



FIAT CHRYSLER AUTOMOBILES

# USCAR Industry Engagement Meeting

## Areas of Research Interest

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Auburn Hills, MI

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# Electronics Areas of Interest

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- High Temperature Capacitor Development
  - >85°C
- Bulk Capacitor Cooling
  - Methods of cooling the foil to lead-frame junction
- Capacitor Life
  - 300,000 mile/15 year vehicle life
- High Voltage/High Current Power Modules
  - 1200V/700A and beyond
- Component Reliability
  - Die to DBC attachment, Solder vs. Sinter vs ?.
- Gate Driver Improvements
  - Built in protection to prevent damage on startup before “initialization” completes.
  - Higher power capability, >5A.
- Integration of smart peripherals to application specific microcontrollers
  - Resolver to Digital Encoder for motor control

# Motor Development Areas of Interest

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- Improvements in motor winding technology
  - New bar wire winding techniques.
  - Use of super conductors (High Temperature Superconductor).
- Enhanced Sensorless Control
  - Develop new techniques to control the motor at low speeds without the use of a position sensor.
- Motor Technologies
  - PM Assisted Synchronous Reluctance Motors
    - ▲ Minimize the magnet quantity, but increase the reluctance torque to maximum.
  - Fractional Slot, Bar-type Winding Motors
  - Flux Switching Motors
    - ▲ Comparisons in terms of performance, cost, and motor control complexity.
- Two Phase Material for Motor Cooling
  - Development of low cost two phase material to be used in stator windings for more effective thermal management.
- Amorphous Steel Development and Commercialization
  - Development of alternative material to replace traditional lamination steel in an effort to minimize the very process and cost