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STATUS REPORT ON MILLIMETER-WAVE PROJECTS IN THE CENTRAL DEVELOPMENT LABORATORY

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August 11, 1986

SIS MIXER STATUS

SIS Junctions

Sources: NBS/Princeton/GISS (stock)
IBM ("soon"!)
Hypres (stock)
UVA/NRAO collaboration (soon)

90-120 GHz SIS Receiver

SSB, at 4.2K, Hypres junctions can now repeatedly get T_R < 100K SSB in the lab test-receiver, or 80-90K cooled to 2.5K.

DSB at 2.5K we can get ~ 60K. (Results on the lab test-receiver are 10° worse than on the Columbia sky-survey telescope.)

When James Lamb visited us a month ago, we discussed the excessively high noise of the present telescope receiver, and believe we can account for most of it in the excess input waveguide and IF cable losses.

230 GHz SIS Receiver

The mixers blocks are made, and the 230 GHz test-receiver about half complete.

We plan to use UVA/NRAO junctions when they are ready.

Time scale --- end of the year for working mixers.

345 GHz SIS Receiver

This is essentially a scaled version of the 230 GHz mixer. The initial NRAO/UVA SIS mask set will not include 345 GHz devices, concentrating on 115 and 230 GHz.

Time scale --- second half of 1987.

SIS Direct Detectors

These are expected to be limited in sensitivity almost entirely by their video amplifiers. Work is needed in this area, especially Paul Richards' suggested AC-bias scheme.

The NRAO/UVA SIS mask set at present being fabricated will have some single junctions specifically for experimental SIS detectors at ~ 100 GHz.

SCHOTTKY MIXER STATUS

200-240 GHz Mixers - for the 4(8) beam receiver and Liu's site testing receiver.

We have seven new blocks (#20-26) and have just started measuring these. There are three different diode types (1H6, 2I1, 2I2) to be evaluated.

Unfortunately, we have no SEM photographs of the good mixers now on the telescope. They had 2P9-300 diodes which are no longer available.

240-270 GHz Mixers

We are now repairing three mixers for Tucson (#'s 1A, 11, 12). One has been returned to nearly its original performance.

200-270 GHz Broadband Mixer

There is one mixer (#14) which had fairly flat performance over the whole band. However, it would give T_R 150-300° greater than the optimized low- and high-band mixers -- probably T_R = 700 - 900K (200-270 GHz) compared with 400-650K for the separately optimized mixers.

280-310 GHz Mixers - (Needed November)

We hope to be able to tune the 340 GHz mixer down to 280-310 GHz. However, we cannot test in this range without an LO tripler.

LO MULTIPLIER STATUS

340 GHz Q-O Tripler - (Needed January 1987)

Neil is re-contacting.

We are confident it will work at 330-360 GHz, but it is not clear it will work at 300 GHz.

280-310 GHz Waveguide Tripler - (Needed early October)

Peter's new design is in the shop. He hopes it will operate all the way from 280-350 GHz.

This is "on-hold" because of the pressure of other work.

Line Receiver:

Questions needing immmediate attention before committing ourselves to a planar multi-beam array receiver are:

- If our back-end can only handle eight IF's, will the planar array be in any way superior to eight conventional SIS receivers?
- How do we connect IF and bias to an array of, say, 50 mixers in an area 5 mm x 5 mm?
- What is the best way to make an IF processor to give correct gain and phasing in 50 channels and produce eight IF outputs?
- How can we achieve LO injection with sufficient uniformity to drive SIS mixers?

Continuum Receiver

A focal plane array of direct detectors clearly has attractions for continuum work. At present SIS direct detectors would appear the prime choice.

- See "SIS Direct Detectors" above.
- Optics more difficult than with coherent (mixer) array receiver.

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