

National Radio Astronomy Observatory  
Tucson, Arizona

March 28, 1983

MEMORANDUM

TO: M. Balister  
FROM: J. M. Payne  
SUBJECT: 12-M Projects

Now that we are observing with the 12-M telescope it seems appropriate to give some thought to future projects for the new telescope.

Our top priorities for the next several months must be:

- 1) Test the bolometer system and fix any problems.
- 2) Complete and test the 200-300 GHz cooled mixer receiver and release it to observers.
- 3) Develop any electronic systems needed by J. Findlay for further improvements in the surface.

Assuming that there are no dramatic breakthroughs in SIS mixers (i.e., NRAO doesn't push to put one on the 12-M telescope). My list of projects looks like this:

- 1) 70-90, 90-120 GHz Cooled Mixer Receiver

As we all know our present cooled mixer receiver is by no means outstanding at the CO frequencies. With improved mixers and by splitting the band into two parts we will be able to achieve 200 K S.S.B. over this band. Magne, Jesse and myself have developed and tested a dual polarization diplexer that would also serve as an image terminator. Provided an SIS receiver is not on the horizon, I believe this project should have top priority.

Engineer - New Engineer or Payne

2) Consolidation of Optical Devices

The basic concept of receiver mounting and selection outlined in my original memo has been well demonstrated over the past several weeks. The system right now is "bare bones". Here is a list of things that need to be done:

- a) Build an automatic drive system for the selection mirror.
- b) Incorporate the path length modulator into the selection mirror.
- c) Build a cooled chopper calibration system to sit under the selection mirror.
- d) Build an image termination system to terminate the unwanted sideband in a 15 K load.
- e) Build a fast beam switch into the optical path.

Engineer - Payne

3) Inductosyn Electronics and Interface

The Baldwin encoder situation keeps me awake at nights. We could be just fine for the next couple of years or we could be caught with our pants down. I think fast action is justified and we seem to be doing this.

Engineer - Freund

4) 130-170 GHz Receiver

There doesn't seem to be a tremendous amount of demand for a good receiver in this band. I believe the correct way to proceed is to modify our existing receiver (as far as I know it is still the best around) and make do with this for the next year. We should then build an improved dual channel, dual band receiver.

Engineer - Payne/Cochran

5) Edge Ball Measurer

John Findlay has suggested a way of measuring the edge balls quickly and accurately. A fair bit of mechanical and electrical design needs to go into this to do it right. I think it's a high priority job.

Engineer - Payne

6) New Digitized Cable System

Rich LaCasse has been working on a digital multiplexer for eliminating the majority of the control cables on the telescope. This is important if we wish to have three receivers cold and operational at the same time. Quite a bit of modifications to receivers and control room will be needed.

Engineer - Moorey

7) New Spectral Line Backend

The time has come to stop building filter receivers. The acousto-optic spectrograph has been well demonstrated at Caltech and I think it's time for NRAO to pick it up. A new back end consisting of several AOS devices and an autocorrelator would seem ideal for a spectral line back end that will last for the life of the telescope. A dual 1000 channel AOS with a 500 MHz BW and a dual 100 MHz 100 channel correlator would appear to be a good start. I'd like to talk to Sandy and Ray about this in detail.

Engineers - Payne - Optical  
Moorey - Digital

8) A New Computer System

The time seems to be ripe for a complete overhaul of our control and analysis system. Times have changed since the conception of the present control system some 12 years ago and many old fashioned home made interfaces can be eliminated now. Betty Stobie, Bob Freund and Graham Moorey are working on this at the present time. They have a rough idea of the cost and will be writing a separate memo on this. This major change will require a lot of engineering support.

Engineers - Freund, Moorey

9) Array Receiver

There has been a great deal of interest expressed in an array receiver for spectral line work. A 3 x 3 array seems to be a reasonable start from a hardware point of view but a major question needs to be answered. Does each of the 9 feeds illuminate the whole dish with suitable spatial separation to produce nine separate beams? Or does each feed illuminate 1/9 of the dish and using VLA techniques so generate 36 beams? Someone needs to look at the concept and find out what astronomers want.

Engineers - ?

There are other projects that come to mind, of course, but these seem to be the major ones. At any rate I hope this quickly written memo can be used as a starting point for some discussion.