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AUTHORITY
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SUPPLEMENT TO

THE EFFECT OF THE NUMBER AND SPACING OF ELEMENTS ON THE EFFICIENCY OF LASA BEAMS

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TELEDYNE, INC.

Under
Project VELA UNIFORM

Sponsored By
ADVANCED RESEARCH PROJECTS AGENCY
Nuclear Test Detection Office
ARPA Order No. 624

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SUPPLEMENT 1

SUPPLEMENT TO

THE EFFECT OF THE NUMBER AND SPACING OF
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SEISMIC DATA LABORATORY REPORT NO. 203

AFTAC Project No.: VELA T/6702
Project Title: Seismic Data Laboratory
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Project Manager: Royal A. Hartenberger
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AVAILABILITY

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SUMMARY

A report entitled "The Effect of the Number and Spacing of Elements on the Efficiency of LASA Beams", was distributed on 21 December 1967. The study described the average signal loss, rms noise reduction, and S/N gain produced by beamforming eight teleseismic events two different ways. First, each event was beamsteered using 51 LASA SPZ inputs (intersensor spacing, Δ > 6 km), and the results were averaged to obtain the values plotted in the original figures. Second, each event was beamformed using outputs from 525 elements (Δ > 0.5 km) to obtain average values. We concluded from this study that beams composed of 51 traces reduce rms noise and improve S/N within 1 db of that produced by 525-element beams.

After publication of the report described above, we extended the analysis to include beams containing 17 channels (Δ > 12 km), 34 (Δ > 6 km), 68 (Δ > 3.5 km), and 119 channels (Δ > 3.0 km). The number of channels contributed to these beams by each of 17 subarrays was 1, 2, 4, and 7, respectively. Outputs from subarrays B1 through B4 were not used.

Recently we extended the study still further by forming LASA beams containing 336 traces (Δ ≥ 1 km) derived from the 21 subarrays. In these beams, outputs from sensors in the "B" and "C" rings of each subarray (a total of 9 per subarray) were not used. We have beamformed the original eight events in this manner and the results are shown in Figures 1, 2, and 3 along with the results of the original and extended SDL studies.
Figure 1

AVERAGE SIGNAL LOSS AND RMS NOISE REDUCTION PRODUCED
BY BEAMFORMING LASA TRACES.
DATA ARE PREFILTERED (0.4-3.0 CPS)
SPZ RECORDINGS OF P-WAVES FROM 8 TELESEISMIC EVENTS.
AVERAGE S/N GAIN PRODUCED BY BEAMFORMING LASA TRACES.
DATA ARE PREFILTERED (0.4–3.0 cps)
SPZ RECORDINGS OF P-WAVES FROM 8 TELESEISMIC EVENTS.

Figure 2
AVERAGE RMS NOISE LEVEL ON LASA BEAMS. DATA ARE PREFILTERED (0.4-3.0 cps) SPZ RECORDINGS OF 8 TELESEISMIC EVENTS.

Figure 3
SUPPLEMENT TO
THE EFFECT OF THE NUMBER AND SPACING OF ELEMENTS ON THE
EFFICIENCY OF LASA BEAMS SDL REPORT NO. 203

Scientific

Hartenberger, R. A.

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16. KEY WORDS
LASA
Beam efficiency
Array efficiency
Signal
rms noise
Signal-to-noise ratio