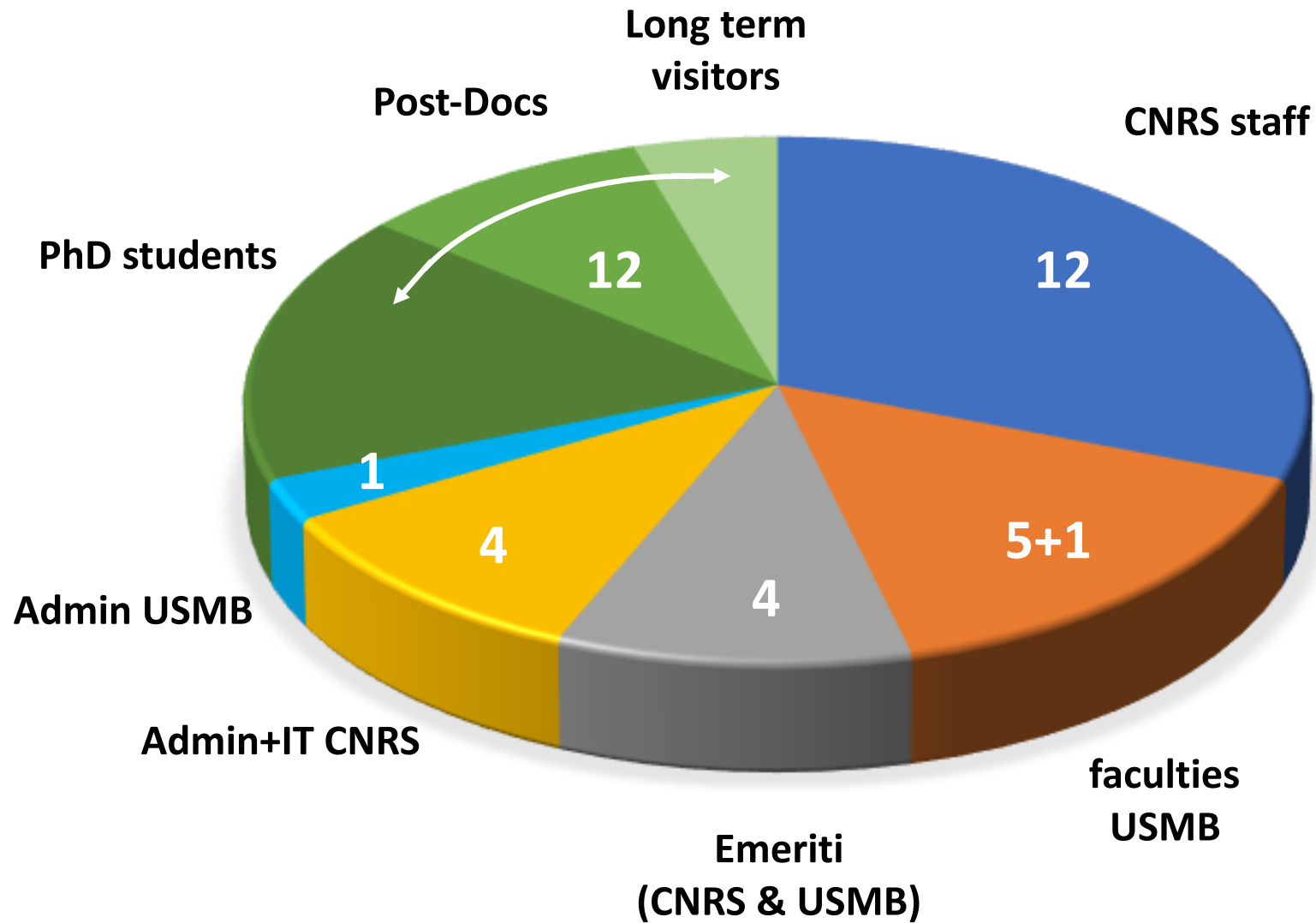




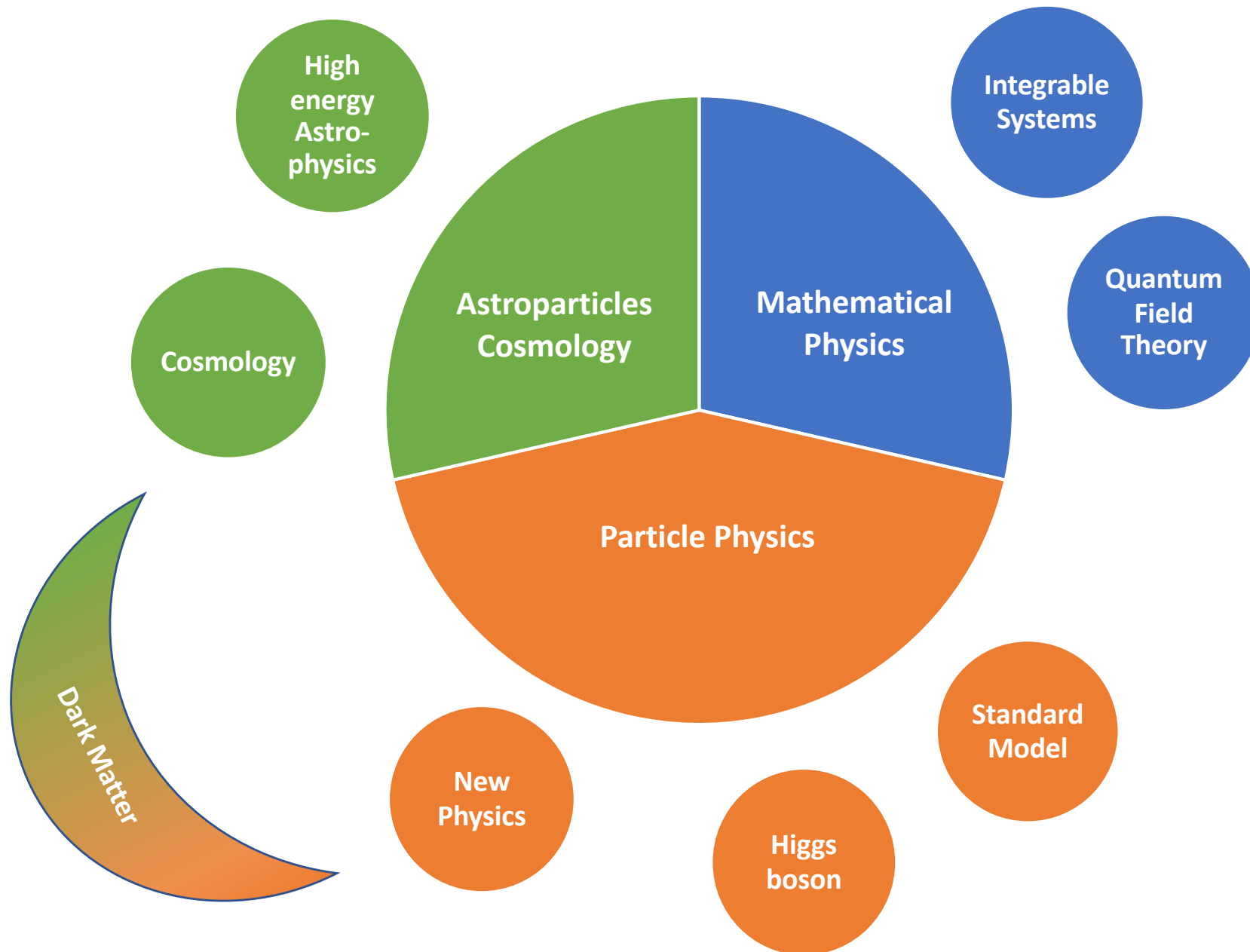
UMR CNRS/INP – Université Savoie Mont Blanc

ENIGMASS – 18/01/2021

The people



The teams



A major discovery in particle physics with the Higgs boson



confirms the elementary particle mass generation but picture is still obscure: the very existence of this particle and the lack of understanding of the EW phase transition below 1 TeV



matter/antimatter asymmetry unexplained, dark matter and dark energy problems

hint at the presence of some new phenomena beyond the SM
some discrepancies in the quark sector, far from conclusive



yet, no signal of new physics!

we should look for BSM effects everywhere



precision calculations are becoming increasingly necessary as a strategy to detect some signals of new physics

Discovery of GW has opened up a new era in astro/cosmo

multi-wavelength and multi-messenger observations are key tools to characterize GW sources, the high energy sky, and cosmic rays, in order to address major open questions in fundamental physics



through remarkable synergies with experimental experts (Virgo, CTA, LSST), the LAPTh is well positioned to have a high impact contribution in this line of research

And what about the contribution of math phys?



spectacular progresses have been made in the domain of amplitudes, allowing one to develop a powerful framework for multi-loop calculations directly applicable to high energy physics



line of research rooted in the development of algebraic concepts based on integrability, underlying symmetries (conformal, dual) and other mathematical objects (formalism of symbols, Hopf algebra, etc.)

need to open up to the new techniques in loop calculations that borrow from more formal approaches, the “amplitudes theme”

Main themes for the next years

- Precision calculations and predictions
- Dark Matter, Higgs and New Physics
- Flavor physics

- Cosmic rays and antimatter anomalies
- Probing the dark universe beyond the WIMP paradigm
- Multi-messenger astrophysics of high-energy emitting compact objects and implications for fundamental physics
- Accelerating the discovery of Dark Matter with Machine Learning

- Amplitudes

collaborations with
ATLAS and LHCb*

CRAC

collaborations with
HESS & CTA*

collaborations with
VIRGO

collaborations with LPSC TH

* theses in co-
supervision

Thanks for your attention