



EBERHARD KARLS
UNIVERSITÄT
TÜBINGEN



CSC-Tübingen PhD Scholarship Program

2026/2027 application round: prospective PhD positions at the University of Tübingen

Faculty: of Science

Institute / Section / Subject: Institute of Astronomy and Astrophysics, High Energy Astrophysics section

Supervising Professor(s): Prof. Andrea Santangelo, Dr. Gerd Pühlhofer (both in Tübingen)

About the Supervisor(s): Professor Andrea Santangelo is Professor for High Energy Astrophysics at the University of Tübingen and head of the section 'High Energy Astrophysics'. He is currently the speaker of the Kepler Center for Astro and Particle Physics in Tübingen. A leading figure in high energy astrophysics, his research spans X-rays to ultra-high-energy cosmic rays (up to 10^{21} eV). He has played key roles in major missions like BeppoSAX, INTEGRAL, XMM-Newton, eROSITA, ATHENA, eXTP, and THESEUS, and led research for TeV observatories (HESS, CTA). Beside, experimental activities, his work focuses on endpoints of stellar evolution, dark matter, and TeV emitters, with ~800 refereed publications. Honors include the Bruno Rossi Prize (2010) and EU Descartes Prize (2007) with the HESS Collaboration, a RIKEN Grant (2009) for visiting distinguished scientist, three CAS President's International Fellowships (2016, 2021, 2026), Fudan Scholar (2025). A dedicated mentor, Prof. Santangelo takes particular pride in having supervised approximately 150 research theses (Bachelor, Master and PhD levels), guiding different generations of students through their academic development.

Specification/Project title: Supernova remnant observations in the early phase of CTAO-South.

Topic Description: The Cherenkov Telescope Array Observatory (CTAO), currently entering its construction phase, will open a new window on the origin of Galactic cosmic rays. In particular, CTAO-South in Chile, with its initial array of medium- and small-sized telescopes, will provide unprecedented sensitivity at the high gamma-ray energies most relevant to cosmic-ray physics. A key objective will be the identification of Galactic PeVatrons—sources capable of accelerating particles to PeV energies. While supernova remnants (SNRs) have traditionally been considered the main sources of Galactic cosmic rays, observations have so far failed to establish them as PeV accelerators. At the same time, LHAASO has discovered several PeVatrons in the Northern sky, raising the question of which source classes dominate the cosmic-ray population around the knee. CTAO observations of SNRs and other candidate accelerators will be crucial for establishing their contribution to the Galactic cosmic-ray budget and understanding the origin of the highest-energy particles in our Galaxy. The proposed project deals with optimizing and exploiting the science program of these initial observations in the forthcoming years. Simulations will be performed with the goal to quantify the sensitivity of these intermediate configurations and to select the most-suited targets for initial science verification and for rapid science yield. For this, a thorough assessment of the H.E.S.S. data on supernova remnants, specifically from the second

H.E.S.S. Galactic plane survey (HGPS2) results in the TeV band, which are imminent to become available, will be performed. At the same time, sources from the (mostly Northern-sky) LHAASO catalog which are still visible from the southern CTAO site and which are suited for study with the initial CTAO-South MSTs will be identified. First data taken on Galactic SNRs with those CTAO-MSTs that will be deployed starting 2027 onwards will be analyzed.

Intended Degree: *Dr. rer. nat.*

Type of the PhD Study: *Full-time (complete doctoral studies at the University of Tübingen)*

Required Degrees and Qualifications: Master in Physics, or Astro and Particle Physics, or Astronomy and Astrophysics

Language Requirements: English as a working language.

Notes: None.