

Dr. Graham Brooks  
Particle Physics and Astronomy Research Council  
Polaris House  
North Star Avenue  
Swindon Wiltshire SN2 1 SZ  
United Kingdom

Dear Dr. Brooks:

The National Aeronautics and Space Administration (NASA) and the Particle Physics and Astronomy Research Council (PPARC) have a mutual interest in pursuing cooperation on the Helioseismic Magnetic Imager (HMI) of the Solar Dynamics Observatory (SDO) mission. The purpose of this letter is to establish an Agreement between NASA and PPARC (hereinafter, "the Parties") to address our cooperation on the SDO mission.

The SDO is the first Space Weather Research Network mission in the Living With a Star program for the National Aeronautics and Space Administration (NASA). Living With a Star (LWS) is managed by the Sun-Earth Connection Division of the Office of Space Science (OSS) within NASA. The LWS program sponsors the targeted basic research required to develop the scientific understanding necessary to effectively address those aspects of the coupled Sun-Earth system that directly affect life and society.

The NASA Headquarters' Office of Space Science solicited proposals for science participation in the SDO mission including the opportunity for international collaboration in January 2002 and made selections in August 2002. A team led by Dr. Philip Scherrer Stanford University was selected to provide the Helioseismic and Magnetic Imager (HMI) instrument suite as part of the SDO payload. The instrument consists of two units: an optics unit containing a Doppler and line-of-light magnetic imager and a vector magnetic field imager, and a data processing unit.

The Helioseismic and Magnetic Imager (HMI) will study the origin of solar variability and will seek to characterize and understand the various components of magnetic activity. HMI makes measurements of Doppler velocity to detect small motions of the photosphere. These data will allow the study of solar oscillations. In addition measurements of the polarization in a spectral line will be used to measure all the components of the photospheric magnetic field. The observations will allow study of the evolution of solar variability and magnetic activity in the convection zone and of the relationship between processes inside the Sun and the surface magnetic field and activity. HMI observations will be crucial for establishing the relationships between internal dynamics and magnetic activity and will thus lead to a reliable predictive capability; one of the key elements of the LWS program. The HMI instrument will obtain stabilized 1 arc sec resolution full disk Doppler velocity and line-of-sight magnetic flux images every 45 seconds and vector magnetic field maps every 90 seconds. The basic scientific observables are full-disk Doppler velocity, brightness, line-of-sight magnetic field and vector magnetic field maps. These will enable the provision of sub-surface flow and far-side activity maps and coronal and solar wind models. HMI investigations also have aspects that will be of great interest for the public at large.

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Four investigators from the United Kingdom were selected to provide components and science data analysis support for HMI:

- Investigators from the Rutherford Appleton Laboratory were selected to provide the design and qualification of the CCD cameras;
- Investigators at the Mullard Space Science Laboratory were selected to provide the Charge-Coupled Device (CCD) screening and the fabrication of the cameras and science data analysis support for magnetic fields;
- Investigators from the Institute of Astronomy, Cambridge University were selected to provide science data analysis support for helioseismology; and
- Investigators from Imperial College of Science, Technology and Medicine were selected to provide science data analysis support for helioseismology.

Pursuant to this letter of Agreement, the PPARC will use reasonable efforts to carry out the following responsibilities:

1. Provide three development units and three flight unit CCDs
2. Provide one brassboard and one flight camera electronics box
3. Provide interface documentation
4. Provide ground support equipment to support the provided flight and development unit
5. Provide design and specification details
6. Support technical interchange meeting
7. Participate in test program at contractor facilities
8. Provide support for the PPARC Co-Investigators

NASA and the PPARC-funded institutions will provide, on occasion, as appropriate, for personnel to visit one another's facilities to participate in integration and testing, and to observe, confer and advise the other Party in regard to aspects of design and development of compatible instrument interfaces, integration, and testing.

#### **POINTS OF CONTACT**

The NASA point-of-contact for this program is

Dr. Dana A. Brewer  
Program Executive  
Advanced Technology and Mission Studies Division  
Office of Space Science, Code SM  
NASA Headquarters  
Washington, DC 20546  
Telephone: 202-358-1678  
Facsimile: 202-358-2697

The GSFC point-of-contact for this mission is:

Mr. U. Schwer  
SDO Program Manager  
Goddard Space Flight Center

Greenbelt, MD 20771  
Telephone: 301-286-3225  
Facsimile: 301-286-1690

The PPARC point-of-contact for this program is:

Dr. Graham Brooks  
Particle Physics and Astronomy Research Council  
Polaris House  
North Star Avenue  
Swindon Wiltshire SN2 1 SZ  
United Kingdom  
Telephone: 44 1793 442019  
Fax: 44 1793 442036

The point-of contact at the Mullard Space Science Laboratory is:

Prof. J. Leonard Culhane  
Director, MSSL and Head, Dept. of Space and Climate Physics  
Mullard Space Science Laboratory  
Holmbury St. Mary  
Dorking  
Surrey RH5 6NT  
United Kingdom  
Telephone: 44 0 1483 274111  
Facsimile: 44 0 1483 278312

The point-of-contact at the Rutherford Appleton Laboratory is:

Prof. Richard Harrison  
Rutherford Appleton Laboratory  
Chilton Didcot  
Oxfordshire, OX11 0QX  
United Kingdom  
Telephone: 44 0 1235 44 6364  
Facsimile: 44 0 1235 44 5848

The point-of-contact at the Institute of Astronomy is:

Prof. Douglas O. Gough  
Institute of Astronomy,  
University of Cambridge,  
Madingley Road,  
Cambridge. CB3 0HA,  
United Kingdom  
Telephone: 44 0 1223 337518  
Facsimile: 44 0 1223 337523

The point-of-contact at the Imperial College of Science, Technology and Medicine is:

Prof. Michael J. Thompson  
Blackett Laboratory  
Imperial College  
Prince Consort Road  
London SW7 2BW  
United Kingdom  
Telephone: 44-(0)20-7594-7660  
Facsimile: 44-(0)20-7594-7772

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### **FINANCIAL ARRANGEMENTS**

Each Party will bear the costs of discharging its respective responsibilities, including travel and subsistence of its own personnel and transportation of all equipment for which it is responsible. It is understood that the ability of the Parties to carry out their obligations is subject to the availability of funds.

### **DATA RIGHTS**

The Parties have access to and use of the scientific data generated under this Agreement. In accordance with criteria established in the NASA solicitation for science participation in the SDO mission, the SDO data will be treated as a public resource and will be made available for public access as soon as is practical. After the initial check out and calibration period of approximately 3 months after initial operation, the SDO database and requisite basic analysis software will be made available to the international community through a NASA data center. After the initial period, the data will be made public with no more than a two-month delay.

### **EXCHANGE OF TECHNICAL DATA AND GOODS**

The Parties are obligated to transfer only those technical data (including software) and goods necessary to fulfill their respective responsibilities under this Agreement, in accordance with the following provisions:

1. The transfer of technical data for the purpose of discharging the parties' responsibilities with regard to interface, integration, and safety shall normally be made without restriction, except as required by national laws and regulations relating to export control or the control of classified data. If design, manufacturing, and processing data and associated software, which is proprietary but not export controlled, is necessary for interface, integration, or safety purposes, the transfer shall be made and the data and associated software shall be appropriately marked.
2. All transfers of proprietary technical data and export-controlled goods and technical data are subject to the following provisions. In the event a Party finds it necessary to transfer goods which are subject to export controls or technical data which is proprietary or subject to export control, and for which protection is to be maintained, such goods shall be specifically identified and such technical data shall be marked with a notice to indicate that they shall be used and disclosed by the receiving Party and its related entities (e.g., contractors and subcontractors) only for the purposes of fulfilling the receiving Party's responsibilities under the programs implemented by

this Agreement, and that the identified goods and marked technical data shall not be disclosed or retransferred to any other entity without the prior written permission of the furnishing party. The receiving party agrees to abide by the terms of the notice, and to protect any such identified goods and marked technical data from unauthorized use and disclosure, and also agrees to obtain these same obligations from its related entities prior to the transfer.

3. All goods, marked proprietary data, and marked or unmarked technical data subject to export control, which is transferred under this Agreement, shall be used by the receiving party exclusively for the purposes of the programs implemented by this Agreement.
4. Title to all hardware to be exchanged under this Agreement will be retained by the party providing the item.

### **INVENTION AND PATENT RIGHTS**

Nothing in this Agreement shall be construed as granting or implying any rights to, or interest in, patents or inventions of the Parties or their contractors or subcontractors.

All equipment and technical data transferred by the Parties under this Agreement shall remain the property of the originating Party unless specified otherwise in this Agreement. In accordance with its laws and regulations, each Party shall facilitate free customs clearance and waiver of all applicable customs duties and taxes for equipment and related goods necessary for the implementation of this Agreement. In the event that any customs duties or taxes of any kind are nonetheless levied on such equipment and related goods, such customs duties or taxes shall be born by the Party of the country levying such customs duties or taxes. The Parties' obligation to ensure duty-free entry and exit of equipment and related goods is fully reciprocal.

### **LIABILITY AND RISK OF LOSS**

With regard to activities undertaken pursuant to this Agreement, neither Party shall make any claim against the other, employees of the other, the other's related entities (e.g., contractors, subcontractors, investigators, or their contractors or subcontractors), or employees of its related entities, or for damage to or loss of its own property or that of its related entities, whether such injury, death, damage or loss arises through negligence or otherwise, except in the case of willful misconduct.

The Parties further agree to use all reasonable efforts to extend this provision as set forth above to their own related entities by requiring them, by contract or otherwise, to waive all claims against the other Party and its related entities against any claim for injury, death, damage or loss arising from activities undertaken pursuant to this Agreement.

This cross-waiver of liability shall not be applicable to:

1. Claims between a Party and its own related entity or between its own related entities;
2. Claims made by a natural person, his/her estate, survivors or subrogates for bodily injury, other impairment of health, or death of such natural person;
3. Claims for damage caused by willful misconduct;
4. Intellectual property claims;

5. Claims for damage based upon a failure of the Parties to extend the provision as set forth above or from a failure of the Parties to ensure that their related entities extend the provision as set forth above; or
6. Contract claims between the Parties based on express contractual provisions.

Nothing in this section shall be construed to create the basis for a claim or suit where none would otherwise exist.

### **CUSTOMS CLEARANCE**

NASA and PPARC will arrange for timely, free customs clearance of equipment and data required for this project. In the event that any customs duty, fees and/or taxes of any kind are levied by the governments of the Parties on the equipment and related goods for the execution of this Agreement, and after seeking the necessary free customs clearance and waiver of applicable customs duties and taxes, such customs duty, fees and/or taxes shall be borne by the Party of the country levying the customs duty, fees and/or taxes. Such arrangements shall be reciprocal and in accordance with the respective national laws and regulations of the Parties.

### **PUBLIC INFORMATION**

Release of public information regarding this program may be made by the appropriate agency for its own portion of the program as desired and, insofar as participation of the other is involved, after suitable consultation.

### **CHOICE OF LAW**

The parties hereby designate the U.S. Federal law to govern this Agreement for all purposes, including, but not limited to, determining the validity of the Agreement, the meaning of its provisions, and the rights, obligations, and remedies of the Parties.

### **ENTRY INTO FORCE AND TERMINATION**

This Letter of Agreement will go into effect upon the date of PPARC affirmative reply. It will remain in force for the duration of the SDO mission including data analysis and archiving, or until SDO is on station two years. It may be extended or amended by mutual written agreement of the Parties. This Agreement can be terminated by NASA or PPARC after six months' written notice of its intention to terminate the Agreement.

If the above terms and conditions are acceptable to PPARC, we propose that this letter, together with your affirmative reply, document our joint understanding as to the implementation of this cooperative effort.

Sincerely,

P. Diane Rausch  
Director  
Space Science and Aeronautics Division  
Office of External Relations