



United States Steel Automotive Solutions to Light Weighting

August 18, 2015



- ***Founded in 1901***
- ***Largest integrated steel producer headquartered in the United States, with additional operations in Central Europe***
 - ***24.4 million net tons annually***
 - ***Employ more than 35,000 globally***
- ***Operate coke making, steelmaking and flat-rolled and tubular finishing facilities throughout the eastern half of the United States.***
- ***North America's largest flat roll producer for sheet and tin***
- ***Offer customers a significant commitment to Research & Development with four major research facilities***



U. S. Steel...

making the steels that make
the Vehicles
we drive safer

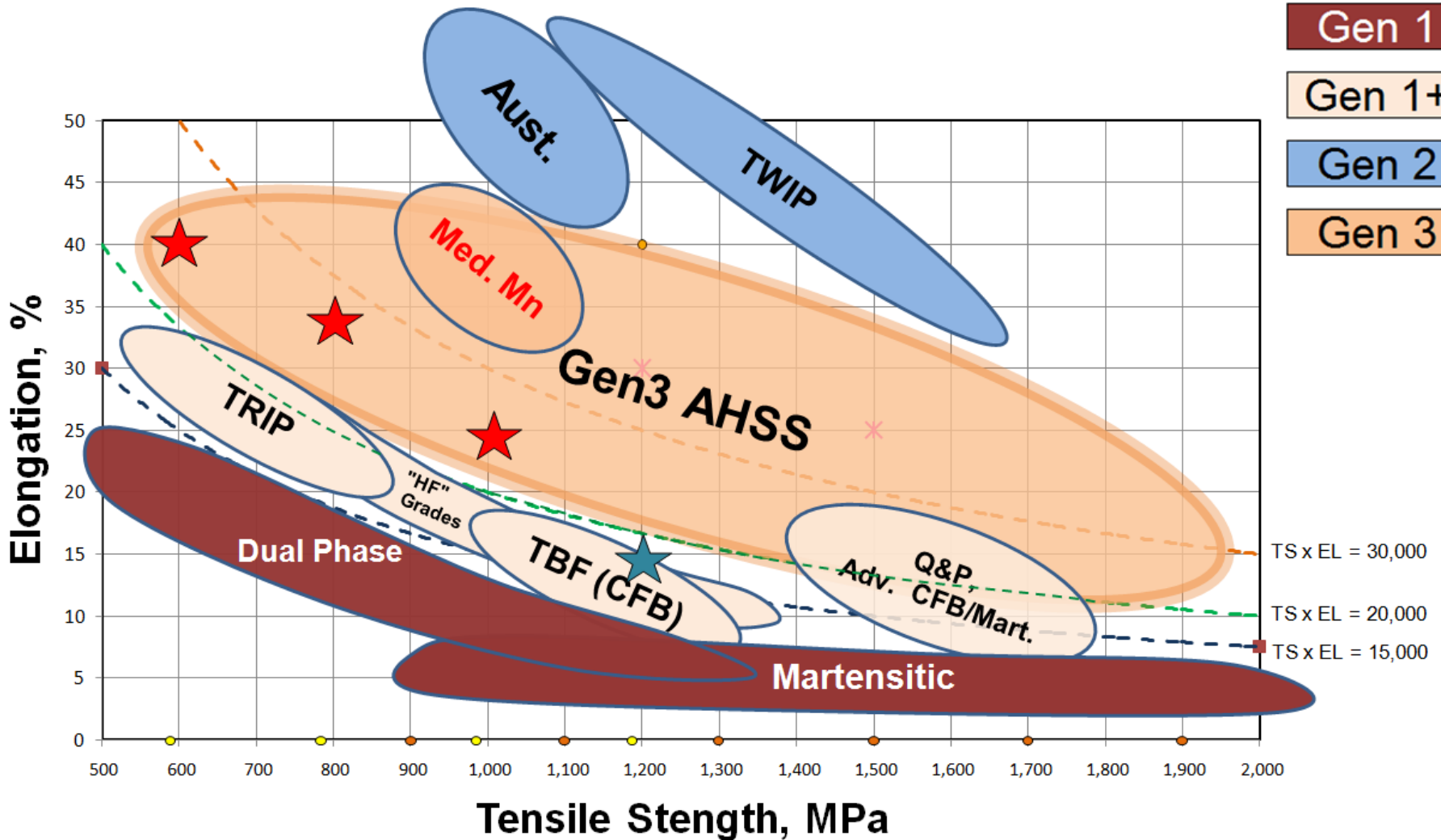


U. S. Steel Automotive Strategies

- ***Create long term strategic relationships with our customers***
- ***Co-develop engineered solutions with our customers using cutting edge steels for optimized performance***
- ***Continue to push the boundaries of grade development at R&D and shorten time to market***
- ***Develop products to help our customers meet increasingly stringent safety and fuel efficiency requirements***



Current & Future State of AHSS Grades



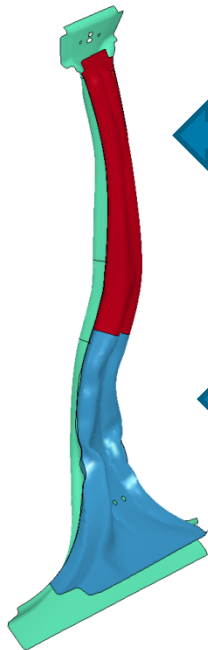
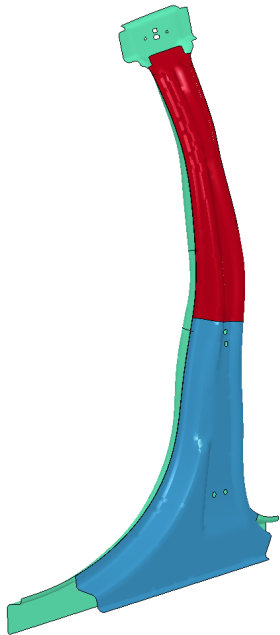
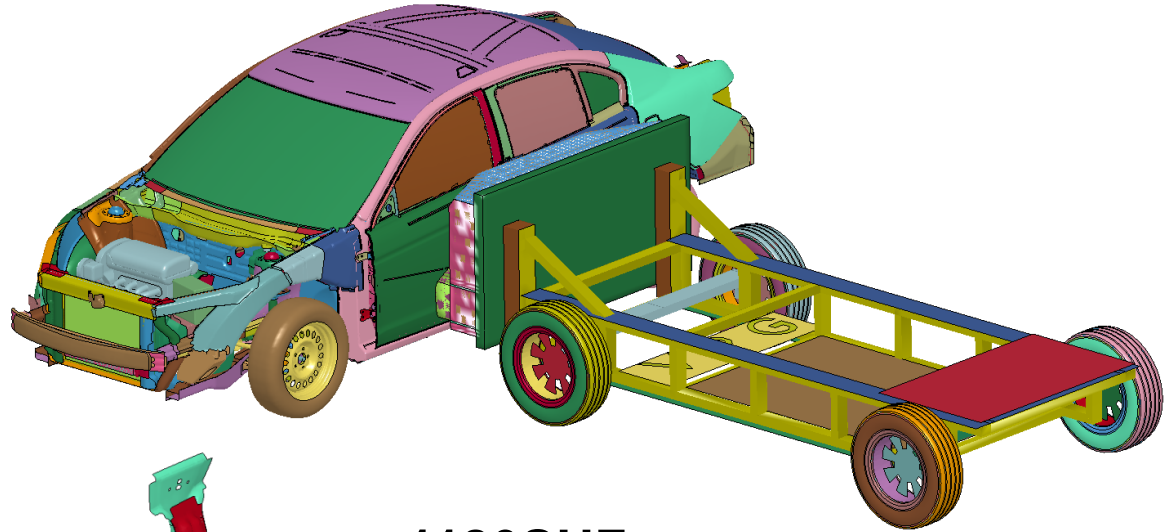


Gen 1+ Products provide solutions

- *1180 SHF is a TRIP Assisted Bainite Ferrite grade with the approximate properties:*
 - *YS \approx 900 MPa*
 - *UTS \approx 1,230 MPa*
 - *Total Elongation = 14% min.*
 - *UTS x TE \approx 17,200 MPa-%*
- *1180 SHF may not be a true Gen 3 material but it can replace PHS 1500 at a lower cost*



IIHS Side Impact Model – U. S. Steel BIW



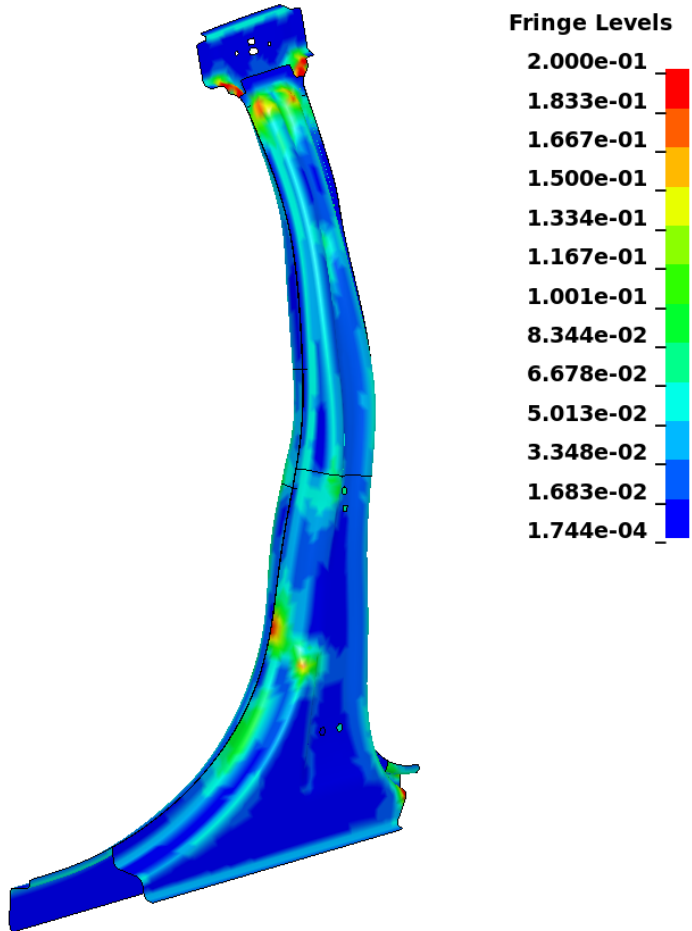
**1180SHF
(1.6mm)**

**1180SHF
(1.2mm)**

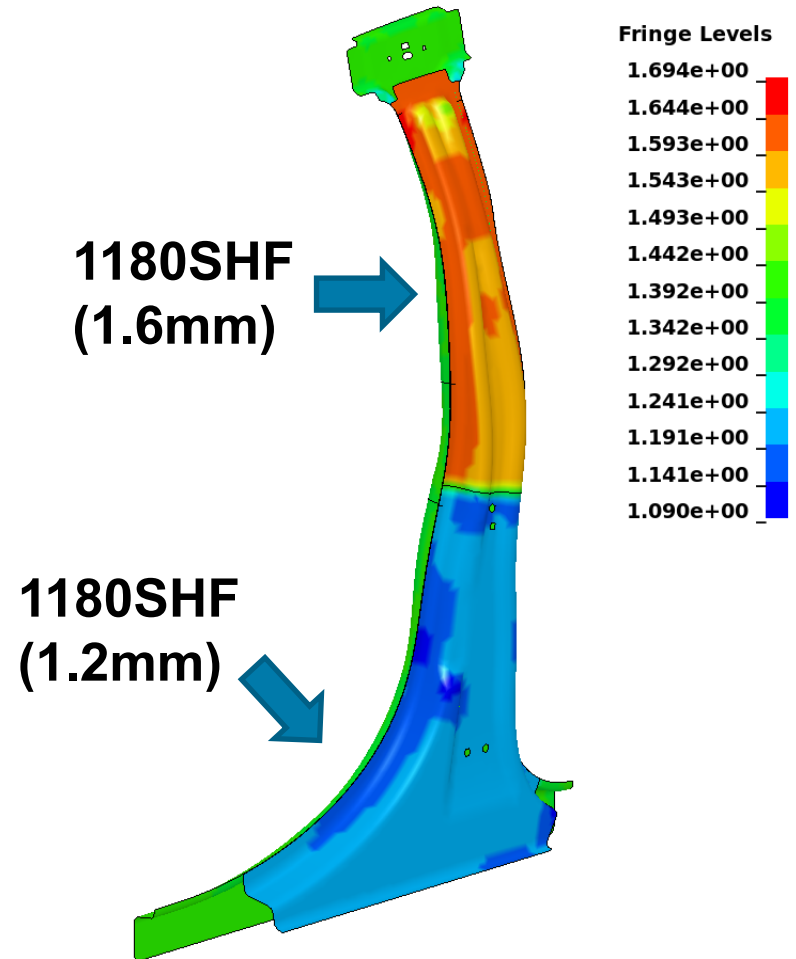


Forming Effect

Plastic strain

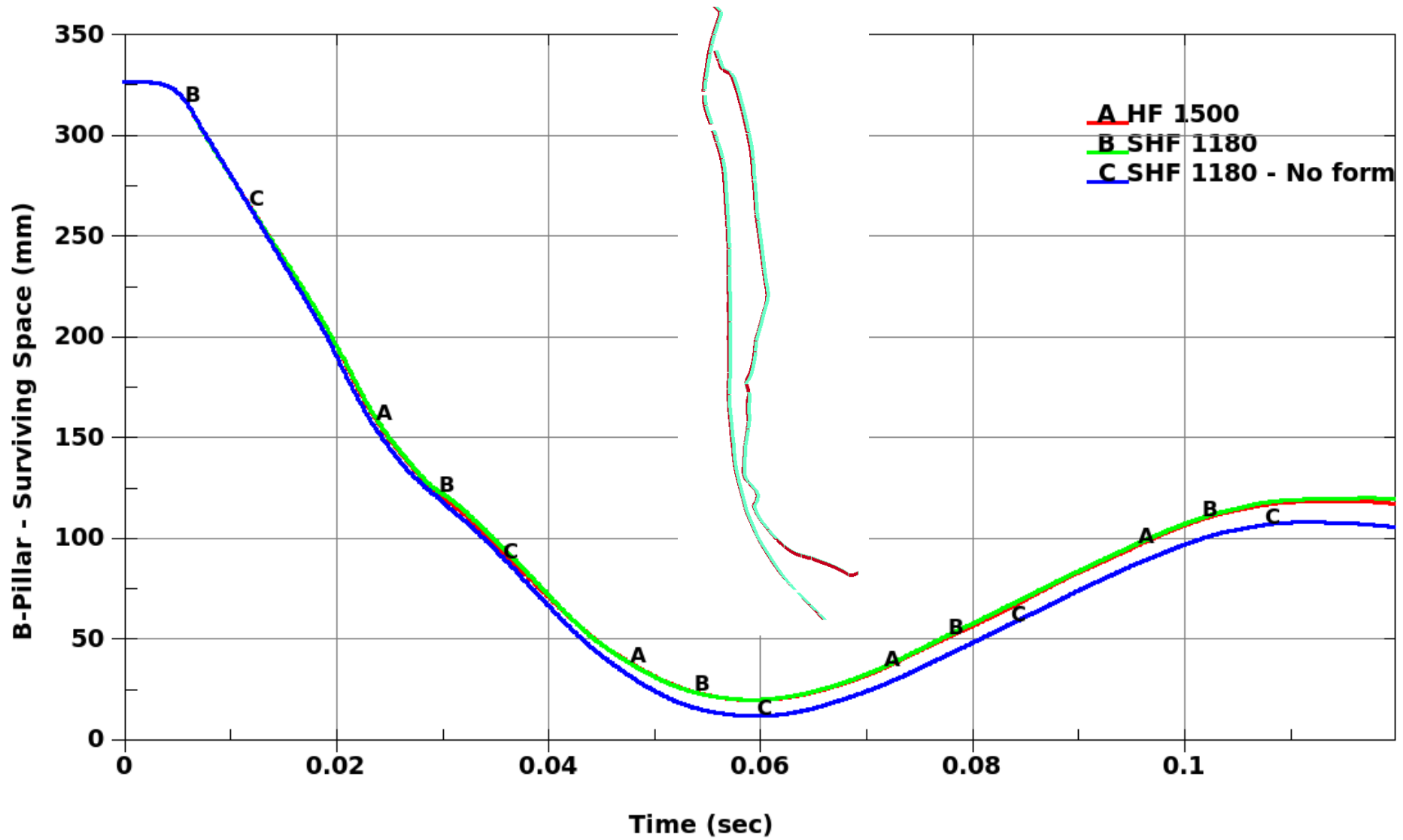


Thickness





IIHS Side Impact – SHF 1180



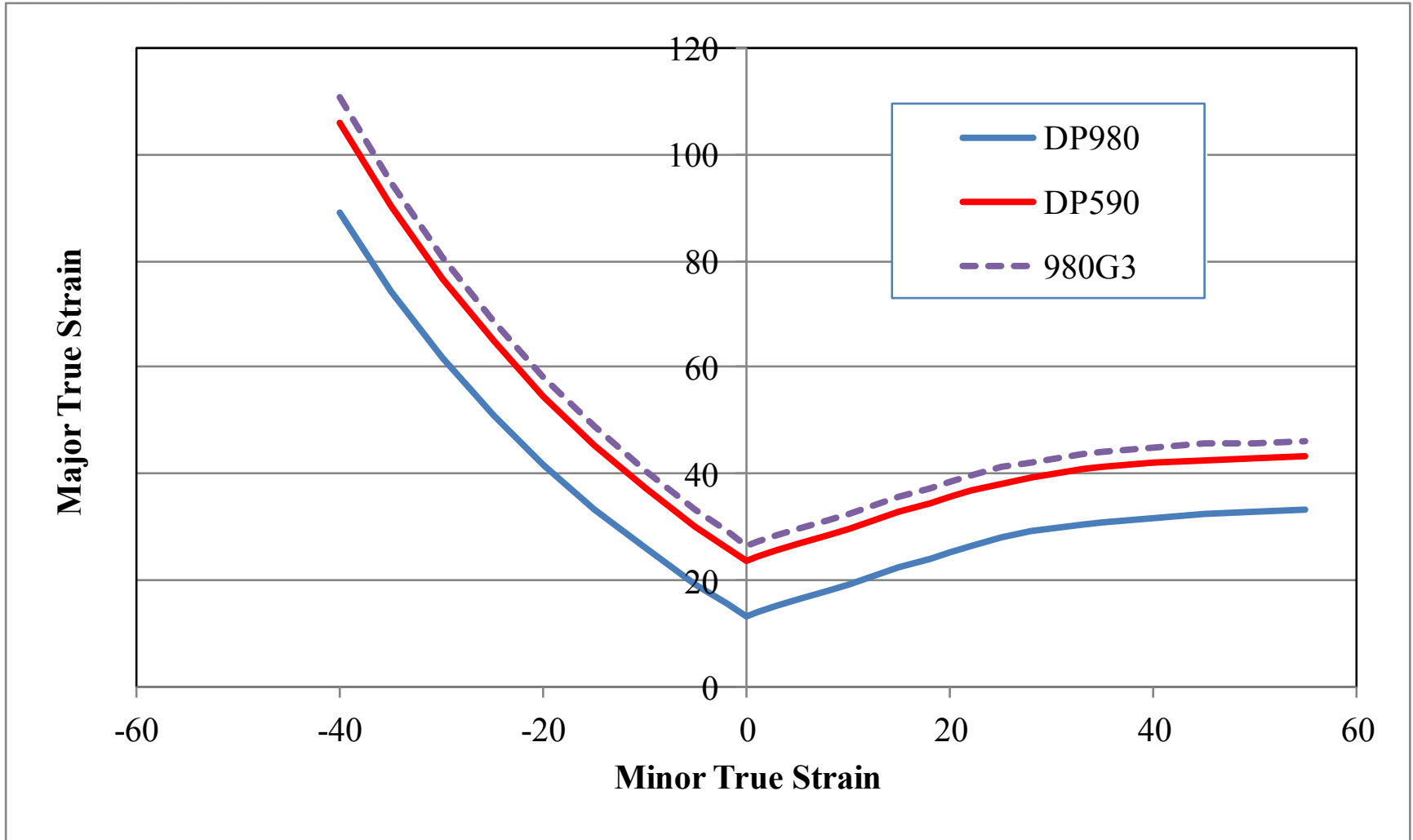


U. S. Steel CR Gen 3 980 Characterization

- **Extensive characterization has been completed**
 - **Bendability is exceptional (less than 1.0 rating for V-bend test), with hole expansion values in the 30 – 35 % range**
 - **Weld evaluations completed with good results**
 - **Phosphating treatments completed with good results**
 - **LDH (limiting dome height) testing completed with the 980G3 material performing better than 590DP, 780T, and 980DP**
 - **Successful stamping trials performed**
- **Commercially available 0.9mm – 2.2mm cold rolled and EG**
 - **ASTM-L properties:**
 - **YS \approx 620 MPa**
 - **UTS \approx 1,000 MPa**
 - **TE \approx 24 %**
 - **UTS * TE \approx 24,000**



U. S. Steel CR Gen 3 980 Forming Limit Diagram





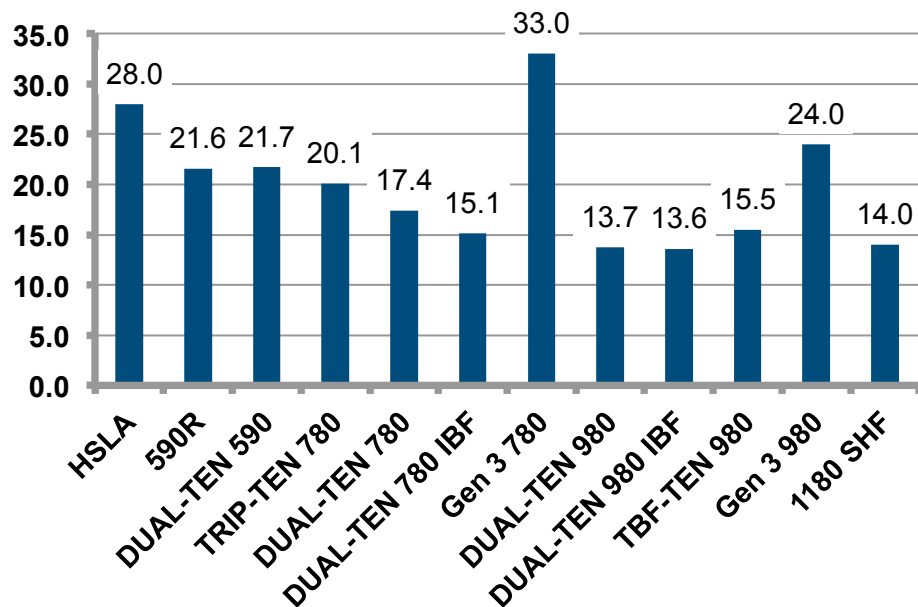
CR 780 Gen 3 product in mill for qualification and commercial validation

- *YS \approx 600 MPa*
- *UTS \approx 850 MPa*
- *Uniform Elongation \approx 28%*
- *Total Elongation \approx 36%*
- *UTS x TE \approx 31,700 MPa-%*
- *Hole Expansion Ratio \approx 55%*

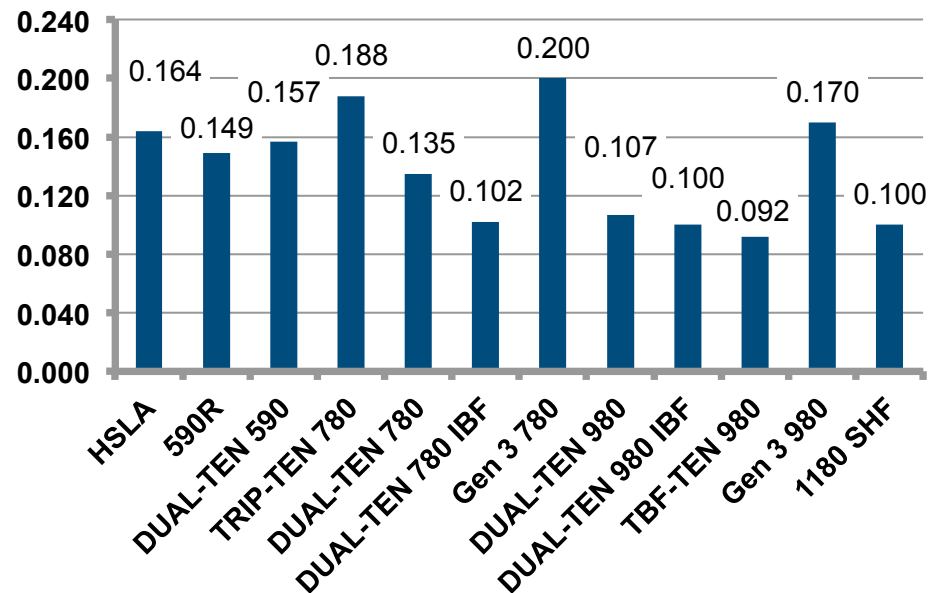


Global Formability Measures

Total Elongation

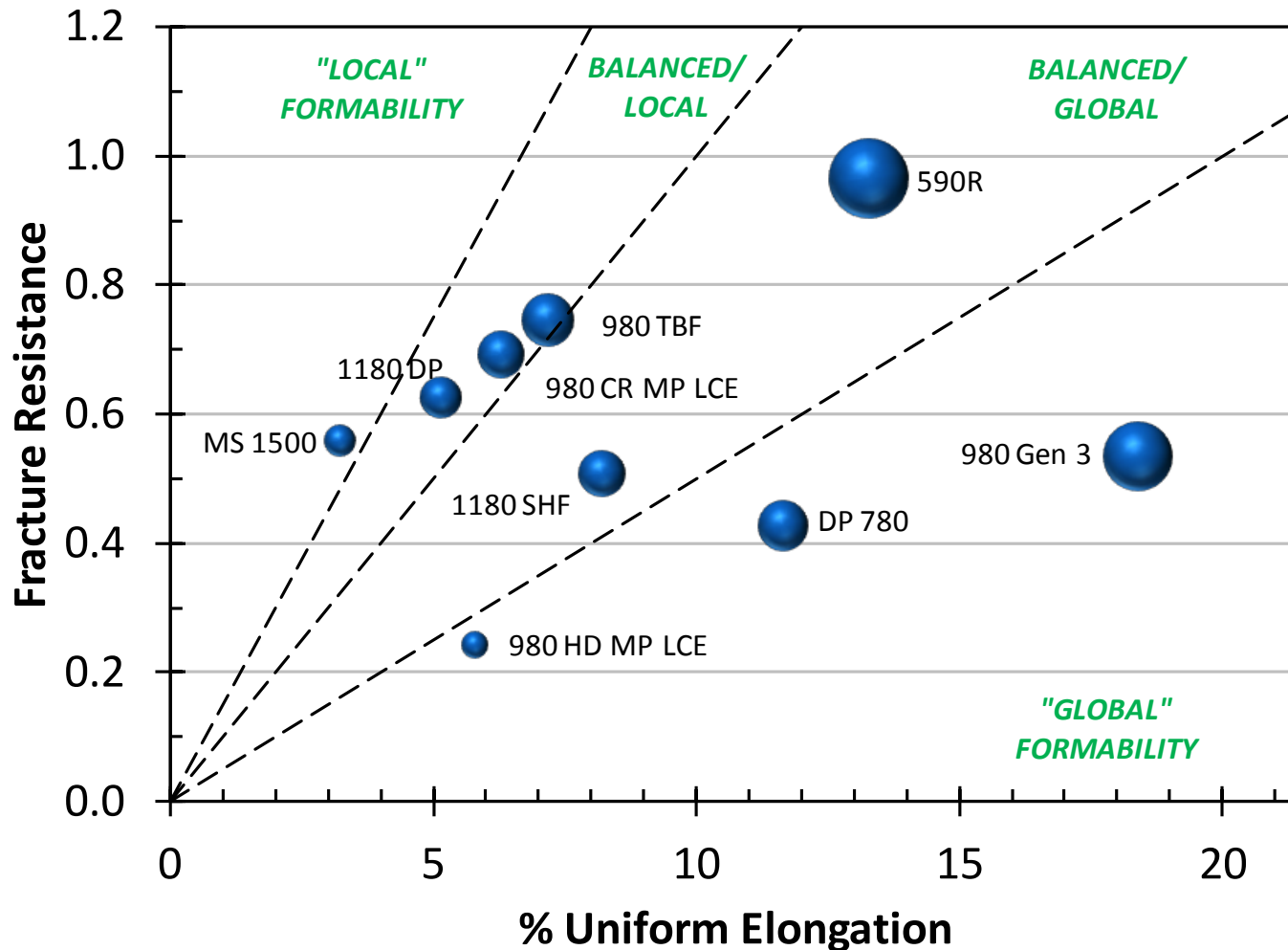


n-Value





More Comprehensive View of AHSS Formability Using both Global and Local Formability Measures





Generation 3 Steels - Purchasing Strategy Impact

A “one size fits all” approach will not work for purchasing Generation 3 steels

- *Specifying mechanical properties and chemistry alone is insufficient*
- *Up front interaction to understand application-specific needs is critical*
- *U. S. Steel has the ability to customize grades for individual customer applications forming requirements*



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