thermal infrared, and superb photometric dynamic range. This study shows that it is possible to achieve all of these performance requirements using a 6.5m unobstructed, off-axis telescope. This concept has compelling natural advantages for adaptive optics, coronagraphic astronomical imaging, and thermal infrared imaging.

Unique features of the NPT include wide-field imaging capability, with a field-of-view of at least two degrees, optimization for unprecedented low scattered light and high dynamic range astronomy, extremely low infrared emissivity, and innovative instruments uniquely designed to take full advantage of these capabilities.

This telescope concept breaks new ground in telescope technology, and it is therefore an ideal technical development project for NASA. NASA is currently at the forefront of development in interferometry using the Keck telescopes. The NPT complements and enhances this program since it provides an important baseline to add to those already planned on Mauna Kea. Moreover, the NPT is the ideal telescope for a full-fledged optical/infrared array of interferometric telescopes.

59.44

SMART-1 Technology and Science Experiments in Preparation of Future Missions and ESA Cornerstones

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SMART-1 is the first ESA Small Mission for Advanced Research in Technology, aimed at the demonstration of enabling technologies for future scientific missions.

SMART-1’s prime technology objective is the demonstration of the solar primary electric propulsion, a key for future interplanetary missions. SMART-1 will use a Stationary Plasma Thruster engine, cruising 15 months to capture a Moon polar orbit.

A gallery of images of the spacecraft is available at the web site: http://www.estec.esa.nl/spd/www/smart/html/11742.html

SMART-1 payload aims at monitoring the electric propulsion and its spacecraft environment and to test novel instrument technologies.

The Diagnostic Instruments include SPEDE, a spacecraft potential plasma and charged particles detector, to characterise both spacecraft and planetary environment, together with EPDP, a suite of sensors monitoring secondary thrust-ions, charging and deposition effects.

Innovative spacecraft technologies will be tested on SMART-1: Lithium batteries and KATE, an experimental X/Ka-band deep-space transponder, to support radio-science, to monitor the accelerations of the electric propulsion and to test turbo-code technique, enhancing the return of scientific data.

The scientific instruments for imaging and spectrometry are:

D-CIXS, a compact X-ray spectrometer based on novel SCD detectors and micro-structure optics, to observe X-ray celestial objects and to perform lunar chemistry measurements.

SIR, a miniaturised quasi-monolithic point-spectrometer, operating in the Near-IR (0.9-2.4 micron), to survey the lunar crust in previously uncovered optical regions.

AMIE, a miniature camera based on 3-D integrated electronics, imaging the Moon, and other bodies and supporting LASER-LINK and RSIS. RSIS and LASER-LINK are investigations performed with the SMART-1 Payload:

RSIS: A radio-science Experiment to validate in-orbit determination of the libration of the celestial target, based on high-accuracy tracking in Ka-band and imaging of a surface landmark

LASER-LINK: a demonstration of acquisition of a deep-space laser-link from the ESA Optical Ground Station at Tenerife, validating also the novel sub-apertured telescope designed for the mitigation of atmospheric scintillation disturbances.

59.45

Missions to Phobos and Other Minor Bodies with Space Vehicle of New Generation

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Planetary exploration is a cornerstone of space science and technology development. To accomodate the new political and economical motivations and to recover with the Russian planetary program after "Mars 96" loss, an approach for the development of space vehicle of new generation was elaborately studied. The study was constrained by the principal requirement of "Soyuz-Fregat" type rather than "Proton" launcher utilization to accomplish a number of challenging goals with space missions. The vehicle design incorporates innovative technology being focused on small propulsion electrojet engines to be installed in order to significantly increase the potential mission's energetic capabilities. The project is optimized around Phobos sample return mission and missions targeted to study some main asteroid belt bodies and/or comets and for NEO approach, as well as for a potential lunar mission, the latter being addressed as a test flight at the beginning phase of the vehicle exploitation. Preliminary evaluation made by the team allowed to find out basic criteria for these missions scenario and rationale and brought evidence on high efficiency of their implementation after the turn of the century. This study was supported by the Russian Aviation and Space Agency under "Expedition" Grant.

59.46

MIDAS - the dust counter and imager on Rosetta mission

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The MIDAS instrument (Micro Imaging Dust Analysis System) has been selected as payload on the international Rosetta mission to comet Wirtanen. The instrument is based on the technology of atomic force microscopy. This technique is well introduced in laboratory studies, but as a space application it has to match many crucial criteria to withstand the harsh conditions of space flight. The advanced design of the flight model consists of four major functional units, (1) the microscope (2) the system for collection and transport of the dust grains, (3) a microvibration damping unit and (4) the control electronics and computing facilities. The MIDAS instrument will be mounted on the orbiting spacecraft. Over the mission period it will collect small dust particles that are released from the cometary nucleus. The dust collection system consists of 64 especially coated facets, which can be individually exposed to the cometary environment. A shutter that closes the funnels of the system from the outside of the spacecraft controls the exposure time. Eventually the loaded collector surface presents the dust grains to the actual atomic force microscope. The high-resolution capabilities of MIDAS allow to observe a grain size range from 4 nanometer up to 5 micrometer, thus it covers the smallest grain size, which has been observed ever in a space environment. The results of the analysis of the data cover the following fields: (1) dust counting statistics (2) true three-dimensional images of dust particles and (3) dust characterisation. The unique approach of Rosetta mission to monitor a comet from the low active phase far away from the sun to the high active phase at perihelion gives an exceptional opportunity for all instruments to observe different stages in a life of a comet that might be expressed in drastic changes of material properties.

59.47

The MIDAS Instrument in the vicinity of comet Wirtanen - the laboratory approach

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The MIDAS instrument is part of the orbiter payload on the international Rosetta mission. This gadget is based on the principle of atomic force microscopy. In order to accompany the technical development of the instrument as well as the initialization of a scientific database a research program