

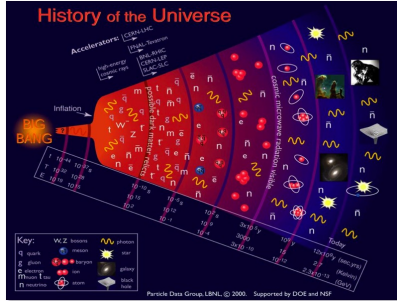
High Energy Physics Phenomenology

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Where do we stand in HEP?



- ◆ **Standard Model of Particle Physics**
- ◆ **Standard Model of Cosmology**

Drei Generationen der Materie (Fermionen)

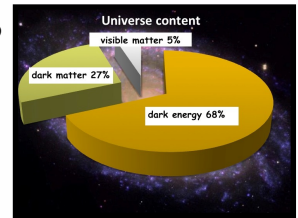
	I	II	III	
Masse	2,3 MeV	1,275 GeV	173,07 GeV	125,9 GeV
Ladung	$\frac{2}{3}$	$\frac{2}{3}$	$\frac{2}{3}$	0
Spin	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	0
Name	u up	c charm	t top	q e/p-Quark
Quarks	d down	s strange	b bottom	g Gluon
Leptonen	<2 eV Elektron-Neutrino	$<0,19$ MeV Myon-Neutrino	$<18,2$ MeV Tau-Neutrino	91,2 GeV Z-Boson
	0,511 MeV Elektron	105,7 MeV Myon	1,777 GeV Tau	80,4 GeV W-Boson
				Eichbosonen

Many fundamental questions still open...

- Force Unification ?
- String Theory ?
- Quantum Gravity ?
- Inflation ?



- Hierarchy problem ?
- Dark matter ?
- Matter-Antimatter ?



Physics Beyond the Standard Model (BSM)

What is the experimental signatures?

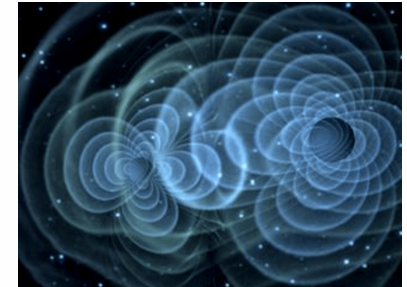
Research Lines

✦ *BSM physics at colliders*

- Model building on dark matter physics and axions
- Unconventional signatures at the LHC (e.g. displaced vertices)
- Future colliders (FCC, muon collider ...)

✦ *Gravitational waves*

- Focus on Stochastic Gravitational Wave background (SGWB)
- Data analysis to detect astrophysical SGWB (BH and NS mergers)
- Modelling of cosmological SGWB to explore early stages of Universe, Phase transitions and cosmological defects
- Members of LIGO-Virgo-Kagra and Einstein Telescope



E.G. 2023 Master Thesis

- *Superconducting Domain Walls and GW (R. Camphyn 2023)*

