



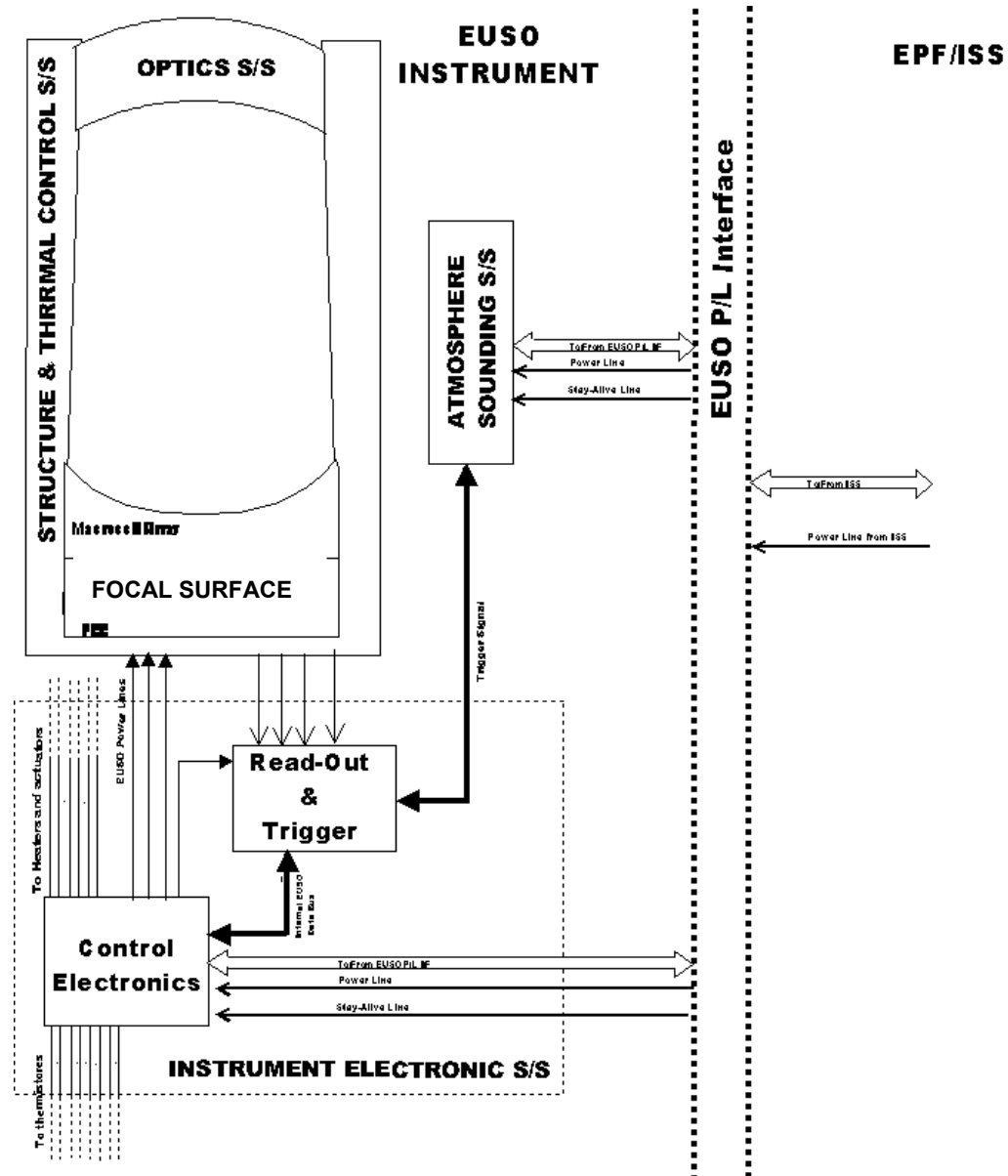
# Alenia

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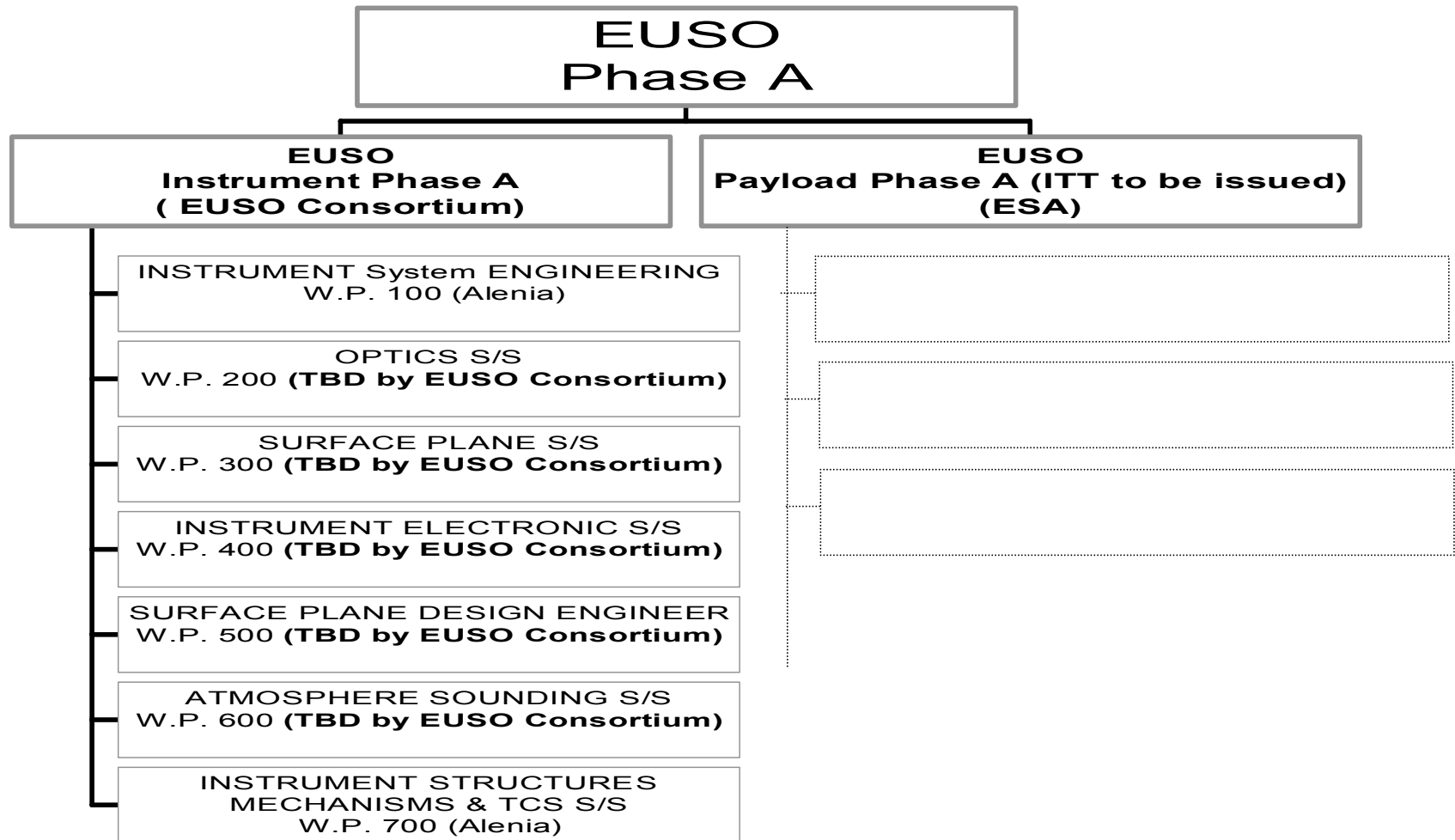
SPAZIO

*EUSO System Overview*

# EUSO: General Functional Block Diagram



# EUSO Instrument Phase A Work Organization



# EUSO Instrument Phase A: Main Goals

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- Consolidation of the IDD (to be performed jointly with the EUSO Payload Phase A)
- Definition of the EUSO Instrument Architecture
- Preliminary Hardware Matrix and Identification of the EUSO Software Architecture
- First Issue of the EUSO Instrument Specification
- First Issue of the:
  - Optics S/S Specification
  - Focal Surface S/S Specification
  - Instrument Electronic S/S Specification
  - Structure, Mechanism & Thermal Control S/S Specification
- Preliminary Environment effect evaluation
- Definition of the Development, qualification and testing approach
- Identification of prototypes to verify the more critical technological issues
- Preliminary Mission Control and Operation scenario
- Preliminary Analysis of Safety & Quality

# Instrument H/W to be developed by ALENIA

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- Main structure
- Structure Supporting the Optics S/S
- Structure Supporting the Focal Surface S/S
- Active protection versus day light (shutter incl. mechanism)
- Light Baffle (if necessary)
- Thermal control HW
- Harness
- Interface devices versus Payload

# Instrument System Engineering - W.P. 100 (ALENIA) 1

The aim of this WP is the production of a synthesis of the results of all the W.P.'s and demonstrate that EUSO Instrument is a feasible space system, suitable for upload, accommodation and operation on the ISS. The main sub-tasks are shown in the following.

## **System Design**

1. definition of the EUSO configuration (launch, operation, re-entry), including the accommodation of all the subsystems; trade-off of alternative solutions (ESA Input);
2. preliminary definition of S/S's interfaces and allocation of resources;
3. preparation of EUSO CAD configuration drawings;

# Instrument System Engineering - W.P. 100 (ALENIA) 2

4. performance of a preliminary analysis showing the compatibility of the proposed system configuration with the mission requirements ;
5. definition of Instrument budgets (mass; power; thermal; data)
6. follow-on and technical co-ordination (supporting P.I.) of all the instrument subsystems activities;
7. definition and planning of the successive phases of the program (support to the P.I.): identification of critical areas and need for dedicated activities; preliminary planning and costing

## **Product Assurance and Safety**

Preliminary identification of the main constraints on the design and development of the Instrument imposed by P.A.

requirements,  
such as:

1. identification of safety hazards;
2. identification of possible criticality in terms of parts, materials, processes;
3. mission reliability aspects;

## **Mission Operations**

Definition of main elements and functionalities, in compliance with the EUSO mission and with the ISS/EPF requirements



# Instrument System Engineering - W.P. 100 (ALENIA) 4

## Environmental Compatibility

Assessment of the potentially most critical aspects of the ISS environment, like

1. Contamination;
2. Atomic oxygen;
3. Micrometeoroids/debris;
4. EMC/EMI/ESD;
5. Dynamics/statics load and temperatures

## AIV/AIT

Preliminary elaboration of an Instrument development plan, including:

1. Model philosophy;
2. Integration flux;
3. Verification approach;
4. Testing.



# Optics S/S - W.P. 200 (TBD by EUSO CONSORTIUM)

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Preliminary identification of the feasible Optics Subsystem design taking into account:

1. technological constraints and special optical material availability (also with the goal to optimize the mass);
2. identification of the more appropriate technology for the U.V. filter;
3. evaluation of the support frame solution and thermal control need;
4. effect of launch and environmental condition (temperature, dynamics load...) on the optical performance.
5. Identification of the integration and testing needs.

# **Focal Surface S/S - W.P. 300 (TBD by EUSO CONSORTIUM)**

Preliminary identification of the best Focal Surface Subsystem design taking into account:

1. Modularity;
2. Performance versus resources constraints (power, mass);
3. Effect of launch and environmental condition (temperature, dynamics load, straylight...) on the detection performance.
4. Identification of the integration and testing needs.

This W.P. is supported by the W.P. 600

# **Instrument Electronics - W.P. 400 (TBD by EUSO CONSORTIUM)**

1. support to the P.I. and the Scientific Team for the definition of the Instrument Electronics Specification
2. Study and trade-off for power conversion and distribution;
3. Preliminary definition of requirements for the control electronics;
4. Preliminary definition of the budgets for the Instrument Electronics
5. Preliminary definition of the Instrument Electronic development plans
6. Identification of critical items
7. Preliminary estimate of time and cost for the development of the Instrument Electronics S/S

# **Focal Surface design Engineering - W.P. 500** (TBD by EUSO

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CONSORTIUM)

1. support the Consortium for the definition of the Focal Surface spec.
2. definition of Focal Surface architecture
3. Preliminary definition and trade-off of the Macrocells including:
  - follow-on of Riken activities for the study of detectors (MAPMTs);
  - follow-on of the trade-off study on light concentrators
4. Architectural study & support of the Focal Surface Electronics; in particular:
  - analog electronics & ASIC front end feasibility study,
  - architectural design and preliminary study for the accommodation
  - preliminary design of the trigger logic (trade-off)
5. Preliminary definition of the Focal Surface S/S development plans
6. Identification of critical items
7. Preliminary estimate of time and cost for the Focal Surface development



# **Atmosphere Sounding S/S - W.P. 600** (TBD by EUSO CONSORTIUM)

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Preliminary identification of the Atmosphere Sounding design taking into account:

1. position on the ISS and F.o.V;
2. performance versus resources constraints (power, mass);
3. Safety requirements in the utilization of laser source on ISS
4. Effect of launch and environmental condition (temperature, dynamics load, straylight...) on the performance.

# **Instrument Structures Mechanism & TCS S/S - W.P. 700 (ALENIA)**

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Preliminary definition of:

- Instrument primary structure, including the interfaces with the P/L and the interfaces with the secondary structures/the Instrument equipment; development of a simplified mathematical model.
- Instrument secondary structures (lenses mounting; shutter; baffle; atmospheric sounding instrument)
- Shutter mechanism (trade-off)
- Instrument thermal control, including in particular the focal surface; development of a simplified mathematical model; assessment of thermo-elastic aspects