THE CANADIAN GEOPHYSICAL LONG BASELINE INTERFEROMETER

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A new VLBI system has been developed and put into operation. The system has three distinctive characteristics as compared with current VLBI practice, namely, the use of a wavefront clock at each station, the capability of a burst mode operation with high speed sampling, and the use of multiple 12 Mb/s data recording channels on commercial VCR's. The main use of the system is to be in geophysical investigations where these new features may prove of value.

A wavefront clock at each station is used to generate the local oscillator for down conversion of RF signal to baseband and to sample the baseband signal for recording. The clock depends on the reference source position as well as the station location. At each station a received wavefront from the reference source position is tagged with the time of its arrival at the earth's centre. Thus signals received at different stations tagged with the same time came from the same wavefront. This provides station oriented fringe rotation and delay tracking as opposed to the commonly used baseline oriented corrections. The more complicated microprocessor controlled clock at each recording station is balanced by the simplicity of the processor required to correlate the data.

The use of the wavefront clock to tag the received signal removed the constraint of sampling the received signal uniformly at each station. Since signals tagged with the same time received at different stations belong to the same wavefront and hence are correlated, as long as signals with the same times are recorded at each station, they can be correlated without regards to how these samples are distributed in time. This makes possible the burst mode operation of the system. Sampling at each station can be performed at high speed in bursts, stored in a buffer memory, and then recorded at a lower rate. This means bursts of signals of larger bandwidth than that dictated by the

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recording bit rate can be recorded. The width of the correlation function is thereby reduced. A ten to one expansion in signal bandwidth is readily achieved. In addition, to observe impulsive phenomena such as pulars, the entire record would contain useful signal. It should be noted that since the total number of samples recorded in a time interval is given by the recording bit rate, the signal to noise ratio obtained in each recording channel remains unchanged.

Each recording channel makes use of a VHS type VCR operating with a bit rate of 12 Mb/s. This is made possible by the use of partial response signaling, an adaptive equalizer and a viterbi decoder on playback. Currently the VCR industry is witnessing advances in higher quality video. This would be directly translated into higher channel bit rate. The electronics of the recording system is designed to operate at higher rates to accommodate anticipated enhancements without modifications. The small size and simplicity of VCR's as well as the potential for enhancement makes the system attractive in many situations.

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