ANL / LBL CACC VEHICLE DISCUSSION – 11/16/2018

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CAVs Experimental Fleet – BEV, PHEV, REx, Conv.

Honda Accord PHEV with ACC

Prius Prime PHEV with ACC

BMW i3 with ACC and Traffic Assist
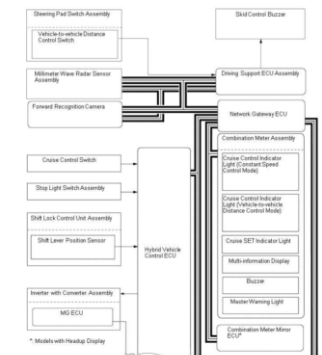

Ford Taurus 2.0L Ecoboost with ACC

On-Road Instrumentation Options

High-fidelity data regardless of location:

- Vehicle-based messages from CAN/diagnostics
- Decoded messages for ACC/related systems
- Cameras (up to 8 time sync'd)
- Direct axle torque measurement
- GPS data @ 5Hz (std.) 20Hz (supplemental hardware)
- Direct fuel in-line measurement
- Supplementary data as needed…
- Characterized/Cert. fuel as needed for efficiency comparisons
- Man-in-the-middle capability for further experimentation

U.S. DEPARTMENT OF ENERGY

Example Signals: i3REx

Diagnostic CAN

Broadcast CAN

Broadcast CAN
Motor_Torque_Act_CAN[Nm]
Motor_Spd_CAN[rpm]
Trans_PRNDL_Pos_CAN[]
Pedal_Accel_Pos_CAN[pcnt]
Pedal_Brake_Press_CAN[bar]
HVBatt_Curr_CAN[A]
HVBatt_Volt_CAN[V]
HVBatt_SOC_CAN[pcnt]
Steering_Wheel_Pos_CAN[]
AC_Switch_Pos_CAN[IO]
Gen_Spd_CAN[rpm]
Eng_Fuel_Flow_Integrated_CAN[]
12VBatt_Volt_CAN[V]
Veh_Amb_Temp_CAN[C]
Veh_Spd_Displayed_CAN[mph]
Veh_Wheel_Spd_Rear1_CAN[]
Veh_Wheel_Spd_Rear2_CAN[]
Veh_Wheel_Spd_Front1_CAN[]
Veh_Wheel_Spd_Front2_CAN[]
Brake_Vac_Pump_Press_CAN[hPa]
Veh_odometer_CAN[km]

HV Battery

HV Battery
HVBatt_Cooling_Shutoff_Valve_Status_SME[]
HVBatt_Cooling_Circuit_Temp_SME[C]
HVBatt_Min_Cell_Temp_SME[C]
HVBatt_Max_Cell_Temp_SME[C]
HVBatt_Average_Cell_Temp_SME[C]
HVBatt_switch_contactor_status_SME[]
HVBatt_Control_of_switch_contactors_active_SME[]
HVBatt_service_disconnect_status_SME[]
HVBatt_Voltage_Calculated_SME[V]
HVBatt_Charge_Time_SME[h]
HVBatt_individual_cell_voltage_min_SME[V]
HVBatt_individual_cell_voltage_max_SME[V]
HVBatt_SOC_displayed_SME[%]
HVBatt_SOC_upper_limit_SME[%]
HVBatt_SOC_lower_limit_SME[%]
HVBatt_SOC_SME[%]
HVBatt_Voltage_SME[V]
HVBatt_Current_SME[A]
HVBatt_interlock_loop_status_SME[]
HVBatt_Impact_sensor_voltage_SME[V]

Electric Machine / Electronics

Electric Machine / Electronics
DCDC_Current_Low_Voltage_EME[A]
DCDC_Current_High_Voltage_EME[A]
Motor_Temp_sensor_1_EME[C]
Motor_Temp_sensor_2_EME[C]
Motor_Speed_EME[rpm]
Motor_Torque_actual_EME[Nm]
Motor_Torque_setpoint_EME[Nm]
Motor_Operating_mode_EME[]
12VBatt_voltage_pos_side_EME[V]
12VBatt_current_pos_side_EME[A]
Motor_intertlock_circuit_status_EME[]
HV_Converter_current_signal_EME[A]
Motor_stator_temp_sensor_signal_EME[V]
DCDC_Voltage_High_EME[V]
Brake_Vaccuum_pump_temp_EME[C]
Brake_Vaccuum_pump_Switching_mode_EME[]
Brake_Vaccuum_pump_voltage_signal_EME[V]
Brake_Vaccuum_pump_current_signal_EME[A]
Charger_HVbatt_SOC2_EME[per]
DCDC_Voltage_Low_EME[V]
Charger_release_charging_interface_module_EME[]
Charger_HVBatt_SOC_EME[per]
Charger_HVBatt_charging_time_EME[min]
Charger_input_voltage_EME[V]
Charger_Remaining_range_EME[km]
Charger_HVBatt_temp_EME[C]
Charger_output_voltage_EME[V]
Charger_output_current_EME[A]
DCDC_operating_mode_EME[]
Brake_vacuum_pump_signal_pressure_EME[hPa]

Example Signals: i3REx

Integrated HVAC

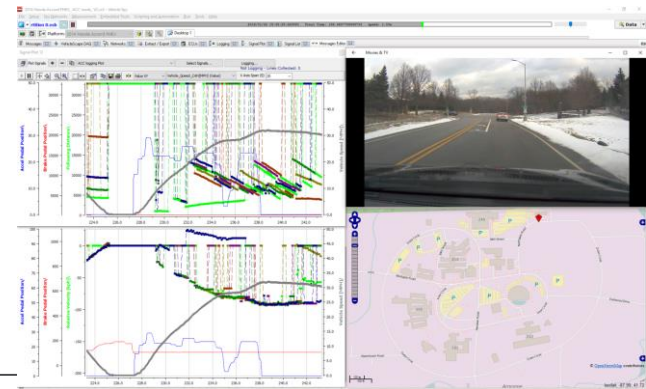| |
|---|
| HVAC_Ambient_Temp_IHKA[C] |
| HVAC_blower_fan_output_IHKA[%] |
| HVAC_blower_fan_button_pos_IHKA[] |
| HVAC_Drivers_Seat_heater_pos_IHKA[] |
| HVAC_Pass_Seat_heater_pos_IHKA[] |
| HVAC_recirc_air_flap_actual_pos_IHKA[%] |
| HVAC_recirc_air_flap_setpoint_pos_IHKA[%] |
| HVAC_mixing_air_flap_actual_pos_IHKA[%] |
| HVAC_mixing_air_flap_setpoint_pos_IHKA[%] |
| HVAC_foot_flap_actual_pos_IHKA[%] |
| HVAC_foot_flap_setpoint_pos_IHKA[%] |
| HVAC_Solar_sensor_left_IHKA[Wpm2] |
| HVAC_Solar_sensor_right_IHKA[Wpm2] |
| HVAC_refrigerant_pressure_IHKA[bar] |
| HVAC_interior_temp_IHKA[C] |
| HVAC_EVAP_temp_IHKA[C] |
| HVAC_Coolant_Temp_IHKA[C] |
| HVAC_Condensation_sensor_bus_IHKA[%] |
| HVAC_defrost_flap_actual_pos_IHKA[%] |
| HVAC_defrost_flap_setpoint_pos_IHKA[%] |

Instrument Panel

Veh_current_electric_range_KOMBI[km]
Veh_range_display_current_KOMBI[km]
Veh_Electrical_consumption_KOMBI[kWp100km]
Veh_Electrical_consumer_output_KOMBI[kW]
Veh_Fuel_consumption_AVG_from_BC_KOMBI[Lp100km]
Veh_Fuel_consumption_AVG_from_10000km_from_BC_KOMBI[Lp100km]
Veh_Fuel_consumption_AVG_from_33km_from_BC_KOMBI[Lp100km]
Veh_Odometer_1_KOMBI[km]
Veh_Odometer_2_KOMBI[km]
Veh_Fuel_level_sensor_1_KOMBI[L]
Veh_Fuel_level_sensor_2_KOMBI[L]

Range Extender

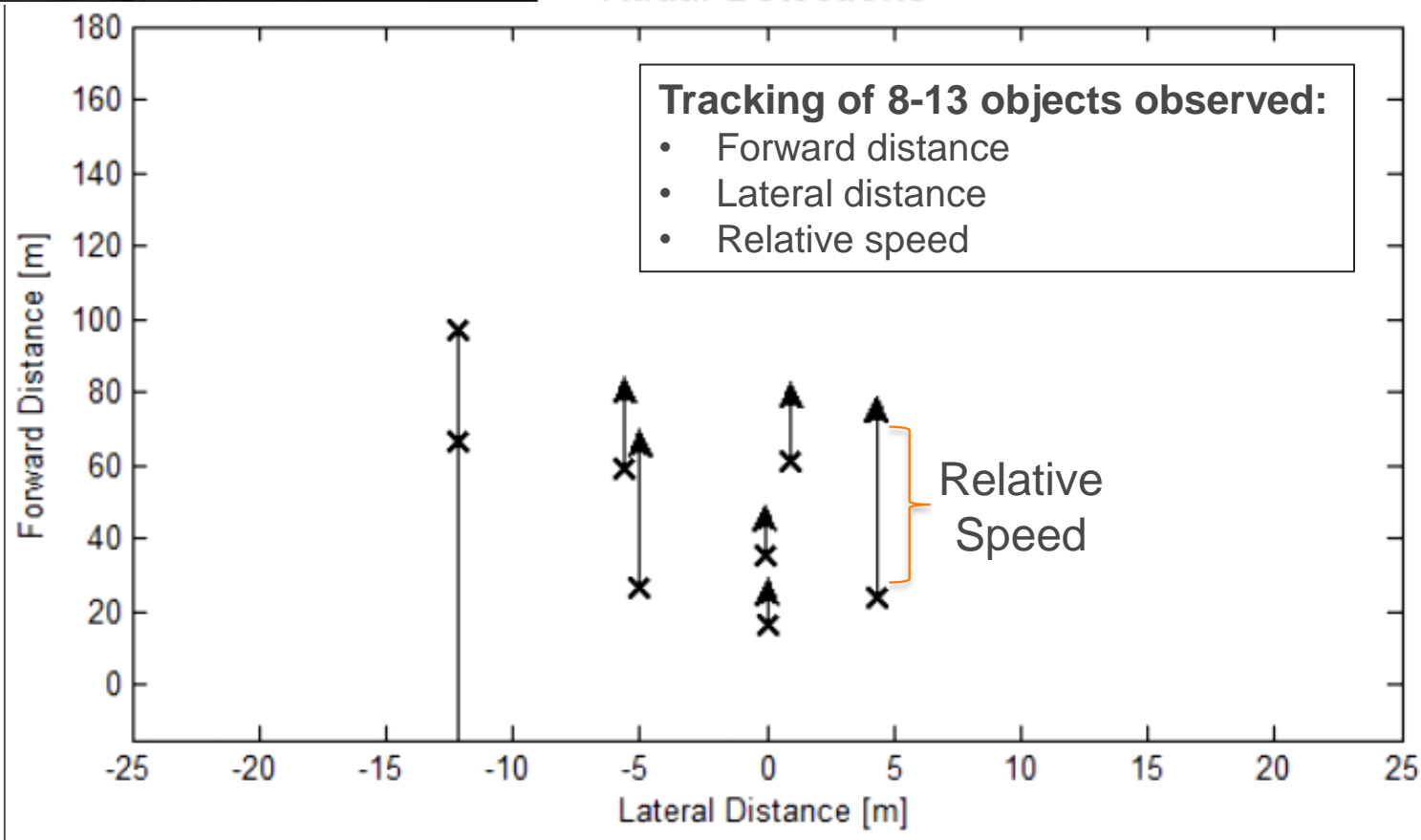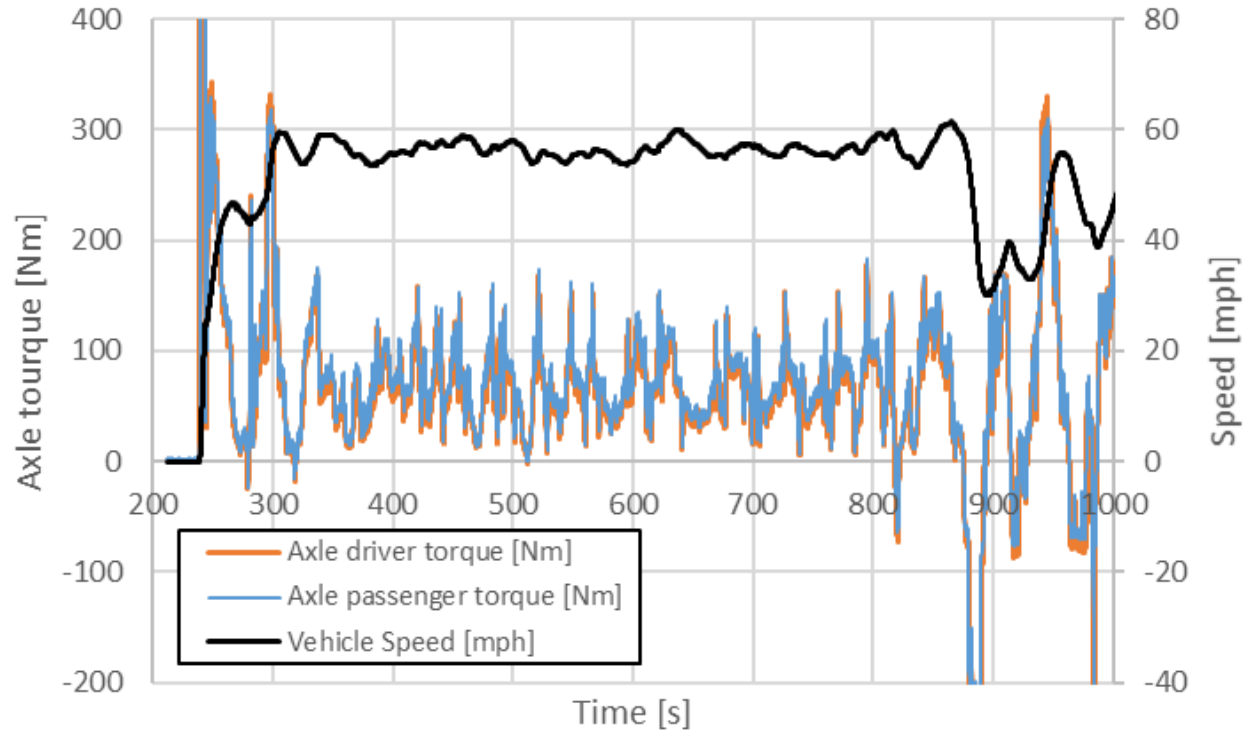| |
|---|
| Gen_voltage_after_rectification_REME[V] |
| Gen_temp_REME[C] |
| Gen_inverter_temp_phase_average_REME[C] |
| Gen_inverter_temp_phase_V_REME[C] |
| Gen_inverter_temp_phase_W_REME[C] |
| Gen_inverter_temp_phase_U_REME[C] |
| Gen_HV_current_REME[A] |
| Gen_Speed_REME[rpm] |
| Gen_Torque_Actual_REME[Nm] |
| Gen_Torque_Setpoint_REME[Nm] |
| Eng_IntakeAir_temp_in_intake_RDME[C] |

Logging ACC System Inputs

Veh Speed: 61 kph
Veh Accel: -0.8 m/s²
ACC ON
721 sec

Radar Detections

Tracking of 8-13 objects observed:
- Forward distance
- Lateral distance
- Relative speed

Relative Speed

Direct Axle Torque Measurement

On road testing

Axle sensor installed on Accord PHEV

Highway

Note: cruise control