HYDROPHONE CABLE CROSSTALK TESTS
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2/12/91

SUMMARY: We measured audio-frequency crosstalk between unshielded pairs in a standard multiconductor cable, using hydrophone signals as input. Results show crosstalk amplitudes of a few percent, indicating the need for individually shielded pairs in DUMAND hydrophone cabling.

We propose to mount 5 hydrophones per string, and cabling would be simplified if we could avoid individually shielded twisted pairs. To test crosstalk levels, we borrowed a partial spool of standard multi-twisted-pair communications cable, applied a hydrophone signal to one pair, and measured voltage levels on the unconnected pairs.

The cable used was a 20m length of Belden 9305, which contains 4 pairs of 22 AWG solid tinned copper conductors inside an overall foil shield. The shield drain wire was connected to the ground lead in each test case.

We connected a Benthos AQ17 hydrophone/preamp to one pair and measured the output of disconnected pairs using our GESPAC data logger, which reads a 12-bit ADC at 200 kHz. With the ADC input scale set to $\pm$ 5V, this provides a 2.4 mV least count at 50 microsecond intervals. The sound source was a 13.58 kHz pinger coupled to the hydrophone in a 5 gal water pail. Pinger amplitude was adjusted to give approximately 2.5V peak output from the hydrophone.
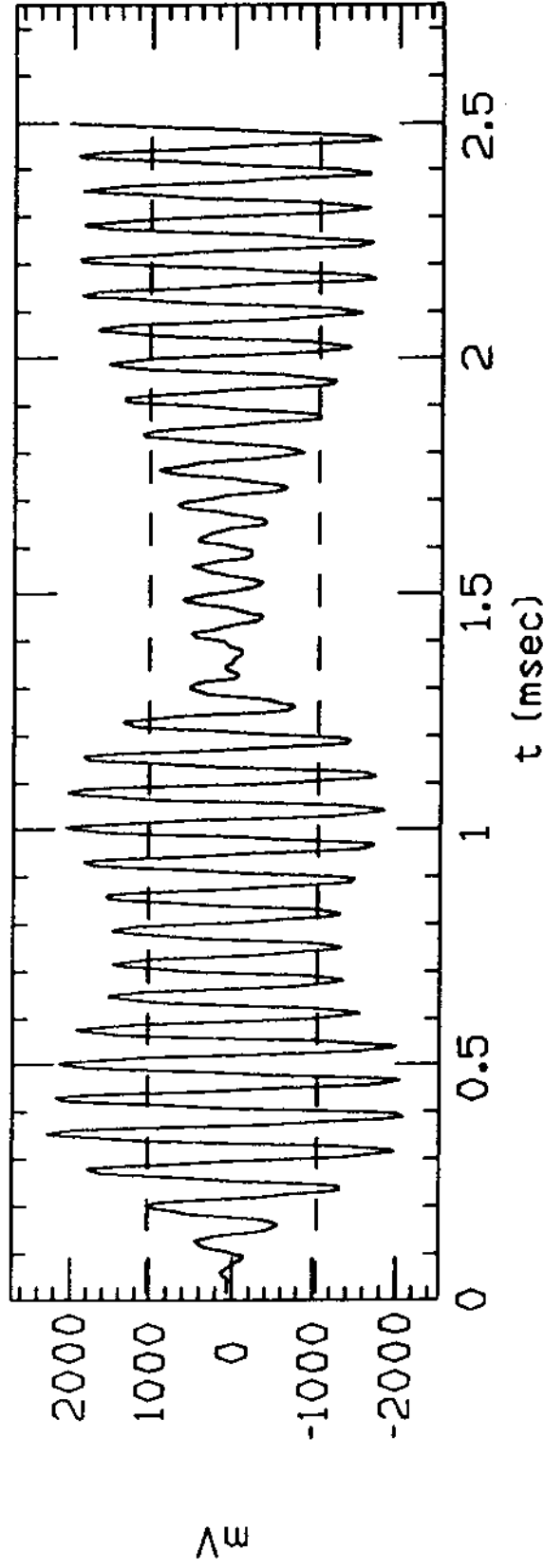
No difference was observed on an oscilloscope between results obtained with the cable unrolled and rolled on the spool. The logged data were taken with the cable spooled.

Results are summarized in the table below. The attached plots show a sample of the signals obtained directly from the hydrophone, and from a disconnected pair. The RMS level for the sample shown is indicated by dashed lines on the signal graphs. The frequency spectrum was obtained by applying an FFT procedure to the logged signals. These results suggest lower crosstalk efficiency for higher frequencies.
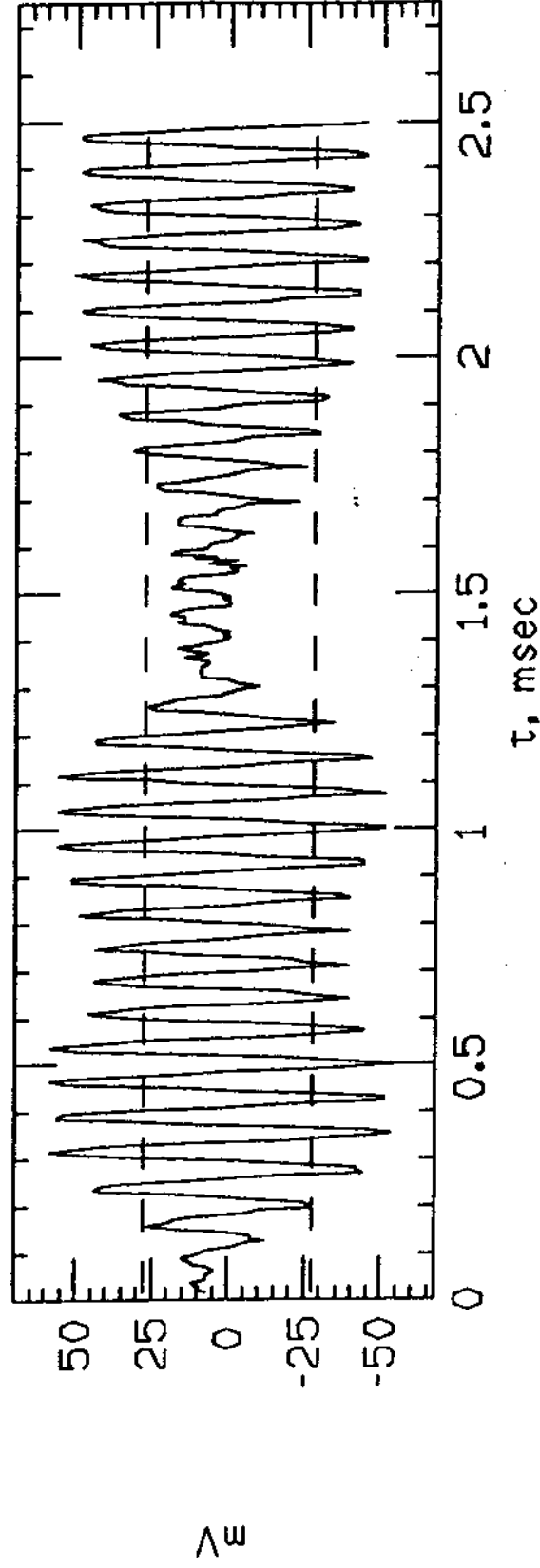
CROSSTALK TEST RESULTS

Signal	P-P (ADC counts)	RMS (ADC counts)
Input (hydrophone)	1831	421.3
Pair 1 (connected)	1827	418.4
Pair 2 (disconnected)	51	11.3
Pair 3 (disconnected)	61	12.9
Pair 4 (disconnected)	30	7.0

crosstalk test: input signal

mV

t (msec)

crosstalk test: unconnected pair

mV

t, msec

crosstalk test: input signal spectrum

I(f), arbitrary scale

Frequency (kHz)
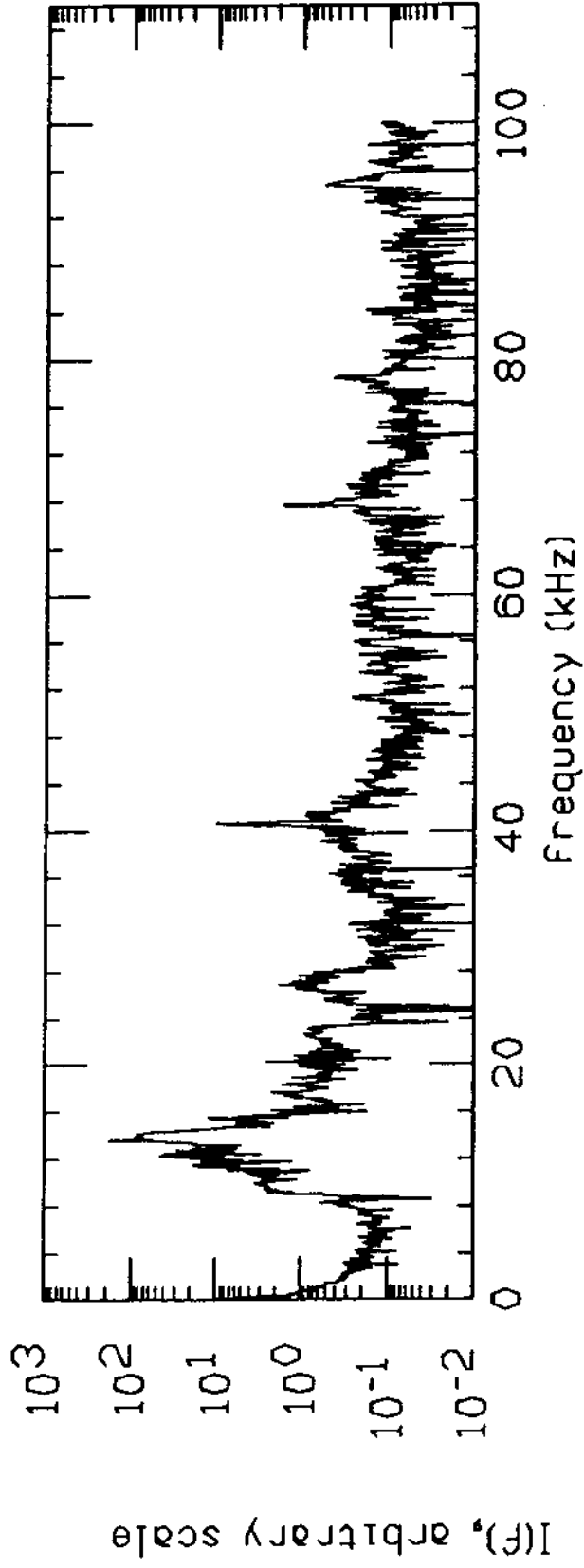
crosstalk test: unconnected pair spectrum

I(f), arbitrary scale

Frequency (kHz)