9 Publicity plan

9.1 Introduction

The SPIRE PI and Co-Is are willing to co-operate fully and enthusiastically with ESA in its aim to publicise and promote the mission amongst the general public, and recognise the importance of this in maintaining and enhancing a strong European space science programme.

In this section we provide brief answers to the questions listed in Appendix 3 of the draft publicity agreement circulated by fax on Dec. 22 1997 (PT-05123).

9.2 Scientific/Technological

9.2.1 With the general public in mind, what is new or different about this experiment?

This will be the first large telescope in space designed to study the submillimetre band, a crucial range of wavelengths between the far infrared (previously studied by the IRAS and ISO satellites) and the microwave band, which is accessible from the ground. In this band, SPIRE will make unique and highly sensitive observations (which can only be made from space) revealing very distant galaxies making their first stars, when the universe was only a fraction of its present age. It will also see nearby stars and planetary systems in the process of formation in our own galaxy.

9.2.2 How would you position the experiment for the general public in terms of what it will discover?

- FIRST and SPIRE are the logical next step for deep exploration of the universe after the deep surveys of the Hubble Space Telescope, allowing us to look back in time to when the universe was a fraction of its present age and to see very distant galaxies most of whose light is hidden from view by dust grains.

- FIRST and SPIRE will open up the cool universe, of material at temperatures of only 5 - 20 degrees above absolute zero (-253 to -268 ^{o}C), to our view.

- Within our own Milky Way Galaxy we can take our searches for stars and solar systems in the process of formation beyond previous studies by the IRAS mission and by ground-based millimetre-wave telescopes to determine how (and how many) stars form from giant clouds of gas and dust.

- SPIRE will enable astronomers to investigate the processes by which stars enrich the interstellar medium (from which the next generation of stars will form) with the heavy elements from which planetary systems are made.

- SPIRE's scientific programme is an important part of a world-wide effort by physicists and astronomers to form a complete picture of the evolution of the universe from the earliest times (the big bang) through to the present time and beyond (the ultimate fate of the universe).

- It will allow astronomers to investigate the composition and conditions in planetary atmospheres.

9.2.3 How will this experiment contribute to our knowledge?

SPIRE will give us new deep images and low-resolution spectra in the submillimetre band (200-500 μm) and we expect that these will contribute to our knowledge in a very wide range of astronomical fields: cosmology (the search for distant starburst galaxies); active galaxies and quasars powered by massive black holes; the life-cycle of stars in our own galaxy (star formation, mass-loss from stars, enrichment of the interstellar medium, the properties of interstellar dust grains and molecules); the solar system (the composition of comets and the atmospheres of the giant planets).

9.2.4 What questions will the experiment answer?

Among the most important questions which SPIRE will address are:

- What is the star formation history of the universe from the appearance of the first galaxies to the present day?
- What is the link between the ultraluminous infrared galaxies discovered by IRAS and quasars ?
- What factors cause or prevent the formation of stars and planetary systems ?
- How many low-mass stars and brown dwarfs and are there in our Galaxy ?
- How do powerful winds from ageing stars enrich the interstellar medium with heavy elements?

9.2.5 With the general public in mind, what is new or different about the technology for this experiment?

- SPIRE will be able to make "pictures" using novel submillimetre camera technology, thus gaining access to important phenomena that are completely invisible in the optical.
- It will do this with advanced detectors which are cooled to exceedingly low temperature (a fraction of a degree above absolute zero, and colder than space itself).
- Its detectors will be of unprecedented sensitivity (a factor of ten better than the most sensitive used so far) so that the performance of the instrument will be determined by the thermal glow from the telescope itself.
- The SPIRE will be cooled to very low temperature. It will need to be extremely robust, but supported mechanically in a manner that allows hardly any heat to flow into it from the outside world.
- The instrument optics will require very careful design. If the whole thing were scaled in size from submillimetre to optical wavelengths, it would have to fit inside a 1 x 1 x 1 mm box.

9.2.6 What will be of interest visually in the design and development of this instrument or in the results it produces?

Instrument:
- ^{3}He refrigerator
- Detector arrays (including magnified detail)
- Chopper and FTS mirror drive mechanisms
- Instrument optics
- Instrument calibration facility

Results:
- Pictures of proto-stars and nearby galaxies at wavelengths that reveal detail which is completely obscured from view at visible wavelengths
- Pictures of primeval galaxies that cannot be seen in visible light
- Representation of galaxy survey data as 3-D structure of the early universe
- Spectral data showing features due to atoms and molecules in distant objects

9.2.7 What specialist expertise will be employed in the instrument's development?

- Low-temperature physics and engineering in space
- Ultra-sensitive detectors

- Compression of large amounts of data to allow it to be transmitted to the ground without loss of information

- State-of-the-art low-temperature thermal/mechanical engineering

- Advanced optical design

- Novel low-power/low-vibration/high reliability mechanisms

9.2.8 With the general public in mind, what can be described - in the long term - as benefits for mankind derived from the mission and its elements?

- A clearer picture of how and why the universe turned out as it did

- A better understanding of how stars and planetary systems form in galaxies

- A better understanding of whether solar systems like ours and galaxies like ours are unusual or commonplace

- Technical advances catalysed by the project

9.3 Socio-economic

9.3.1 What are the socio-economic benefits of your experiment for your region/country (e.g., employment)?

- Employment in universities, research laboratories, and industry

- Technological advances

- Training of young scientists and engineers

- Significant international scientific and cultural exchange and co-operation, as the project involves six nations

- Cultural enrichment through promotion of interest in and understanding of science

9.3.2 What links or partnerships with the local community will you be able to implement (e.g., links with local schools).

- Publicity in media (TV, Radio, mainstream and science press, books, etc.). The SPIRE consortium will work closely with the PR sections at RAL and other SPIRE institutes to maximise the impact of the mission with the general public.

- "Outreach" to schools, astronomy societies etc.

- Visits by school parties, etc. to laboratories see space hardware and facilities

- World Wide Web