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John,

Although I agree with you that the ALMA receiver design is not yet optimised I would like to comment on some of the points you have made.

Although Memo 183 was a useful starting point for the receiver design it is not true to say that "The optical performance in this configuration has been shown to be satisfactory". In particular

- (1) The design was based on an 8-m antenna with different optics from the present design.
- (2) The truncation and dissipative losses in the optics were not calculated.
- (3) The aberration calculations were not complete (for example the curvature aberration and the need to be near the Petzval surface).
- (4) No provision was made for the WVR.
- (5) Polarization degradation due to off-axis feeds was not evaluated.
- (6) Details of how the channels are physically located in the dewar were not given. For example, Fig. 1 shows three bands located relative to the Cassegrain focus (neglecting curvature) but it is not clear how the dewar fits round these (particularly the lowest band).
- (7) It is not clear that the arrangement is compatible with the cartridge concept which has been adopted.
- (8) No thermal budgeting was done.

Since that Memo we have explored many of these points and the present design has evolved from these considerations. It is clear that the Cold Load has been a driver in the design, but I don't think that it has been the only one in evolving away from the Memo 183 concept.

The reason for using external optics was not only for thermal

loading on the cryocooler. Rather it was a combination of

- (a) Having an image of the primary near the window so that the beam extent is well defined there
- (b) Being able to move the beam from the cartridge axis to a better position in the focal area.
- (c) Reducing window and IR filter thicknesses to reduce losses
- (d) Avoid lenses for reasons which will probably be discussed at the meeting.

The IR filtering issue is one that we need to look into in more detail. My feeling is that we should have overcapacity in the cryocooler since that allows you to cope better with degradation due to small leaks, power outages, etc.

It is clear that many people have misconceptions as to how the present design has been developed so I started trying to tabulate the major decisions and the documents which influenced these decisions. In the process I found that I had plenty of misconceptions myself! I will try to bring a draft of the document to the meeting in Cambridge. I think that it is important to be able to go back quickly to see what the basis of the design is so that if changes in direction are required the original work can be checked to see if it is still relevant. Otherwise we risk re-inventing the wheel. The document has hyperlinks to the relevant references, but there are some areas where there is little or no documentation, and we should try to find or compile any relevant information. (Please let me know if anyone at NRAO is doing this so that I don't duplicate the effort).

It would be useful if we could also collect some of the relevant e-mail in a central site (perhaps in a folder or set of subject folders on the ESO BSCW site), since I think that there is a lot of relevant information contained in them.

It is clear that we have many issues to discuss in Cambridge and I look forward to a very productive meeting.

Regards,

-James

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