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## **Seismic Phase, The Next Exploration Frontier**

For decades Explorationists and Interpreters have represented seismic data of Zero degrees (0°) Phase. Through the processes of Interferometry and Frequency Modulation using Dual Frequency Receivers the technology is here to add a new dimension of phase information to seismic exploration data. Using a simple analogy, think of FM sound speakers and geophones/hydrophones as simple transducers. FM stereos use woofers and tweeters to achieve a rich sound signal. Likewise, geophones and hydrophones can be used like reverse speakers to provide an added richness to the acoustical signal. Vibroseis®, invented by Doty and Crawford (1954) and owned by Conoco, is a frequency modulated (FM) source containing two fundamental frequencies. The process of Interferometry uses a two-frequency receiver analysis on two mutually coherent events. By recording two unique frequency bands, measurements of frequency velocities, phase velocities, and phase data are possible. Techniques of Interferometric imaging are used in sciences such as astronomy, radar and medicine. Tests of dual frequency receivers were carried out in 1999 in the Cretaceous gas province of the Sacramento Basin of California. The results from the tests indicate frequency and phase velocities can be measured accurately. These test results and analysis indicates potential for significant improvements in the following areas: signal-to-noise, environmental impact, imaging (especially in vicinities of large velocity anomalies such as salt bodies and faulting), and new data volumes.