Notes on the FTS Design Splinter Meeting LAS - 24/9/97

Note Number: ~~BOL/RAL/M/0019.10~~
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Present - PARA, WDD, MC, BMS, KD, LR, GW, EA, KJK

The meeting set out to identify the basic design gaols for any sum-millimetre Fourier transform spectrometer for the FIRST bolometer instrument. Additionally, the likely design drivers were identified.

Design Gaols:

1) Diffraction limited imaging within a 3 arc-minute FOV - this was identified as being the maximum FOV left on M3 after allowing for the photometer channel requirements.

2) Short mirror travel (<2 cm) - although firm estimates of the dissipation from any likely mirror mechanism are still required, it is clear that any mirror travel over about 2 cm is going to be very difficult to implement.

3) Resolution of 1000 at 300 microns - the basic specification is still R=400 for comparison with the grating option, however the ORIGINAL specification was R=1000 and was only reduced when it became clear that this was not possible with the grating.

4) The theoretical throughput loss should be no more than that for a standard Martin-Puplett polarising FTS i.e. less than or equal to 1/8.

5) Nominal wavelength range is 200-400 microns (25-50 cm-1). However, the design should not be such as to exclude extension to higher or lower wavelength ranges most importantly the CII line at 157 and the CI line at 609 mcrons.

6) No more than twenty detectors per band - no more than 40 detectors total. This is set by the sampling frequency and telemetry requirements.

7) It is desirable - but not a necessity - to have the second input port available for a calibration source. That is, there will have to be a pressing case in terms of instrument sensitivity for it not to be used for calibration.

8) For ease of construction of the focal plane it is desirable that the final focal ratio be the same as for the photometer - f/5.

These design gaols - and especially 6 - are based on the implicit assumption that the Martin-Puplett polarising FTS is the baseline and can be built. The idea is that the FTS gurus set their minds free to come up with a design with higher throughput that still meets the above criteria.

Further guidelines for what physical limitations will constrain these designs were discussed and the following "design drivers" were noted:

1) Fringe constrast off axis - this will set the largest field of view possible and set a limit on the beam size through the instrument.

2) Measurement of the mirror position - if a design places too high a requirement on this it may be difficult to implement. It is VERY much prefered that a mechanical (encoder or LVDT) solution can be found rather than an optical (laser or Moire fringe) one.

3) Mirror alignment - again too tight a specification on the moving mirror decentre and tilt will prove troublesome to implement.

4) Diffraction limited pixels (2*f*lamba) will be required with lambda here being the longest wavelength in the band in question.

It was agreed that outline designs would be sent by e-mail or fax to BMS and PARA by the 20/10/97 in preparation for another meeting of the group to discuss and evaluate the designs on the 28/10/97 at QMW. This is the day before the QMW detector workshop.