

7 Qualifications and experience of the PI team

7.1 Experience of participating institutes

Caltech/JPL, Pasadena, USA: The Caltech/JPL team combines technology development with a strong observational program, and is one of the world leading groups in sensitive submillimetre bolometric detectors and astronomical instruments. The collaboration has developed the silicon nitride micromesh bolometer, space-borne cryogenics, and DC-stable readout electronics. These technologies have found immediate application in experiments to detect cosmic microwave background anisotropy with balloon-borne receivers, the Sunyaev-Zel'dovich effect with a small ground-based bolometer array, and the interstellar medium with a spaceborne photometer. Caltech/JPL is actively developing a monolithic bolometer camera (BOLOCAM) to search for distant protogalaxies and S-Z clusters, which will serve as a test-bed for many of the important design features of SPIRE. The collaboration developed the first sub-K space-borne bolometric instrument for the Infrared Telescope in Space (IRTS) and is developing the micromesh bolometers base-lined for the PLANCK Surveyor High Frequency Instrument.

CEA Service d'Astrophysique, Saclay (SAP), France: SAP is part of the Commissariat à l'Energie Atomique (CEA) in France. It is part of a large Department of Astrophysics, Particle Physics, Nuclear Physics and Associated Instrumentation divisions (DAPNIA) of about 700 people. Within the DAPNIA/SAP, about 45 scientists and 80 engineers and technicians work in the field of Space Science. Since its origin, the SAP has been heavily involved in space instrumentation and its staff have a long tradition in designing instrument for space, with particular expertise in systems engineering, detectors, analogue and digital electronics, AIV, as well as radiation and EMI/EMC. Originally SAP concentrated on high energy astrophysics; the interests of the SAP scientists have since widened and now encompass several astrophysical domains. In particular, the SAP has acquired expertise in infrared instrumentation for space and ground based observatories. Major recent projects include SIGMA the γ -ray camera on the Russian satellite GRANAT (Co-PI level), GOLF on SOHO (Co-PI level), ISOCAM (PI level), EPIC on XMM (25% of the instrument) and INTEGRAL (Co-PI level), and ground based observatory projects like MEGACAM for the CFHT and VISIR for the ESO VLT. For all space projects, the decision to start a new project is made in agreement with the Centre National D'Etudes Scientifiques (CNES). The development and operation costs are supported partly by CNES and CEA.

Instituto de Astrofísica de Canarias (IAC), Tenerife, Spain: The IAC is a Spanish research organisation whose main purpose is to exploit the exceptional characteristics of the Canary Islands for astronomical observations. It consists of the Institute Headquarters in La Laguna (Tenerife), the Teide Observatory in Tenerife and the Roque de los Muchachos Observatory (ORM) in La Palma. The Instrumentation Division maintains some of the facilities at these observatories and constructs new instruments for them. The IAC is leading the construction of a 10-m telescope, the Gran Telescopio de Canarias (GTC), for the ORM. It has participated in several ESA projects, including flight hardware for ISO and SOHO, and the development of instrumentation for the ARTEMIS Optical Payload in-orbit testing, which will be carried out from the ESA Optical Ground Station at Teide Observatory. ESA projects in which the IAC has participated are: ISO Spacecraft; ISOPHOT-S; SOHO Spacecraft; GOLF Instrument; VIRGO (instrument and data centre) and the assessment study for STARS.

Institut d'Astrophysique Spatiale (IAS), Orsay, France: The IAS has been a space science laboratory for 25 years, and has extensive experience in space astrophysics instrumentation design, fabrication and testing. It has built UV, visible, IR and submillimetric space science instruments in co-operation with French and foreign labs and industry. These include the IR spectrometer IKS for the French/USRR VEGA mission (1986); three instruments (UV and visible) and the MEDOC operation data analysis centre for the ESA/NASA SOHO mission (1995); and the SPM submillimetre photometer for the 2-metre balloon-borne telescope PRONAOS. IAS has also performed cryogenic ground testing of equipment for the ISOCAM instrument flown on ISO (1995). In every case, the

cold optics were developed by IAS. IAS also managed the centre to support the French users of the ISO spectrometers.

Imperial College of Science Technology and Medicine (ICSTM), London, UK: The Astrophysics Group at ICSTM has a strong tradition of involvement in space astronomy missions and is one of the leading European groups in far infrared and submillimetre astronomy. The group was involved in the design and construction of the Wide Field Camera for ROSAT and of the PHOT-S instrument on ISO. Members of the group have been involved in submillimetre astronomy for more than 20 years, and were prominent in the IRAS mission and its ground-based follow-up. The group is leading the largest single ISO open time project, the ELAIS survey, and has 12 other ISO open time proposals mainly in the areas of starburst and active galaxies and quasars. Currently, it leads the UK consortium which is using SCUBA to carry out deep surveys at 850 and 450 μm . The group also has strong activity in theoretical modelling of far infrared and submillimetre sources and in modelling of source counts and background radiation in the infrared. Professor Rowan Robinson has been a member of various ESA scientific study teams for FIRST, and has played a major role in defining the key scientific aims for the mission.

Istituto di Fisica dello Spazio Interplanetario (IFSI), Rome, Italy: IFSI has many years of experience in developing instrumentation for space missions, participating in projects devoted to the study of the interplanetary plasma and magnetic field, solar system exploration and infrared astronomy. In particular, IFSI contributed to the missions of HEOS-1, HEOS-2, GEOS-1, GEOS-2, ISEE, Giotto, Interbol, Tethered (TSS), Cluster, Mars96, ISENA, ISO-LWS. Moreover it is actively participating to the future missions Rosetta, Cassini, Mars Express. Expertise in infrared instrumentation has started in the '80s with the development of subsystems for the TIRGO telescope and focal plane instruments (photometers and spectrometers). The involvement with the ISO project was devoted to the design and building of the DPU and to the implementation of the on-board S/W for the LWS instrument. IFSI scientific participation in ISO-LWS has included the co-ordination of the Central programmes on the studies of star formation and active galaxies. A future involvement in the Planck LFI instrument, as well as in the PHOC and HIFI FIRST instruments, is envisaged.

Laboratoire d'Astronomie Spatiale (LAS), Marseille, France: LAS has a broad experience in the design and development of space instrumentation at ultraviolet, visible and infrared wavelengths. This instrumentation aimed at investigation in essentially three scientific areas: low- and high-redshifted galaxies, interstellar medium and star formation, interplanetary medium and origin of planets. The most recent achievements include participation to the SOHO-LASCO, ISO-LWS, and FUSE. The recognised areas of technical expertise are the optical design, the metrological controls and various testing equipment (vacuum, thermal, vibration and flux calibrations).

Mullard Space Science Laboratory (MSSL), Dorking, UK: MSSL is the UK's largest university-based space science group and has been involved in space science research (including construction of flight hardware) since the beginnings of space flight. It comprises around 130 employees and some 30 postgraduate students. It is organised into five science research groups (Astrophysics, Climate Physics, Solar Physics, Space Plasma Physics and Detector Physics), four engineering groups (Mechanical Engineering, Electrical Engineering, On-board Software and Computing) and an administrative section. Recent projects include ISO, Cluster (currently being rebuilt after the failure of Ariane 5), Soho, Polar and Cassini. ESA's XMM mission will involve two contributions from MSSL: the OM, for which MSSL is PI) and the RGS. MSSL gained experience in cryogenic engineering through its development of the F-P sub-system for the ISO LWS and its long-standing laboratory cryogenic activities in magnetic refrigerators and cryogenic detectors. The astrophysics group has recently expanded to include a sub-millimetre astronomy sub-group through the employment of a senior sub-millimetre astronomer, Dr. Walter Gear.

NASA Goddard Space Flight Center (GSFC), Greenbelt, Md., USA: Goddard Space Flight Center is NASA's largest center, with major responsibility for enabling space science. The Goddard team brings over 15 years of experience in developing many cryogenic instruments for space, airborne, and ground-based applications. It has extended the applications of thermal detectors from

continuum far infrared detection to a wide variety of applications, and has pioneered the use of micro-machining techniques for the development and integration of large format bolometer arrays. The group conceived of and developed the cryogenic micro-calorimeter, in which a bolometer is used to measure the energy of single X-ray photons, providing high efficiency high-resolution spectroscopy. It participated in the definition and development of the COBE program that revolutionised the study of the CMB and is developing the X-Ray Spectrometer (XRS) for the Japanese Astro-E satellite, which uses cryogenic micro-calorimeters (operating at 65 mK) for high resolution spectroscopy. All GSFC work on SPIRE will be funded by NASA.

National Institute of Standards and Technology (NIST), Boulder Co., USA: The NIST/Boulder team combines world leadership in low-power superconducting readout electronics and superconducting bolometric detectors. The superconducting integrated circuit fabrication facilities at NIST are reliable and versatile: custom readout electronics can quickly be fabricated for the TES bolometer option. The first standards-grade IR radiometer based on superconducting bolometers was developed by the NIST/Boulder team.

Padova Observatory, Italy: The Padova Observatory has a long-standing tradition in the field of optical observations, development of optical instrumentation and related control electronics and software, and has built up expertise in the management of large projects and collaborations. In recent years it had a leading role in the design and construction of the 3.5-m Italian national telescope GALILEO (TNG) in the Canary Islands, which will become fully operational in 1998. The Observatory was also in charge for the active optics, the Rotator Adaptor, and three instruments (the optical imager, the adaptive optics device, and a high-resolution spectrograph). Padova is also contributing most of the real-time control of TNG and of the instruments. The Observatory has participated in the ISOCAM consortium by contributing to the OGS and EGSE, including related software. Members of the Padova group are experienced in the management and processing of large astronomical databases exploiting new advanced technologies for optimal indexing and efficient execution of queries.

Queen Mary and Westfield College (QMW), London, UK: The QMW Astrophysics group has been at the forefront of experimental and observational astronomy in the infrared-millimetre range for the last two decades. Its experimental research programme includes building astronomical instruments and the development of new instrumentation and techniques. QMW pioneered the development of ³He-cooled bolometers for submillimetre observations, opening up this waveband for the astronomical community, and is recognised as the world leading group in the area of FIR/submillimetre filters and quasi-optical components. It has participated in many major ground-based and satellite instrumentation projects. It provided design expertise, feed-optics test facilities and the detector arrays and filters for SCUBA, and was responsible for the detector subsystem for the ISO LWS instrument. The group has also provided instrumentation for a number of other space projects including MARS 96 and Cassini. Prof. Peter Clegg of QMW is principle investigator for the ISO LWS. Members of the group have been actively involved in ESA study groups for FIRST since the mid-1980s.

Rutherford Appleton Laboratory (RAL), Oxfordshire, UK: RAL has a world wide reputation for work in space science, built up over many years and involving extensive collaborations with almost every major space agency in the world, and particularly with ESA and NASA. It covers a wide range of expertise, particularly for space instrumentation, starting from the early design phases, through all aspects of project work for the production of flight hardware, and into operations, data analysis and archiving. RAL has an extensive range of facilities for this work, particularly in support of AIV, testing and calibration. Much of its work is in collaboration with UK university groups, complementing their skills and providing support to build up an effective and comprehensive team for the project. This has involved many types of programme ranging from Earth observation, to orbiting astronomical satellites and solar system probes. In addition, the RAL shares the strong scientific interest in the projects through its own research programmes. Of particular relevance to FIRST is the experience gained by RAL from its participation in IRAS and ISO.

Royal Observatory Edinburgh (ROE), UK: ROE has extensive experience of the design and construction of infrared and submillimetre instruments for ground-based telescopes such as JCMT, UKIRT and Gemini. Its staff have specialist expertise in systems engineering for astronomical instruments, optical design and baffling, low temperature engineering, low vibration structures, microphonic suppression, and sub-mm/infrared real time and pipeline data processing algorithms and software. In particular, ROE has developed world leading expertise in submillimetre bolometer instrument technology, exemplified by the success of SCUBA, now in routine use at the JCMT. SCUBA required major engineering innovations in optics, cryogenic design at 0.1 K, and in low-noise data acquisition, which are of direct relevance to the SPIRE design. ROE was also involved in ISOCAM, responsible for designing the optical layout and for the detailed design and procurement of the aspheric silicon and germanium optics. Testing, characterisation and qualification of the ISOCAM optics, filters and CVFs at 4 K were carried out by ROE.

Stockholm Observatory, Sweden: Observational, theoretical and experimental work is carried out at Stockholm. The fields of research include star formation, AGB-stars, supernovae, galactic structure and dynamics, the Galactic centre, active galactic nuclei, IR-astronomy, high energy astrophysics, and solar physics. Sweden has access to all ESO instruments, the NOT telescope and the Swedish solar telescope on La Palma, the SEST and Onsala millimetre-wave telescopes, and ESA projects such as HST, IUE, ISO, HIPPARCOS, XMM, and INTEGRAL. Computing facilities are very good at both the local and national level. The scientific staff includes 4 professors, 8 associate professors and researchers, 5 research associates, and 5 postdoctoral fellows.

7.2 Experience of SPIRE Co-Is and key personnel

Prof. Peter Ade, QMW, Co-I, received his PhD from QMW in 1973. He heads the continuum receiver laboratory of the QMW Astrophysics Group, where teams of specialist scientists and engineers work on far infrared and submillimetre instrumentation for astronomy and atmospheric science. Prof. Ade has over 25 years of experience in astronomy and instrumentation, and has worked on a number of important earth-based and space-borne instrument projects. He pioneered the development of ^3He -cooled submillimetre photometers, opening up this new spectral band for the astronomical community, and has developed unique capabilities in the development and manufacture of far infrared and submillimetre filters. He is a Co-Investigator on the ISO LWS instrument, for which the QMW group provided the detector subsystem, and of the Cassini CIRS instrument. He was responsible for the design, construction and delivery of the bolometer arrays for SCUBA. Prof. Ade is also a Co-I on the PLANCK HFI instrument.

Dr. Philippe André, SAp, Co-I, completed his PhD in Astrophysics at CEA Saclay and University of Paris in 1987. His PhD work focused on the radio continuum emission of young stellar objects, based on observations with the NRAO Very Large Array (VLA). From 1988 to 1991, he worked as a postdoctoral research associate at two major millimetre-wave radio observatories, the IRAM 30m telescope and the NRAO 12-m telescope. During this time, his research interests shifted towards the study of the earliest stages of star formation using (sub)millimetre line and continuum observations as primary tools. In particular, using bolometer observations with the JCMT and IRAM 30-m telescopes, he identified a new class of extremely young protostars which emit the bulk of their luminosity in the submillimetre. These cold protostars are prime targets for FIRST. He returned to CEA/SAp Saclay as a permanent staff member in 1992. Dr. André will play an important role in defining the SPIRE scientific programme in the area of surveys and follow-up observations for study of protostellar evolution.

Dr. Jean-Paul Baluteau, LAS, Co-I and Project Scientist, completed his Doctorat d'Etat at the Observatoire de Paris in 1977. His research interests have embraced studies of the interstellar medium and star formation, instrumentation for mid to far infrared on ground-based, balloon-borne and air-borne telescopes. He was leader of a European team which realised and operated a Michelson interferometer onboard the Kuiper Airborne Observatory for detecting ionic emission lines from the galactic interstellar medium in the mid 70s. He is a Co-Investigator on the ISO-LWS project and was

responsible for the specification and calibration of the LWS grating mode of operation. He is the leader of the LWS Interstellar Medium astronomy group.

Dr. James J Bock, JPL, Co-I, specialises in instrumentation for infrared and millimetre-wave astrophysics. Current research includes studies of the cosmic microwave background anisotropy with a balloon-borne bolometric receiver, a search for baryonic matter in galactic dark matter halos with a rocket-borne near-infrared camera, and investigation of active galactic nuclei in the mid-infrared. He originally developed the silicon nitride micromesh bolometers now in use in numerous sub-orbital millimetre-wave experiments, and is actively developing the transition-edge bolometer and a large format array for a ground-based bolometric camera (BOLOCAM). As a Co-I on the Planck Surveyor, he is developing the micromesh bolometers base-lined for the High Frequency Instrument (HFI). Dr. Bock will be responsible for the development of prototype detector arrays for SPIRE and for production of the flight arrays if this technology is selected for SPIRE

Dr. Pasquale (Riccardo) Cerulli-Irelli, IFSI, Associate Scientist and DPU Project Manager, was awarded the Laurea in Physics at the Rome University in 1967. He is currently a research staff member at the Italian Research Council Istituto di Fisica dello Spazio Interplanetario. He has participated in many space projects, in several cases as project manager for the digital electronics. These have included the ESRO spacecraft HEOS-2, ISEE-2, Giotto, the ISO LWS, SAC-B (an Argentinean satellite to study energetic neutral atoms), and the TSS-1R ASI-NASA mission.

Dr. Pierre Cox, IAS, Co-I, completed his PhD in Astrophysics at the University of Paris VII in 1984. He is Charge de Recherche at the CNRS and works at the Institut d'Astrophysique Spatiale. He has extensive observational experience in radio, millimetre and submillimetre, and infrared astronomy. His main research interests are studies of the interstellar medium, star formation, late stages of stellar evolution and galaxies. He is a Co-Investigator on the ISO LWS project.

Mr. Colin Cunningham, ROE, Associate Scientist and Hardware Systems Engineer, gained his BSc in Electrical Engineering at Imperial College in 1974. He spent 12 years working in Government laboratories and industry on electronic instrumentation and systems. Since 1987 he has worked at the Royal Observatory Edinburgh, as Project Manager and Project Engineer for the SCUBA 0.1-K bolometer array camera which was installed on the JCMT in June 1996. He spent a year at the Joint Astronomy Centre in Hawaii supervising engineering and systems aspects of the successful commissioning of SCUBA, returning to ROE in April 1997 where he is now Deputy Head of the Technology Division. When the UK Astronomy Technology Centre begins operations in April 1998, it is expected that he will be appointed its Chief Engineer. He is a Chartered Engineer and a Fellow of the Institution of Electrical Engineers (IEE).

Dr. Kjetil Dohlen, LAS, Associate Scientist, was awarded the PhD in Applied Optics at Imperial College, University of London, in 1994 for his work on static Fourier transform spectrometers. As a post-doctoral researcher at Aerospatiale in Cannes, France, he was then involved with modelling of the instrument function of the IASI instrument, a thermal infrared satellite-borne Fourier transform spectrometer for next-generation meteorological observations. He gained experience with instrumentation for space astronomy when he obtained a Fellowship of the European Space Agency at the Laboratoire d'Astronomie Spatiale (LAS) in Marseilles, France. There he was primarily concerned with the optical design of the narrow-angle camera for the Rosetta cometary mission. In 1996 he obtained a permanent position at the Observatory of Marseilles. He works in close collaboration with LAS on several space projects. Dr. Dohlen will be responsible for the SPIRE optical design.

Dr. Lionel Duband, CEA Grenoble, Associate Scientist, completed his PhD in Low Temperature Physics at the Centre de Recherche sur les Tres Basses Temperatures (CRTBT), of the French CNRS in 1987. Since then his research has been focused on small cryocoolers, mostly for space applications. Between 1988 and 1990 he spent 3 years as a post-doctoral fellow in the Lange group at the Department of physics and the Space Sciences Laboratory of the University of Berkeley (USA). During this stay he was responsible for the development of self contained He sorption coolers for space applications. In particular he designed the cooler of the IRTS satellite which successfully flew

in March 1995 and still remains the first sub-1-K temperature on orbit. Since 1991 he works at the *Service des Basses Températures* (SBT) of the French CEA where he is in charge of the development of small cryocoolers. His activities mainly concern pulse tubes and sorption coolers. Dr. Duband will be responsible for the design and manufacture of the ^3He fridge for SPIRE.

Dr. Roger Emery, RAL, Co-I, completed his PhD in Astrophysics at Queen Mary College, London in 1968. He then worked at the GISS, New York, using a balloon-borne telescope for far-infrared astronomy, including the first mapping of the extended emission from the Galactic Centre. He returned to the UK to work at the Appleton Laboratory on atmospheric spectroscopy, and also on IRAS, to establish the scientific analysis facility at the ground operations centre. In 1979, he moved to ESTEC as leader of the infrared group in the Astronomy Division, developing Fourier spectrometer instruments for use with ground-based and balloon-borne telescopes, directed towards mapping fine-structure line emission at far-infrared wavelengths. At this time, he was also Study Scientist for ISO, taking the project through its preparatory studies to formal selection by ESA. He returned to RAL in 1983 as Project Scientist for the ISO-LWS instrument and also participated in the ROSAT/WFC programme. Amongst a number of UK and international committees, he has served on the FIRST Payload Working Group. His research interests include the interstellar medium and star formation regions. Since 1994, he has been Head of the Astrophysics Division at RAL. He is also a Co-Investigator in the PLANCK HFI instrument.

Prof. Alberto Franceschini, Padova Observatory, Co-I, carried out his PhD at the International School for Advanced Studies in Trieste on the X-ray AGN evolution and synthesis of the X-ray background. He is active in many fields of extragalactic astronomy and observational cosmology. He is an expert in statistical astronomy, and has developed now-standard statistical tests for 2-D and 3-D pattern recognition. His main research interests are in the field of faint source detection at optical, radio, infrared and millimetre wavelengths, modelling of evolutionary effects and population synthesis, and the contribution of sources to the background radiations at various wavelengths. Since 1988, he has participated in the organisation, execution, data analysis and interpretation of deep extragalactic survey observations with ISO, and is a Co-I in the ISOCAM consortium. He is a Co-I on the European Large Area ISO Survey (ELAIS), and has also contributed to the PLANCK Red Book.

Dr. Walter Gear, MSSL, Co-I and Project Scientist, completed his PhD on infrared and submillimetre studies of AGN in 1984 at QMW, London. From 1984-86 he was a research fellow at Lancashire Polytechnic (now University of Central Lancashire) continuing these observational and theoretical studies, with emphasis on relativistic jets in compact radio sources. He moved to ROE in 1986, where he initiated the bolometer array project SCUBA and acted as SCUBA Project Scientist until its delivery and commissioning in 1996. Having supervised the installation, commissioning and early operation of SCUBA at the JCMT in 1996, Dr. Gear returned to ROE in July 1997 and in December 1997 moved to MSSL where he now heads the infrared and submillimetre group. He has maintained an active research programme, extending from his initial AGN studies into the role of dust in star-formation in our own and external galaxies and, more recently, cosmological studies using SCUBA and a proposed ground-based experiment to measure the polarisation of the Cosmic Background.

Dr. Matt Griffin, QMW, PI, completed his PhD in Astrophysics at the then Queen Mary College, London, in 1985. Since then his research interests have included instrumentation for far-infrared and submillimetre astronomy and Earth observation (specialising in bolometric and photoconductive detector systems), planetary astronomy and star formation. He has participated in several instrumentation projects for the James Clerk Maxwell Telescope (JCMT), including SCUBA, the 100-mK bolometer array receiver. He is a Co-Investigator on the ISO-LWS project and was responsible for the specification and calibration of the LWS detectors, the cold readout electronics, specification of the analogue signal chain and EMC modelling. He is the leader of the LWS Solar System astronomy team. Between 1992 and 1997, he was a member of ESA's main payload study teams for FIRST and PLANCK, including the FIRST Tiger Team, the FIRST Payload Working Group, the PLANCK Science Team and the FIRST/PLANCK Payload Working Group. He has served on a

number of UK and international committees, including the JCMT and UKIRT Telescope Boards, the Astronomy and Astrophysics Committee, the Panel for Allocation of Telescope Time, and the UK ISO Steering Panel. He is also a Co-Investigator in the PLANCK HFI instrument.

Dr. Ken King, RAL, Project Manager and ICC Development Manager, has worked on infrared astronomical instrumentation since 1972, initially on the development of Fourier transform spectrometers for balloon-borne observations of the planets and bright HII regions for which he obtained his PhD in Physics at University College, London. This was followed by a period as support scientist for the UK Guest Observer Programme on IRAS. He joined the Rutherford and Appleton Laboratory in 1985 as the Test and Operations Manager for the Long Wavelength Spectrometer (LWS) on ISO with responsibilities for the design and manufacture of the EGSE system and the definition and execution of the LWS instrument and system level testing procedures. Subsequently he was appointed leader of the LWS Instrument Dedicated Team, responsible for development of the team, its software and its operational role within the ISO Ground Segment. In 1994, he became the Project Manager for the LWS and remains in this post. He has served as a member of the ESA FIRST Science Operations Definition Group and has been invited to become a member of the FIRST/PLANCK Commonality Working Group.

Jean-Michel Lamarre, IAS, Associate Scientist, is a Directeur de Recherche with CNRS. He received his Engineering Degree in 1968 and his PhD in 1988. He has over 20 years experience in infrared and submillimetre astronomy. He contributed to the development of this field in France by leading or contributing to the conception of number experiments: EMILIE at South Pole, the balloon-borne AROME experiment, the space projects CRYOSPIR, AELITA, SAMBA, FIRE, and FIRST. He was the PI of the imaging channel of IKS on the VEGA sounder to the comet Halley, and is the PI of SPM-PRONAOS that measured the positive part of the SZ effect. He served on the ESA payload study teams for FIRST and Planck. He has played a major role in the definition of the Planck-HFI concept and design, and is the instrument scientist of this experiment.

Prof. Andrew Lange, Caltech, US SPIRE Steering Group Member, completed his Ph.D. in Physics at UC Berkeley in 1987, and is currently Professor of Physics at the California Institute of Technology. His research includes the development of instrumentation for observations of the Sunyaev-Zeldovich effect, far IR emission from primeval galaxies, the diffuse infrared backgrounds, and the spatial distribution and polarisation of the cosmic microwave background. He has been involved in the development of numerous cryogenic instruments for ground-based, balloon-borne, rocket-borne and orbital telescopes. His group has pioneered many recent advances in space cryogenics and bolometric detector technology, and is the only group to have achieved sub-Kelvin temperatures in orbit. Lange is US PI for the Planck HFI, and is responsible for the development of the bolometric detectors for Planck. His laboratory is responsible for the development of the detector array and optics for BOLOCAM, a 144 element bolometric camera that will test many of the technologies relevant to the detectors for the SPIRE instrument on FIRST.

Dr. Emmanuel Lellouch, DESPA, Co-I, completed his PhD in Astrophysics at the Observatoire de Meudon, France, in 1989. Most of his work has been concerned with the study of planetary and satellite atmospheres. Being primarily an observer, he has performed numerous observations of planets and satellites at millimetre (mostly with the IRAM 30-m telescope) and infrared (CFHT, IRTF) wavelengths. His fields of interests have now extended to comets and planetary/satellite surfaces. He is also largely involved as a scientific Co-I or associate in many planetary spacecraft missions: Phobos (instrument ISM), Galileo (NIMS), Cassini-Huygens (DISR and CIRS), Mars96 (now Mars-Express (PFS), Rosetta (MIRO). He has extensively participated in the preparation of the ISO Solar System observations on the Guaranteed Time. He has also worked on stellar occultation data and has developed modelling tools (aeronomical and photochemical models) of upper planetary atmospheres.

Dr. S Harvey Mosely, NASA/GSFC, Co-I, received his Ph.D. from the University of Chicago in 1979 on the first far infrared study of planetary nebulae using the Kuiper Airborne Observatory. He joined the Goddard Space Flight Center in 1979, where he became a Co-Investigator on COBE, with

responsibility for the cryogenic focal planes. During this time, he maintained a program of far infrared astronomy, developing spectrometers that produced the first far infrared spectrum of SN 1987A and the discovery of emission from circumstellar water ice. In 1982, he conceived the idea of using thermal detectors as X-ray spectrometers, and in 1983 demonstrated the first X-ray spectrum from such a device. In 1995, he developed the concept of the pop-up bolometer, a method of producing close packed two dimensional arrays. Dr. Moseley is a Co-Investigator on the IRAC instrument for SIRTF, the XRS instrument on the Japanese Astro-E satellite, and the Wide Field Infrared Explorer mission. He leads, in collaboration with Kent Irwin at NIST, a programme for the production of large format arrays of bolometers. He is a Fellow of the American Physical Society.

Dr. Seb Oliver, ICSTM, Associate Scientist and ICC Scientist, completed his PhD on cosmological studies from faint IRAS surveys at Queen Mary and Westfield College, London, in 1993. Following a brief period as a research associate at QMW he moved to Imperial College as a research associate in October 1993, a position he currently holds. His PhD project was the construction and analysis of a redshift survey of ~ 3000 IRAS FSC galaxies. The highlights of this included the discovery of F10214+4724 and a better understanding of IRAS galaxy evolution and Large Scale Structure. In 1995 he was appointed Project Scientist for the European Large Area ISO survey (ELAIS). His work on IRAS surveys continues through his involvement in the IRAS PSC-z project and ISO studies of IRAS galaxy samples. Currently his main research interests are ISO field surveys, ELAIS and ISO and SCUBA observations of the Hubble Deep Field.

Dr. Göran Olofsson, Stockholm Observatory, Co-I and Swedish Steering Group member, was awarded his PhD at the Stockholm Observatory 1974, and has many years of experience in ground-based airborne, balloon-borne and space astronomy. This includes stellar photometric observations using NASA's Lear Jet for calibration of stellar model atmospheres, a rocket experiment from with a 3-band FIR photometer and a helium-cooled 30-cm telescope (the first European space experiment using a helium-cooled telescope and stressed Ga:Ge photoconductors), balloon observations of the CII line at $157 \mu\text{m}$ using a helium-cooled scanning Fabry-Perot interferometer, and an experiment to observe the 557 GHz water line and interstellar O_2 . He has constructed several focal plane instruments for ground-based telescopes (photometers, polarimeters, spectrometers and cameras both for the optical and the IR part of the spectrum). Dr. Olofsson participated in the early studies of the ISO mission and took part in the definition and the design of ISOCAM, and was responsible for the optical filters. He is currently working on ISOCAM observations of star formation regions. He is a member of the ODIN science team, including an involvement in the cold hardware.

Dr. Renato Orfei, IFSI, Associate Scientist, was awarded his PhD by the University of Rome in 1968. He is currently a research staff member at IFSI-CNR, Rome. He has worked on many space projects including: the Sirio satellite search coil experiment; GEOS1 and 2, flux gate experiment; ISO LWS, DPU and on-board software; the MARS 96 PFS experiment; and the SAC-B ISENA experiment. Dr. Orfei leads the group that will provide the DPU for SPIRE.

Dr. Ismael Perez-Fournon, IAC, Co-I and Spanish Steering Group member, completed his PhD in Astrophysics at the University of La Laguna, Tenerife, Spain, in 1985. He is "Profesor Titular de Universidad" at the Astrophysics Department of the University of La Laguna and research staff of the IAC. He is also Head of the Astrophysics Department of the University of La Laguna and of the Graduate Studies Division of the IAC. His research interests include nearby AGN, quasars, radio galaxies, elliptical and starburst galaxies, and observational cosmology. He has participated in several large international collaborations as leader of the Spanish team: LAG (on AGNs), RIXOS (ROSAT International X-ray Optical Survey), WENSS (Westerbork Northern Sky Survey), ELAIS (European Large Area ISO Survey). He has experience with observations with large optical and IR ground-based telescopes as well as with space telescopes (ISO, ROSAT, HST). He is the PI of the Spanish team in the European TMR research network "ISO Survey" which is undertaking the IR surveys ELAIS and ISO-HDF (north and south) and the follow-up at other wavelengths. He participates in the instrumentation team of the 10-m telescope Gran Telescopio de Canarias.

Dr. Louis Rodriguez, SAp, Associate Scientist and Systems Engineer, qualified as Docteur d'Etat (1985) in nuclear physics at Paris VII University, France. Between 1986-1991 he worked in thermonuclear Fusion program at the CEA/EURATOM, TORE SUPRA Tokamak program on plasma electronic cyclotronic emission processes (ECE), and was responsible for the manufacture and scientific exploitation of three rapid scanning Fourier Transform Spectrometers (FTS) in the millimetre and submillimetre range. He established collaborations with the Joint European Torus (Oxford) on ECE, and Doublet IIID (San Diego/USA) on a DOE/CEA program for cyclotronic electron heating and current drive. In 1991, he moved to Saclay/SAp for the infrared photovoltaic detector array tests of the CASSINI/CIRS FTS on a NASA(GSFC)/CNES-CEA programme. In 1993, he was also in charge of the local management of the CEA contribution to CIRS. In 1996 he assumed responsibility for co-ordination of the ISO/QSS irradiation tests at Saclay, to determine the susceptibility to gamma rays and charged particles of this device. Since 1996, his work at SAp has been to manage the LETI/LIR development program on bolometer planar arrays for SPIRE.

Prof. Michael Rowan-Robinson, ICSTM, Co-I and UK Steering Group Member, has been Head of the Astrophysics Group at Imperial College, London, since 1993. Previously he was Professor of Astrophysics at QMW, London. He began involvement in submillimetre astronomy in 1970s. He was a member of the IRAS Science Team, responsible for the completeness and reliability of the IRAS Point Source Catalogue (PSC), and led the QDOT team in ground-based follow-up of IRAS, resulting in several papers in the top 20 most cited astronomical papers in the world. He is PI of the European Large Area ISO Survey (ELAIS) project, and leads the UK SCUBA Submillimetre Survey Consortium, currently carrying out a cosmological survey with SCUBA on the JCMT. He is author of many books and articles on astronomy and cosmology including *Far Infrared Astronomy, Cosmology, The Cosmological Distance Ladder, Universe, and Ripples in the Cosmos*. Prof. Rowan-Robinson has a long association with the FIRST mission. He was a co-author of the FIRST Red Book, and was an invited expert for SSAC discussions of FIRST in 1996. In 1997, he was chairman of the Scientific Organising Committee for the Grenoble Symposium on FIRST. He has served on many national and international scientific committees, including ESA's Astronomy Working Group.

Dr. Paolo Saraceno, IFSI, Co-I, obtained his Laurea in Physics in 1968. In the early years of his scientific career he worked on plasma physics, participating in the HEOS A and B satellite experiments and their data analysis. Since 1974, his research interests have focused on infrared astronomy, both on instrumentation and scientific programmes in the area of early stellar evolution. He is the leader of the infrared group at IFSI-CNR and he participated in the construction of the TIRGO telescope and in several projects for focal plane instruments. In 1984 he became Co-investigator on the ISO-LWS instrument and he is the leader of the ISO-LWS Pre Main Sequence Evolution team. Besides observations at near-, mid- and far-IR wavelengths of star forming regions, he has also made and analysed ground-based millimetre and submillimetre wave observations.

Dr. Timothy Sumner, ICSTM, Associate Scientist, was awarded his PhD in Experimental Physics, by the University of Sussex in 1979. After post-doctoral positions at the Institut Laue-Langevin in Grenoble and Imperial College, London, he was appointed as lecturer at ICSTM in 1990 and senior lecturer in 1997. His research interests have included far infrared astronomy, X-ray astronomy, and Dark Matter detection. He was ICSTM Project Manager for ROSAT, and the ISO ELAIS survey projects. He is a Co-I on the MiniSTEP and LISA projects, and has served on the ESA study team member for these projects, and on the ESA FPAG committee. Dr. Sumner will be responsible for managing the ICSTM activities on SPIRE hardware (EGSE) and the initial development of the ICSTM DAPSAS Centre.

Dr. Bruce Swinyard, RAL, Associate Scientist and Instrument Scientist, was awarded an MSc in Astronomy at the University of Sussex in 1985. He worked in the surface science equipment industry for two years before joining the Space Science Department at the Rutherford Appleton Laboratory in 1987. Since joining RAL he has worked on a number of space instrumentation programmes including the ROSAT Wide Field Camera and the design and definition of the INTEGRAL gamma ray imager. While based at RAL, he also studied for his PhD in γ -ray astronomy at Southampton University, graduating in 1993. Since 1990 he has been the calibration scientist for the ISO Long Wavelength

Spectrometer which has involved the definition of the ground and in-orbit calibration programmes, the definition and writing of the calibration analysis software, the identification and study of instrument-related problems with the data analysis and instrument operations, and the definition of the science analysis pipeline software. He has played a large part in the design and definition of the FIRST bolometer instrument and chairs the technical working team for the instrument design.

Prof. Gianni Tofani, Obs. di Arcetri, Italian Steering Group Member, was awarded his Laurea Degree in Electronic Engineering at the University of Pisa in 1964. Between 1964 and 1987, he acted as a research scientist for the Consiglio Nazionale delle Ricerche (CNR), and, from 1979, was Director of the Astronomy Group. He was Associate Professor at the Università di Firenze between 1974 and 1987. Between 1987 and now he has been Senior Astronomer at the Osservatorio Astrofisico Arcetri, Firenze and Director of the Centre for Infrared Astronomy of CNR. He has also been a member of the Consiglio Ricerche Astronomiche of the Ministry of the University and Technology, and has recently been appointed to the ESA Astronomy Working Group. His research interests are radio astronomy; interstellar medium and star formation; and electromagnetic microwave and millimetre techniques. He has much experience in space research and in ESA projects and activities. He was a member of the ESA study team of QUASAT and IVS; he was responsible for an ESA-ESTEC contract for microwave radiometry; he administered ASI contracts for space VLBI and space communication antennas. He has a long-standing interest in the FIRST mission, and is a member of the ESA SAG for FIRST.

Dr. Laurent Vigroux, SAp, Co-PI, completed his PhD in 1978. Since then he has worked in the Service d'Astrophysique (SAp) of the Commissariat à l'Energie Atomique in Saclay, France. His main astrophysics research interest is the evolution of galaxies and clusters. He was in charge of several instrumentation projects for ground based and space observatories. His main activity during the last 10 years was the preparation of the ISOCAM instrument for ISO, for which he was the system engineer of the project and in charge of all system specifications, the whole AIV plan and detector testing and optimisation. On the scientific side, he co-ordinates all the observations and data analysis of nearby galaxies. Since the successful commissioning of the instrument in flight, he was invited to present ISOCAM results in several international meetings, like the AAS meeting in 1997 or the 1997 Kyoto IAU symposium. He has served on a number of national and international committees, including the Scientific Advisory Committee of the CFHT, the Scientific and Technical Committee of ESO, and currently, ESA's Astronomy Working Group. Since 1993, he has been the head of the Service d'Astrophysique.

Dr. Gillian Wright, ROE, Co-I, completed her PhD on mid- and far- infrared observations of interacting galaxies at the then Imperial College, London, in 1986. Since then her research interests have centered on exploiting state of the art near-IR instrumentation and detector technology for studies of active and ultra-luminous infrared galaxies. She has recently returned to the UK after many years' experience at UKIRT supporting and developing IR instrumentation. She has extensive experience of day-to-day observatory operations, and played a major role in the development of observing techniques at UKIRT and in the development of data reduction pipelines for array spectrometers. As Head of UKIRT instrumentation she was responsible for defining and overseeing the procurement of future UKIRT instrumentation and the development programme, as well as for ensuring the scientific performance of all the common-user instruments at UKIRT. In 1994 she served on the NASA Airborne Astronomy Review Panel, and is now a member of the UK Panel for the Allocation of Telescope Time. She is currently the project scientist for the UKIRT Observatory Reduction and Acquisition Control project at the ROE, and is responsible for specifying the requirements for the user interface, data reduction pipeline algorithms and queue scheduling software.