# Accelerometer Based Sensing of Combustion in a High Speed HPCR Diesel Engine

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**Abstract:**
The capability to detect combustion in a diesel engine has the potential of being an important control feature to meet increasingly stringent emission regulations and for the development of alternative combustion strategies such as HCCI and PCCI. In this work, block-mounted accelerometers are investigated as potential feedback sensors for detecting combustion characteristics in a high-speed, high-pressure common rail (HPCR), 1.9L diesel engine. Accelerometers are positioned in multiple placements and orientations on the engine, and engine testing is conducted under motored, single and pilot-main injection conditions. Engine tests are then conducted at varying injection timings to observe the resulting time and frequency domain changes of both the pressure and acceleration signals. The higher-frequency (3 kHz \mL f\ mL 25 kHz) components of the in-cylinder pressure are found to correlate to the peak rate of in-cylinder heat release and indicated a potential application to the detection of combustion. The accelerometer and pressure signals are analyzed through the use of various functions including angle-dependant fast Fourier transforms (FFT) and coherence to isolate frequency components that are well correlated between the cylinder pressure and accelerometer signals. In addition, these analysis techniques are used to compare the three accelerometer orientations and the individual accelerometer placements.