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January 17, 1990

Dr. Paul Vanden Bout  
Director, NRAO  
Edgemont Rd.  
Charlottesville, VA 22903

Dear Paul:

I am writing this letter in connection with our recent phone conversation, where we discussed the possibility of equipping the 12 meter telescope with SIS mixers over its entire operating range (70-360 GHz). I would, again, like to emphasize the importance of supplying the 12 meter telescope with these mixers. From my extensive observational work FCRAO, NRAO, CSO and IRAM, I have found SIS receivers to clearly be superior to Schottky diode mixers. In fact, there is quite a dramatic improvement in sensitivity in going from Schottky diode to SIS mixers. One of the reasons why the 12 meter has remained competitive has been because of its superior 3mm SIS receiver. I feel it essential that other such receivers be built.

For the past two years, I have been anxious to try various projects at the 12 meter telescope at frequencies that are not covered by its one SIS receiver. Tucson has indicated to me on various occasions that SIS mixers will be built at the other frequencies. Yet, I have seen very little progress in this area. In fact, in the four years that have elapsed since John Archer left NRAO, the only new innovations in mm-wave receivers for the 12 telescope appear to have come from the people in Tucson (i.e., the eight-beam 230 GHz system). Furthermore, I understand that the NRAO 3 mm receiver, the one SIS device presently working on the 12 m telescope, was in fact developed at NASA Goodard, not NRAO. Apparently, very little mixer development for the 12 m telescope has occurred. As I am not familiar with SIS technology, I discussed the timescales on which SIS mixers can be produced with Dr. Thomas G. Phillips at Caltech. Dr. Phillips is certainly one of the world's foremost experts on SIS development. He said to me that there is no excuse for the 12 meter not to have SIS mixers across its entire operating range, given the personnel at the Central Development Lab and the number of year SIS development has been occurring at NRAO. Since Dr. Phillips has been on the NRAO Visiting Committee, I am sure he is also quite knowledgeable about the activities of the Central Development Lab.

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It, therefore, appears that the absence of SIS mixers on the 12 m telescope, at least in part, is really an emphasis problem at the Central Development Lab rather than a result of technological difficulties. I find this lack of emphasis particularly unacceptable, since it appears much effort goes into selling SIS mixers to other observatories, including IRAM. Perhaps the remoteness of the Central Development Lab from the telescope that they are supposed to be supporting creates an atmosphere of detachment from the telescope's needs. This isolation must be counter-productive, as the main purpose of the Central Development Lab surely has to be to support NRAO telescopes, not market devices to the competitors. It seems only logical that the entire mm-wave effort at NRAO should be in one location--namely, at the site.

I must point out that as a mm-wave astronomer, I have had tremendous difficulty in obtaining observing time at IRAM. This appears to be a common problem for U.S. astronomers. The "open-observer" policy that NRAO has always followed apparently is not being reciprocated by IRAM. I therefore find it particularly inappropriate for the Central Development Lab to be selling any mixers to IRAM, especially since new receivers for the 12 m telescope are not being built. In fact, I am sure that both N.S.F. and Congress, which are the sources of funding for NRAO, would also question these activities. Such action by the Central Development Lab does not endear them to the U.S. mm-wave community.

In your recent letter to supporters of the 12 m telescope, you stated quite clearly that NRAO is still supporting mm-wave astronomy. I would think that the best method by which NRAO can do this is by providing the 12 meter telescope with more SIS mixers. In particular, the complete 3 mm band (70-115 GHz) needs to be covered, as well as the entire 1.2 mm band (200-300 GHz). In addition, I would strongly suggest a 2 mm receiver (120-170 GHz) be constructed. I have heard that plans have been made for a 2 mm system, but it appears to always drop from the priority list due to certain scientists within NRAO feeling the 2 mm region to be a "barren" band. Consequently, I have enclosed a spectrum at 2 mm, taken at IRAM with their SIS receiver. The spectral line confusion limit illustrated in this spectrum was reached in only a few hours integration time.

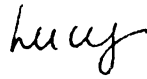
I would also like to point out that I have used SIS receivers on the CSO in October, 1989 at 1.2 and 0.8 mm both which utilized waveguide mixers. These receivers, made with lead junctions, worked tremendously well. I would rather see SIS receivers with lead junctions on the 12 meter now, rather than with niobium junctions five years from now.

If NRAO claims to be supporting a mm-wave effort, then it ought to be taking more aggressive action in this regard. Having endless discussions and expensive meetings about the proposed mm-wave array is not a particularly profitable way to accomplish this. Nor is selling SIS mixers to IRAM. Building SIS mixers for the 12 meter telescope is far more crucial. In fact, it is really what NRAO is all about.

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Thank you for your attention in this matter.

Sincerely yours,



Lucy M. Ziurys  
Assistant Professor of Chemistry

LMZ/lcb

xc: M. Balister  
D. Emerson

$V_{LSR} = +125 \text{ km/s}$   
Shift ①

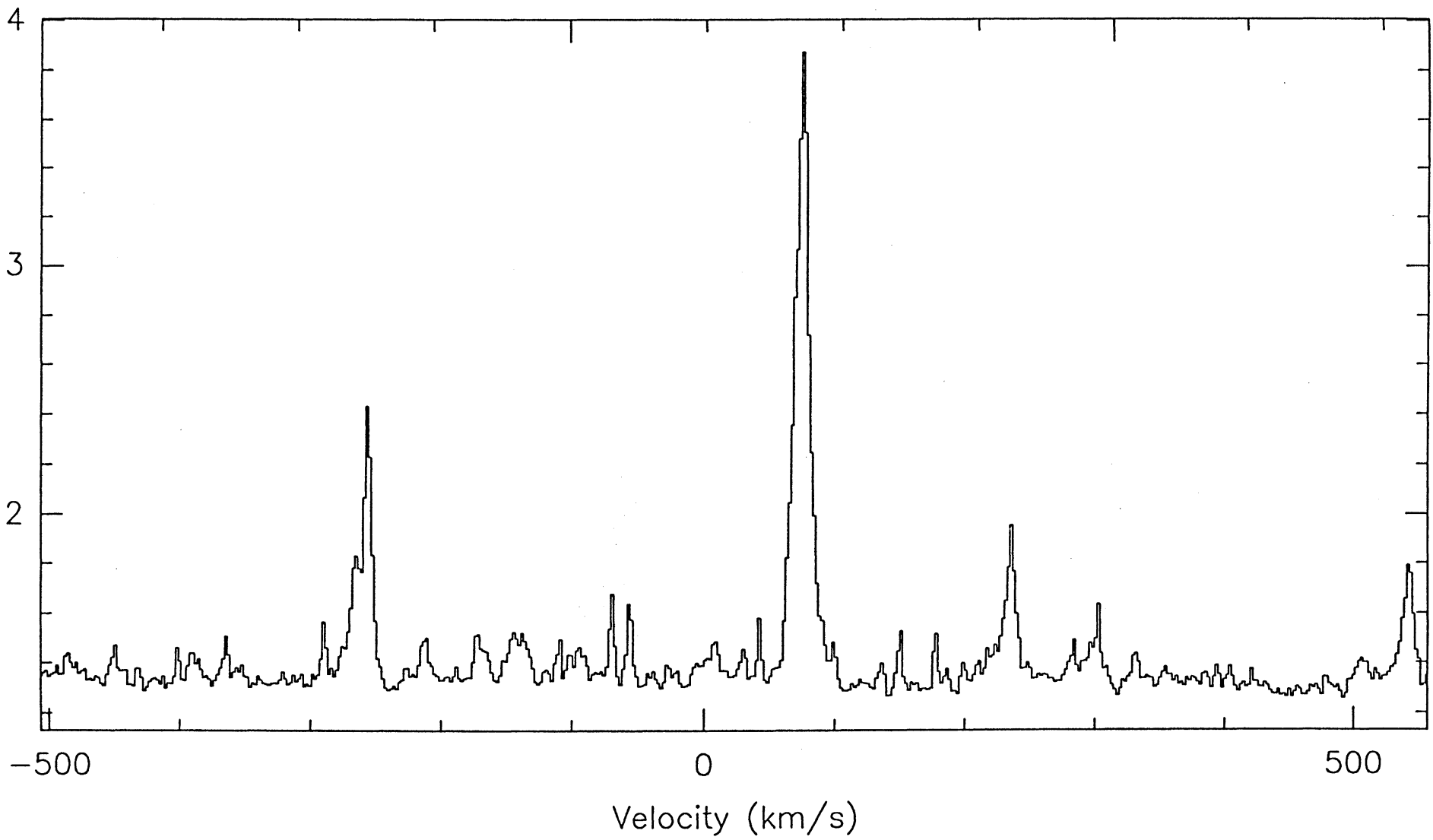
Ziurys et al: IRAM

144 GHz  
Orion-KL

Rest Frequency (MHz)

144200

144000



Rest Frequency (MHz)

144200

144000

