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**Pages** : 1 of 1 + 3 attached

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**Subject** : AI-PACS-05

Dear All,

This is to close subject AI on G. Pilbratt, as defined in the FIRST/Planck technical meeting with PACS held at ESTEC, 02-09-1998 (ref. PT-MM-05799)

### **AI: Research criteria for instrument replacement especially for the FPU.**

The attached pages show for ISO the criteria under which a FM instrument would have been replaced by its FS especially for the FPU's.

Although the action was defined at the PACS meeting, the information is equally relevant to HIFI and SPIRE. Therefore it is sent to all FIRST PI's and PM's.

It is the idea that the above is discussed by G. Pilbratt with the Instrument teams, after the instruments have been fully designed, with the intention to define similar criteria for FIRST.

With this info the AI is considered closed.

Best regards,

Harm Schaap

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## Go/NoGo Criteria for the ISO Scientific Instruments

SAI/92-84/Tn, 13 March 1992.

This paper defines "Go/NoGo" criteria for three major points in the ISO programme, namely:

- a. (for use immediately prior to) Delivery of the FM instrument to ESA,
- b. (for use during) FM Integrated System Tests,
- c. (for use during) Integrated System Test at Kourou.

The criteria get less restrictive as one goes down the above list. Criteria for points a. and b. are on a *per instrument* basis, while those for point c. are for *the payload* as a whole.

The criteria for points b. and c. are aimed towards exchanges of the instruments' focal plane units, which are located within the ISO cryostat. Due to the much reduced programmatic impact of a change of warm boxes, no specific criteria are set for exchange of these units.

ISO has a sophisticated payload, capable of a multitude of photometric, imaging, spectroscopic and polarimetric measurements. To the extent that the instruments were designed to complement ground-based and airborne observing opportunities, virtually all of the capabilities they encompass provide unique opportunities. Where duplication or overlap with existing facilities exist, they tend to be marginal. In fact, some overlap is essential for the cross-calibrations needed, if the new observations are to be woven coherently into the fabric of existing information. Nonetheless, even among the observing modes of ISO, some are likely to be of greater importance than others.

Due to the multiple possibilities offered by the ISO payload, it is not realistic to attempt to define criteria for all possible situations. Thus, the following criteria have deliberately been kept very simple. They are to be invoked at various points in the development and test of the ISO payload. The criteria describe a course of action to be followed if they are violated; it is expected that any waiving of any of these criteria should only occur after discussion involving the ISO Science Team.

The expected scientific performance of the instruments, is documented in the "Scientific Capabilities of the ISO Payload" (SCD, ISO-SSD-8805, issue 1.0 dated 29 November 1991.SCD). These performances are expressed in terms of scientific parameters which are measurable and/or calculable in the PI institutes during the calibration of the instruments. When integrated into the ISO cryostat, only a much more limited set of parameters can be measured. Thus criterion a is measured against the SCD while criteria b. and c. are to be measured against other parameters (dark currents, noise, response to internal stimulators etc) that will have values assigned at the time of FM delivery which reflect the performance of the instrument at that time. For LWS only, its performance for criterion a. is to be compared to that in the proposal (January 1985).

The "functions" of an instrument are those listed in appendix A to this document. The "key" operating modes of the instruments are defined in appendix B to this document. Performance is to be interpreted in terms of the time needed to reach a certain flux level.

Similar GO/NOGO criteria are to be applied (document TBW by the IST ) to vital spacecraft functions such as straylight, pointing accuracy including raster pointing, image quality, lifetime, EMC, alignment, cover sources, contamination.

Use/No. to criteria for the ISO Scientific Instruments, SA/92-34/17, 13 March 1992

The criteria are:

a. Delivery of FM (FS) instrument to ESA

The instrument shall not be delivered to ESA unless it provides all the functions listed in appendix A with a performance for each detector or band not worse than a factor 3 below that in the SCD (for the LWS, a performance not worse than that in the proposal).

b. FM Integrated System Tests

During testing at Payload Module level, the FM shall be replaced by the FS if the performance in any of the instrument functions (listed in appendix A) falls - due to an internal failure - by more than a factor 2 below that at the time of FM delivery.

During testing at ISO system level, the FM shall be replaced by the FS if the performance in any of the 6 key operating modes (defined in appendix B) falls by more than a factor 2 below that at the time of FM delivery or if more than 25% of an instrument's defined functions (see appendix A) have performances worse than a factor 2 below those at the time of FM delivery

If the cryostat has to be opened for some other reason, then the replacement of an instrument shall be decided on a case-by-case basis, even if the performance degradation is less than specified here.

c. Integrated System Test at Kourou

ISO shall not be launched if the performance in any of the 6 key operating modes (defined in appendix B) falls more than a factor 5 below that at the time of FM delivery

ISO Science Team, March 1992.

Use/NOUO criteria for the ISO Scientific Instruments, SALSU-84/12, 15 March 1992.

## APPENDIX A INSTRUMENT FUNCTIONS

The following instrument functions have been defined in terms of capabilities over a wavelength range so as to be able to quantify to some extent loss of part of a function. Correct functioning of an instrument mode is taken to include correct functioning of all necessary ancillary on-board equipment (e.g. calibration source, interchange wheels, chopper/shutter, curing capability, electronics functionality, etc.).

### PHT:

- PHT-C200 (4 pixels, photopolarimetry, 100 - 200  $\mu\text{m}$  wavelength)
- PHT-C100 (9 pixels, photopolarimetry, 50 - 100  $\mu\text{m}$  wavelength)
- PHT-P1 (multiband, multiaperture photopolarimetry, 2 - 17  $\mu\text{m}$  wavelength)
- PHT-P2 (multiband, multiaperture photopolarimetry, 20 - 30  $\mu\text{m}$  wavelength)
- PHT-P3 (multiband, multiaperture photopolarimetry, 50 - 100  $\mu\text{m}$  wavelength)
- PHT-S1 (spectrophotometry, 2.5 - 5  $\mu\text{m}$  wavelength)
- PHT-S2 (spectrophotometry, 6 - 12  $\mu\text{m}$  wavelength)

### CAM:

- LW (multifilter, multi field of view imaging, 2.5 - 5.5  $\mu\text{m}$  wavelength)
- SW (multifilter, multi field of view imaging, 4 - 17  $\mu\text{m}$  wavelength)
- Polarisation (2.5 - 17  $\mu\text{m}$  wavelength)

### LWS:

- Medium resolution mode (45 - 180  $\mu\text{m}$  wavelength)
- High resolution mode (45 - 90  $\mu\text{m}$  wavelength)
- High resolution mode (90 - 180  $\mu\text{m}$  wavelength)

### SWS:

- Band 1 (medium resolution, 2.5 - 4  $\mu\text{m}$  wavelength)
- Band 2 (medium resolution, 4 - 13  $\mu\text{m}$  wavelength)
- Band 3 (medium resolution, 13 - 29  $\mu\text{m}$  wavelength)
- Band 4 (medium resolution, 29 - 44  $\mu\text{m}$  wavelength)
- Band 5 (high resolution, 15 - 25  $\mu\text{m}$  wavelength)
- Band 6 (high resolution, 25 - 35  $\mu\text{m}$  wavelength)

## APPENDIX B KEY OPERATING MODES

The following 6 modes are the key operating modes for ISO. Note that both the long- and short-wavelength channels of ISOCAM are included as ISOCAM is used (i) to "peak-up" the satellite pointing for the SWS instrument (ii) to "peak-up" the satellite pointing for some modes of the ISOPHOT instrument and (iii) as a back-up to the spacecraft's Quadrant Star Sensor.

- ISOCAM LW and SW (with LW including several filters)
- ISOPHOT C200
- ISOPHOT P (P3 plus at least 1 other detector and wide-beam capability)
- LWS Grating
- SWS Grating
- ISOPHOT-S.