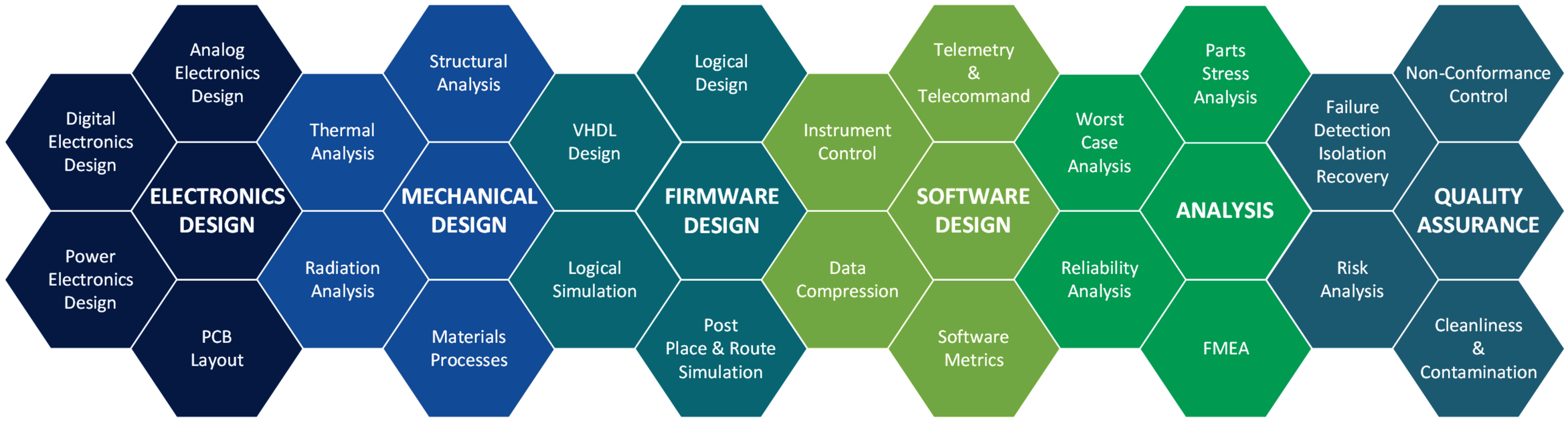
ÖAW — AUSTRIAN ACADEMY OF SCIENCES

ONBOARD COMPUTING

Gabriel Giono, J. Hasiba, K. Hofmann, I. Jernej, H. Jeszenszky, Ch. Kürbisch, G. Laky, M. Leichtfried, S. Neukirchner, H. Ottacher, M. Steinberger, M. Steller, J. Tonfat, R. Wallner

MORE ABOUT US

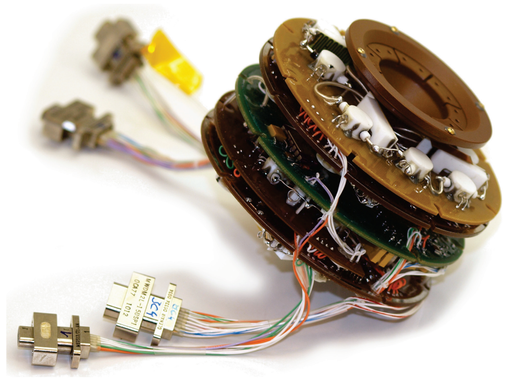


MAIN RESEARCH QUESTIONS

- **What can we contribute to a mission or flight instrument?**
- **Design of high reliable and performant onboard computers**
- **Design of IP cores to accelerate instrument specific data processing algorithms**
- **New algorithms for data compression to maximize the scientific return**

INSTRUMENTS ACTIVE IN SPACE

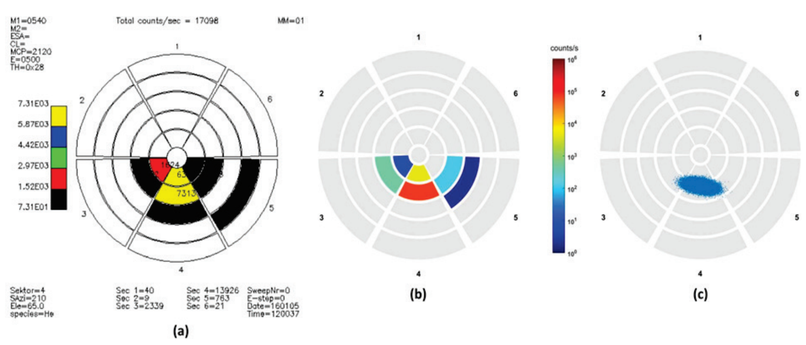
The team has participated in ESA and NASA missions with instruments like the Active Satellite Potential Control for Cluster and MMS, the Boîtier Extracteur for the first exoplanetology mission CoRoT and the Electron Gun for the Electron Drift Instrument on board MMS. In the last years, the focus was shifted more to onboard computing including software development fulfilling quality level B.



EDI Gun electronics

BEPICOLOMBO: PLANETARY ION CAMERA

- Launched in October 2018
- PICAM, a time of flight mass spectrometer, classifies ions escaping from Mercury
- Mass range ~132 amu, mass resolution >1:50
- As Principal Investigator, the IWF provided the DPU and the software, and was responsible for building, integrating and testing the instrument



(a): Azimuth and elevation mapping of the incoming ion beam (He+, 500 eV) entering the centre of sector 4 (azimuth = 210° elevation = 65°) as shown in (c); (b), (c): Best fitting of the ion beam pattern, resolved by numerical calculations; (b) represents the number of counts per pixel, when the particles are hitting the detector

CHEOPS: BACK-END-ELECTRONICS

- Launched in December 2019
- CHEOPS performs high precision photometry on known targets, determining the accurate radii and identifying possible atmosphere
- IWF contributed the Back-End-Electronics, which contains the data processing unit and the power supply for the entire instrument

SOLAR ORBITER, RADIO AND PLASMA WAVE ANALYZER

- Launched in February 2020
- The closest approach to the Sun is in approximately 0.28 AU
- RPW uses large E-field antennas and a search coil magnetometer to analyze the behaviour of plasma waves in the vicinity of the Sun
- Electric field DC to 20 MHz, magnetic field 0.1 Hz to 1 MHz
- The IWF contributed the RPW DPU, controlling the low frequency and high frequency receivers and the time domain sampler

INSTRUMENTS UNDER PREPARATION

SMILE: SXI ELECTRONICS BOX

SMILE is a joint project between ESA and the Chinese Academy of Sciences with the goal to build a more detailed understanding of the dynamic interaction between solar wind, magnetosphere and ionosphere. The IWF contributes the digital processing unit and the electronics box for the Soft X-ray Instrument.

Qualification model of the SXI EBox The red coloured handles, red tag items, are removed after installation at the instrument platform.

PLATO: ROUTER AND DATA COMPRESSION UNIT

The objective of ESA's PLATO (PLAnetary Transits and Oscillation of stars) mission is to find and study a large number of extrasolar planetary systems, with emphasis on the properties of terrestrial planets in the habitable zone around solar-like stars. PLATO uses 24 cameras with overlapping field of view. The IWF contributes the node in the data chain, which enables the communication between all cameras and the instrument control unit.

FUTURE TOPICS

DATA REDUCTION AND COMPRESSION

- Use of similarities in data content
- Hardware based algorithms for event detection, in particular for multi-sensor configurations
- Use of neural networks and machine learning for optimizing onboard data processing

READ-OUT ELECTRONICS FOR OPTICAL SENSORS

- Low-noise analogue amplification chain
- Digital circuitry for modular read-out schemes

IWF — INSTITUT FÜR WELTRAUMFORSCHUNG, WWW.OEAW.AC.AT/IWF, GABRIEL.GIONO@OEAW.AC.AT

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