Contents

Preface **ix**

Conference Scientific Program **1**

Oral Papers

A mission to explore the Pioneer anomaly, H. Dittus, S. G. Turyshev, C. Lämmerzahl et al. **3**

Fundamental physics with the laser astrometric test of relativity, S. G. Turyshev, H. Dittus, C. Lämmerzahl et al. **11**

High precision tests of the Equivalence Principle, N. A. Lockerbie, T. J. Sumner **19**

Pioneering gravitational wave astronomy with LISA, S. Vitale, K. Danzmann, O. Jennrich, P. McNamara **27**

Massive black hole formation and growth, P.L. Bender, M.C. Begelman **33**

Precision tests of General Relativity and of the Equivalence Principle using ultrastable optical clocks: a mission proposal, S. Schiller, A. Görlitz, A. Nevsky et al. **39**

Atom interferometry and coherent matter waves, A. Landragin, P. Bouyer **43**

Trends in space astronomy and Cosmic Vision 2015-2025, C. Turon, C. Done, A. Quirrenbach et al. **53**

Other worlds and life in the Universe, A. Quirrenbach **59**

Understanding the planetary population in our galaxy, G. Piotto, S. Desidera, M. Barbieri et al. **69**

A large UV-optical telescope for characterization of the atmospheres of extrasolar planets and satellites, A. Lecavelier des Etangs, D. Ehrenreich **73**

A future far-infrared mission, R.J. Ivison, A.W. Blain **81**

Studying the formation and distribution of the elements using X-ray spectroscopy, J.S. Kaastra **91**

The life of stars and their planets, C. Catala, C. Aerts, S. Aigrain et al. **99**

Probing the birth of the first quasars with the future far infrared mission, M. J. Page **105**

The energetic Universe, X. Barcons **113**

At the frontier of X-ray astronomy: probing the magnetic field of isolated neutron stars with XMM-Newton, P.A. Caraveo, A. De Luca, S. Mereghetti, G.F. Bignami **125**

Prospects in space-based gamma-ray astronomy, J. Knödlseder **133**

Opening a new window to fundamental physics and astrophysics: X-ray polarimetry, E. Costa, R. Bellazzini, P. Soffitta et al. **141**

Charting the new frontier of the cosmic microwave background polarisation, F.R. Bouchet **151**

Perspectives for hunting the missing baryons in the local Universe, P. Richter **157**

The Long Lived Martian Geoscience Observatory, P. Lognonné, T. Spohn, D. Breuer et al. **163**

The Europa Microprobe In-Situ Explorer (EMPIE), T. Velasco, D. Renton, J. Alonso, P. Falkner **171**

The importance of Mars for understanding the evolution of planet habitability in the Solar System, F. Westall, W. Nijman, A. Leger, D. Depois, J. Vago, B. Hofmann **179**

Multi-point, multi-scale investigations of fundamental plasma processes in the Earth's magnetosphere, C.J. Owen, A.N. Fazakerley, S.J. Schwartz et al. **185**

The magnetism of the solar interior for a complete MHD solar vision, S. Turck-Chièze, T. Appourchaux, J. Ballot et al. **193**

The scientific case for spectropolarimetry from space: a novel diagnostic window on cosmic magnetic fields, J. Trujillo Bueno, E. Landi Degl'Innocenti, R. Casini, V. Martínez Pillet **203**

Tracing the origins of the Solar System, M. Blanc, D. Moura, Y. Alibert et al. **213**

A multi-disciplinary investigation of the Jovian system, N. Thomas, W. Baumjohann, H. Boehnhardt, E. Chassefiere et al. **225**

Towards real comparative planetology: synergies between Solar System science and the DARWIN mission, H. Lammer, E. Chassefière, Yu. N. Kulikov et al. **233**

Interstellar Heliopause Probe. Design of a challenging mission to 200 AU, M. Leipold, A. Lyngvi, P. Falkner et al. **241**

The SCOPE mission, M. Fujimoto, Y. Tsuda, Y. Saito, I. Shinohara, Y. Kasaba, H. Kojima **249**

Sub-millimetre wave (terahertz) observations of the Solar System gaseous planets and planetary satellites, B. Ellison, S. Dunkin, D. Matheson et al. **255**

Poster Papers:

The Pioneer Anomaly: the measure of a topological phase defect of light in cosmology, J.L. Rosales **263**

Ultraviolet capabilities to study the formation of planetary systems, A.I. Gómez de Castro, E. Verdugo, C. Ferro-Fontán **267**

Probing strong gravity with fast X-ray timing: from the Rossi X-ray Timing Explorer to XEUS, D. Barret **271**

ESI: a proposed european instrument for SPICA, B. Swinyard, D. Griffin, G. White et al. **275**

Habitability of Earth-like exoplanets under the action of host stars intensive CME activity, M.L. Khodachenko, J.-M. Grießmeier, I. Ribas et al. **279**

POLAR - a compact detector for GRB photon polarization measurements, N. Produit, W. Hajdas, F. Barao et al. **283**

Using 3D instruments to break the confusion limit in far-IR cosmological surveys, D.L. Clements **287**

Exploratory submm space radio-interferometric telescope (ESPRIT), F. P. Helmich, A. Baryshev, W. Wild et al. **291**

High-energy observations of neutron stars, and the Equation of State of nuclear matter, M. Méndez **295**

The diversity that we may find among terrestrial exoplanets, D. Despois, A. Léger, F. Westall, F. Selsis **299**

The impact of galactic cosmic rays on extrasolar Earth-like planets in close-in habitable zones, J.-M. Grießmeier, A. Stadelmann, H. Lammer, N. Belisheva, U. Motschmann **305**

The Darwin stellar catalogue. Stellar properties and preparatory observational science, C. Eiroa, M. Fridlund, L. Kaltenegger et al. **311**

Future exoplanet detections from space, and Drake's formula: discussion on different parameters. Implications on further space research and SETI?, A. Labèque, A. Léger, C. Valette, F. Brachet, B. Chazelas **315**

A crystal diffraction lens for nuclear astrophysics, P. von Ballmoos (on behalf of the MAX collaboration) **319**

Exploring the hard X-/soft gamma-ray continuum spectra with Laue lenses, F. Frontera, A. Pisa, P. De Chiara et al. **323**

Aperture synthesis in the far-infrared, W. Wild, Th. de Graauw, F.P. Helmich, B. Jackson **327**

Unveiling the high energy obscured universe: hunting explosive and collapsed objects physics, P. Ubertini, A. Bazzano, M. Cocchi et al. **331**

Physics and astrophysics at Ultra High Energies – A Cosmic Vision theme for the search of UHE CR and neutrinos from space, A. Santangelo, A. Petrolini, E. Plagnol **335**

Science case for an interferometer in the visible to characterize exoplanets and consolidate biosignatures, J. Schneider, L. Arnold, O. Lardière, F. Vakikili **339**

Dark energy-dark matter unification: the generalized Chaplygin gas, O. Bertolami **343**

Surveying the Galaxy: nano-arcsec astrometry, photometry, and radial velocities, M. A. C. Perryman **347**

Models and observation of high energy emission from stellar explosions: novae and type Ia supernovae, M. Hernanz, J. Isern, A. Hirschmann, E. Bravo, J. José **351**

Astrophysics with digitised astronomical archival plates, R. Hudec **355**

The view of changing Universe: the science with advanced LOBSTER X-ray ASM, L. Sveda, R. Hudec, L. Pina, A. Inneman, V. Semencova **359**

Novel technologies for future large X-ray space telescopes, R. Hudec, L. Pina, L. Sveda et al. **363**

Monitoring the X-ray sky with Lobster-Eye telescopes, R. Hudec, L. Pina, L. Sveda, A. Inneman, V. Semencova **367**

The importance of high resolution FIR/submm data in star formation, P. Saraceno, S. Molinari, L. Spinoglio, L. Testi, P. André **371**

Detecting neutron star induced wiggles in X-ray binaries with SuperGaia resolution, E.J.A. Meurs, C. O'Maoileidigh, L. Norci **375**

Solar / heliospheric dynamics and magnetism. Solar vision 2015-2025, M.L. Khodachenko, T.D. Arber, J.L. Ballester et al. **379**

Prediction of solar flaring and CME activity by means of COnceptual MODelling (COMOD) technology for the reconstruction of complex systems, B.F. Fomin, T.L. Kachanova, M.L. Khodachenko et al. **381**

Raman-Microscopy for in situ planetary science, J. Popp, M. Schmitt, N. Tarcea et al. **385**

The Beleinos cornerstone: the Sun, the star close to Earth, T. Appourchaux, F. Auchère, K. Bocchialini, R.M. Bonnet, A. Gabriel, J.-C. Vial **389**

X-ray exploration of the giant planets, their magnetospheres and the solar connection: from XMM-Newton to XEUS, G. Branduardi-Raymont, A. Bhardwaj, R. Elsner et al. **393**

Budget and roles of heavy ions in the Solar System, M. Yamauchi, I. Sandahl, H. Nilsson, R. Lundin, L. Eliasson **397**

Multi spacecraft observations from the Sun to the Earth, L.K. Harra, A. Smith, A.N. Fazakerley, C. Mandrini, S.A. Matthews **401**

Search for trojans of the outer planets, R. Albrecht, C. Barbieri, S. Marchi et al. **405**

Long-term variability of the zonal winds of Jupiter and Saturn, A. Sánchez-Lavega, R. Hueso, S. Pérez-Hoyos, E. García-Melendo, J. F. Rojas **407**

Author Index **413**

List of participants **420**