Seismic 8

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Eddy-Seis from "eddy current seismometer". The inertia element is a tubular slug of copper, which generates eddy currents as it moves in the permanent magnet field. The coil is fixed and is soldered directly to the terminals of the geophone. The eddy currents, which flow in the inertia element (tubular slug), induce a voltage in the coil. The theoretical characteristics of the Eddy-Seis were analyzed by means of studying a linear system model of the operation of this new type of geophone. As a result of the study, a characteristic equation was obtained, as follows:

\[ H_s(w) = \frac{E_o}{V} = \frac{G}{[1 - (f_0/f)^2 - 2ah \cdot J(jf/\omega)(j\omega/\omega_0) + 1]}, \]

where \( H_s(w) \) = transfer function as a function of frequency for constant acceleration excitation, \( E_o \) = output voltage, \( V \) = acceleration excitation to frame of unit, \( f = \) frequency of excitation, \( f_0 \) = natural frequency of sprung inertial element, \( f_s \) = high cut-off frequency, \( G \) = transduction, and \( h \) = damping. A study of this equation indicates that a constant acceleration excitation of varying frequency causes the Eddy-Seis to respond in a manner similar to a band-pass filter, and its characteristics can be described by four parameters, \( f_0, h, G, \) and \( f_s \).

A further study of the obtained characteristics equation was made to develop a test method and we found that it can be easily tested by applying the spectral analysis method.

Microwave Seismic Telemetry Data

Link Span Inaccessible Terrain

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Inaccessible terrain often encounters major problems in seismic fieldwork. Swamps, rivers, waterways, highways, railroads as well as canyons and other impassable obstacles set certain limits to field crew activity. Those obstructions not only cause a discontinuity of the geophone pattern, which could be compensated by a modified shooting-pattern, but an interruption of the cable-based data transfer to the recording truck is often undesirable. In order to overcome this problem, a microwave seismic telemetry data link was developed and successfully field tested. The primary design goal was low-cost, portable, easy to install equipment to substitute an SN 348/368 cable by a wireless network operating over a distance between 20 and 1 000 m. Optical links suffer from deterioration of signal quality by fog and rain. To overcome interference from sunshine and scattered daylight, an optical transmitter of extremely narrow beamwidth has to be aligned to a small aperture receiver, demanding a very stable supporting structure and preferably a beam-aligning servo control. Therefore, preference was given to a microwave-based system, which is more or less insensitive to the above-mentioned interference sources.

But a flowless transfer of real-time telemetry data at a high data rate proved to be opposed by a low-cost easy to install solution. Interference by multipath propagation of microwave signals caused by reflections on the earth's surface and other structures in the propagation path cause failure rates in data transfer. These problems may be reduced by more complex and expensive signal processing or beam-shaping with bulky antenna systems. In fact, microwave data links have to be set up with careful con-