System engineering, project management PA/QA, AIV & EGSE @ OAS

Vito Conforti, Andrea Bulgarelli, Nicolò Parmiggiani: ASTRI Mini-Array + CTA ACADA

Francesco Cuttaia: Strip/LSPE / Alma /TMS

Fausto Cortecchia, Emiliano Diolaiti, Matteo Lombini, Giuseppe Malaguti, Laura Schreiber, Adriano De Rosa, Gianluca Morgante, Filomena Schiavone, Luca Terenzi: optical and infrared instrumentation

Eduardo Medinaceli: Euclid/Athena

Enrico Franceschi: AIV activities and EGSE expertise for space missions

Natalia Auricchio: Ariel (ICU HW & FGS DCU) + PLATO (CAM) + Athena/X-IFU (ICU HW/ASW) + Euclid/NISP

Overview

- INAF OAS People & Projects
- Principles and Guidelines
- Tools
- Open points
- off-line
  - Publication & Technical Reports
  - INAF OAS People and responsibilities

INAF People & Projects

ASTRI Mini-Array

cta

ASTRI M.A & CTA

V. Conforti

A. Bulgarelli

N. Parmiggiani

F. Russo

F. Gianotti

V. Fioretti

Euclid

N. Auricchio

E. Franceschi

P. Battaglia

E. Medinaceli

F. Gianotti

G. Morgante

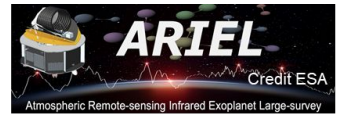
Athena

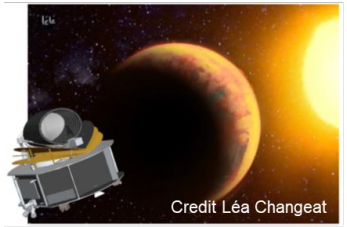
N. Auricchio

E. Medinaceli

SPHERE+

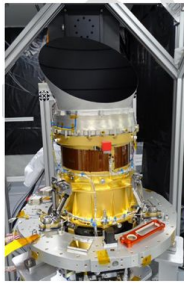
F. Cortecchia
A. De Rosa
E. Diolaiti
M. Lombini
G. Malaguti
G. Morgante
F. Schiavone
L. Schreiber
L. Terenzi

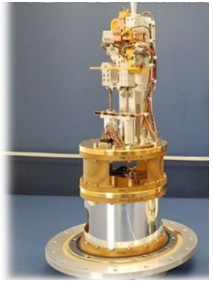


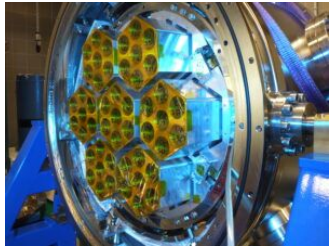


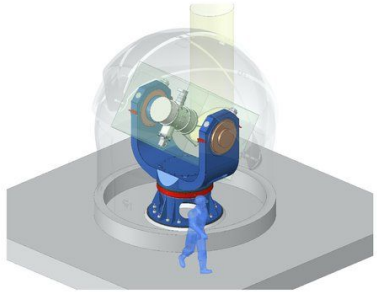
ARIEL

G. Malaguti
N. Auricchio
F. Cortecchia
E. Diolaiti
M. Lombini
G. Morgante
F. Schiavone
L. Schreiber
L. Terenzi









PLATO

N. Auricchio

F. Cogato

Alma Band 2

F. Villa

F. Cuttaia

L. Terenzi

LSPE-Strip

G. Morgante

F. Cuttaia

L. Terenzi

F. Villa

LiteBIRD

G. Morgante

F. Cuttaia

L. Terenzi

TMS

F. Cuttaia

L. Terenzi

Principles and Guidelines

Principles and Guidelines

- System Engineering:
  - ECSS-E-Series
- Project Management
  - ECSS-M-Series
- PA/QA
  - ECSS-Q-ST-80C (Space System Software Product Assurance)
  - ECSS-Q-series
- AIV & EGSE
  - ECSS-E-Series, in particular
    - ECSS-E-ST-10-02C Verification
    - ECSS-E-ST-10-03C Testing
    - ECSS-E-ST-70C Ground systems

Tools

Design & Architecture

- Enterprise Architect
- Visual Paradigm

Requirements & Project Management

- JIRA (issues and requirements tracker)
- Microsoft Project (time schedule, task management, budget and responsibilities)
- Redmine (issue tracker, wiki, DMS)
- CONFLUENCE (project organization environment)
- XMind (PBS / WBS)
- ECLIPSE (centralised web-based project management environment)
- eNCTS
- Terma CCS & TSC (EGSE and Mission Control Systems)

Software

- SonarQube
- Gitlab, GitHub & SVN (software version control)
- Docker Container
- Kubernates
- Virtual infrastructure environment
- Simulators
- dedicated SW development frameworks

Open Points

Resources standardization and centralization

- Procurement and management of the software licenses concerning PM, SE, AIV, PA/QA (campus, centralized) available for all the INAF community. We think would be useful to plan a procurement (centralized, campus licences, ..)
- Assessment of the licenses acquired from the INAF structures, and a survey to collect new needed tools.

Training

- In the WBS of many projects the roles concerning PM, SE, AIV, PA/QA are often covered by people who don’t have specific education. They just acquired skill during the previous project/mission. Is it enough?
- The continuous training is essential in order to improve our processes.
- INAF provided some training/workshop very appreciated. Is it enough?

Link ‘INAF Engineering Office’- Projects

- It should be discussed how the INAF Eng. Office can practically help projects or groups submitting a proposal.
- A clear path to access and take advantage from the INAF Eng office should be indicated.
- The possibility to create an enlarged SE group including all the possible INAF people already operating in this field should be envisaged.

Thank You


Vito Conforti


Andrea Bulgarelli


Francesco Cuttaia


Fausto Cortecchia


F. Schiavone


Pino Malaguti


Luca Terenzi


Laura Schreiber


Emiliano Diolaiti


Eduardo Medinaceli


Gianluca Morgante


Adriano De Rosa


Natalia Auricchio


Enrico Franceschi


Fabrizio Villa


Matteo Lombini


Nicolò Parmiggiani

Off-line

Publication &
Technical Reports

ASTRI Mini-Array & CTA

- V. Conforti “ASTRI Mini-Array Software Development Plan” - Internal Report
- V. Conforti “ASTRI Mini-Array Software Integration test model” - Internal Report
- A. Bulgarelli “ASTRI Mini-Array Interface Management Plan” - Internal Report
- V. Conforti “ASTRI Mini-Array Software Quality Assurance Plan” - Internal Report
- V. Conforti “The Software Quality Assurance programme of the ASTRI Mini-Array project” - submitted to the ACAT 2022.
- V. Conforti “Release plan of Mini-ACADA version for Array Control and Data Acquisition System”
- V. Conforti “Integration Test Model For Array Control and Data Acquisition System”
- A. Bulgarelli, et al., “The Software Architecture and development approach for the ASTRI Mini-Array gamma-ray air-Cherenkov experiment at the Observatorio del Teide”, SPIE 2022
- A. Bulgarelli, et al, “The Cherenkov Telescope Array Observatory: top level use cases”, SPIE 2016

SE general topics (INAF related)

- V. Belvedere , F. Cuttaia, M. Rossi, L. Stringhetti. Mapping wastes in complex projects for Lean Product Development. International Journal of Project Management 37 (2019) 410– 424. https://doi.org/10.1016/j.ijproman.2019.01.008
- V. Belvedere , F. Cuttaia, L. Stringhetti. Can Lean Systems Engineering enhance the value of astrophysical projects? Human Systems Management, vol. 33, no. 3, pp. 99-111, 2014. https://doi.org/10.3233/HSM-140815
- S. Ricciardi, C. Leardi, L. Stringhetti, Verification Validation and Testing: Passion and Deployment Challenges in the Italian Eco-System. CIISE 2016: 103-111, Proceedings of the 2nd INCOSE Italia Conference on Systems Engineering, Turin, Italy, November 14-16, 2016, Vol. 1728, pp. 103--111

SPHERE+

- Boccaletti A. et al., "Upgrading the high contrast imaging facility SPHERE: science drivers and instrument choices", submitted to SPIE Astronomical Telescopes and Instrumentation 2022
- Gratton R. et al., "MedRes: a new MEDium RESolution integral field spectrograph for SPHERE", submitted to SPIE Astronomical Telescopes and Instrumentation 2022
- Stadler E. et al., "SAXO+, a second-stage adaptive optics for SPHERE on VLT: optical and mechanical design concept", submitted to SPIE Astronomical Telescopes and Instrumentation 2022

Ariel

- Malaguti G. et al., "ARIEL IOSDC Management Plan", Ariel internal document ARIEL-INAF-GS-PL-002
- Malaguti G. et al., "Science data product levels", Ariel internal document ARIEL-INAF-GS-DD-001
- Malaguti G. et al., "ARIEL Consortium Science Implementation Plan - SIP-C", Ariel internal document ARIEL-INAF-GS-PL-004
- Morgante G., "Payload Thermal ICD", Ariel internal document ARIEL-INAF-PL-IF-002
- Morgante G., Terenzi L., "Thermal mathematical model", Ariel internal document ARIEL-INAF-PL-ML-002
- Terenzi L., Morgante G., "Telescope Assembly Thermal ICD", Ariel internal document ARIEL-INAF-PL-ICD-002
- Diolaiti E. et al., "Telescope Assembly Zemax OpticStudio® tools for statistical analysis of optical tolerances", Ariel internal document ARIEL-INAF-PL-TN-015
- Diolaiti E. et al., "Telescope Assembly AIT plan", Ariel internal document ARIEL-INAF-PL-PL-013

Ariel

- Auricchio N., "ARIEL - ICU HW PA, QA & Safety Plan", Ariel internal document ARIEL-INAF-PL-PL-010 (including the compliance matrix), Issue 1.1
- Auricchio N., "ARIEL - ICU Cleanliness and contamination control plan (CCCP)", Ariel internal document ARIEL-INAF-PL-PL-012, Issue 1.0
- Auricchio N., "ARIEL - ICU Qualification Status List (QSL)", Ariel internal document ARIEL-INAF-PL-LI-007, Issue 1.0

Ariel

- Chioetto P. et al., "Qualification of the thermal stabilization, polishing and coating procedures for the aluminum telescope mirrors of the ARIEL mission", Exp. Astr., V. 53, Iss. 2, p. 885 (2022)
- Morgante G. et al., "The thermal architecture of the ESA ARIEL payload at the end of phase B1", Experimental Astronomy volume 53, pages 905–944 (2022)
- Pearson C. et al., "The Ariel ground segment and instrument operations science data centre", Exp. Astr., V. 53, Iss. 2, p. 773 (2022)
- Amiaux J. et al. "AIRS: ARIEL IR Spectrometer status", 43rd COSPAR Scientific Assembly (2021)
- Chioetto P. et al., "Test of protected silver coating on aluminum samples of ARIEL main telescope mirror substrate material", Proceedings of the SPIE, Volume 11852, id. 118524L 8 pp. (2021)
- Tinetti G. et al., "Ariel: Enabling planetary science across light-years", eprint arXiv:2104.04824 (2021)
- Chioetto P. et al., "The primary mirror of the Ariel mission: cryotesting of aluminum mirror samples with protected silver coating", Proceedings of the SPIE, Volume 11451, id. 114511A 9 pp. (2020)
- Naponiello L. et al., "The role of the instrument control unit within the ARIEL Payload and its current design", Proceedings of the SPIE, Volume 11443, id. 114434P 12 pp. (2020)
- Tinetti, G. et al. "Ariel: Enabling planetary science across light-years", Ariel Definition Study Report, 147 pages. Reviewed by ESA Science Advisory Structure in November 2020
- Chioetto P. et al., "The primary mirror of the ARIEL mission: study of thermal, figuring, and finishing treatments and optical characterization of Al 6061 samples mirrors", Proceedings of the SPIE, Volume 11116, id. 111161C 13 pp. (2019)
- Chioetto P. et al., "The primary mirror of the ARIEL mission: testing of a modified stress-release procedure for Al 6061 cryogenic opto-mechanical stability", EPSC-DPS Joint Meeting (2019)
- Da Deppo V. et al. "Study and realization of a prototype of the primary off-axis 1-m diameter aluminium mirror for the ESA ARIEL mission", Proceedings of the SPIE, Volume 11180, id. 111806V 11 pp. (2019)

Ariel

- Middleton K. F. et al., "An integrated payload design for the atmospheric remote-sensing infrared exoplanet large-survey (ARIEL): results from phase A and forward look to phase B1", Proceedings of the SPIE, Volume 11180, id. 1118036 7 pp. (2019)
- Da Deppo V. et al., "The primary mirror of the ARIEL mission: study and development of a prototype", European Planetary Science Congress (2018)
- Da Deppo V. et al, "The optical configuration of the telescope for the ARIEL ESA mission", Proceedings of the SPIE, Volume 10698, id. 106984O 9 pp. (2018)
- Da Deppo V. et al., "A prototype for the primary mirror of the ESA ARIEL mission: design and development of an off-axis 1-m diameter aluminum mirror for infrared space applications", Proceedings of the SPIE, Volume 10706, id. 1070632 11 pp. (2018)
- Focardi M. et al., "A modular design for the ARIEL on-board electronics", European Planetary Science Congress (2018)
- Focardi M. et al., "Design of the instrument and telescope control units integrated subsystem of the ESA-ARIEL payload", Proceedings of the SPIE, Volume 10698, id. 106984P 9 pp. (2018)
- Focardi M. et al., "The ARIEL Instrument Control Unit design. For the M4 Mission Selection Review of the ESA's Cosmic Vision Program", Experimental Astronomy, Volume 46, Issue 1, pp.1-30 (2018)
- Focardi M. et al., "Design of the instrument and telescope control units integrated subsystem of the ESA-ARIEL payload", Proceedings of the SPIE, Volume 10698, id. 106984P 9 pp. (2018)
- Morgante G. et al., "Thermal architecture of the ESA ARIEL payload", Proceedings of the SPIE, Volume 10698, id. 106984H 14 pp. (2018)
- Pascale E. et al., "The ARIEL space mission", Proceedings of the SPIE, Volume 10698, id. 106980H 10 pp. (2018)
- Tinetti G. et al., "A chemical survey of exoplanets with ARIEL", Experimental Astronomy, Volume 46, Issue 1, pp.135-209 (2018)
- Da Deppo V. et al., "An afocal telescope configuration for the ESA ARIEL mission", CEAS Space Journal, Volume 9, Issue 4, pp.379-398 (2017)
- Da Deppo V. et al., "The afocal telescope optical design and tolerance analysis for the ESA ARIEL mission", Proceedings of the SPIE, Volume 10590, id. 105901P 12 pp. (2017)
- Da Deppo V. et al., "An afocal telescope configuration for the ESA Ariel mission", Proceedings of the SPIE, Volume 10562, id. 105624W 9 pp. (2017)

Euclid

1. EUCL-IBO-NOTE-7-003 NI-DPU-ASW QR+AR Organization Note

Design Definition File:

2. EUCL-OPD-OTH-7-002 NI-DPU ASW Requirement Compliance Matrix
3. EUCL-OPD-VCD-7-001 NI-DPU ASW Verification Control Document
4. EUCL-OPD-RS-7-001NI-DPU ASW Requirement Specifications
5. EUCL-OPD-RP-7-003 Data Processing Definition and Justification File

Design Justification File:

6. EUCL-OPD-RP-7-001 NI-DPU ASW Design Definition Document
7. EUCL-OPD-ICD-7-003 NI-DPU ASW ICD, Issue 3.1
8. EUCL-OPD-MA-7-001 NI-DPU ASW User Manual, Issue 2.0
9. EUCL-OPD-CS-7-001_DPU_ASW_ConfigurationControl - Issues
10. EUCL-OPD-PL-7-003 NI-DPU ASW Test Specifications
11. EUCL-IBO-TR-7-003 DPU-ASW Integration Tests Report during NI AVM, EM-TV, and TV1/2/3 campaigns

Management File:

12. EUCL-IBO-LI-7-021 NI-DPU ASW Configuration Item Data List (CIDL)
13. EUCL-OPD-QR-7-002 NI-DPU ASW Risk Register
14. EUCL-OTO-QR-7-001 Risk_assessment_register

Product Assurance File:

15. NI-DPU ASW v1.3.5 – Release Notes
16. EUCL-OPD-PL-7-001 NI-DPU ASW Product Assurance Plan
17. EUCL-OPD-RP-7-015 NI-DPU ASW Product Assurance Management Report (SPAMR)
18. EUCL-OTO-PL-7-001 NI-ICU ASW Product assurance plan
19. EUCL-OTO-RP-7-016 NI-ICU ASW PA milestone management report
20. DPU/ICU ASW & SCOE NCRs
21. Pa reporting
22. NCR staus
23. EUCL-OTO-TN-7-014 NI-ICU ASW v 1.9 Software Problem Reports
24. EUCL-OTO-TN-7-016 NI-ICU ASW v1.10 – Release Notes
25. EUCL-OTO-TN-7-012 NI-ICU ASW Software Problem Reports
26. EUCL-OTO-TN-7-008 NI-ICU ASW v1.9 – Release Notes

Technical Specification:

27. EUCL-OPD-ICD-7-004 NI-DPU ASW to Spacecraft ICD
28. EUCL-OPD-TN-7-010-DPU ASW Handling Error Strategy, Issue 1.3
29. EUCL-OPD-TN-7-007 DPU ASW FDIR

Euclid

Maintenance:

30. EUCL-IBO-PL-7-024 NI-DPU-ASW Maintenance Plan, Issue 1.0
31. EUCL-OTO-PL-7-009 NI-ICU ASW maintenance plan

Technical notes:

32. EUCL-OPD-TN-7-011 SCE/SCA setup for cold and room Temperature operations (~135/~100 K), Issue 1.3
33. EUCL-IBO-RP-7-029 DPU SpW error detection
34. EUCL-IBO-TN-7-016 NISP Broadcast and Single Detector Exposure configuration
35. EUCL-IBO-TR-7-001 Two DPU synchronization test
36 EUCL-IBO-TN-7-018 NISP Flight model SCE-SCA Telemetry Conversion to engineering units

Acceptance Review Documentation:

37. EUCL-IBO-PL-7-023 NI-DPU ASW Acceptance Test Plan

Source Code:

1. EUCL-OPD-LI-7-001_DPU_ASW_FileList, Issue 1.1
2. EUCL-OPD-PL-7-005 DPU ASW Static & Unit Test Report, Issue 2.0
3. DPU-ASW source code V1.3.5
4. ASW UML 2.0 Architecture Model (Enterprise Architect V.13), Issue 2.0

Warm Electronics FMs

38. EUCL-LAM-RP-7-096 Incoming inspection Report of the NI-DPU/DCU PFM
39. EUCL-INFN-PR-7-003 NISP DPU FM01 Mechanical Integration Procedure: AS RUN
40. EUCL-INFN-PR-7-004 DPU FM1 Electrical Integration Test Procedure As RUN
41. EUCL-OBO-LB-7-002 DPU FM 01 Logbook at LAM
42. EUCL-LAM-RP-7-097 Incoming inspection Report of the NI-DPU/DCU FM02
43. EUCL-INFN-PR-7-007 NISP DPU FM02 Mechanical Integration Procedure: AS RUN
44. EUCL-INFN-PR-7-007 DPU FM2 Electrical Integration Test Procedure As RUN
45. EUCL-OBO-LB-7-003 DPU FM 02 Logbook at LAM
46. EUCL-IBO-TR-7-002 Incoming inspection Report of the NI-ICU PFM
47. EUCL-INFN-PR-7-005 NISP ICU PFM Mechanical Integration Procedure: AS RUN
48. EUCL-INFN-PR-7-006 ICU FM Electrical Integration Test Procedure: AS RUN
49. EUCL-OBO-LB-7-001 ICU FM Logbook at LAM

NISP FM

50. EUCL-LAM-LI-7-088 NISP PFM ABCL
51. EUCL-LAM-LI-7-089 NISP PFM NCRs RFDs RFWs List
52. EUCL-LAM-LI-7 NISP PFM Spare Parts List NI-DPU
53. Annex to EUCL-LAM-QR-7-002 FMEA-FDIR cross check
54. EUCL-IBO-MA-7-005 NISP Instrument Flight User Manual Document

Euclid

DPU-ASW documentation currently maintained for NISP

Technical Notes:
1. EUCL-IBO-TN-7-025 DPU-ASW Processing Gain Factor, Issue 1.0
2. EUCL-IBO-TN-7-023 Procedure to configure the NISP Focal Plane for room temperature operations - SCA Zero Bias, Issue 1.0
3. EUCL-IBO-TN-7-017 Reset of SCA bias and clock voltages, Issue 1.2
4. EUCL-IBO-TN-7-029 DPU-ASW error injection analysis, Issue 1.0
5. EUCL-IBO-TN-7-028 NI-DPU-ASW post QAR configuration Control - Issues/SPR, Issue 1.1
6. EUCL-IBO-TN-7-035 DPU-ASW management of the DCU ERROR REG content with possible offline recovery actions, Issue 1.1
7. EUCL-IBO-TN-7-041 NISP Science data products size budget, Issue 1.0
8. EUCL-IBO-TN-7-040 Redefined NISP exposure start time tag, Issue 1.0
9. EUCL-IBO-TN-7-039 NISP Baseline Adjustment, Issue 1.0

Test Reports
10. EUCL-IBO-TR-7-005 NI-DPU-ASW v.1.3.7 Test Plan and Test Report, Issue 1.0
11. EUCL-INFN-PL-7-001 Test plan for integrated WE ASW test, Issue 1.0
12. EUCL-IBO-TN-7-022 SCA Zero Bias Configuration Validation Test, Issue 1.0
13. EUCL-IBO-TN-7-037 NI-DPU-ASW v1.3.8(Flight) Test Plan and Test Report, Issue 1.0
14. EUCL-IBO-TR-7-007 Test Report of NISP dedicated activities during the CLS campaign, Issue 1.0

Product Assurance File:
15. EUCL-IBO-TN-7-026 NI-DPU-ASW v1.3.7 Software Release Note, Issue 1.0
16. EUCL-IBO-TN-7-036 NI-DPU-ASW v1.3.8 (Flight) Software Release Note, Issue 1.0

PAPERS: Proceedings to the SPIE conference

1. On-board data processing for the near infrared spectrograph and photometer (NISP) of the Euclid mission, C. Bonolli et. al, SPIE Proceedings Volume 9904, Space Telescope and Instrumentation 2016, 99045R; doi.org/10.1117/12.2232856
2. Data processing unit's hardware and application software description of the Near Infrared Spectro-Photometer: Euclid mission, E. Medinaceli et. al, SPIE Proceedings Volume 11443, Space Telescope and Instrumentation 2020, 1144359; doi.org/10.1117/12.2561530
3. SPIE2022 Conference Proceedings, E. Medinaceli et al., EUCLID's Near Infrared Spectro-Photometer ready for flight - review of final performances - under preparation

INAF People and Responsibilities

ASTRI Mini-Array & CTA

Vito Conforti responsibilities:

- ASTRI Mini-Array:
  - Software QA Manager
  - Software Engineering team member
  - Software Release Management & Integration test
- CTA - ACADA:
  - Software Release Manager
  - AIV team member
  - CCB team member

ASTRI Mini-Array Software Engineering Activities

- ASTRI Mini-Array software system (MASS):
  - (OAS responsibility): Preparation of documents for a “gara europea” for the ASTRI Mini-Array on-site control software:
    - ASTRI-MA Top Level Software Architecture: **software architecture** and quality requirements
    - ASTRI-MA Top Level Use Cases: workflow of the observatory life cycle
    - ASTRI-MA Data Model
    - Derived documents:
      - ASTRI-MA Software Product Breakdown Structure
      - ASTRI-MA Glossary
  - (A. Bulgarelli) Management of software requirements, architecture
  - (A. Bulgarelli) Co-deputy of MASS
  - (N. Parmiggiani) Management of software reviews
- ASTRI Mini-Array on-site Supervisor Control and Data Acquisition (A. Bulgarelli, N. Parmiggiani, F. Russo, V. Conforti):
  - Management of the on-site software life cycle
  - Preparation of use cases, software requirement, software design document
- (A. Bulgarelli) Software and system interface management responsibilities

Euclid - NISP instrument Project Office @OAS

PA/QA: Natalia Auricchio – NISP Product Assurance Manager (SW/HW) delle unità warm di Near-Infrared SpectroPhotometer (NISP)

Management: Enrico Franceschi – Manager dell'Electrical Ground Support Equipment (EGSE) di NISP

Management: Paola Battaglia – Manager delle operazioni del rivelatore NISP

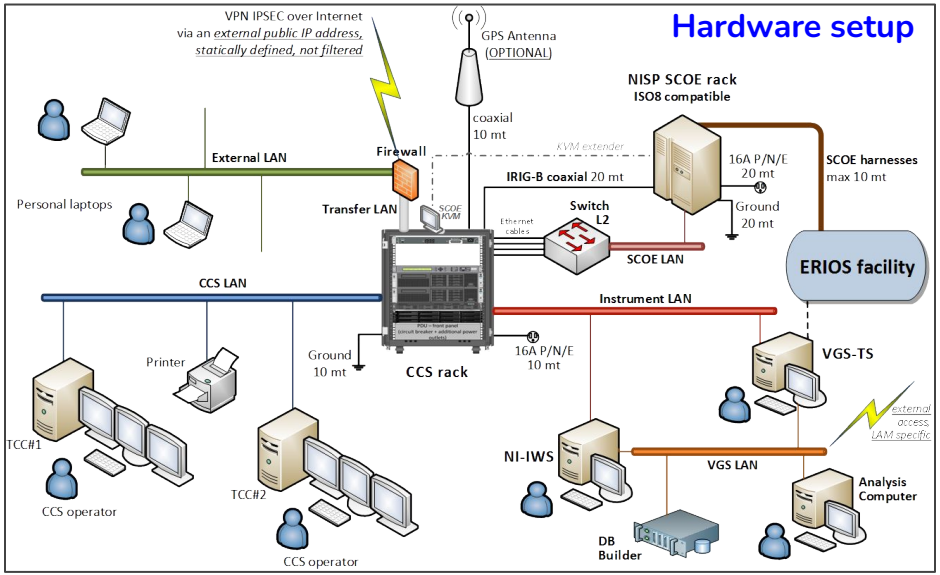
Management: Eduardo Medinaceli – Manager dell'Applicativo Software della Data Processing Unit del rivelatore NISP

Management: Fulvio Gianotti – Manager della Instrument Workstation per la gestione dati di NISP

System Engineering: Gianluca Morgante - Thermal System Engineer, Responsabile del disegno termico di NISP

NISP AIV: il team dell'OAS al completo ha partecipato in tutte le attività di test a livello di sottosistema e sistema

Euclid - NISP FM EGSE setup & development as a **Use Case of the EGSE expertise @OAS**



Software development required about 1400 SVN/GIT commits, related to:

- 220 scripts available for tests, for a total of approximately 16,000 lines of TCL code, also based on
- 13 NISP-dedicated TCL libraries, involving around 700 entry points and more than 31,000 lines of code;
- the NISP MIB (Mission Information Base), including:

- 130 TeleCommands (TCs)	- 220 TeleMetry (TM) packets
- 360 different TC params	- 3000 TM params (400 overs)
- 60 textual decalibs	- 30 synthetic parameters
- 20 numerical decalibs	- 100 textual calibrations
	- 1500 polynomial cal. curves

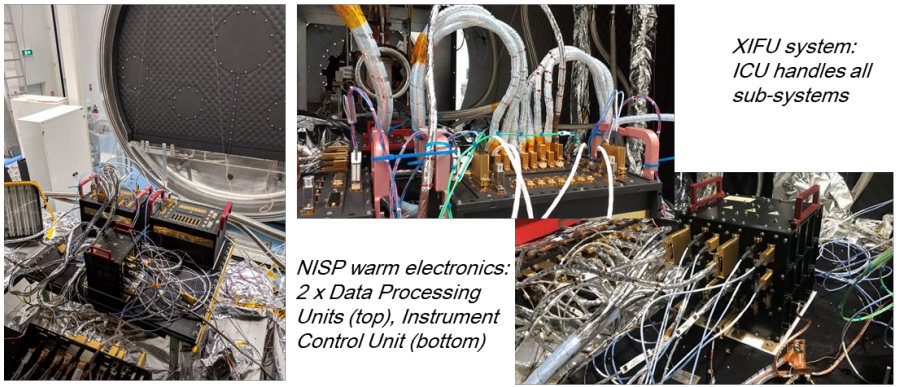
A further step along the technological path started many years ago, that allows OAS to design and develop HW & SW for AIV/AIT & calibration, then provided to: Instrument Development Teams, at Instrument level; to Industry, at Payload/Satellite level; and to ESA/MOC, for in-orbit Commissioning and Contingencies.

Athena – XIFU instrument control unit (ICU) Project Office @ OAS

XIFU - X-ray Integral Field Unit: is an spectrometer in the range 2.5 eV to 7 keV and is one of the two instruments of Athena

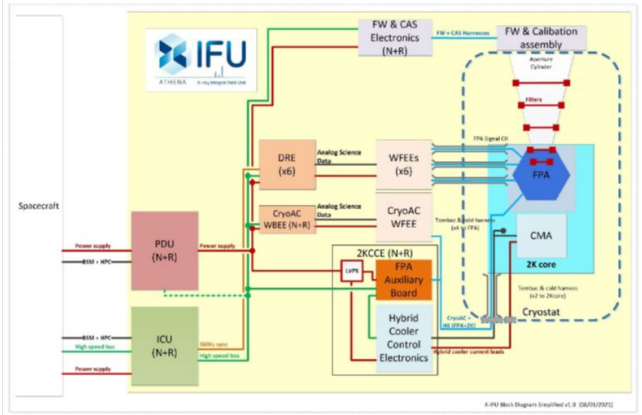
Management: Eduardo Medinaceli – Project Manager della ICU HW (Thales Alenia Space) ed ASW (OATo)

PA/QA: Natalia Auricchio – Product Assurance Manager della ICU SW/HW



NISP warm electronics: 2 x Data Processing Units (top), Instrument Control Unit (bottom)

XIFU system: ICU handles all sub-systems



Optical and infrared instrumentation @OAS

SPHERE+

Upgrade of SPHERE (Spectro-Polarimetric High contrast imager for Exoplanets Research) on ESO's Very Large Telescope (project co-I for INAF: R. Gratton, OA Padova).
SPHERE+ is a pathfinder for the future ELT Planetary Camera and Spectrograph.
It consists of two units

SAXO+: second-stage adaptive optics complement of the existing adaptive optics system
MedRes: infrared medium resolution integral-field spectrograph

OAS involvement

SAXO+: members of System Team, AIV of second-stage module @OAS
MedRes: Project Manager, System Engineer, Thermal System Engineering, System AIV @OAS

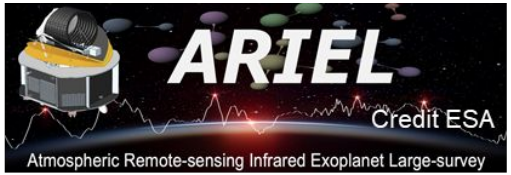
Involved personnel @OAS

F. Cortecchia, A. De Rosa, E. Diolaiti, M. Lombini, G. Malaguti, G. Morgante, F. Schiavone, L. Schreiber, L. Terenzi

SPHERE installed on VLT
Credit: ESO / J. Girard

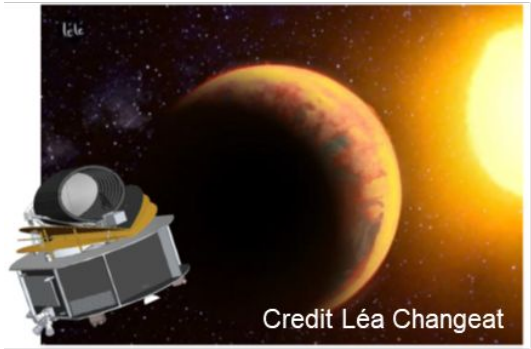
Optical and infrared instrumentation @OAS
Ariel

ESA Cosmic Vision M4 mission to study composition, formation and evolution of exoplanets and their atmospheres



OAS involvement

Ariel Mission CoPI, Systems Team members
Payload Thermal System Lead
Telescope Assembly AIV
PA/QA
Instrument Operations and Science Data Centre (IOSDC)



Involved personnel @OAS

G. Malaguti, N. Auricchio, F. Cortecchia, E. Diolaiti, M. Lombini, G. Morgante, F. Schiavone, L. Schreiber, L. Terenzi

PLAnetary Transits and Oscillations of stars @ OAS

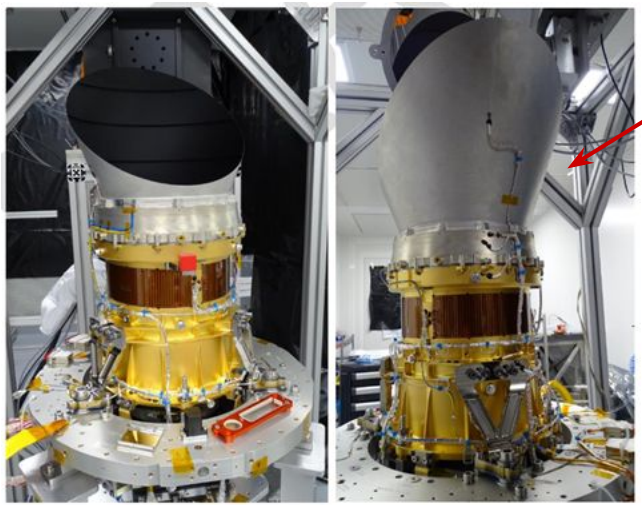
ESA Cosmic Vision M3 mission to find and study a large number of extrasolar planetary systems, with emphasis on the properties of terrestrial planets in the habitable zone around solar-like stars.

OAS involvement

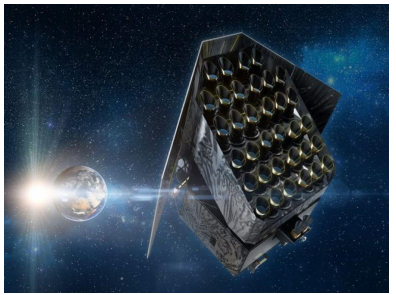
- CAMERA Team
- PA/QA
- HW Configuration and Logistic

Involved personnel @OAS

- N. Auricchio, F. Cogato



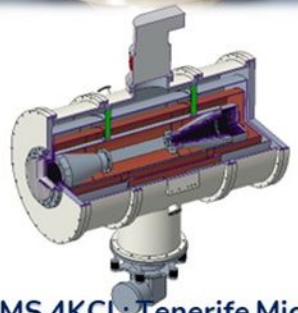
CAMERA EM



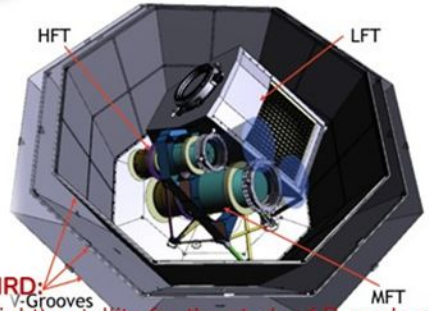
PLATO Spacecraft

OAS involvement in *Radio* & *mm* projects

PROJECT	TASK	ROLE
• Alma Band 2 (2015- 2024) [67 GHz – 116 GHz] ➔ Atacama	Pre-prototype, Prototype, Pre-production Cold receivers: *Design, V&V, SE*	B2 Consortium; INAF, NOVA (NL), GARD (SWE) • PM: Fabrizio Villa • AIV: Francesco Cuttaia • THE: Luca Terenzi
• LSPE Strip (2011-2025) [40 GHz – 100 GHz] ➔ Tenerife (Teide)	Strip instrument *Design, production, V&V, SE*	• SE: Gianluca Morgante • AIV: Francesco Cuttaia • THE: Luca Terenzi • PM (PH2): Fabrizio Villa
• Litebird MHFT (2018-2032) [90-450 GHz] ➔ L2	MHFT Telescope & Thermal chain *Thermal Design, V&V, SE*	• THE-SE: Gianluca Morgante • RF/AIV: Francesco Cuttaia • THE/AIV: Luca Terenzi
• TMS(2018-2023) [10-20 GHz] ➔ Tenerife (Teide)	TMS 4K Calibrator *Design, V&V, PM, SE, production*	• PM & RF-SE: Francesco Cuttaia • THE-SE: Luca Terenzi



TMS 4KCL: Tenerife Microwave Spectrometer



LITEBIRD:
Lite (Light) satellite for the study of B-mode polarization and Inflation from cosmic background Radiation Detection