



IN MEMORIAM OF  
ECKHARD KENDZIORRA

\*21.12.1945 †02.09.2015

Martin Stuhlinger  
Prof. Rüdiger Staubert



# Founder member of IACHEC

IACHEC-2006: CAL Management  
Eckhard Kendziorra



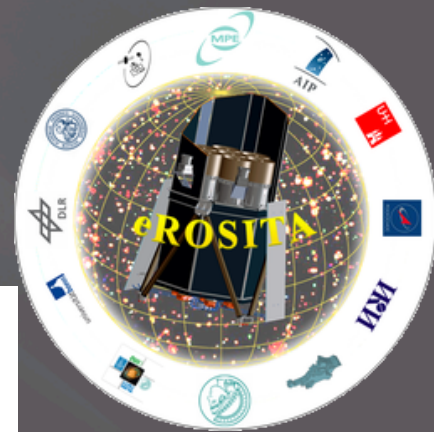
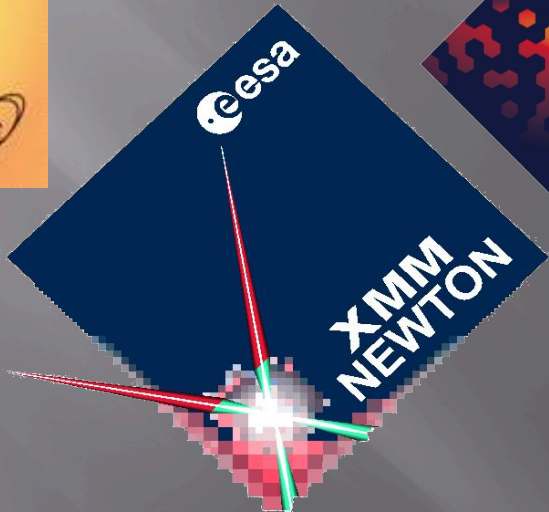
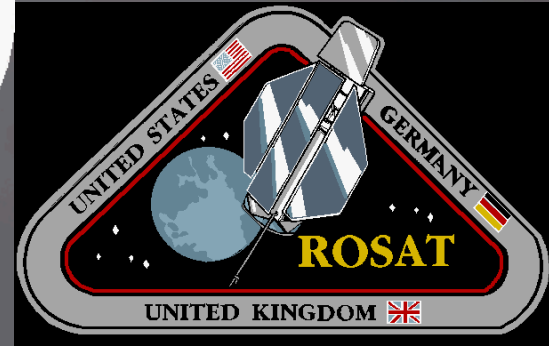
ICWG / 1st IACHEC  
Nesjavellir, Iceland

2nd IACHEC  
Lake Arrowhead, USA





# Key person for high energy instruments and missions



# Professional career

1971 Diploma in Physics, University of Kiel

1971 Scientific employee, AIT/IAAT,  
University of Tübingen

X-ray astronomy department

1971-1975 Prof. Joachim Trümper

1975-2004 Prof. Rüdiger Staubert

2004-2009 Prof. Andrea Santangelo



Kendziorra & Staubert, 1973

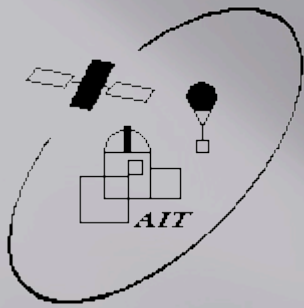
1976 PhD, University of Tübingen

(Crab - balloons and rocket: Moon occultation 07.10.74)

2009 Retirement (grade "Akademischer Direktor")



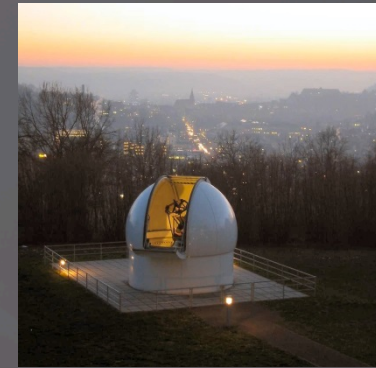




# Responsibilities



- Research: Science (X-ray Astronomy)
- Detector development (detector tests and calibration)
- Development of digital electronics
- Teaching: "Astronomisches Praktikum"
- Thesis advising (Diploma / PhD / "Staatsexamen")
- Institute organization: Coordination of mechanical and electronical workshops
- Administration: Project planning / management



# Skylark Rocket experiment

Digital electronics, Subject of his PhD



Moon occultation of the Crab on 07.10.1974

Provide information on spatial extent and structure (1-dim)

Campaign in El Arenosillo, Spain  
by Uni.Leicester/ AIT/ MPE





Mission project scientist: Jeff Hoffmann

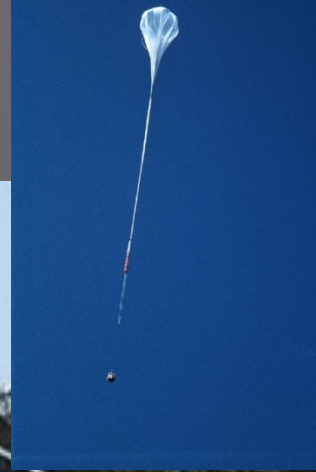


L.to.r.: Roy Daldorph (U.L.), Eckhard Kendziorra (AIT), Rüdiger Staubert (AIT), Claus Reppin (MPE), Jeff Hoffmann (U.L.), Roger Cooper (U.L.), Barry Giles (U.L.)





# Balloon experiments



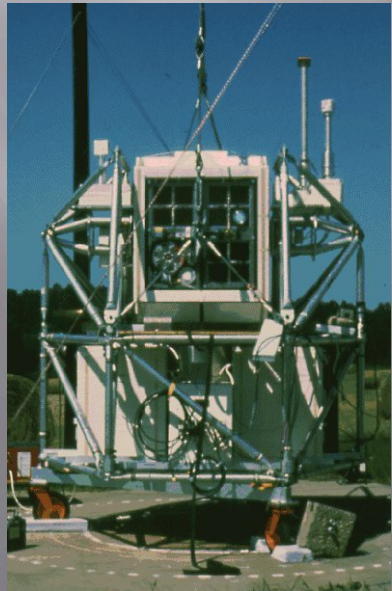
Electronics, overall operations

~10 campaigns between  
1973 and 1992

Palestine/Texas  
(=> Her X-1 cyclotron lines 1976)

Alice Springs/Australia

Uberaba/Brazil





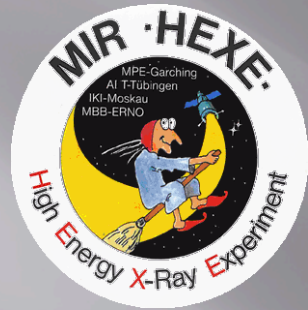
# AIT/MPE HEXE team

1980, Palestine/Texas: After football victory vs. an Italian team



From the left: Jürgen Krämer (AIT), Rüdiger Staubert (AIT), Günter Wölfl (MPE), Wolfgang Voges (MPE), Eckhard Kendziorra (top; AIT), Fritz Laux (AIT), Norbert Huber (MPE), Wolfgang Pietsch (MPE), Helmut Steinle (MPE)





# MIR-HEXE

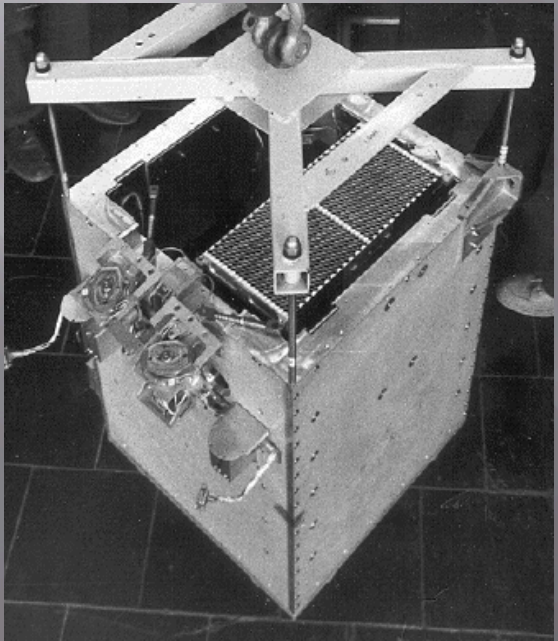
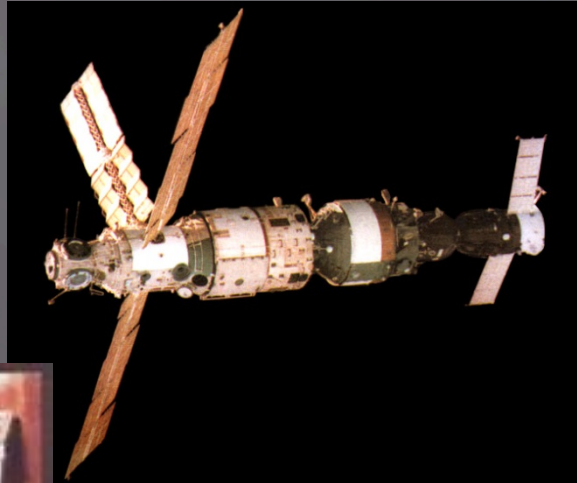


Data Processing Electronics

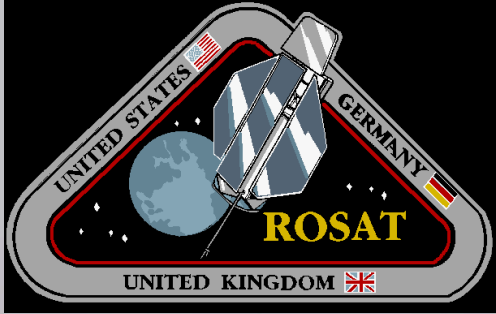
31.03.1987 Launched with KVANT1 module

X-ray emission from comptonised gamma rays  
from Ni-Co-Fe decay of SN 1987A

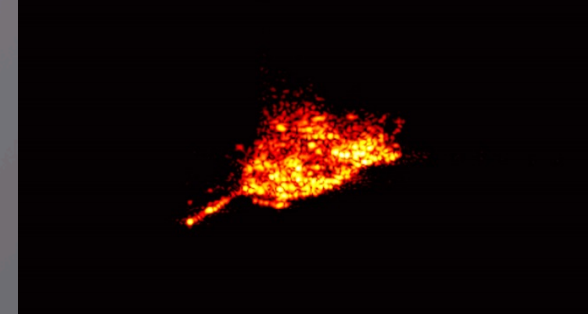
23.03.2001 Re-entry with MIR







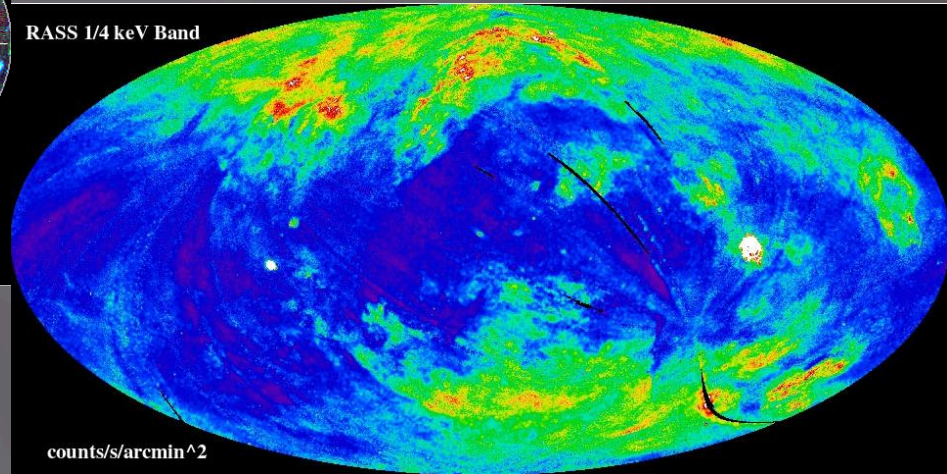
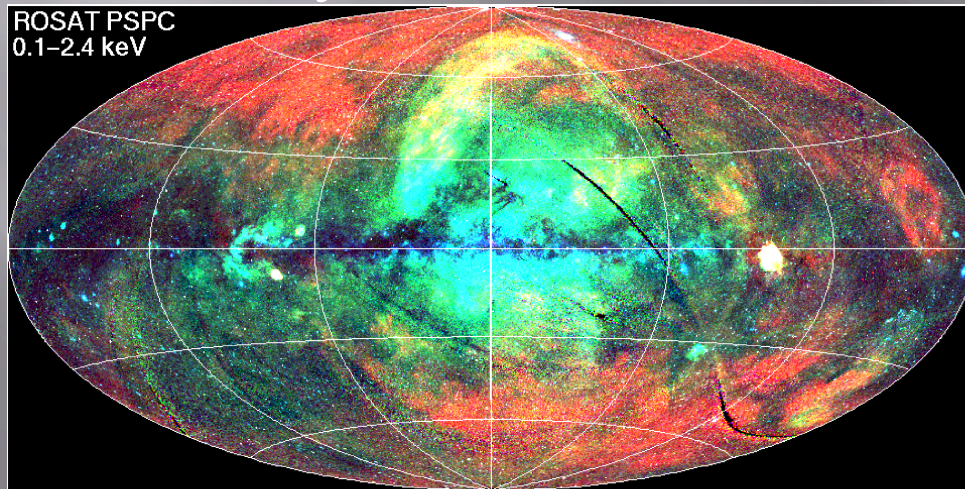
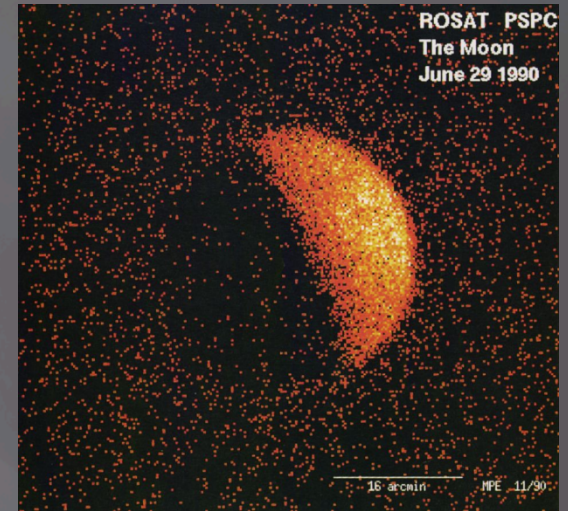
# ROSAT



Early onboard computer development

Live time: 01.06.1990-12.02.1999

Re-entry: 23.10.2011





A  
B  
R  
I  
X  
A  
S  
Broad band  
Imaging  
X-ray  
All-sky  
Survey

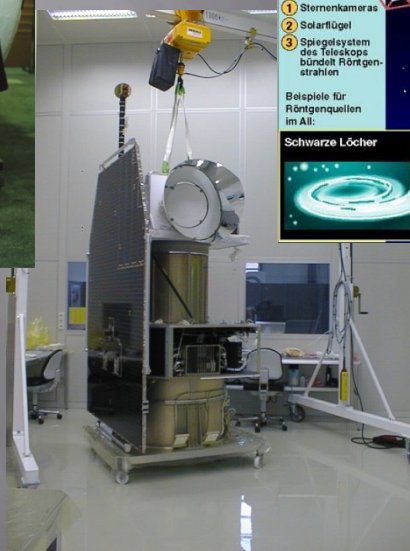
# ABRIXAS

**ABRIXAS**  
**A Broad-band Imaging X-ray All-sky Survey**  
 G. Richter, G. Hasinger, P. Friedrich, K. Fritze (AIP, An der Sternwarte 16, 14482 Potsdam)  
 J. Trümper, H. Bräuninger, P. Predehl (MPE, Karl Schwarzschild-Str. 1, 85748 Garching)  
 R. Staubert, E. Kendziorra (AIT Univ. Tübingen, Waldhäuserstr. 64, 72076 Tübingen)  
**In a cooperation between Astr. Inst. Potsdam, MPE Garching and Astr. Inst. Univ. Tübingen we have proposed to DARA to build a small X-ray satellite for an all-sky survey in the 0.5-10 keV band in order to observe an expected population of AGN, absorbed by a gas and dust torus.**  
 Keywords: satellite - X-ray telescope - AGN  
**Astrophysical Background**  
 There is a longstanding debate on the nature of the extragalactic X-ray background between 1 and 100 keV: whether it is the integrated effect of faint discrete sources, or whether there is a truly diffuse radiator, e.g. a hot intergalactic gas. The latter would fit the observed spectrum quite well, but would have a substantial effect on the cosmic microwave background, which has already been excluded by the recent COBE measurements (Nather et al. 1990).  
 In the past the discrete source model, however, seemed unattractive because of the so-called "spectral paradox", i.e. the fact that no known class of sources has a spectrum similar to the background.  
 Recently deep ROSAT pointed observations (Hasinger et al. 1993) have shown that a substantial fraction (about 60%) of the background in the 1-2 keV band can be resolved into discrete sources at a flux level of about  $3 \times 10^{-14}$  W m<sup>-2</sup> sr<sup>-1</sup>. For the rest of the spectrum the background is dominated by unresolved sources.

DPE, tests of pn-CCDs, detector calibration  
 German joint venture of AIP, MPE and IAAT  
 Launch: 29.04.1999 (failure of power management system)



G. Hasinger,  
 J. Trümper  
 R. Staubert  
 OHB, Bremen



**Satellit mit Röntgenblick**  
 Der deutsche Satellit ABRIXAS (A Broad-band Imaging X-ray All-sky Survey Satellite, deutsch: Himmeldurchmusterung im breiten Röntgenspektrum) soll unbekannte Röntgenquellen im All aufspüren.  
**Mission:** Datenaufnahme für eine Weltkarte  
**Missiondauer:** ca. 3 Jahre

Gewicht: 620 kg  
 Länge: 2,5 m

- 1 Sternenkameras
- 2 Solarflügel
- 3 Spiegelsystem des Teleskops bündelt Röntgenstrahlen

Beispiele für Röntgenquellen im All:  
 Schwarze Löcher  
 Neutronensterne

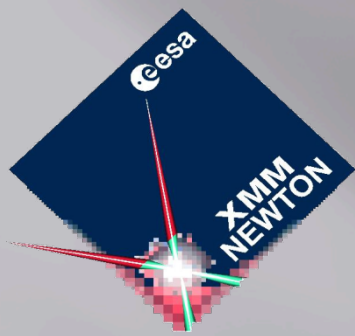
Höhe der Erdumlaufbahn: 580 km

dpa Grafik 1627

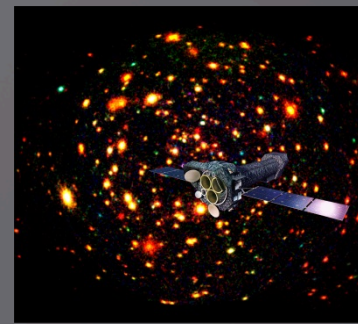


Norbert Meidinger, Peter Friedrich, Eckhard Kendziorra, Rüdiger Staubert at ABRIXAS launch campaign in Kapustin Jar, Russland.



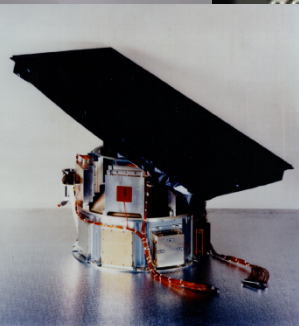
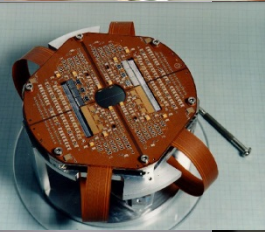


# XMM-Newton



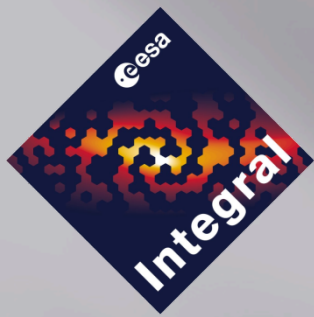
DPE, tests of EPIC-pn CCDs, operational modes  
detector calibration

Launch: 10.12.1999



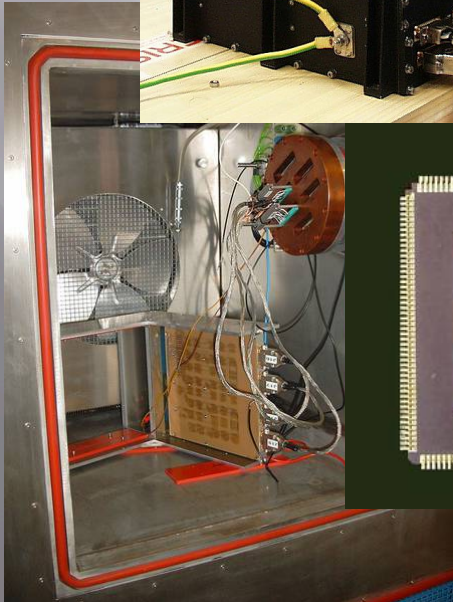
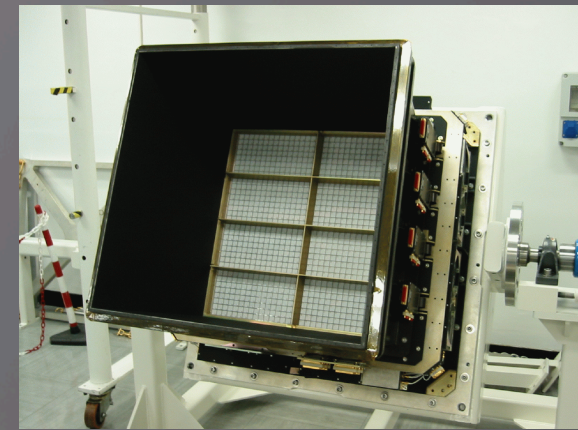
Josef Hoell (DLR), Eckhard Kendziorra, Rüdiger Staubert,  
Heiner Bräuninger (MPE), Claus Reppin (MPE)  
at XMM launch campaign in Kourou. French Guiana





# INTEGRAL

DPE of imager IBIS  
Launch: 17.10.2002



Claus Dreischer, Eckhard Kendziorra, Reiner Volkmer, Juergen Barnstedt, Eckart Göhler, Martin Stuhlinger, Nikolai v. Krusenstiern, Malgorzata Michalska, Andrez Zdiarski, Mauro Quadrini, Piotr Orleansky, Angela Bazzano, Pietro Ubertini, INTEGRAL launch party at ESOC

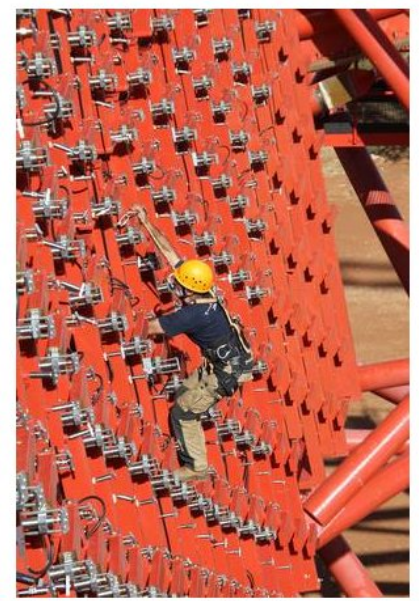
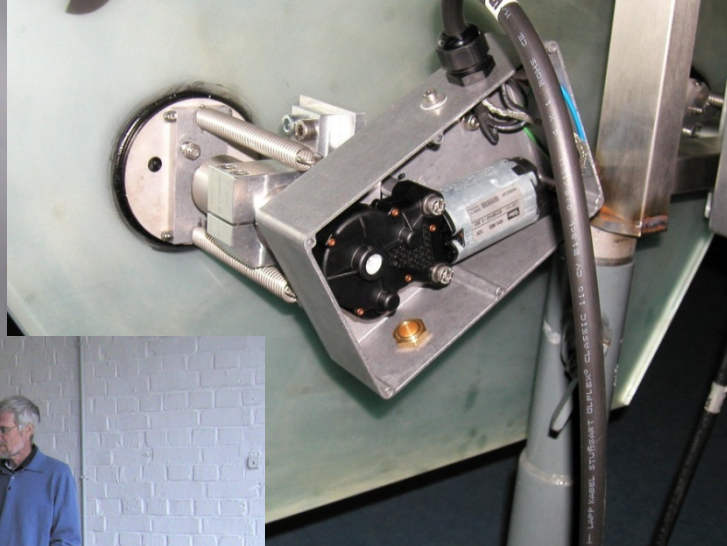




# HESS II

## Mirror alignment system

Siegfried Vetter & E. Kendziorra



Tübingen crew members climbing in the new telescope dish during the mirror actuator installation campaign at the H.E.S.S. site end of 2011. All mirror actuators of the H.E.S.S. II telescope have been prepared by the H.E.S.S. group of the Institute for Astronomy and Astrophysics Tübingen. © H.E.S.S. Collaboration, Eckhard Kendziorra/AAT





# Soft Proton Reflections



## Experimental Verification of the Soft Proton Small Angle Reflection Process on X-Ray Mirror Shells

Sebastian Diebold, Josef Jochum, Eckhard Kendziorra,  
Emanuele Perinati, Andrea Santangelo, Christoph Tenzer

Kepler Center for Astro and Particle Physics  
University of Tübingen



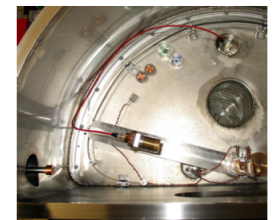
### Van-de-Graaff Accelerator Facility

- 3 MV single ended Van-de-Graaff accelerator
- Terminal voltage: 0.7 - 3.7 MV (currently 0.7 - 2.4 MV)
- Beam current: 200 nA - 40  $\mu$ A continuous current
- Ion types: p, H<sub>2</sub><sup>+</sup>, d, D<sub>2</sub><sup>+</sup>, <sup>4</sup>He<sup>+</sup>, <sup>12</sup>C<sup>+</sup>, <sup>13</sup>C<sup>+</sup>, <sup>16</sup>O<sup>+</sup>
- 6 beam lines



### Recent Applications

- Soft proton radiation hardness tests of *XMM-Newton* CCDs and silicon drift detector prototypes for *LOFT* (details follow)
- Low energy proton (75 - 1440 keV) response measurement of silicon strip detector for *EXL@FAIR*
- Thin film material analysis (RBS)
- Under construction: D<sub>2</sub> gas target for neutron radiation hardness tests of silicon detectors for *CBM@FAIR* and *ALICE@LHC*





# Sailing



X-Ray Astronomy



Out of a WSO presentation at the workshop on the occasion of Eckhard's 65<sup>th</sup> birthday

Rüdiger Staubert,  
Eckhard & Heide,  
Turkey 2014



