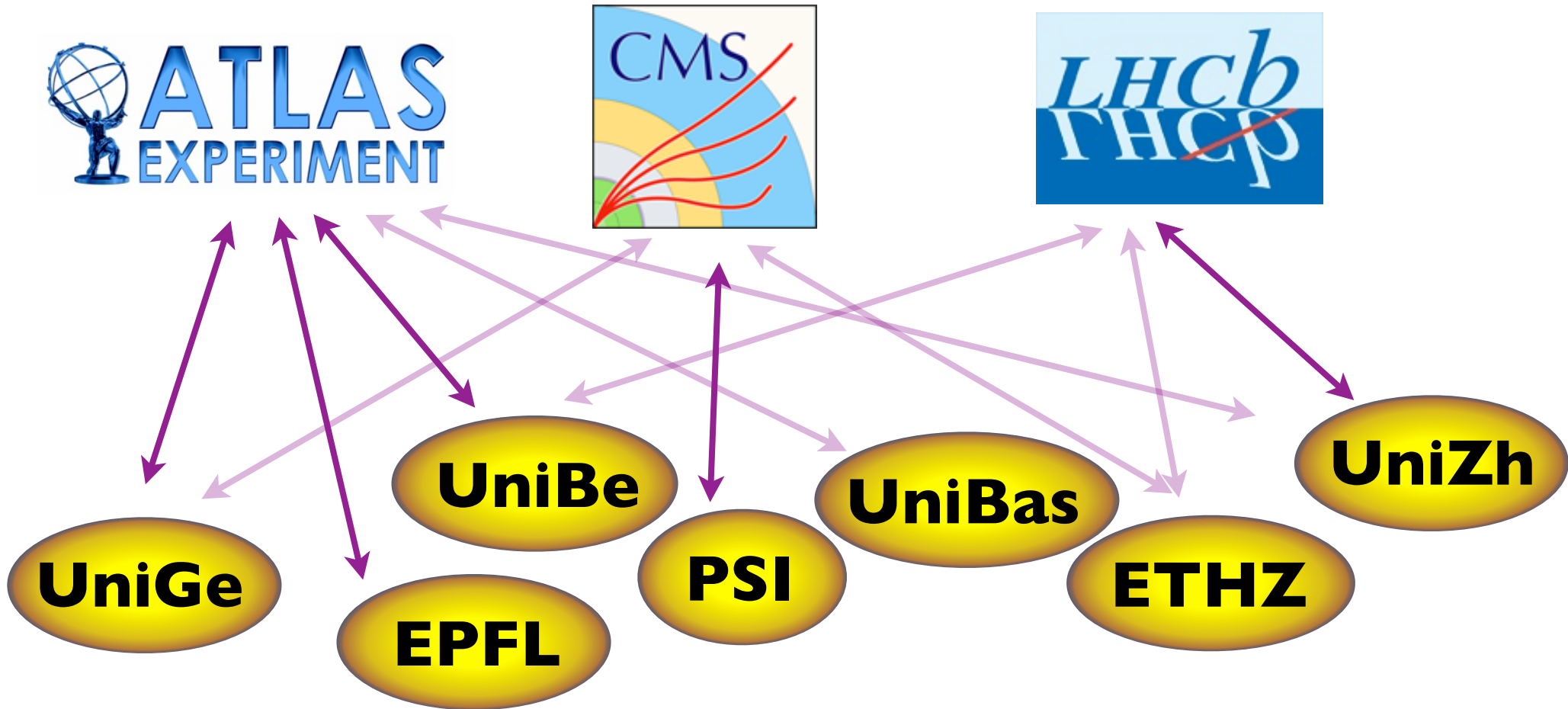
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6 senior fellows including

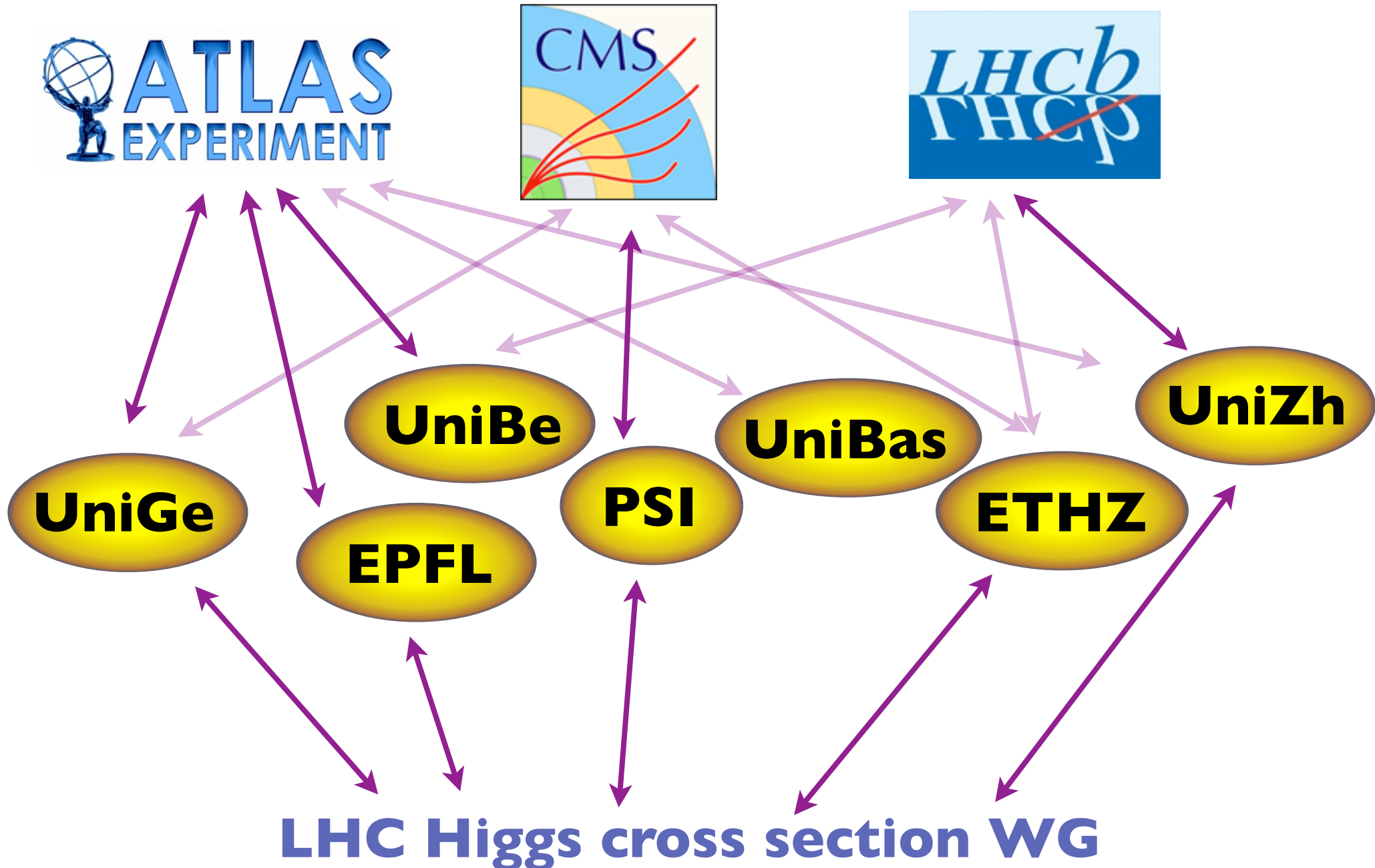
- Barbieri (particle physics, BSM, SUSY, flavor),
- Brandenberger (cosmology, early Universe, dark energy)

+ 8 junior fellows

Interaction with LHC @ CERN



Interaction with LHC @ CERN



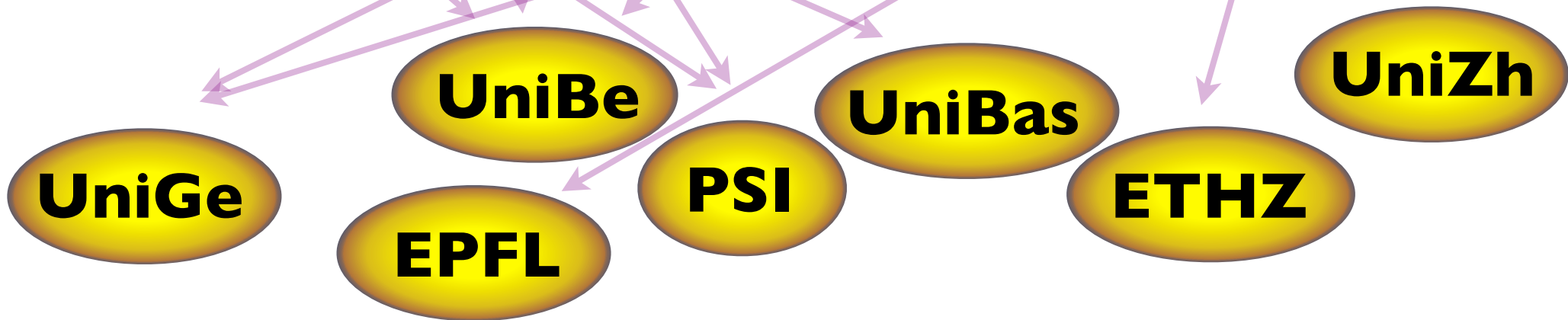
Interaction with non-LHC experimental groups

MEG
(PSI)

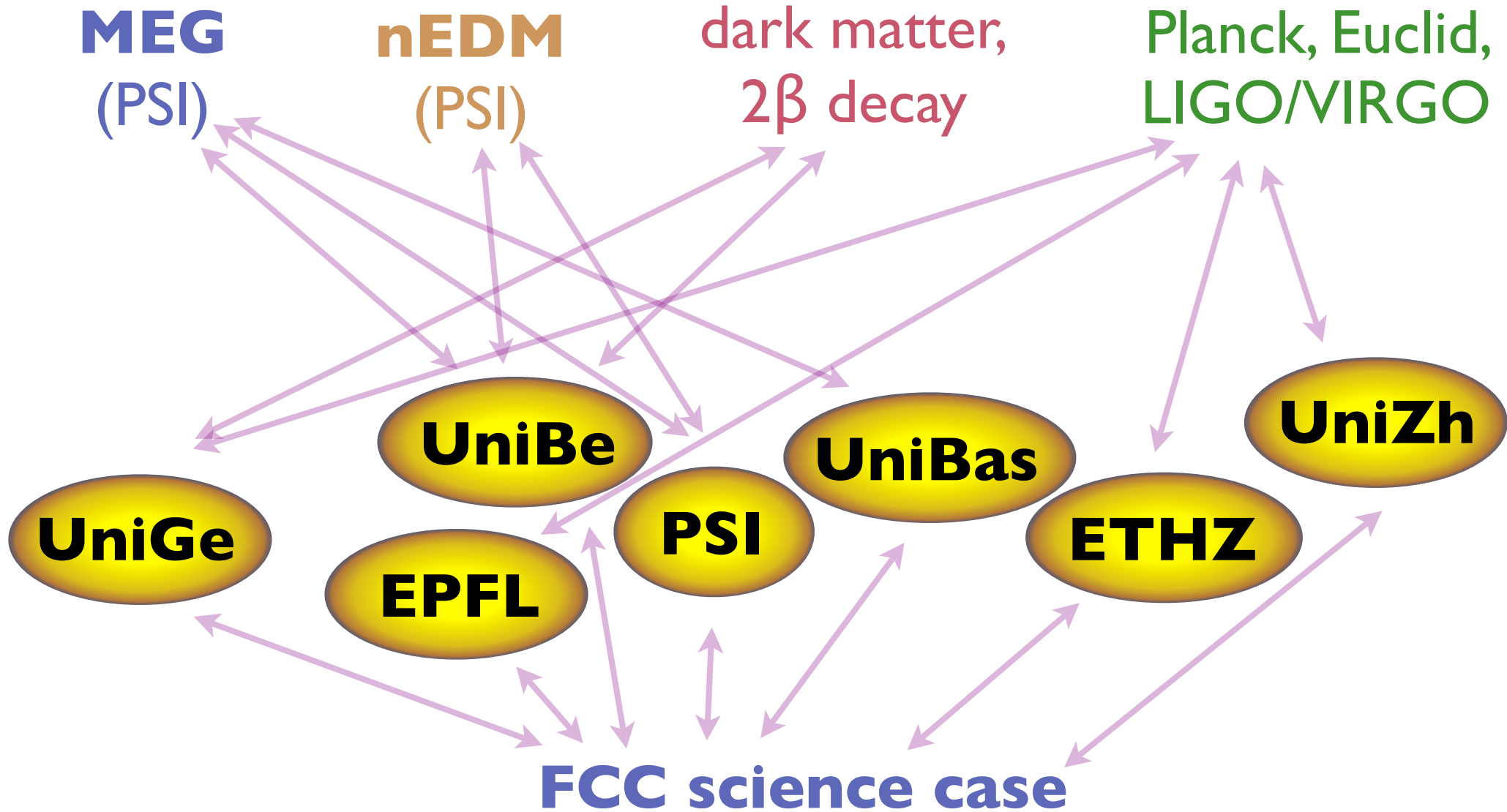
nEDM
(PSI)

dark matter,
 2β decay

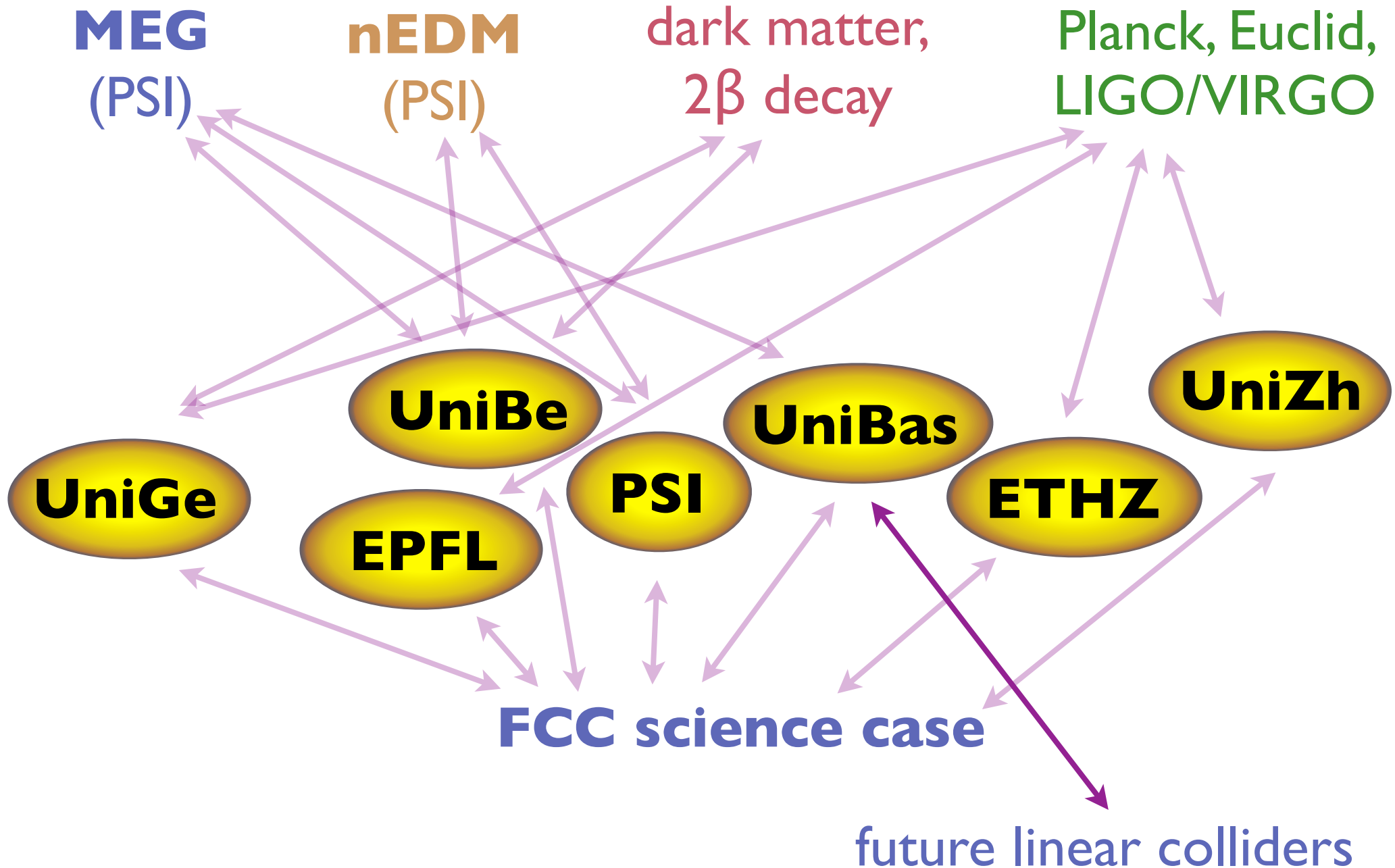
Planck, Euclid,
LIGO/VIRGO



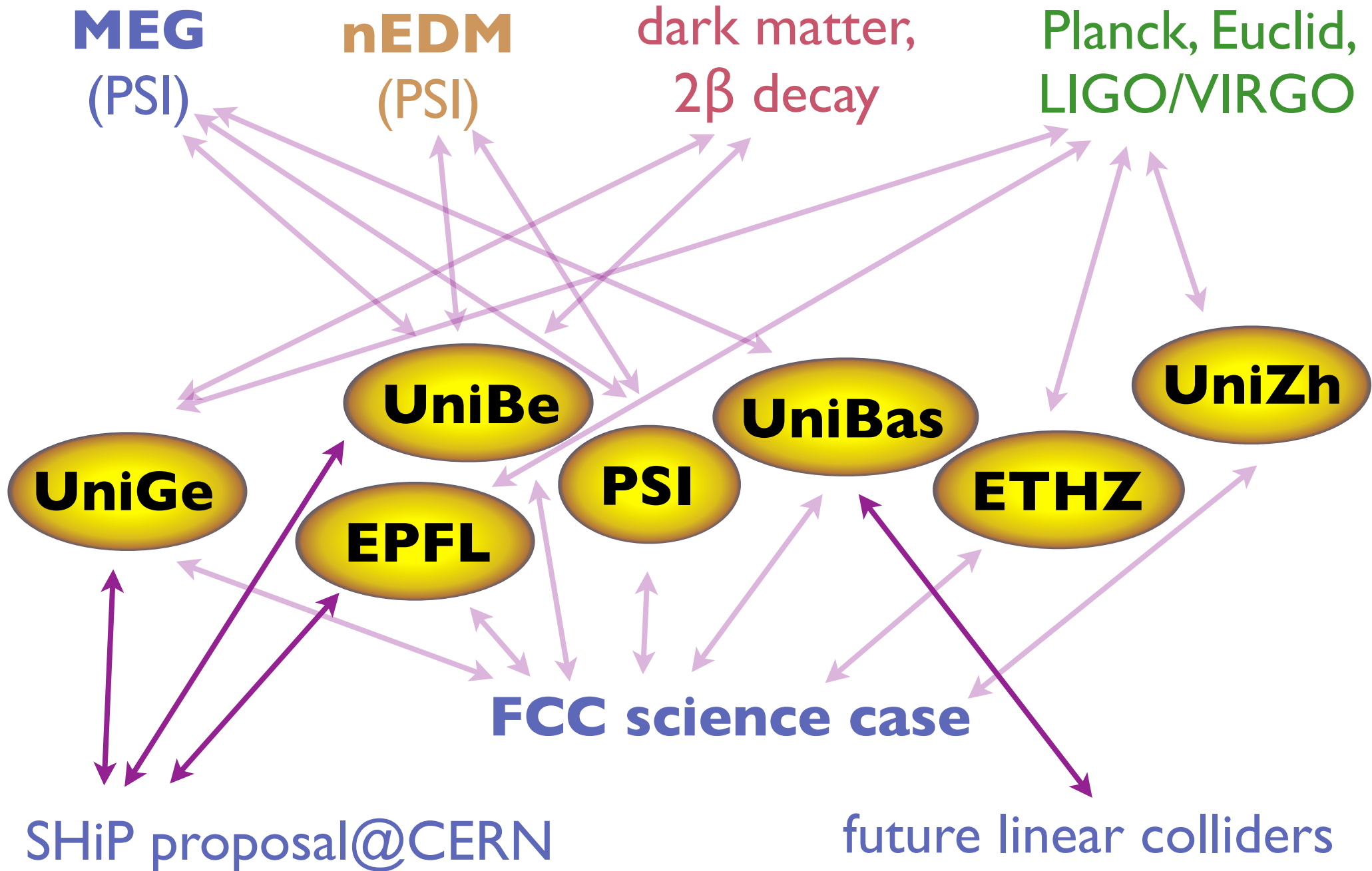
Interaction with non-LHC experimental groups





Interaction with non-LHC experimental groups



Interaction with non-LHC experimental groups



Networks

-  **SwissMAP**
The Mathematics of Physics
National Centre of Competence in Research
 - Leading house: **Uni Geneva**
 - Co-leading house: **ETHZ**
 - + **EPFL, Uni Bern, Uni Zurich, CERN**
- EU-COST Action “**The String Theory Universe**”
Uni Bern, ETHZ
- SNSF Sinergia grant “**Particle Physics with high-quality data from the CERN LHC**”
Uni Zurich, ETHZ, Uni Bern, EPFL
-  **higgstools**
 - EC FP7 Initial Training Network
 - ETHZ, Uni Zurich, PSI**
- EU-COST Action “**Connecting insights in fundamental physics**”
Uni Zurich, EPFL, Uni Bern

Conferences and Workshops

- **Strong and Electroweak Matter**, EPFL, July 2014
- **Amplitudes**, July 2015, ETH/Uni Zurich
- **28th Texas Symposium on Relativistic Astrophysics**, Geneva, December 2015
- **Supersymmetric Theories, Dualities and Deformations**, Bern, July 2016
- **QCD@LHC**, ETH Zurich, August 2016
- **Zurich Phenomenology Workshop** 2014, 2015, 2016
- **Swiss Cosmology Days** 2014, 2015, 2016

involvement into organization of other meetings in Europe and beyond

CERN TH Institutes

“TH institutes are extended workshops intended to structure the TH visitor programme around topical themes. The Institutes host programmes in HEP and related areas. While the organizers can be from anywhere outside CERN, there should be at least one local staff member in the organizing committee of the program. This guarantees a smooth interaction with the CERN administration. Institutes usually last between one and a few weeks.”

Pauli Center for Theoretical Studies (former CTS)

“PCTS aims to foster teaching and research in theoretical physics and related subjects in the Zurich area. Our mission is to bring scientists from all over the world to come to Zurich, to interact with local and other visiting scientists and to enrich the graduate education. Pauli Center organises thematic programs of a few months' duration as well as shorter workshops. It also invites scientists to come to Zurich for collaborative visits and to teach graduate courses. Proposals for thematic programs and workshops can be submitted by any professor of a Swiss university.”

Strong visitor programme at Albert Einstein Center for Fundamental Physics

Advanced education

- Graduate schools in EPFL, Uni. Bern, Uni. Zurich
- PhD studies in Uni. Geneva, ETHZ
- Troisième cycle de la physique de la Suisse Romande (Fribourg + Geneva + Neuchatel + Lausanne)
since 2017 split into autonomous advanced doctoral programs at each institution
- Saas Fee Advanced Course “Cosmology with Wide-Field Surveys” organized by Uni. Geneva + EPFL + ETHZ, 2014
- CHiPP Winter School 2011, 2013, 2015
- PSI Summer School, Zuoz, 2014, 2016

Summary

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- Fruitful exchange of ideas across fields:
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- Fruitful exchange of ideas across fields:
mathematical physics ↔ particle physics ↔ cosmology
and with experimental colleagues
- Pro-active part in developing future strategies
- Intensive interactions within Swiss / European networks and beyond