ISTITUTO NAZIONALE DI ASTROFISICA
NATIONAL INSTITUTE FOR ASTROPHYSICS
OSSERVATORIO ASTRONOMICO DI TORINO

RAPPORTO TECNICO - TECHNICAL REPORT

METIS INSTRUMENT PROPOSAL
for the Solar Orbiter Mission
Part 6: Instrument Financial Plan

Ester Antonucci (P.I.), S. Fineschi, G. Naletto, M. Romoli, D. Spadaro, S. Solanski, P. Lami and the Co-I's Team

Rapporto nr. 98 14/01/2008

METIS INSTCUMENT PCOPOSAL
for the
Solar Orbiter Mission

Part VI
Instrument Financial Plan

Principal Investigator:

Ester Antonucci (1)

Co-Proposers:

S. Fineschi (1), G. Naletto (2), M. Comoli (3), D. Spadaro (4),
S. Solanki (5), P. Lamy (6), and the Co-I's Team

(1) INAF – Astronomical Observatory of Turin, Torino, Italy
(2) University of Padua, Padova, Italy
(3) University of Florence, Firenze, Italy
(4) INAF - Astrophysical Observatory of Catania, Italy
(5) Max-Plank-Institute fuer Sonnensystemforschung, Germany
(6) Laboratoire d'Astrophysique de Marseille, France,

Leading Funding Agency:

ASI – Agenzia Spaziale Italiana
(Cef. S. Di Pippo – (simonetta.dipippo@asi.it) - Viale Liegi 26 – 00198 Coma Italy
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In cooperation with:

CNES – Centre National d'Etudies Spatiale
DLC – Detuches Zentrum fuer Luft und Caumfahrt

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Prof. Sergio De Julio	INAF Viale del Parco Mellini n.84 00136 Roma

(*) Hardcopy version only

Change Log

date	issue	revision	pages	reason for change
15/01/2008	01	0	all	First Issue

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1 Introduction

This document provides the financial justification to the METIS investigation in terms of estimated resources, manpower, hardware and tech development.

The METIS investigation is proposed by an International Consortium under the responsibility of the Principal Investigator, Ester Antonucci, INAF-Osservatorio Astronomico di Torino. Experiment Manager of the METIS project is Giampiero Naletto, University of Padua and the METIS Investigation Scientist is Silvano Fineschi, INAF-Osservatorio Astronomico di Torino. The METIS elements are in turn under the leadership of the following Co-PIs: Marco Romoli, University of Florence (COR), Daniele Spadaro, INAF- Osservatorio Astrofisico di Catania (EUS) and Dan Moses, Naval Research Laboratory, US (SOCS).
The METIS proposal is endorsed by the Italian Space Agency (ASI) as Leading Funding Agency.

The consortium is formed the following Italian institutions: Istituto Nazionale di Astrofisica (INAF), the Universities of Florence, Padua, Pavia, Catania, the Consiglio Nazionale delle Ricerche – Istituto di Fisica della Materia (CNR-INFM), the Politecnico of Torino, and the following foreign institutions: Naval Research Laboratory (NRL), US, Max-Planck-Institut für Sonnensystemforschung (MPS), Lindau, Germany, Laboratoire d'Astrophysique de Marseille (LAM), France, the Institute d'Astrophysique Spatiale (IAS), France, University of Athens, Greece, Royal Observatory of Belgium, Bruxelles, Belgium and Mullard Space Science Laboratory, UK. In terms of hardware contributions, NRL intends to provide the SOCS optical bench and sensors MCP, and is submitting to NASA a proposal in response to the NASA Focused Opportunity for Solar Orbiter, FOSO (deadline 31 January 2008), MPS intends to provide the two detectors of the COR element, LAM intends to provide the mirrors and mountings for COR.

2 Project Funding

As stated by ASI, METIS leading funding agency, the investigation cost details will not herein be provided. These will be part of a later issue of this document after the instrument selection and consequence of a direct contact between ESA and the Leading Funding Agency.

The overall manpower estimation is reported in table1.
The FTE manpower effort is expressed in man-year.

Country	Phase 1	Phase 2	Phase 3	Phase 4	Tot
Belgium:	1.0	0.5	0.5	0.0	2.0
France	16.0	5.0	5.0	0.5	26.5
Germany	3.0	2.0	2.5	0.5	8.0
Greece	1.0	0.0	2.0	0.0	3.0
Spain	0.0	0.0	1.0	0.0	1.0
UK	0.7	0.3	0.3	0.0	1.3
Europe (*)	**21.7**	**7.8**	**11.3**	**1.0**	**41.8**
Italy	**113.0**	**54.5**	**72.5**	**8.5**	**248.5**
Totals (**):	**134.7**	**62.3**	**83.8**	**9.5**	**290.3**

(*) Excluded Italy
(**) SOCS not included

Table 1: Manpower (FTE man-year) allocated by the team consortium to the METIS investigation

For reference in Figure 1 and Figure 2 are shown the METIS HW tree and a preliminary WBS respectively.

2.1 Partner contributions

NRL will submit at end of January their proposal to NASA in order to contribute to METIS with the SOCS sensor.
Max-Plank-Institute Lindau will provide the COR detectors.
LAM will provide COR mirrors blank and mounts.
Further hardware contributions (e.g. from the Greece Space Office) have not yet been finalized.

2.2 Overall Cost

The overall ROM funding requirements estimation of METIS, inclusive of Manpower, Hardware, Tech Dev, is about 67M€, based on a cost estimation made by Thales Alenia Space, Galileo Avionica and the contributing partners.
The detailed cost plan will be part of direct contact between ESA and the Leading Funding Agency.

2.3 Technology development

A preliminary estimation for the activities related to technology development within the METIS project is shown in Table 2

Table 2

Technology	Dev. Cost
Multilayers	250k€
Liquid Crystal Variable Retarder	350k€
Detectors	450k€

The backup technologies do not require a space development or qualification program.

Funding Agencies
ASI is the leading funding agency of METIS. Annex 1 includes:

- the Letter of Commitment of ASI
- Letters of Endorsement to ASI from DLR and CNES
- Letter of Endorsement for CO-I participation from BELSPO and MSSL.
- Letter of Information by part of NASA – Science Mission Directorate- that a notice of intent to submit a proposal in response to NASA solicitation NNH07ZDA003O (SMEX Amendment 1: Focused Opportunity for Solar Orbiter) by the US Naval Research Laboratory concerning the Solar Orbiter Coronal spectroscopy Sensor SOCS, PI Dr. J. Daniel Moses.

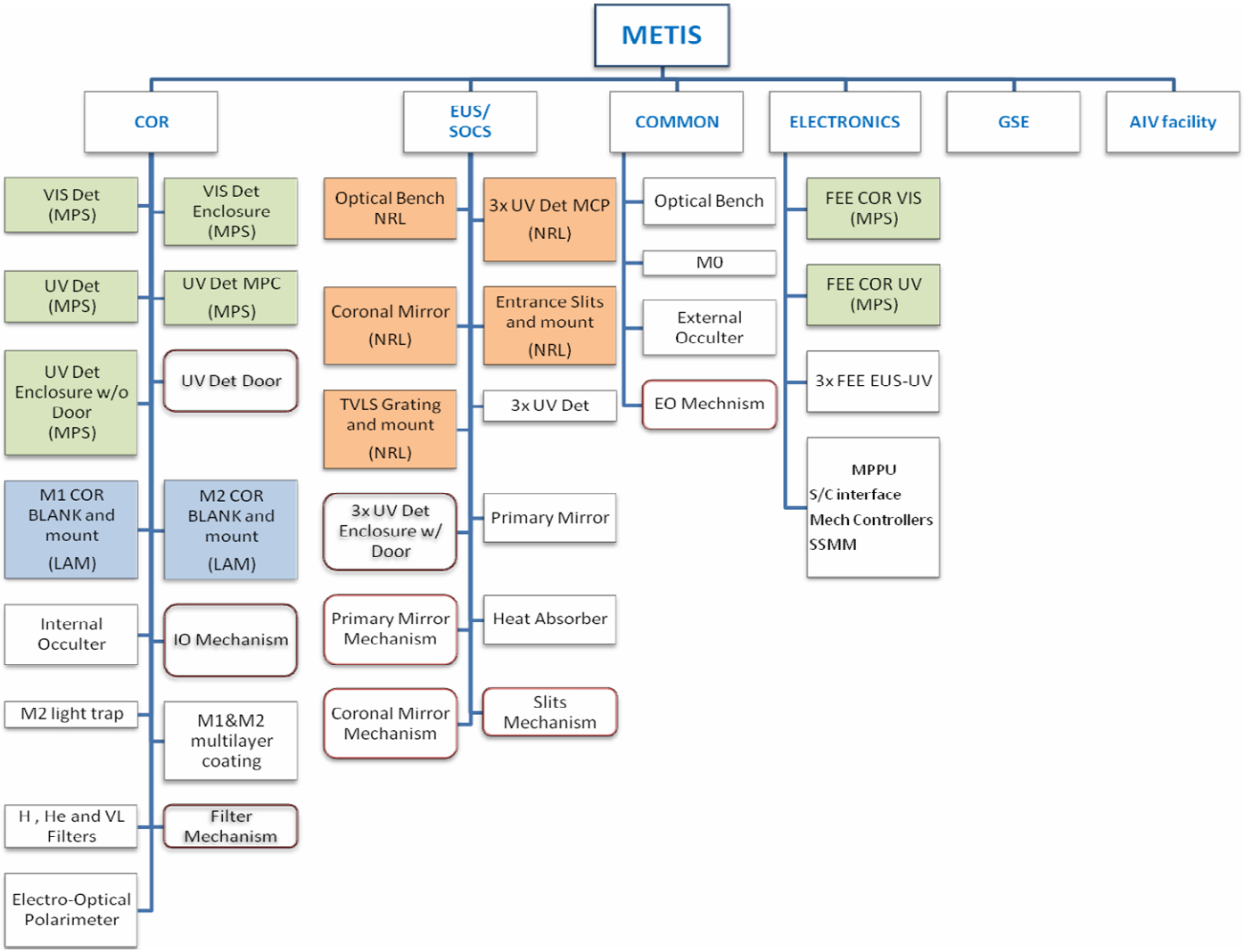

Figure 1: METIS HW Tree

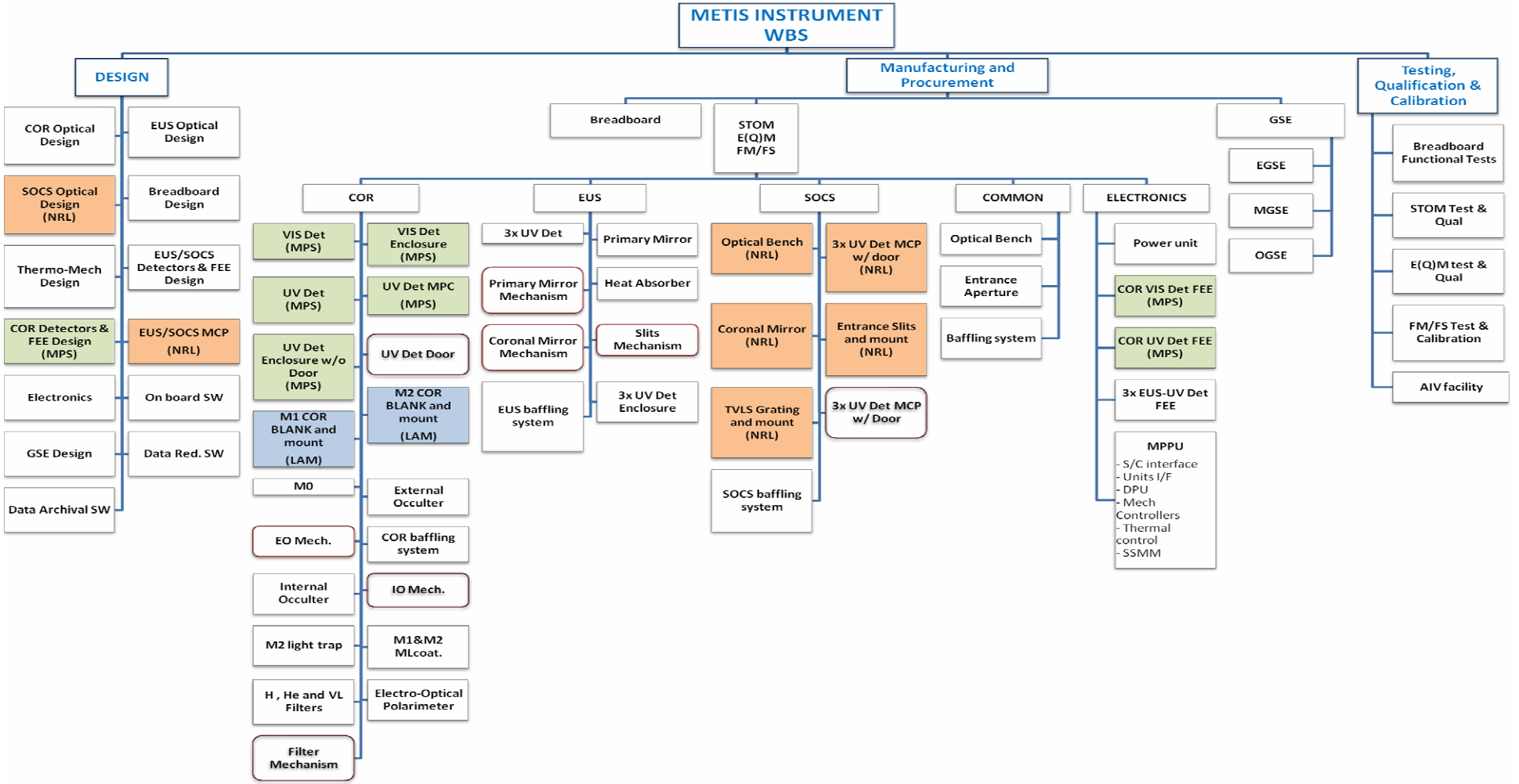

Figure 2: METIS WBS

3 Acronyms

ADC	Analog to Digital Converter
AFT	Abbreviated Functional Test
AIT	Assembly, Integration and Test
AOCS	Attitude and Orbit Control System
APS	Active Pixel Sensor
BB	Breadboard
BBM	Bread-Board Model
BELSPO	Belgian Space Policy
CCD	Charge Couple Device
CFRP	Carbon Fiber Reinforced Plastic
CME	Coronal Mass Ejections
CNR	Consiglio Nazionale delle Ricerche
CNRS	Centre National de la Recherche Scientifique
CoI	Co-Investigator
CoM	Center of Mass
CoPI	Co-Principal Investigator
COR	METIS Visible and EUV Coronagraphic imager
CTE	Coefficient of Thermal Expansion
DMS	Data Management System
ECSS	European Cooperation for Space Standardization
EEO	Extended External Occulter
EEOM	EEO Mechanism
EM	Electrical Model
EM	Experiment Manager
EO	External occulter
EOM	External occulter Mechanism
EQM	Electrical Qualification Model
ESA	European Space Agency
EUI	EUV Imager
EUS	METIS EUV disk Spectrometer
EUV	Extreme UltraViolet
EUVC	EUV Channel
FEE	Front End Electronics
FEM	Filter Exchange Mechanism
FFT	Full Functional Test
FM	Flight Model
FOV	Field Of View
FS	Flight Spare
FWHM	Full Width at Half Maximum
GSE	Ground Support Equipment
H/W	Hardware
HeF	Aluminum low-pass filter of the coronagraph
HELEX	Heliophysical Explorers
HERSCHEL	Helium Resonance Scattering in the Corona and Heliosphere
HF	Narrow-band multilayer filter of the coronagraph

HGA	High Gain Antenna
HVPS	High Voltage Power Supply
HWRP	Half Wave Retarder Plate
IAC	Instituto de Astrofísica de Canarias
IAPS	Itensified APS
IAS	Institut d'Astrophysique Spatiale
IASF	Istituto di Astrofisica Spaziale e Fisica cosmica
IDP	Instrument Development Plan
IFE	Instrument Front End
IFSI	Istituto di Fisica dello Spazio Interplanetario
ILS	Instrument Line of Sight
INAF	Istituto Nazionale di AstroFisica
INFM	Istituto Nazionale Fisica della Materia
IO	Internal Occulter
IOM	Internal Occulter Mechanism
IR	Infrared
LAM	Laboratoire d'Astrophysique de Marseille
LCL	Latching Current Limiters
LCVR	Liquid Crystal Variable Retarder
M0	Sun-disk rejection mirror of the coronagraph
M1	Primary mirror of the coronagraph
M2	Secondary mirror of the coronagraph
MCP	Micro Channel Plate
METIS	Multi Element Telescope for Imaging and Spectroscopy
MGSE	Mechanical Ground Support Equipment
ML	Multilayer
MOC	Mission Operation Center
MoI	Moment of Inertia
MPPU	METIS Processing & Power Unit
MPS	Max-Planck-Institut fuer Sonnensystemforschung
MSSL	Mullard Space Science Laboratory
N/A	Not Applicable
NASA	National Areonautics and Space Administration
NOM	Nominal Observing Mode
NRL	Naval Research Laboratory
OAA	Osservatorio Astronomico di Arcetri
OACN	Osservatorio Astronomico di Capodimonte Napoli
OACt	Osservatorio Astronomico di Catania
OAPa	Osservatorio Astronomico di Palermo
OAR	Osservatorio Astronomico di Roma
OATo	Osservatorio Astronomico di Torino
OATs	Osservatorio Astronomico di Trieste
OGSE	Optical Ground Support Equipment
OP	Off Pointing
PA	Product Assurance
PI	Principal Investigator
PoliTo	Politecnico di Torino
QE	Quantum Efficiency

RD-n	Reference Document n
S/C	Spacecraft
S/W	Software
SC	Sun Center
SCORE	Sounding-rocket Coronagraphic Experiment
SEP	Solar Energetic Particles
SMM	Structural Mathematical Model
SO	Solar Orbiter
SOCS	METIS Solar Orbiter Coronal Spectrometer
SOHO	Solar and Heliospheric Observatory
STOM	Structural Thermal Optical Model
TBC	To Be Confirmed
TBD	To Be Defined
TBW	To Be Written
TEC	Thermo Electric Coooler
TM	Telemetry
TSOM	Time Share Observing Mode
TVLS	Toroidal Variable Line Space
UFOV	Unobstructed Field Of View
UniAq	Università di Aquila
UniCal	Università della Calabria
UniFi	Università di Firenze
UniPD	Università di Padova
UniPd	Università di Padova
UniPg	Università di Perugia
UniPv	Università di Pavia
UniRm	Università di Roma
UORF	Unit Optical Reference Frame
URF	Unit Reference Frame
UV	Ultraviolet
UVC	UV channel
UVD	Ultraviolet Detector
VD	Visible Detector
VIM	Visible Imager & Magnetograph
VLC	Visible Light Channel
VUV	Vacuum ultraviolet

ANNEX – 1 : Letters from the funding Agencies

LOC-ASI-Metis.pdf

DLR_METIS_COR LoE-1.pdf

CNES_SOLAR_ORBITER_METIS.pdf

LoE_BELSPO-ASI_EUS.pdf

MSCL_METIS.pdf

NASA_SOCS_NOI.pdf

agenzia spaziale
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75738 Paris Cedex 15
France

SUBJECT: ASI endorsement to the participation of the METIS experiment on the Solar Orbiter Mission in response to ESA Announcement of Opportunity for the Solar Orbiter Payload (Ref.: D/SCI/DJS/SV/val/23487and D/SCI – 23482)

The Italian Space Agency hereby endorses the proposed participation by the Multi-Element Telescope for Imaging and Spectroscopy (METIS) experiment for the ESA Solar Orbiter mission. The METIS investigation Team is lead by the P.I. Prof. Ester Antonucci of Osservatorio Astronomico di Torino – INAF.

Should the METIS experiment be selected, ASI will manage all the industrial and scientific contracts in Italy as well the agreements, based on non exchange of funds, with the hardware contributors belonging to the other National Funding Agencies or Institutions. The project will include a contribution by Co-Principal Investigators and Co-Investigators from Naval Researh Laboratory-NRL, USA, Max-Plank-Institute fur Sonnensystemforshung, Deutschland and Centre National d'Etudes Spatiales- CNES. Therefore, NASA, DLR and CNES are expected to guarantee the funding of the respective Co-PI contributions by formal interagency agreements with ASI as the Lead Funding Agency.

The letters of endorsement for the hardware contribution from the NRL and MPI are in annex to this letter.

In case of selection of the METIS instrument ASI will make its best effort to support the full development and the exploitation of this experiment, in coordination with the other National Funding Agencies who will contribute to the realization of the experiment.

The level of this support will be subjected to the availability of funds within the global Italian budget allocation for the Solar Orbiter mission payload.

Dr. Simonetta Di Pippo
Director, Observation of the Universe
Italian Space Agency

Cc. M. Coradini ESA/HQ (D/SCI), **R. Marsden** ESA/ESTEC (SCI-SM), **Ph. Kletzkine** ESA/ESTEC (SCI-PS), **E. Antonucci** (INAF OAT), **E. Flamini** (ASI- UOU)

Presidenza, Direzione Generale
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Space Agency / Space Science

Deutsches Zentrum
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Postfach 30 03 64, 53183 Bonn, Germany

Prof. Ester Antonucci

INAF-Osservatorio Astronomico di Torino,
Strada Osservatorio 20,
10025 Pino Torinese,
Italy

Fax: 0039 011 8101930
1 page

Your reference
Your letter
Our reference

Your correspondent Dr. Wolfgang Frings

Telephone +49 228 357
Telefax +49 228 745
E-mail

December 20, 2007

ESA ANNOUNCEMENT OF OPPORTUNITY FOR SOLAR ORBITER PAYLOAD

Letter of endorsement for the participation of Prof. S. K. Solanki and Dr. L. Teriaca in the Solar Orbiter proposal METIS (which includes COR and EUS).

Dear Prof. Antonucci,

Prof. S. K. Solanki and Dr. L. Teriaca, *Max-Planck-Institut für Sonnensystemforschung, Katlenburg-Lindau*, intend to participate in the proposal "METIS: Spectro-Coronograph and EUV disk-spectrometer" for Solar Orbiter to be submitted by you as the Principal Investigator.

They intend to develop the detector units (without covers) for the COR segment of the METIS instrument.

We welcome and endorse their participation in this proposal.

It is understood that this endorsement is subject to the relevant DLR funding procedures.

Therefore, at present time this endorsement does not constitute any obligation to provide financial support.

Sincerely

i. V. Dr. W. Klinkmann

i. A. Dr. W. Frings

Bonn-Oberkassel
Königswinterer Str. 522-524
53227 Bonn, Germany
Telephone +49 228 447-0
Internet www.DLR.de

CENTRE NATIONAL D'ÉTUDES SPATIALES

Directorate for Strategy, Programmes and International Relations

Prof. Dr. Ester ANTONUCCI
Astronomical Observatory of Turin
STRADA OSSERVATORIO 20
10025 PINO TORINESE
antonucci@oato.inaf.it

Paris, January 8, 2008
CNES/DSP/EU-2008/0171

Dear Dr Antonucci,

The present letter is to confirm that the Centre National d' Etudes Spatiales (CNES) is aware that you are currently coordinating a proposal concerning a Multi Element Telescope for Imaging and Spectroscopy (METIS) instrument for the Solar Orbiter mission.

CNES is also aware that the Laboratoire d'Astrophysique de Marseille (LAM) is participating to this proposal with specific commitments regarding the procurement of hardware sub-systems and that Philippe Lamy from this institute is involved as Co Investigator.

CNES is committed to support the participation of French scientists for the Solar Orbiter Definition Phase in accordance to the above mentioned proposal.

Once the instrument consortia are selected by ESA (by fall 2008), CNES will assess the level of resources that would be required for a full support of the French contribution to Solar Orbiter.

Should priorities be necessary, after consulting its advisory committee (CPS), CNES will enter a discussion phase with ESA and the concerned partners in order to seek a share of contributions within this consortium that is compatible with our expected level of resources and then settle the required frame of Inter Agency agreements.

Best regards,

F. Casoli

Fabienne CASOLI
Head, Space Science and Exploration Office

Copies :

Marcello Coradini	ESA/HQ
Philippe Kletzkine, Richard Marsden	ESTEC
Philippe Lamy	LAM

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Dr. Simonetta Di Pippo
Agenzia Spaziale Italiana
Viale Liegi 26
00198 Roma
Italy

your reference	our reference		enclosure(s)
	\S\scienc\solar orbiter\LoE_BELSPO-ASI_EUS.doc		
contact	**e-mail**	**telephone**	**date**
Werner VERSCHUEREN	verw@belspo.be	+32.2.23.83.589	10/1/2008

Subject : **SOLAR ORBITER AO – EUS** Instrument - **Letter of Endorsement**

Dear Dr. Di Pippo,

In response to the Announcement of Opportunity for the payload of the SOLAR ORBITER mission, a proposal for the Extreme Ultraviolet Spectrograph (EUS) instrument is submitted by Dr. Ester Antonucci as PI (INAF, Italy).

The Belgian Science Policy Office (BELSPO) hereby endorses the participation of Dr. Susanna Parenti (Royal Observatory of Belgium) to this proposal. We understand that this participation will be in the form of science support activities.

The provision of funding (via the PRODEX Programme) for the Belgian participation to the EUS instrument is subject to definitive selection of the proposal by ESA and subject to the availability of the necessary funds at Belgian level within the relevant years.

Yours Sincerely,

Dr. Werner Verschueren
Belgian ESA Delegation – Space Sciences and Exploration

.be

DEPARTMENT OF SPACE & CLIMATE PHYSICS

UCL

Ester Antonucci
INAF-Astronomical Observatory of Turin, Torino, Italy

10 January 2008

Dear Dr. Antonucci,

The *UCL Mullard Space Science Laboratory* is aware of your Solar Orbiter METIS proposal for a combined imaging coronagraph and ultraviolet spectrometer, to be submitted by Dr. E. Antonucci (Principal Investigator), and is fully supportive of the role of Dr. Giulio Del Zanna (Co-Investigator) in this effort.

If METIS is selected for Solar Orbiter, the *UCL Mullard Space Science Laboratory* commits approximately *0.1* Full Time Equivalent (FTE) per year of Dr. Del Zanna's time for he instrument development, science operation and scientific analysis phases of METIS, which is in part subject to the availability of funds from the UK Science and Technology Facilities Council (STFC). Dr. Del Zanna currently holds a STFC advanced fellowship which covers his research activities until 2012.

Sincerely,

Prof. A. Smith

UCL Space & Climate Physics
University College London, Holmbury St.. Mary, Dorking RH5 6NT
Tel: +44 (0)1483 204100 Fax: +44 (0)1483 278312
www.mssl.ucl.ac.uk

Notice of Intent
to Submit a Proposal

NASA Notice of Intent Number

N7-SMEXFOSO07-0012

PROPRIETARY INFORMATION

This Notice of Intent may contain proprietary information, and shall only be used in a manner consistent with NASA policies. A copy of this notice shall be applied to any reproduction of this Notice of Intent.

SECTION I - NOI Information

Principal Investigator	E-mail Address	Phone Number
John Moses	**dan.moses@nrl.navy.mil**	**202-404-8108**

Street Address (1)	Street Address (2)
4555 Overlook Ave SW	**Code 7661**

City	State / Province	Postal Code	Country Code
Washington	**DC**	**20375-0001**	**US**

NOI Title : **Investigation of Solar Wind Energetics and the Origins and Acceleration of Solar Energetic Particles**

Proposed Start Date	Proposed End Date	Total Budget
06 / 30 / 2008	**07 / 31 / 2020**	**No budget required**

SECTION II - Application Information

NASA Program Announcement Number	NASA Program Announcement Title
NNH07ZDA003O	**Small Explorer (SMEX) and Missions of Opportunity**

For Consideration By NASA Organization *(the soliciting organization, or the organization to which an unsolicited proposal is submitted)*

NASA , Headquarters , Science Mission Directorate , Cross Division

Date Submitted	Submission Method	Grants.gov Application Identifier	Applicant Proposal Identifier
11 / 16 / 2007	**Electronic Submission Only**		

Type of Application	Predecessor Award Number	Other Federal Agencies to Which Proposal Has Been Submitted
New		

International Participation	Type of International Participation
Yes	**Other**

SECTION III - Submitting Organization Information

DUNS Number	CAGE Code	Employer Identification Number (EIN or TIN)	Organization Type
020060658	**3NBG8**	**530197019**	**2A**

Organization Name (Legal Name)	Company Division
NAVAL RESEARCH LAB	

Organization DBA Name	Division Number

Street Address (1)	Street Address (2)
4555 OVERLOOK AVE SW	

City	State / Province	Postal Code	Country Code
WASHINGTON	**DC**	**203750001**	**USA**

SECTION IV - Project Point of Contact Information

Name	Email Address	Phone Number
John Moses	**dan.moses@nrl.navy.mil**	**202-404-8108**

SECTION V - Authorization

A Notice of Intent (NOI) to Propose, and the information contained therein, is not binding on the submitter, and the signature of an Authorized Organization Representative is not required. Although an NOI is not binding, it should be as accurate and complete as possible, and submitted by its due date.

PI Name : **John Moses**	**NASA Notice of Intent Number**
Organization Name : **NAVAL RESEARCH LAB**	**N7-SMEXFOSO07-0012**
	NASA Notice of Intent Number

NOI Title : **Investigation of Solar Wind Energetics and the Origins and Acceleration of Solar Energetic Particles**

SECTION VI - Team Members

Team Member Name	E-mail Address	Phone Number
John Moses	**dan.moses@nrl.navy.mil**	**202-404-8108**
Organization Name	Team Member Role	International Participation
Naval Research Laboratory	**PI**	**No**
U.S. Government Agency Participation	U.S. Government Agency	Total Funds Requested
No		**0.00**

Team Member Name	E-mail Address	Phone Number
Dennis Socker	**dennis.socker@nrl.navy.mil**	**202-767-2093**
Organization Name	Team Member Role	International Participation
Naval Research Laboratory	**Co-I**	**No**
U.S. Government Agency Participation	U.S. Government Agency	Total Funds Requested
Yes	**Department of the Navy**	**1.00**

Team Member Name	E-mail Address	Phone Number
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Organization Name	Team Member Role	International Participation
Naval Research Laboratory	**Co-I**	**No**
U.S. Government Agency Participation	U.S. Government Agency	Total Funds Requested
Yes	**Department of the Navy**	**1.00**

Team Member Name	E-mail Address	Phone Number
George Doschek	**gdoschek@ssd5.nrl.navy.mil**	**202-767-3527**
Organization Name	Team Member Role	International Participation
Code 7670, Naval Research Laboratory	**Co-I**	**No**
U.S. Government Agency Participation	U.S. Government Agency	Total Funds Requested
Yes	**Department of the Navy**	**1.00**

Team Member Name	E-mail Address	Phone Number
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Organization Name	Team Member Role	International Participation
Naval Research Laboratory	**Co-I**	**No**
U.S. Government Agency Participation	U.S. Government Agency	Total Funds Requested
Yes	**Department of the Navy**	**1.00**

Team Member Name	E-mail Address	Phone Number
Allan Tylka	**allan.tylka@nrl.navy.mil**	**202-767-2200**
Organization Name	Team Member Role	International Participation
US Naval Research Laboratory	**Co-I**	**No**
U.S. Government Agency Participation	U.S. Government Agency	Total Funds Requested
Yes	**Department of the Navy**	**1.00**

Team Member Name	E-mail Address	Phone Number
Clarence Korendyke	**ckorendyke@ssd5.nrl.navy.mil**	**202-767-3144**
Organization Name	Team Member Role	International Participation
Naval Research Laboratory	**Co-I**	**No**
U.S. Government Agency Participation	U.S. Government Agency	Total Funds Requested
Yes	**Department of the Navy**	**1.00**

PI Name : **John Moses**

Organization Name : **NAVAL RESEARCH LAB**

NASA Notice of Intent Number

N7-SMEXFOSO07-0012

NASA Notice of Intent Number

NOI Title : **Investigation of Solar Wind Energetics and the Origins and Acceleration of Solar Energetic Particles**

SECTION VII - Project Summary

The coronal processes determining solar wind energetics and the generation of solar energetic particles (SEPs) are predominantly non-thermal. Spectroscopy of UV and EUV radiation either emitted or scattered by ions in the corona can measure the generation and evolution of non-thermal populations in the critical coronal region linking the Sun to the inner heliosphere. The proposed HELEX mission Solar Orbiter Coronal Spectrometer (SOCS) sensor will obtain the breakthrough first measurements of these processes that can be directly traced to inner Heliospheric phenomena observed in situ by complementary components of the HELEX mission.

The SOCS observations uniquely enable an investigation of the sources, acceleration, and transport of Solar Energetic Particles (SEPs). The SOCS sensor will detect the generation of suprathermal particle populations above the threshold necessary for efficient acceleration by shocks associated with high speed coronal mass ejections (CMEs). SOCS will observe the evolution of the non-thermal characteristics of the coronal plasma as CME shocks traverse the corona and inner heliosphere. This investigation will demonstrate the site of SEP acceleration can be identified and parameters determining the magnitude and the energy distribution of an SEP event can be measured in pre- and post-shock coronal plasmas - thus fulfilling the NASA HELEX mission and providing information about the solar sources of space weather that affect our home planet.

PI Name : **John Moses**	**NASA Notice of Intent Number**
Organization Name : **NAVAL RESEARCH LAB**	**N7-SMEXFOSO07-0012**
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SECTION VIII - Other Project Information

Proprietary Information

Is proprietary/privileged information included in this application?

Yes

International Collaboration

Does this project involve activities outside the U.S. or partnership with International Collaborators?

Yes

Principal Investigator	Co-Investigator	Collaborator	Equipment	Facilities
No	**No**	**Yes**	**No**	**No**

Explanation :

The proposed investigation is achieved through the development of a sensor to be integrated into an instrument suite led by an ESA member state institution.

NASA Civil Servant Project Personnel

Are NASA civil servant personnel participating as team members on this project (include funded and unfunded)?

No

Fiscal Year	Fiscal Year	Fiscal Year	Fiscal Year	Fiscal Year
Number of FTEs	Number of FTEs	Number of FTEs	Number of FTEs	Number of FTEs

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SECTION VIII - Other Project Information

Environmental Impact

Does this project have an actual or potential impact on the environment?	Has an exemption been authorized or an environmental assessment (EA) or an environmental impact statement (EIS) been performed?
No	**No**

Environmental Impact Explanation:

Exemption/EA/EIS Explanation:

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SECTION VIII - Other Project Information

Historical Site/Object Impact

Does this project have the potential to affect historic, archeological, or traditional cultural sites (such as Native American burial or ceremonial grounds) or historic objects (such as an historic aircraft or spacecraft)?

No

Explanation:

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SECTION IX - Program Specific Data

Question 1 : Short Title:

Answer: Solar Orbiter Coronal Spectrograph (SOCS) Sensor

Question 2 : Team Members Missing From Cover Page:

Answer:

Steven Myers, Naval Research Laboratory, Program Manager

At this time, review of information on the international collaboration anticipated for the proposal described in this NOI has not been been completed by the Naval Research Laboratory Office of Legal Counsel. Thus, specific information on this collaboration does not appear in the NOI.

Question 3 : In order to handle FOSO proposals with SMEX proposals, in spite of the later due date, NASA requires that the team members (Co-Is, collaborators, industry partners, etc.) be finalized by the SMEX due date of January 15, 2008, and that the final team member list be entered into the unsubmitted FOSO proposal cover page in NSPIRES.I acknowledge that the final team member list for my FOSO proposal will be entered into the unsubmitted proposal cover page in NSPIRES by January 15, 2008.

Answer: Yes

Question 4 : I give NASA permission to view the team member list on my unsubmitted proposal cover page in order to plan for the peer review of my FOSO proposal. I give NASA permission to view my unsubmitted proposal cover page at any time after January 15, 2008, but before my proposal is submitted by an authorized representative of my organization.

Answer: Yes

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SECTION X - Budget

Total Budget: No budget required