

GTR-04-06



Summary of the BioRID-II Test Program

PDB Test Series 2006 – 2010

GTR 7 – BioRID-II TEG

Federal Ministry of Transportation

Berlin, September 21, 2010

Objectives

- Analysis of the repeatability and reproducibility (R&R)
 - Focus on dummy
 - Seat and pulse also analysed
- Investigation of potential causes of the variances
 - Friction based (cables, head contact switch, neck bolts, jacket)
 - Stiffness based (pelvis)

Test Programme

- Dummies
 - 8 BioRID-II
- Crash pulses
 - Low (trapezoid, $dv=16$ km/h)
 - Medium (triangular, $dv=16$ km/h)
 - High (trapezoid, $dv=24$ km/h)
- Seat
 - Standard vehicle seat
 - Hard bucket seat (race car seat)
- Laboratory
 - 2 test institutes
- Certification test

→ **200+ dummy data sets**

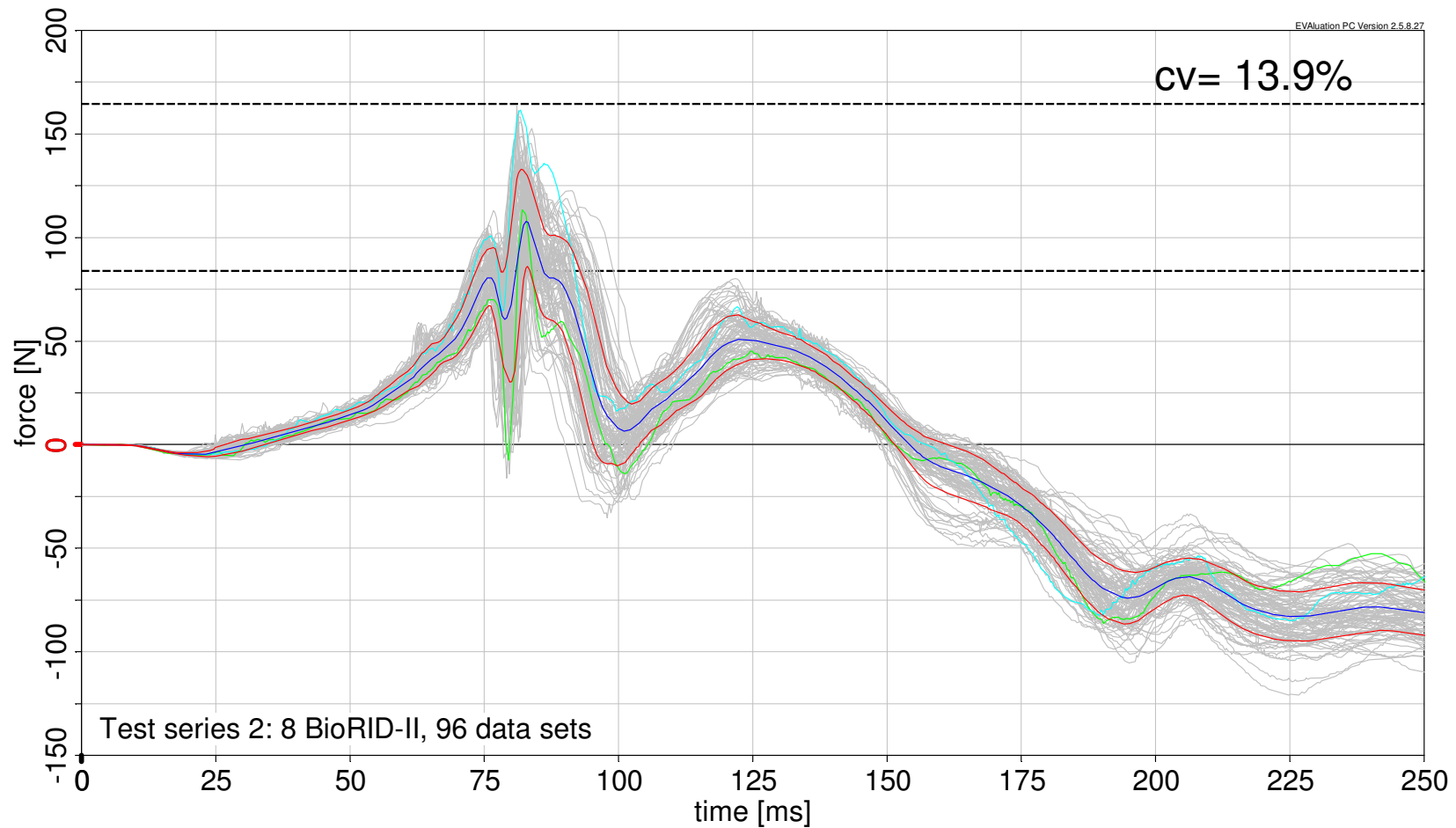
Results – R&R-Study 2009

Hard bucket seat, low severity pulse, 8 dummies



Results – Upper Neck Fx

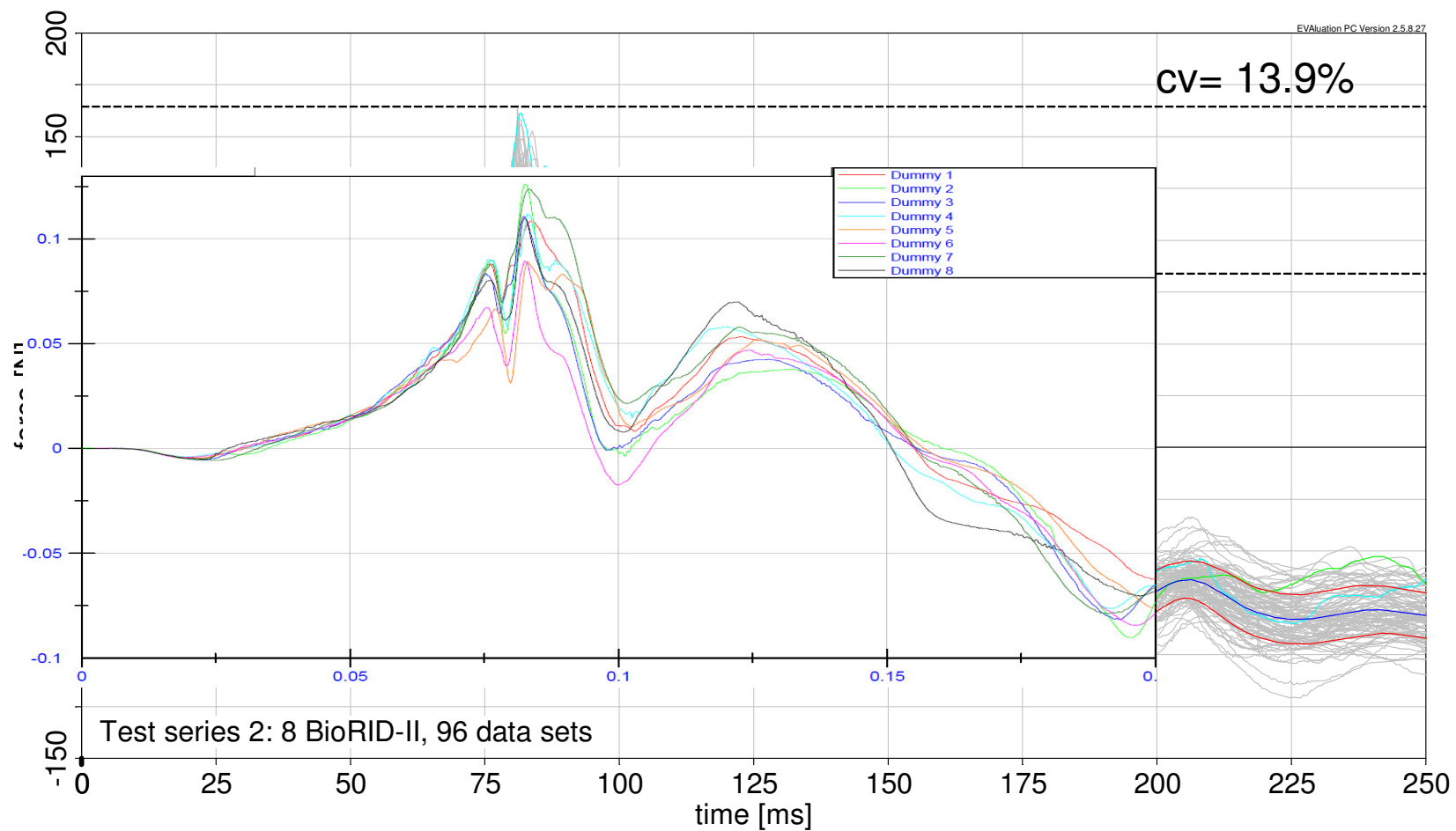
Hard bucket seat, low severity pulse, 8 dummies



Mean Curve, 1-Sigma Corridor,

Results – Upper Neck Fx

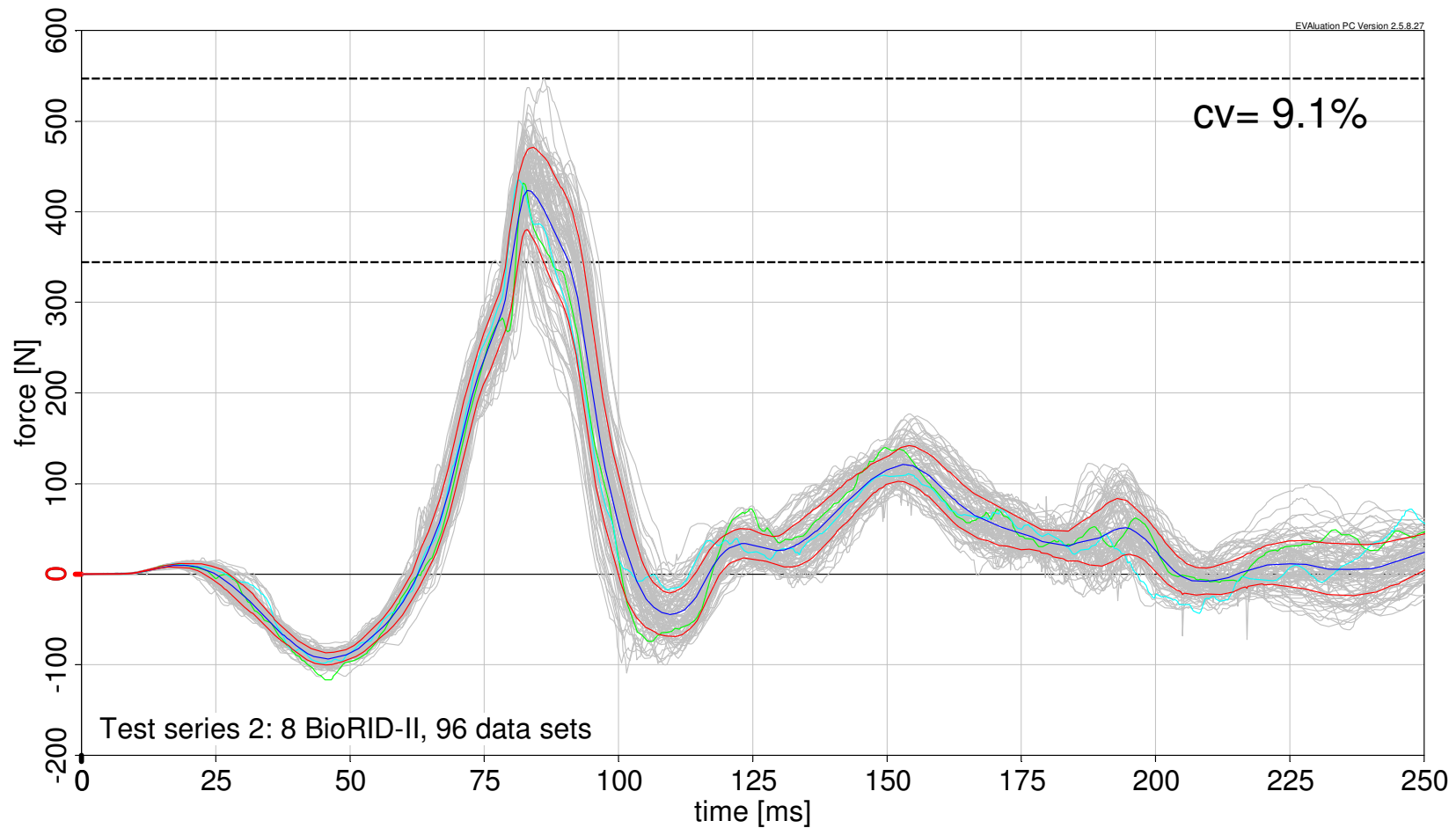
Hard bucket seat, low severity pulse, 8 dummies



Mean Curve, 1-Sigma Corridor,

Results – Upper Neck Fz

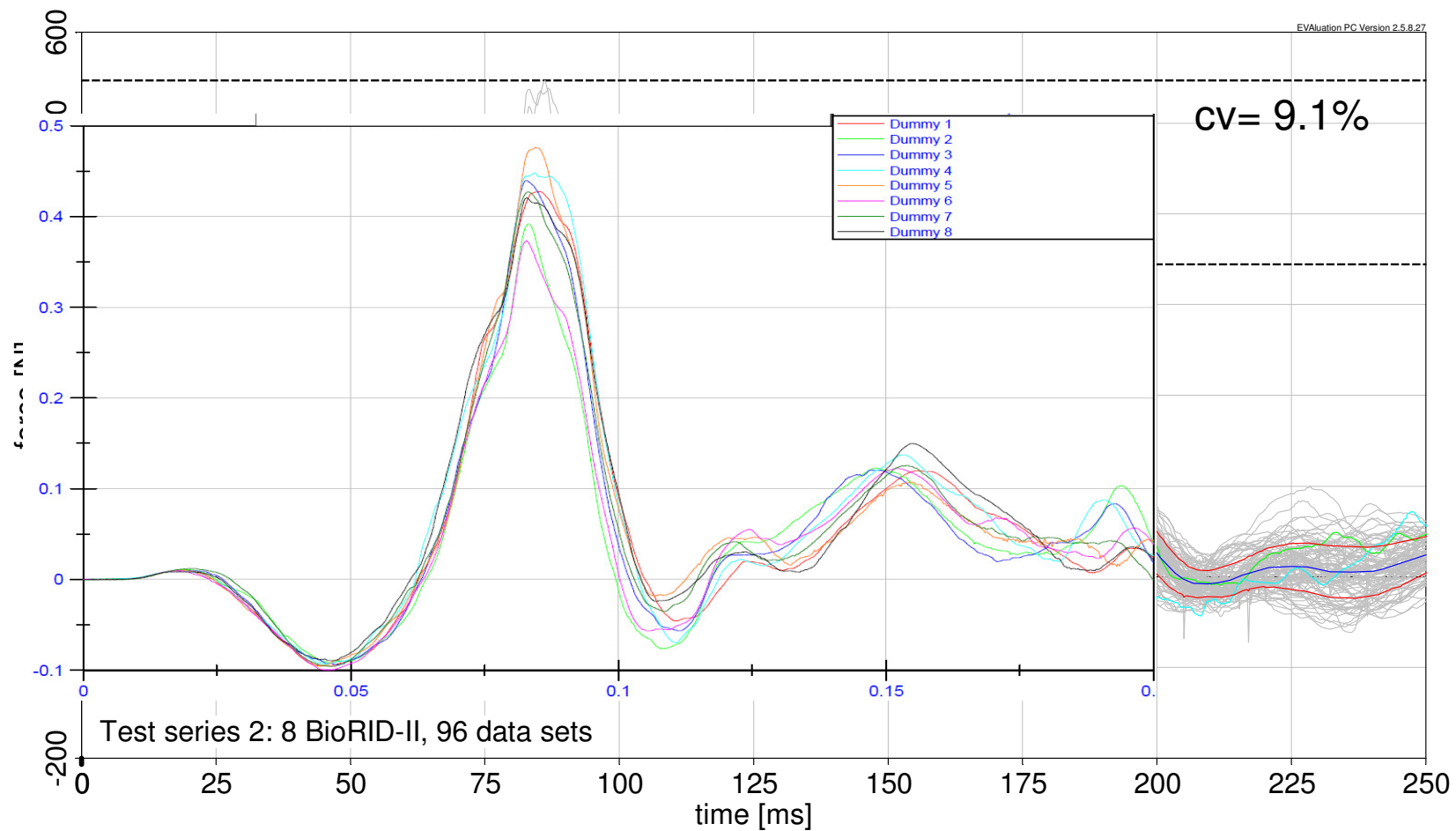
Hard bucket seat, low severity pulse, 8 dummies



Mean Curve, 1-Sigma Corridor,

Results – Upper Neck Fz

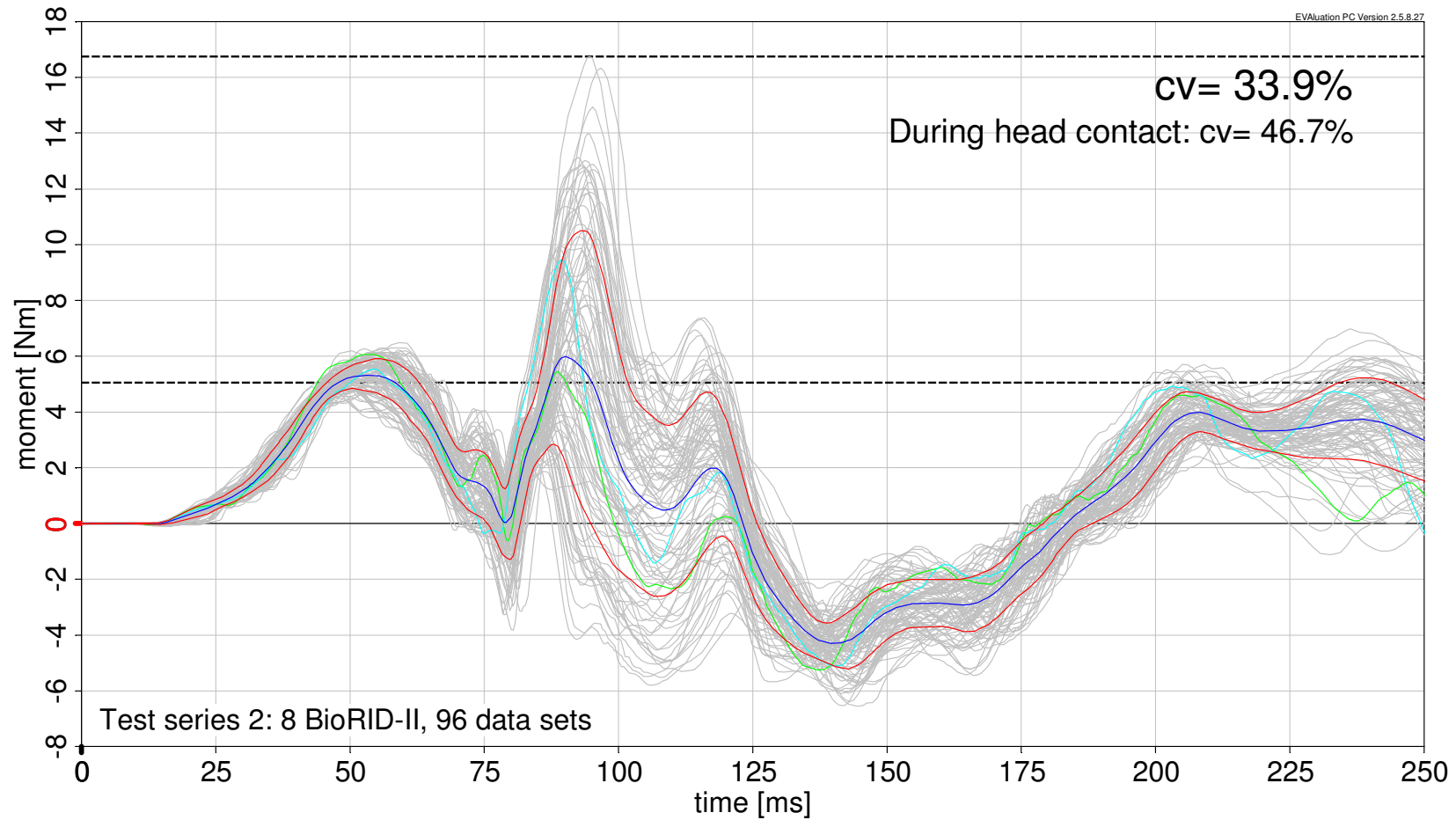
Hard bucket seat, low severity pulse, 8 dummies



Mean Curve, 1-Sigma Corridor,

Results – Upper Neck My

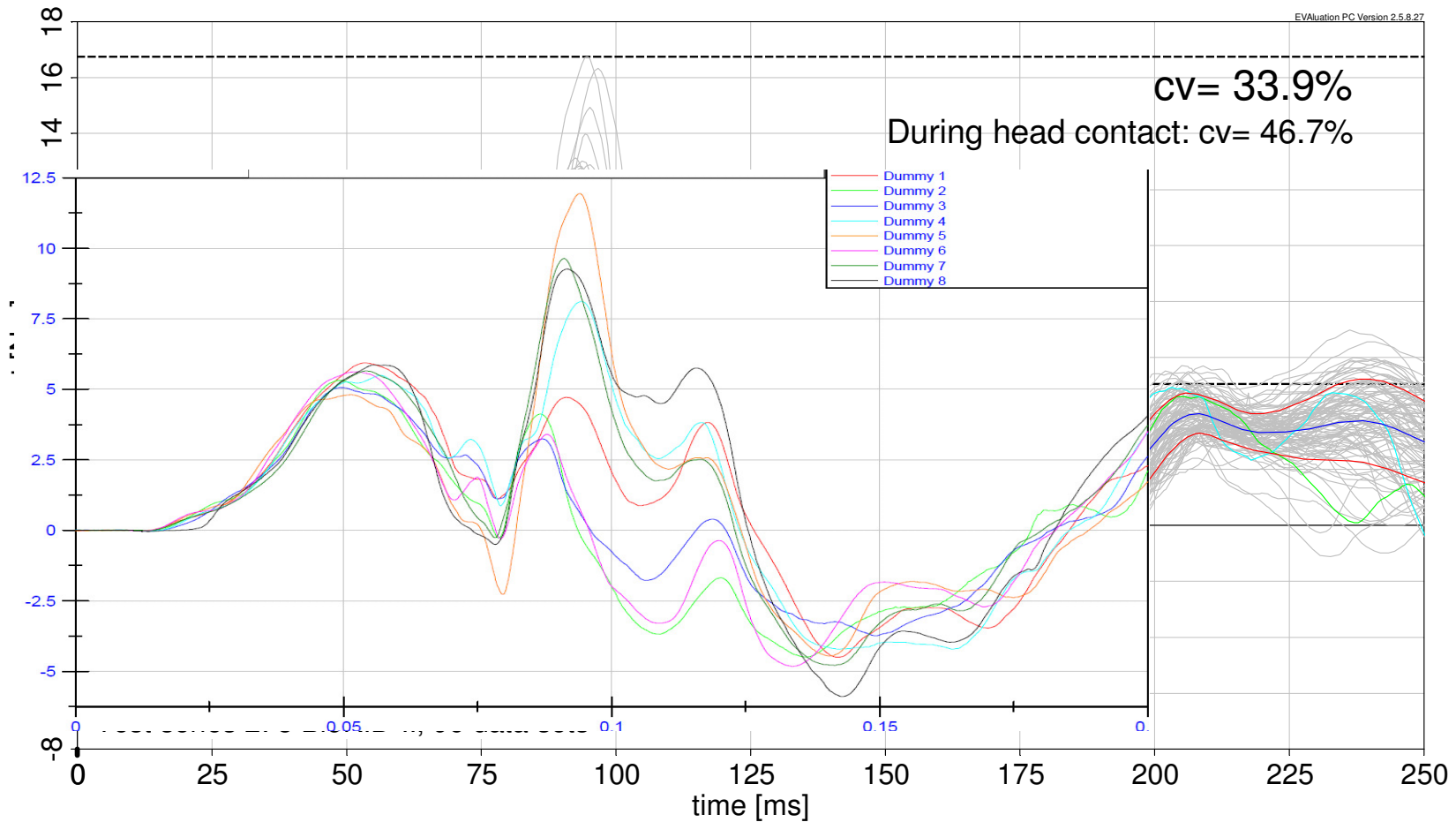
Hard bucket seat, low severity pulse, 8 dummies



Mean Curve, 1-Sigma Corridor,

Results – Upper Neck My

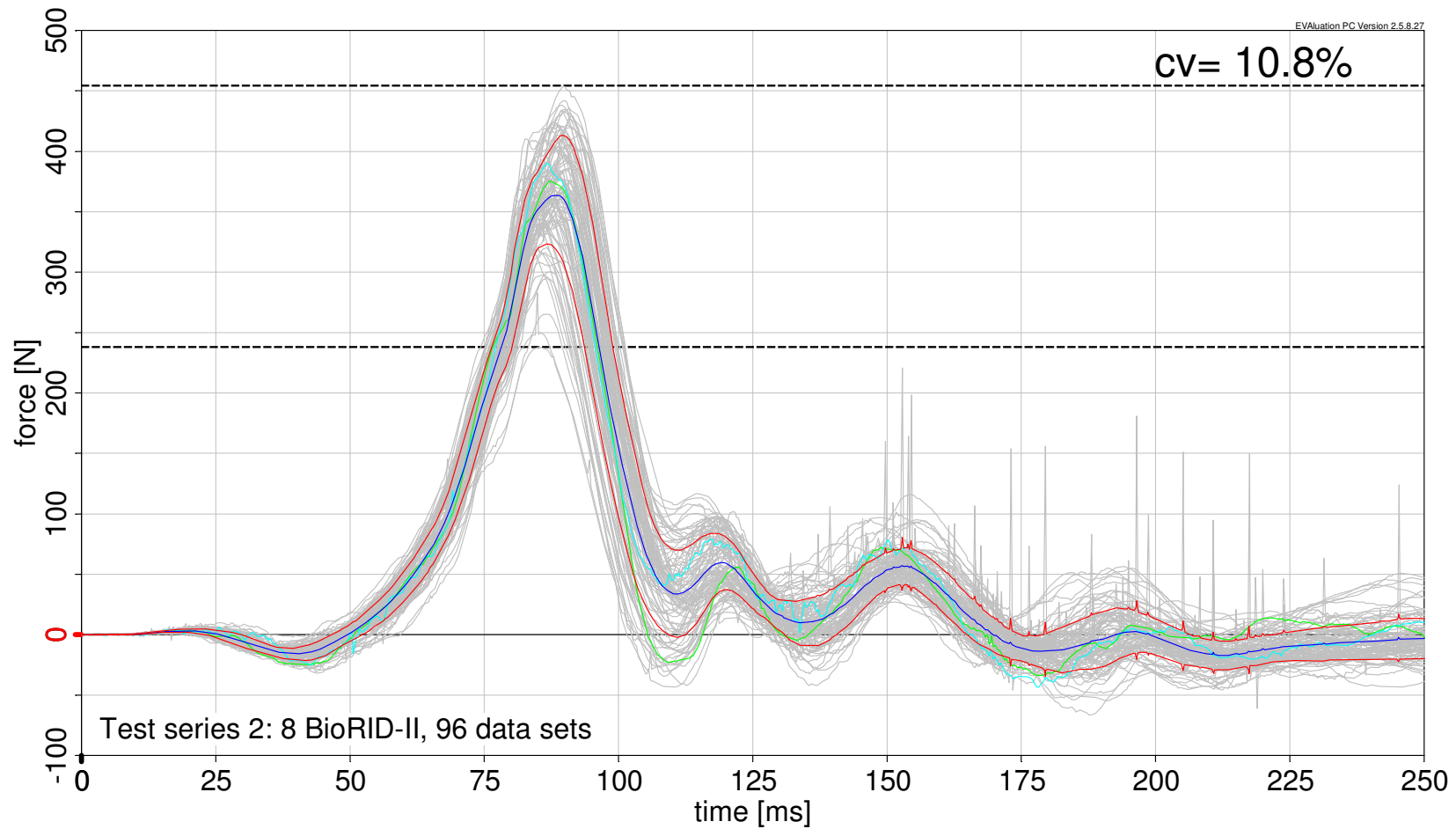
Hard bucket seat, low severity pulse, 8 dummies



Mean Curve, 1-Sigma Corridor,

Results – Lower Neck Fx

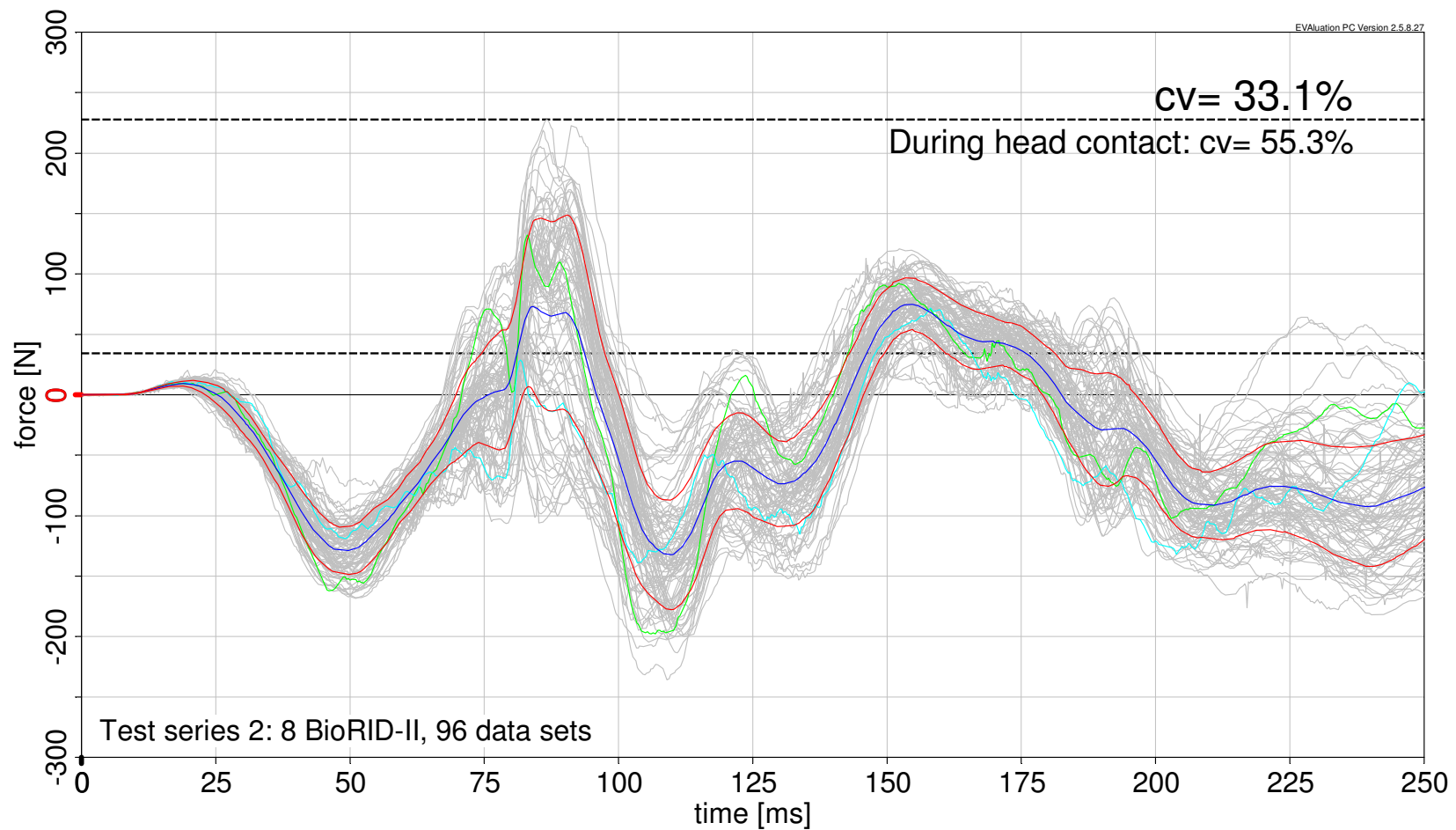
Hard bucket seat, low severity pulse, 8 dummies



Mean Curve, 1-Sigma Corridor,

Results – Lower Neck Fz

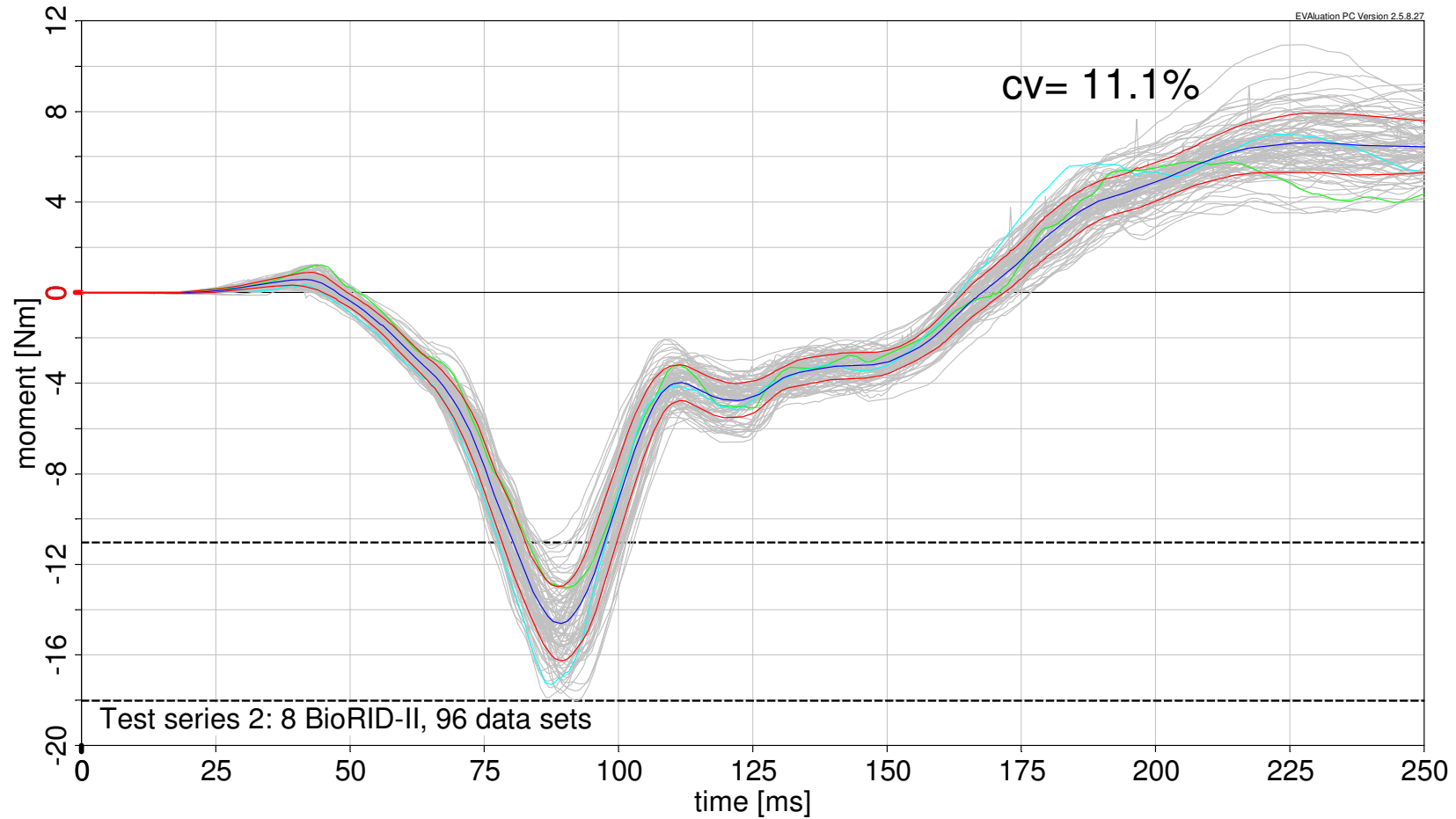
Hard bucket seat, low severity pulse, 8 dummies



Mean Curve, 1-Sigma Corridor,

Results – Lower Neck My

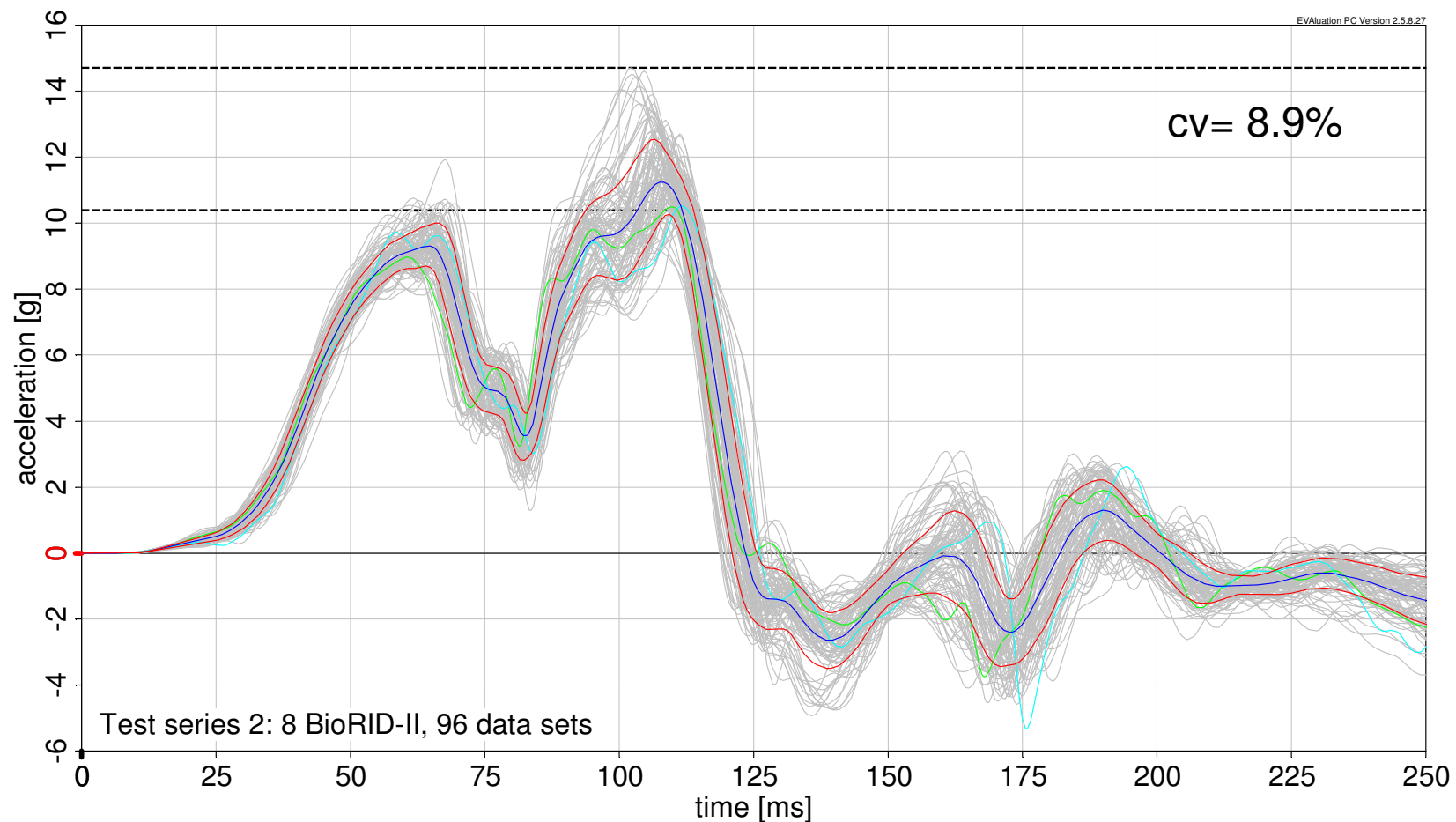
Hard bucket seat, low severity pulse, 8 dummies



Mean Curve, 1-Sigma Corridor,

Results – T1 ax

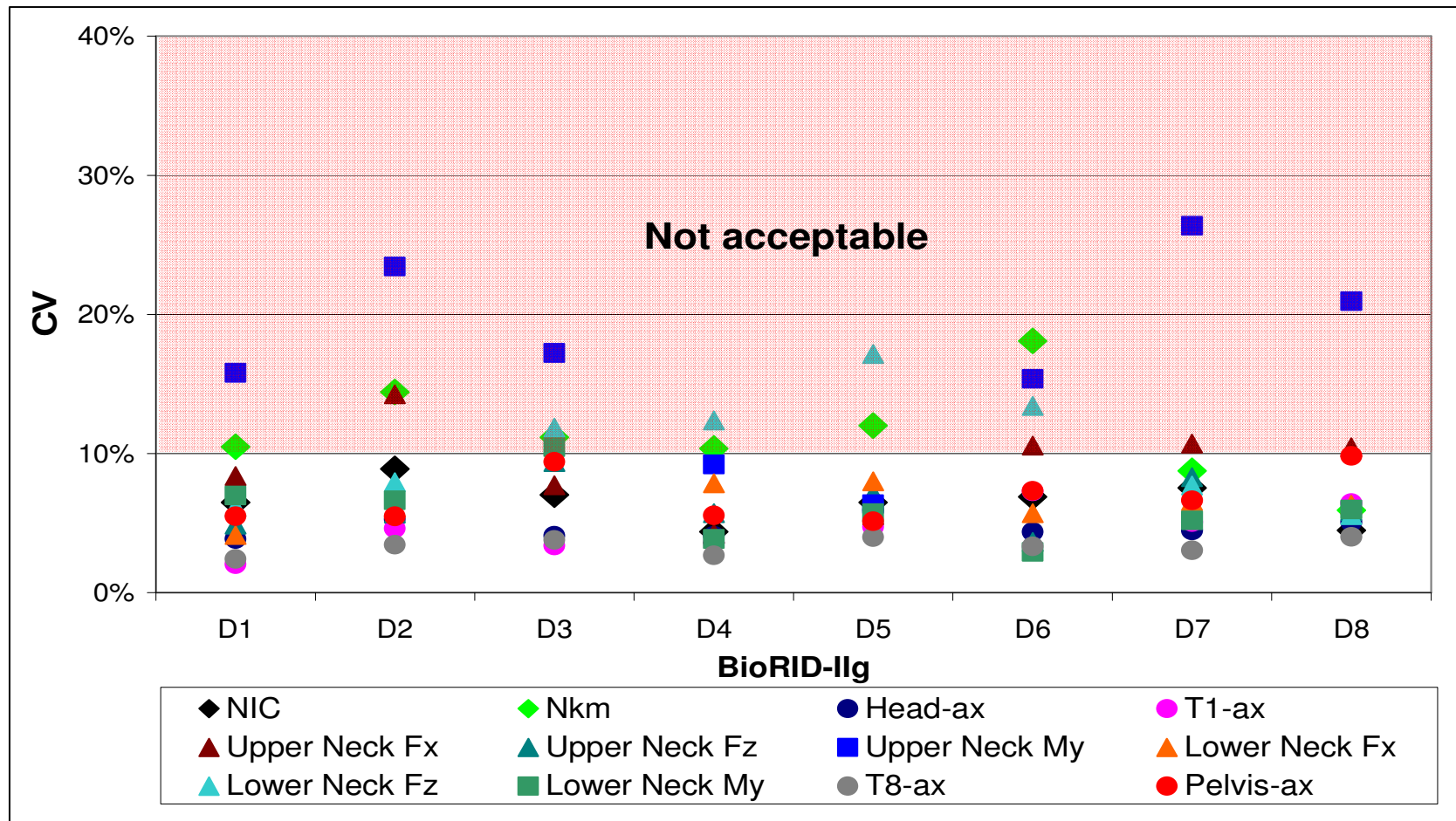
Hard bucket seat, low severity pulse, 8 dummies



Mean Curve, 1-Sigma Corridor,

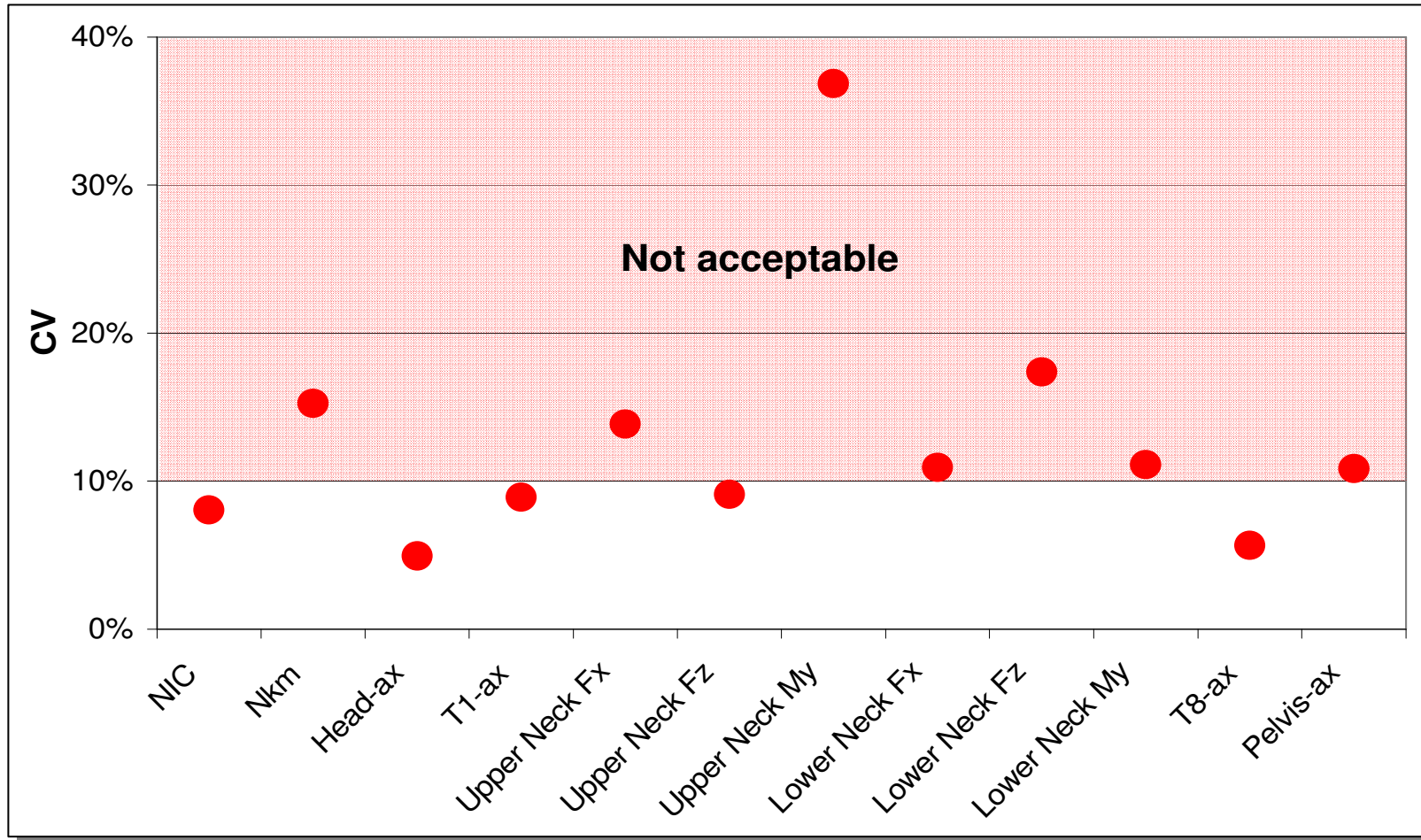
Repeatability

Hard bucket seat, low severity pulse, 8 dummies



Reproducibility

Hard bucket seat, low severity pulse, 8 dummies



Results & Conclusion

- Overall Test Accuracy
 - Accelerations
 - single measurements: **cv = 5 ... 10 %**
 - NIC: **cv > 10 %**
 - Forces & Moments
 - cv = 10 ... 35 %**
 - Kinematics
 - dynamic backset: **cv < 10 %**

Results & Conclusion

- Investigation of potential causes of the variances
 - Friction based (cables, head contact switch, neck bolts)
 - **Minor influence on R&R**
 - Stiffness based (pelvis)
 - **No influence on R&R**