Sequence X Severity Task Force

Meeting Minutes

09/15/21

Attendance

- Michael Deegan
- Rich Grundza
- Christian Porter
- Christine Eickstead
- Amol Savant
- George Szappanos (absent)
- Jason Soto
- Alfonso Lopez

Agenda 09/15/21

- ## Review Action Item List

- Labs to provide the following for comparison
  - BB stack coolant flow control detail
    - Flow rate, counter flow or parallel
  - Plumbing details
    - BB gas thermocouple plumbing to prevent condensation from saturating the thermocouple (45 degree fittings)
    - Size of hose from 3 –way valve to the air duct.
  - Oil analysis (Ni , Ox, Water content, Fuel dilution, Oil Consumption)
- Amol to provide op data for 3 tests that were on target. Template sent.
- Oil consumption data review – Al /Jason
- Review IVB work on BB gas humidity measurements – Al
- Study PCV valve flow design change (Oil Separator Part # AG9Z6A785A/AG9G6A785CA) – Mike
- Send Procedure changes to E-ballot - Al

- ## Review Travis plots of Valvoline 271 test

Seq X Test Lab BB Stack Detail

- Differences noted in table below
- There is conflicting heat exchanger flow direction in the procedure. Six locations reference the flow direction. Action – choose flow direction and edit procedure.
- Labs discussed heat transfer and BB gas temperature. The gas temperature is controlled but flow rates and plumping differences are a concern. Are all these set ups producing the same level of condensation returning to the crankcase?

	SWRI	LZ	AFT	VALV	IAR
BB Stack Coolant Flow Rate L/m	12	20	12	16	12
Flow Direction (coolant)	Parallel	Parallel	Counter	Counter	Counter
Plumbing Post Heat Exchanger (gas)	Straight	45 deg fittings	Straight	45 deg fittings	Straight
Hose - Size 3 Way to Air Duct	¾” Tygon	3/4" Tygon	¾” Tygon	3/4" WITH 3/4 Barbed Connection	5/8" SS braided line
BB Restrictor	No		No	YES	No

Water in Oil Discussion

- Amol began the discussion of water in oil. He referenced an SAE paper that details the three levels of miscibility.
    - Free water
    - Emulsion
    - Suspension in oil
- A level of micro erosion is present when high levels of water are held in suspension by the oil according to Amol’s reading of the paper.
- When crankcase pressure is considered, there may be an effect of containment of the water in suspension. This may explain why some recent test with high crankcase pressure are producing higher chain wear.
- The Karl Fischer method of testing oil in water needs to be better understood as it applies to the theory above.

Operational Review Valvoline Test Oil 271

- Travis added the op data from the Valvoline test that was on target to the plots. See plots in slides below.
- The test was conducted using a blowby gas orifice restrictor.
- Remarkable data:
  - Higher crankcase pressure in Phase 1 and 2
  - The highest crankcase pressure in 1-2 ramp
  - Lowest blowby gas temperature in Phase 1
- Amol to submit operational data from mild 271 test with no blowby restrictor. Travis to add data to the plots for comparison.

Action Items from 09/15/21

- Make procedure correction for flow direction in the blowby gas heat exchanger.
- Study Karl Fischer method of water in oil analysis.
- Amol to submit op data from mild 271 test.
- Travis to add mild 271 data to the plots for comparison.

Valvoline Data Comparison to Other Industry Data

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The Data Set

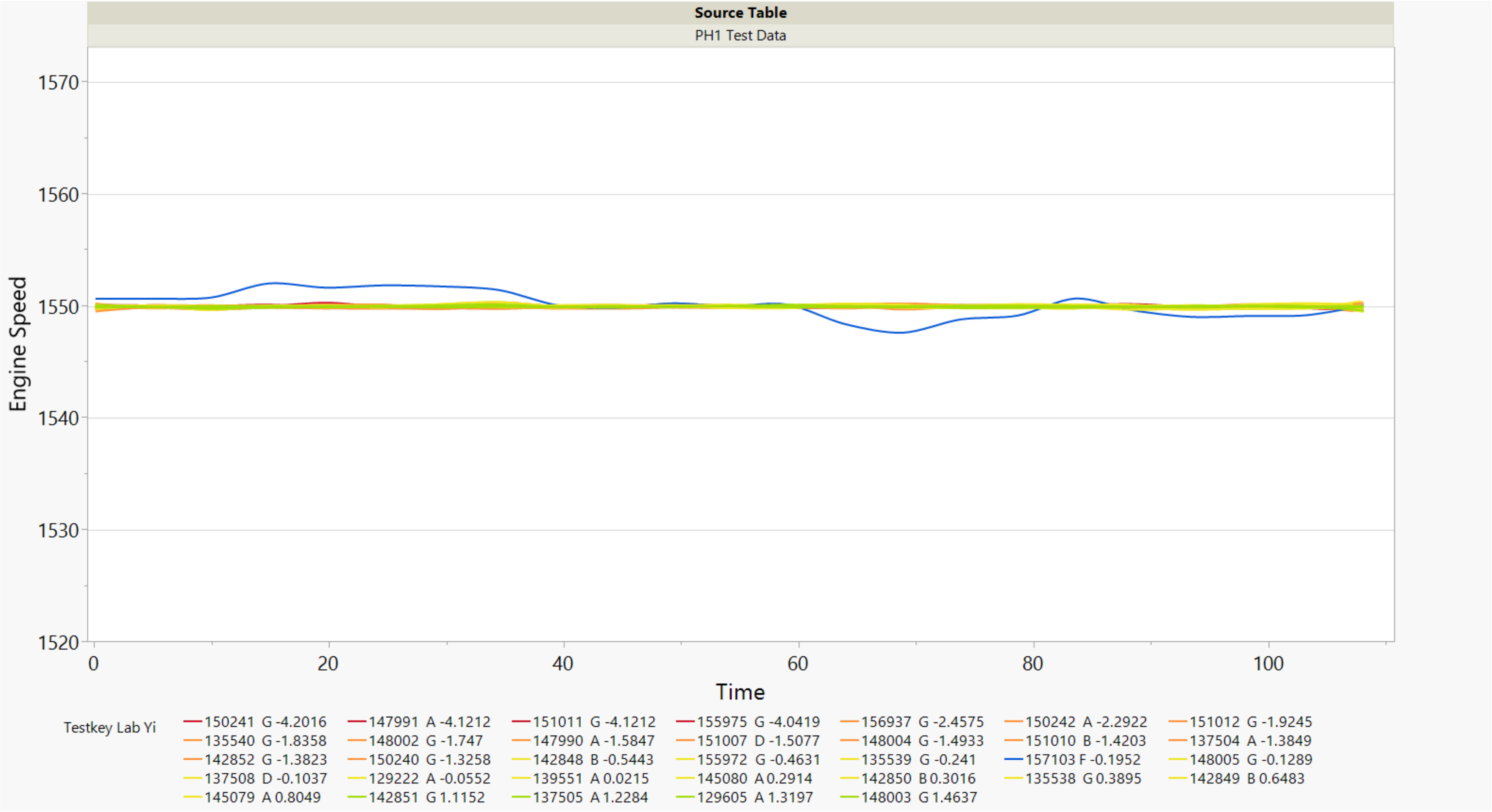
Previous Analysis

- Based on the EWMA, labs asked to submit tests both before and after the severity shift, going back to 09/01/2018
- 32 tests were collected for the analysis
  - Lab A, 10 tests (4 test missing CAN data)
  - Lab B, 4 tests (only reported a single ramp for Phase 1-2 Ramp and Phase 2-1 Ramp)
  - Lab D, 2 tests
  - Lab G, 16 tests (Reported every 6^{th} ramp for the Phase 2-1 Ramp)
- This data is color coded by severity (more red means more negative Yi, more green means more positive Yi)

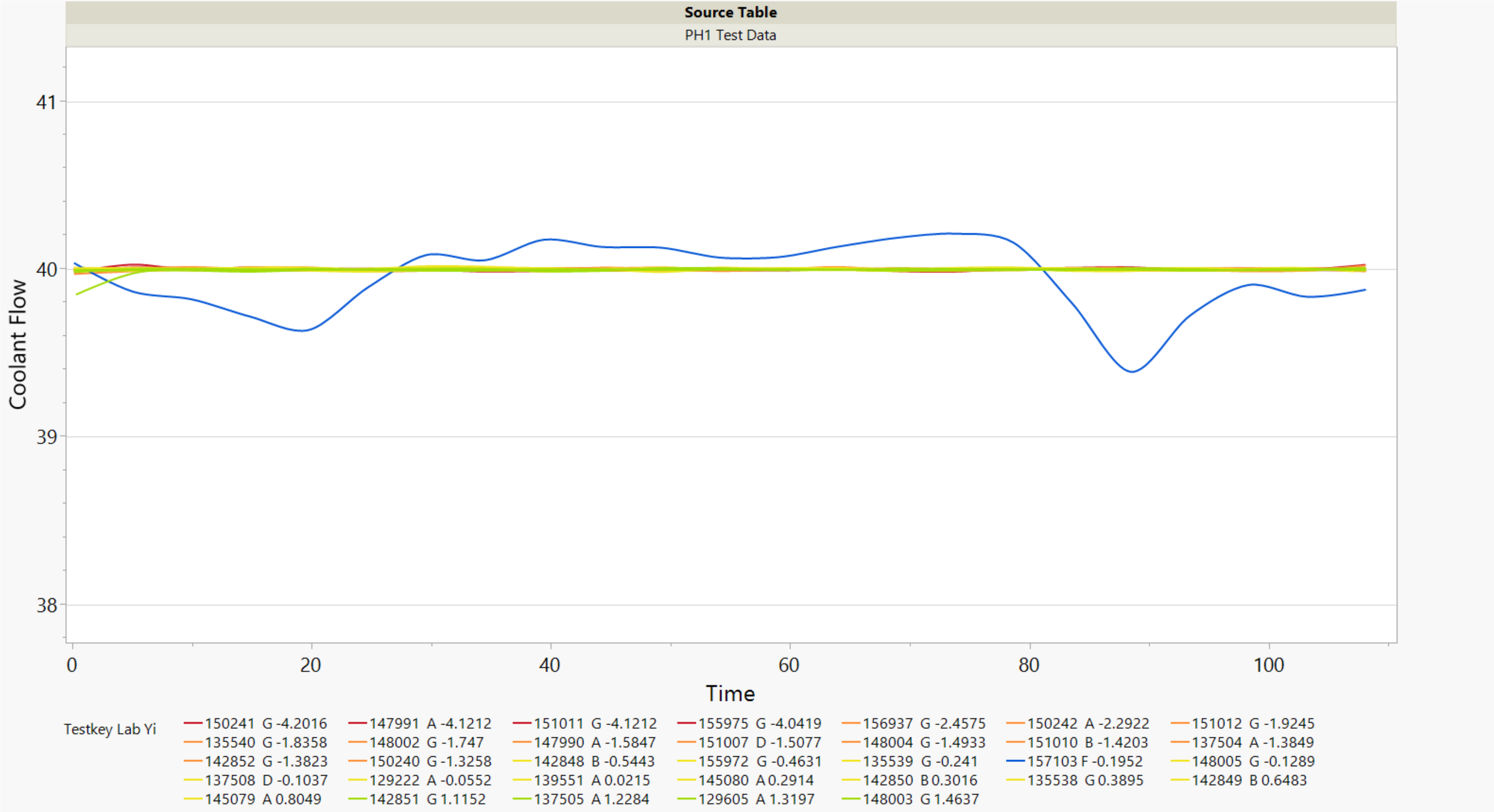
New Data with Blowby Restriction

- Lab F, 1 test (Missing 2-1 Ramp Data)
- This test is blue

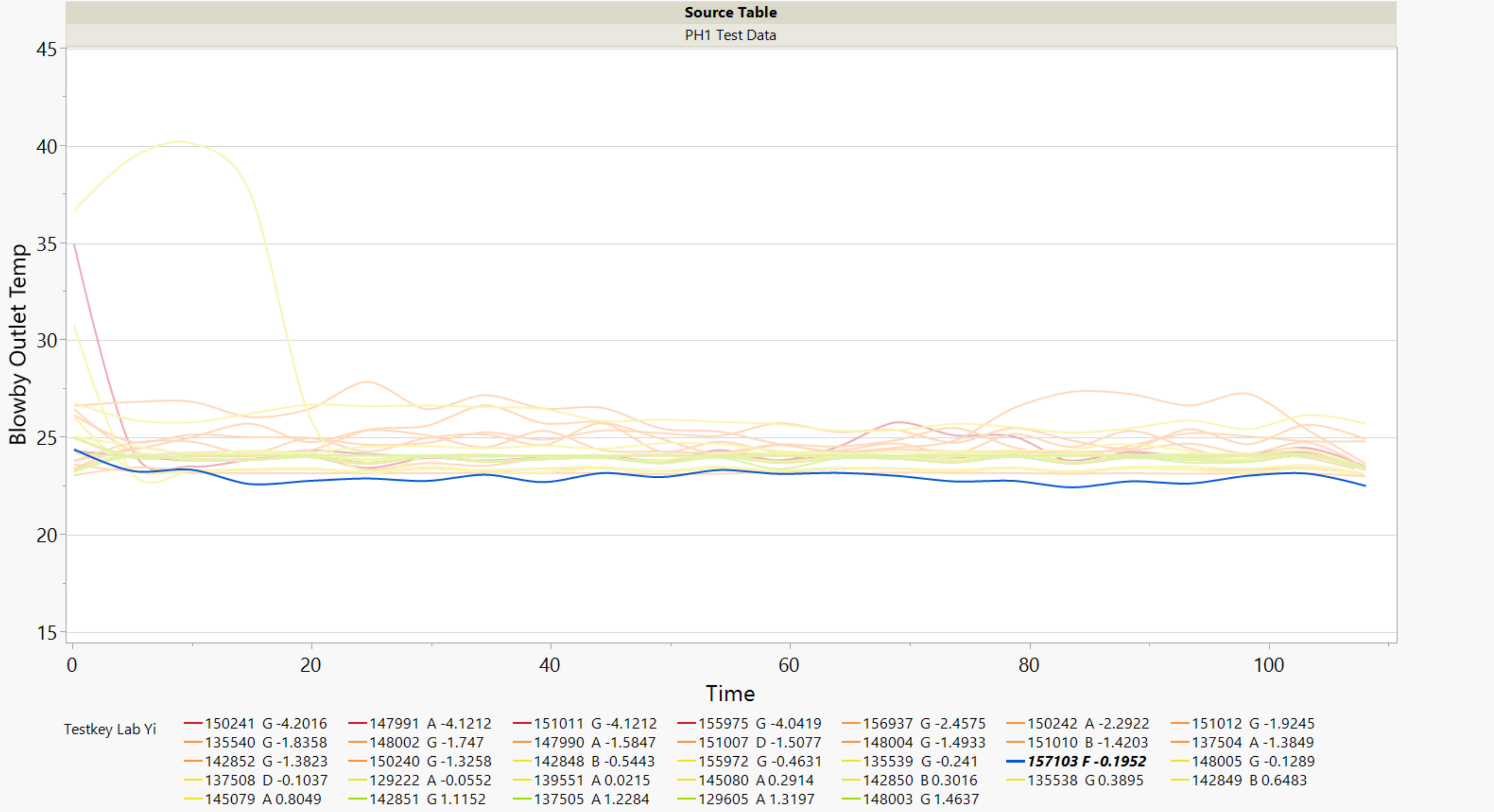
Engine Speed – Phase I



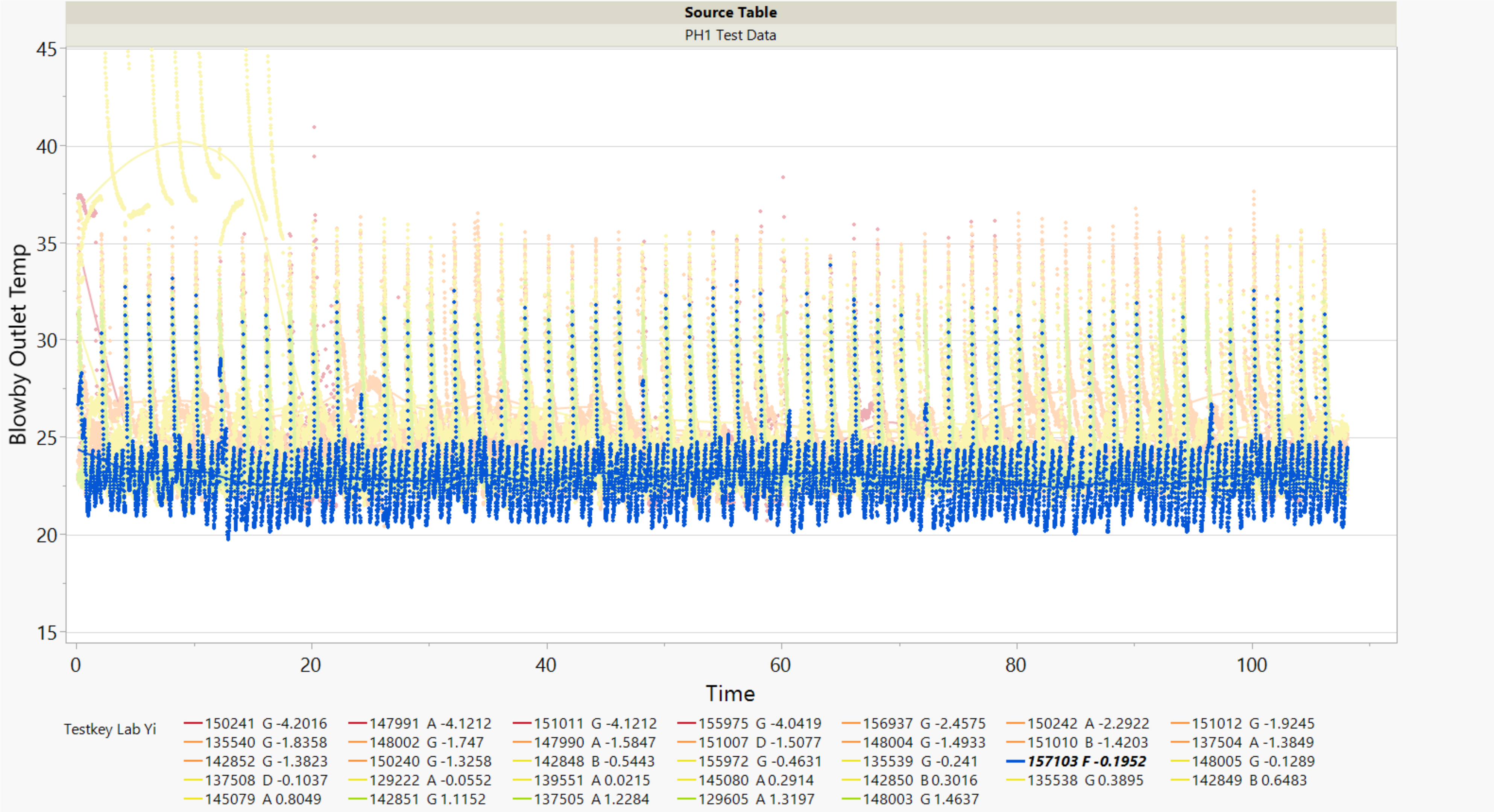
Coolant Flow – Phase I



Blowby Outlet Temperature – Phase I



Blowby Outlet Temperature – Phase I



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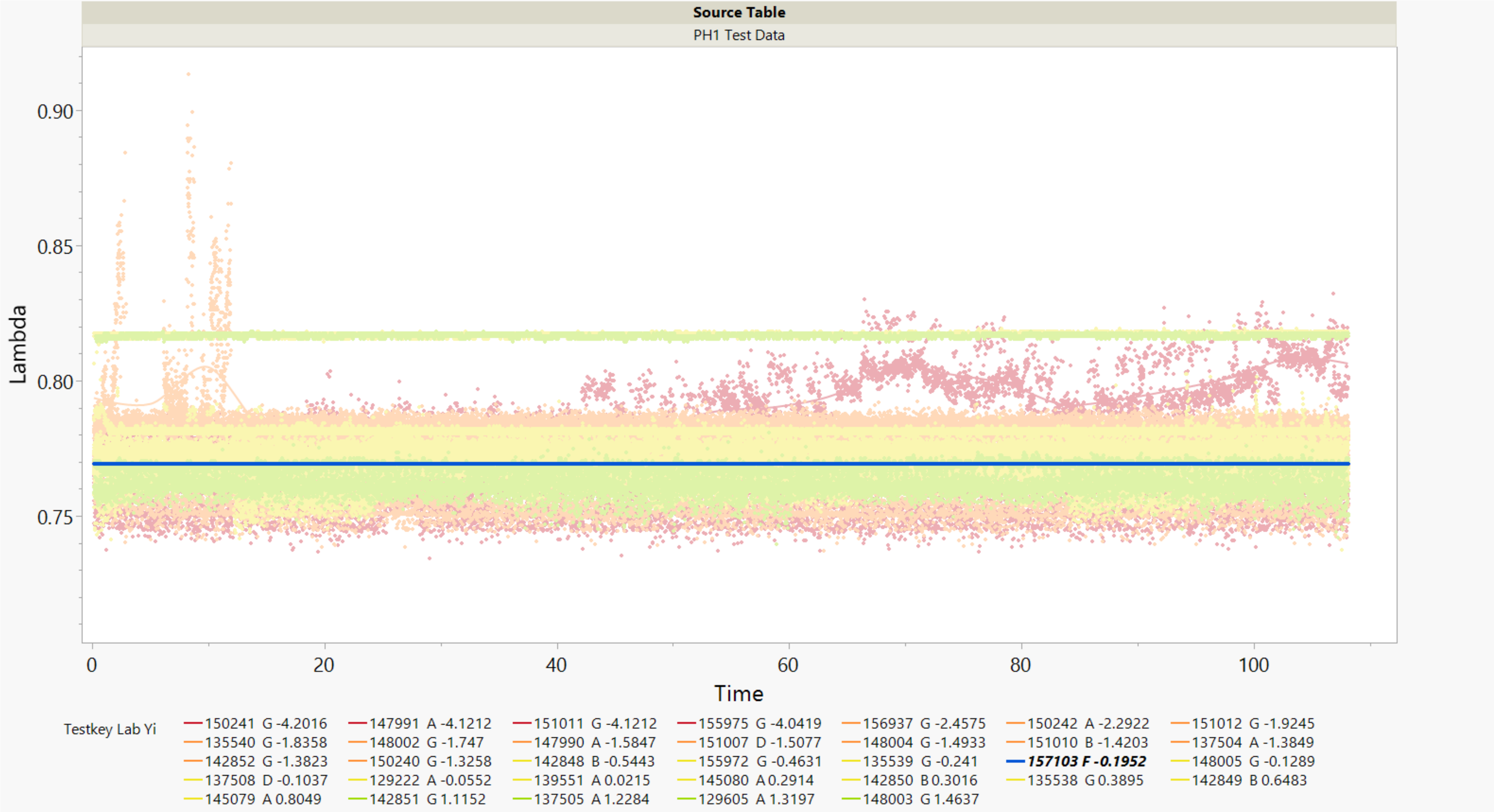
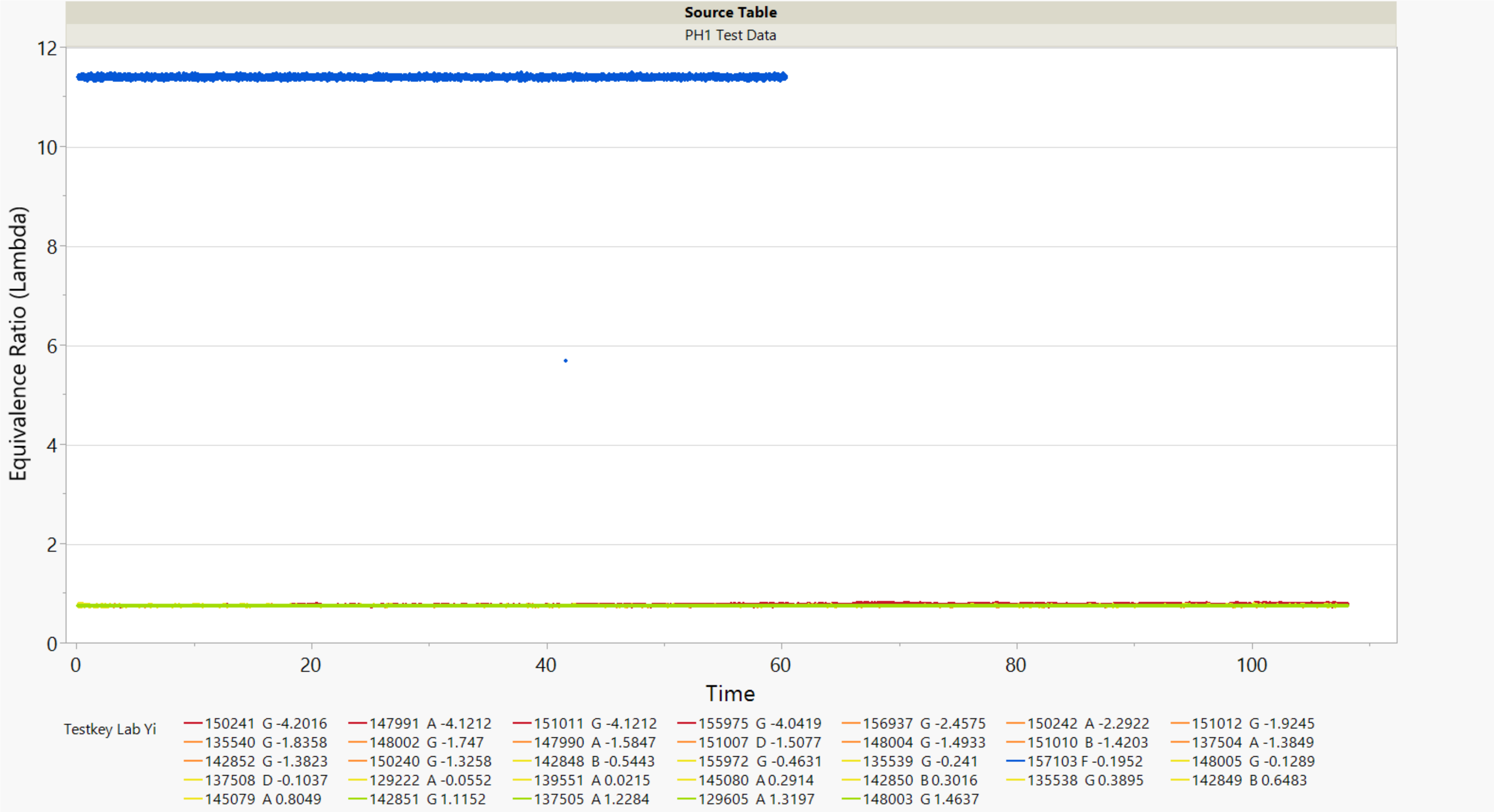
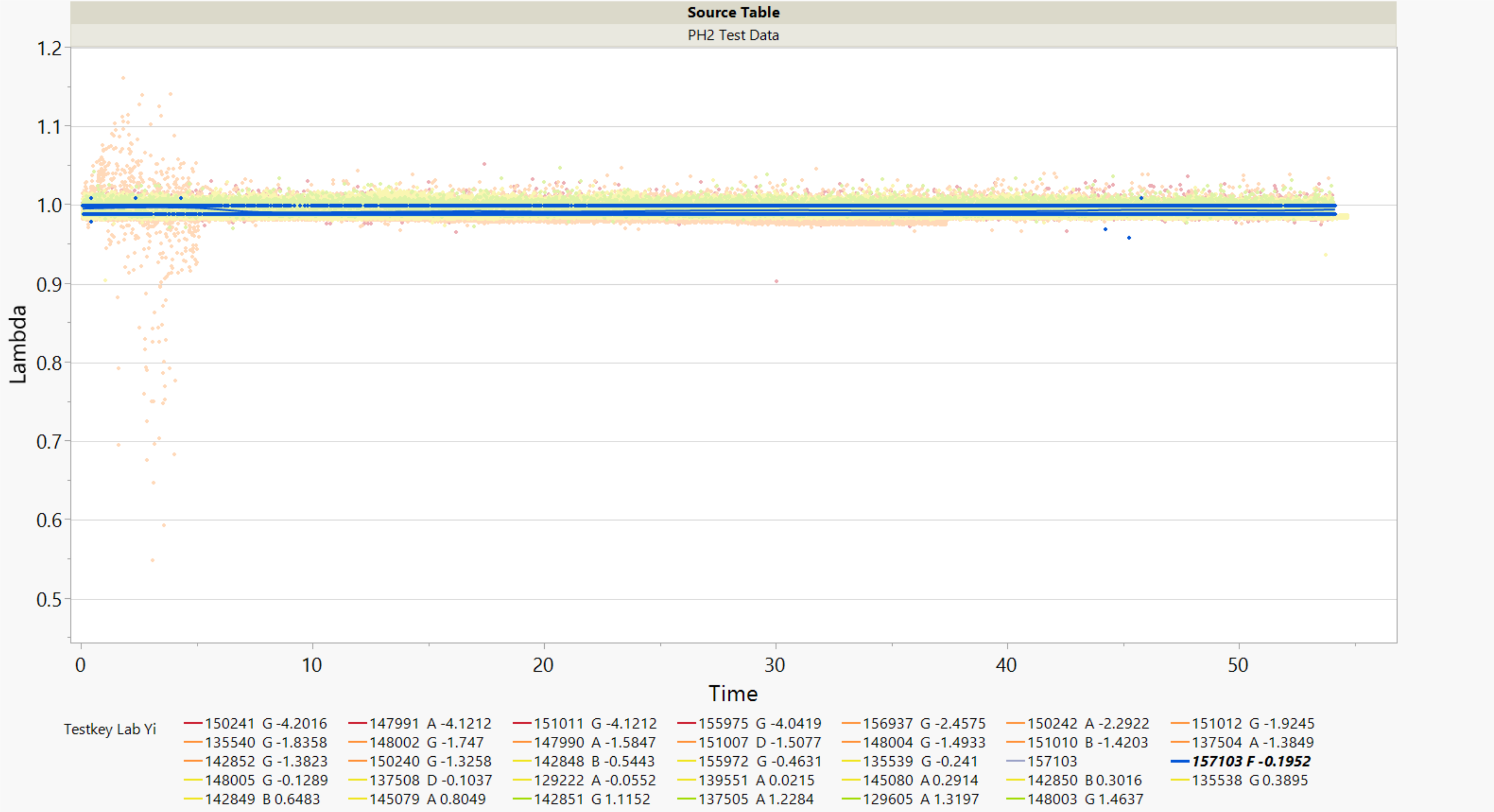
Lambda – Phase I



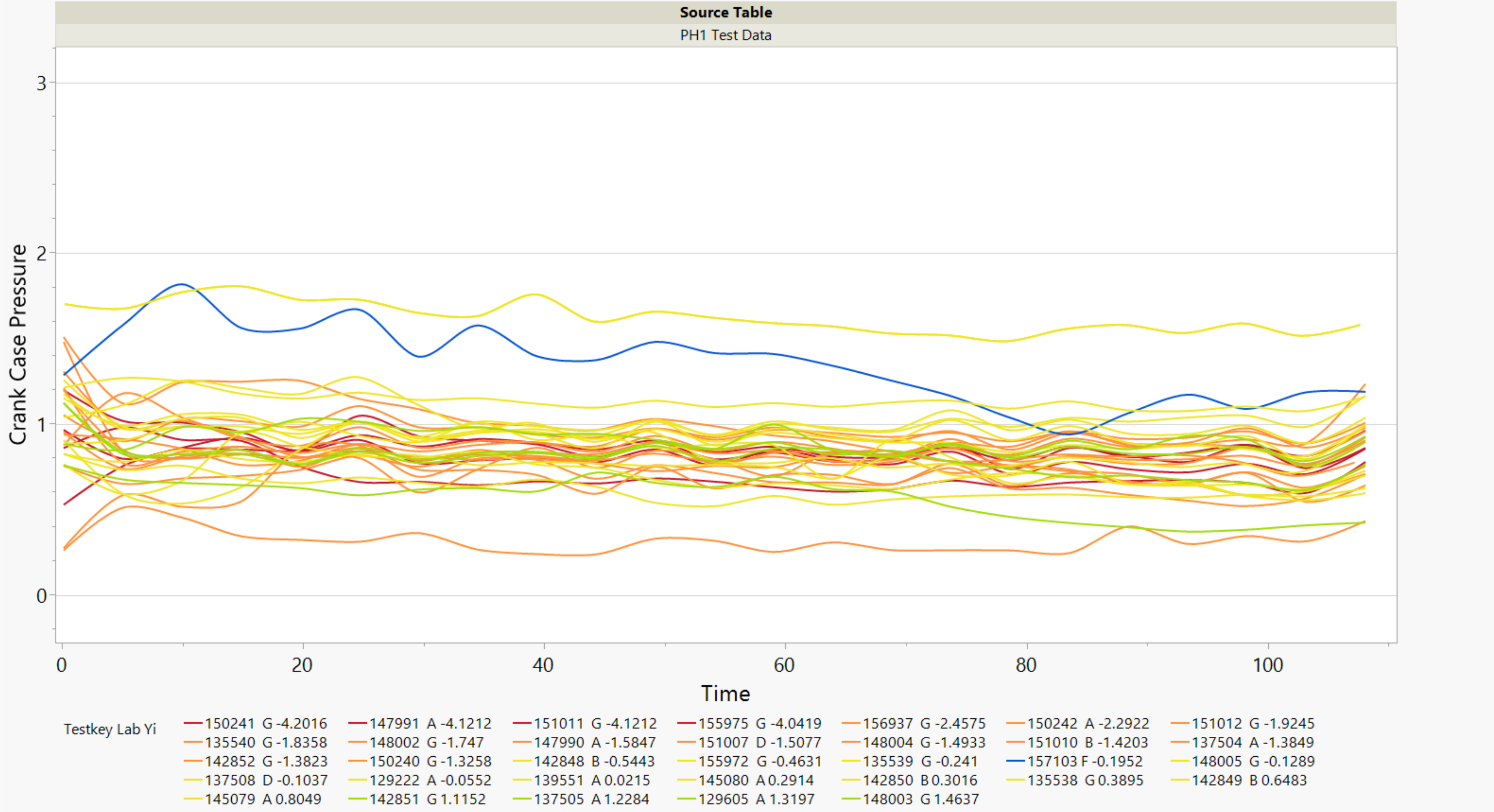
ECM Lambda Phase I



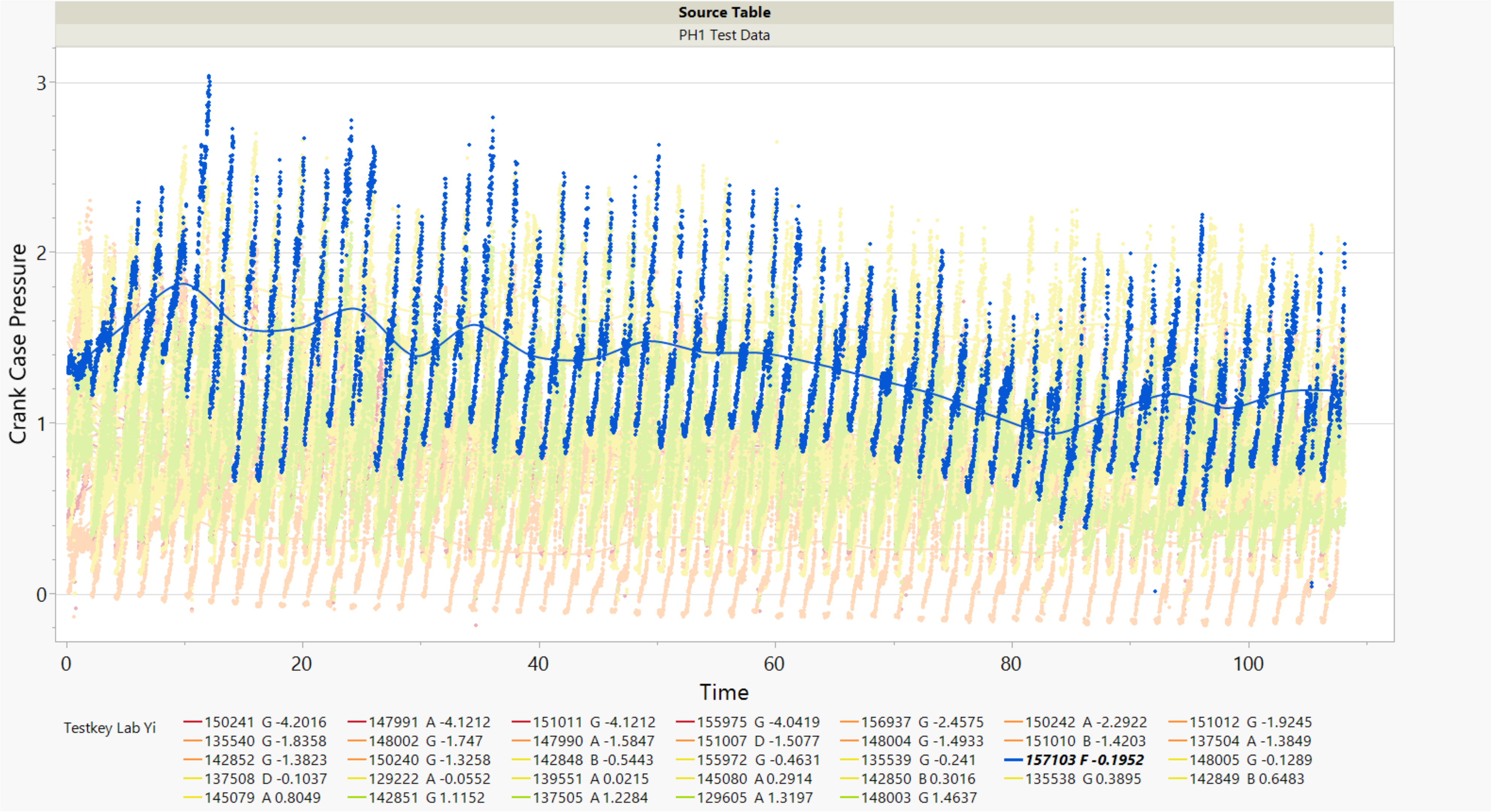
Lambda – Phase 2



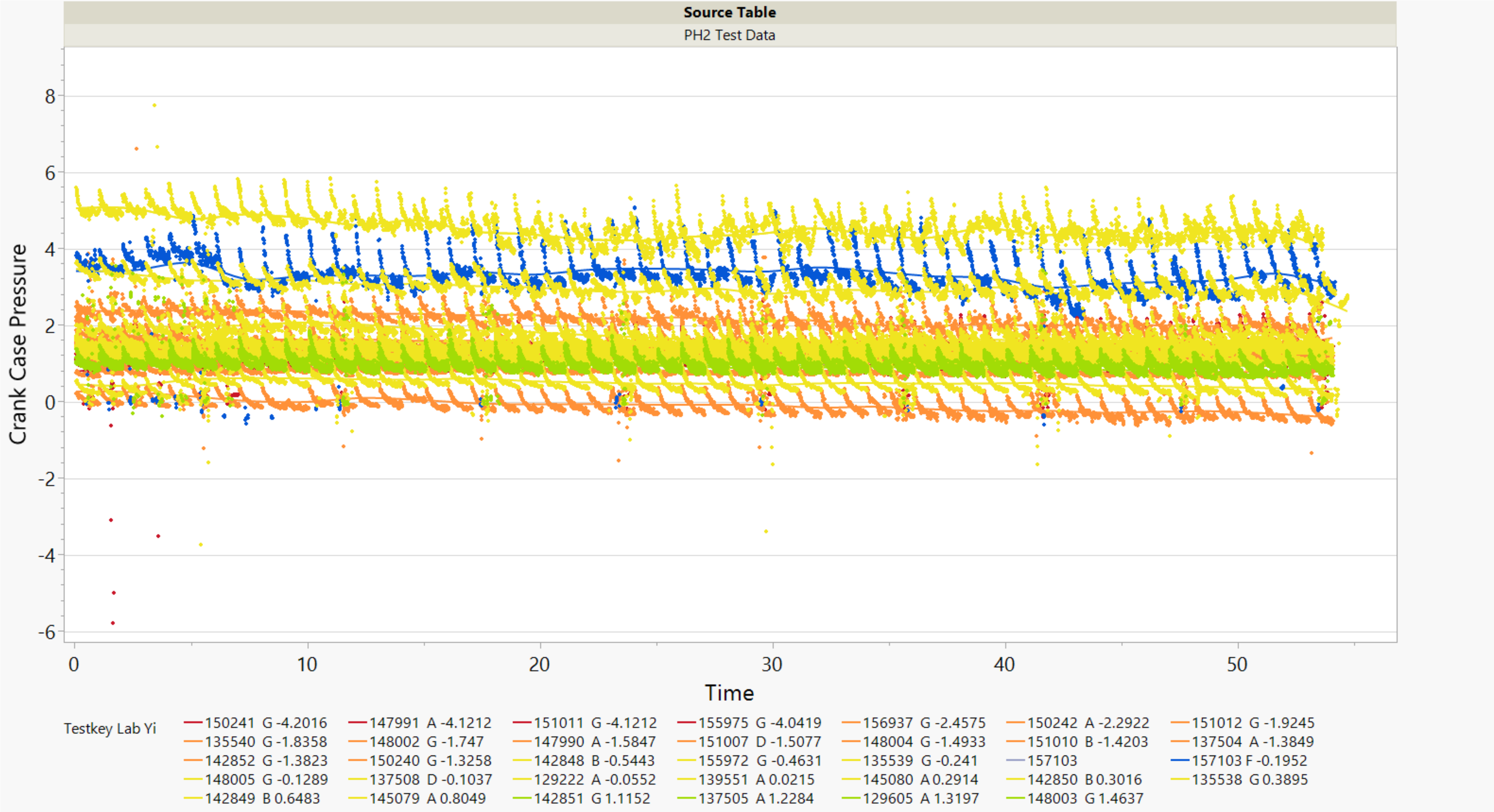
Crankcase Pressure – Phase 1



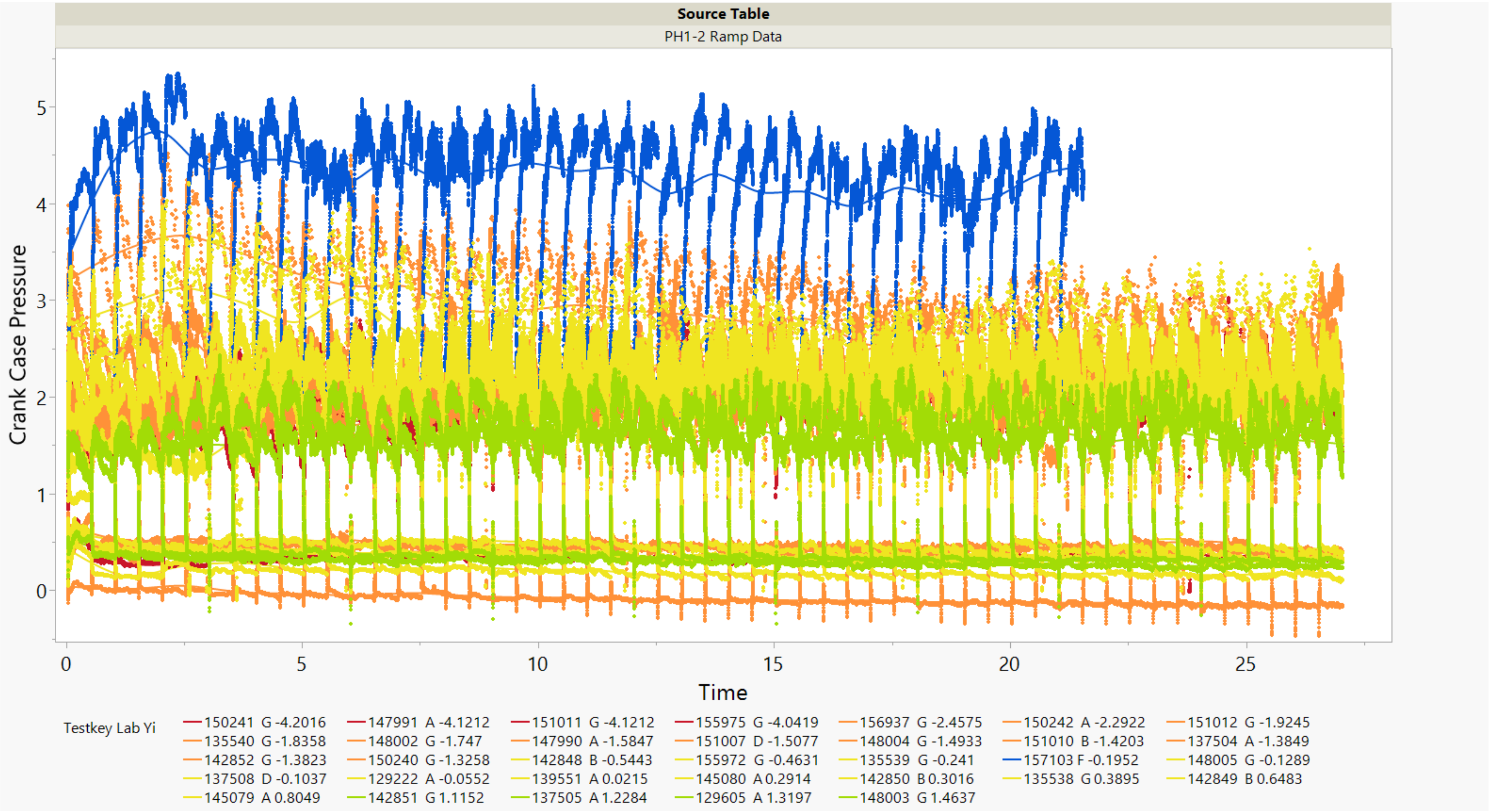
Crankcase Pressure – Phase I



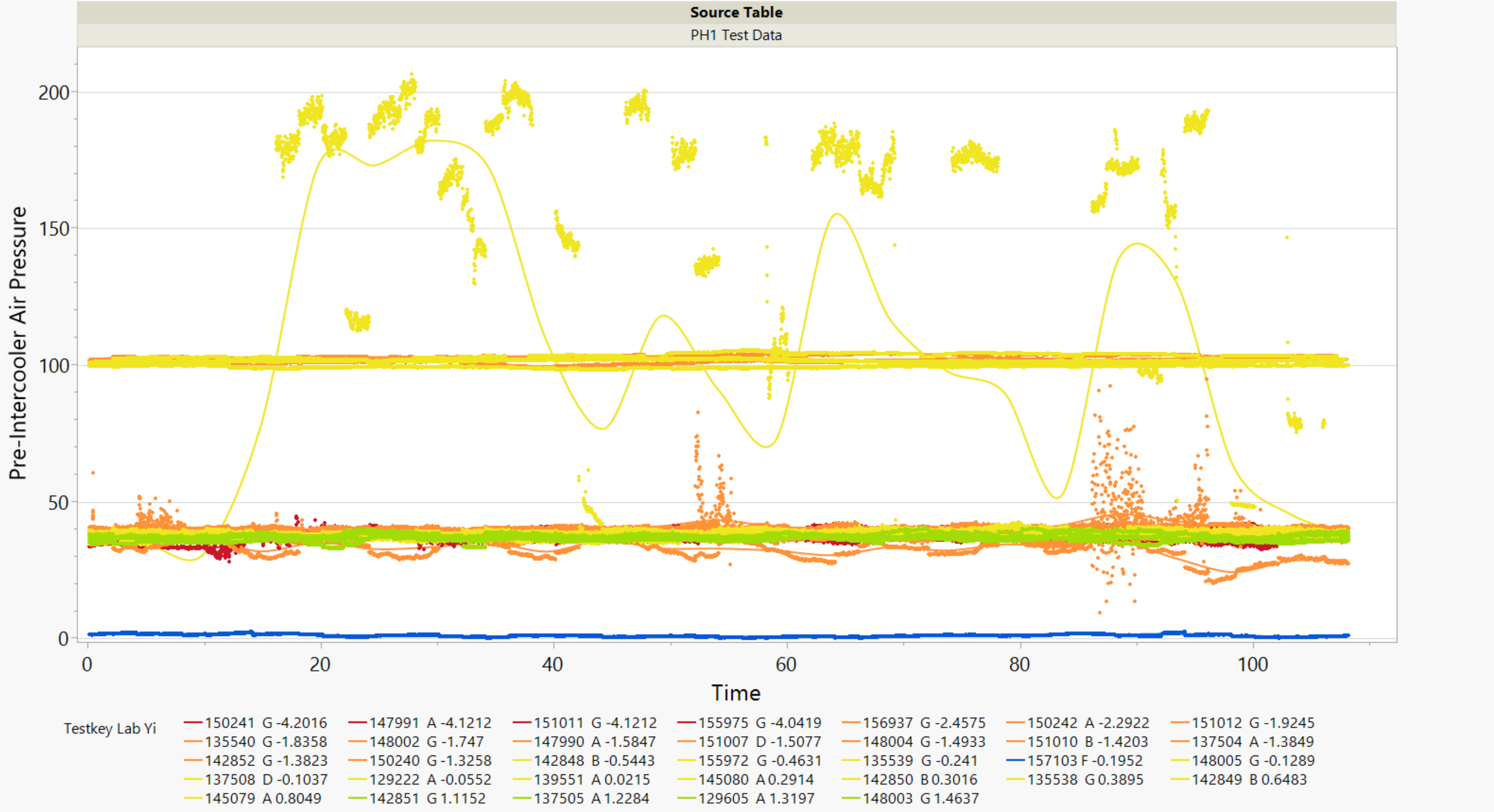
Crankcase Pressure – Phase 2



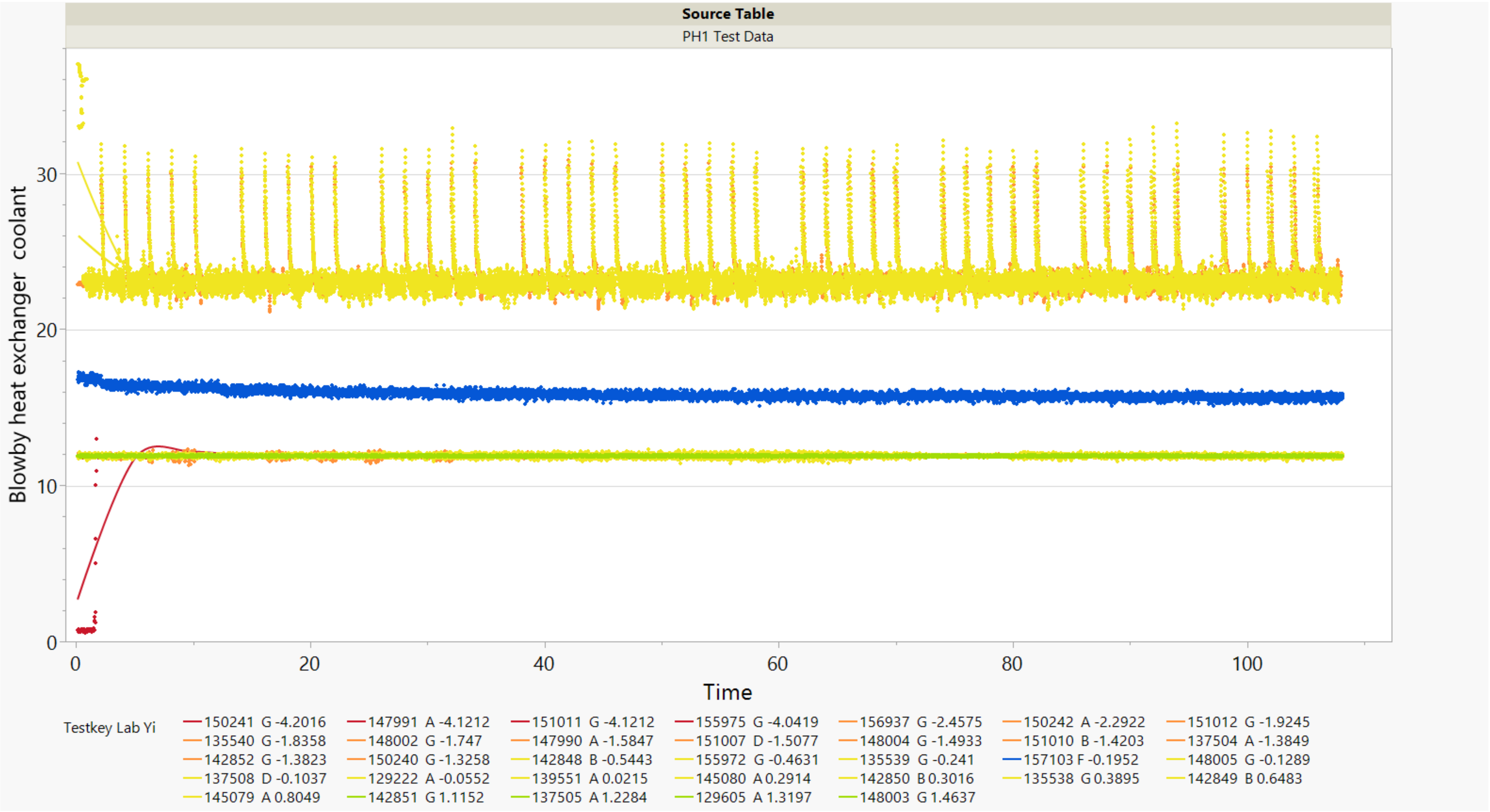
Crankcase Pressure – Phase 1-2 Ramp



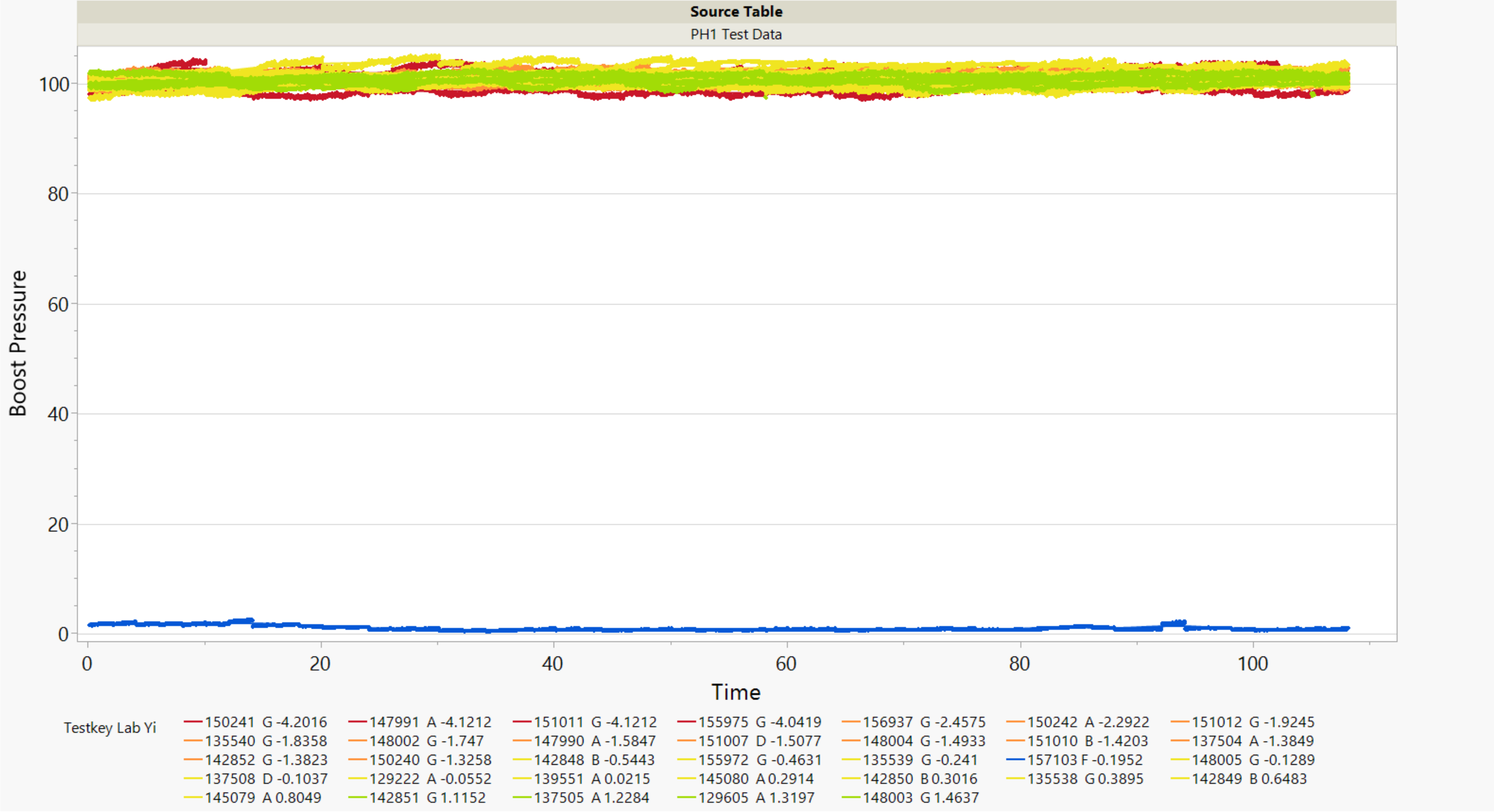
Pre-Intercooler Air Pressure – Phase I



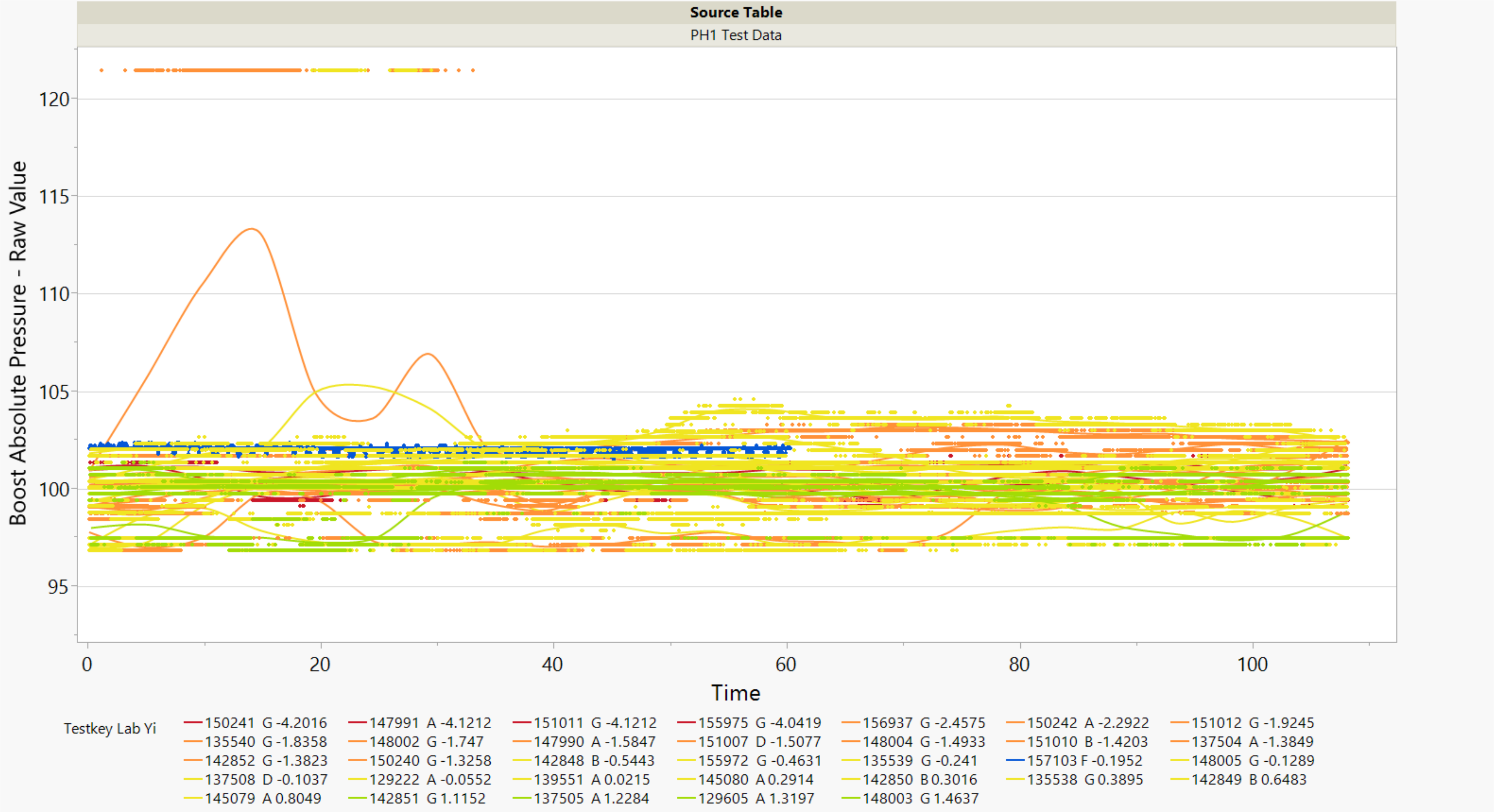
Blowby Heat Exchanger Coolant – Phase I



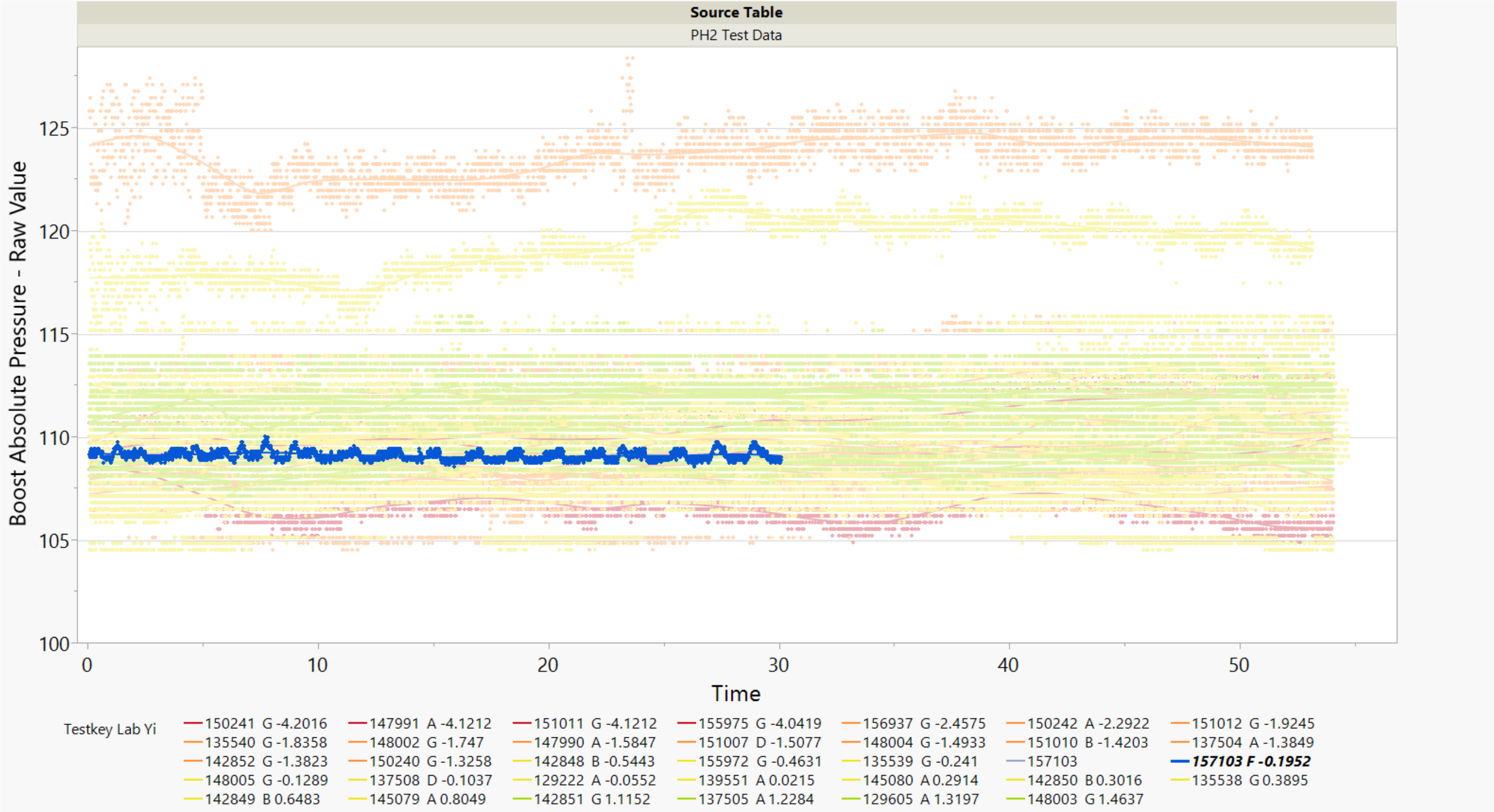
Boost Pressure – Phase I



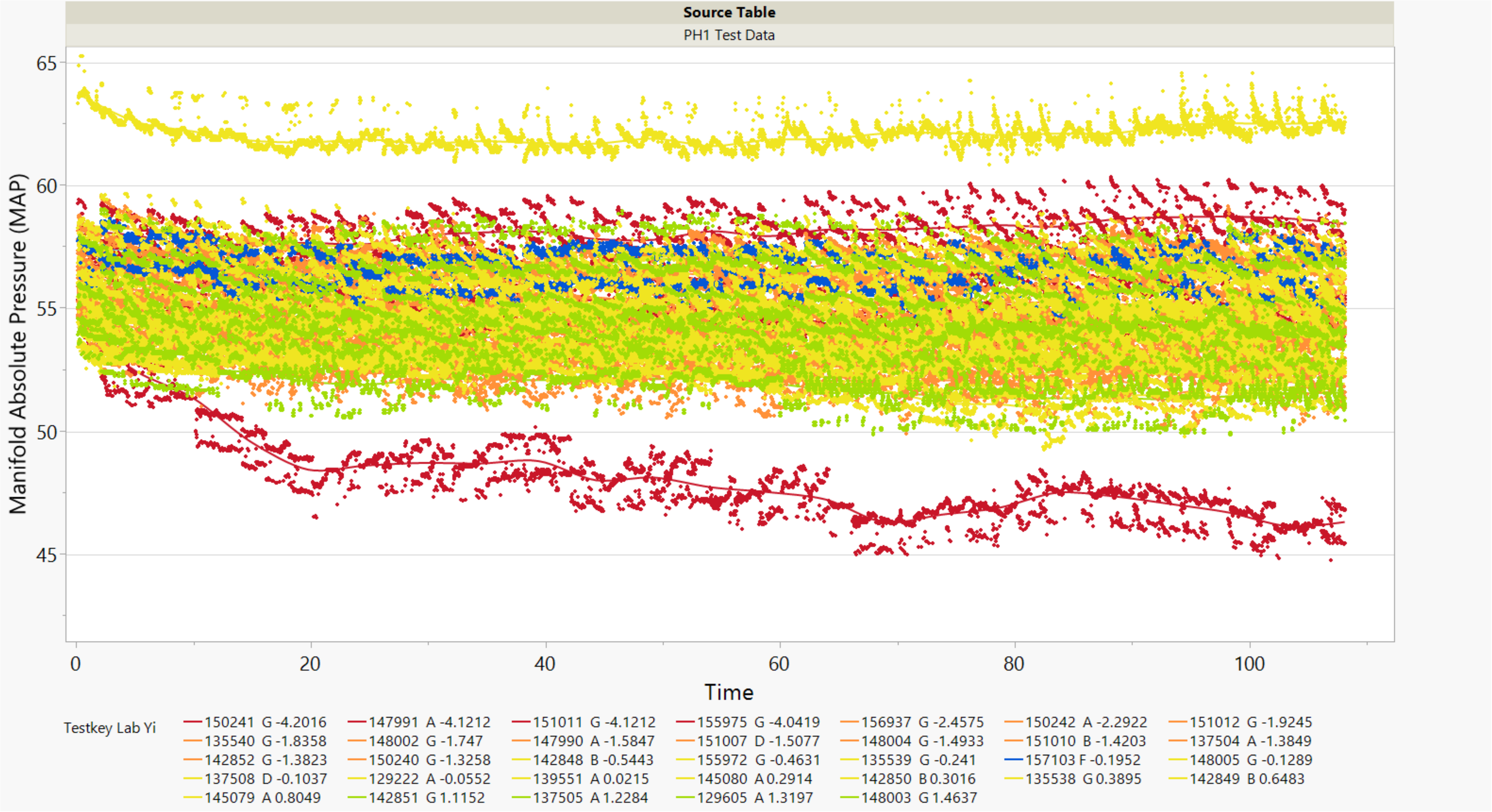
ECM Boost – Phase I



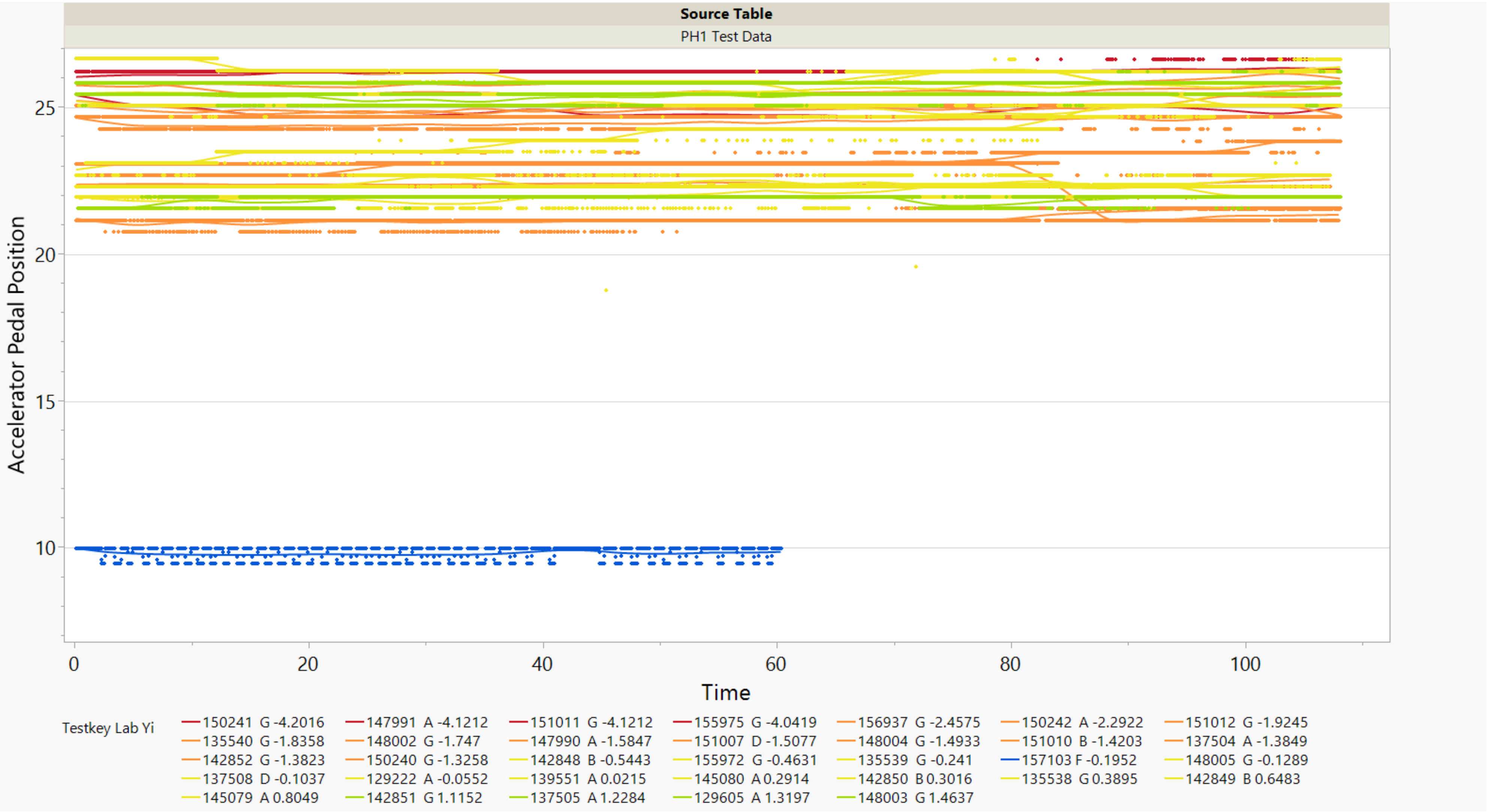
ECM Boost – Phase 2



Manifold Absolute Pressure – Phase I



Accelerator Pedal Position – Phase I



Oil Gallery Pressure – Phase I

Note: Color scheme changed. Lab F is red test highlighted.