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## **The Effects of External EGR During Spark Ignition/Controlled Auto Ignition Combustion Transitions**

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### **ABSTRACT**

The work was concerned with the benefits of combining internal and external exhaust gas recirculation during gasoline controlled auto-ignition combustion in a multi-cylinder direct fuel injection research engine. During steady state engine operation supplementary external exhaust gas recirculation allowed additional control over the combustion phasing and increased the achievable load. The investigation was then extended to steady state transitions from spark ignition to controlled auto-ignition combustion and vice versa. At low engine speeds (~1500rpm) a vane-type cam phaser was used to switch between each mode of combustion without misfire. To investigate transitions at higher engine speeds, a second research engine was prepared with two-stage cam profile switching. In summary, external EGR could also be used to improve the quality of the combustion transition, with reduced differences in inlet plenum pressures and the peak knocking pressure experienced during the combustion mode change decreased.