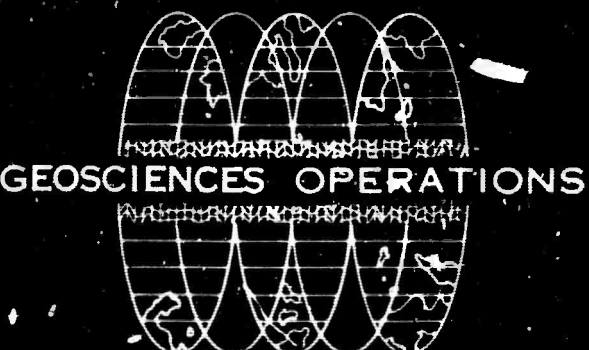


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TEXAS INSTRUMENTS
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MULTIPLE ARRAY PROCESSOR

QUARTERLY REPORT NO. 2

Covering the Period

1 January 1965 through 31 March 1965

TEXAS INSTRUMENTS INCORPORATED

Science Services Division

P. O. Box 5621

Dallas, Texas 75222

Contract AF 33(657)-13904

Beginning 1 October 1964

Terminating 31 July 1965

Total Estimated Cost

\$305,605.00

ARPA Order No. 104

Project Code 8100

Sponsored by

Advanced Research Project Agency

Nuclear Test Detection Office

Prepared for

AIR FORCE TECHNICAL APPLICATIONS CENTER

Washington, D. C.

April 25, 1965

MULTIPLE ARRAY PROCESSOR

A. INTRODUCTION

Quarterly Report No. 1 for this contract included a rather extensive introduction into the requirements and concepts of the contract itself and broadly detailed objectives. Reference to those objectives should be made while reading this current report.

B. DEVELOPMENT AND ANALYSIS

1. Data Collection and Design

Sufficient data were collected at UBSO both to measure the wavenumber spectrum of the noise and to develop multichannel filter (MCF) systems for that station. Three multichannel filter systems have been developed. The first system was designed for infinite velocity signal models; the second, to preserve all signals with horizontal propagation velocities between 8.1 km/sec and infinite velocity; and the third, to preserve all signals with horizontal propagation velocities between 8.1 km/sec and 15 km/sec.

2. Evaluation of Multichannel Filter Systems

The wavenumber response of each of the multichannel filter systems was measured, and the response of the first two systems was found to be satisfactory. Signal preservation was good, and noise rejection lobes were found at wavenumbers corresponding to the actual measured wavenumber spectrum of the noise. The third system, however, was found to be unsatisfactory. The multichannel-filtered array did not produce appreciable rejection of noise in the velocity range between 15 km/sec and infinite velocity. This was due to the array's small size.

The contract monitor has been informed of this situation. No decision has been made yet regarding the signal model to be used for the third multichannel filter system at UBSO. Information regarding the measured wavenumber spectrum of the noise and the synthesis and evaluation of the UBSO multichannel filter systems is contained in a technical report now in preparation.

Data collection at TFSO was terminated because of flooded vaults and a large number of earthquakes from the Aleutian Islands. About 5 hr of usable noise spanning a 75-hr period was obtained. Because of the short time-span involved, TFSO noise data were not suitable for use

in synthesizing a multichannel filter system. However, the data were suitable for use in measuring wavenumber spectra of the noise.

Wavenumber spectra have been measured, and a preliminary interpretation indicates that the TFSO noise contains dominantly high-velocity components. These results are essentially in agreement with results obtained previously on Project VT/4053. The principal means by which multichannel processing separates teleseismic signals from ambient noise is the velocity difference between signal and noise; therefore, utilization of multichannel processing at TFSO probably will not be an effective means of separating teleseismic signals from noise at that station.

A meeting has been arranged with the project monitor, and the possibility of installing the 19-channel multichannel processor at some other station will be discussed. Results of the noise analysis at TFSO will be contained in a special technical report to be published at a later date.

C. ENGINEERING

Quarterly Report No. 1 contained a rather complete description of the hardware being developed. Design and construction of this hardware have progressed on schedule and, at this time, no problems have been encountered. A test set containing one delay line and two multichannel outputs has been constructed and tested. Very good results have been obtained for analog measurements. Digital computer measurements of the characteristics of the delay line test set are being made.

D. SUMMARY

The following are events considered to be important with regard to the progress of the contract:

- Two acceptable MCF systems have been developed for use at UBSO.
- Wavenumber spectral estimates of the noise field at TFSO have indicated high-velocity noise to be dominant.
- Good results from a MCF test set containing one input and two outputs have been obtained. More exact digital measurements are being made.
- Construction of the hardware has begun and is proceeding on schedule.