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Plots of the Processed Data from the

Temporary Instrumentation in the

GOLDEN GATE BRIDGE (SOUTH TOWER)

from the M_L 5.3 Gilroy Area Earthquake of 16 January 1993

California Strong Motion Instrumentation Program (CSMIP)

OSMS 93-10

Low-level accelerograms were recorded on the temporary SMIP instrumentation in the South Tower of the Golden Gate Bridge from a small, distant earthquake. The M_L 5.3 earthquake occurred near Gilroy, approximately 130 km away. The locations of the 8 sensors in the east leg of the South Tower of the bridge are shown in Figure 1. Three sensors are located at the base level, three at the roadway level, and two sensors are at the top level of the South Tower. The orientation of the horizontal sensors is given on the data plots as 180° (parallel to the bridge, nominally South (S)) and 90° (transverse to the bridge, nominally East (E)). The temporary instrumentation system includes two 12-bit synchronized digital recorders.

The peak acceleration, velocity and displacement on the bridge are 0.02 g, 1 cm/sec and 0.07 cm, respectively. This motion was recorded on channel 8, located at the top level, in the direction transverse to the bridge.

The processed data plots for these records are presented in the following order:

1. The raw record (20.5 seconds in length) with channels 1 through 8 shown on a single page.

2. Phase 1 (Vol. 1) data: uncorrected accelerations. Accelerations for the full record length (20.5 seconds) are plotted with a common scaling factor for all channels; three channels are plotted per page.

3. Phase 2 (Vol. 2) data: instrument and baseline-corrected acceleration, velocity and displacement. The data are plotted with equal scaling for all channels. The filter bandwidth determined during processing is indicated on the plots. <u>For this processing, the usable data bandwidth is from 1 to 47 Hz (0.021 to 1.0 seconds period)</u> (see Note below).

4. Phase 3 (Vol. 3) data: response spectra. The pseudo-velocity spectra (PSV), the pseudo-acceleration spectra (PSA), and the displacement spectra

(SD) are presented on a tripartite logarithmic plot for each channel; three channels are plotted per page. The spectra are plotted for periods within the usable data bandwidth.

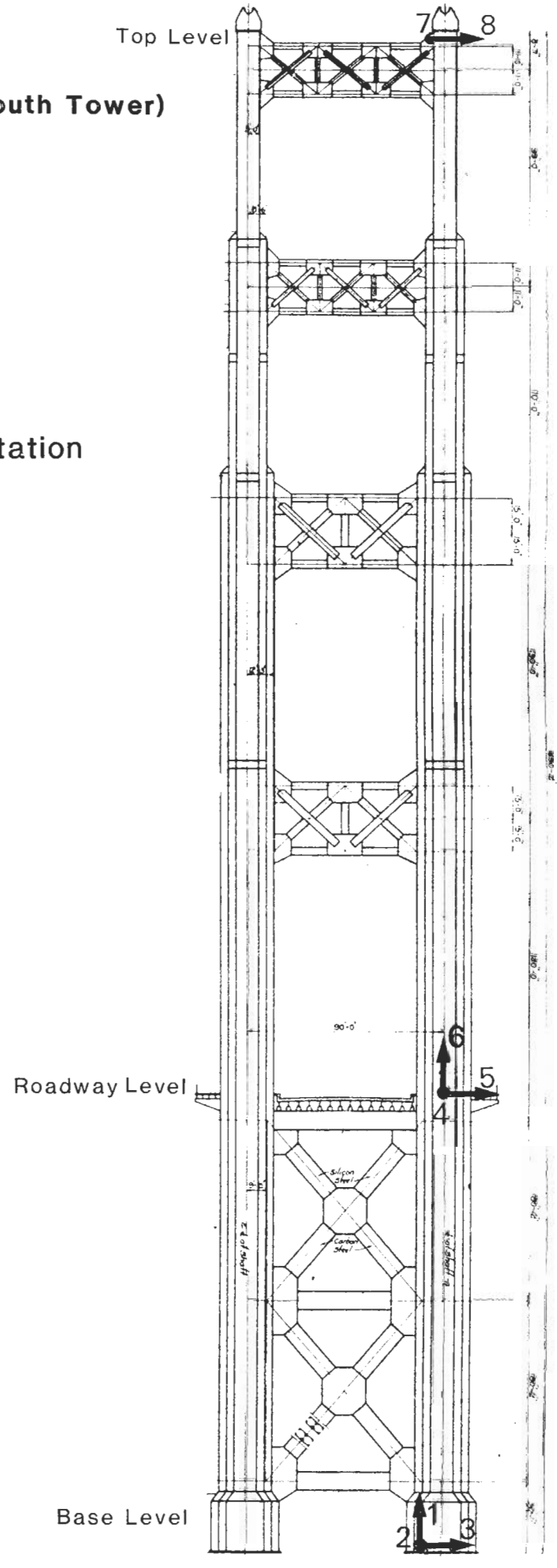
Note:

The low frequency filter has a corner frequency of 1.2 Hz, a roll-off termination frequency of 0.6 Hz, and a 3 dB frequency of 1.0 Hz. The high frequency filter has a corner frequency of 46 Hz, a roll-off termination frequency of 50 Hz, and a 3 dB frequency of 47 Hz. These filters are used for all channels recorded at the bridge to make channel-to-channel comparisons convenient.

10/27/93

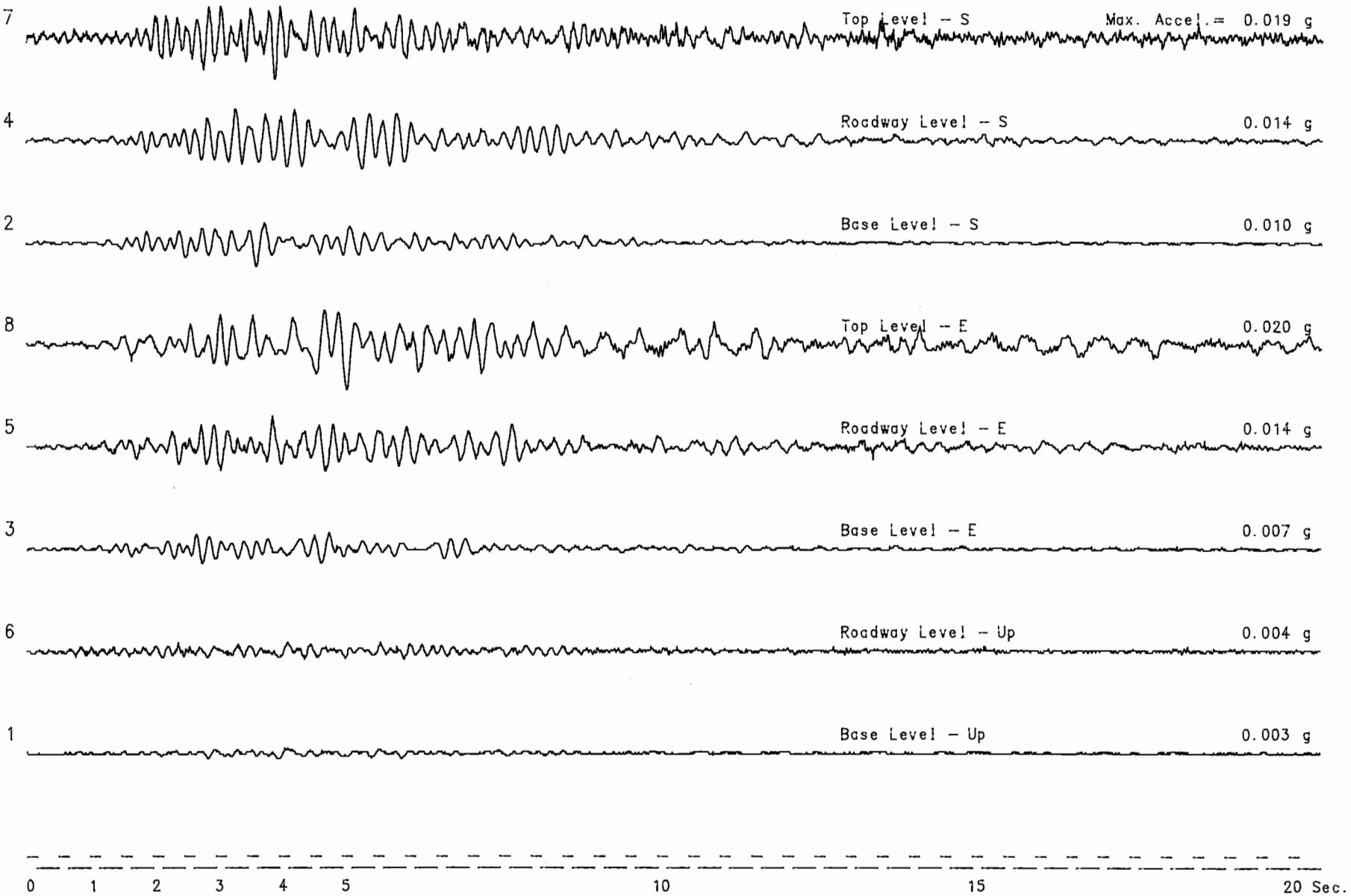
San Francisco-Golden Gate Bridge (South Tower)

Figure 1:
Sensor Locations of
Temporary Loaned Instrumentation



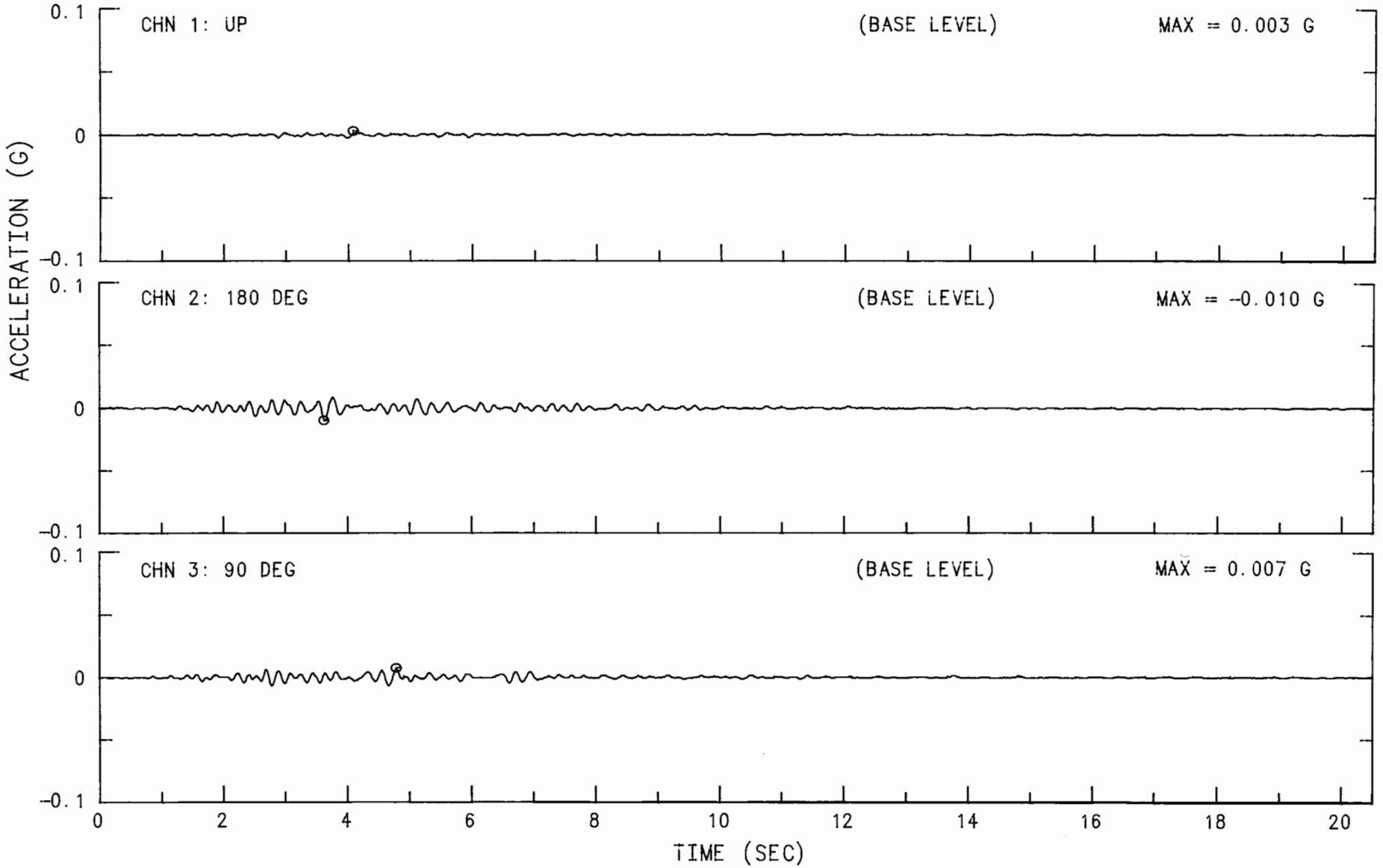
San Francisco – Golden Gate Bridge (South Tower)
(CSMIP Station 58T01)

Gilroy Area EQ of 1/16/93, ML = 5.3 at 130 km
RECORD 58T01-CS113-93098.19



This page plotted with 20x vertical exaggeration.

GILROY AREA EARTHQUAKE JANUARY 15, 1993 22:09 PST
S.F. - GOLDEN GATE BRIDGE (SOUTH TOWER)
UNCORRECTED ACCELEROGRAM 58T01-CS113-93016.19 102693.1641-QG93A338



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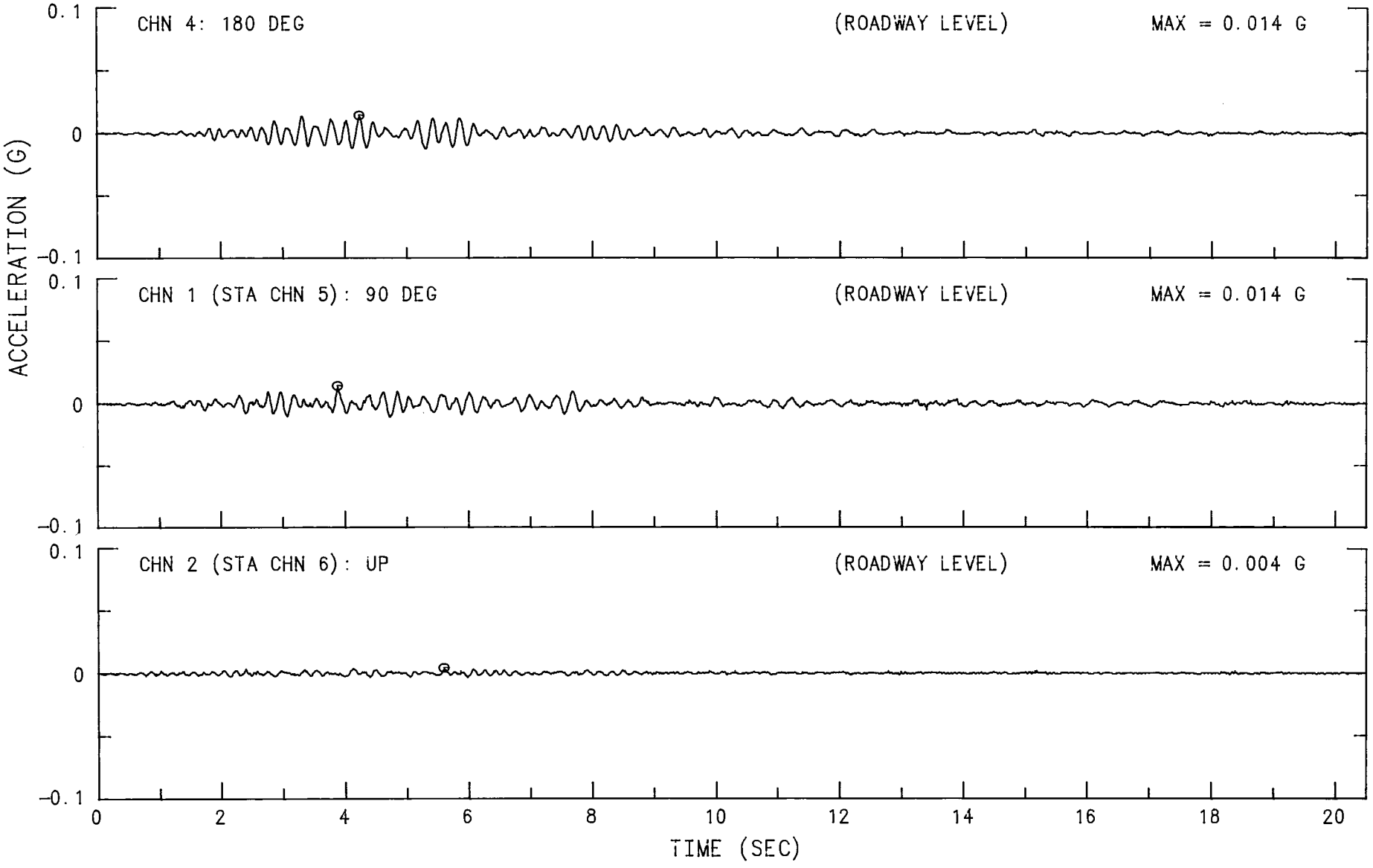
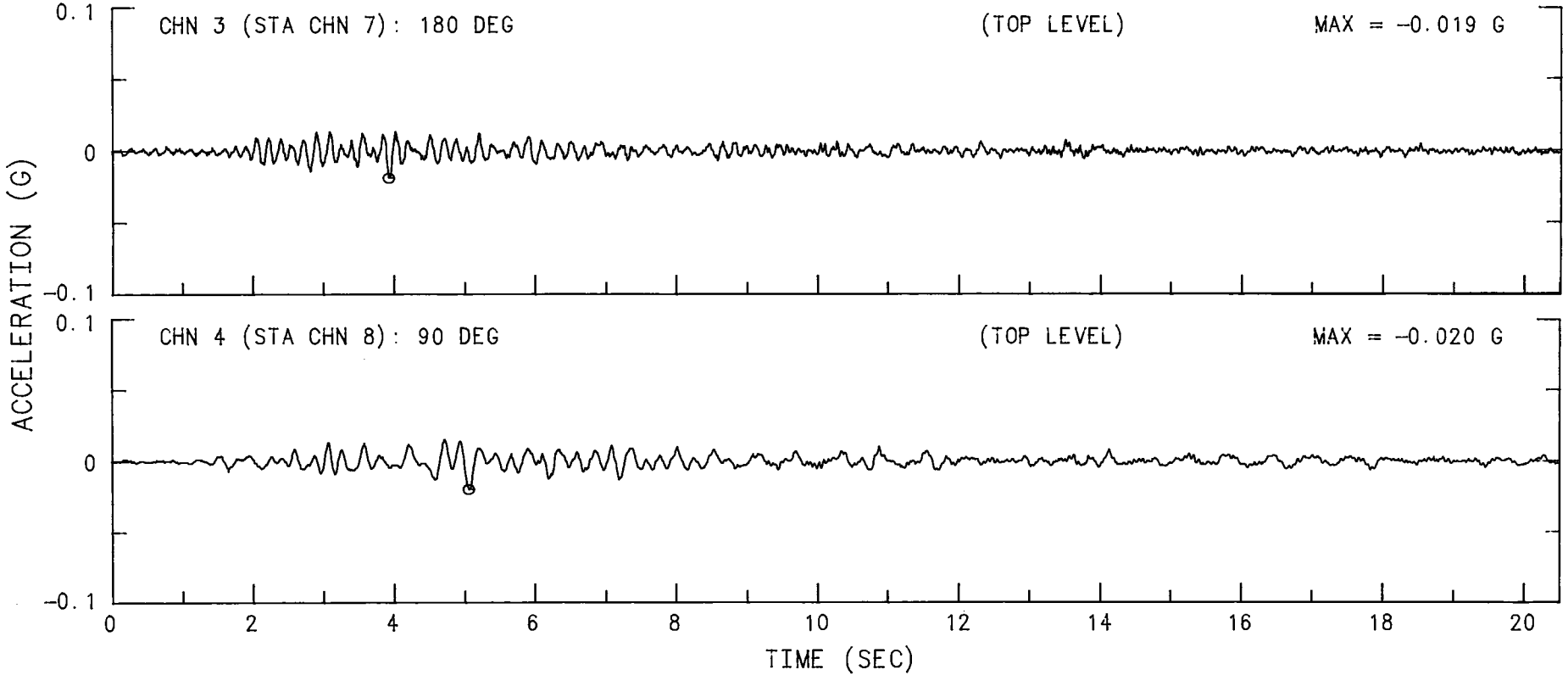
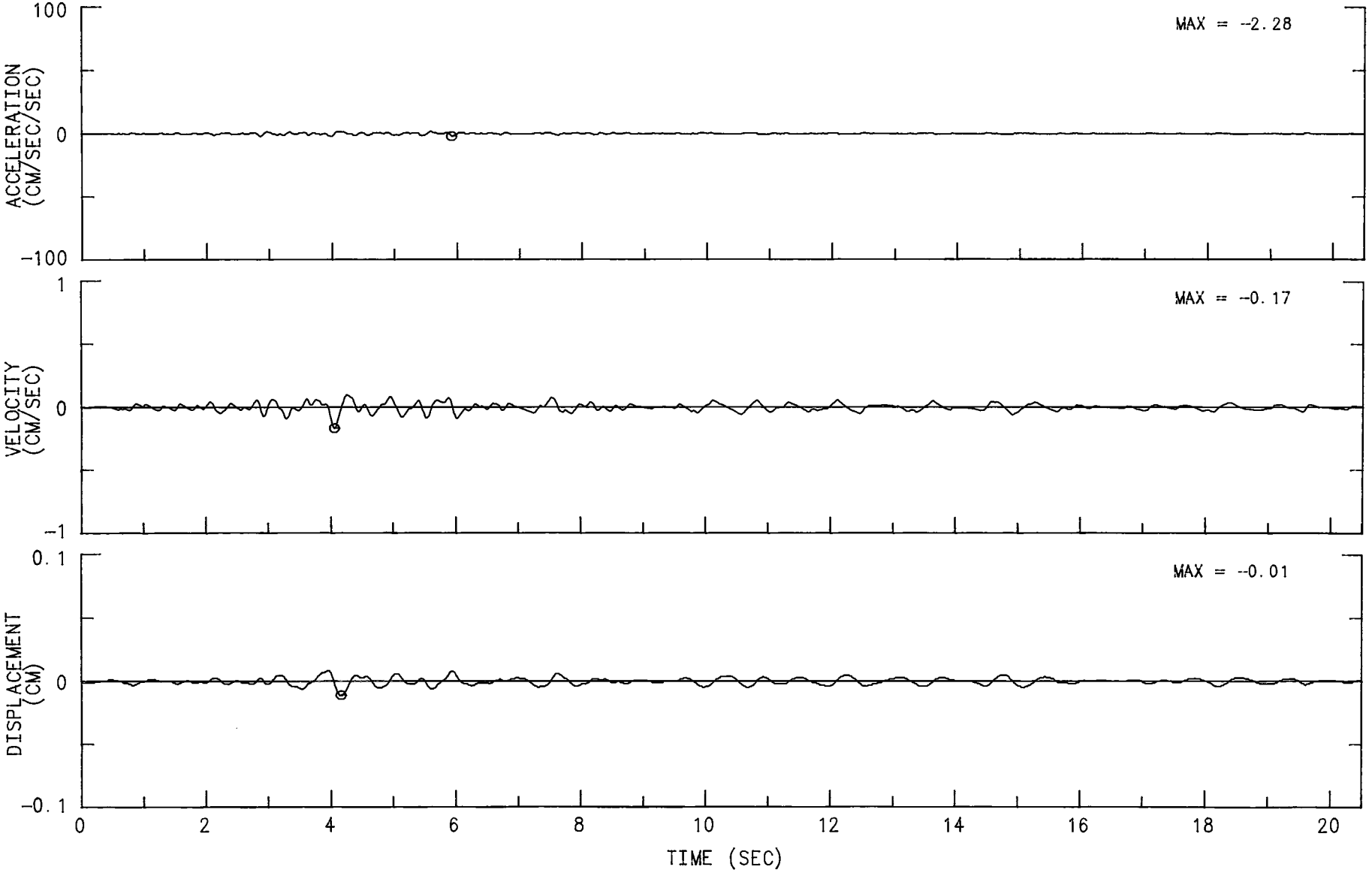


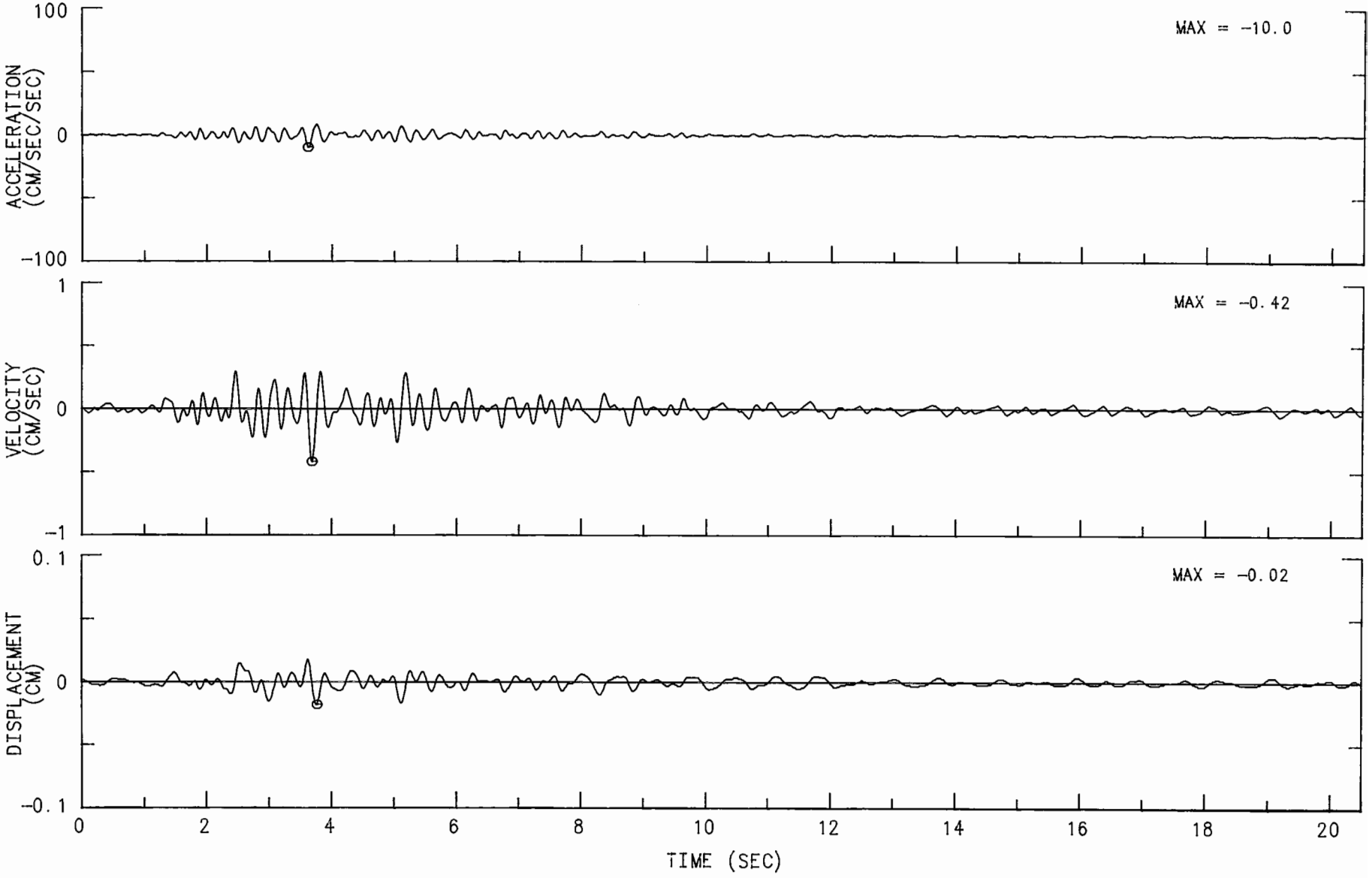
GILROY AREA EARTHQUAKE JANUARY 15, 1993 22:09 PST
S.F. - GOLDEN GATE BRIDGE (SOUTH TOWER)
UNCORRECTED ACCELEROGRAM 58T01-CS113-93016.19 102693.1641-QG93A339



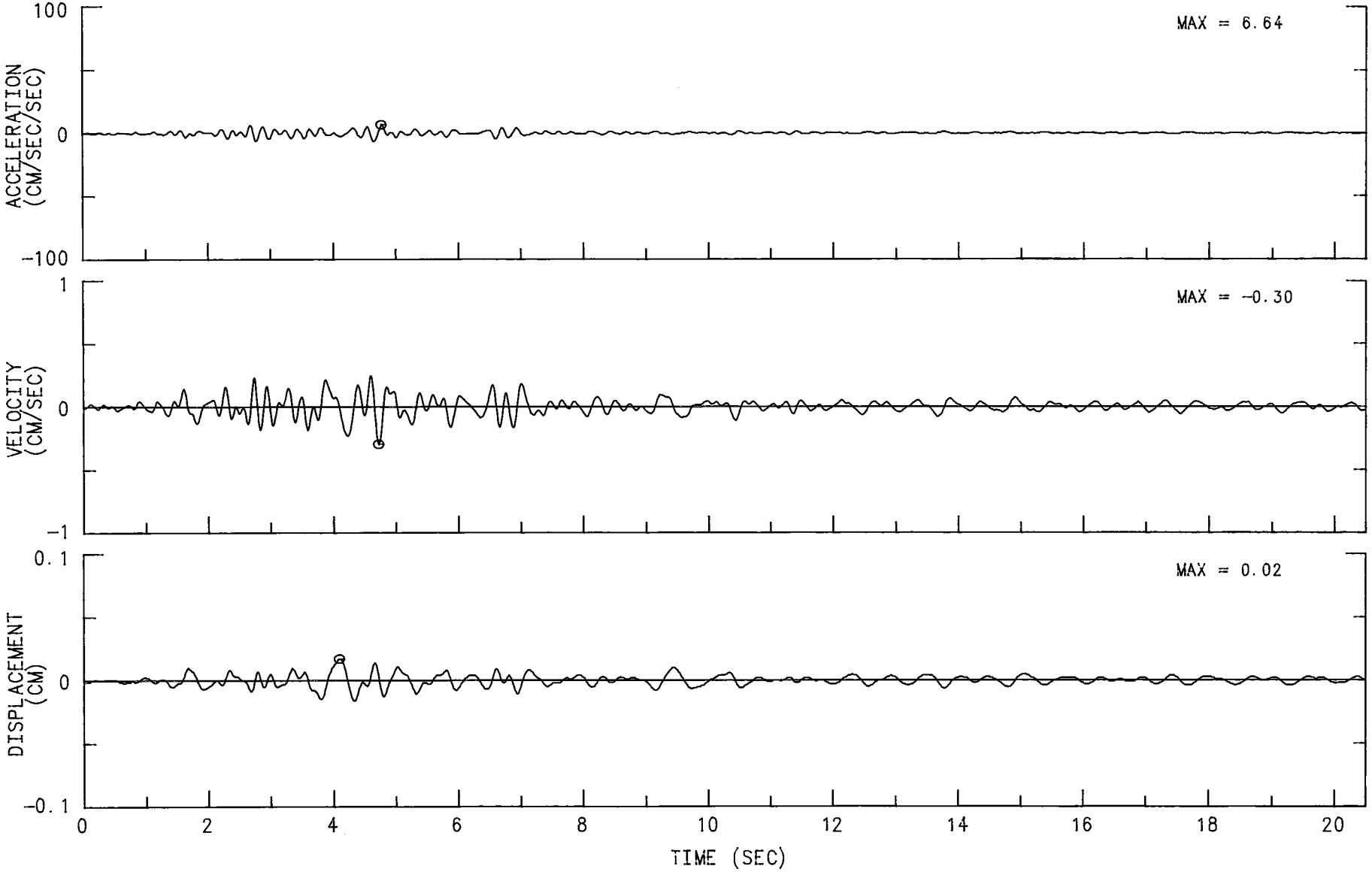
GILROY AREA EARTHQUAKE JANUARY 15, 1993 22:09 PST
S.F. - GOLDEN GATE BRIDGE (SOUTH TOWER) CHN 1: UP (BASE LEVEL)
INSTRUMENT-CORRECTED AND BANDPASS-FILTERED ACCELERATION, VELOCITY AND DISPLACEMENT
FILTER BAND: .60-1.20 TO 46.0-50.0 HZ. 58T01-CS113-93016.19 102693.1652-QG93A338



GILROY AREA EARTHQUAKE JANUARY 15, 1993 22:09 PST
S.F. - GOLDEN GATE BRIDGE (SOUTH TOWER) CHN 2: 180 DEG (BASE LEVEL)
INSTRUMENT-CORRECTED AND BANDPASS-FILTERED ACCELERATION, VELOCITY AND DISPLACEMENT
FILTER BAND: .60-1.20 TO 46.0-50.0 HZ. 58T01-CS113-93016.19 102693.1652-QG93A338



GILROY AREA EARTHQUAKE JANUARY 15, 1993 22:09 PST
S.F. - GOLDEN GATE BRIDGE (SOUTH TOWER) CHN 3: 90 DEG (BASE LEVEL)
INSTRUMENT-CORRECTED AND BANDPASS-FILTERED ACCELERATION, VELOCITY AND DISPLACEMENT
FILTER BAND: .60-1.20 TO 46.0-50.0 HZ. 58T01-CS113-93016.19 102693.1652-QG93A338



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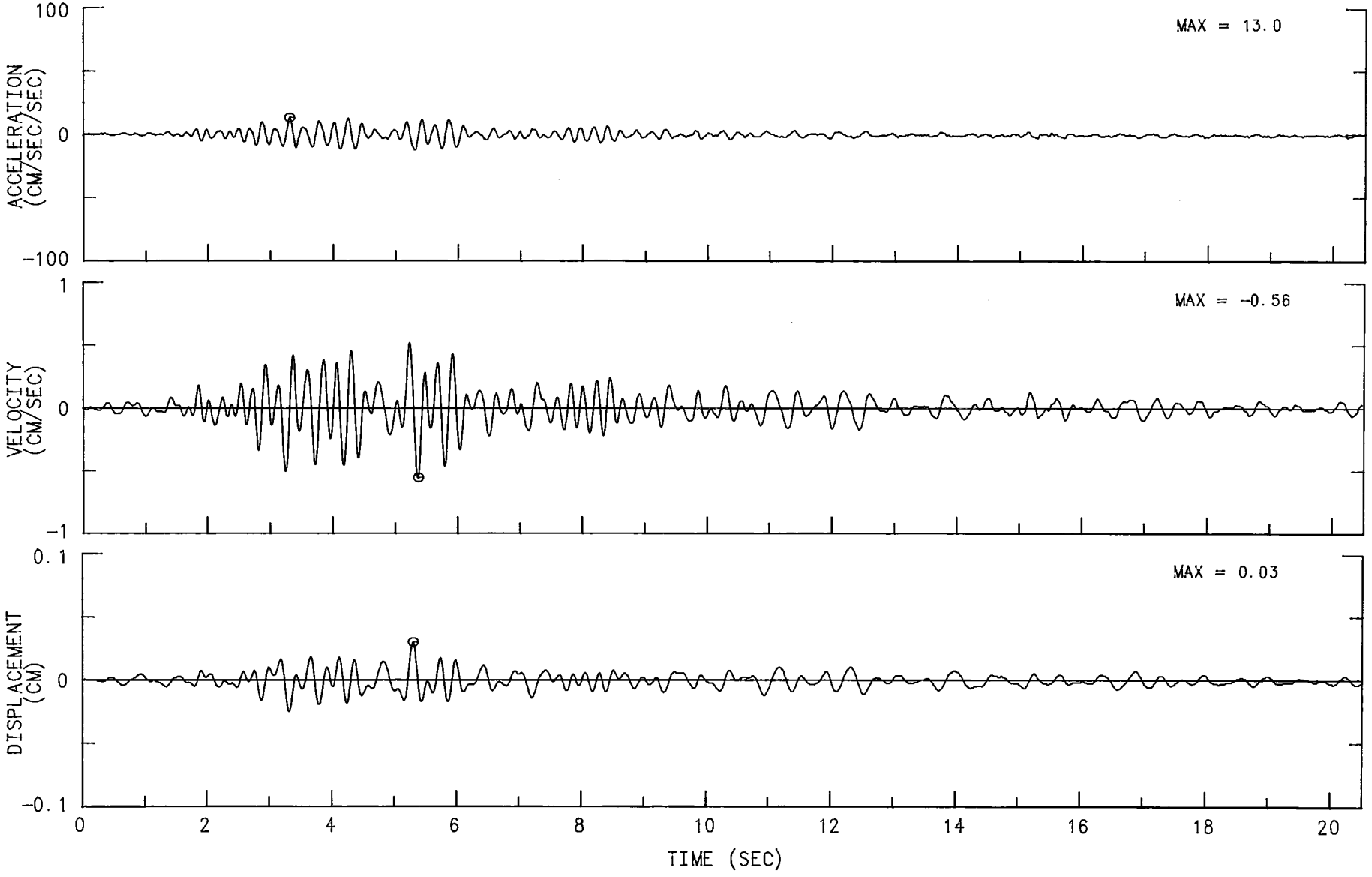
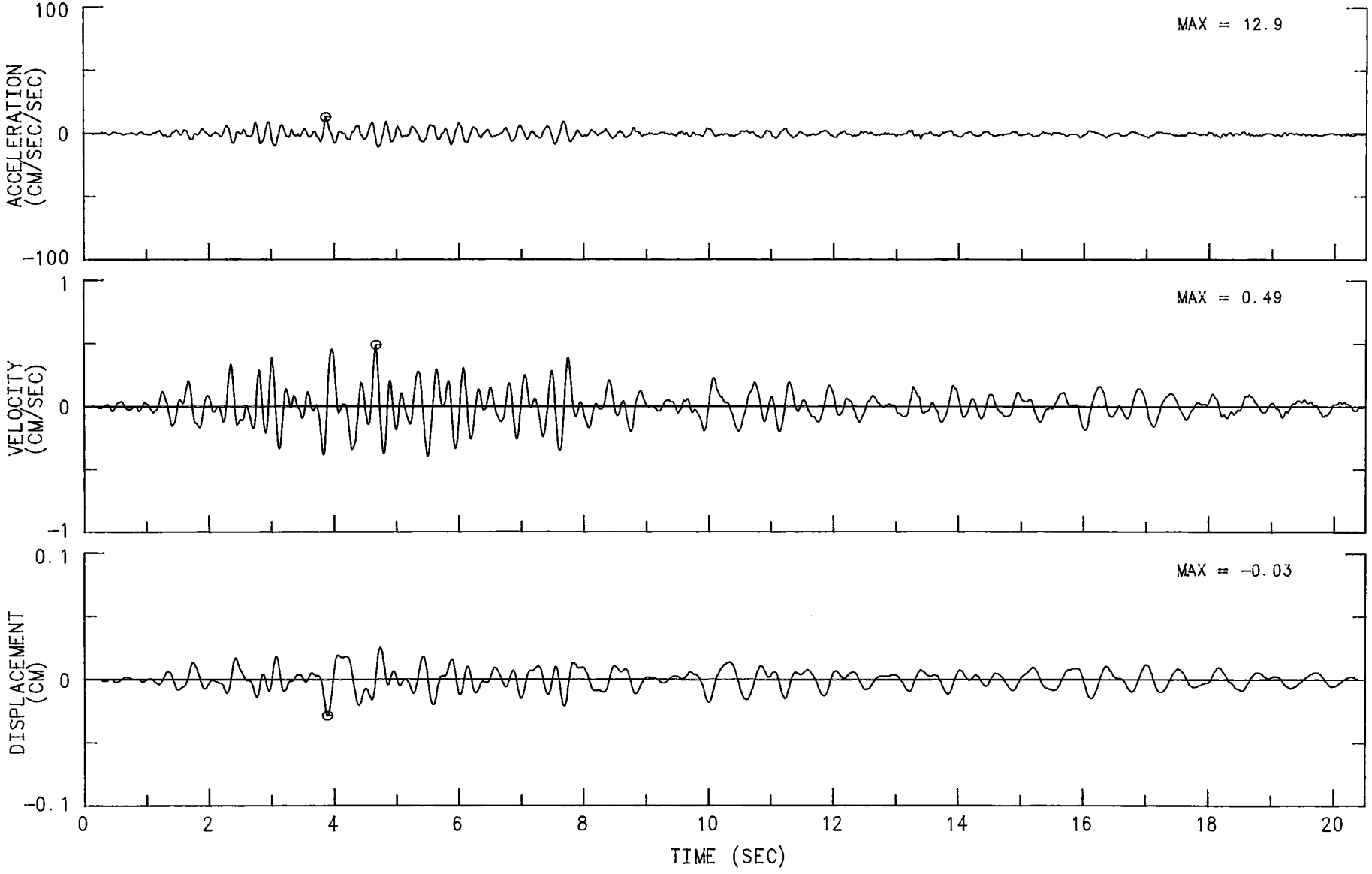
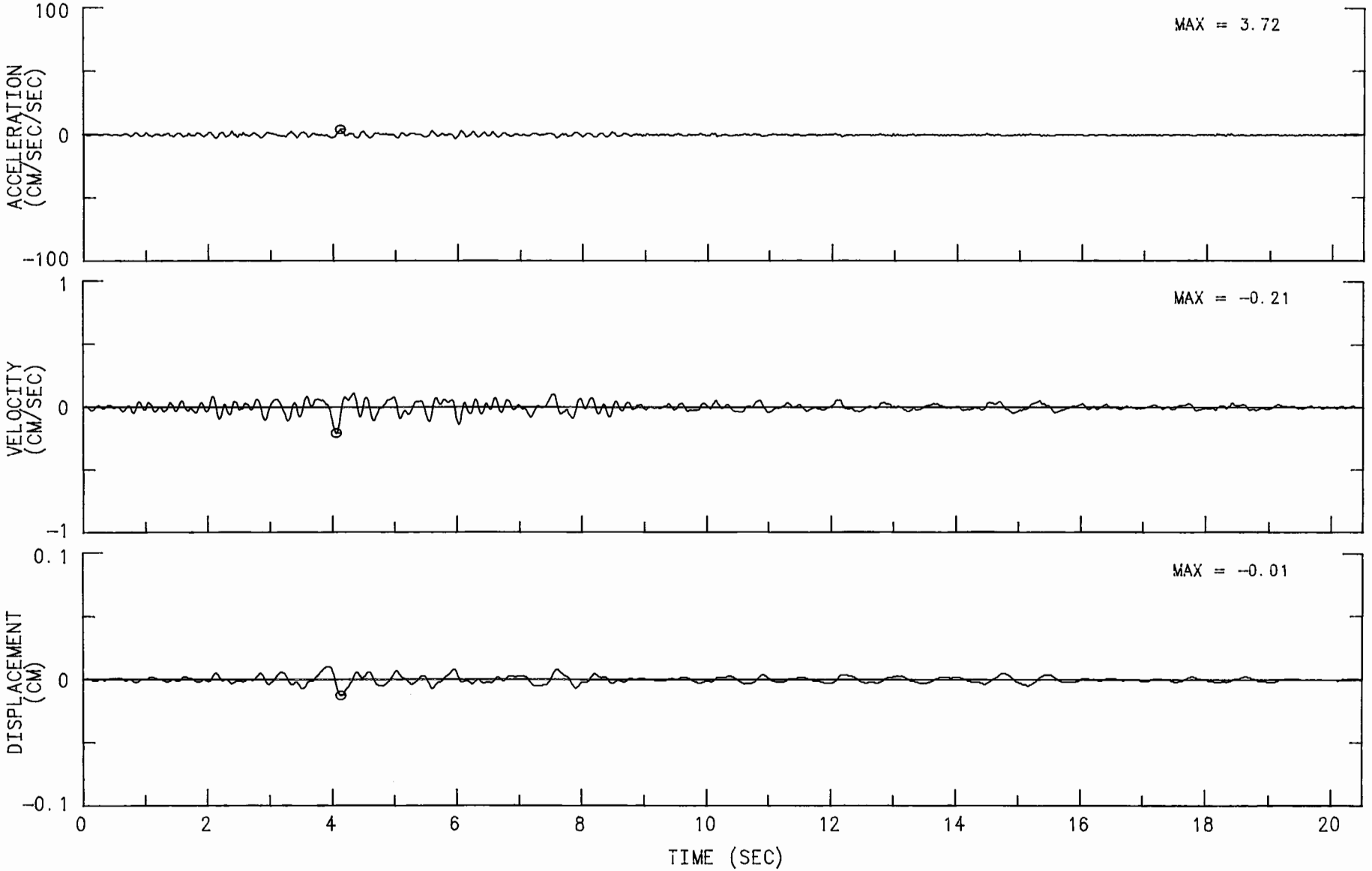
S.F. - GOLDEN GATE BRIDGE (SOUTH TOWER) CHN 4: 180 DEG (ROADWAY LEVEL)
INSTRUMENT-CORRECTED AND BANDPASS-FILTERED ACCELERATION, VELOCITY AND DISPLACEMENT
FILTER BAND: .60-1.20 TO 46.0-50.0 HZ. 58T01-CS113-93016.19 102693.1652-QG93A338



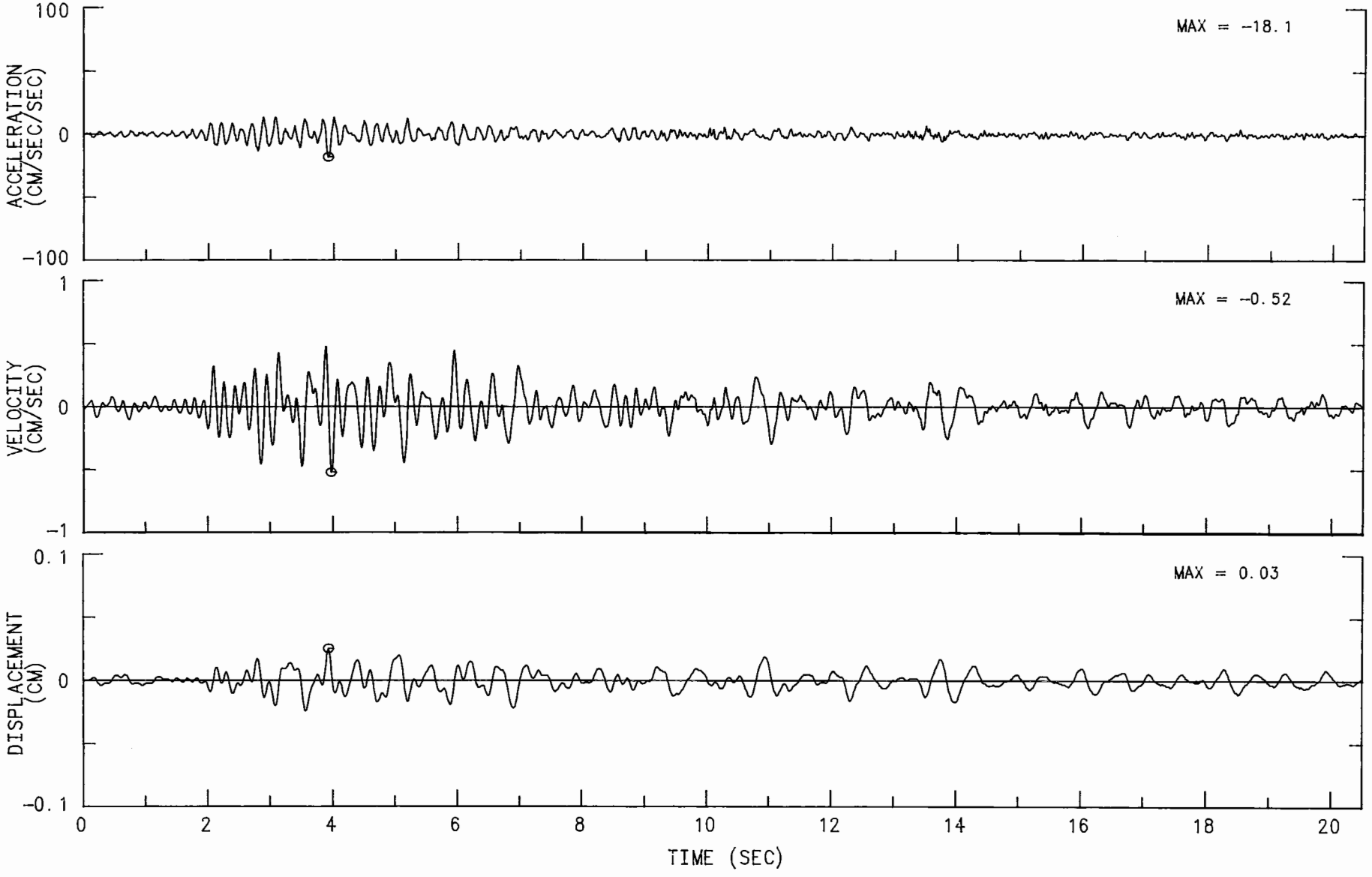
GILROY AREA EARTHQUAKE JANUARY 15, 1993 22:09 PST
S.F. - GOLDEN GATE BRIDGE (SOUTH TOWER) CHN 1 (STA CHN 5): 90 DEG (ROADWAY LEVEL)
INSTRUMENT-CORRECTED AND BANDPASS-FILTERED ACCELERATION, VELOCITY AND DISPLACEMENT
FILTER BAND: .60-1.20 TO 46.0-50.0 HZ. 58T01-CS113-93016.19 102693.1652-QG93A339



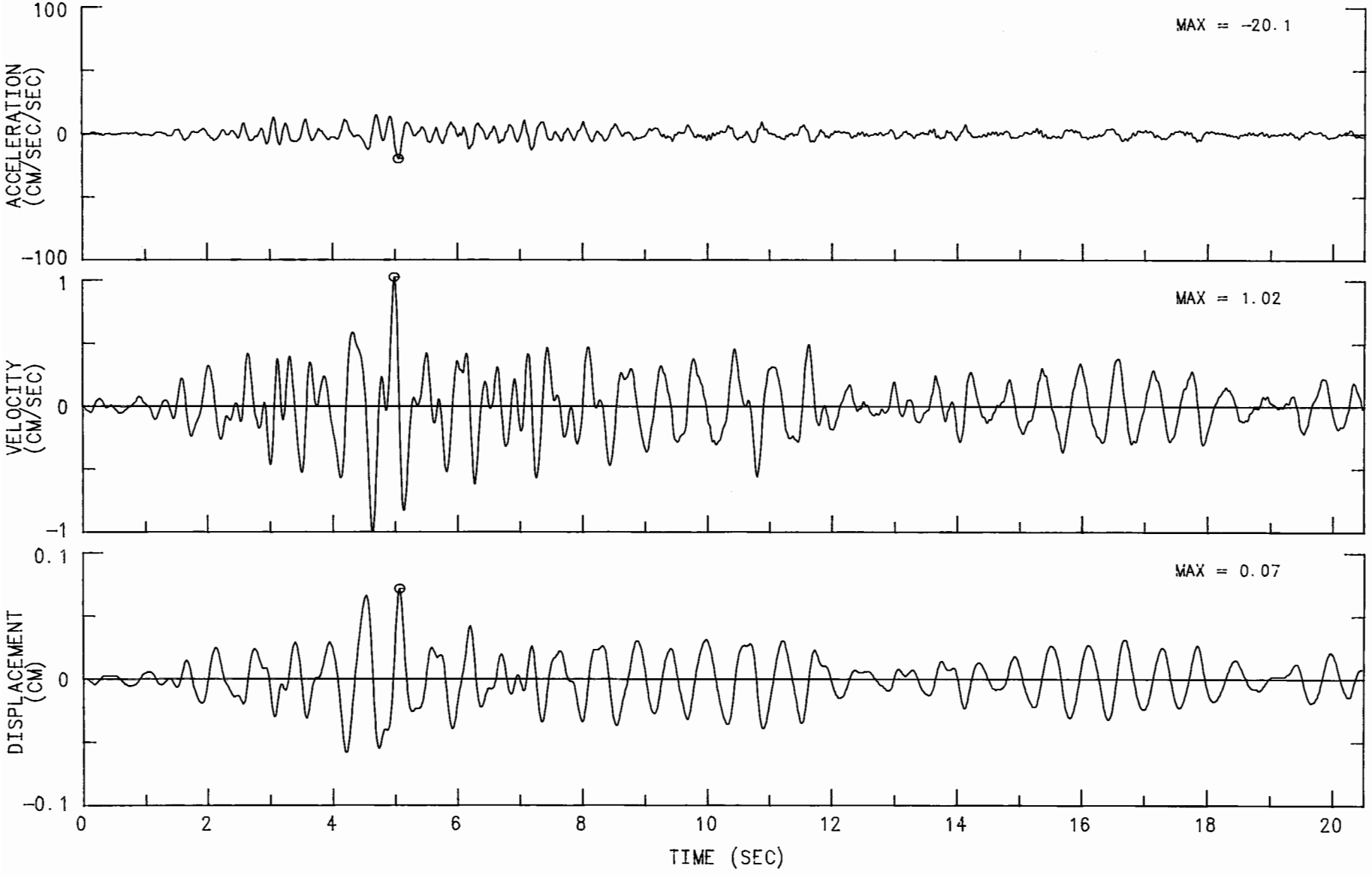
GILROY AREA EARTHQUAKE JANUARY 15, 1993 22:09 PST
S.F. - GOLDEN GATE BRIDGE (SOUTH TOWER) CHN 2 (STA CHN 6): UP (ROADWAY LEVEL)
INSTRUMENT-CORRECTED AND BANDPASS-FILTERED ACCELERATION, VELOCITY AND DISPLACEMENT
FILTER BAND: .60-1.20 TO 46.0-50.0 HZ. 58T01-CS113-93016.19 102693.1652-QG93A339



GILROY AREA EARTHQUAKE JANUARY 15, 1993 22:09 PST
S.F. - GOLDEN GATE BRIDGE (SOUTH TOWER) CHN 3 (STA CHN 7): 180 DEG (TOP LEVEL)
INSTRUMENT-CORRECTED AND BANDPASS-FILTERED ACCELERATION, VELOCITY AND DISPLACEMENT
FILTER BAND: .60-1.20 TO 46.0-50.0 HZ. 58T01-CS113-93016.19 102693.1652-QG93A339



GILROY AREA EARTHQUAKE JANUARY 15, 1993 22:09 PST
S.F. - GOLDEN GATE BRIDGE (SOUTH TOWER) CHN 4 (STA CHN 8): 90 DEG (TOP LEVEL)
INSTRUMENT-CORRECTED AND BANDPASS-FILTERED ACCELERATION, VELOCITY AND DISPLACEMENT
FILTER BAND: .60-1.20 TO 46.0-50.0 HZ. 58T01-CS113-93016.19 102693.1652-QG93A339



S.F. - GOLDEN GATE BRIDGE (SOUTH TOWER): CSMIP S/N T01

GILROY AREA EARTHQUAKE

JANUARY 15, 1993 22:09 PST

PHASE 3 DATA: RESPONSE SPECTRA

USABLE DATA BANDWIDTH: 1.02 TO 47.2 HZ

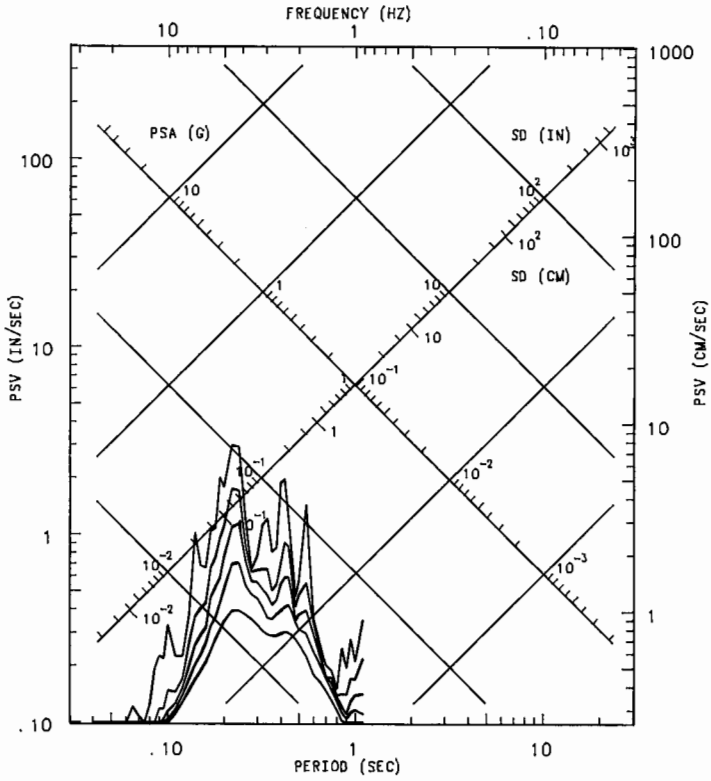
(0.02 TO .98 SEC)

RECORD ID: 58T01-E0338-93016.19

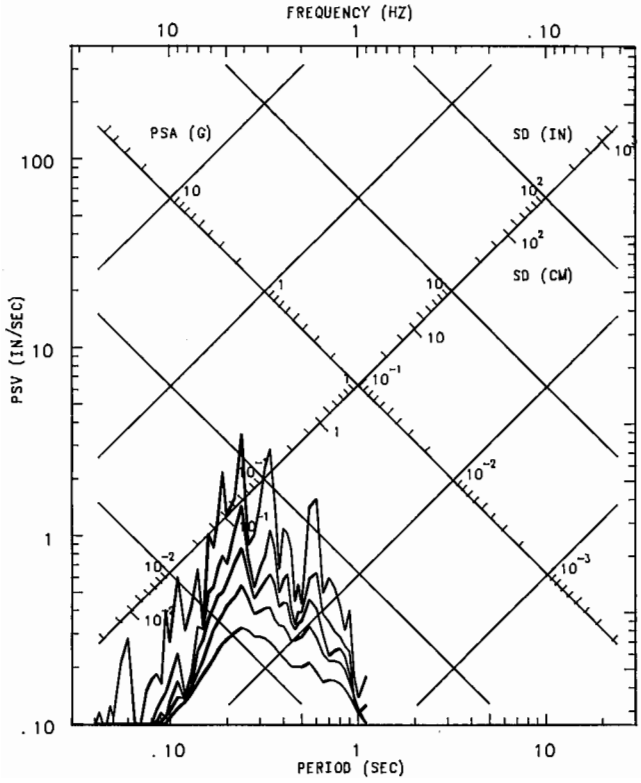
RESPONSE SPECTRA: PSV, PSA & SD

DAMPING VALUES: 0, 2, 5, 10, 20%

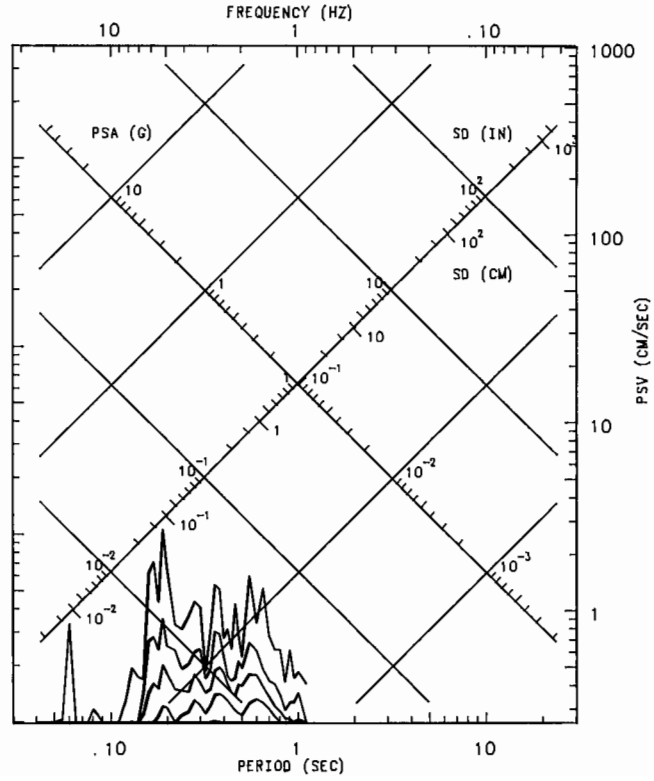
CHN 4: 180 DEG
ROADWAY LEVEL



CHN 1 (STA CHN 5): 90 DEG
ROADWAY LEVEL



CHN 2 (STA CHN 6): UP
ROADWAY LEVEL



S.F. - GOLDEN GATE BRIDGE (SOUTH TOWER): CSMIP S/N T01

GILROY AREA EARTHQUAKE

JANUARY 15, 1993 22:09 PST

PHASE 3 DATA: RESPONSE SPECTRA

USABLE DATA BANDWIDTH: 1.02 TO 47.2 HZ

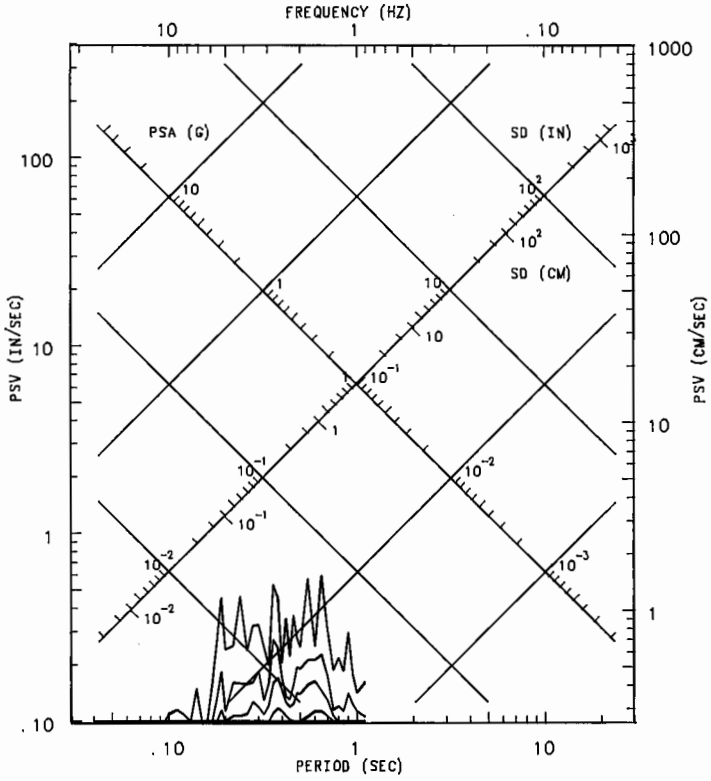
(0.02 TO .98 SEC)

RECORD ID: 58T01-E0338-93016.19

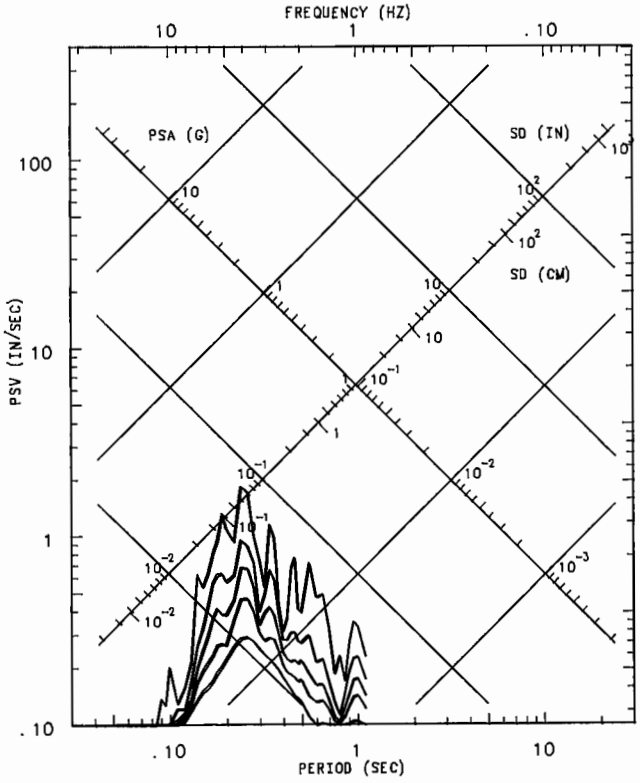
RESPONSE SPECTRA: PSV, PSA & SD

DAMPING VALUES: 0, 2, 5, 10, 20%

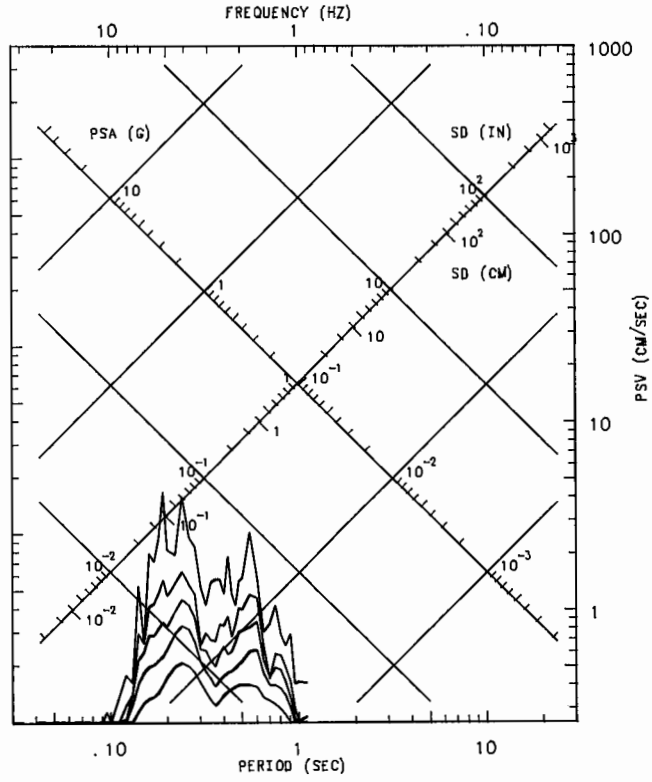
CHN 1: UP
BASE LEVEL



CHN 2: 180 DEG
BASE LEVEL



CHN 3: 90 DEG
BASE LEVEL



S.F. - GOLDEN GATE BRIDGE (SOUTH TOWER): CSMIP S/N T01

GILROY AREA EARTHQUAKE

JANUARY 15, 1993 22:09 PST

PHASE 3 DATA: RESPONSE SPECTRA

USABLE DATA BANDWIDTH: 1.02 TO 47.2 HZ

(0.02 TO .98 SEC)

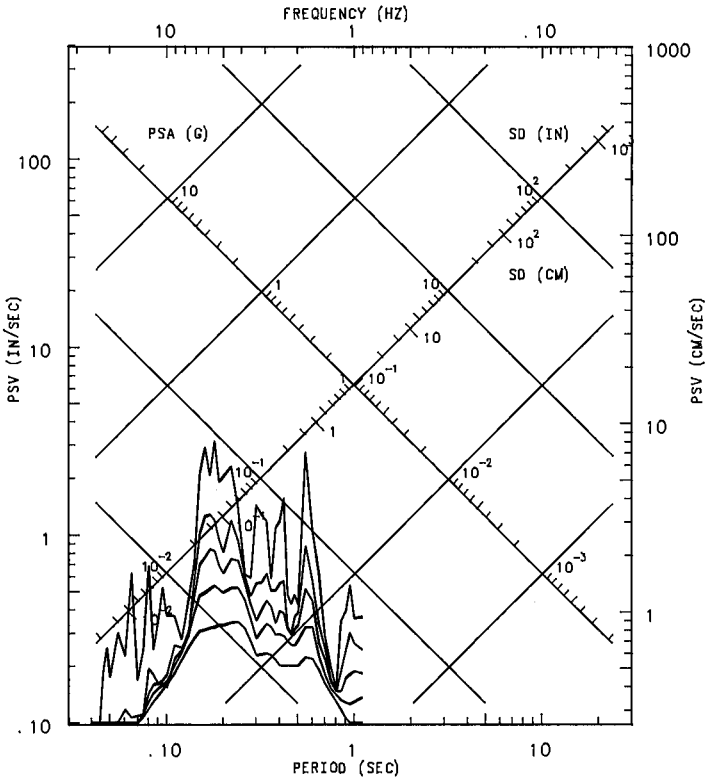
RECORD ID: 58T01-E0339-93016.19

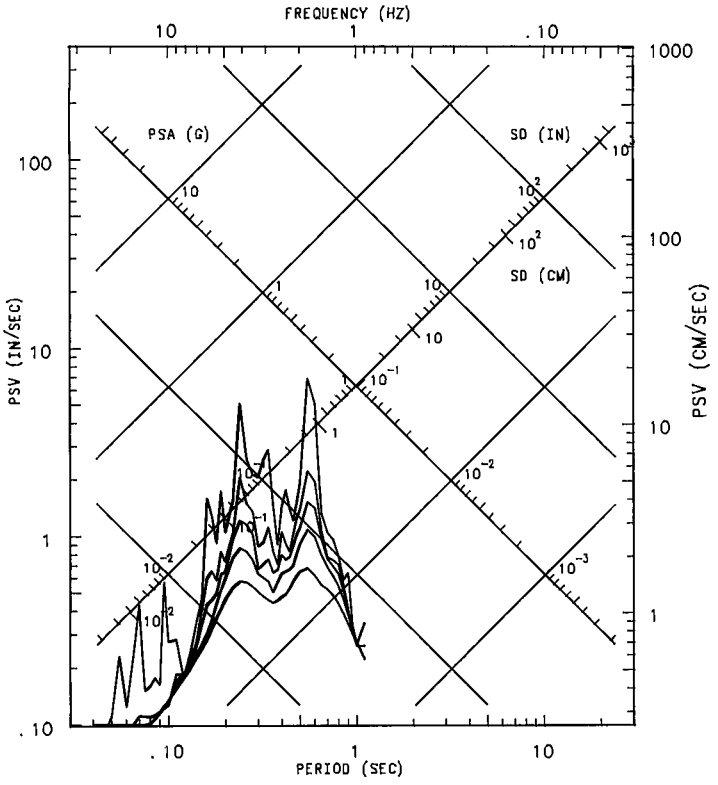
RESPONSE SPECTRA: PSV, PSA & SD

DAMPING VALUES: 0, 2, 5, 10, 20%

CHN 3 (STA CHN 7): 180 DEG

TOP LEVEL



CHN 4 (STA CHN 8): 90 DEG

TOP LEVEL