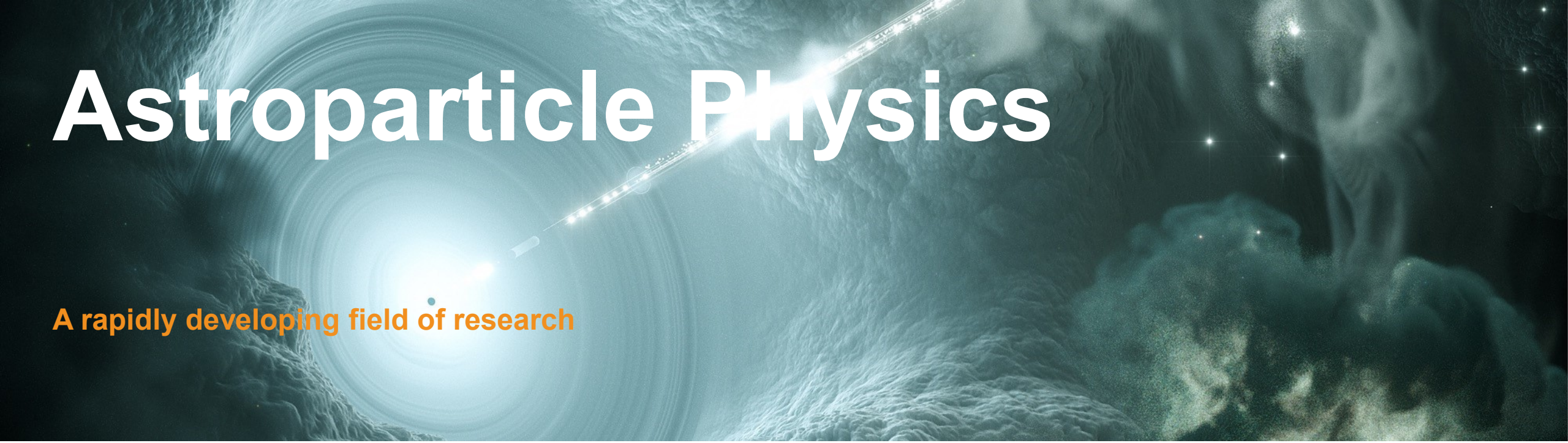


Astroparticle Physics

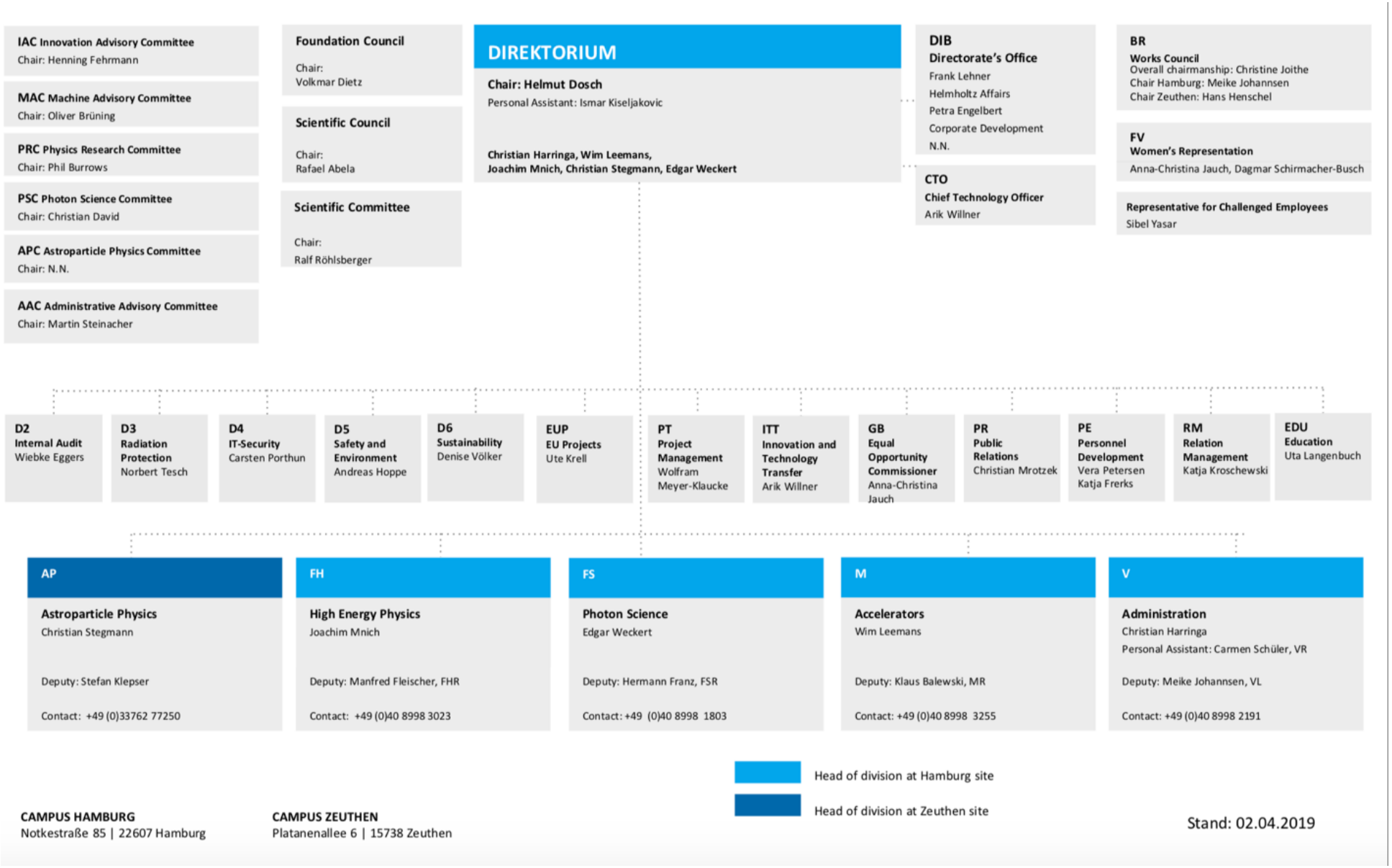
A rapidly developing field of research

Christian Stegmann, 7.2.2020

HELMHOLTZ RESEARCH FOR GRAND CHALLENGES

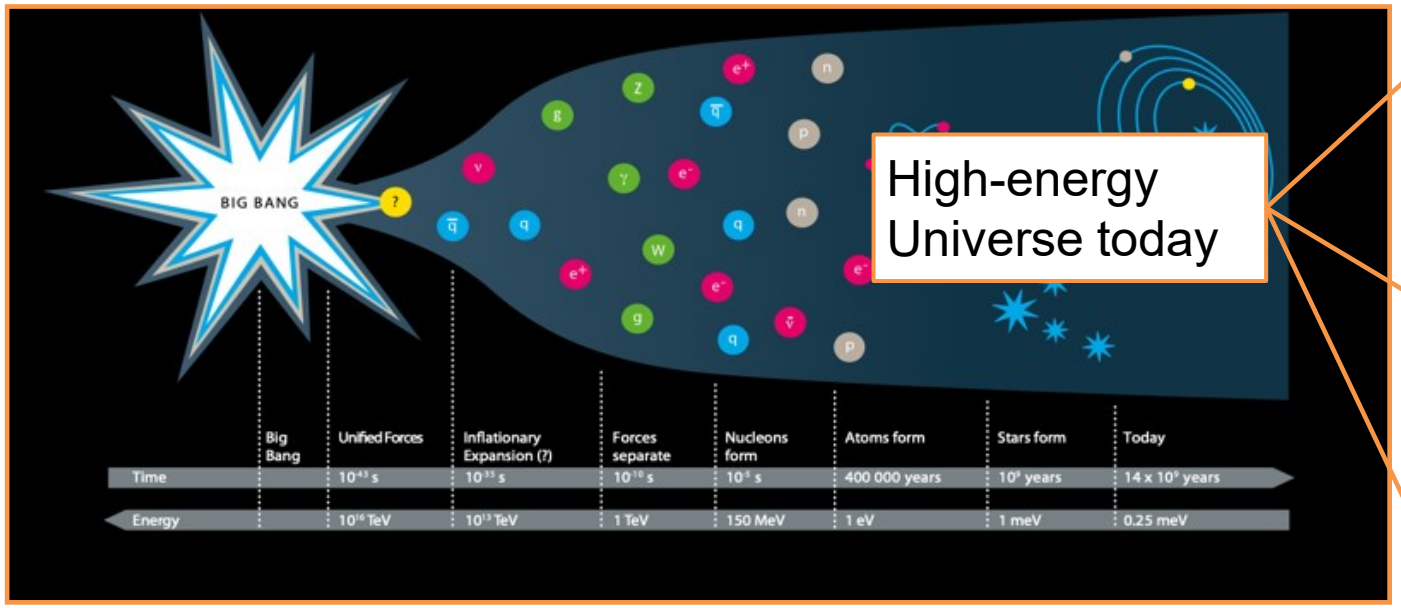
DESY.

The AP Research Division is in place and working



We want to understand the high-energy Universe and ist constituents

A broad but coordinated research program with observatories (and in laboratories) – a growing field of science



High-energy Universe today

Multi-messenger view of the cosmos

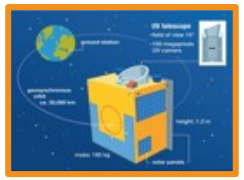
- Gamma-ray astronomy
- Neutrino astronomy
- Cosmic rays
- Gravitational waves

Understand the role of **neutrinos** in the Universe

Search for new physics and **Dark Matter**

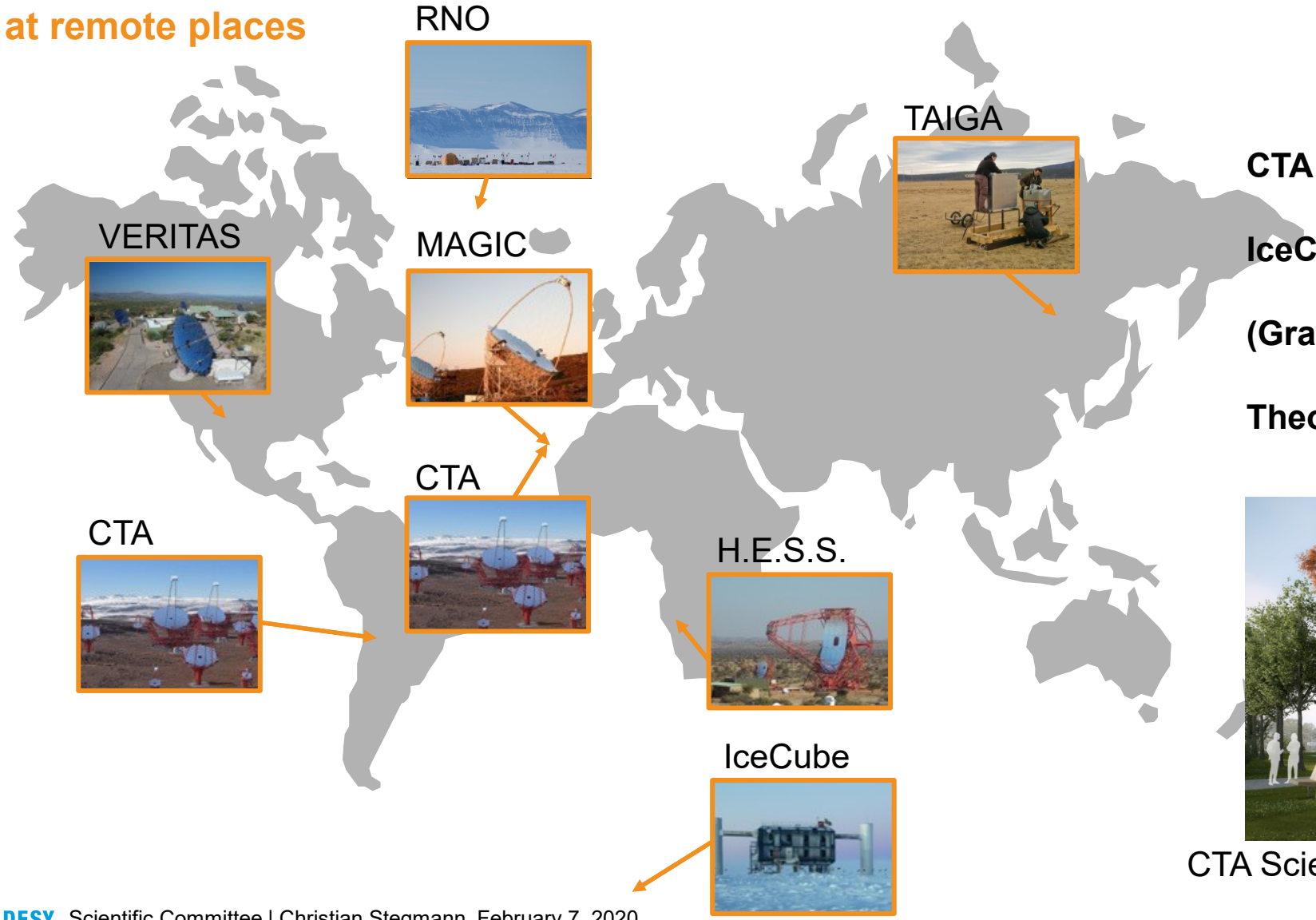
- Strong interplay between experiments and theory
- Received a short but clear PoF IV recommendation:
  „Continue with the ambitious posture of the Helmholtz programm“

INFRASTRUCTURES & COOPERATIONS



ULTRASAT

We are members in large international collaborations operating instruments at remote places

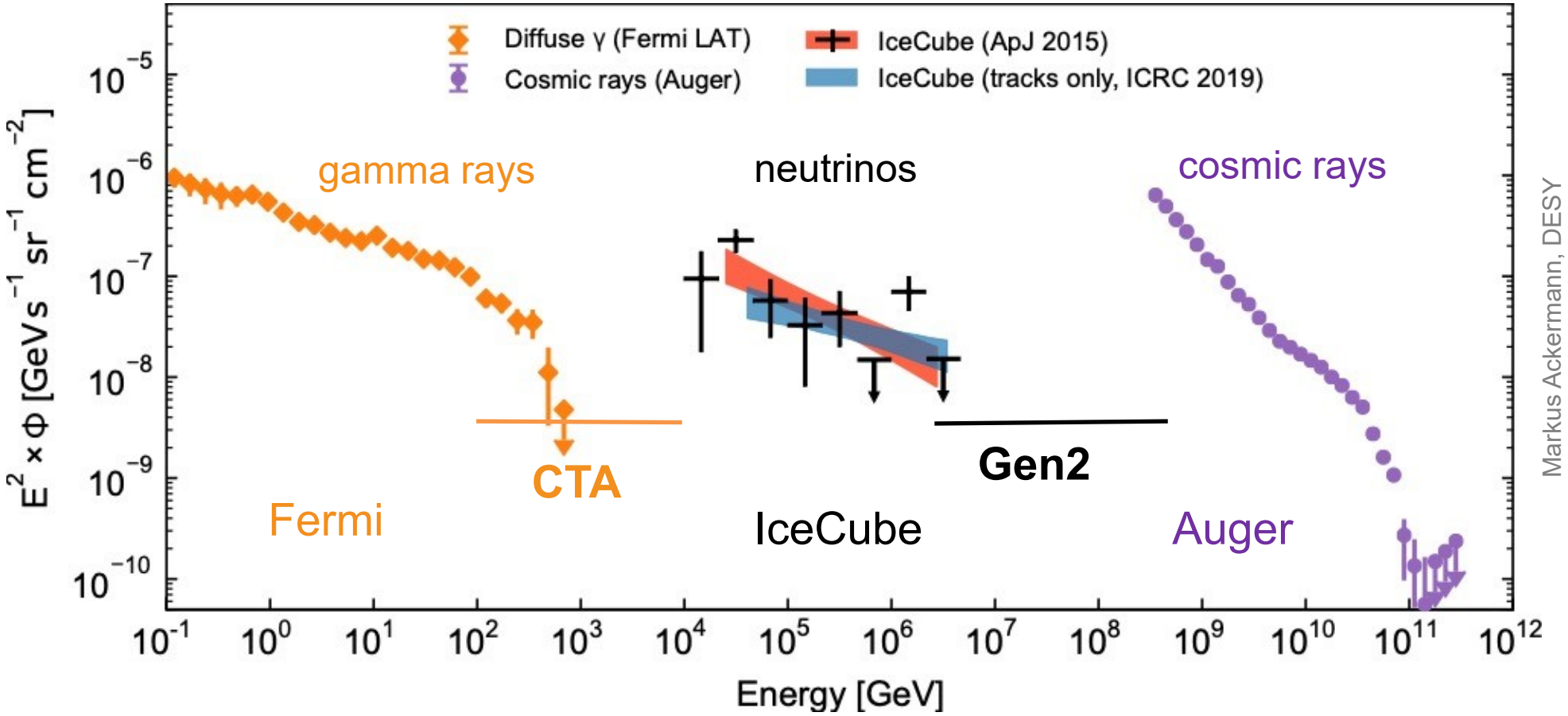


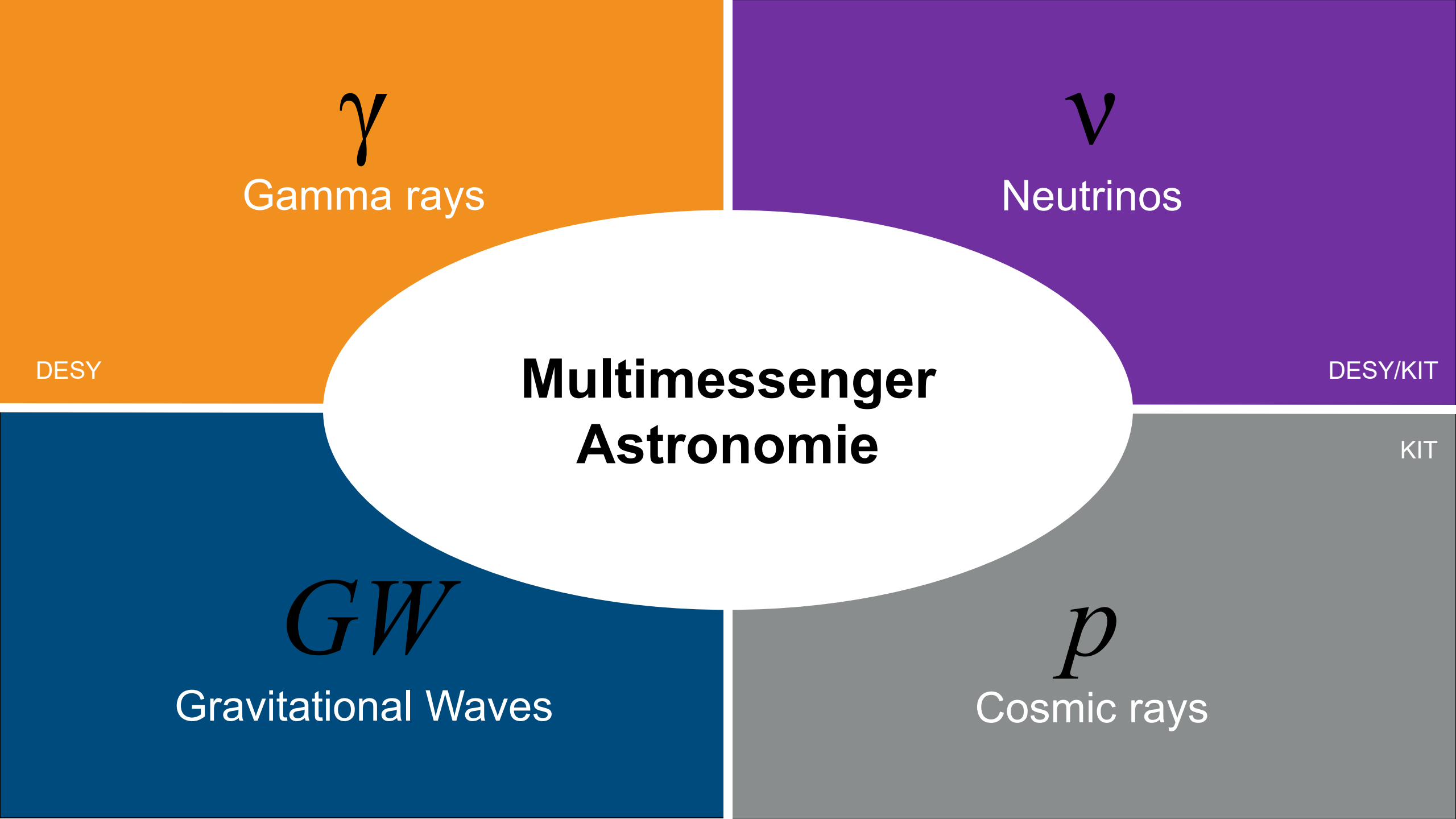
	High-energy Universe	Neutrino properties	Dark Matter
CTA	■		■
IceCube	■	■	■
(Gravitational Waves)	■		■
Theory	■	■	■

CTA Science Data Management Center in Zeuthen

We want to understand cosmic environments

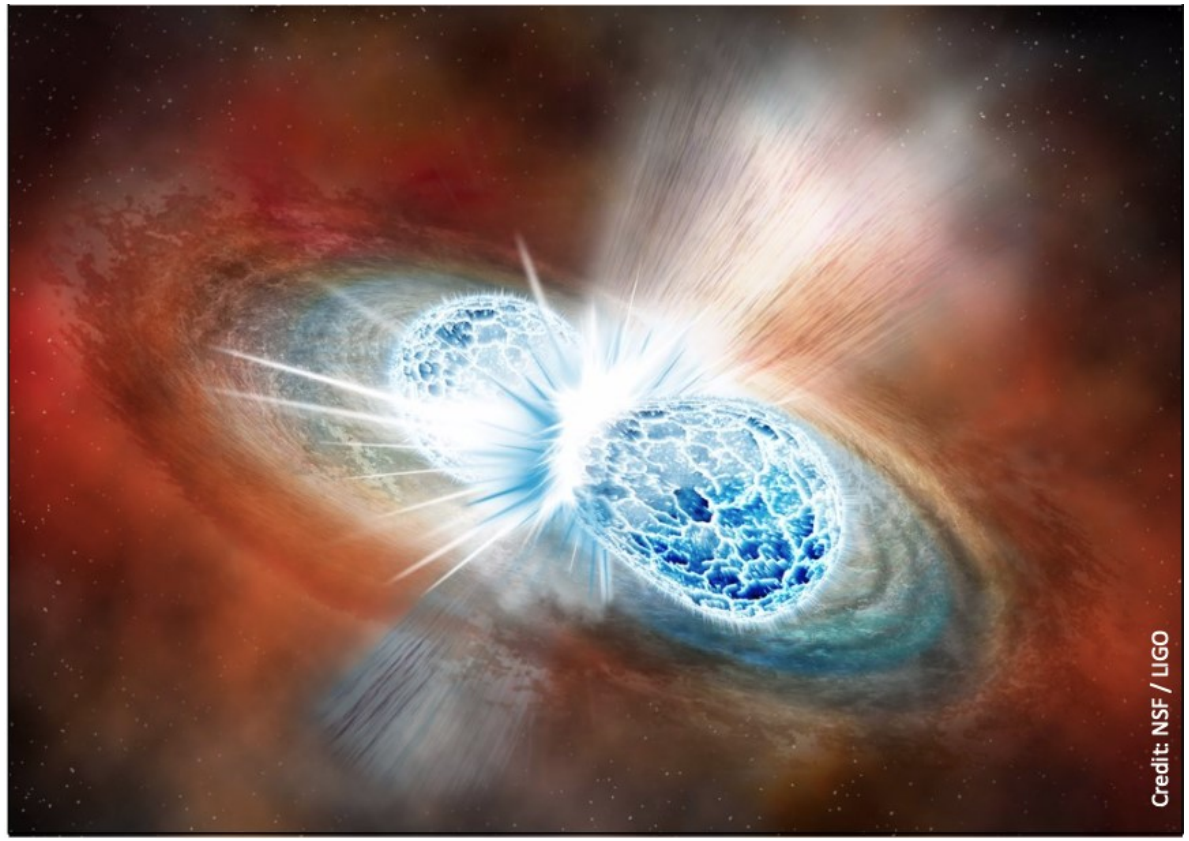
Energy flux of cosmic messengers



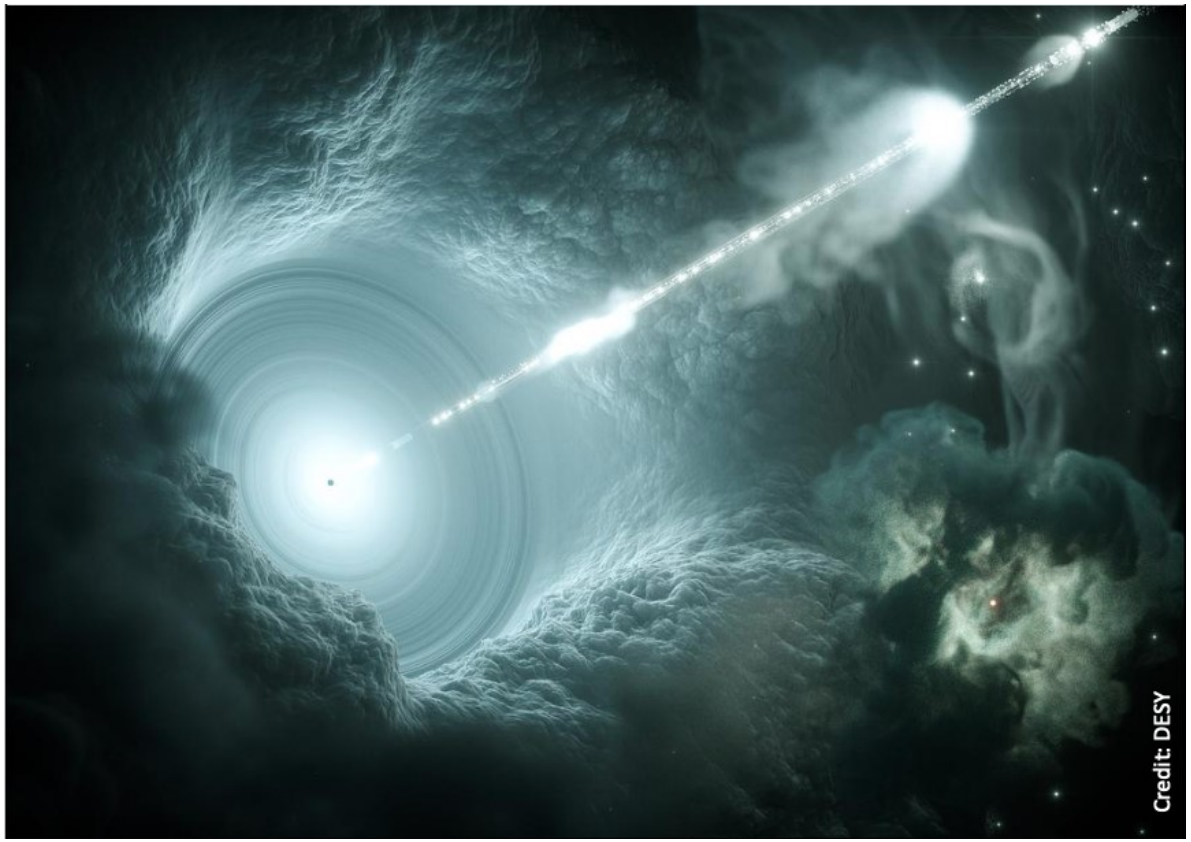

γ
Gamma rays
DESY
ν
Neutrinos
DESY/KIT
Multimessenger
Astronomie
GW
Gravitational Waves
p
Cosmic rays
KIT

The Birth of Multimessenger Astronomy

Highlight 1: Neutron star merger
How: Gravitational waves + optical + x-rays + ...
Observed by more than 70 observatories

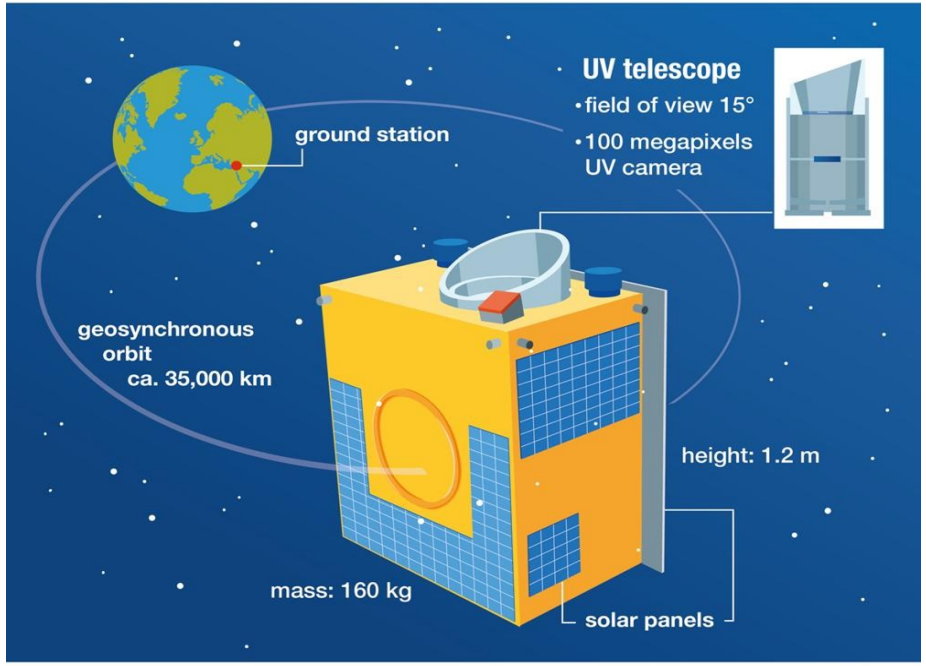


Highlight 2: The first source of cosmic neutrinos
How: Neutrinos + Gamma rays
Observed by 16 observatories



We want to study celestial objects in all channels

Transient multi-messenger astronomy



- Gravitational wave follow-up observations with ULTRASAT
- Advance and run multi-messenger realtime analysis center

Artist image of the neutron star merger GW170817:

Gravitational Wave Astronomy

- Needs national initiative to organize German contribution.
- We are actively participating.

Particle Physics

Photon Science

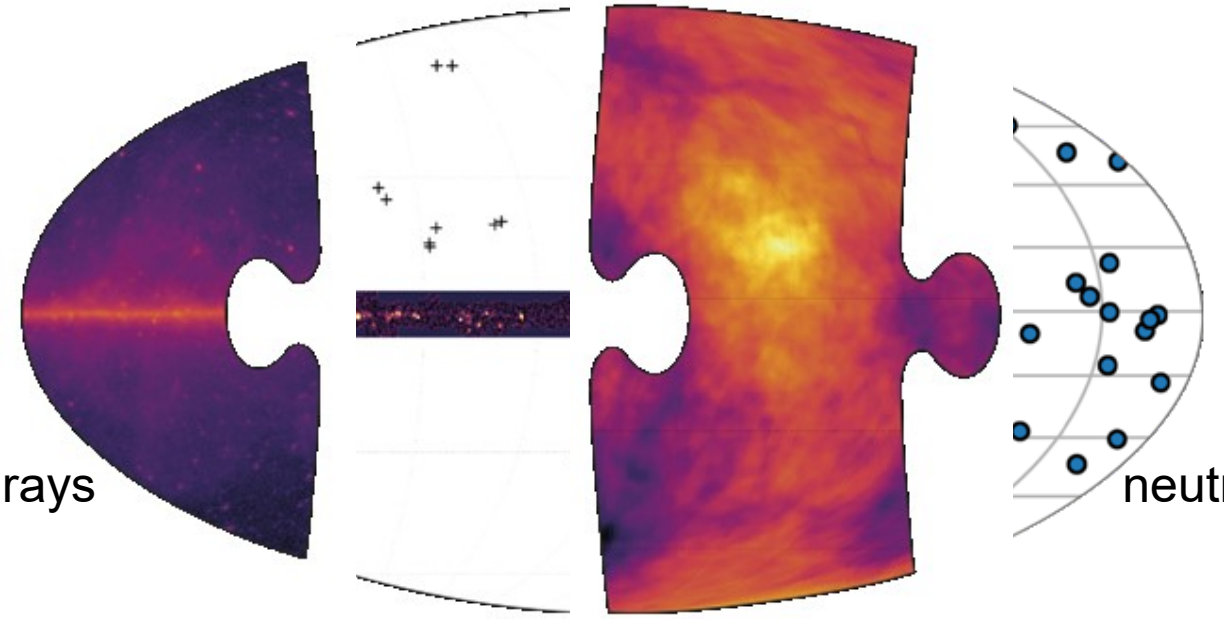
Astroparticle Physics

Accelerator Physics

Berlin-Brandenburg
Hamburg

We see the Cosmos as never before

Our emerging view of the high-energy Universe today:



HELMHOLTZ WEIZMANN RESEARCH SCHOOL MULTIMESSENGER ASTRONOMY

Within the next decade: We make decisive steps towards a coherent picture of the Universe