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ELECTRICAL CONTROL OF POLARIZATION

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The new cooled OH system and the future cooled H system are dual-channel front-ends. This not only halves the required integration time for most measurements but also produces much greater flexibility for polarization measurements.

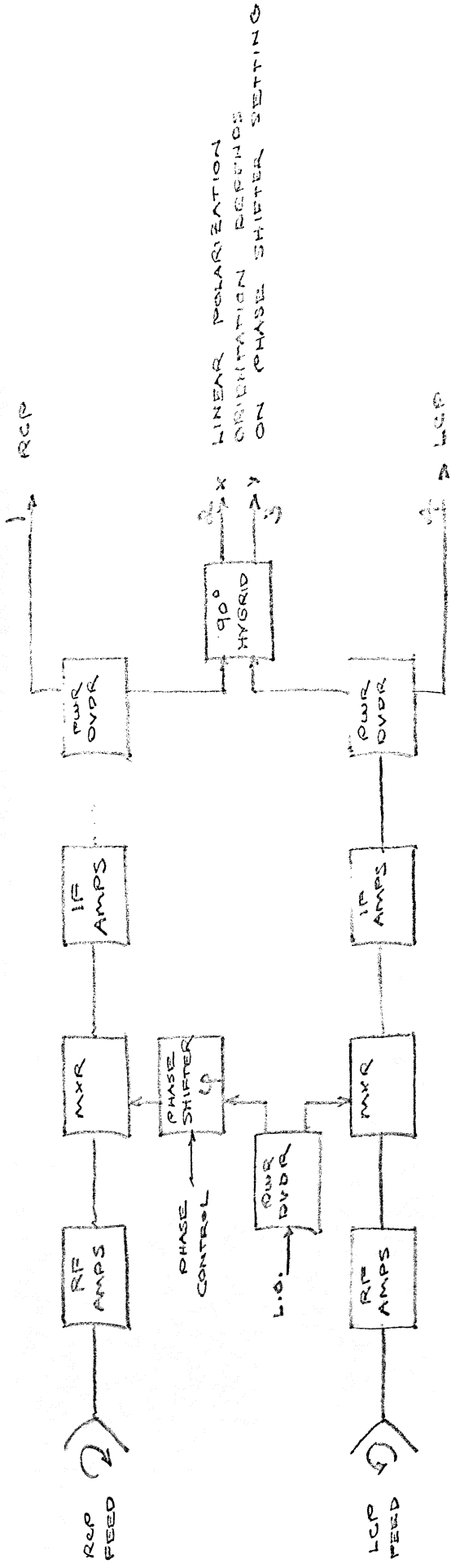
With dual-channel RF amplifiers it is possible to measure both linear and circular polarization without introducing any additional components between the feed and front-end. A method of doing so is shown in the attached figure. The feed in this case produces dual-circular polarization and these are reproduced at outputs 1 and 4, independent of the phase shifter setting, φ . Outputs 2 and 3 are orthogonal linear polarizations; the orientation angle, ϕ , can be varied by changing the phase shifter setting, φ . A variation of 180° in ϕ is produced by a 360° variation in φ .

If the feed is dual linear polarized and the same block diagram is used, outputs 1 and 4 will be linear polarized and outputs 2 and 3 will be circularly or elliptically polarized, dependent on the phase shifter setting. The feed on the new OH box can be changed from linear to circular from the control room through motorized-rotation of a quarter-wave plate. Thus, two methods of producing linear and circular polarization will be available; these are summarized in the table under the figure. The best method will depend on minimizing instrumental effects on the particular experiment. For example, circularly polarized feeds would be best for measuring small, linear polarizations because changes in RF amplifier gain affect both polarizations in the same way.

Some further points which should be considered are:

- 1) The phase shifter should be capable of rapid variation (i. e. , a diode, varactor, or ferrite phase shifter) in order to allow switched polarization measurements.
- 2) Cross-correlation of two outputs with the new 384-channel correlator may prove advantageous.
- 3) The gain and phase shift in each channel to the combined outputs must be equal. An additional calibration signal may be required to make this adjustment.
- 4) Mechanical front-end rotation equipment may be unnecessary in the future. The instrumental effects caused by the rotation of the feed and front-end are probably worse than the instrumental effects with electrical rotation.

A good article on polarization measurements is given by Marshall Cohen in the January 1958 Proceedings of the IRE.



OUTPUTS	FEED POLARIZATION
DIRECT (1 AND 4)	CIRCULAR LINEAR LINEAR WITH FIXED ORIENTATION
COMBINED (2 AND 3)	CIRCULAR OR ELLIPTICAL AS SET BY PHASE SHIFTER

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