



Effective Measurement Tools to Evaluate Vehicle/Track Interaction



Chicago – May 6, 2013



OPTIMIZING WHEEL/RAIL INTERACTION



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- ***Rail Measurement***
- ***Wheel Measurement***

- V
- R
- V
- T



gration



Rail Measurement

- *Generate rail wear database*
 - *wear charts*
 - *comparisons, queries, automated classification, identification of section (115, 136, etc)*
 - *trend analysis / forecasting capability*
- *Support rail grinding operations*
 - *Electronic BAR gauge*
 - *pre-grind survey plan generation*
 - *real time quality control (following grinder)*



- ***Rail Measurement***
- ***Wheel Measurement***



ORMV-1



ORMV-2

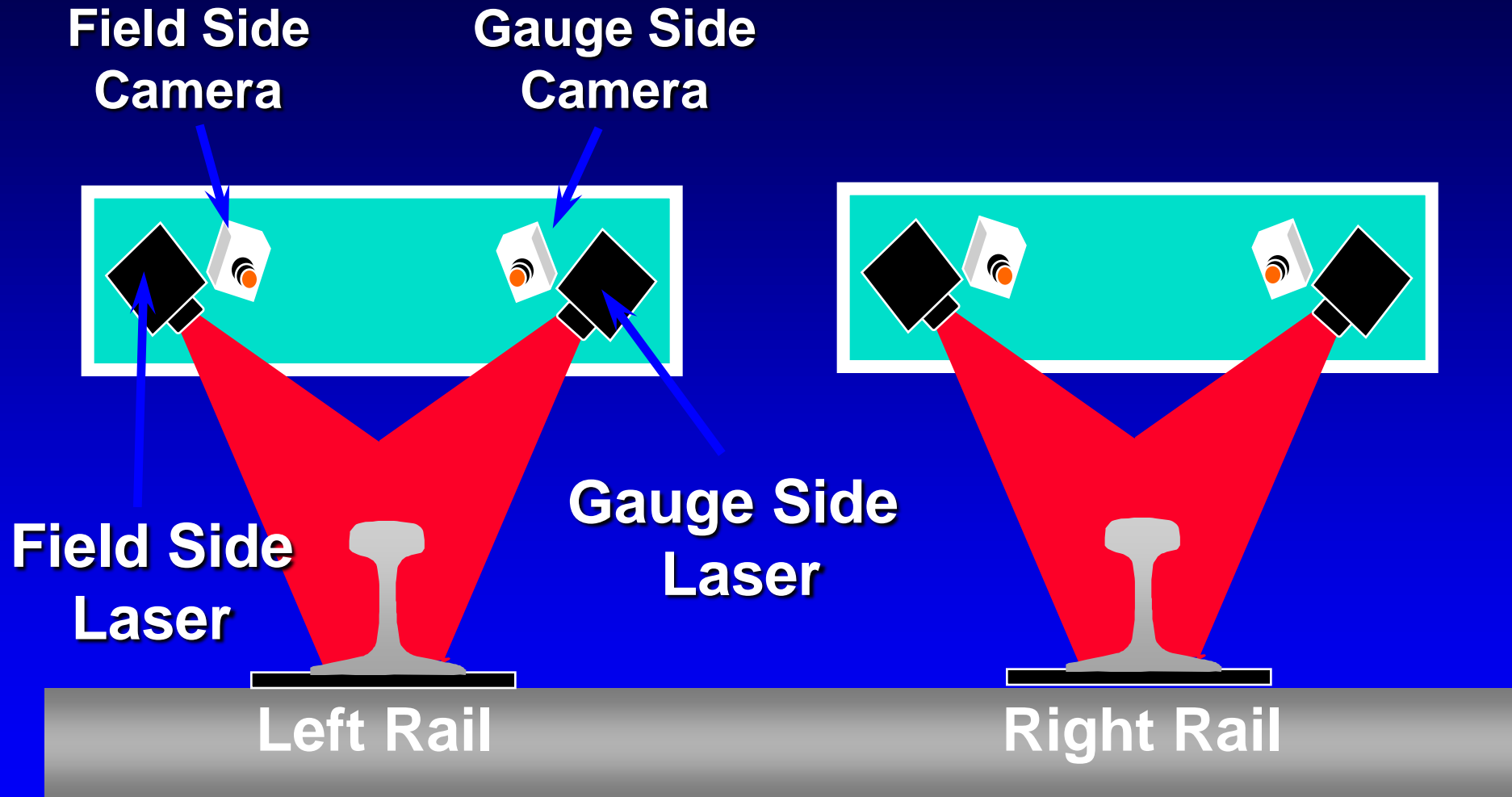


- ***Rail Measurement***
- ***Wheel Measurement***
- ***Wheel & Rail Profile Design***

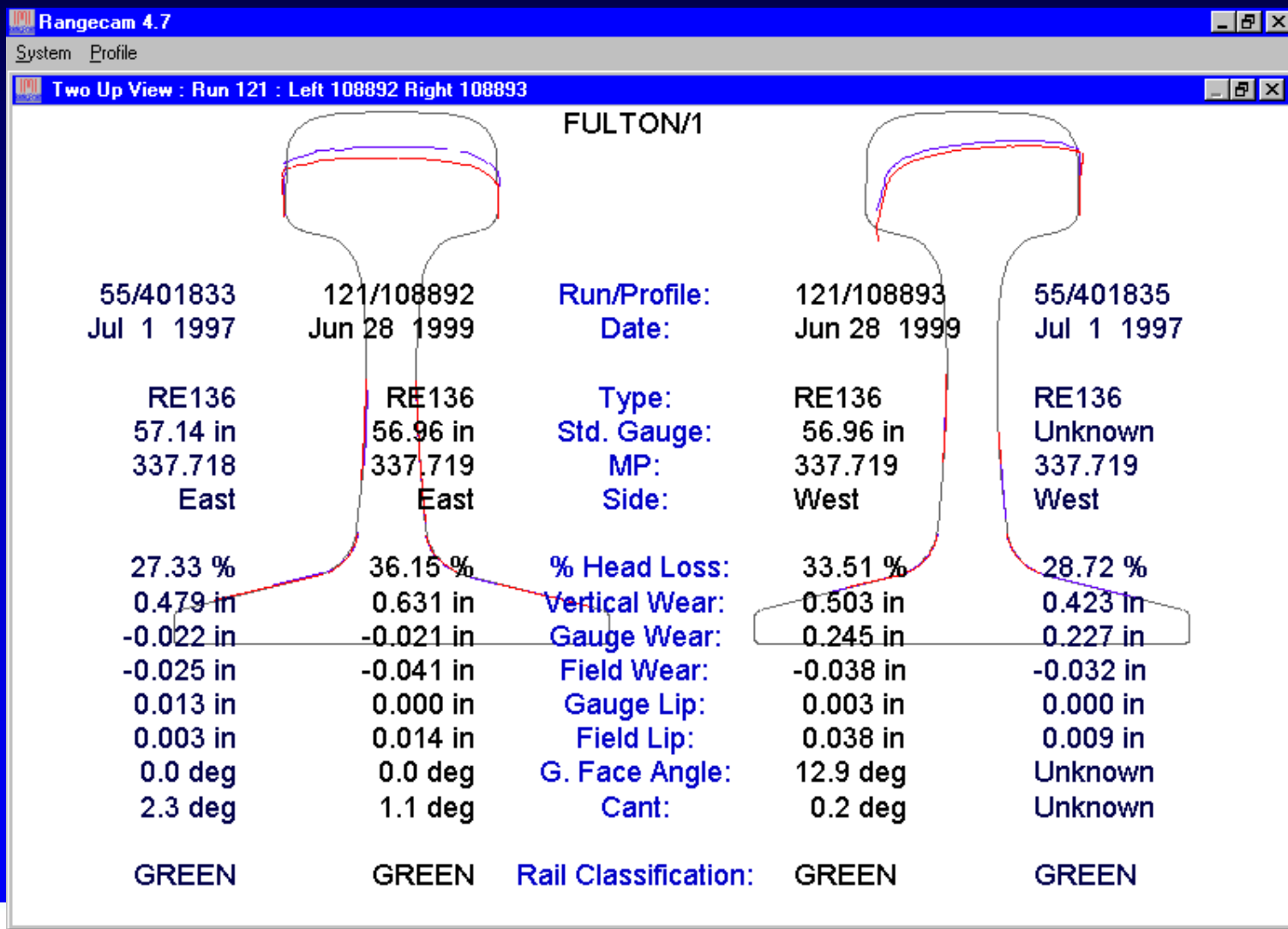


ORIAN

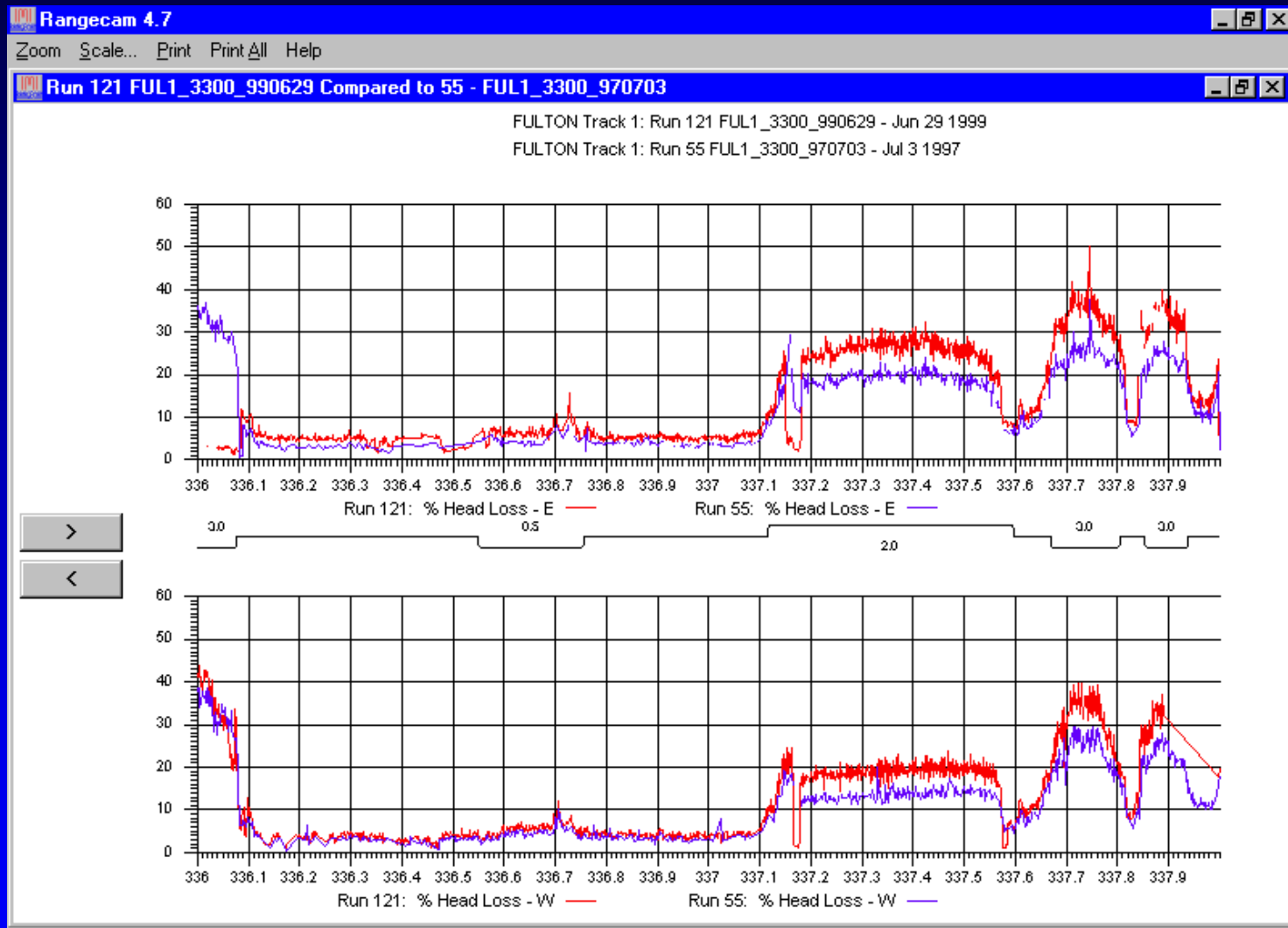
Rail Measurement Sensor Heads



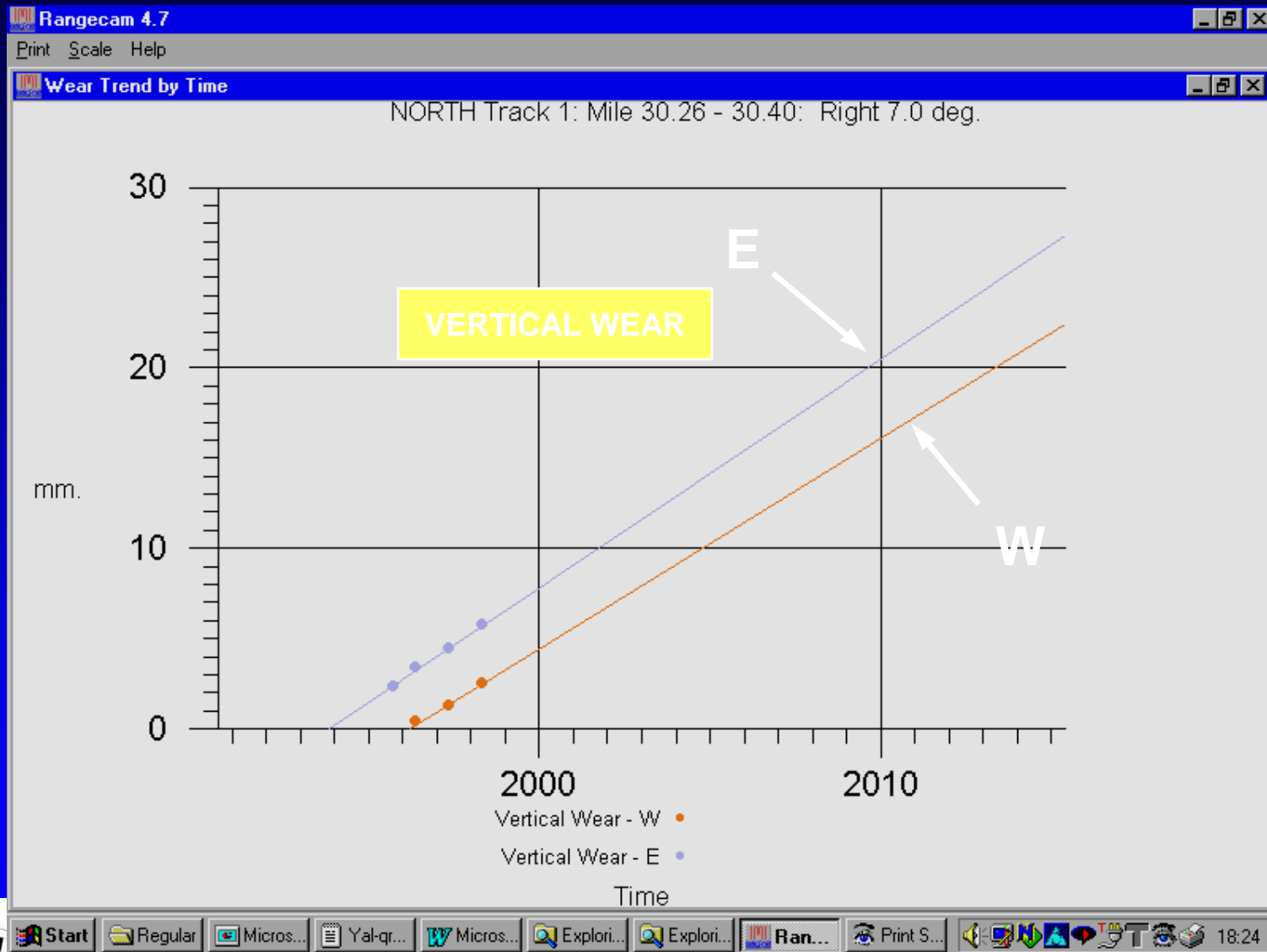
"TWO-UP" COMPARISON VIEW



COMPARISON CHART



TREND CHART-1



- *Rail Measurement*
- *Wheel Measurement*

- W
- R
- W
- T



ation



Wheel Measurement

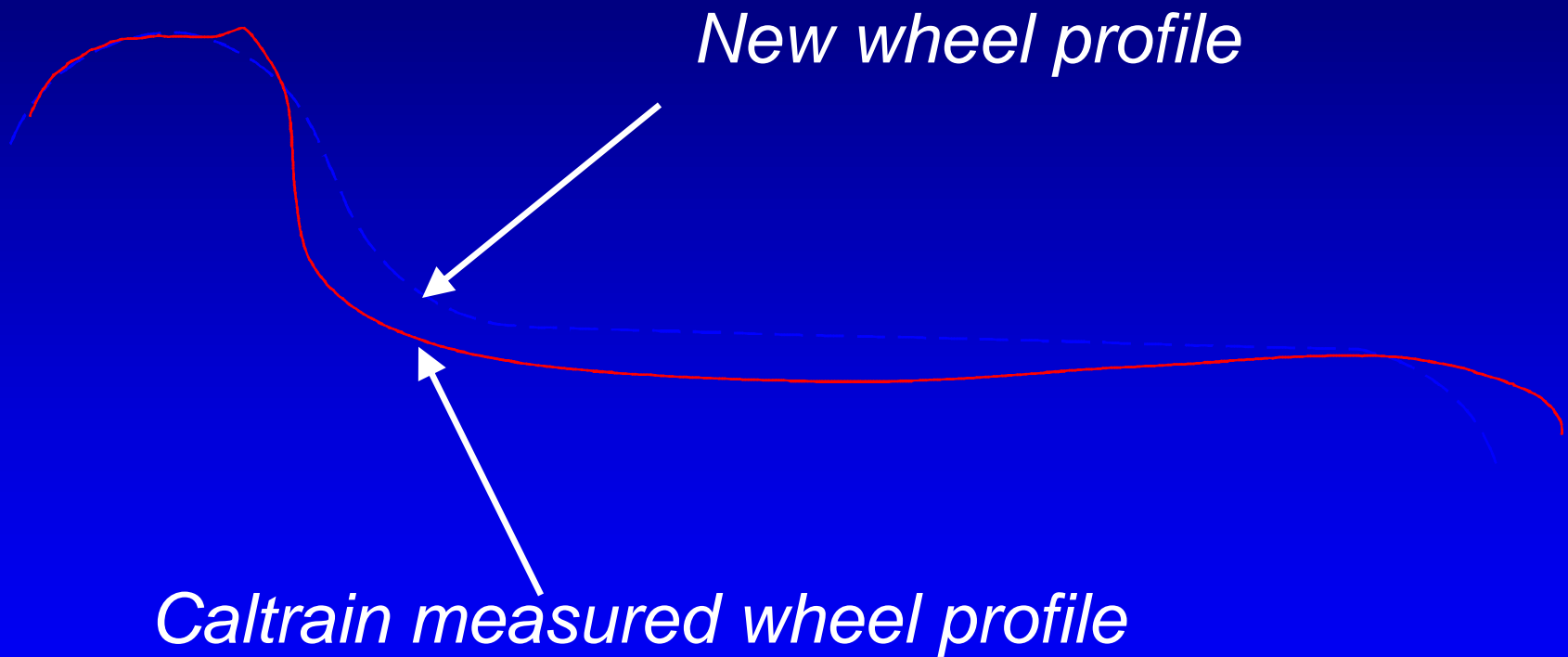
- *Generate wheel wear database*
 - ☐ *wear charts*
 - ☐ *forecasting capability*
 - ☐ *comparisons, queries, automated classification*
- *Support wheel reprofiling operations*
 - ☐ *real time quality control (following reprofiling)*
 - ☐ *monitor wheel/rail contact conditions*



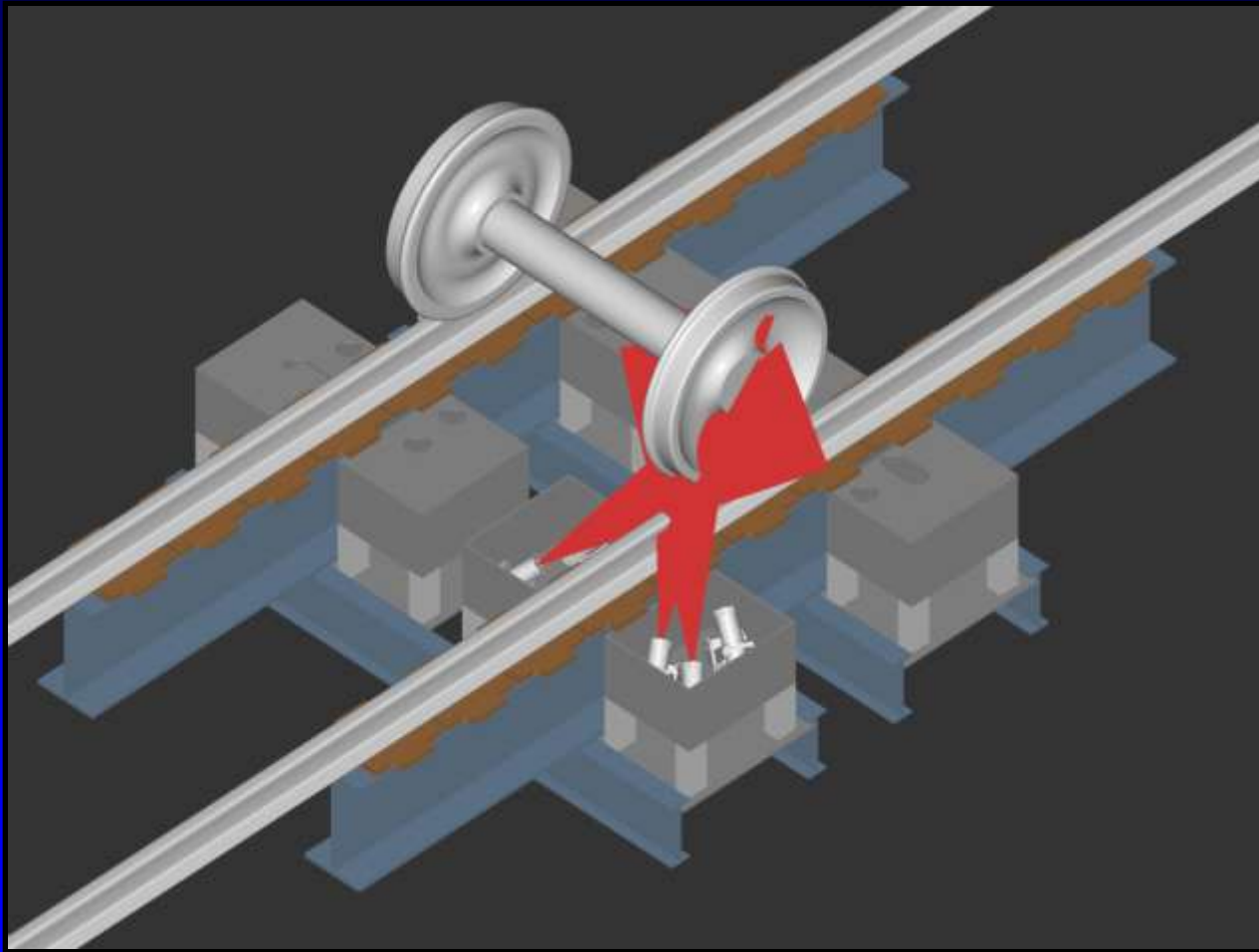
Wheel Measurement

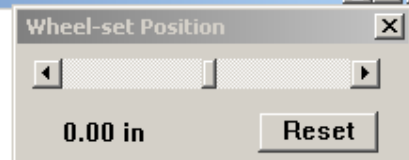
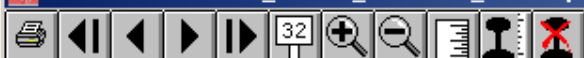


Wheel Measurement



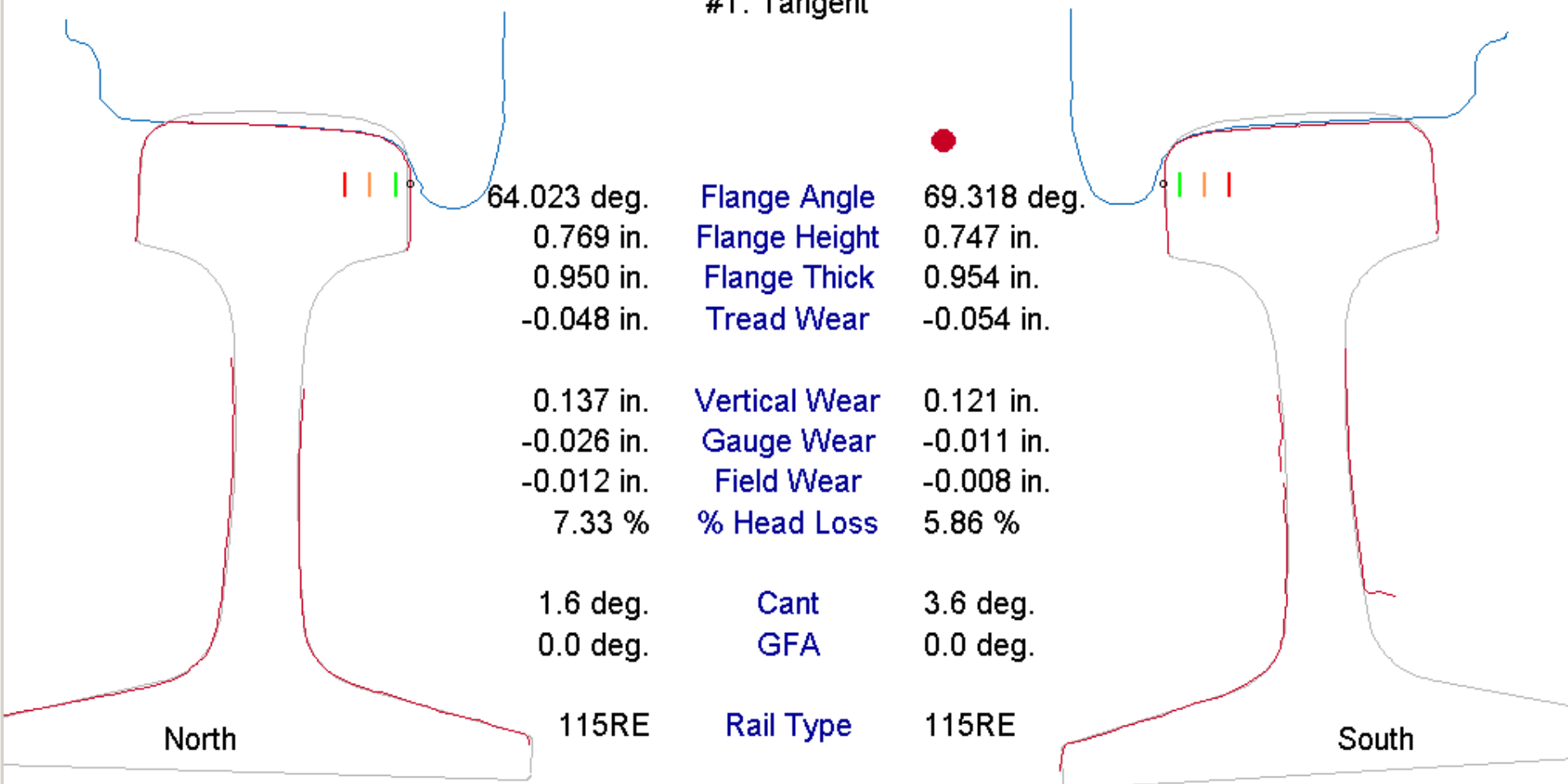
Automated Wheel Inspection *(WheelScan)*

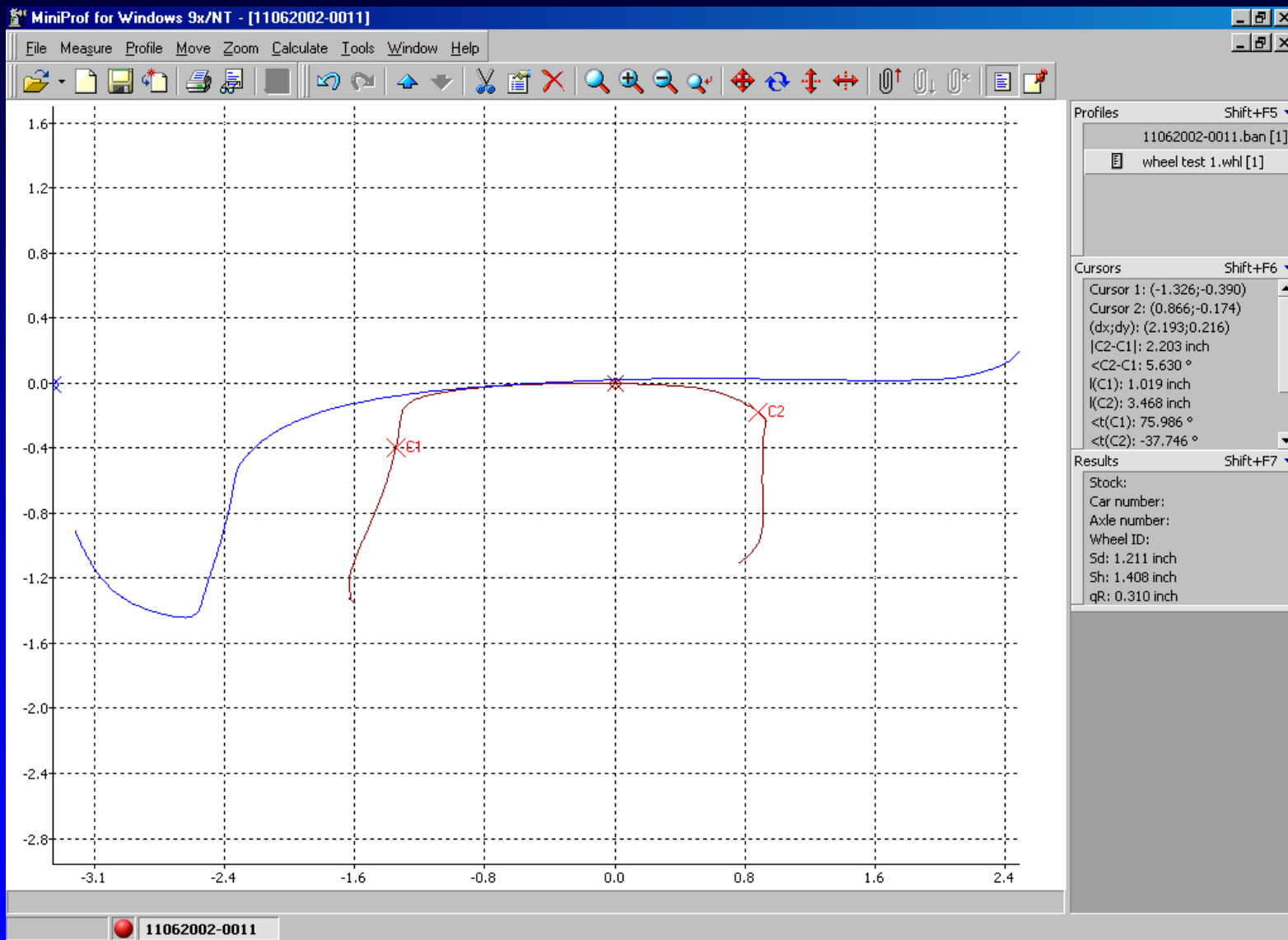




MBTA - GREEN
LINE_A - Track EB

6/3682-2L	Test/Wheel	6/3682-2R
Dec 12 2003	Run - Date - Test	Sep 21 2004
20.002	Stn.	20.002
#T: Tangent		





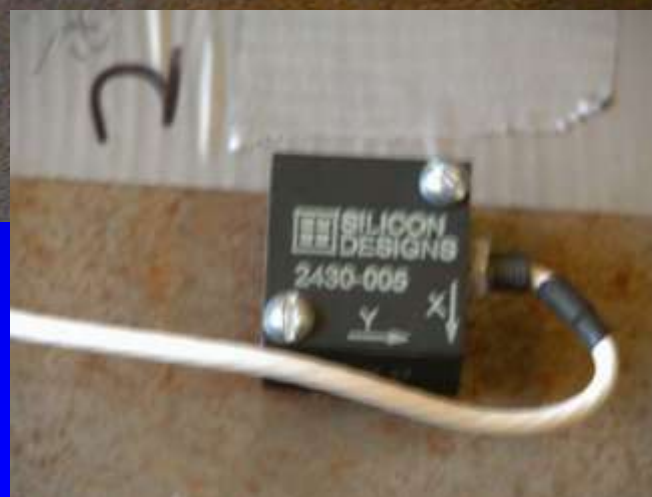
UNDER CAR VIDEO DEMONSTRATION

- *To investigate concerns of poor ride quality on a given system*









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Accelerometer Data samples

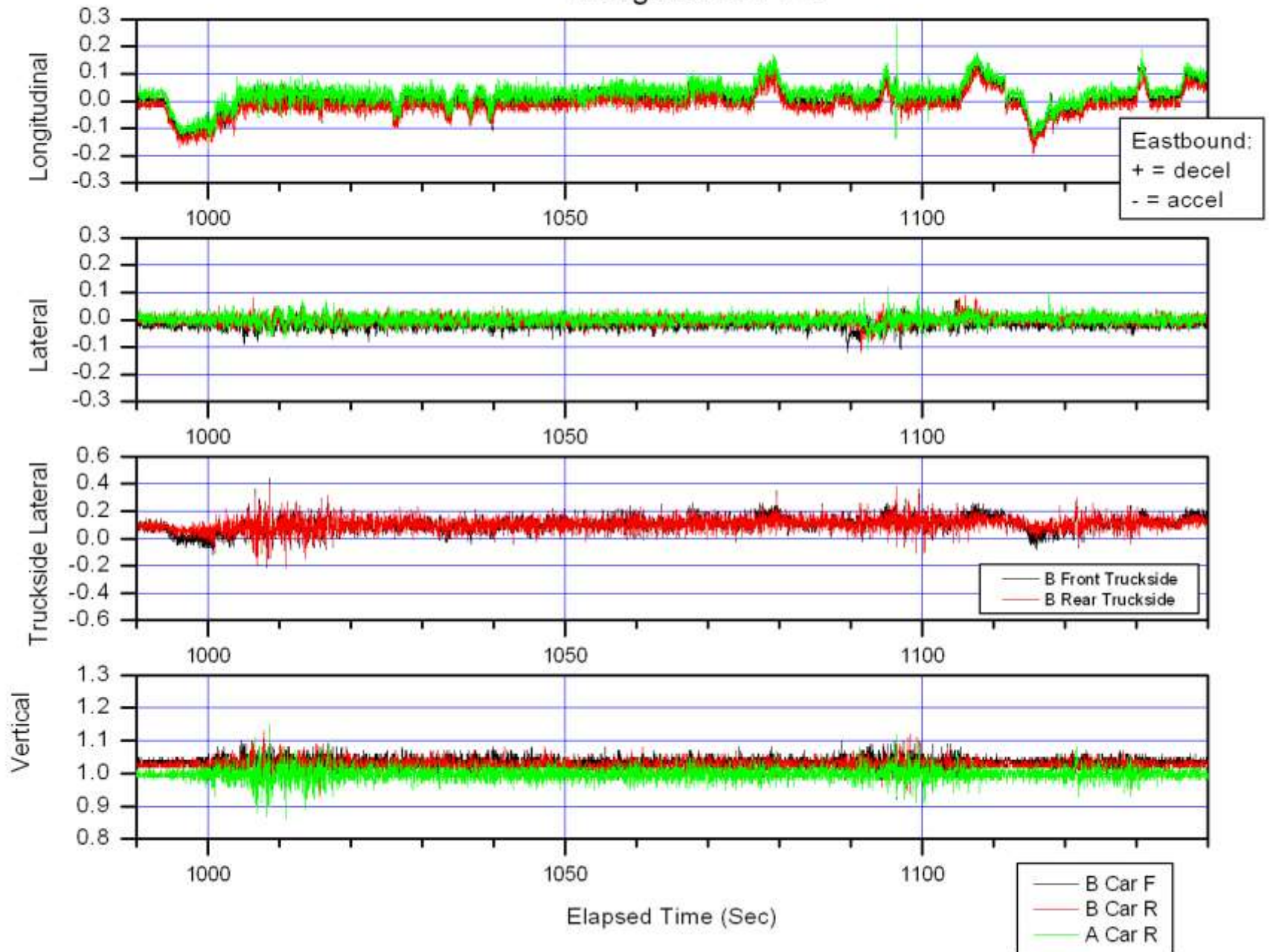


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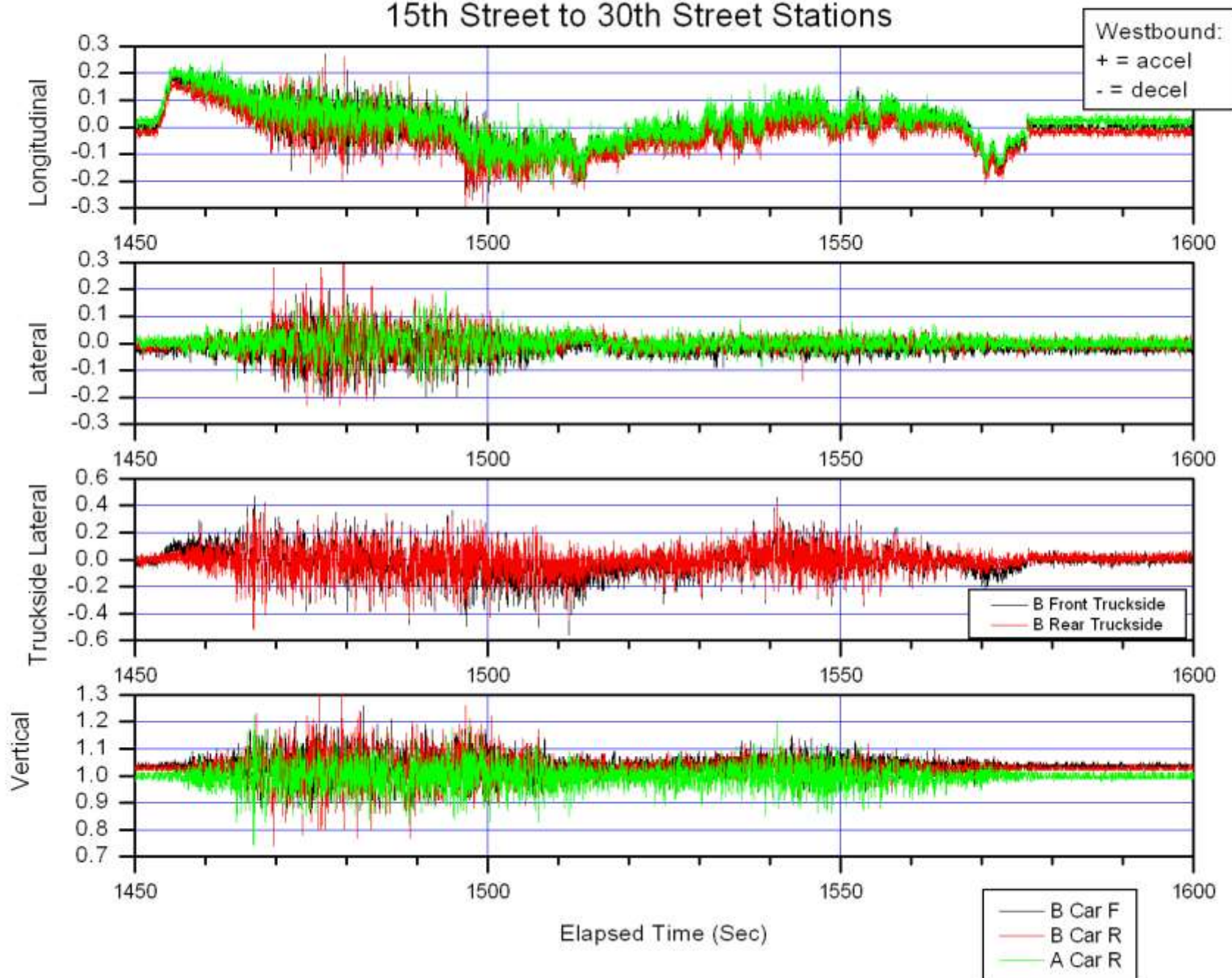


SEPTA 1070 - Eastbound 69th Street to FTC

Margaret to FTC

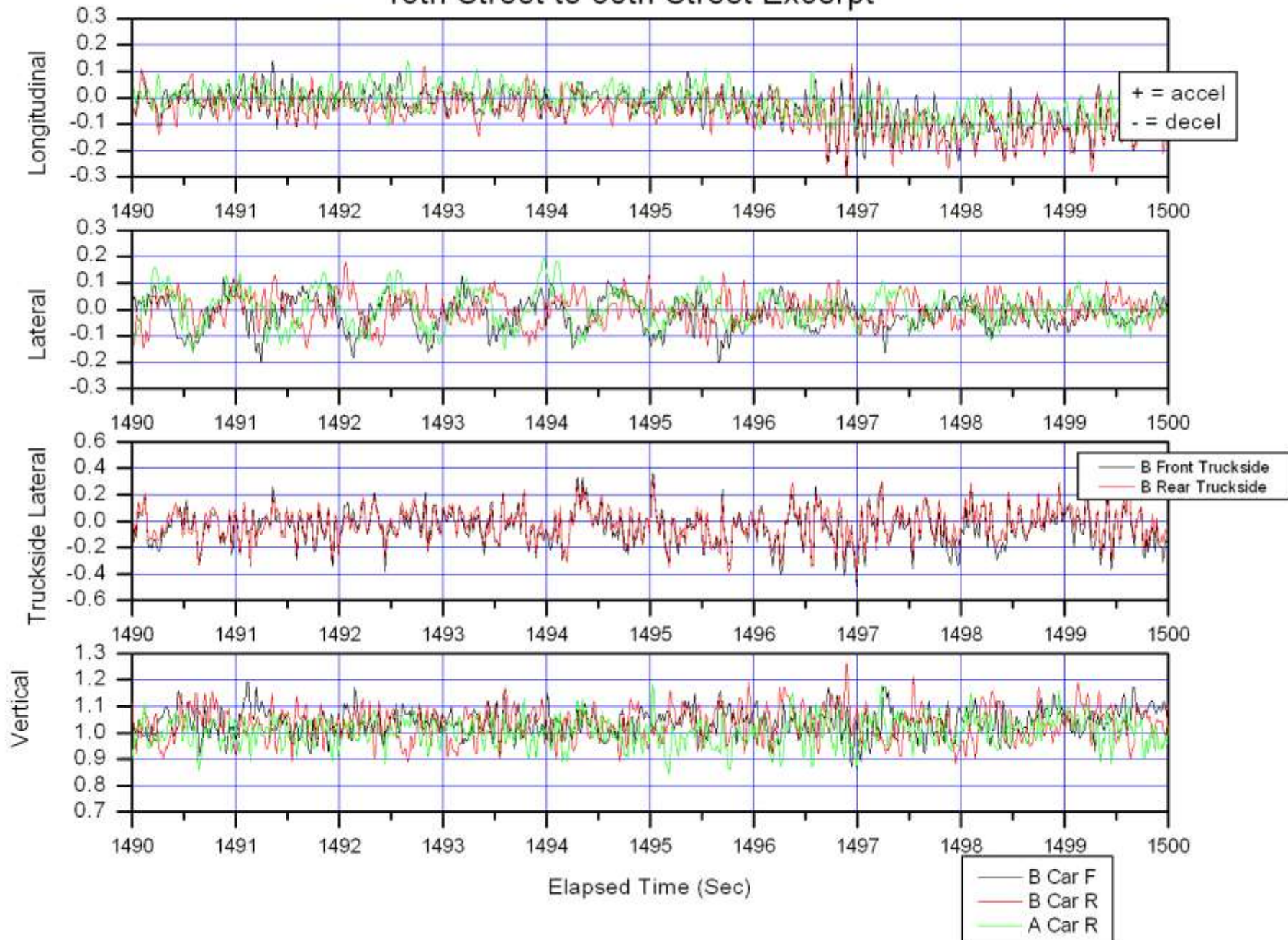


SEPTA 1070 - Westbound FTC to 69th Street 15th Street to 30th Street Stations

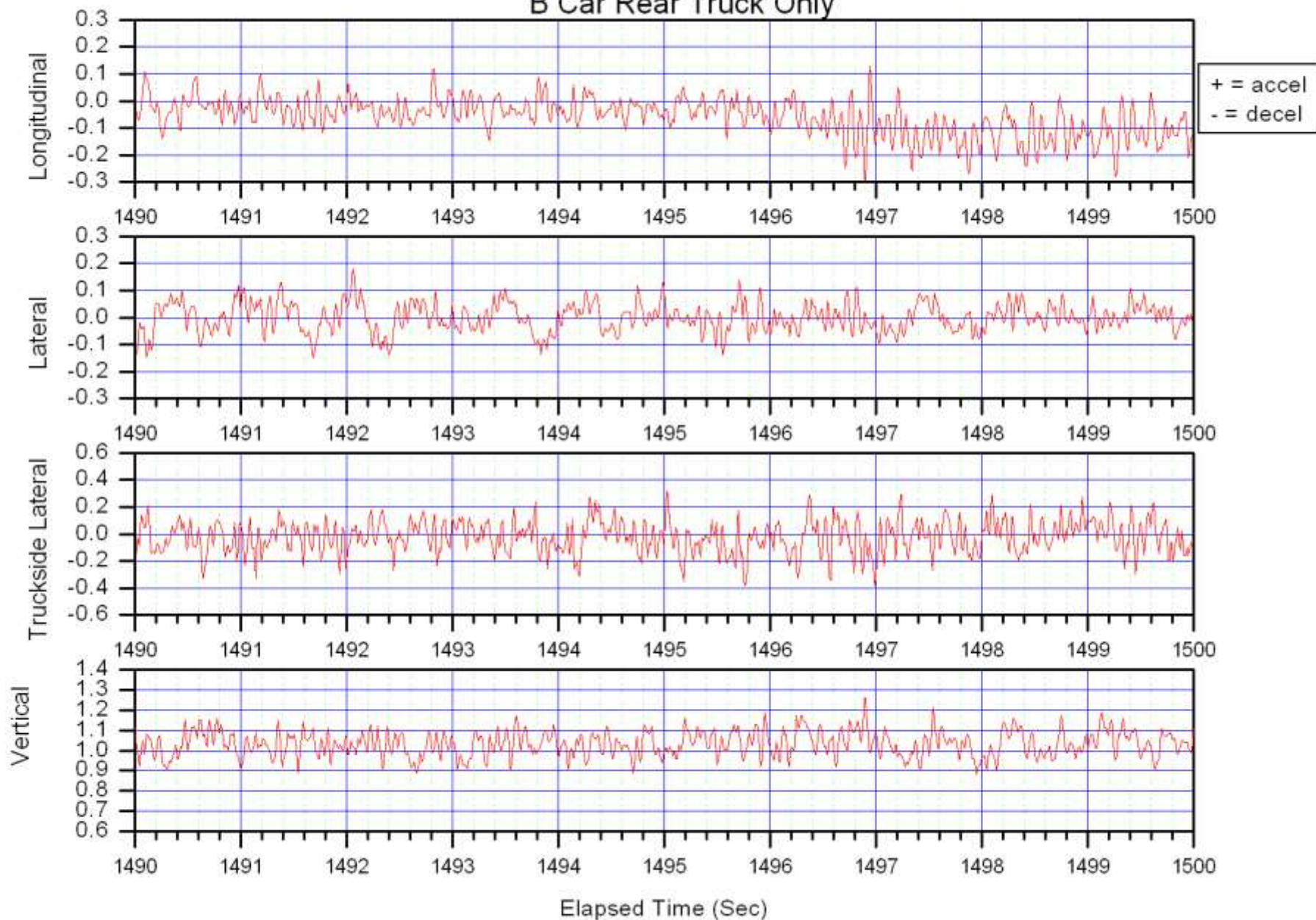


SEPTA 1070 - Westbound FTC to 69th Street

15th Street to 30th Street Excerpt



SEPTA 1070 - Westbound FTC to 69th Street Run
15th Street to 30th Street Stations
B Car Rear Truck Only



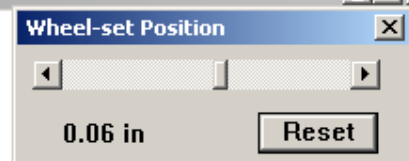
OPTIMIZING WHEEL/RAIL INTERACTION



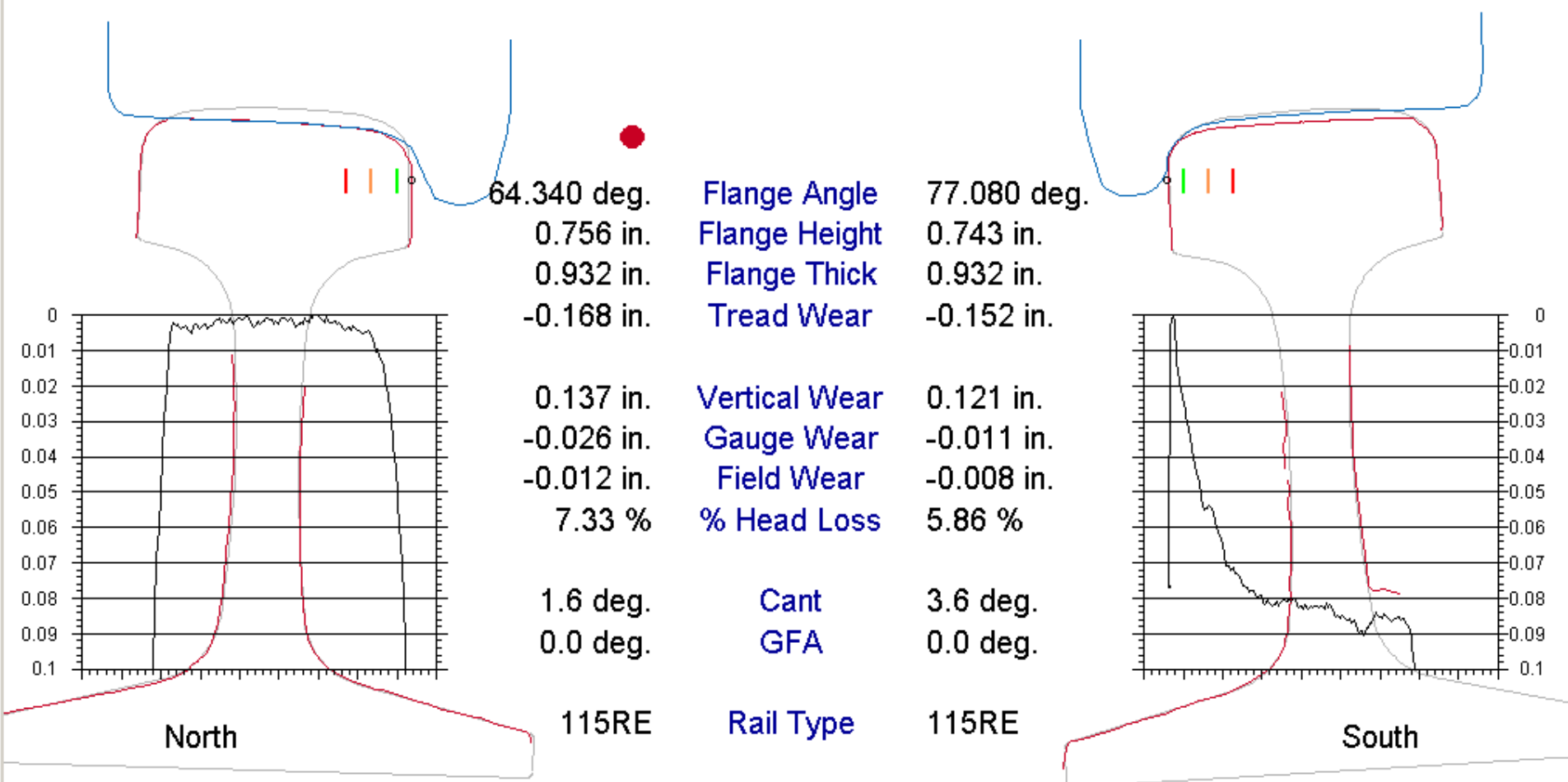
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MBTA - GREEN
LINE_A - Track EB



Wheel/rail data integration



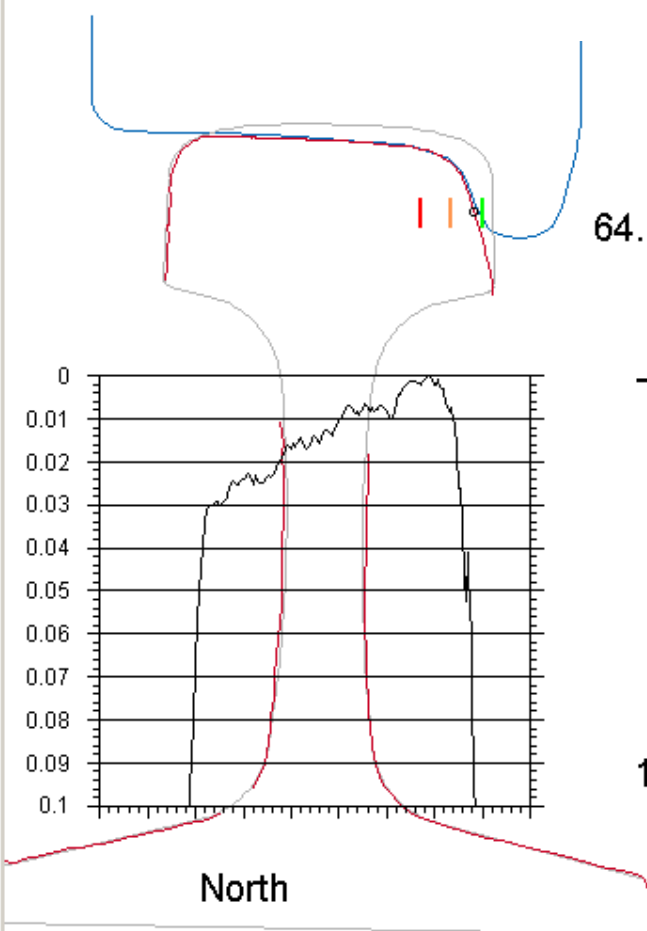
Run 16 - GRAEA0000_031212 [4.45 - 189.89]



MBTA - GREEN
LINE_A - Track EB



Wheel/rail data integration



64.340 deg.
0.756 in.
0.932 in.
-0.168 in.

0.136 in.
0.154 in.
0.015 in.
11.73 %

1.0 deg.
15.8 deg.

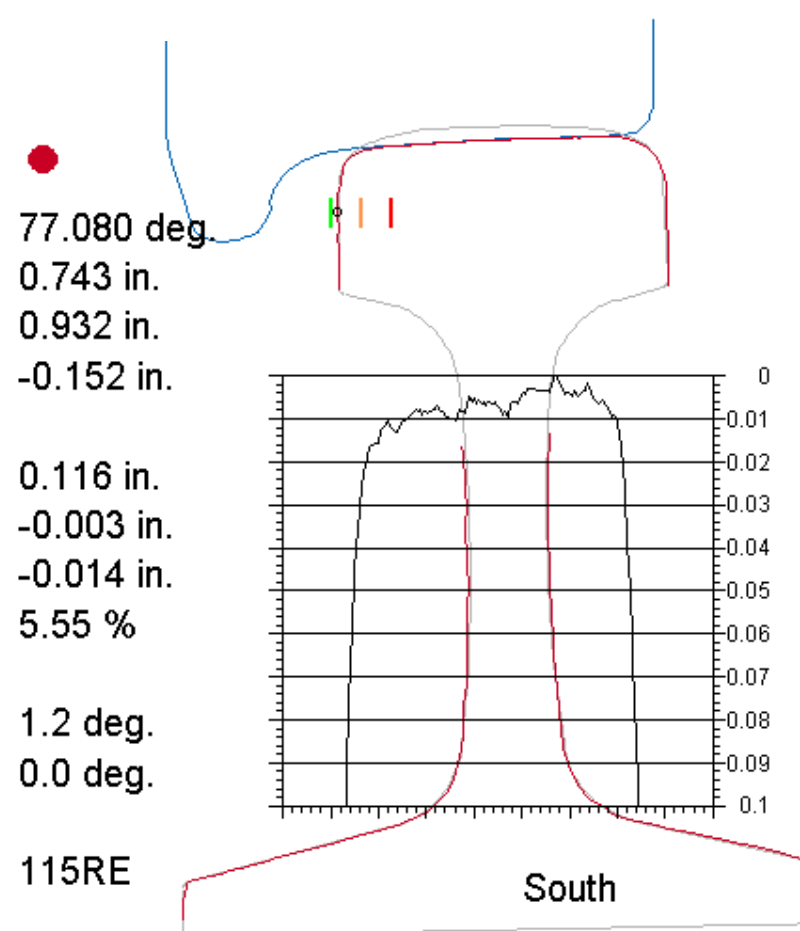
115RE

Flange Angle
Flange Height
Flange Thick
Tread Wear

Vertical Wear
Gauge Wear
Field Wear
% Head Loss

Cant
GFA

Rail Type



77.080 deg.
0.743 in.
0.932 in.
-0.152 in.

0.116 in.
-0.003 in.
-0.014 in.
5.55 %

1.2 deg.
0.0 deg.

115RE

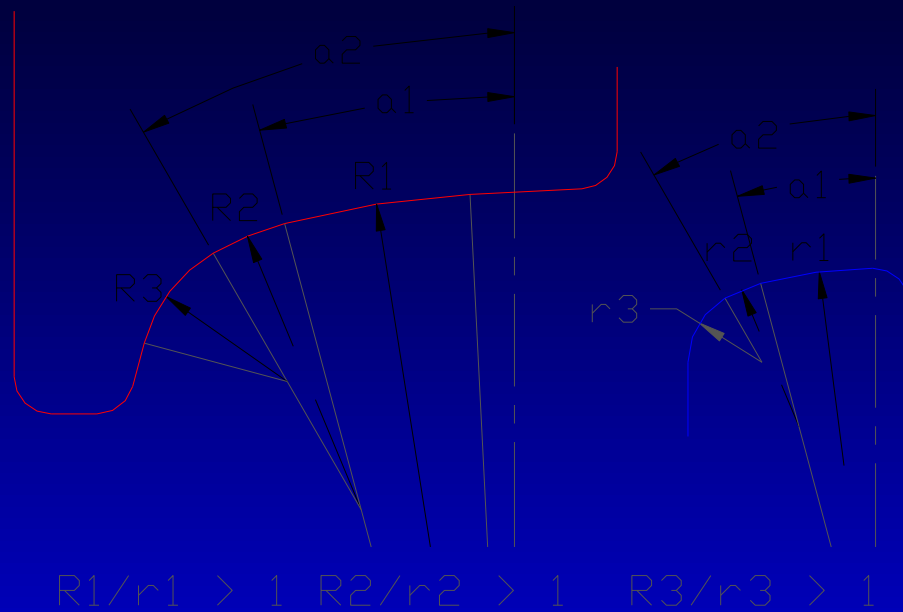
- *Rail Measurement*
- *Wheel Measurement*
- *Wheel & Rail Profile Design*



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Designing the Progressively Curved Wheel/Rail Profile Pair



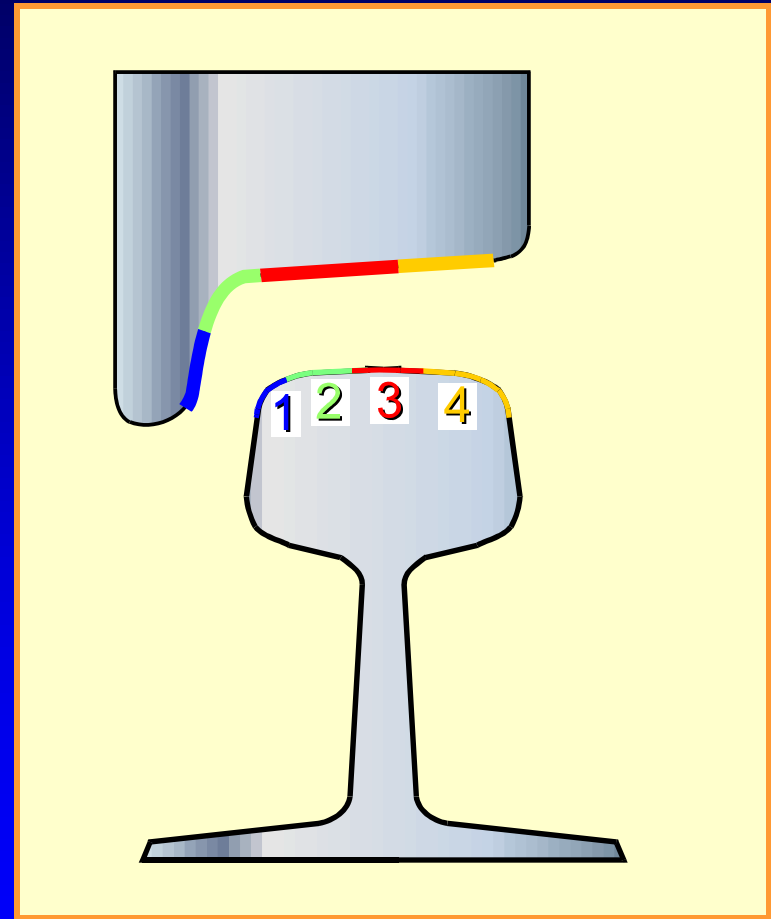
In order to ensure that the contact never ‘jumps’ as the wheel moves laterally across the rail head, the angle at which the transition from one radius to the next occurs must be the same for both the wheel and for the rail. If $r1$ was greater than $R2$ (which is likely) and if it continued too far there would come a point when contact would jump.

As noted above, the ratio of Rr/rw must be greater than 1 but it doesn’t have to be the same for each region of the profile.

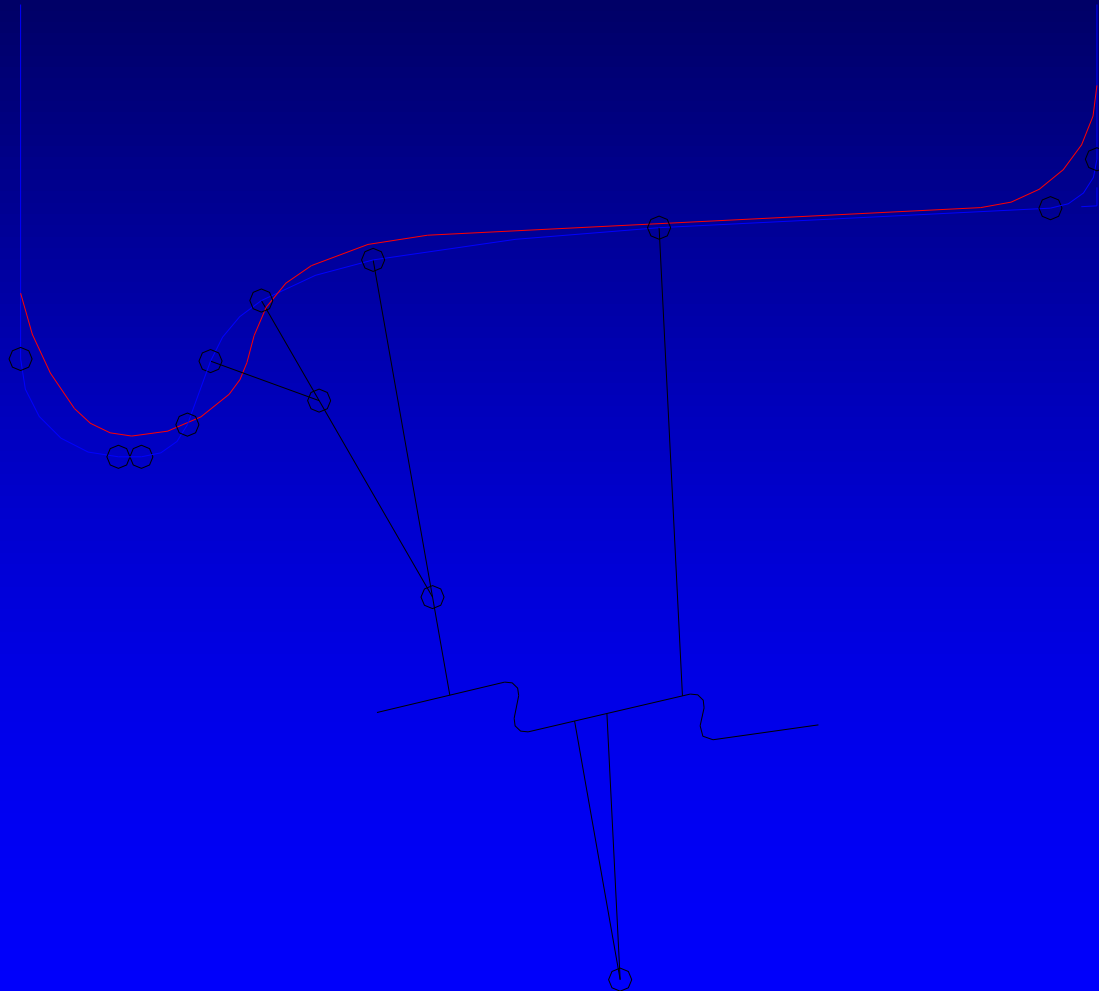


Pummeling Effects

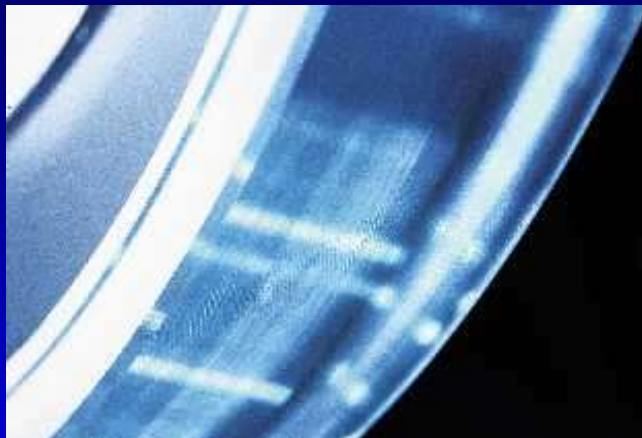
- *Split wheel and rail profiles into contact zones*
- *accept some degree of overlap*
- *Attempt to distribute contact across rail and wheel equally*



Comparison of Wheel Profile for LA Red Line vs AAR1B



Rail / Wheel Optimization



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