Shortest-Pulse Measurements with the SOUSY VHF Radar at Jicamarca

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The SOUSY VHF Radar is now located at the Jicamarca Radio Observatory. The new radar control and digital receiver data acquisition unit replaced the earlier one, used in Germany, and now allows very high resolution range sampling and coding. Experiments were carried out in April 2006 in order to check the thickness of reflectivity layers in the lower atmosphere (see paper in I.1).

We describe here the technical preparations for this special experiment, namely the careful measurements of the bandwidth of the antenna array, the transmitter and the receiver system. Test experiments were carried out with a complementary code with 250 nanoseconds baud length. The transmitter stages were tuned for optimum amplitude and phase response. The signals at the output directional coupler and the received backscattered signals were oversampled at 125 nanoseconds, corresponding to 18.75 meter range. Due to the wide bandwidth of 6 MHz interference by the Channel-2 TV transmitter in Lima had to be minimized. The most resolution limiting factor is the bandwidth of the transmitter 600-kW final amplifier, which resulted in a minimum transmitted pulse width of 370 nanoseconds. Using the driver at 20 kW, the minimum pulse width was even shorter. We describe the decoding and deconvolution procedures, which should allow a better resolution than 370 nanoseconds, as well as a local normalization method applied to the data. This shows that layers/sheets thinner than 30-40 meters were observed, which are described in paper I.1. We claim that this configuration of the SOUSY VHF Radar at Jicamarca is the world-leading MST radar in terms of range resolution.