Main Concerns for the MCE.

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Introduction This is an informal summary of the biggest worries about timely, successful delivery of the *SCUBA*2 Multi-Channel Electronics. The items are not listed in any particular order.

1: The Cryogenic Cables. The MCE are connected to the arrays via woven cables which are $\approx 250\Omega$ and are over 2m long. Because there are literally several *thousand* wires going into the cryostat, thermal engineering severely limits the flexibility in optimizing the electrical properties of these cables. Their high impedance provides Johnson noise and also converts preamp current noise into $1/f$ voltage noise, but this is not the main issue.

The dynamic impedance of these cables may limit the frequency response of our biasing circuitry, and the impedance depends on a hard-to-control spacing in the woven cables. Cross-talk in the cables is also a major concern, and one that is very difficult to model.

This problem has been raised prominently within the *SCUBA*2 consortium, and it is in good hands at the ATC, but until it is resolved it remains on our worry list.

2: The short delivery schedule. From the start, there has been a very rapid schedule required for the MCE. The schematic capture is essentially complete, and board layout fairly well along, but if we encounter any serious surprises in testing the electronics we do not have much schedule slack available to cope with the problem. We constantly re-visit our staffing profile to keep the production and testing schedule on track.

3: RF Protection. It is important to keep RF from the outside world out of the electronics, and absolutely crucial to keep RF from the MCE out of the cryostat. We believe we have a good grounding scheme, and a very nice filtered connector design, but we do not have abundant freedom with these filters if we wish to maintain frequency response too. The main worry is that we will not really know how well we have done until we connect the electronics to a working bolometer array. (We will get some indication from the cold tests at UBC with a dummy array.)

4: Analog-to-Digital Separation. Given how much each board needs to do, there is not as much real estate available to separate the sensitive analog front ends from the digital parts of the circuit as one might build into an unconstrained system. We believe our designs are sufficient, and this is the sort of problem we have solved often in the past, but it stays on the worry list until RC input noise is demonstrated to be low enough.

5: Communication with the ATC. We have a long successful history of building flight

electronics, but our style is different than that of the ATC. There have been times when differences in expectations and some miscommunication have slowed both groups. The fact that we have joined this program when it was already underway, and the 8 hour time difference do not help matters. We have changed our procedures for recording design decisions, and this should help both our group and the ATC to understand the status of and reasoning behind each subsystem. I should add that, especially recently, communication with Maureen Ellis at ATC has been easy and very helpful, and we get perceptive and prompt feedback on a wide range of topics.