

National Radio Astronomy Observatory  
Tucson, Arizona

September 13, 1988

MEMORANDUM

TO: D. T. Emerson

FROM: J. M. Payne

SUBJECT: 230 GHz SIS Rx

Here is a brief report on where we are with the 230 GHz SIS Rx.

What we are trying to build, as quickly as possible, is a 4.2K closed cycle refrigerator system consisting of a main dewar to which may be attached mini dewars outfitted for different frequency ranges. The first mini dewar will be a dual channel 230 GHz receiver.

1) Mixers

Tony's group has recently tested a 230 GHz mixer.

The mixer uses a Hypres junction with integrated tuning elements. On the wafer from Hypres are junctions with slightly different tuning elements. The mixer had spectacularly good performance at 200 GHz-100K DSB. This noise temperature was measured with a substantial room temperature loss and in a practical receiver we would expect a noise temperature of around 70K DSB. The mixer was easy to tune and will be used as a double sideband device. Tests will be repeated with slightly different tuning elements in order to achieve the same performance at 230 GHz.

We have three of these blocks. Tony is going to get another three made immediately.

2) Triplers

Tony's group is building three more triplers.

3) Cryogenics

We have suffered a bad setback as a result of Troy Henderson's accident. This may delay testing of the cryogenics.

a) The Refrigerator

The 4.2K refrigerator is finished and has been tested. It has the proper capacity at 4.2K.

b) The Main Dewar

The main dewar is almost finished and will be assembled in Green Bank during the week of 12 Sept.

c) The Transfer Tubes

The transfer tube for transferring 4.2K from the main dewar to the sub-dewar has been tested and works. A total of four tubes have been fabricated.

d) The Heat Switch

No design work has been done on this as I have been fully occupied with the Scout proposal during my time in Charlottesville. However, the whole system can be tested and put on the telescope for observations without the heat switch.

4) The Mini Dewar

James has designed the mini dewar and we have had two fabricated. James and Jack will work outfitting one with parts to make a dual channel 230 GHz receiver. John will use the other for cryogenic tests in Green Bank. The Charlottesville shop is currently fabricating the internal parts for the receiver dewar.

5) Time Table

This is an extremely optimistic time table and I am doubtful that we can achieve it, but I think it's worth trying.

Job	Completion Date	Person
Test main dewar	30th September	John
Cool down, test mini dewar	15th October	John
Move cryogenics to CV	1st November	John
Complete fabrication of receiver mini dewar	1st November	James & Jack
Start RF tests in CV	15th November	James & John

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To achieve this we need the following:

- a) Two HEMT amplifiers from CV (by 30th Sept.)
- b) One 230 GHz non working mixer to act as mechanical model (by 1st Oct.)
- c) Two working, tested tested 230 GHz mixers (by 15th November)

c: James  
Jack  
Phil ✓  
Tony  
Mike