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9.2A STATUS OF THE JICAMARCA RADAR

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The capabilities of the large 50-MHz radar at Jicamarca for MST observations were discussed in some detail in Handbook for MAP Vol. 9 by Woodman and Farley. Hence the description here will be quite brief and will concentrate on recent improvements in the facility.

MAIN FEATURES

The radar is located about 20 km from Lima, Peru at longitude 76.52 W and latitude 11.56 S. It is well shielded by surrounding mountains, and most of the ground clutter is restricted to ranges of 15 km or less. The antenna consists of 18,432 half-wave dipoles (9216 crossed pairs) covering an area of 290 m by 290 m and divided up into 64 independent modules which can be individually phased and/or used as separate antennas in any way desired. The whole array can be steered about 3 degrees from the on-axis position (the limit is the beam width of the individual modules, which cannot be steered), and any polarization can be arranged. Even with this limited steerability it is straightforward to determine vector wind velocities by pointing segments of the antenna in different directions. The radar can also be used as in interferometer.

There are two sets of 50-MHz transmitters, one high power and one of lower power, and each consisting of 4 independent modules which can be used separately or combined. The high power units have a nominal power of a megawatt or more each and a duty cycle of 5-6%, but only one of the modules currently operates at this level, as is discussed more fully below. The low power units each deliver a maximum of about 60-70 kW of peak power, with a duty cycle of 2% or less and a bandwidth of up to 1 MHz (pulses as short as 1 microsecond). These can run unattended or nearly so and thus are the preferred transmitters for long experimental runs.

There are four independent receivers sharing a common local oscillator so phase comparisons between channels can be made. The output bandwidth can be selected to match pulse lengths ranging from 1 to 500 microseconds. The data-acquisition system consists of a radar controller, an 8-bit ADC system, and a Harris 100 series computer with associated tape drives and disks. The Harris does not have an array processor or a high speed floating-point arithmetic card. The high speed on-line data processing should be done in fixed point. Further details are given in the previous MAP handbook as mentioned above.

RECENT DEVELOPMENTS

The first module of the new high power transmitter designed and built by SRI International is now installed and operating well. The maximum peak power of this unit is about 1.4 MW, with a maximum duty cycle of 6% and a minimum pulse length of 1 microsecond (2 microseconds have been obtained so far). The other three modules are the originals, and pulses shorter than about 15 microseconds are seriously degraded. Furthermore, the tubes of two of these older units are far past their prime and deliver 400-500 kW of peak power at most. One of the old units, however, now has a relatively young tube (perhaps the last in the world?) obtained from Arecibo. This puts out at least 700 kW and probably can be coaxed into delivering more. Work is underway to replace the three remaining old modules with the new SRI design, but it will probably be the summer of 1985 before any of these additional new units are finished and operating.

The old digitizers and interfacing hardware at Jicamarca have now been completely replaced, leading to some improvement in speed and a great improvement in reliability. A major effort to improve the software and make it more user friendly has recently been completed also. It is now quite simple to design a rather complicated radar experiment or interleaved series of experiments, each with a different transmitting and sampling scheme. Experiments can be changed from one pulse to the next, and changes in the experiment can be made easily in real time without missing more than one or two IPPs. One computer console displays the radar pulsing and sampling parameters in a sort of "thumbwheel" format, and the user can easily change these numbers by moving the cursor to the appropriate spot on the screen and typing in the new values. With one more keystroke one initiates the revised experiment. To perform a sequence of experiments the user simply generates a series of thumbwheel displays and the appropriate commands for stepping from one to the next, and then stores these in disk files.