

# 2016 Honda 1.5L L15B7 Tier 2 Fuel - Test Data Plots

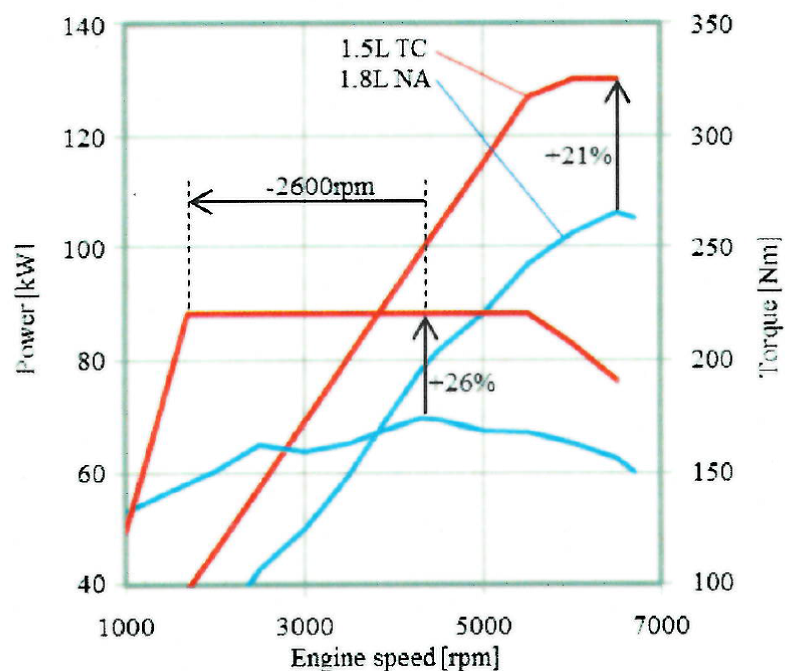
**SUGGESTED CITATION:** 2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Package. Version 2018-04. Ann Arbor, MI: US EPA, National Vehicle and Fuel Emissions Laboratory, National Center for Advanced Technology, 2018.

- - Dashed line indicates the maximum torque curve from published data
- Black dots indicate speed/load points at which steady state data was acquired
- Orange dots indicate speed/load points at which steady state data was acquired coupled to a transmission
- △ Blue triangles indicate speed/load points at which initial data from the transient high load method was acquired
- ▲ Green triangles indicate speed/load points at which final data from the transient high load method was acquired
- × Red Xs indicate speed/load points where data was not collected or did not meet quality standards

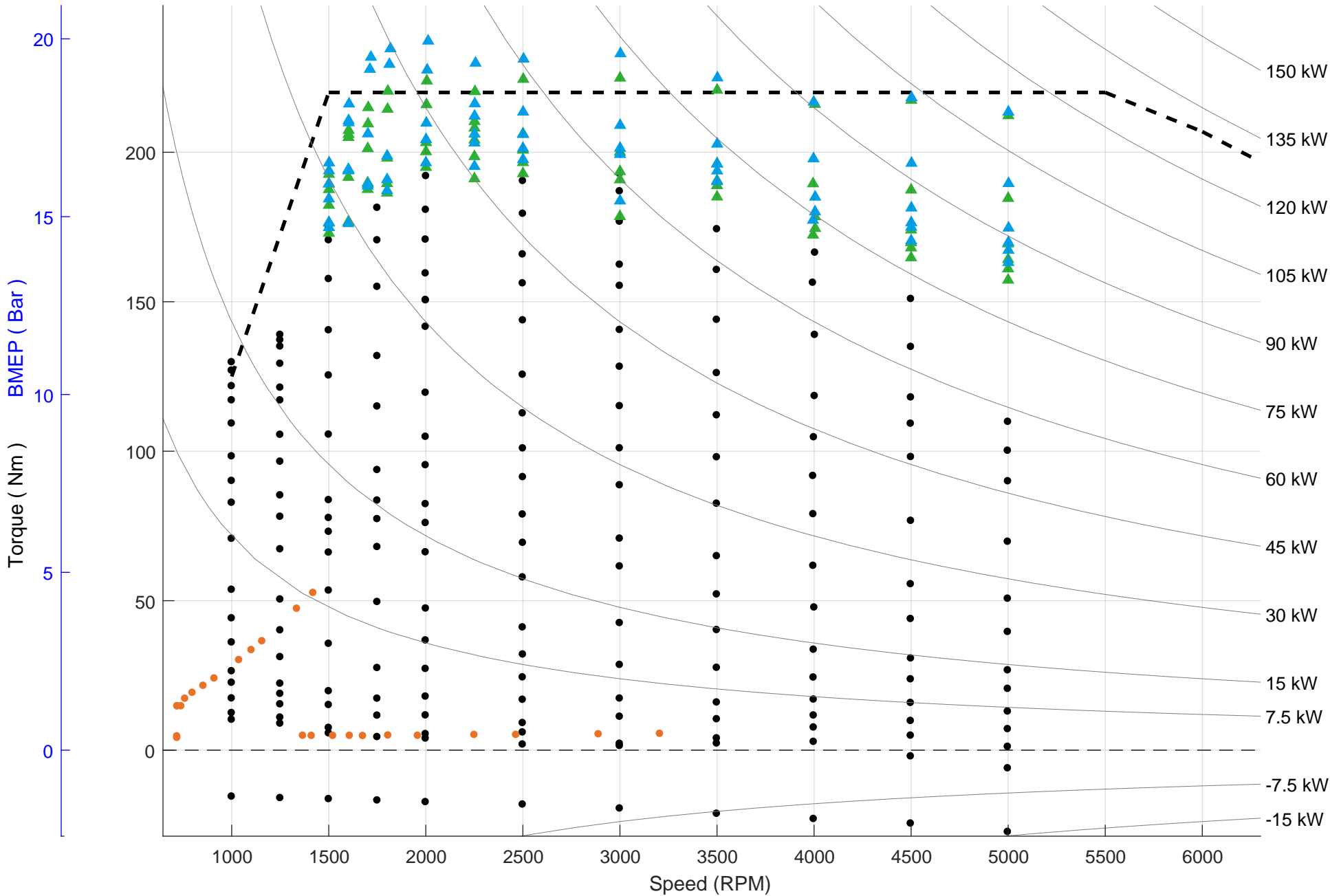
Note: In these contour plots, individual data points may be ignored or removed, using our best engineering judgment, to correct irregularities in the visual presentation of the contour lines; additional details are contained in the test report.

Published maximum torque data from:

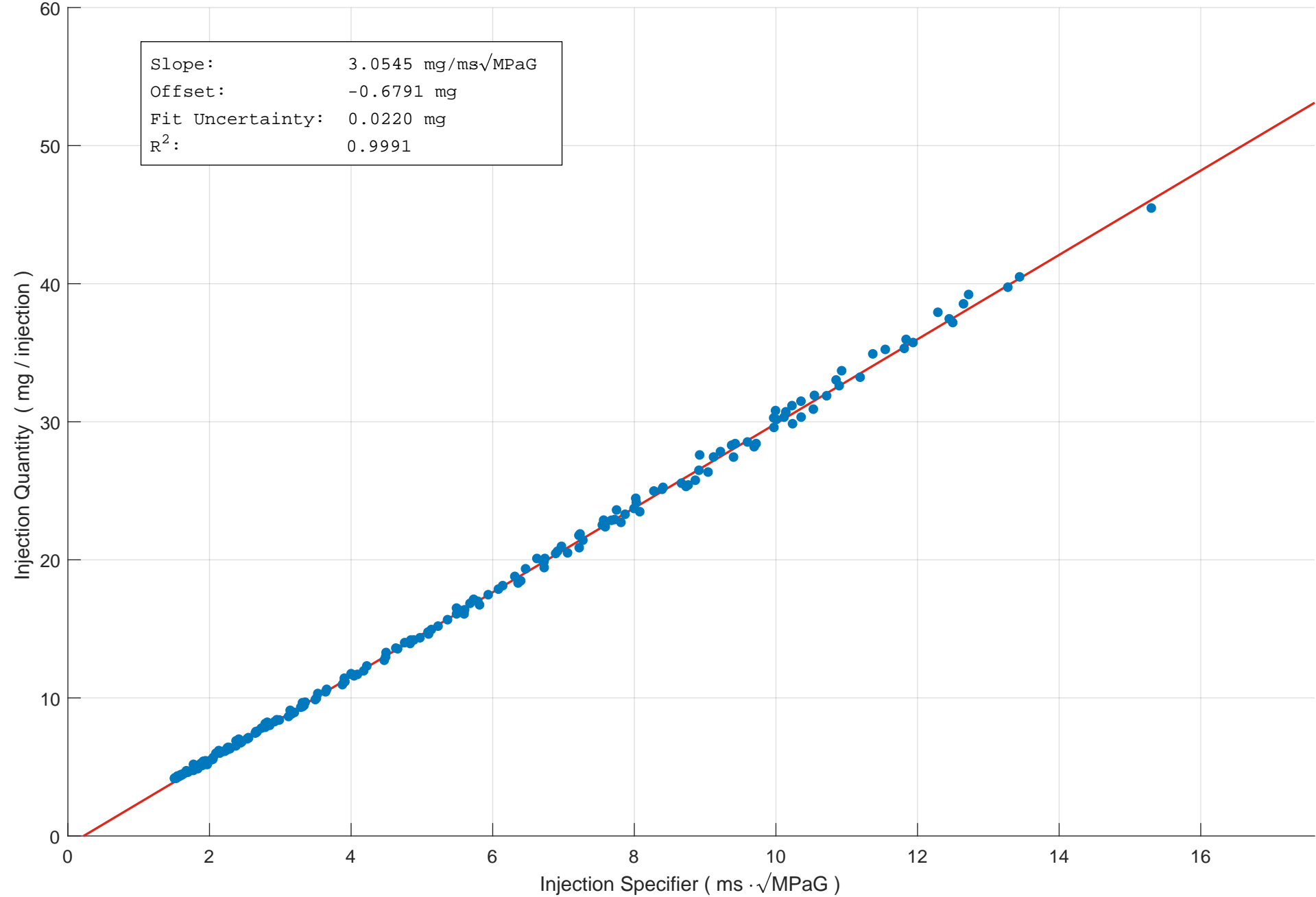
Wada, Y., Nakano, K., Mochizuki, K., and Hata, R., "Development of a New 1.5L I4 Turbocharged Gasoline Direct Injection Engine," SAE Technical Paper 2016-01-1020, 2016, doi:10.4271/2016-01-1020.

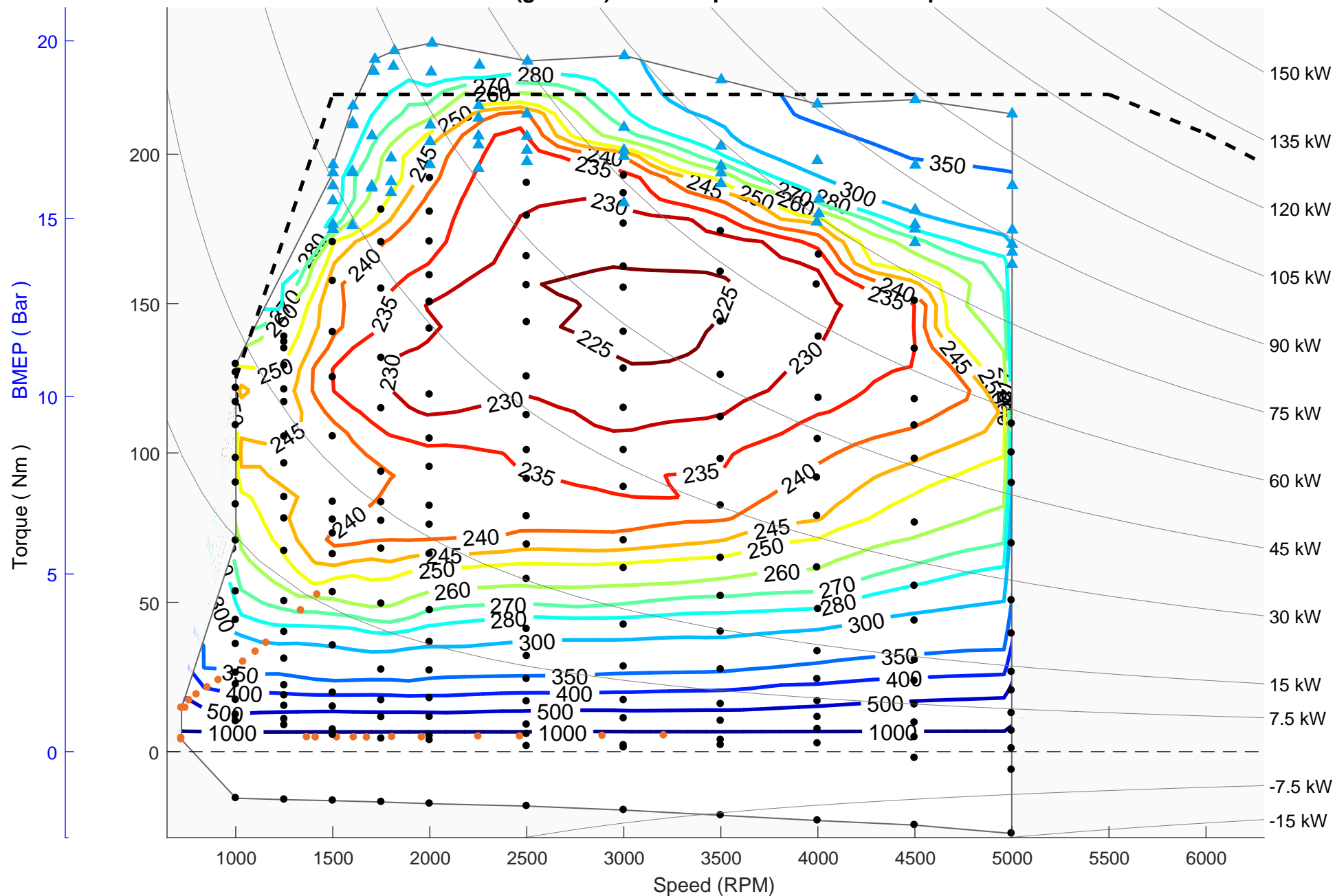


2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots  
Test Data Points

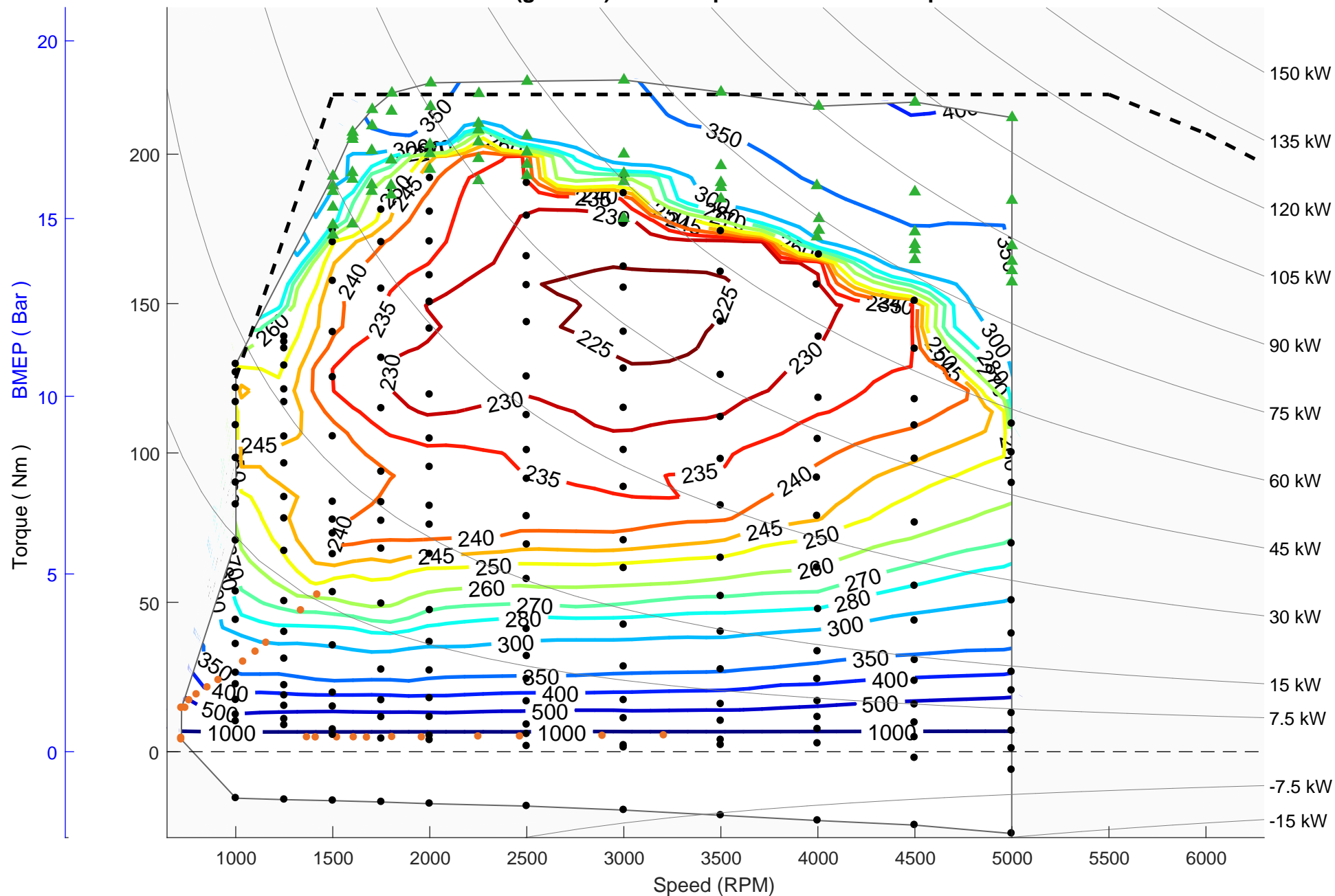


2016 Honda 1.5L L15B7 Tier 2 Fuel - Test Data Plots  
Injector Calibration

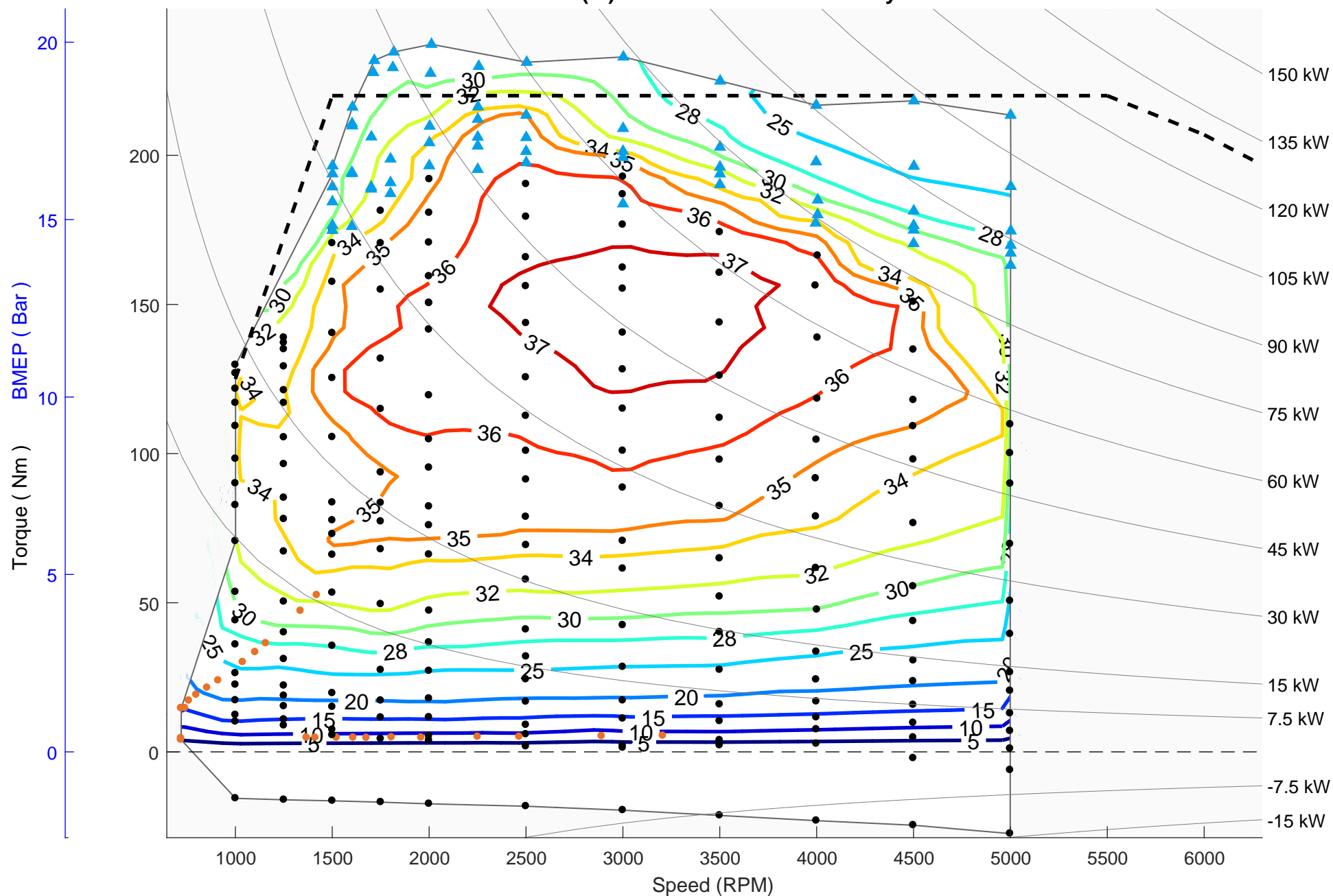


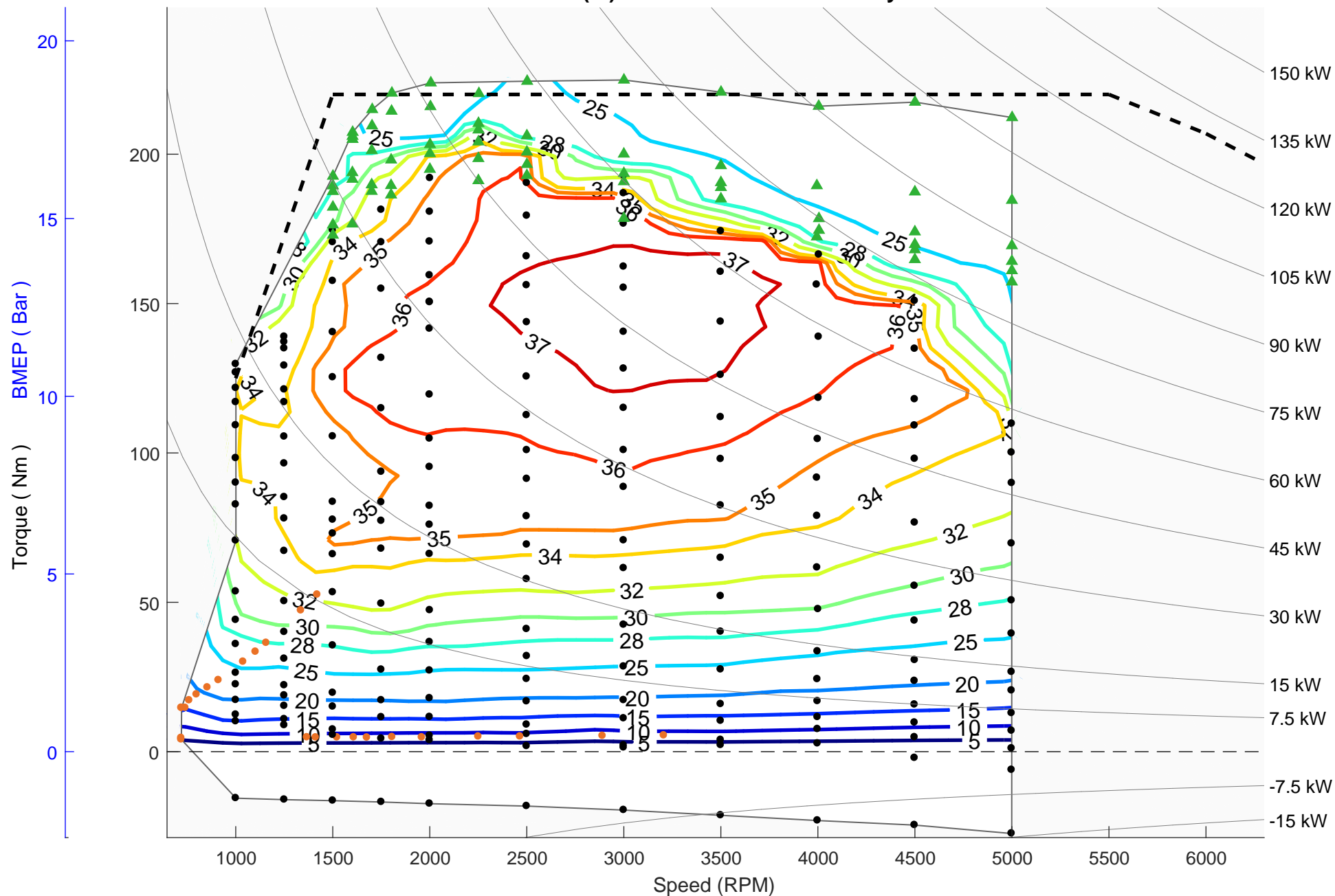


2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots  
Steady State and High Load Final  
BSFC (g/kW-hr) - Brake Specific Fuel Consumption

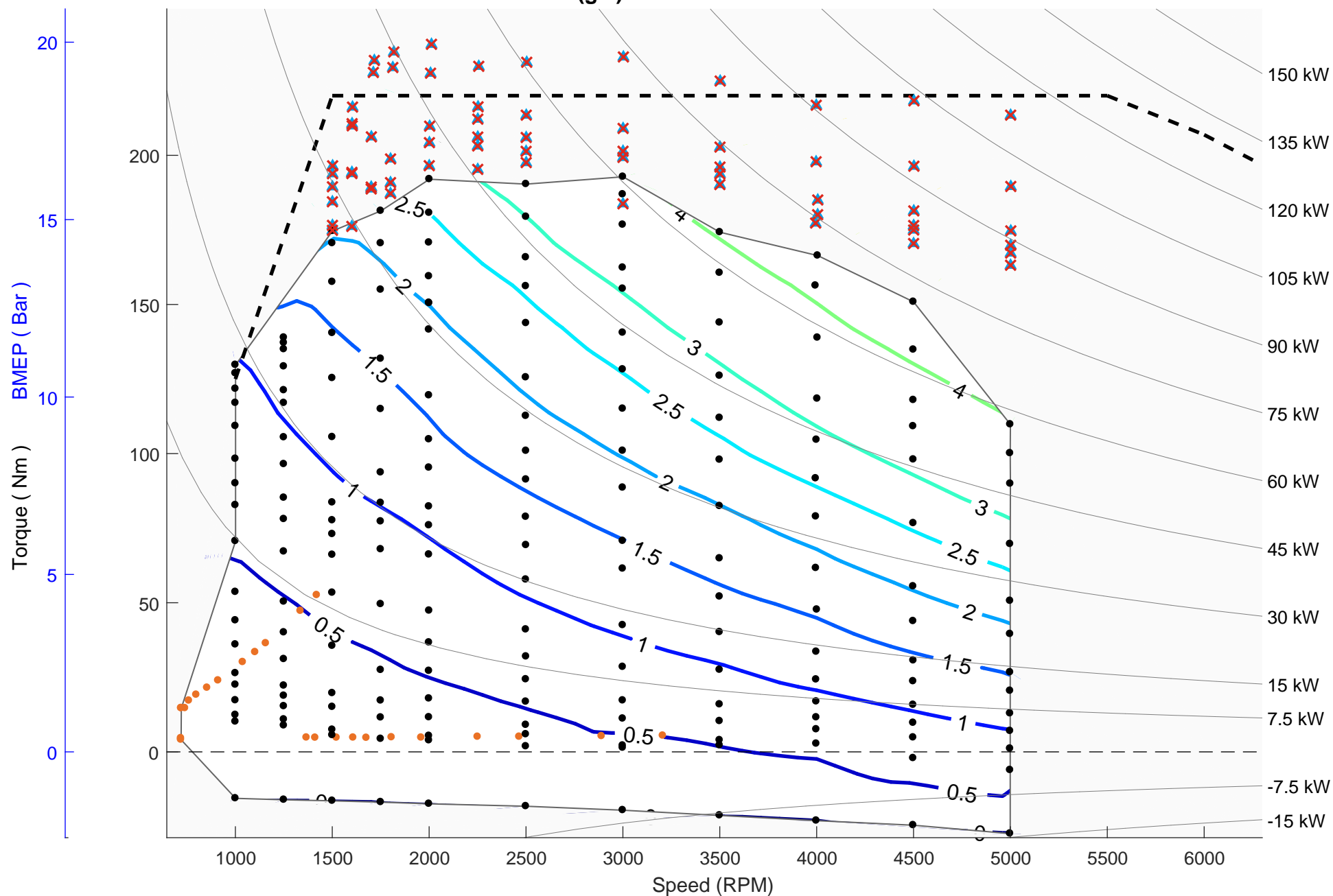


**2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots**  
**Steady State and High Load Initial**  
**BTE (%) - Brake Thermal Efficiency**



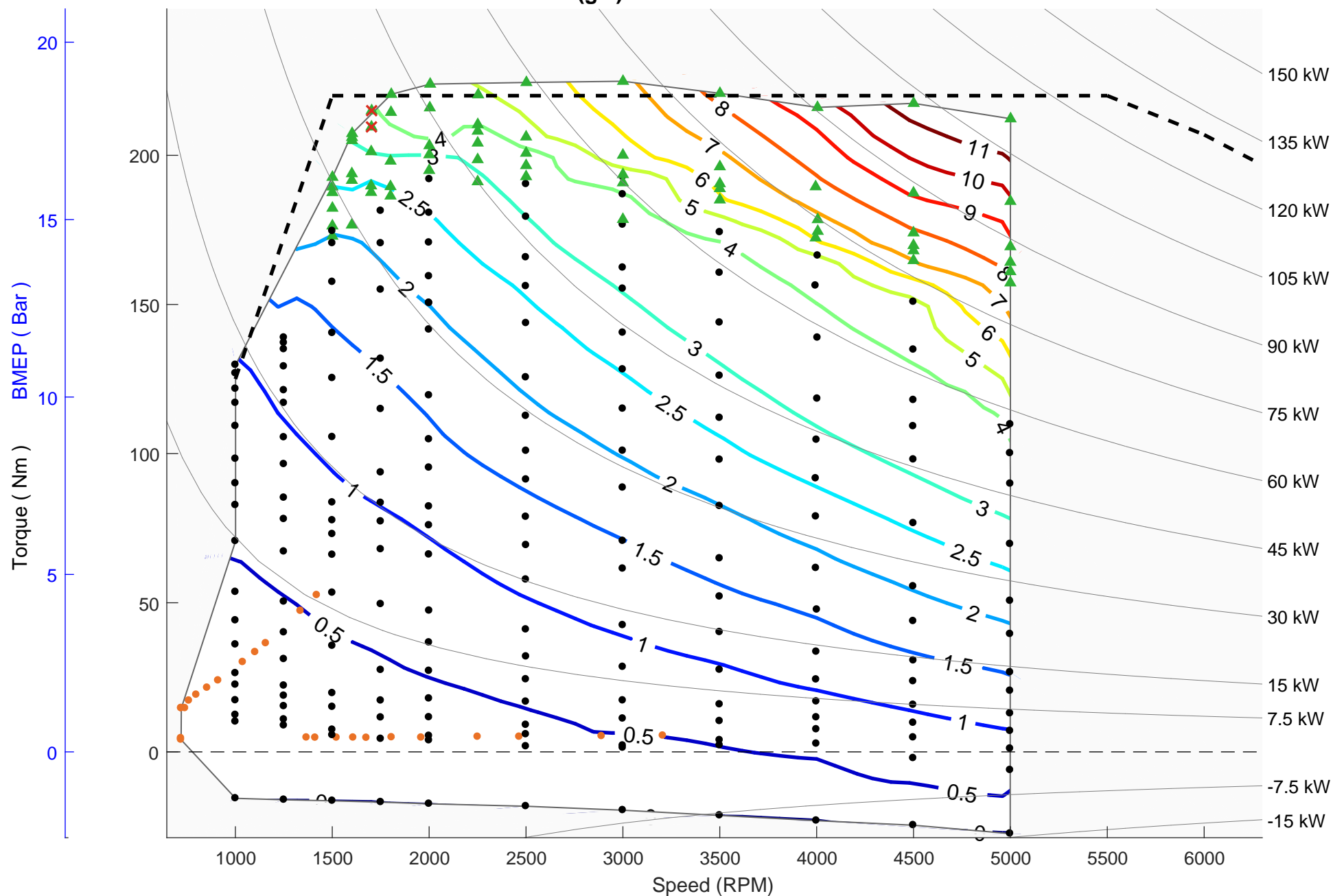


2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots  
Steady State and High Load Initial  
Fuel Meter Flow (g/s) - Fuel Flow Measured with Flow Meter

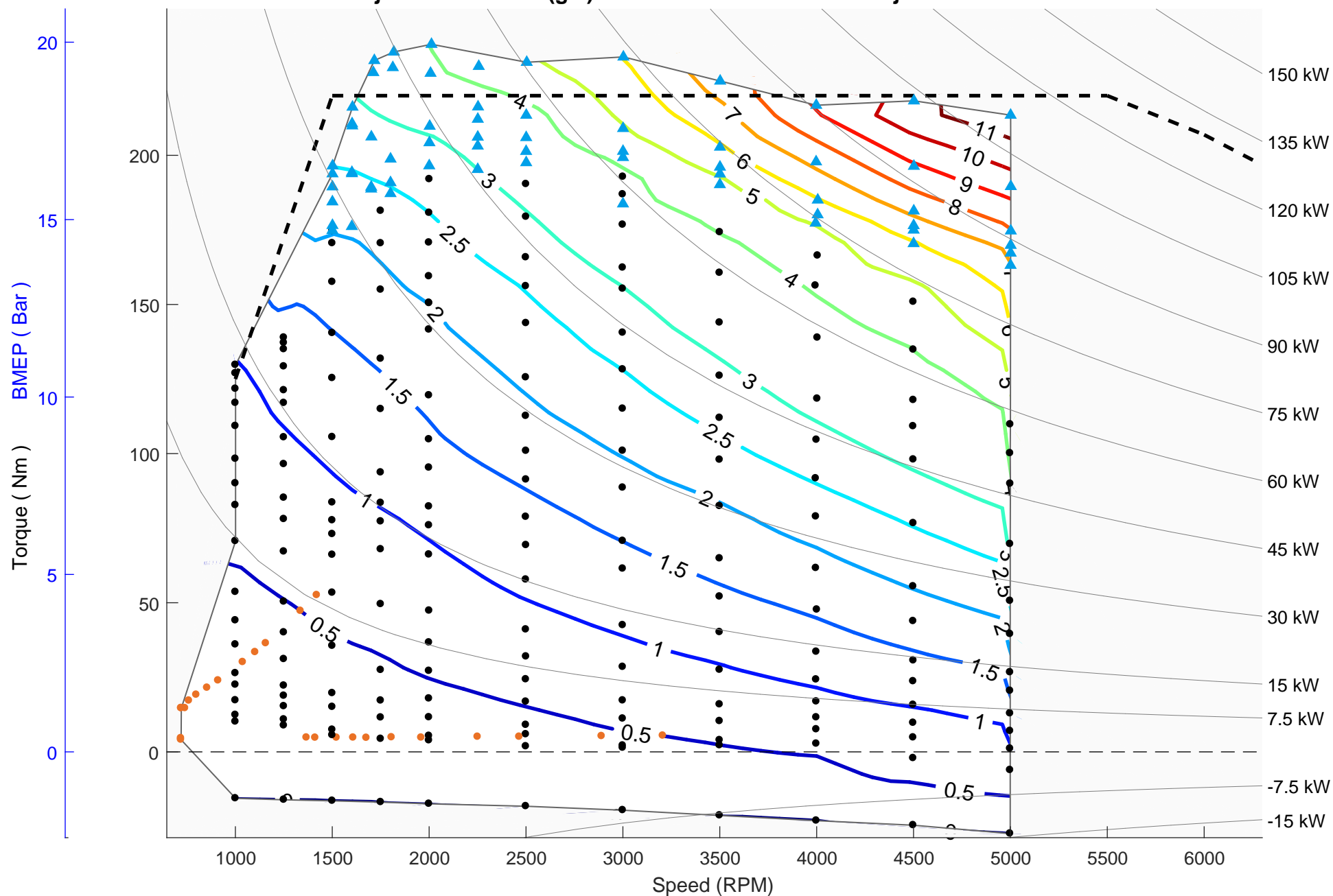




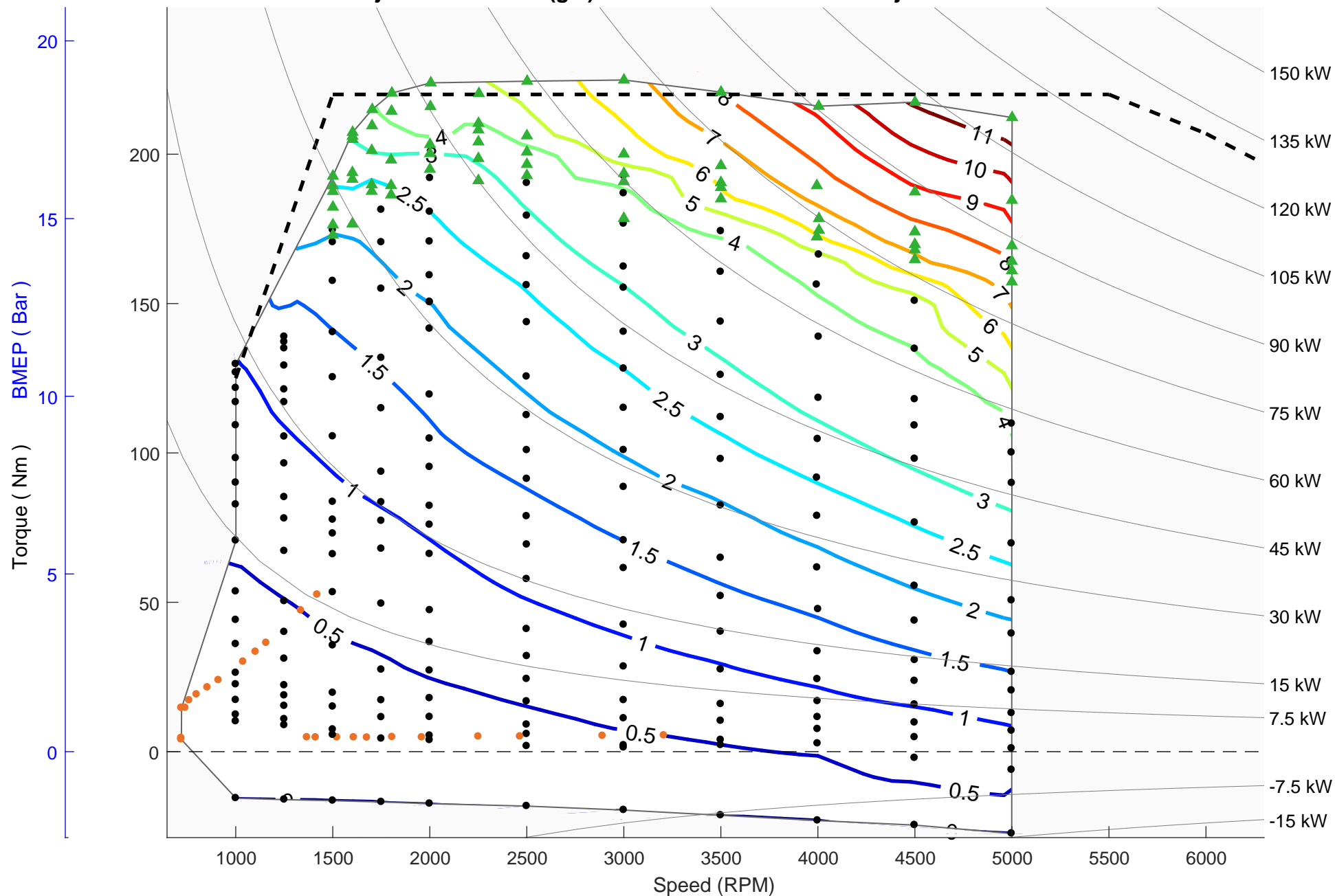
**2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots**  
**Steady State and High Load Final**  
**Fuel Meter Flow (g/s) - Fuel Flow Measured with Flow Meter**



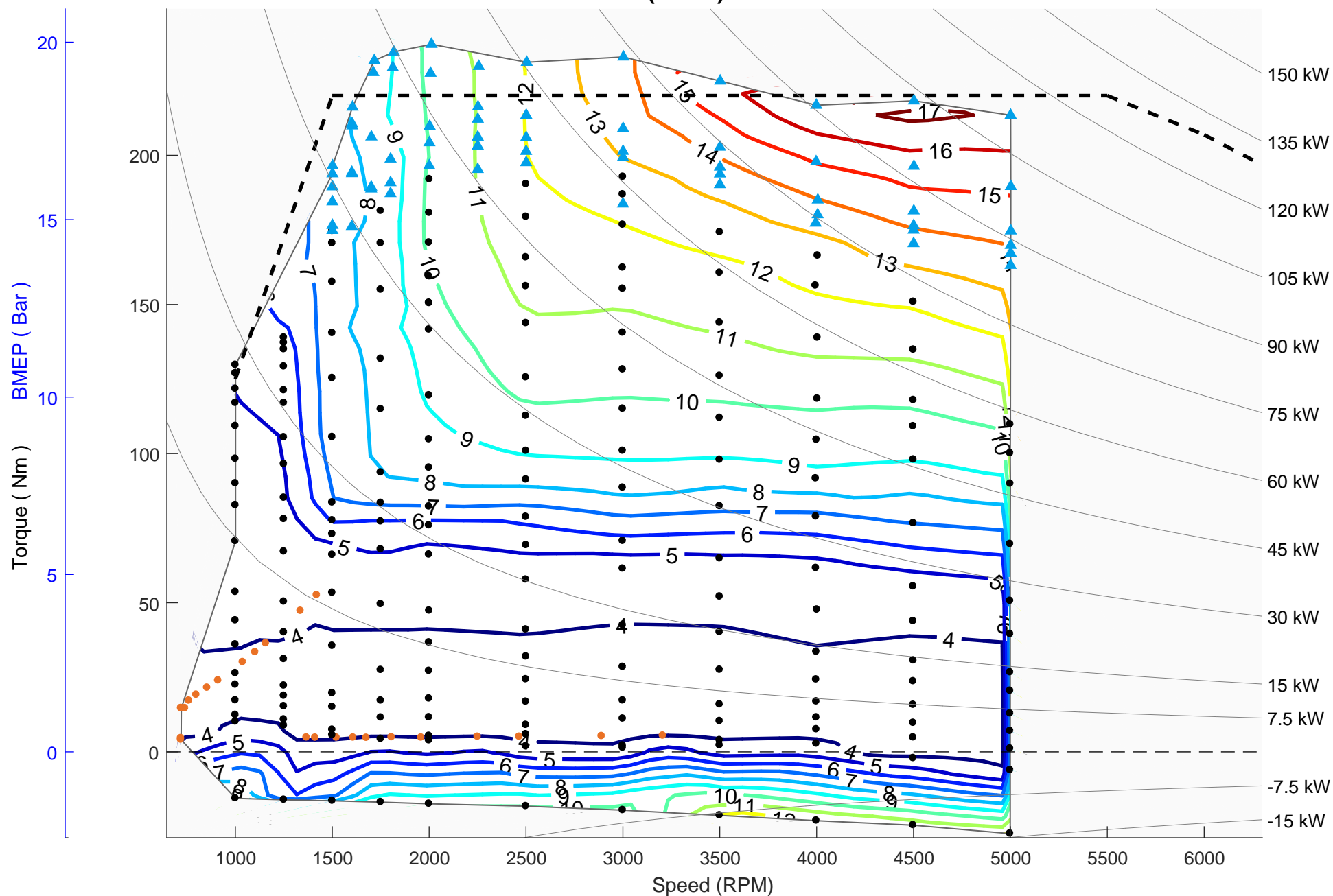
2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots  
Steady State and High Load Initial  
Injector Fuel Flow (g/s) - Fuel Flow Estimate from Injector Calibration



**2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots**  
**Steady State and High Load Final**  
**Injector Fuel Flow (g/s) - Fuel Flow Estimate from Injector Calibration**

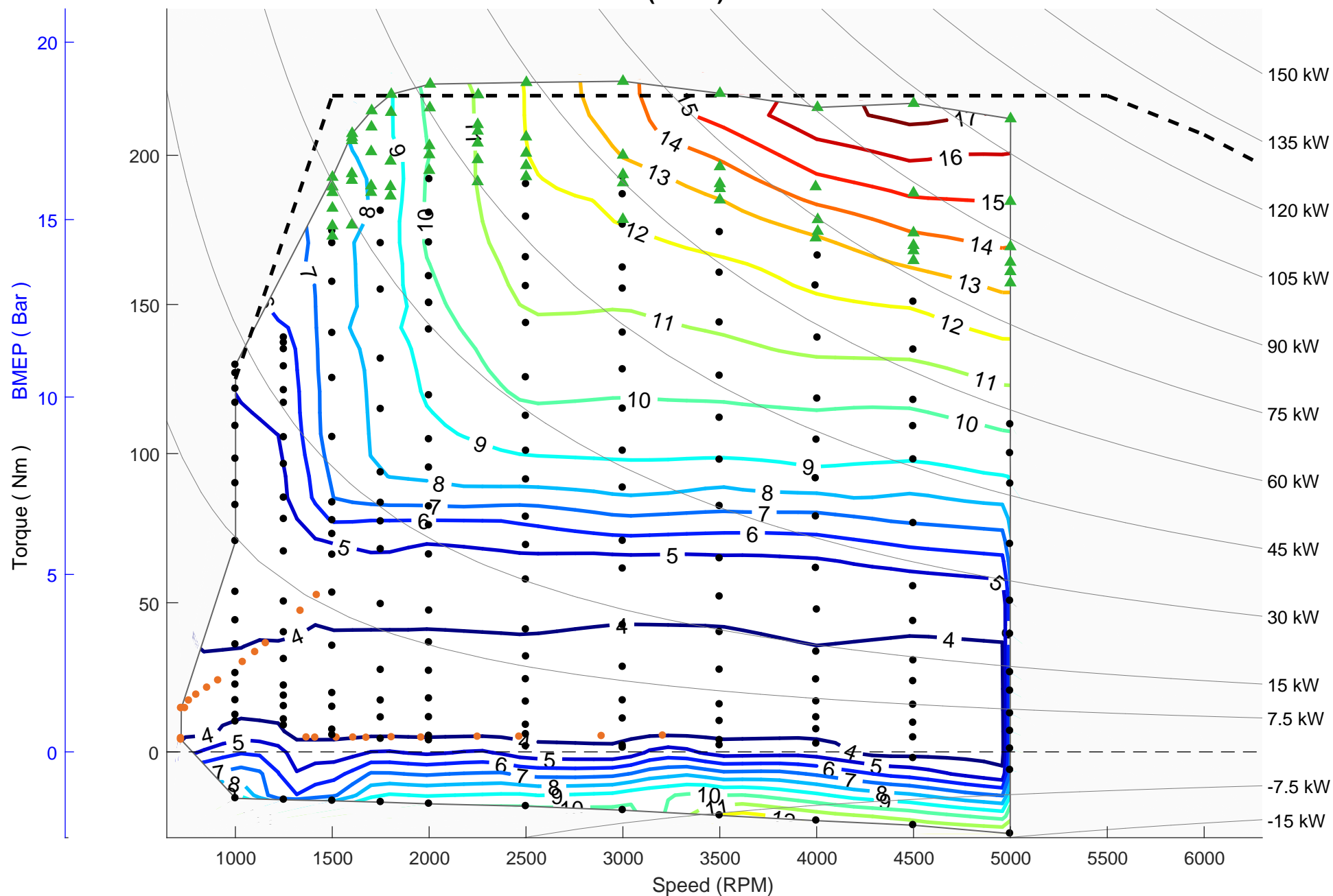


2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots  
Steady State and High Load Initial  
Fuel Rail Press (MPaG) - Fuel Rail Pressure\*



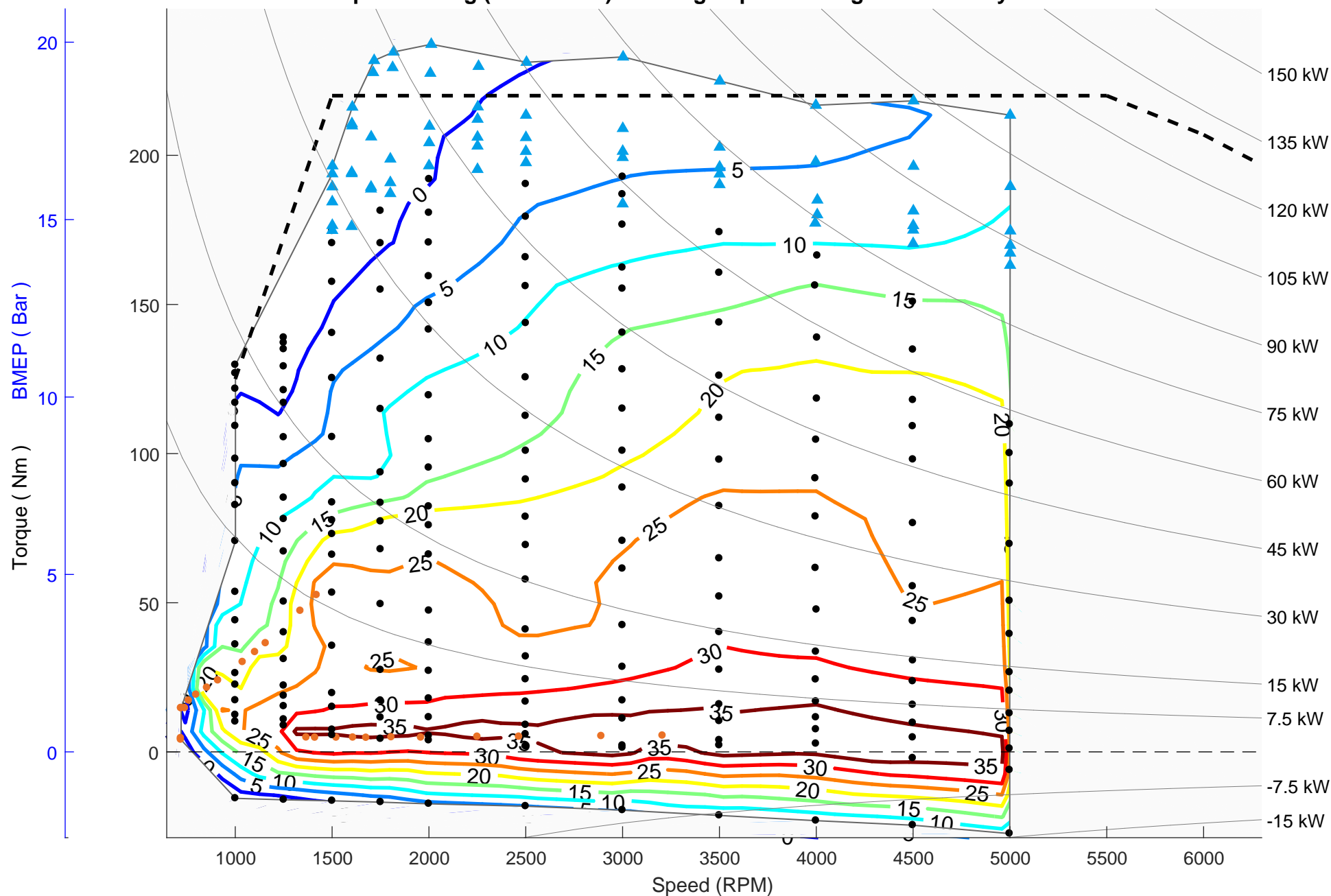
\* Reference Only

2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots  
Steady State and High Load Final  
Fuel Rail Press (MPaG) - Fuel Rail Pressure\*



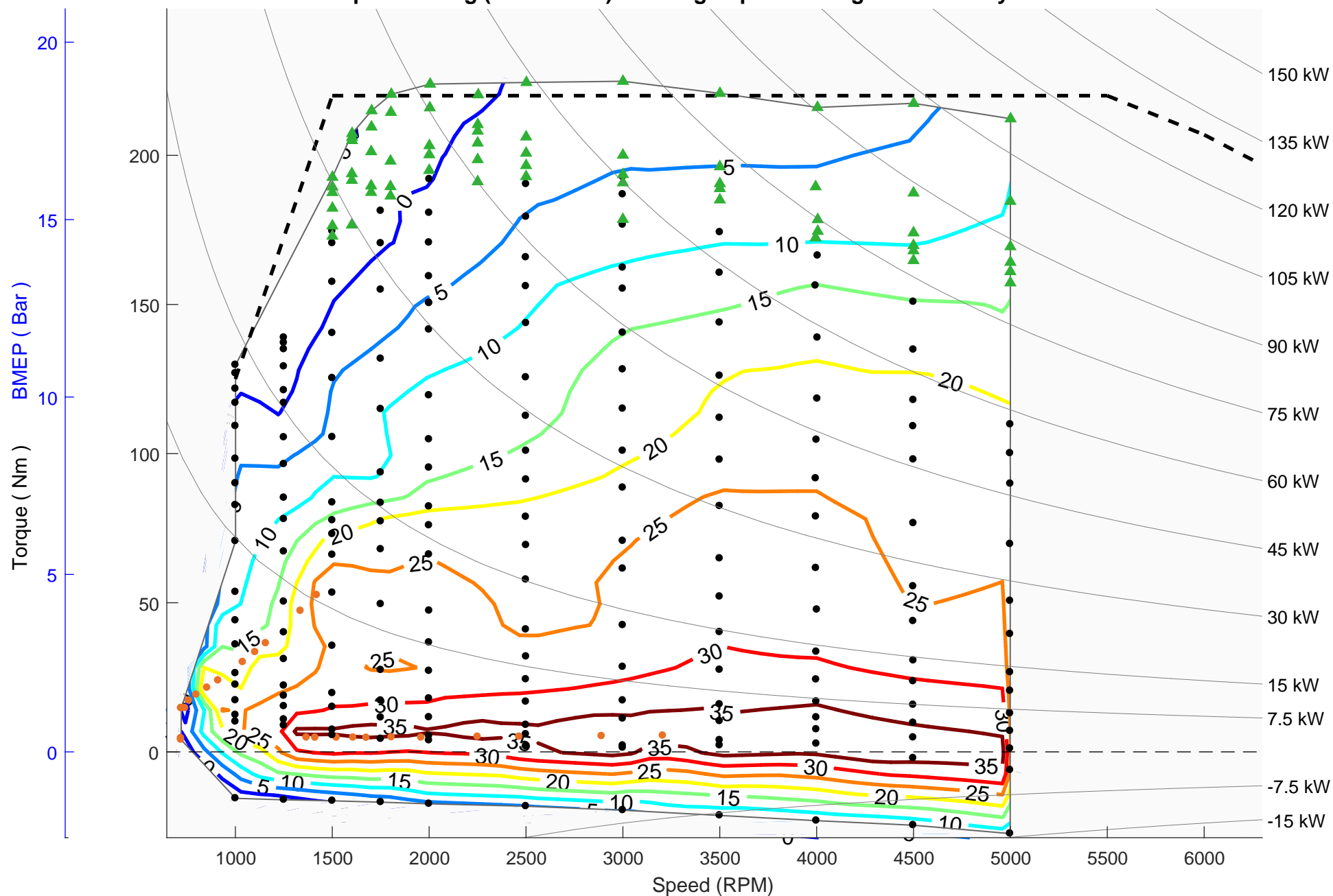
\* Reference Only

**2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots**  
**Steady State and High Load Initial**  
**Spark Timing (CAD BTDC) - Average Spark Timing Across all Cylinders\***



\* Reference Only

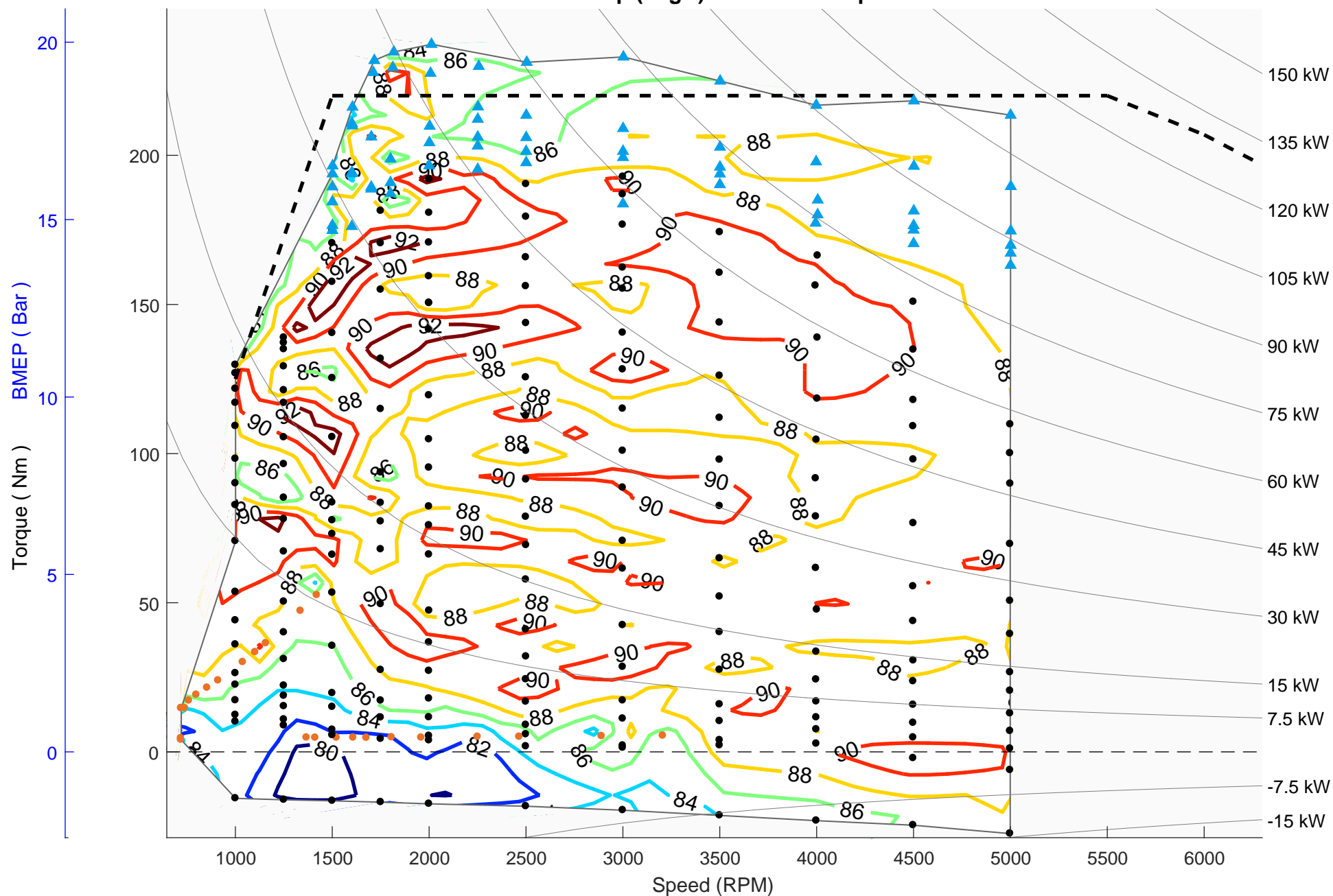
**2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots**  
**Steady State and High Load Final**  
**Spark Timing (CAD BTDC) - Average Spark Timing Across all Cylinders\***



\* Reference Only

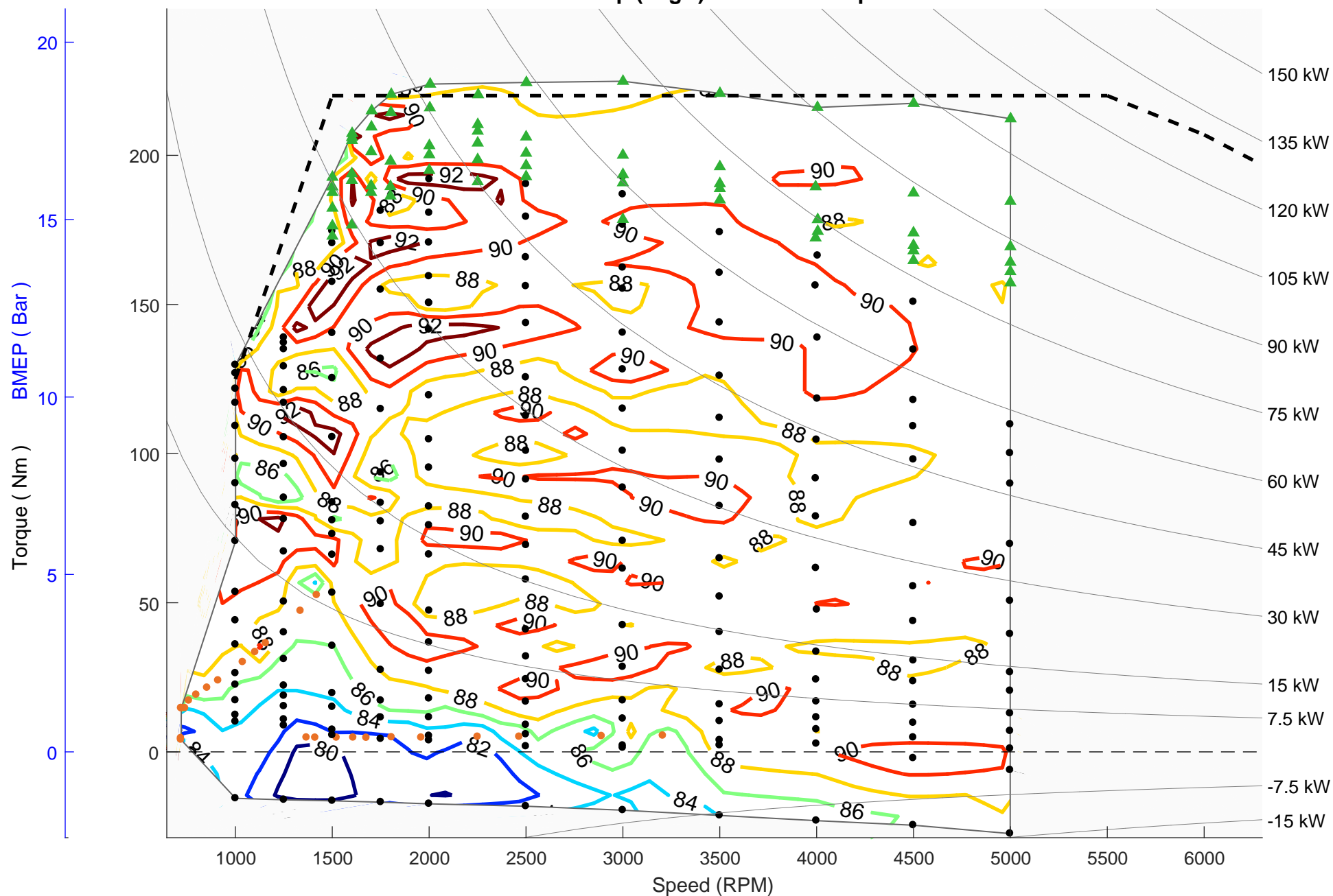


2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots  
Steady State and High Load Initial  
Coolant Temp (degC) - Coolant Temperature

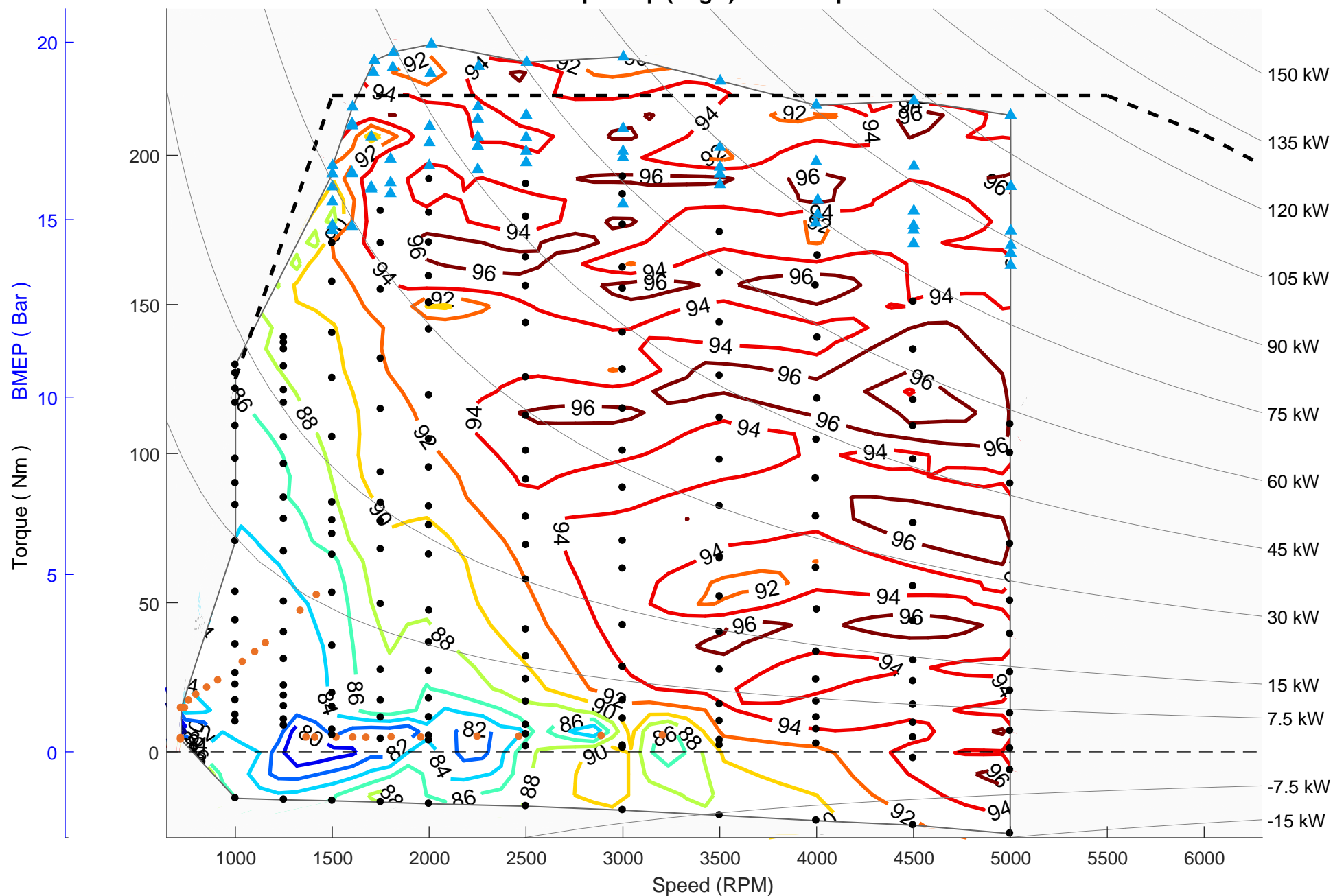




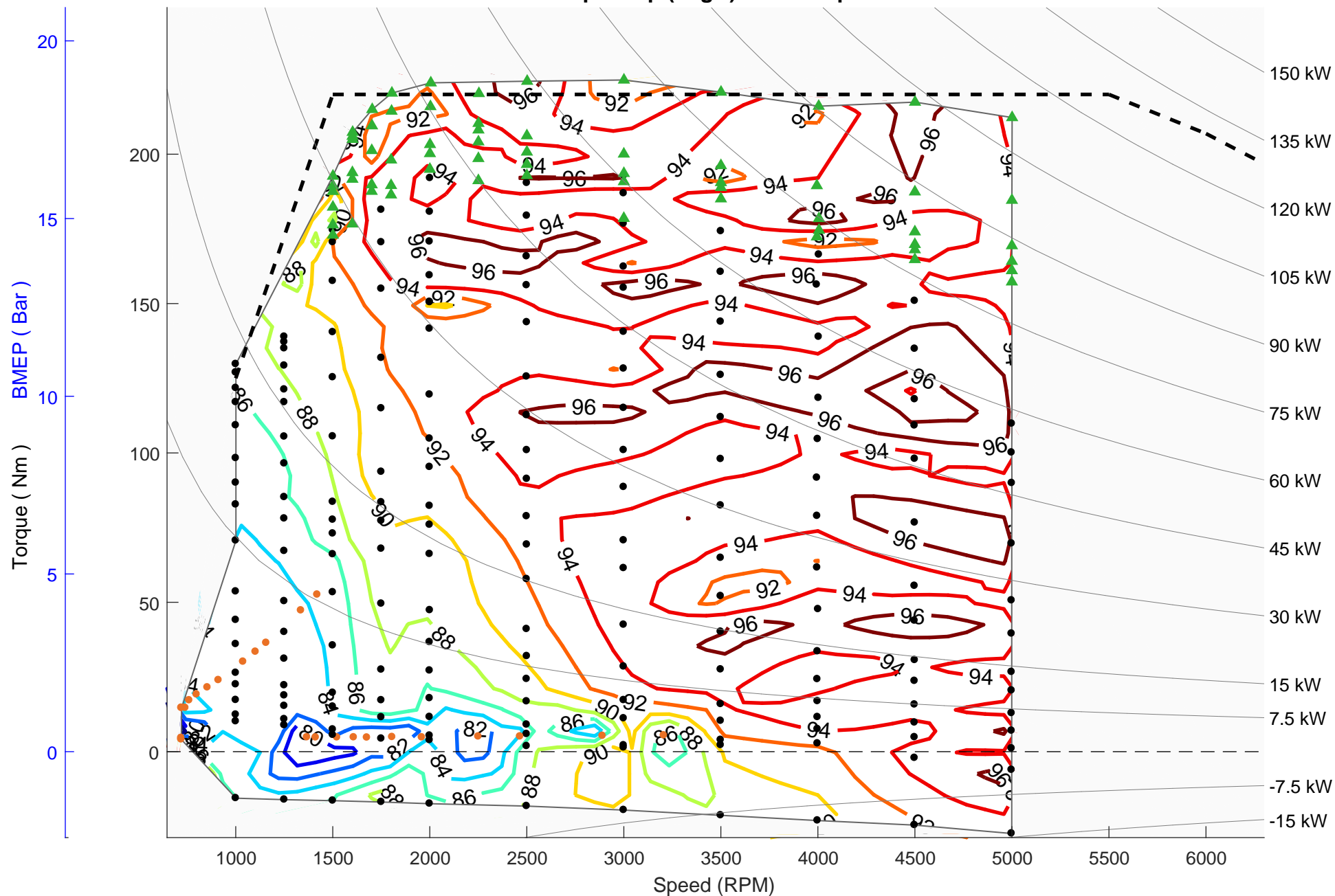
**2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots**  
**Steady State and High Load Final**  
**Coolant Temp (degC) - Coolant Temperature**



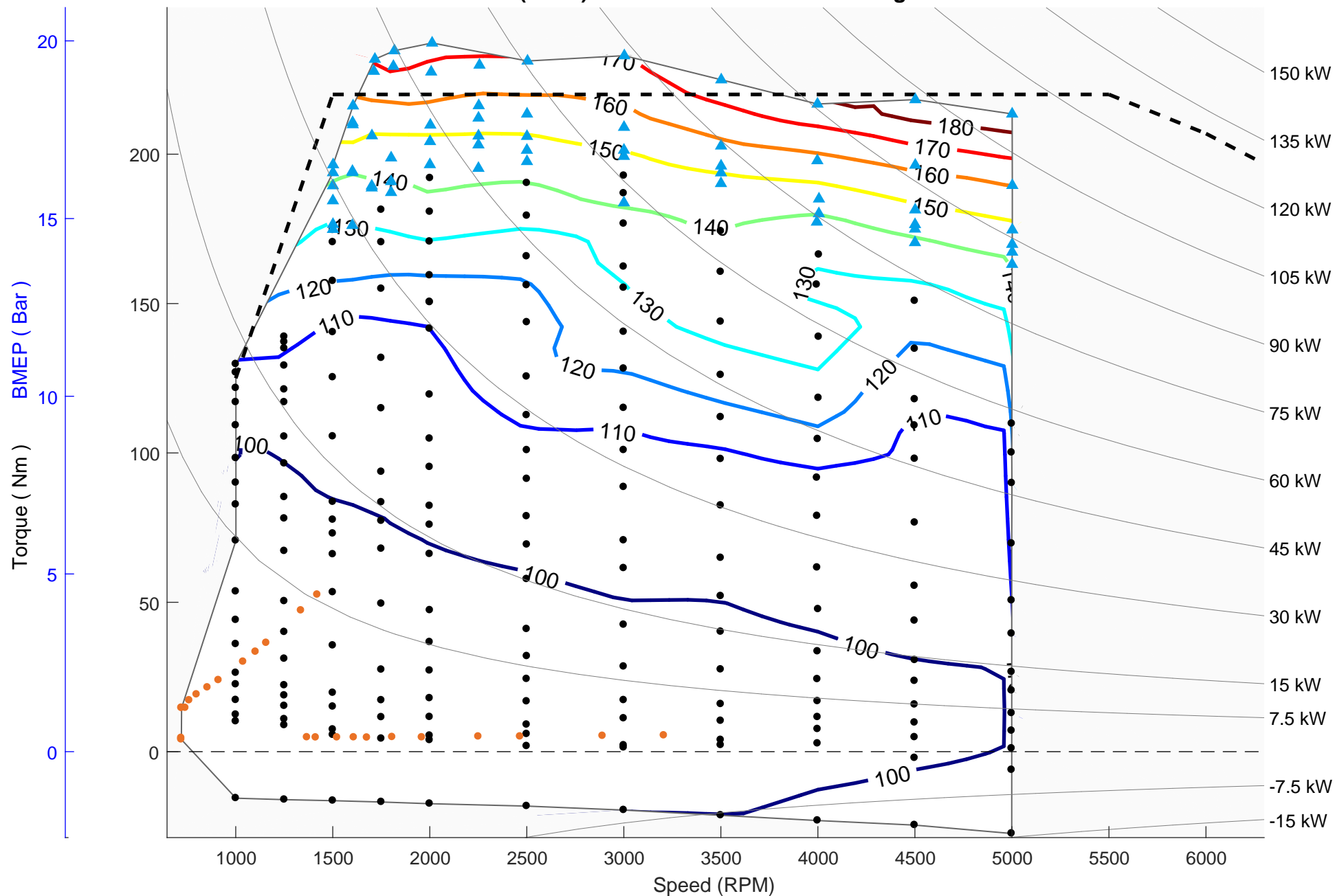
2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots  
Steady State and High Load Initial  
Oil Sump Temp (degC) - Oil Temperature



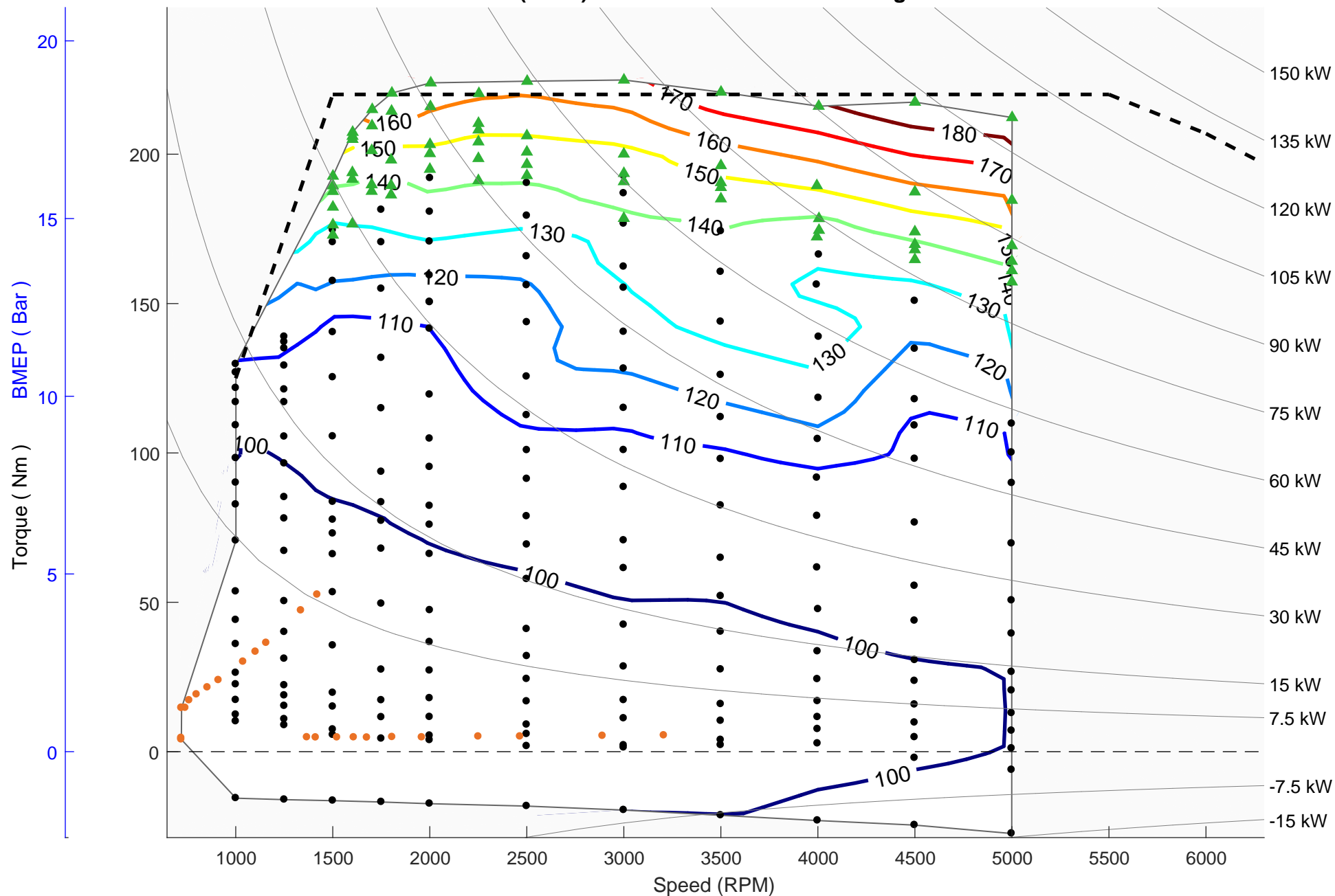
2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots  
Steady State and High Load Final  
Oil Sump Temp (degC) - Oil Temperature



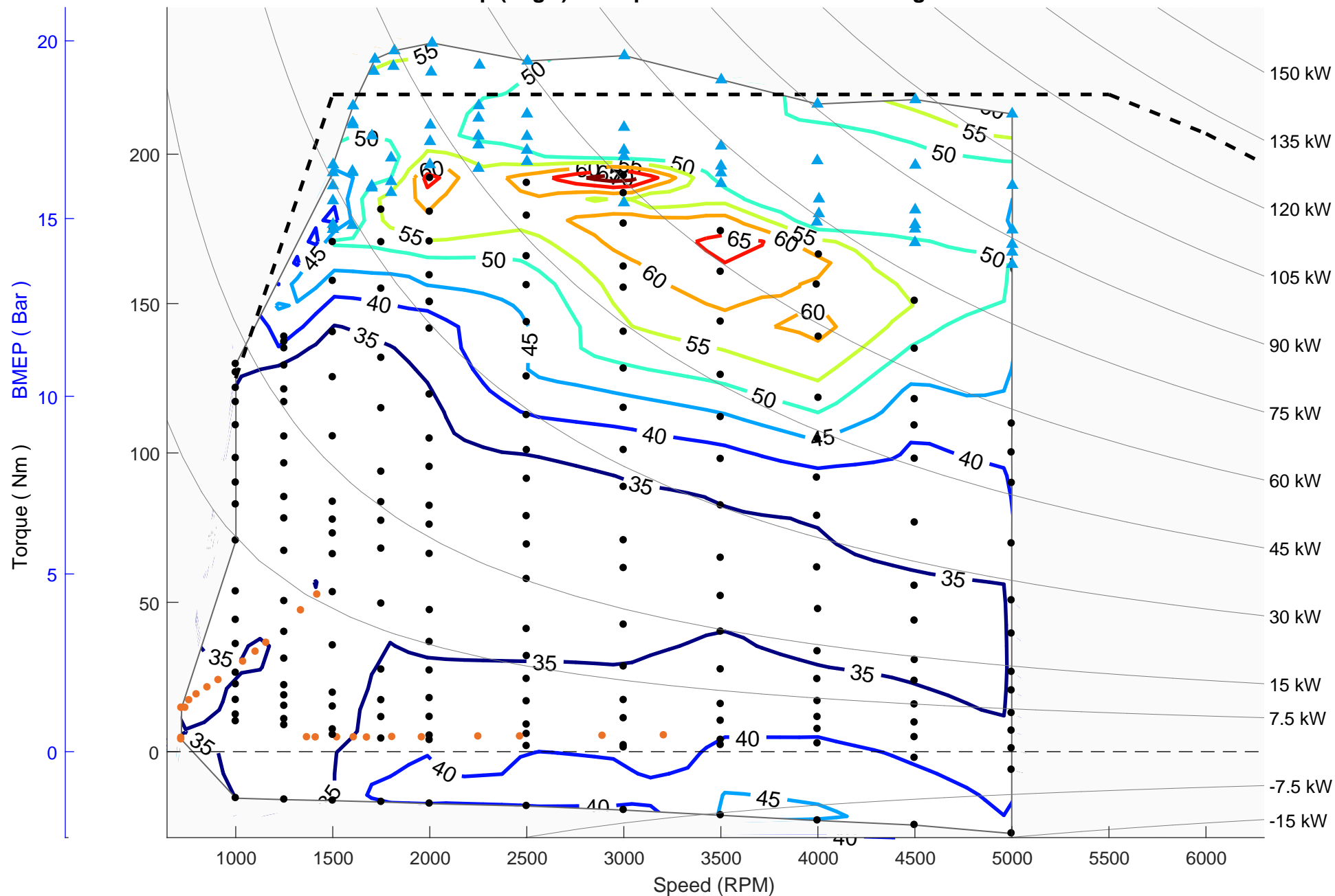
**2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots**  
**Steady State and High Load Initial**  
**CAC Inlet Press (kPaA) - Pressure Measured at Charge Air Cooler Inlet**

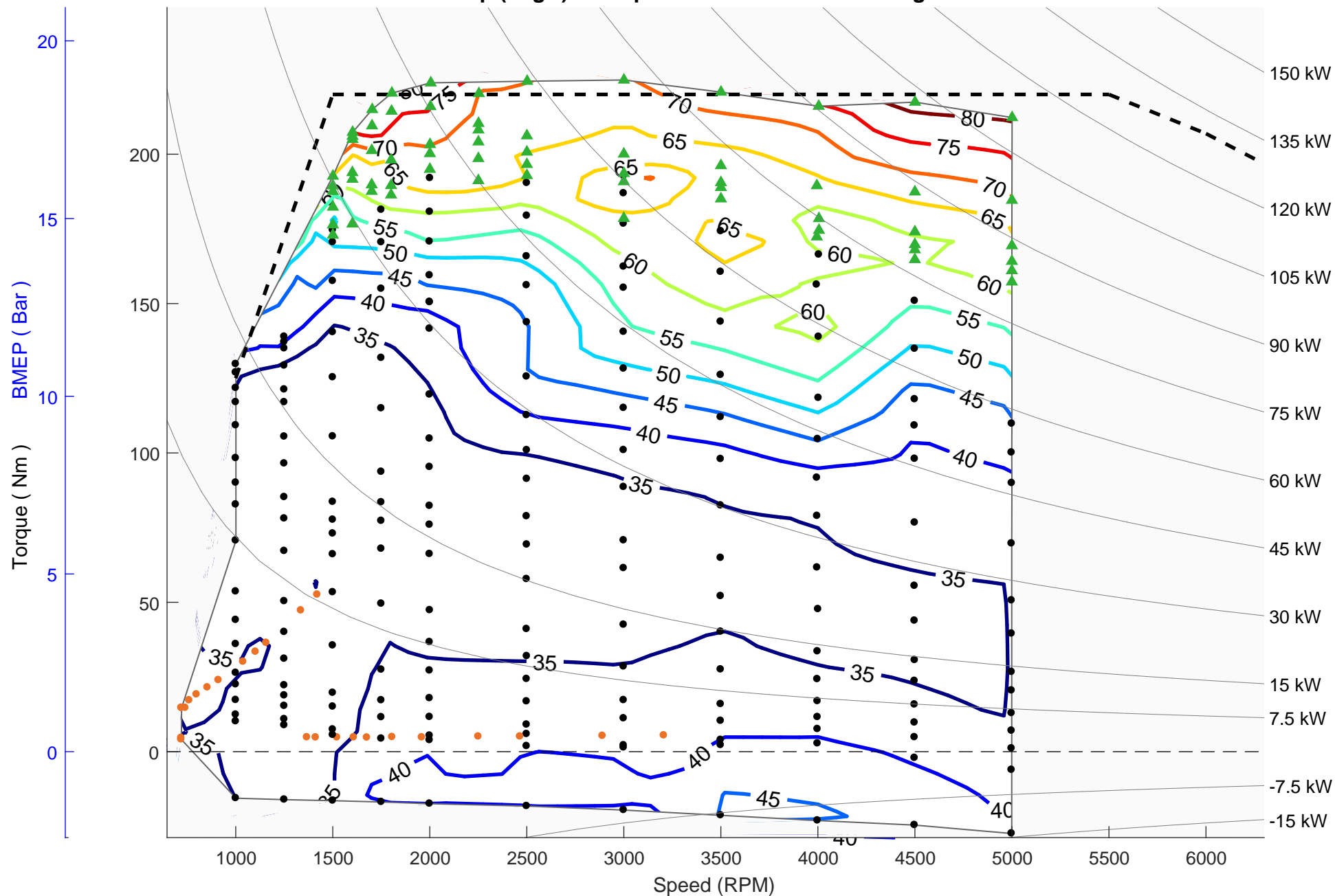


2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots  
Steady State and High Load Final  
CAC Inlet Press (kPaA) - Pressure Measured at Charge Air Cooler Inlet



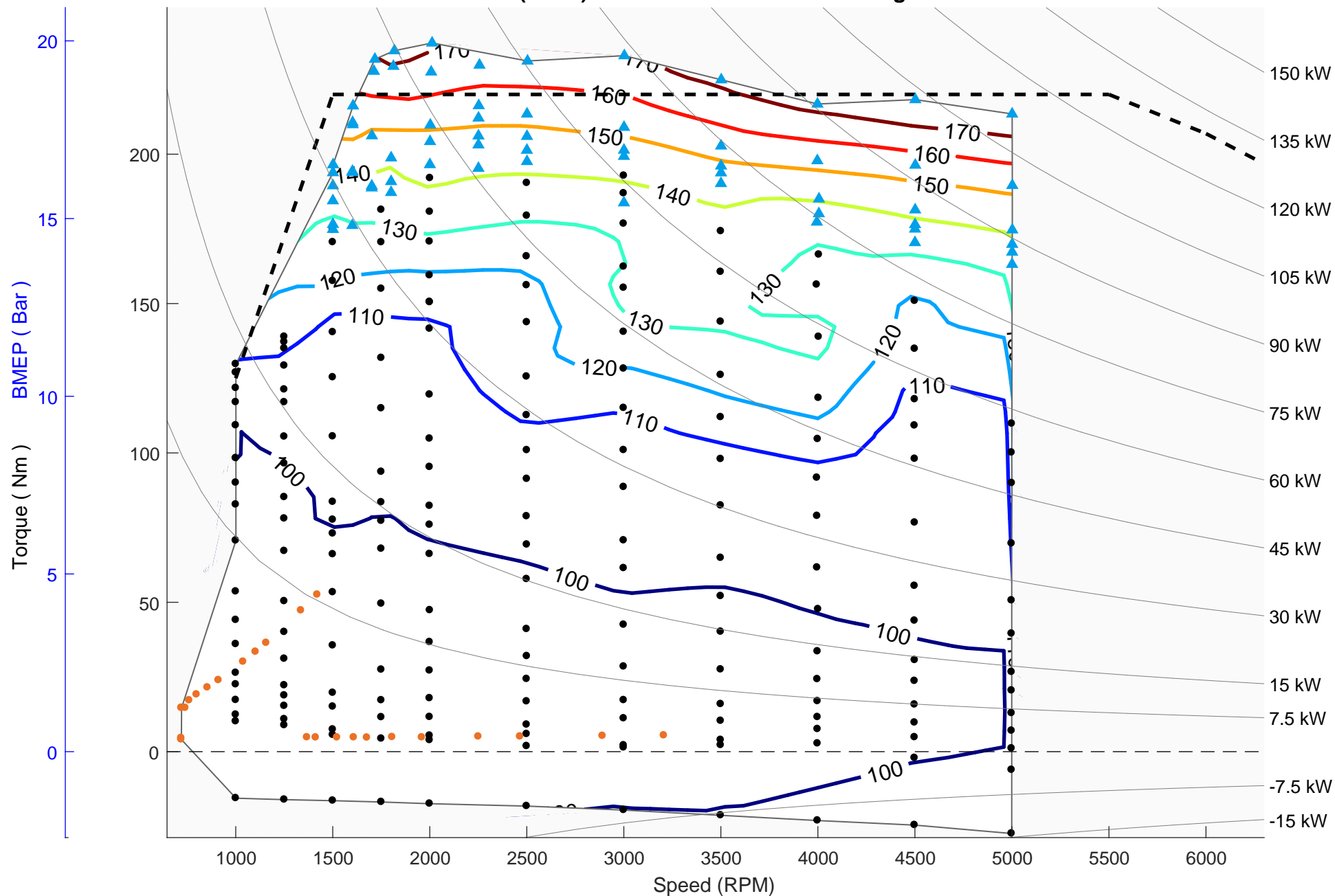
2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots  
Steady State and High Load Initial  
CAC Inlet Temp (degC) - Temperature Measured at Charge Air Cooler Inlet





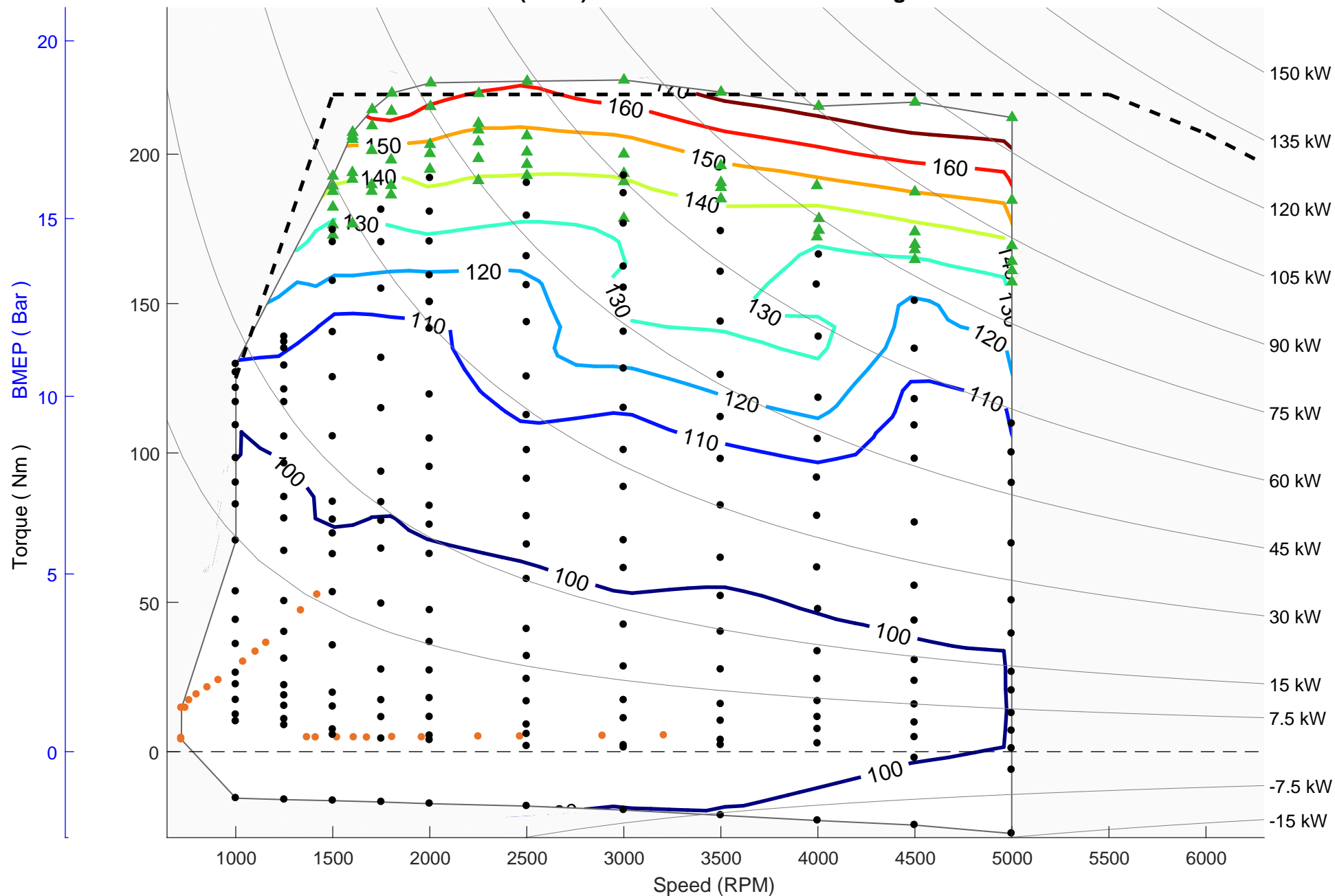


2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots  
Steady State and High Load Initial  
CAC Outlet Press (kPaA) - Pressure Measured at Charge Air Cooler Outlet

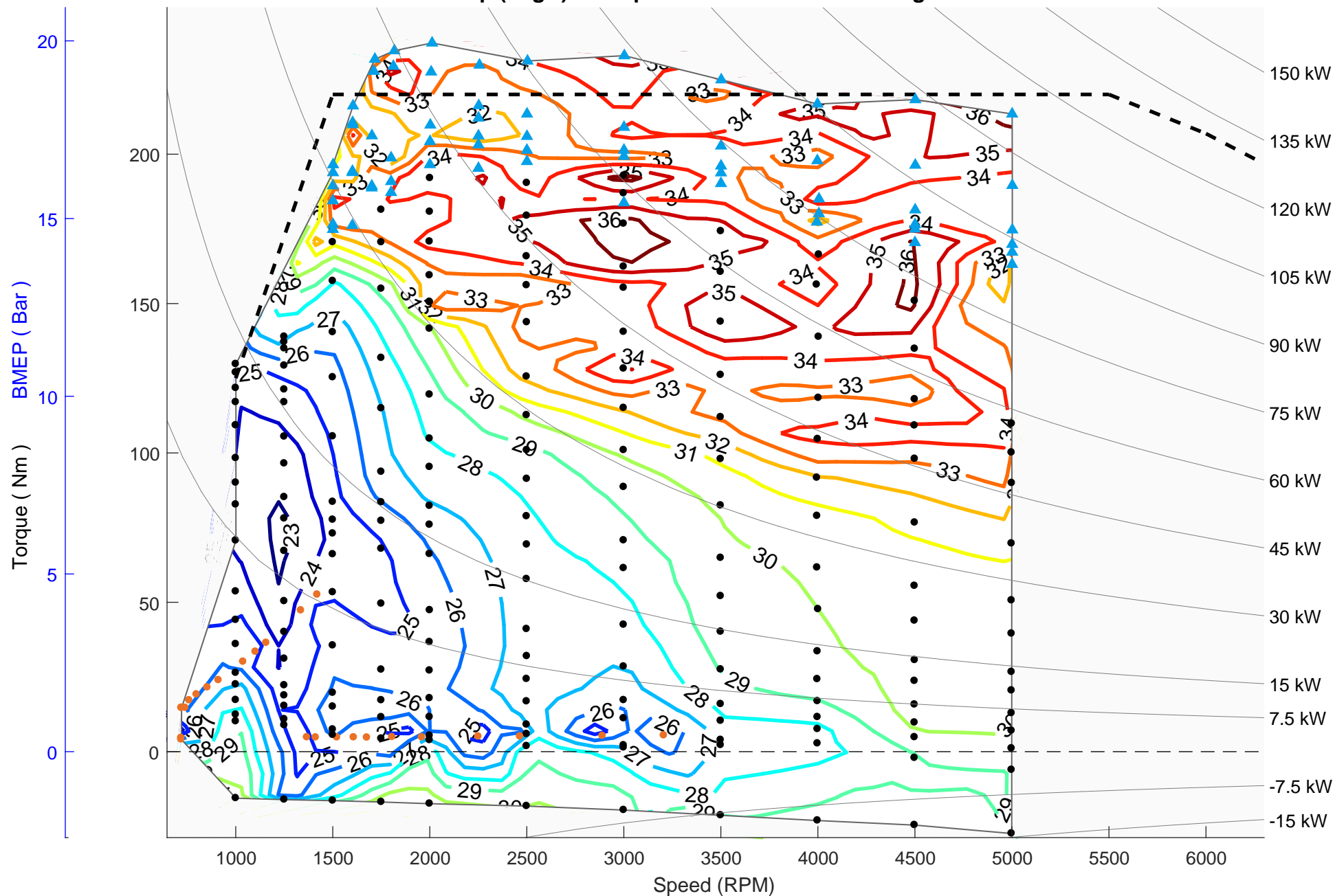




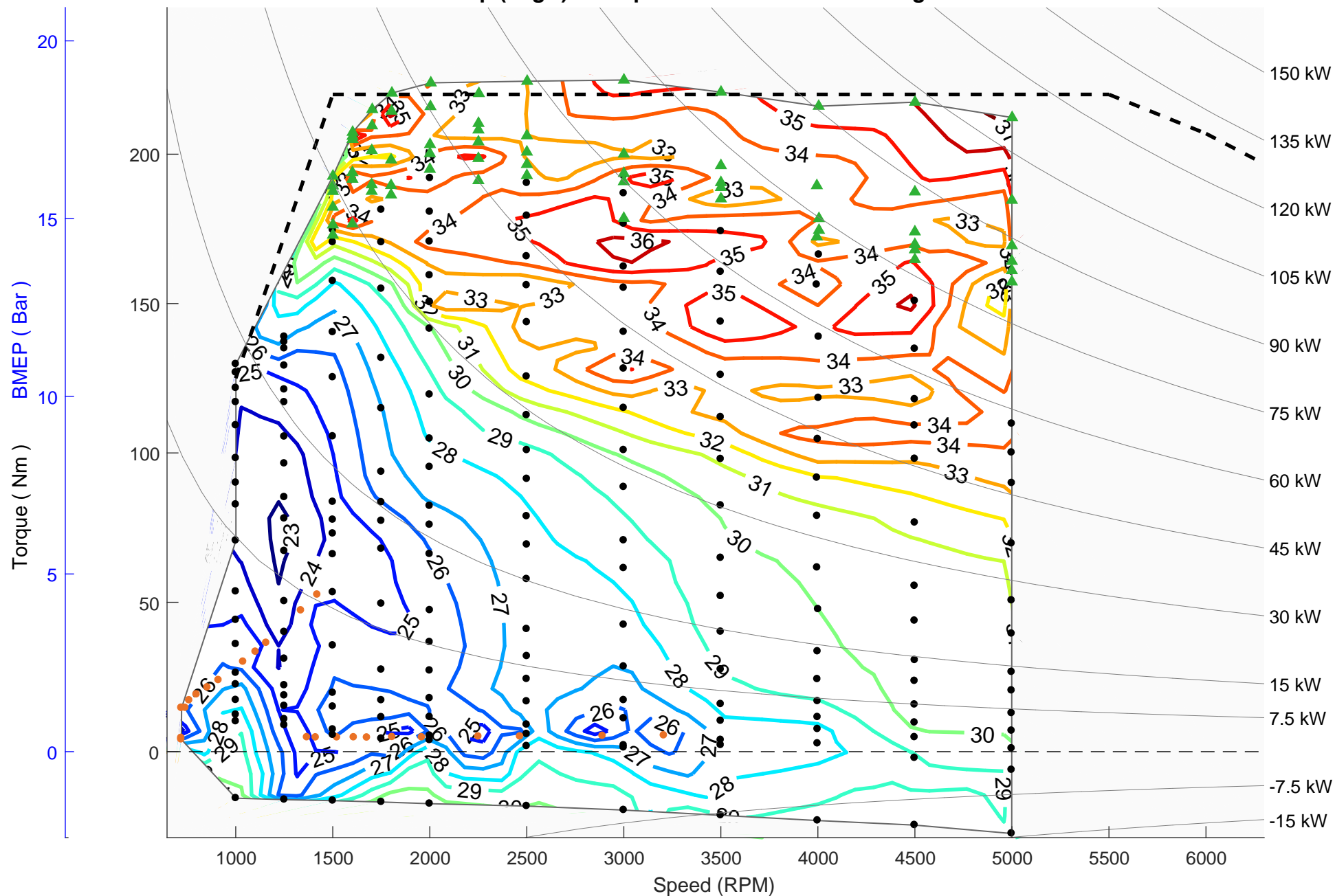
2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots  
Steady State and High Load Final  
CAC Outlet Press (kPaA) - Pressure Measured at Charge Air Cooler Outlet



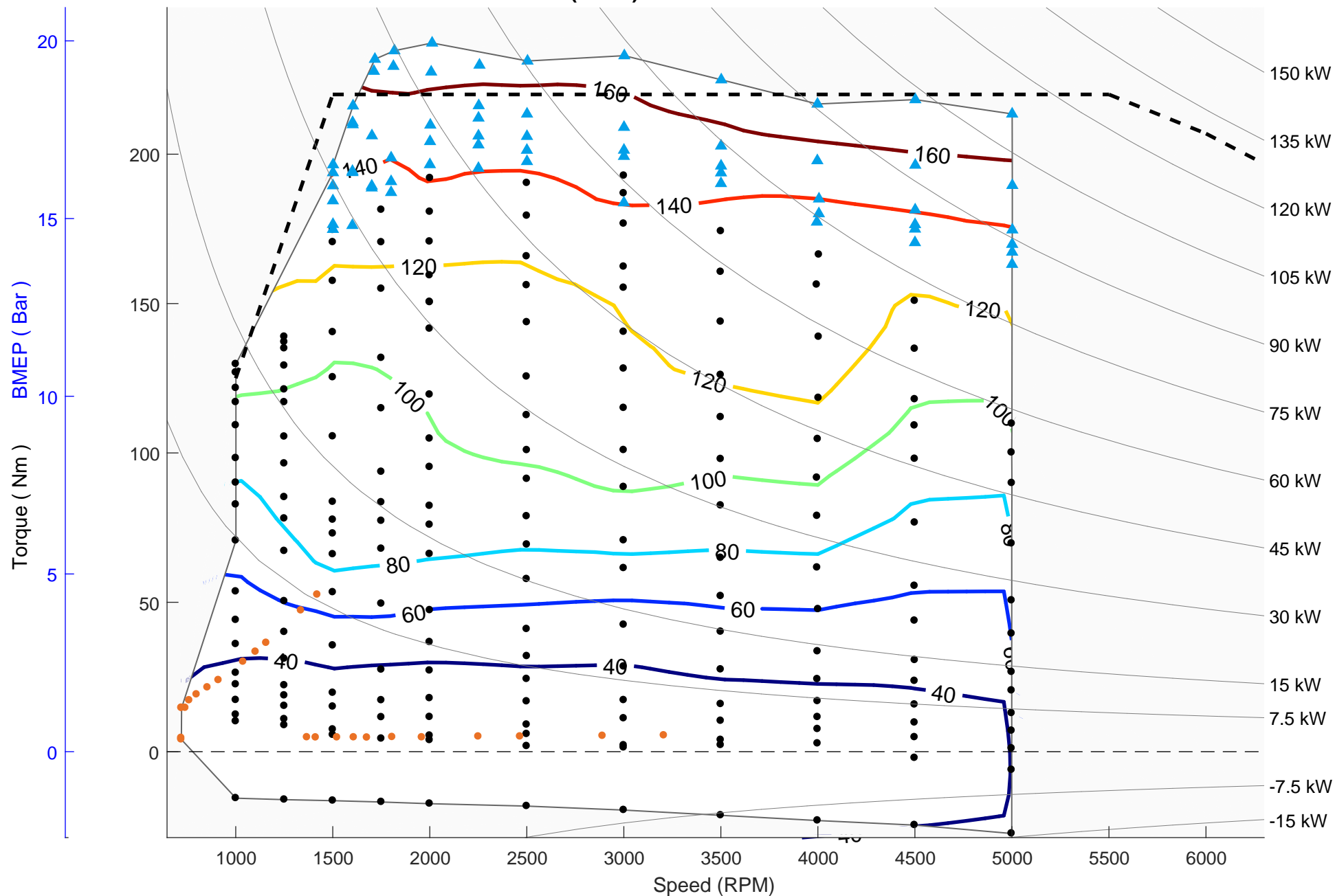
2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots  
Steady State and High Load Initial  
CAC Outlet Temp (degC) - Temperature Measured at Charge Air Cooler Outlet



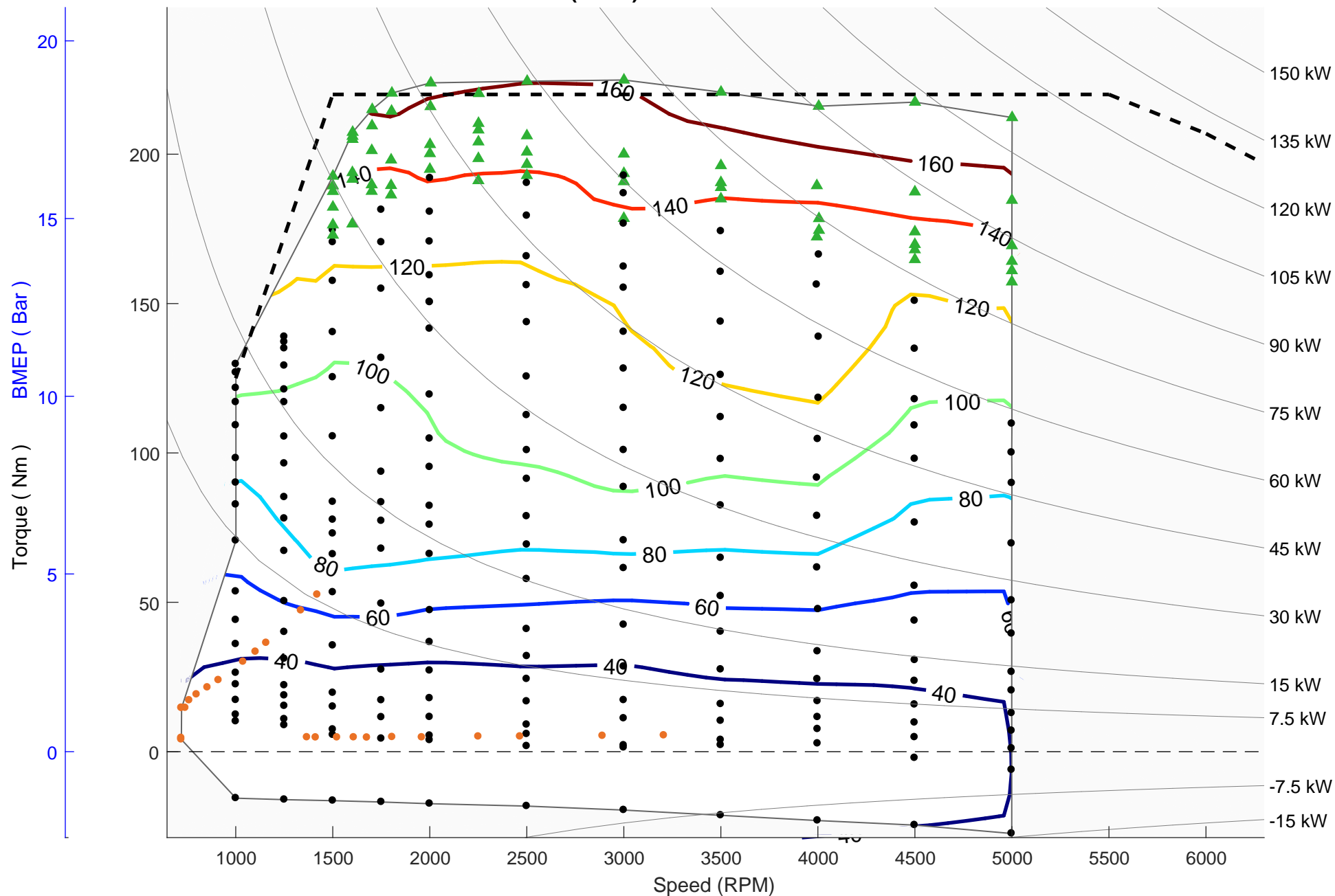
**2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots**  
**Steady State and High Load Final**  
**CAC Outlet Temp (degC) - Temperature Measured at Charge Air Cooler Outlet**



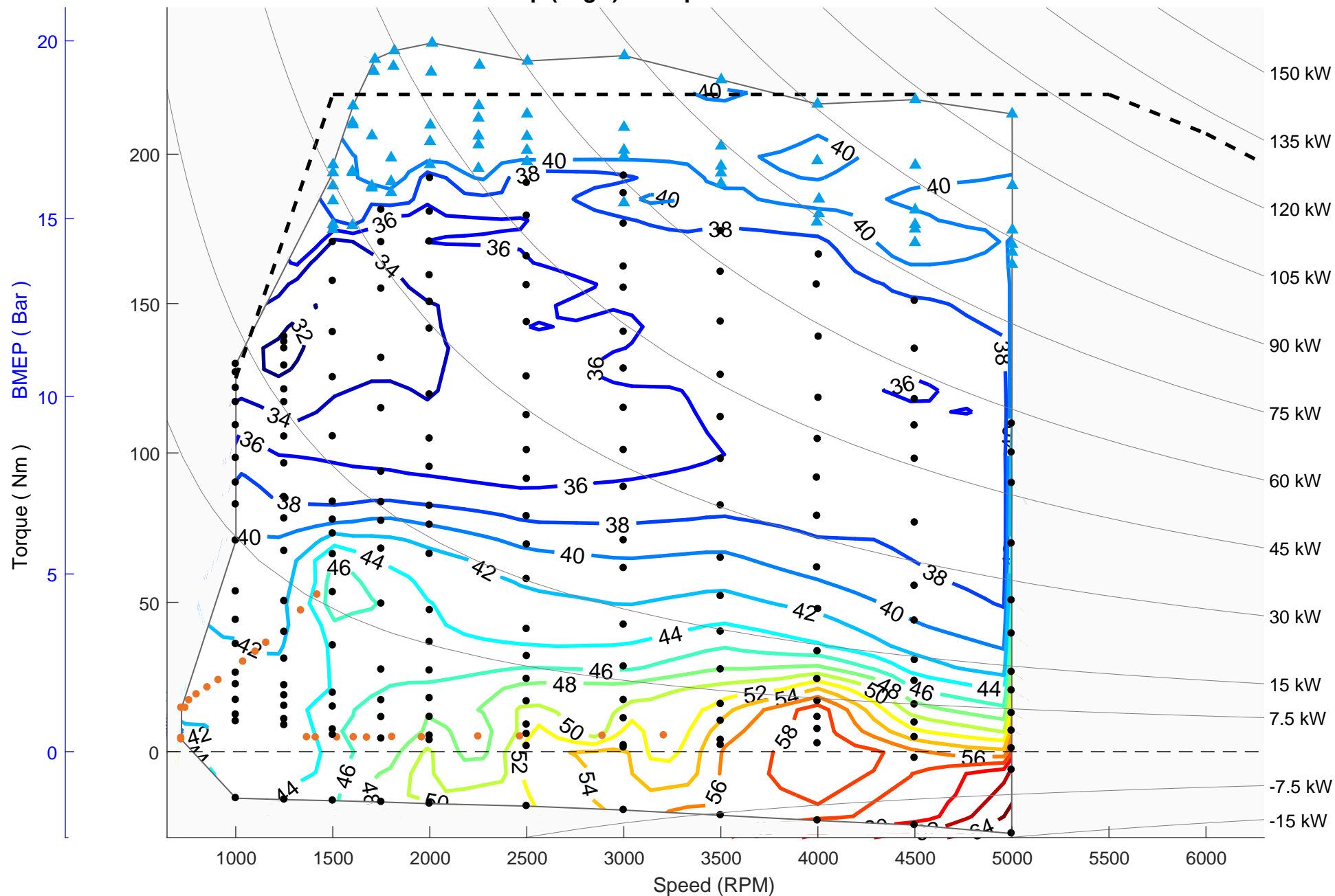
2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots  
Steady State and High Load Initial  
Intake Manifold Press (kPaA) - Pressure Measured in the Intake Manifold



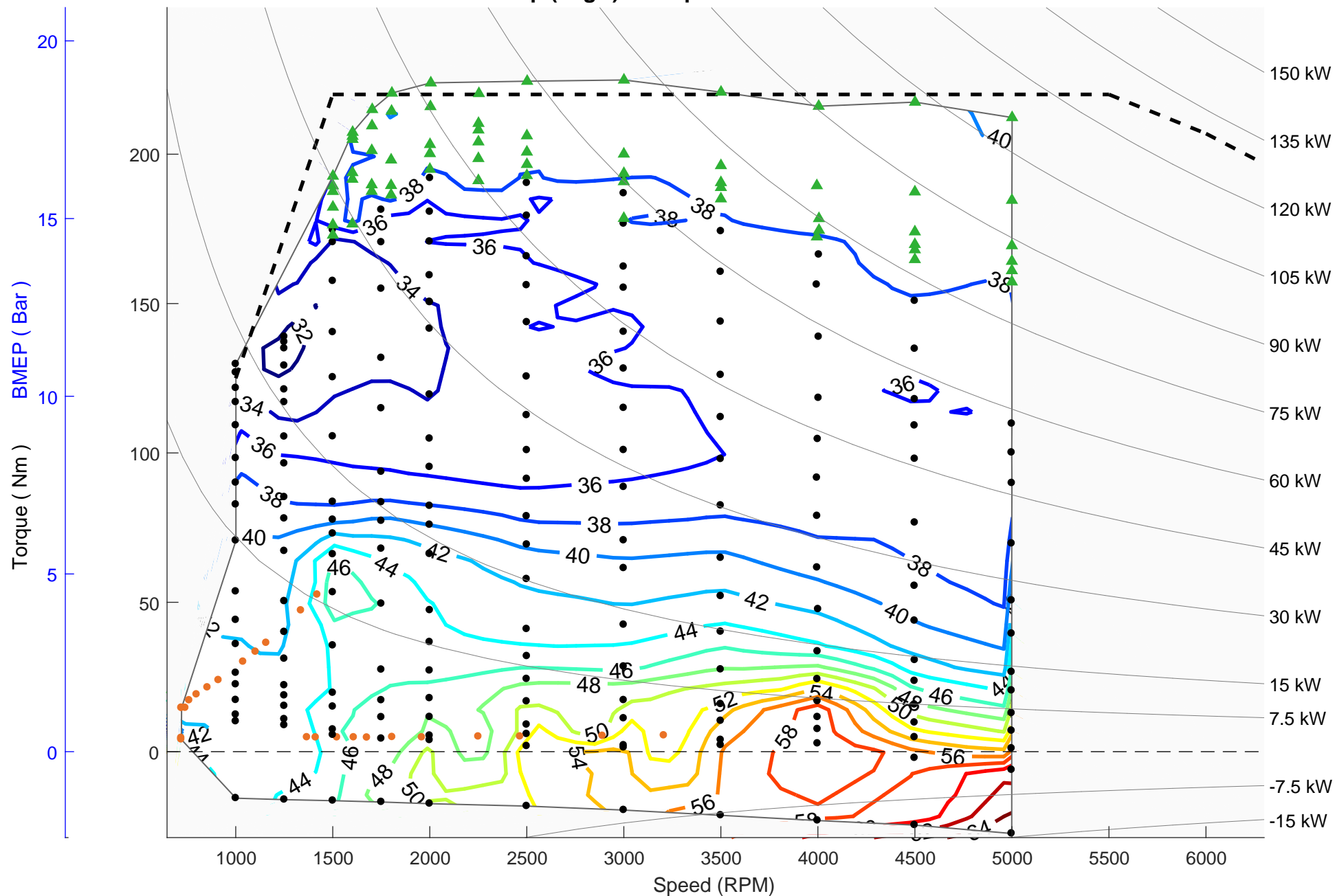
2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots  
Steady State and High Load Final  
Intake Manifold Press (kPaA) - Pressure Measured in the Intake Manifold



2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots  
Steady State and High Load Initial  
Intake Manifold Temp (degC) - Temperature Measured in the Intake Manifold

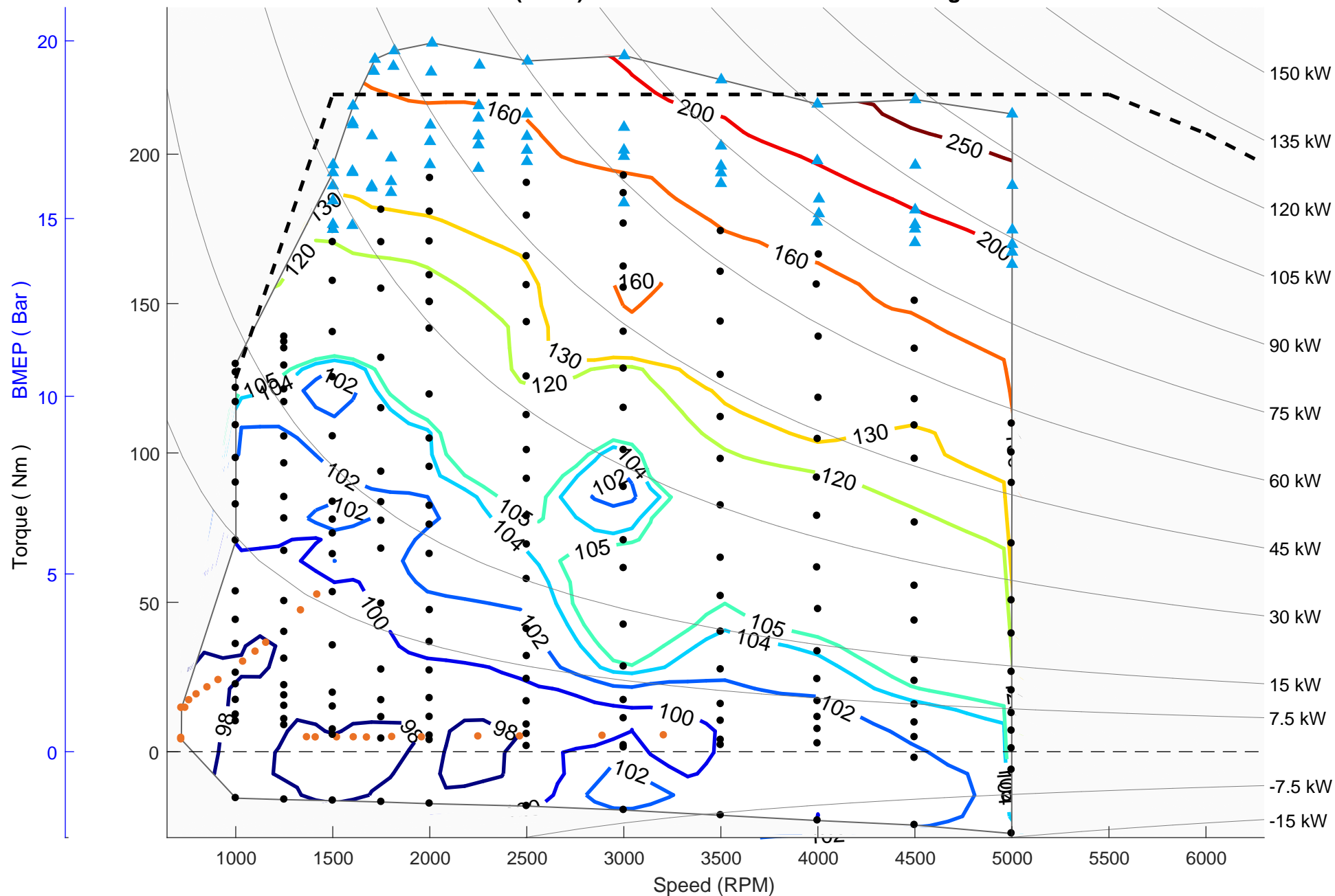


2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots  
Steady State and High Load Final  
Intake Manifold Temp (degC) - Temperature Measured in the Intake Manifold



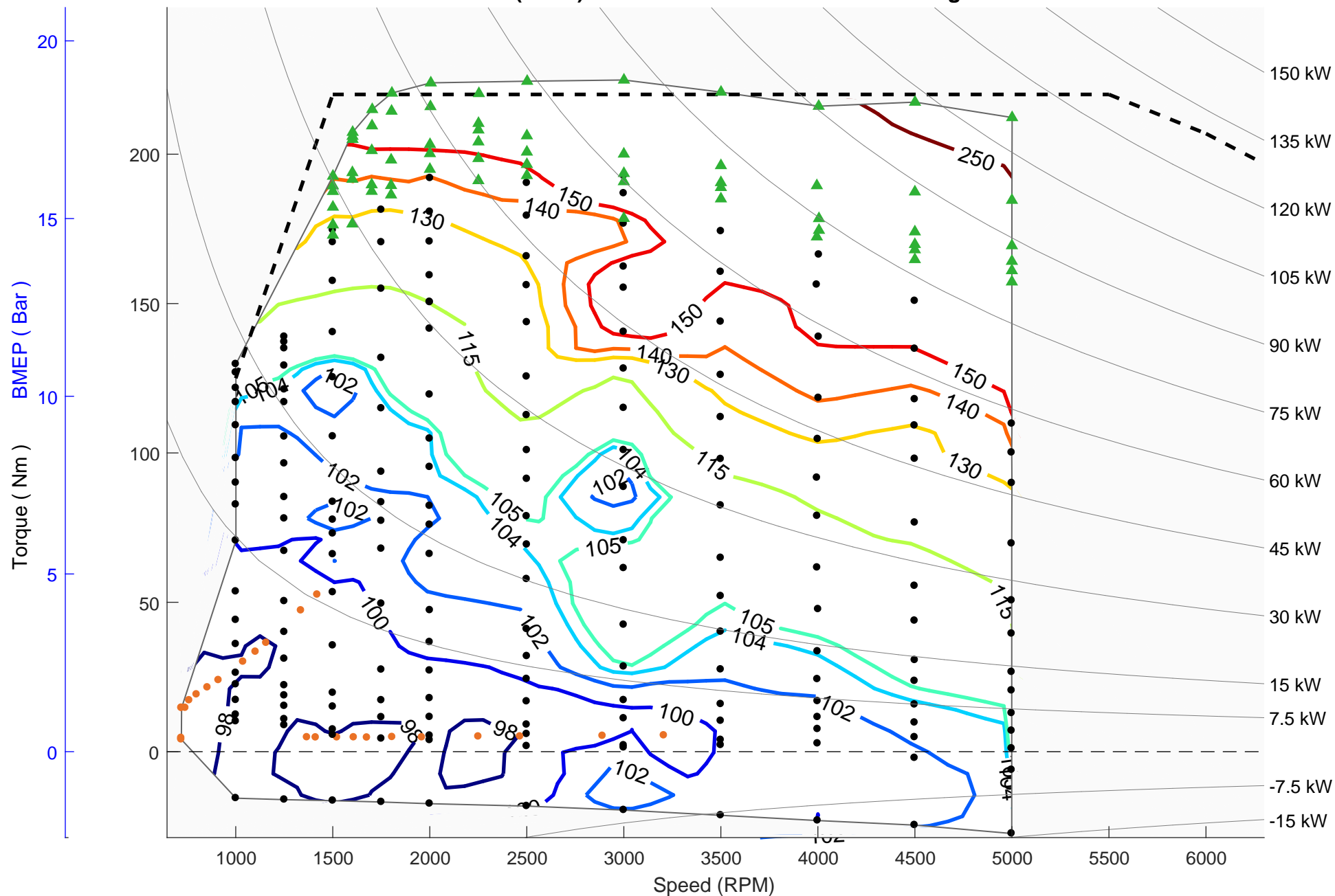


2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots  
Steady State and High Load Initial  
Turbine Inlet Press (kPaA) - Pressure Measured at Turbocharger Turbine Inlet





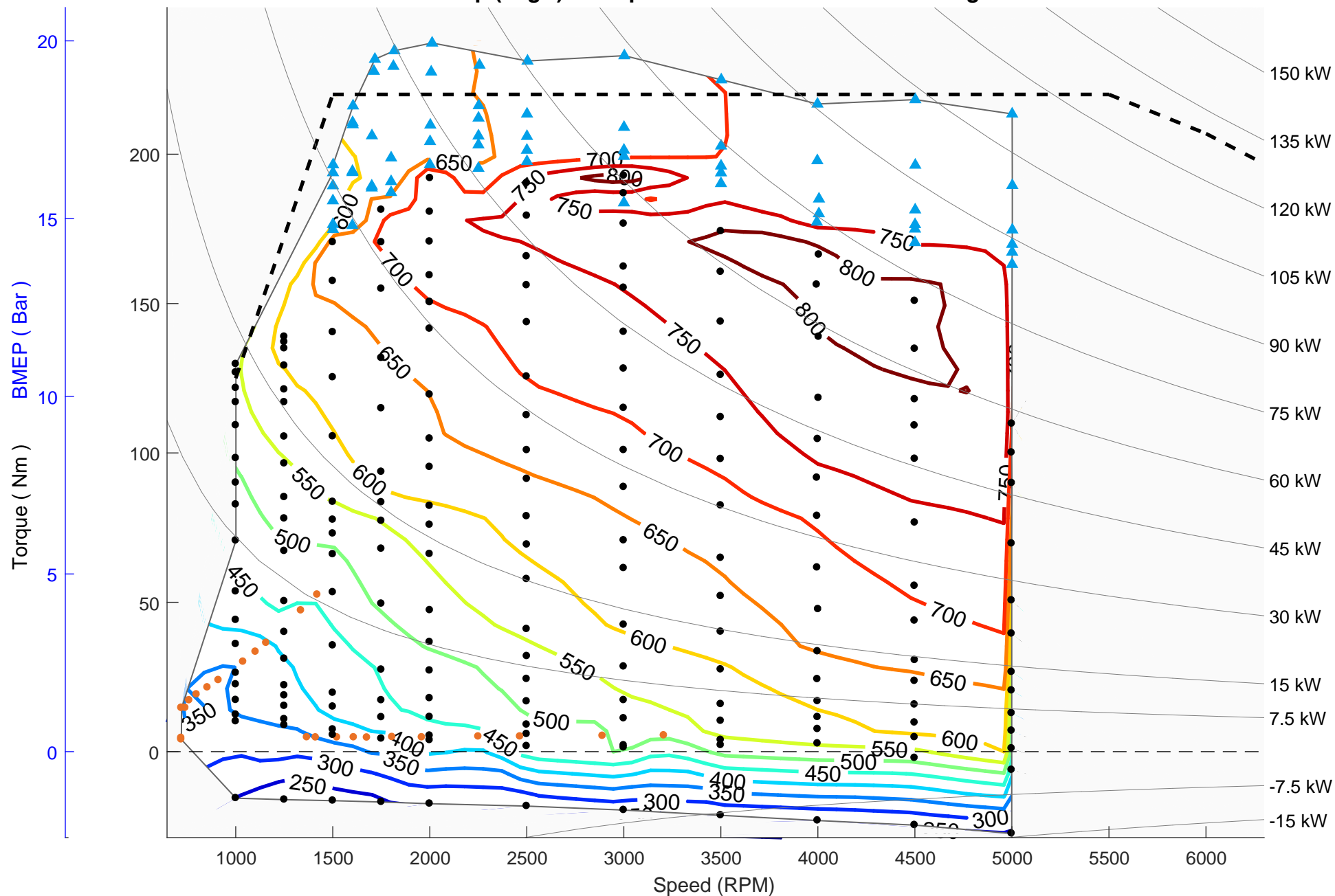
2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots  
Steady State and High Load Final  
Turbine Inlet Press (kPaA) - Pressure Measured at Turbocharger Turbine Inlet



## 2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots

Steady State and High Load Initial

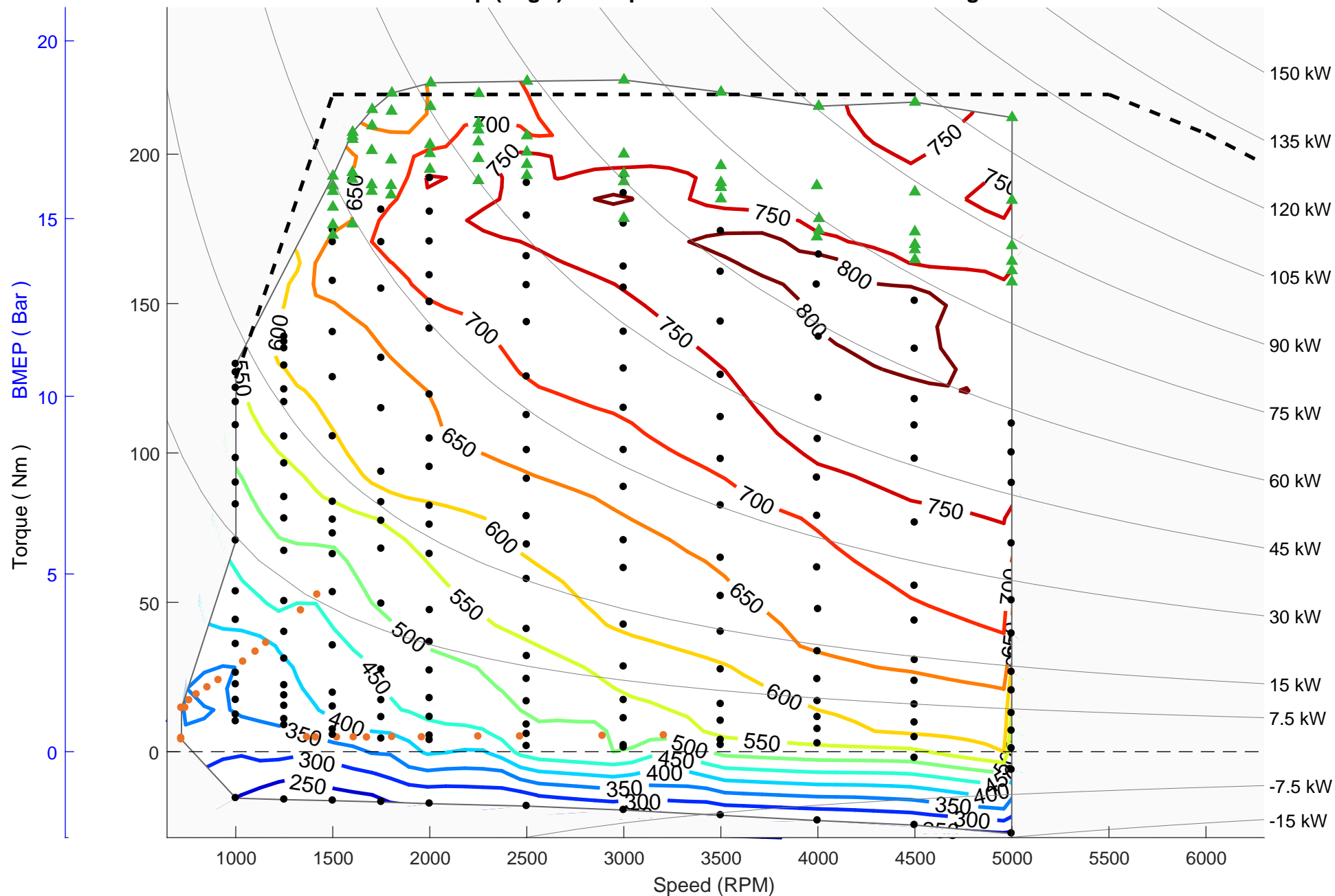
Turbine Inlet Temp (degC) - Temperature Measured at Turbocharger Turbine Inlet



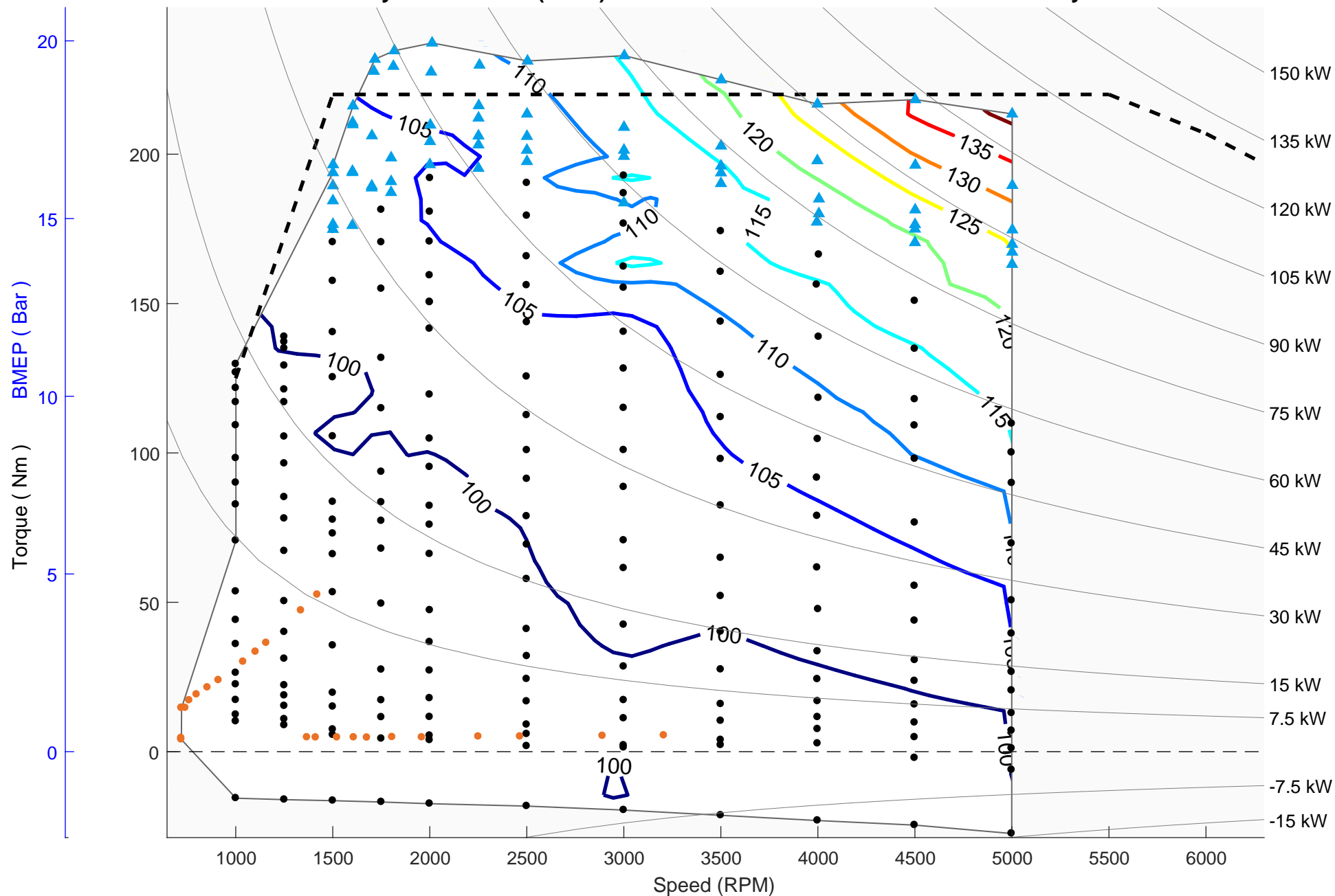
## 2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots

## Steady State and High Load Final

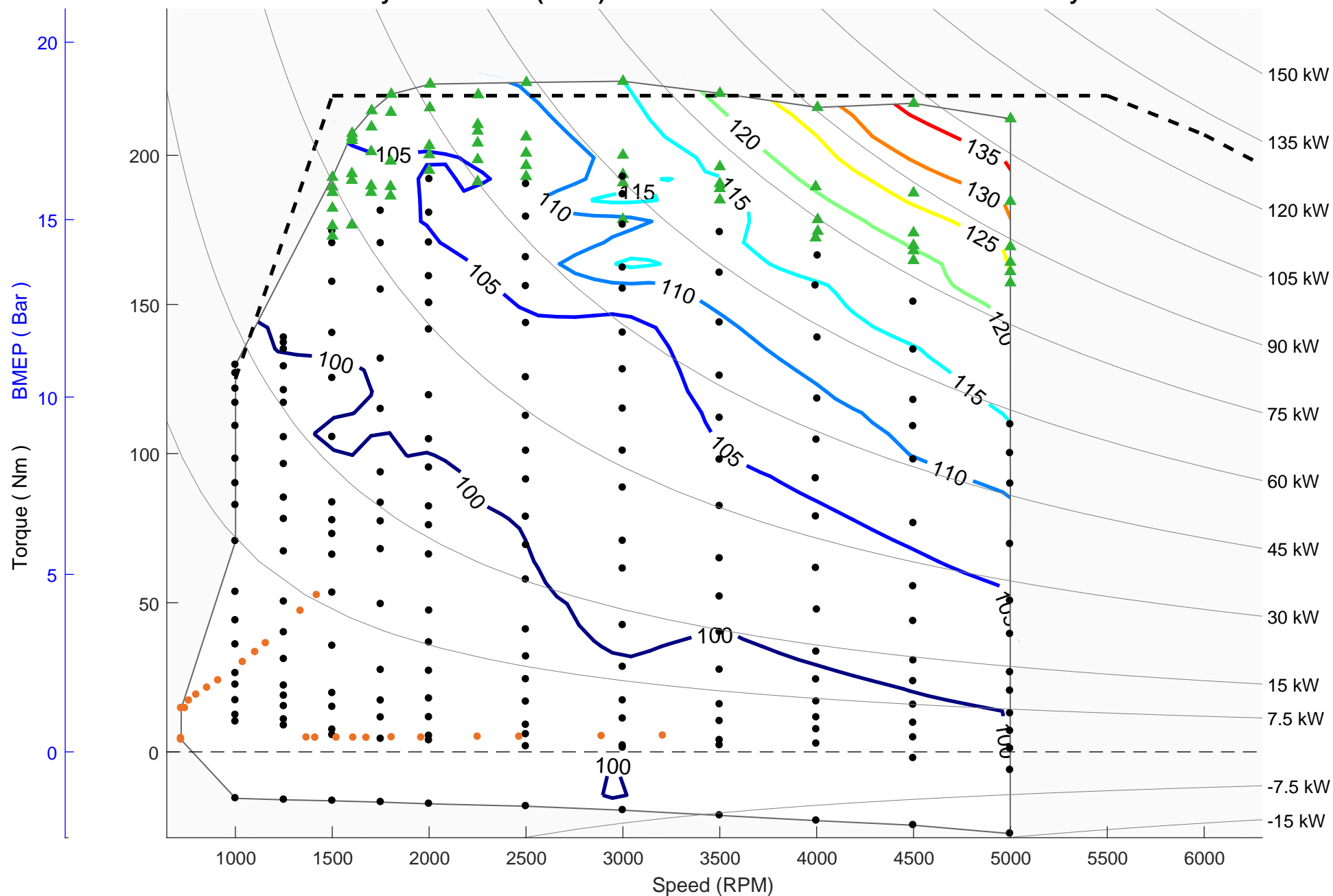
Turbine Inlet Temp (degC) - Temperature Measured at Turbocharger Turbine Inlet



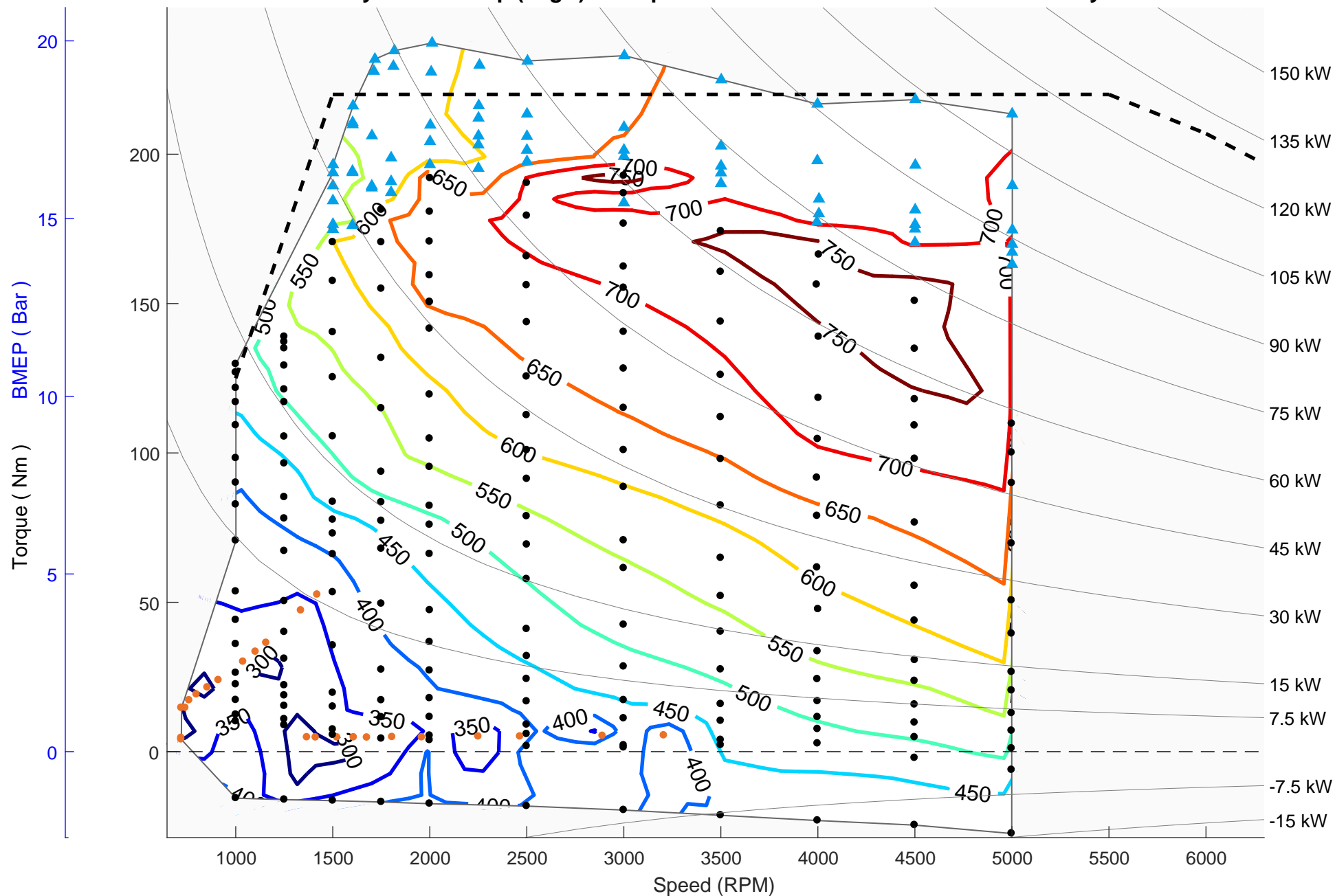
**2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots**  
**Steady State and High Load Initial**  
**Catalyst Inlet Press (kPaA) - Pressure Measured at the Inlet to the Catalyst**



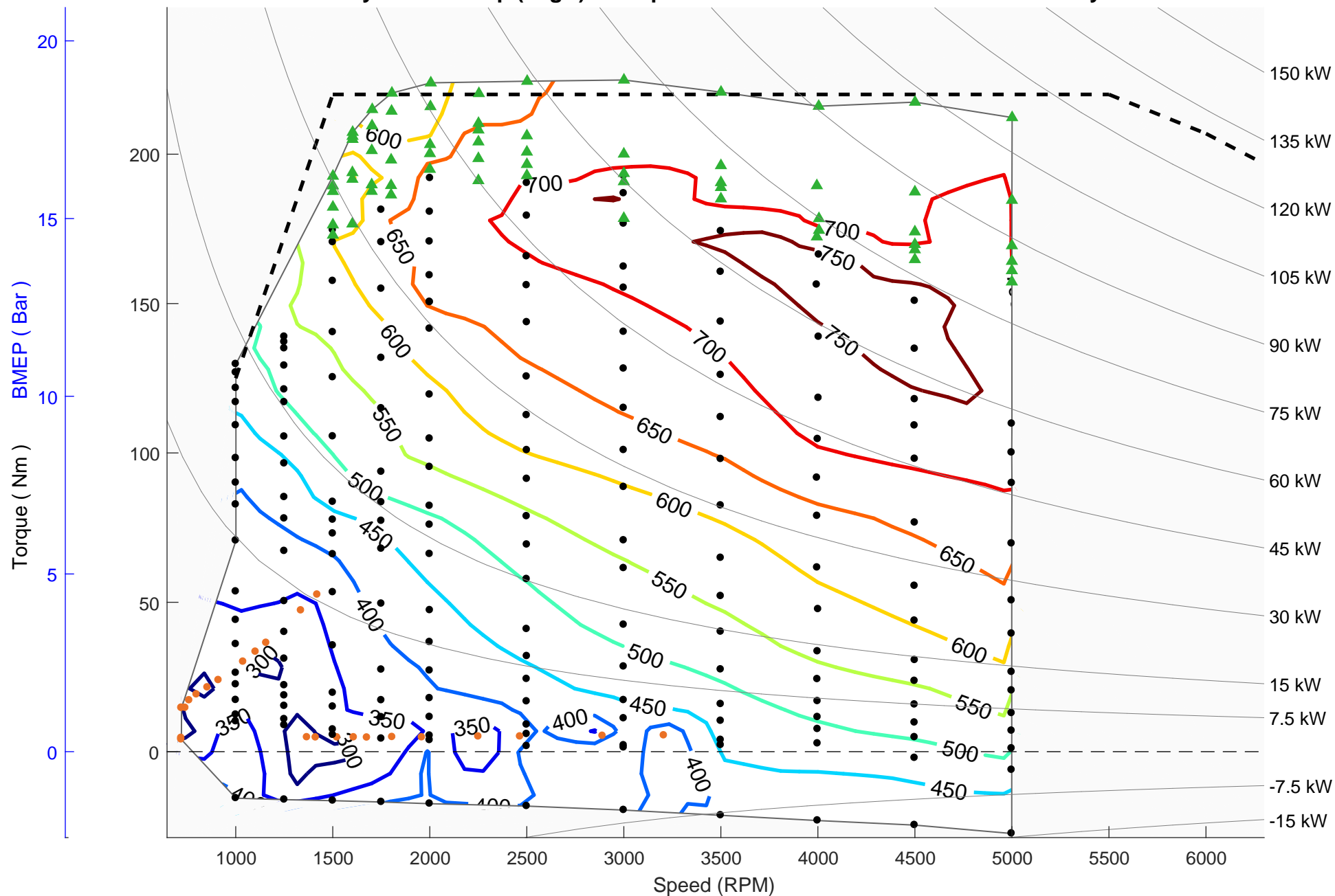
**2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots**  
**Steady State and High Load Final**  
**Catalyst Inlet Press (kPaA) - Pressure Measured at the Inlet to the Catalyst**



**2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots**  
**Steady State and High Load Initial**  
**Catalyst Inlet Temp (degC) - Temperature Measured at the Inlet to the Catalyst**

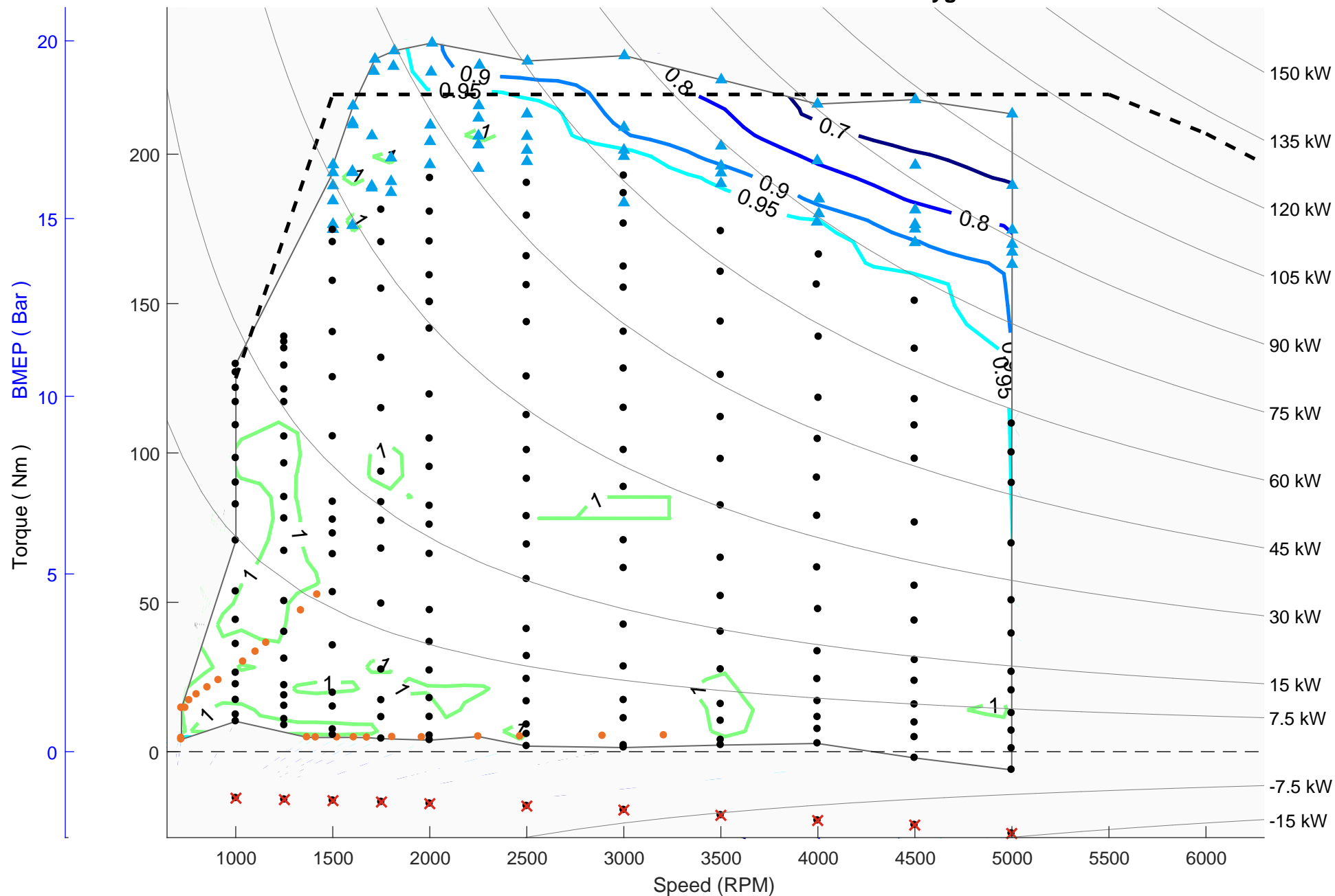


**2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots**  
**Steady State and High Load Final**  
**Catalyst Inlet Temp (degC) - Temperature Measured at the Inlet to the Catalyst**





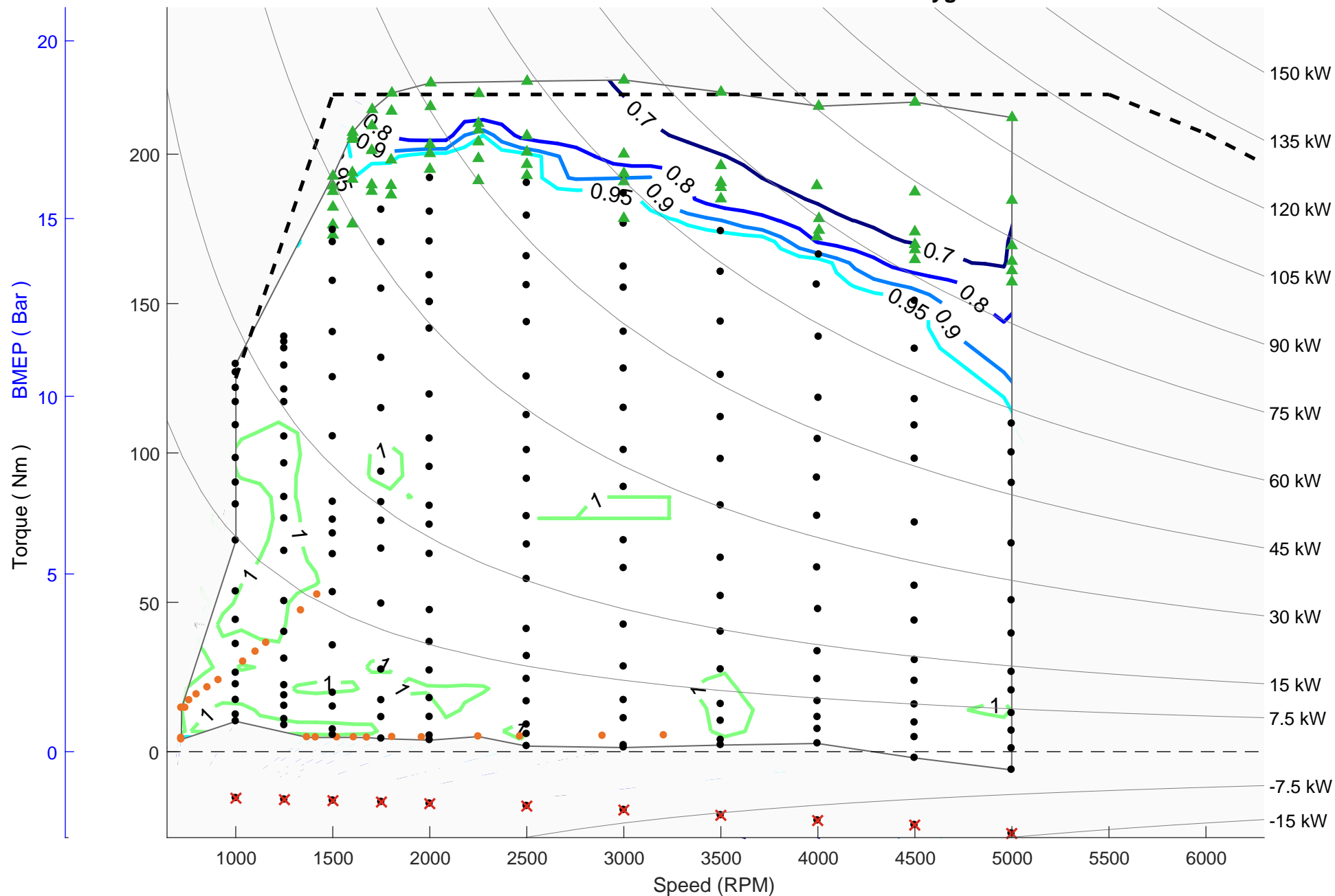
**2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots**  
**Steady State and High Load Initial**  
**Exhaust Lambda - Measured via Wideband Exhaust Oxygen Sensor\***



\* Reference Only

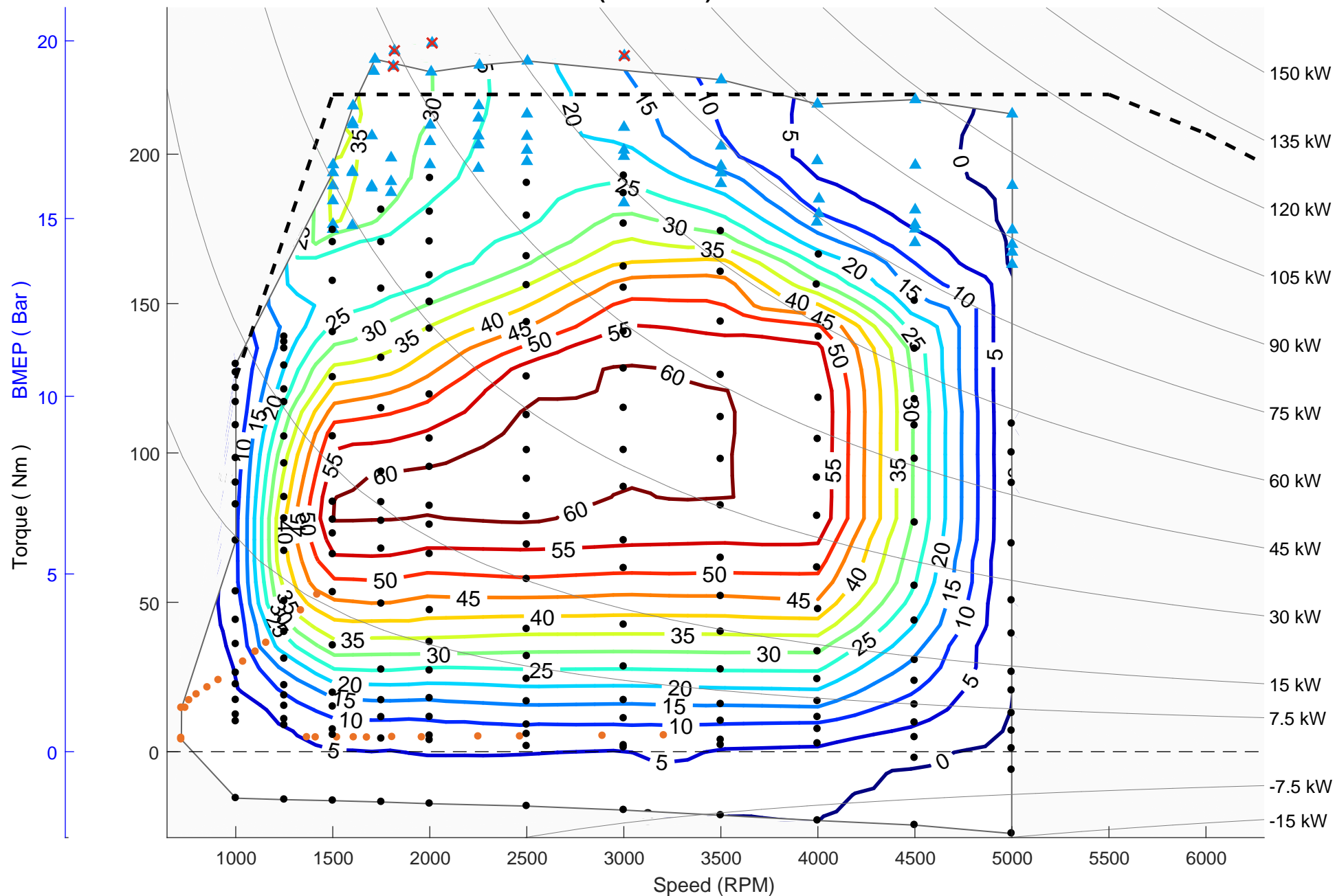


2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots  
Steady State and High Load Final  
Exhaust Lambda - Measured via Wideband Exhaust Oxygen Sensor\*

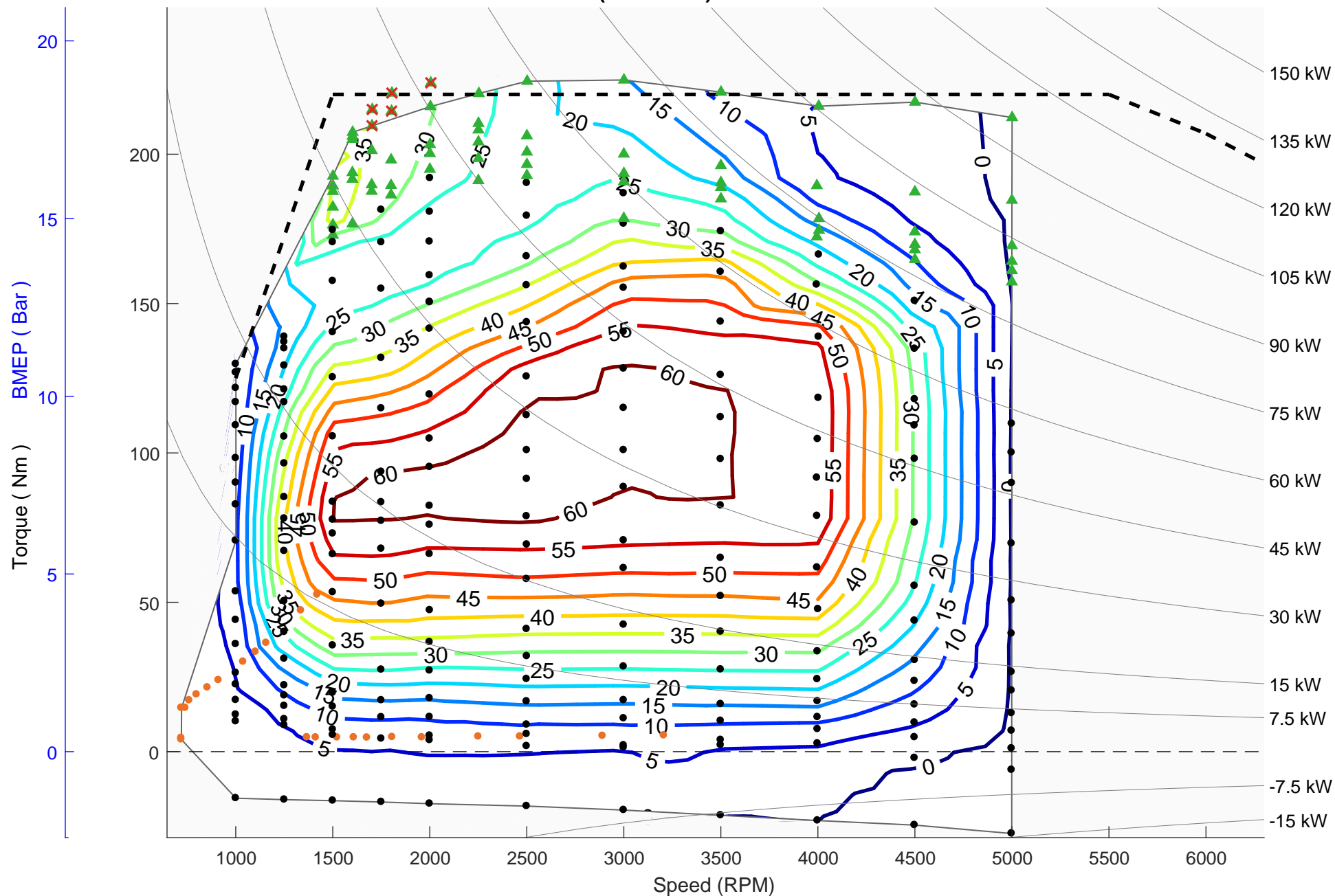


\* Reference Only

2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots  
Steady State and High Load Initial  
Intake Cam Phase (CAD ADV) - Intake Cam Phaser Advance



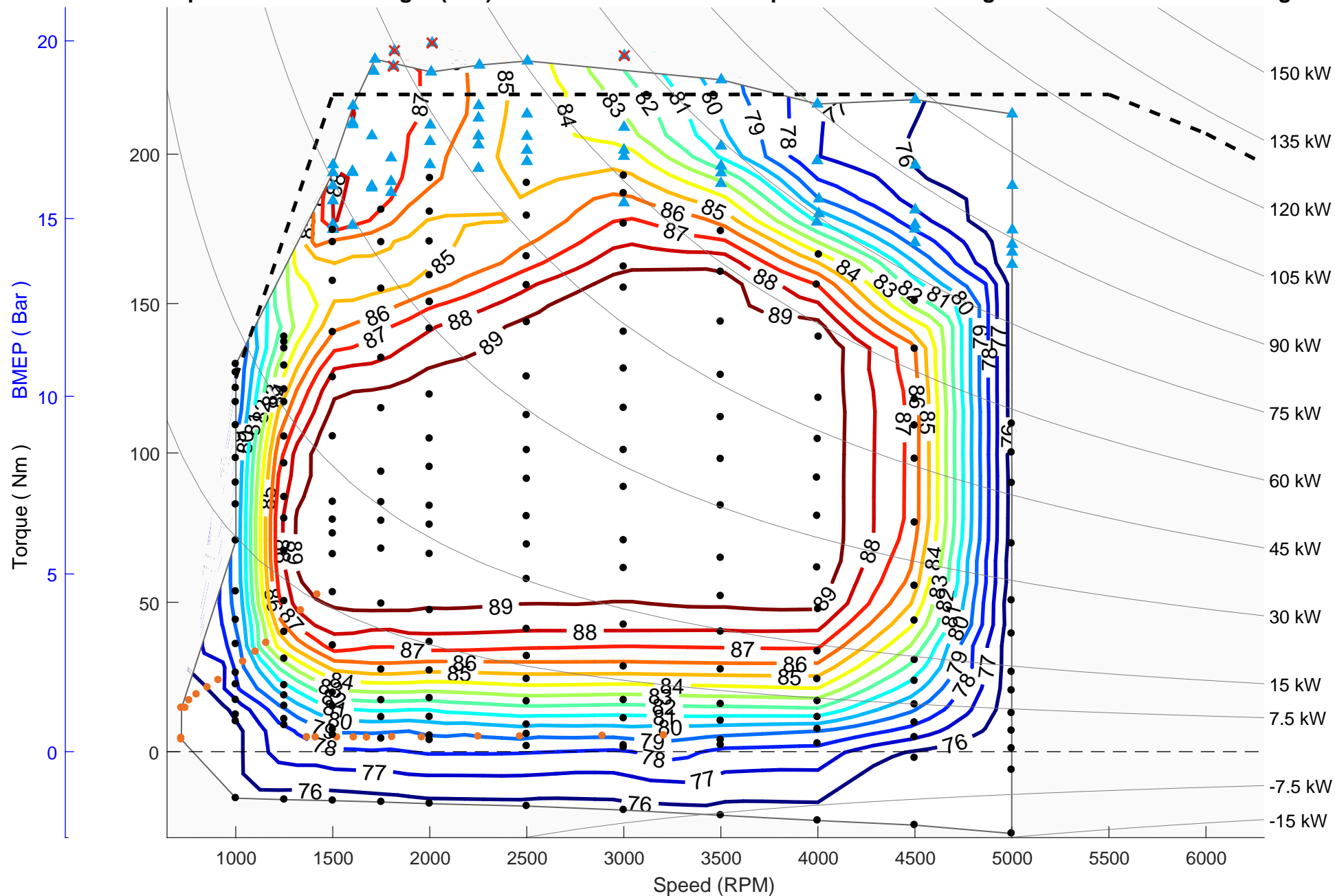
2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots  
Steady State and High Load Final  
Intake Cam Phase (CAD ADV) - Intake Cam Phaser Advance



## 2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots

Steady State and High Load Initial

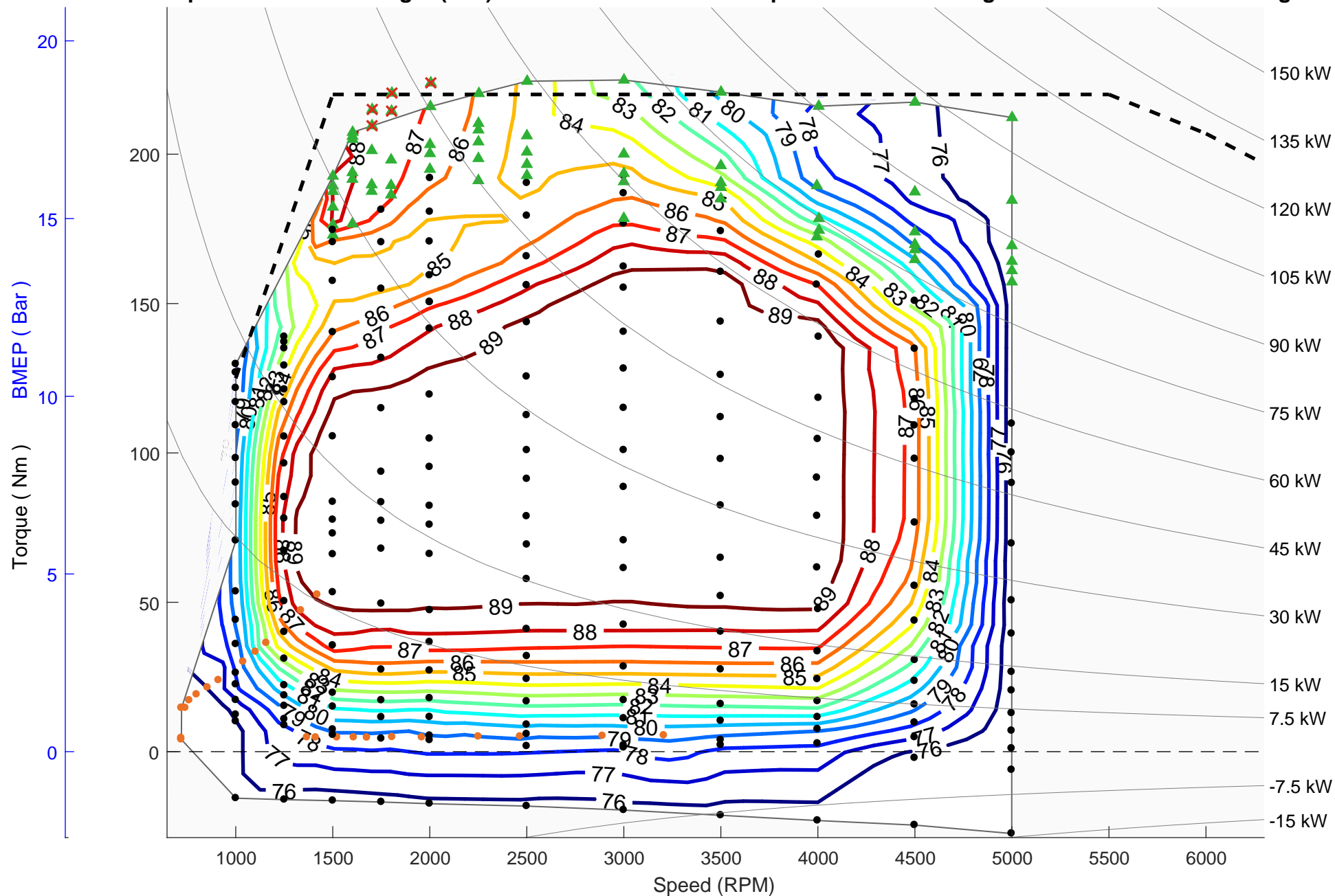
Compression Stroke Length (mm) - Estimated Effective Compression Stroke Length from Intake Valve Closing



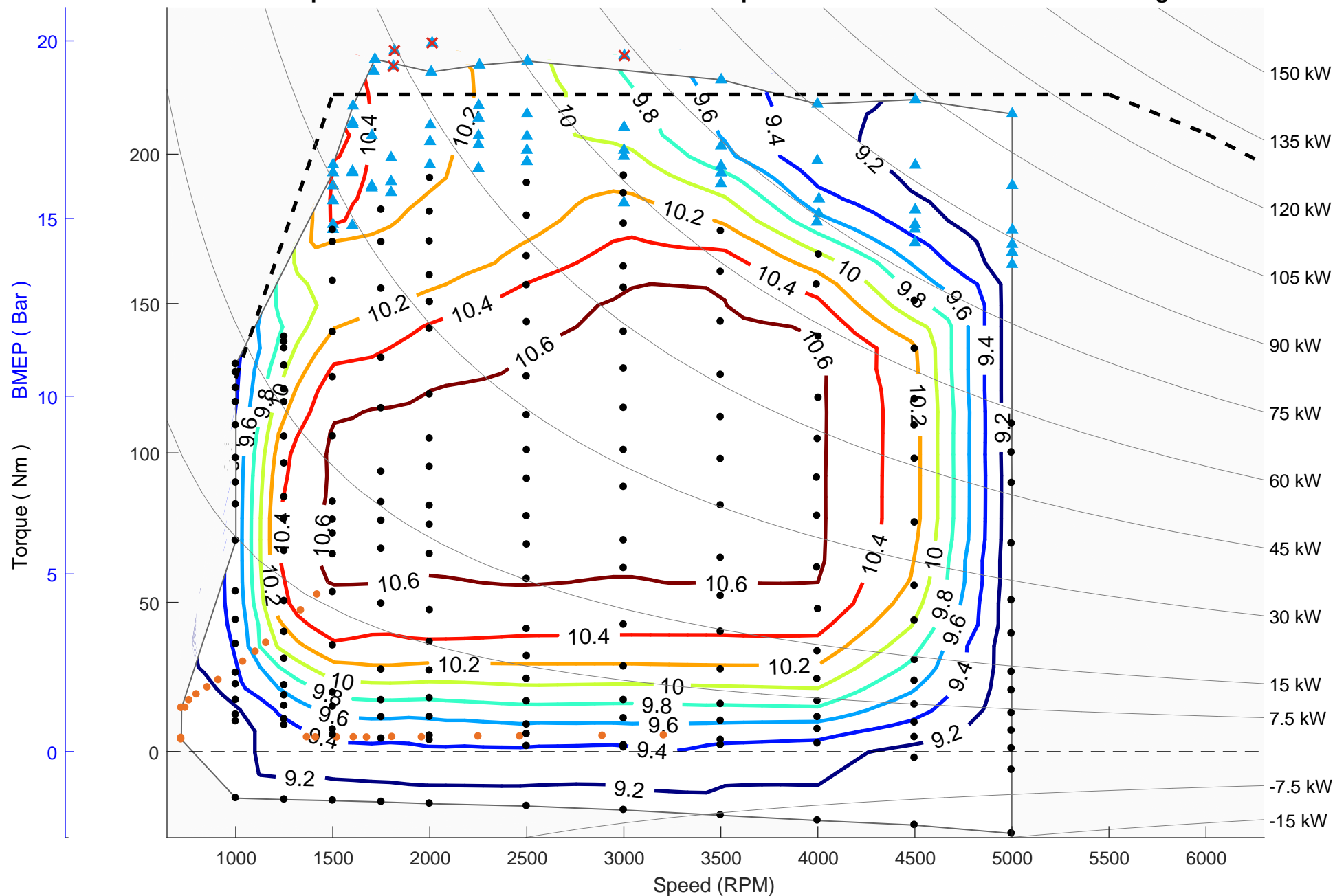
## 2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots

## Steady State and High Load Final

Compression Stroke Length (mm) - Estimated Effective Compression Stroke Length from Intake Valve Closing



**2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots**  
**Steady State and High Load Initial**  
**Compression Ratio - Estimated Effective Compression Ratio from Intake Valve Closing**

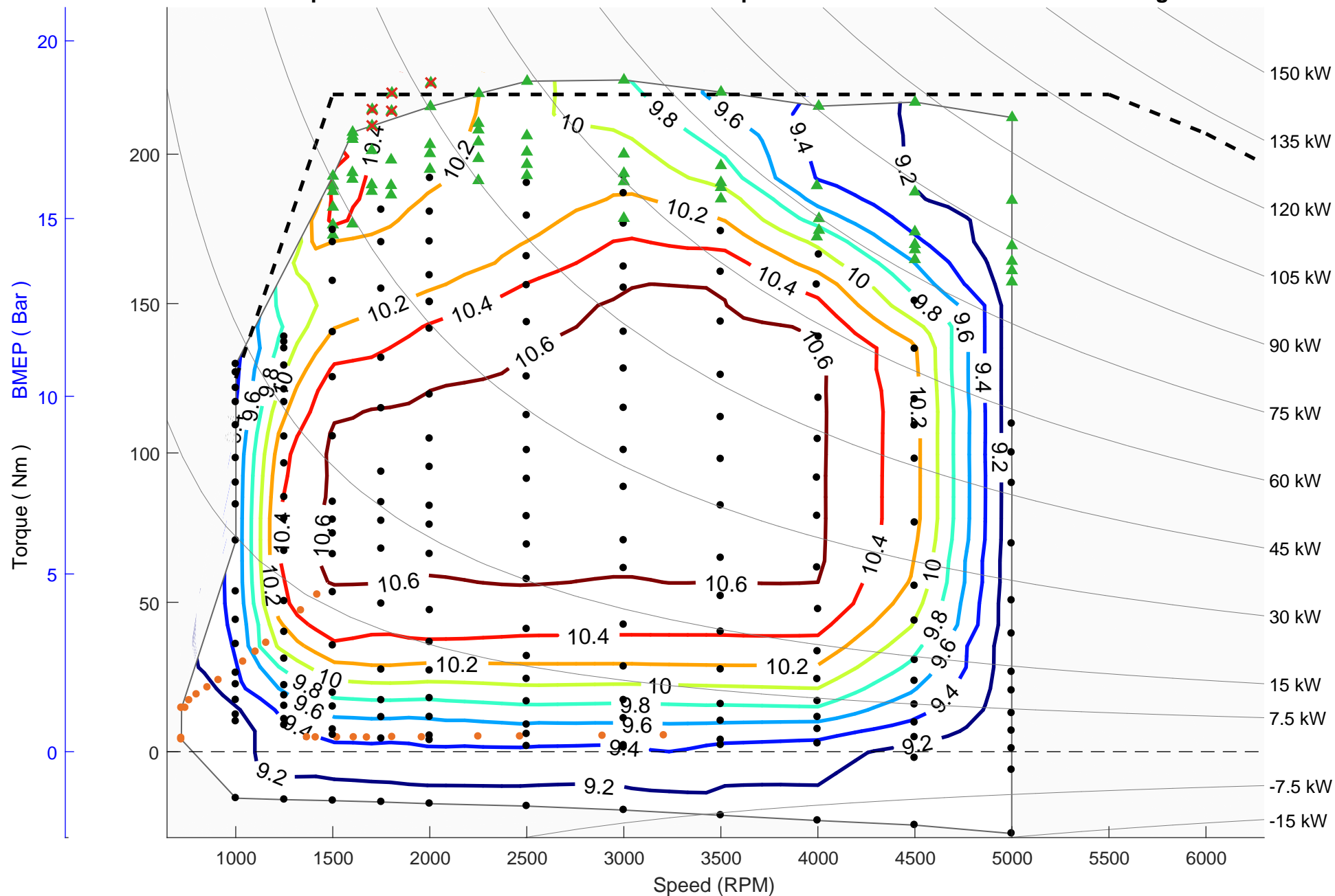




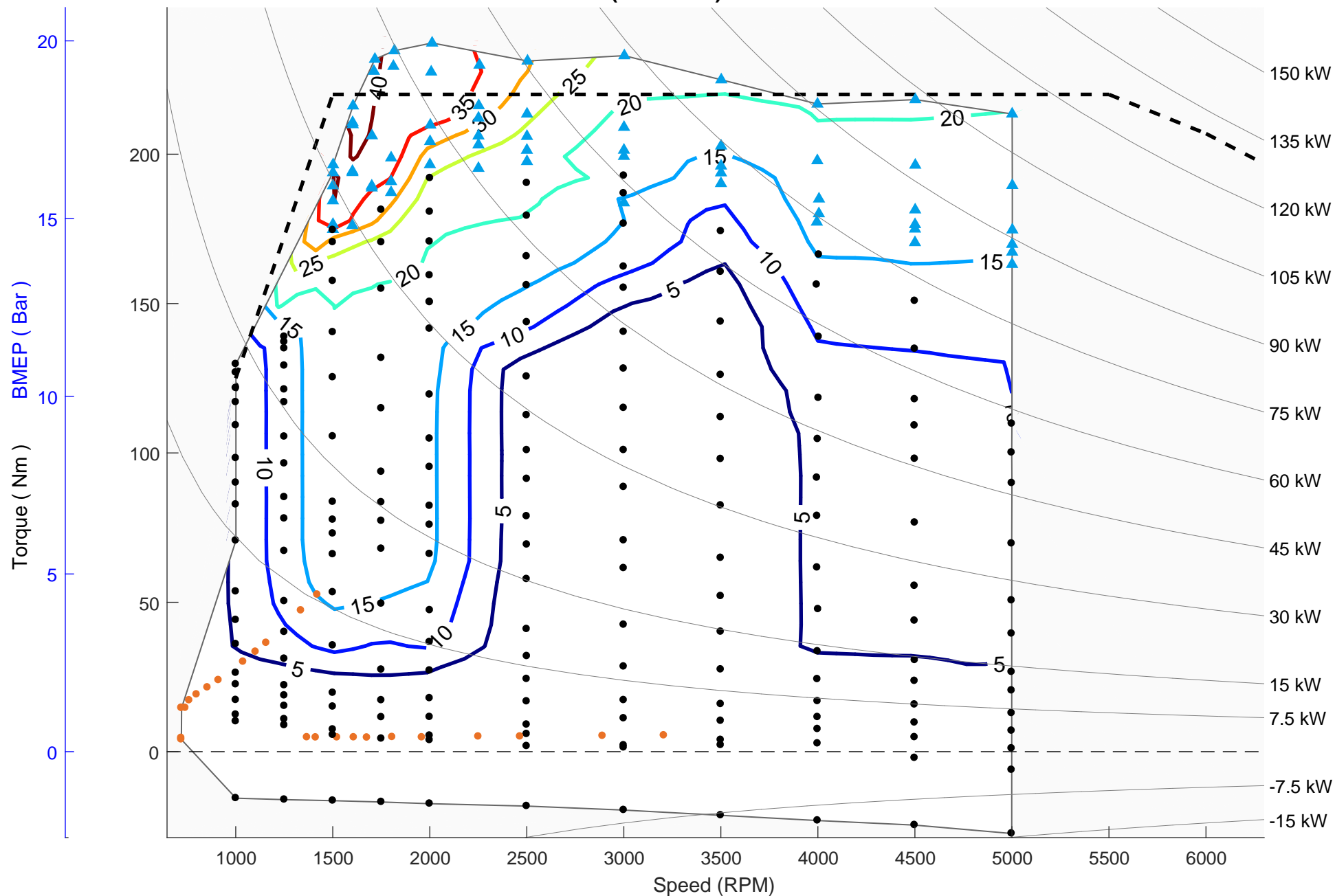
## 2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots

## Steady State and High Load Final

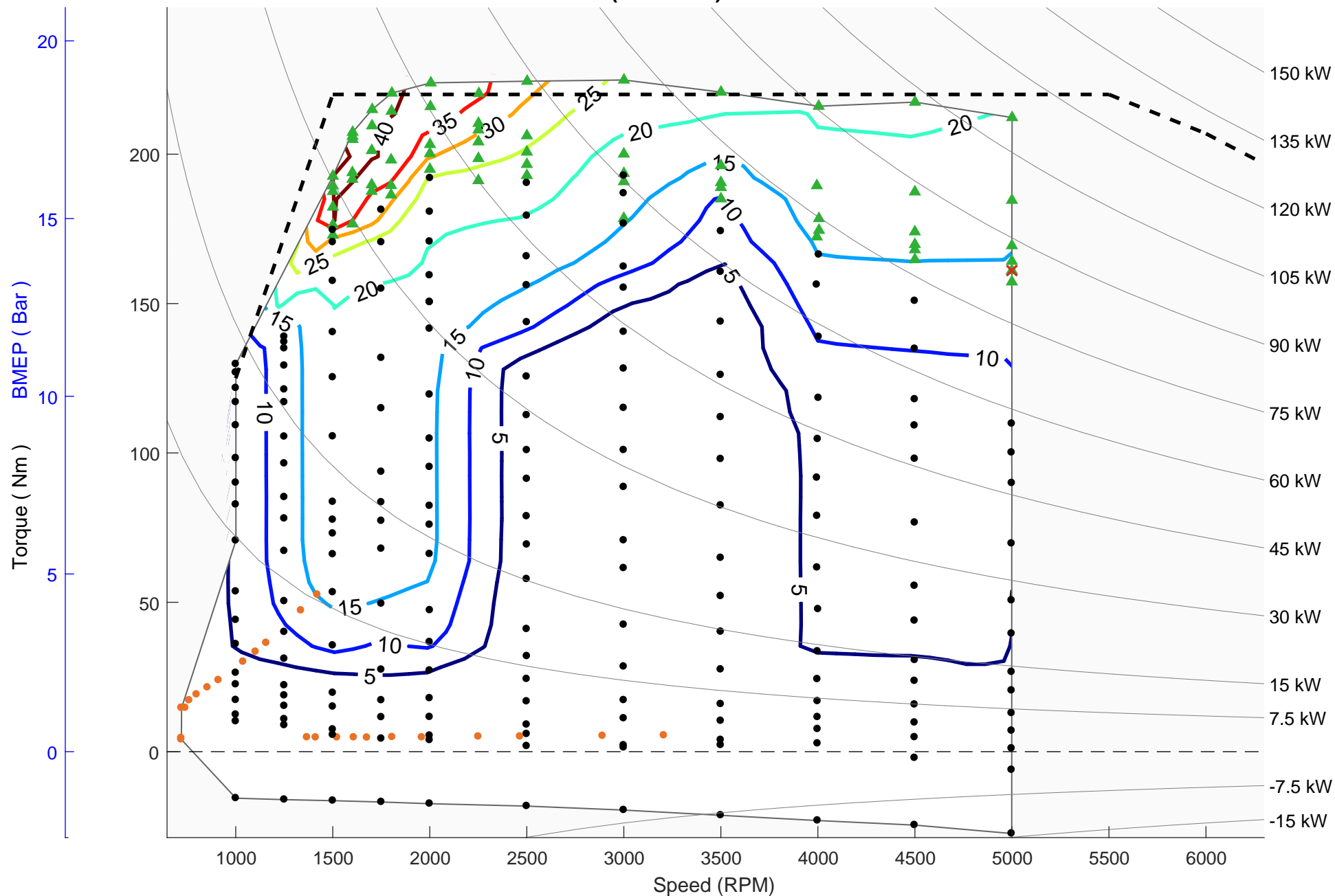
## Compression Ratio - Estimated Effective Compression Ratio from Intake Valve Closing







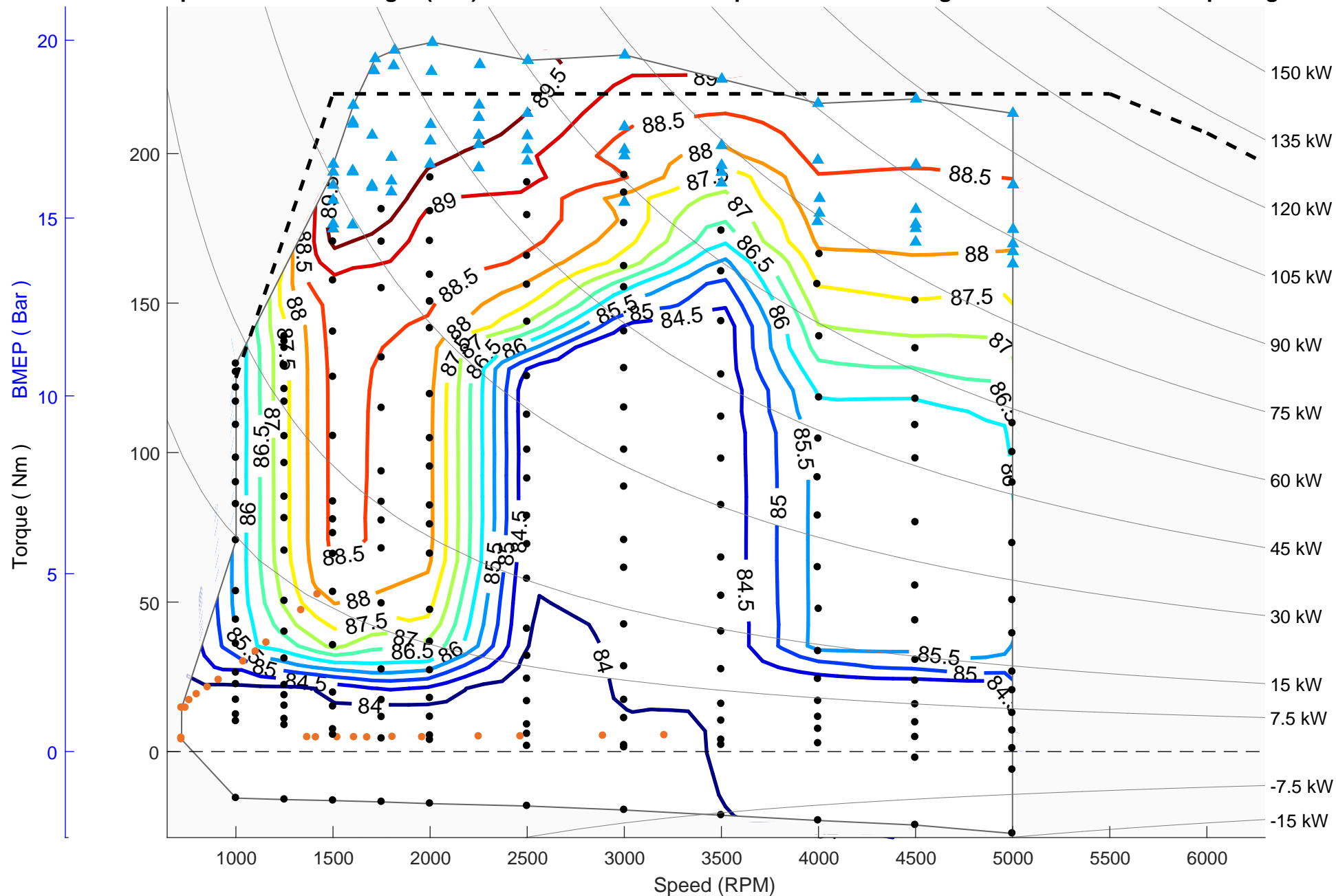
2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots  
Steady State and High Load Final  
Exhaust Cam Phase (CAD RET) - Exhaust Cam Phaser Retard



## 2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots

Steady State and High Load Initial

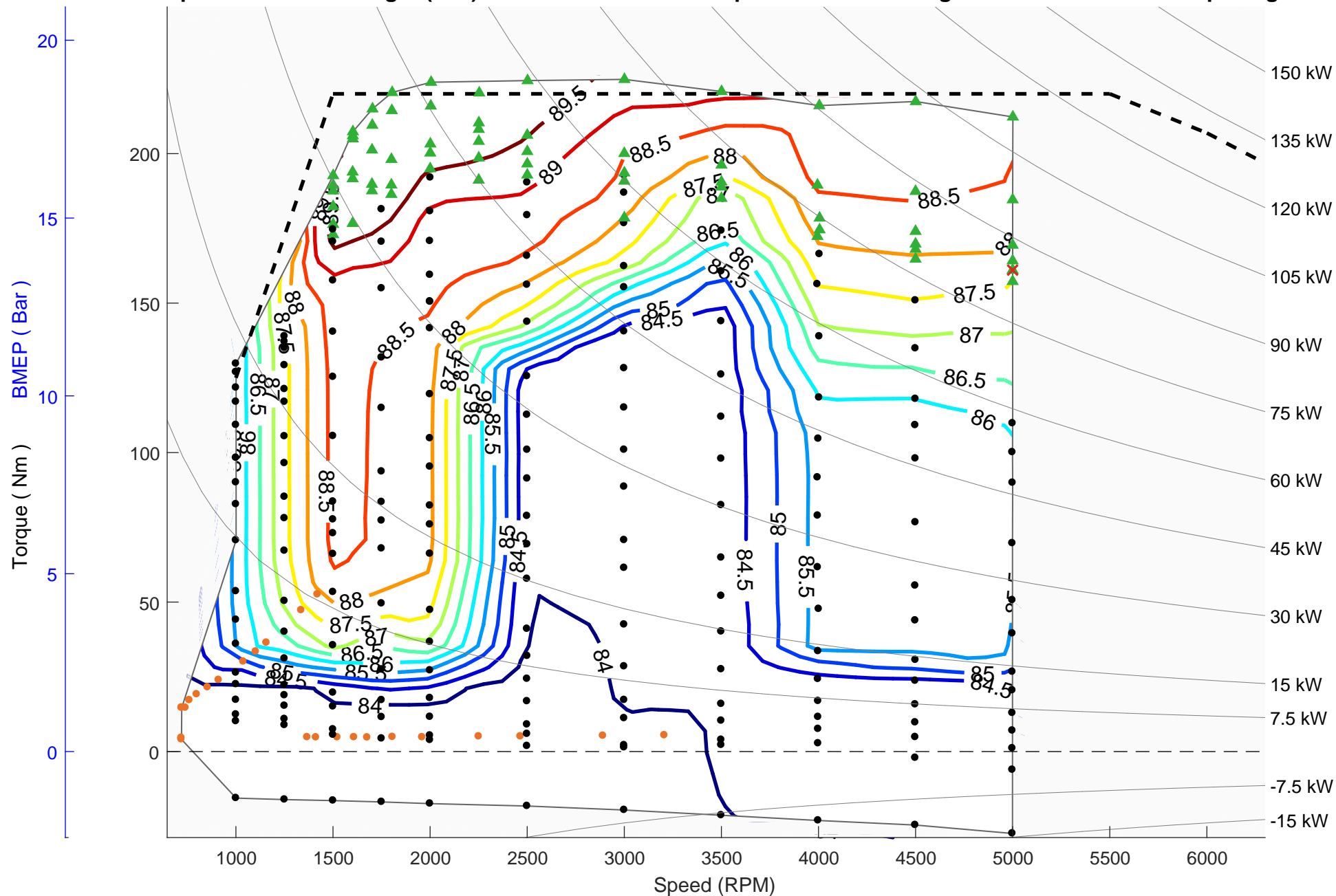
Expansion Stroke Length (mm) - Estimated Effective Expansion Stroke Length Until Exhaust Valve Opening



## 2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots

## Steady State and High Load Final

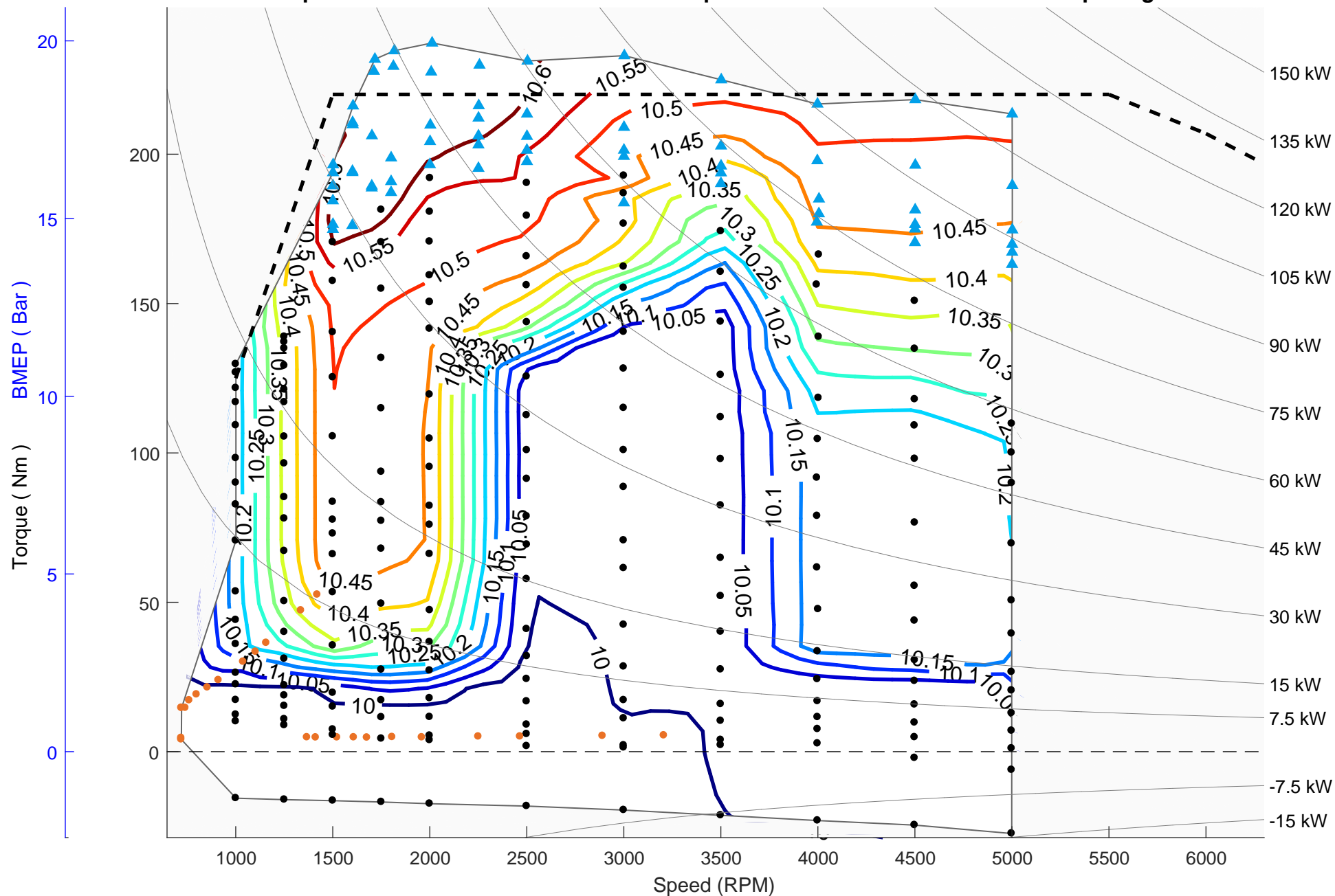
Expansion Stroke Length (mm) - Estimated Effective Expansion Stroke Length Until Exhaust Valve Opening



## 2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots

Steady State and High Load Initial

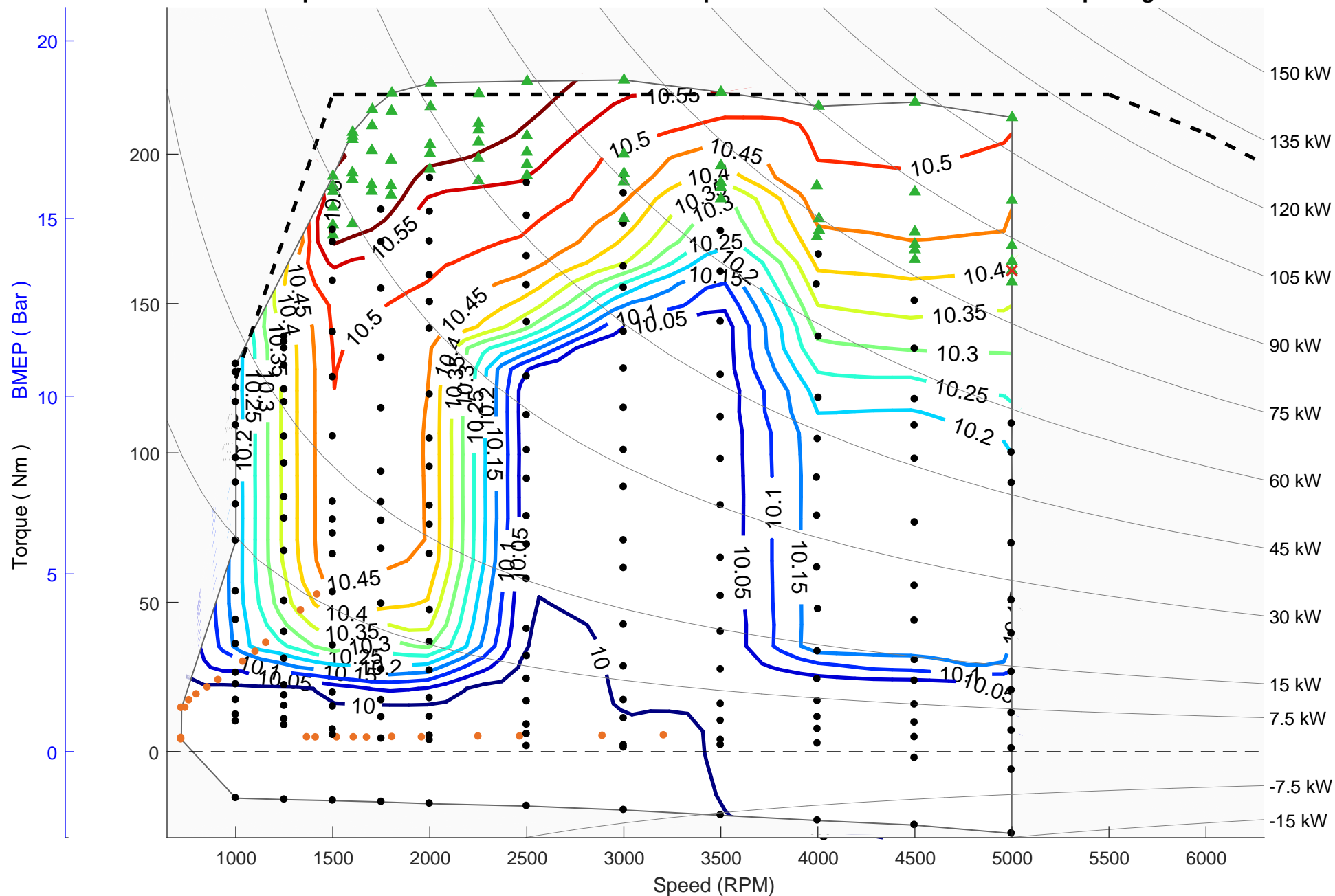
Expansion Ratio - Estimated Effective Expansion Ratio Until Exhaust Valve Opening



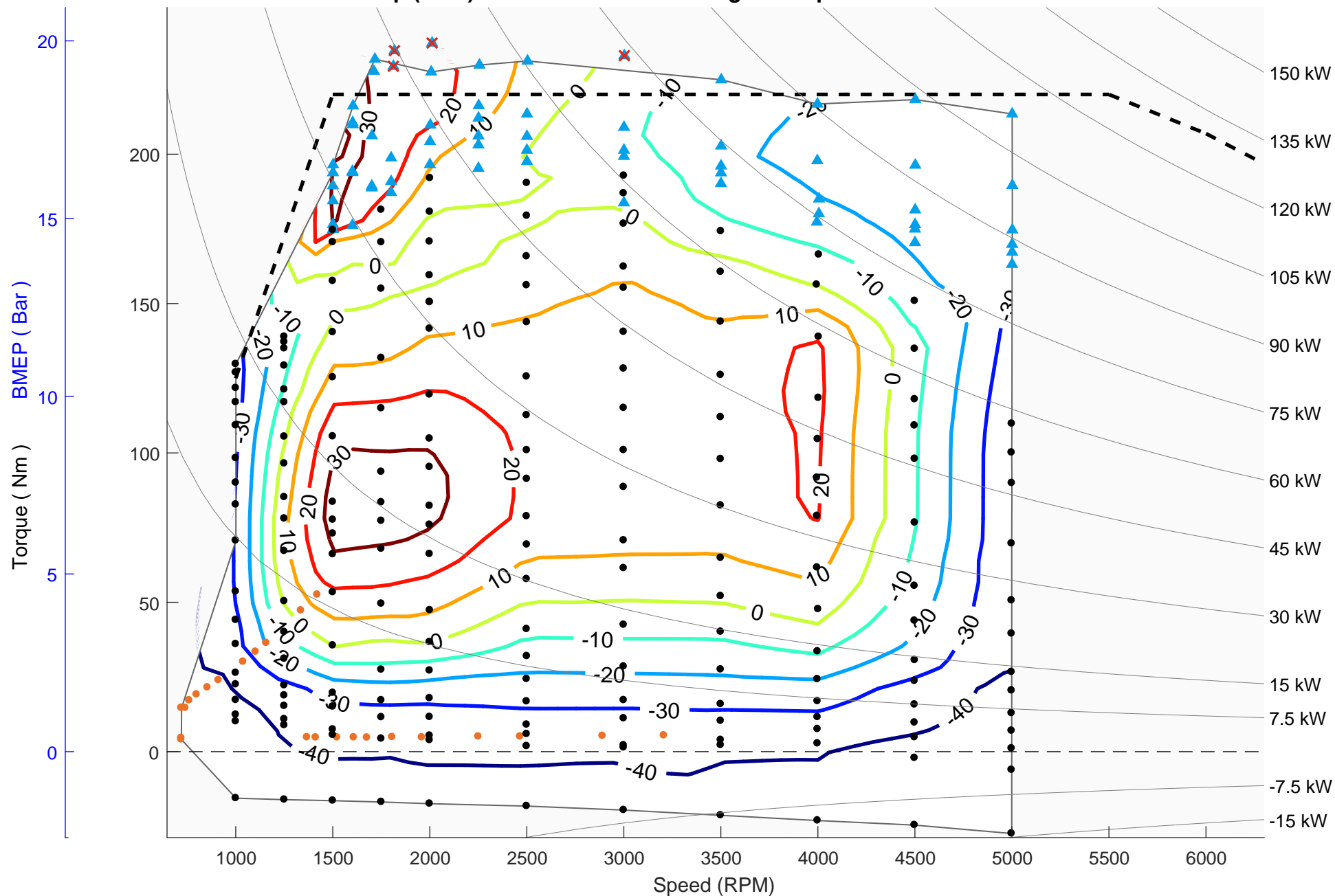
## 2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots

## Steady State and High Load Final

## Expansion Ratio - Estimated Effective Expansion Ratio Until Exhaust Valve Opening



**2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots**  
**Steady State and High Load Initial**  
**Valve Overlap (CAD) - Estimated Valve Timing Overlap from Cam Phase Measurements**





2016 Honda 1.5L L15B7 Engine Tier 2 Fuel - Test Data Plots  
Steady State and High Load Final  
Valve Overlap (CAD) - Estimated Valve Timing Overlap from Cam Phase Measurements

