

FOR SAFER CARS

EURO NCAP

www.euroncap.com



Department for
Transport

sécurité
routière



Thatcham
Representing British Motor Insurers

ICRT
INTERNATIONAL CONSUMER RESEARCH & TESTING

ADAC



FIA FIA Foundation
for the Automobile and Society

Euro NCAP Medium Severity Whiplash Pulse

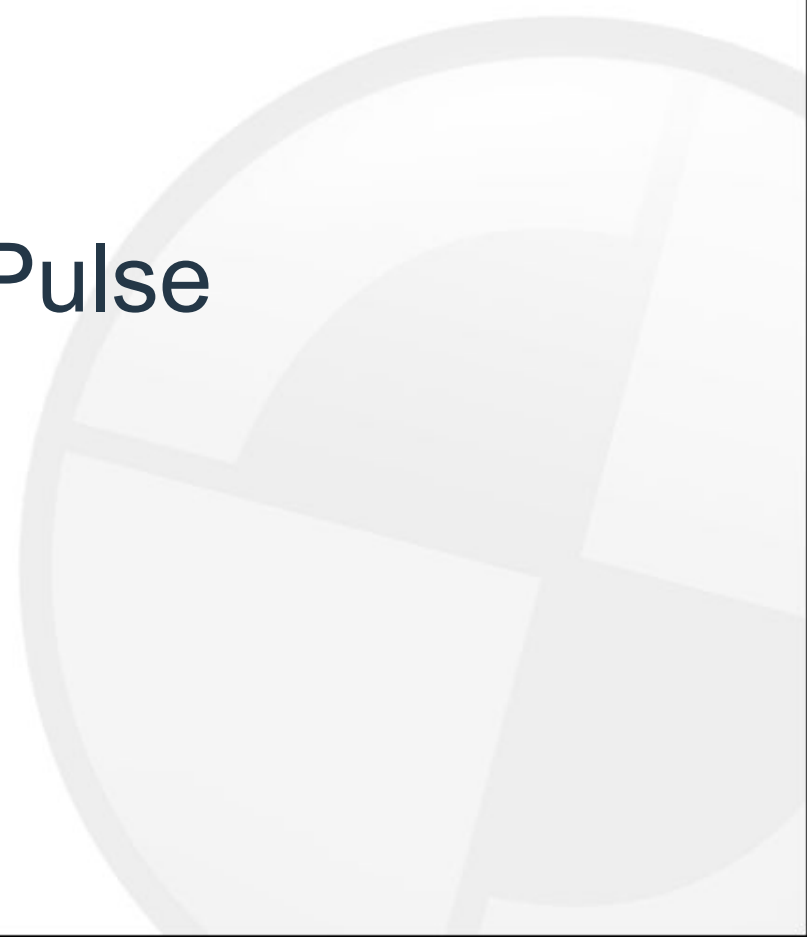
GTR7 – Informal Working Group

1st March 2011

- Target Sled Pulse
- Euro NCAP Corridor Development
- Repeatability and Reproducibility

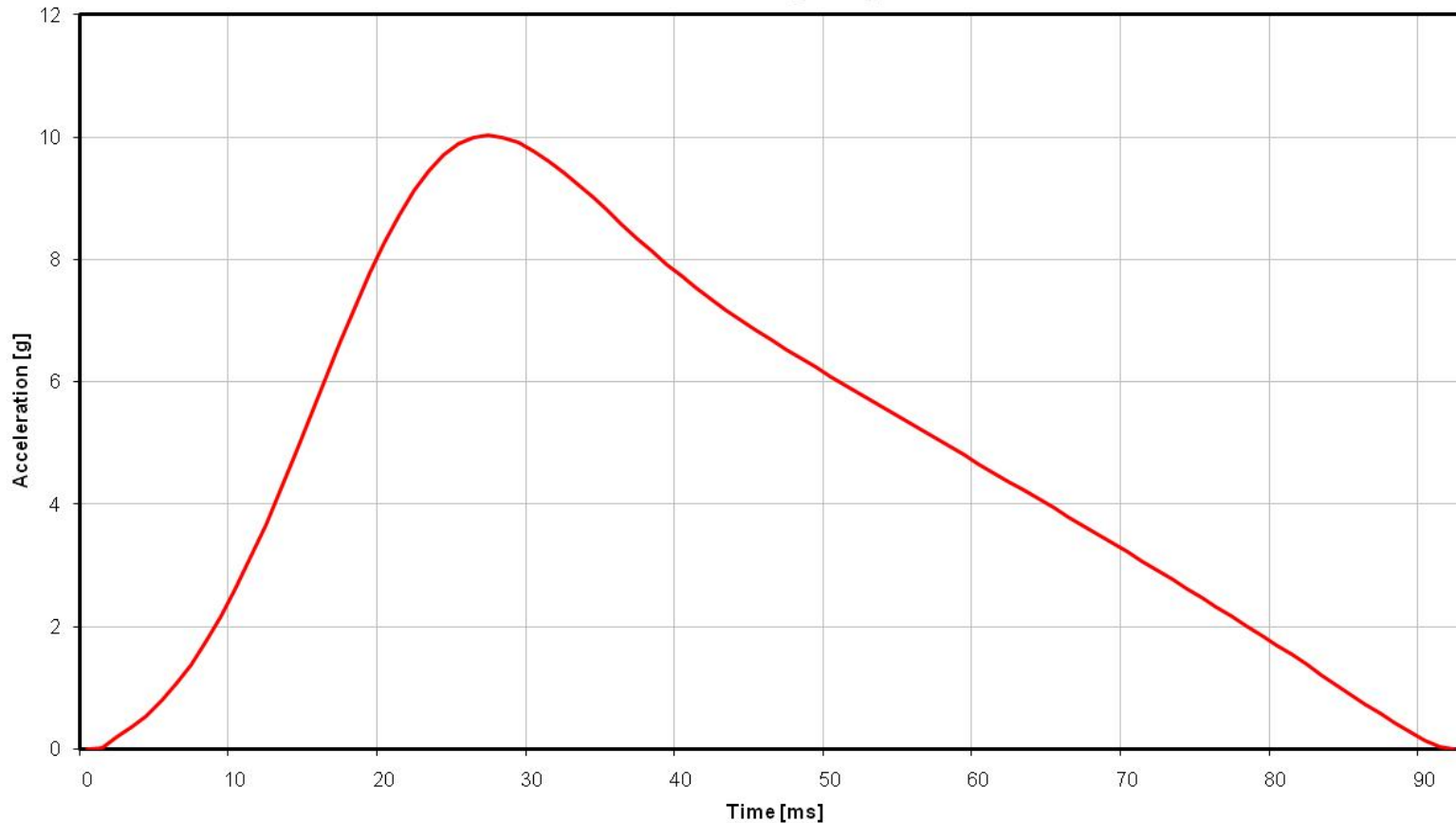
- Euro NCAP whiplash sub-group formed to draft Testing and Assessment procedures
- Draft procedures issued Nov 2005
- Final procedures issued May 2008
- Cooperation with industry and laboratories throughout process

Target Sled Pulse



■ Based upon IIWPG pulse

Medium Severity Target Pulse

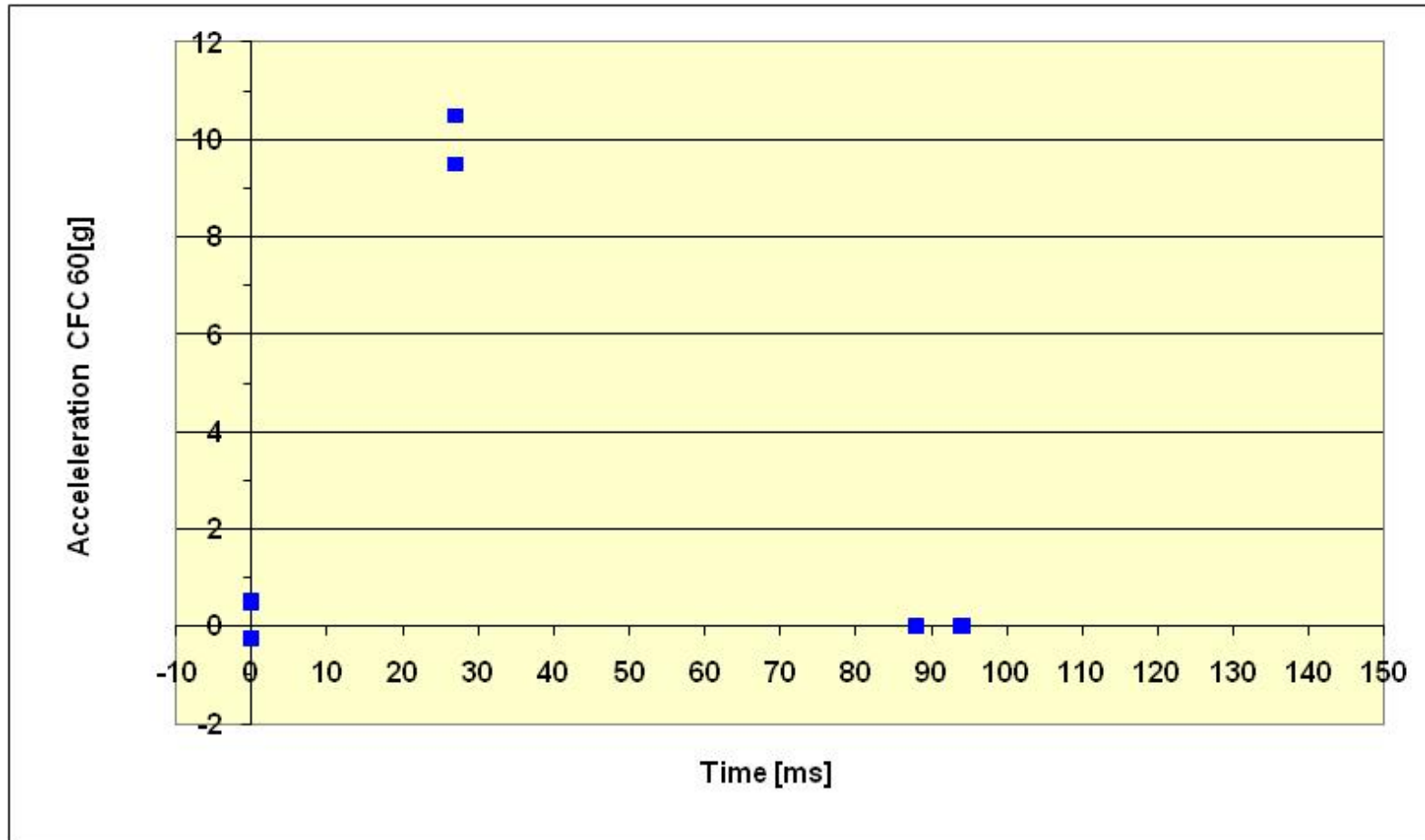


- Triangular pulse
- 16km/h delta V

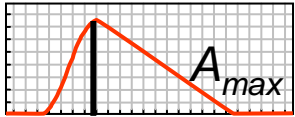
Only limited requirements available

- T0, 0.5g / -0.25g
- Peak acceleration, 9.9g -10.5g @ 27ms
- 0g, 88ms - 94ms
- Delta V, 14.8g - 16.2g

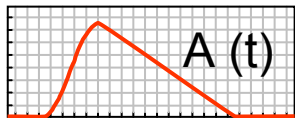
- Clear definition of target pulse needed



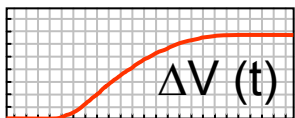
Target Sled Pulse



$$= 9.96 \text{ g}$$

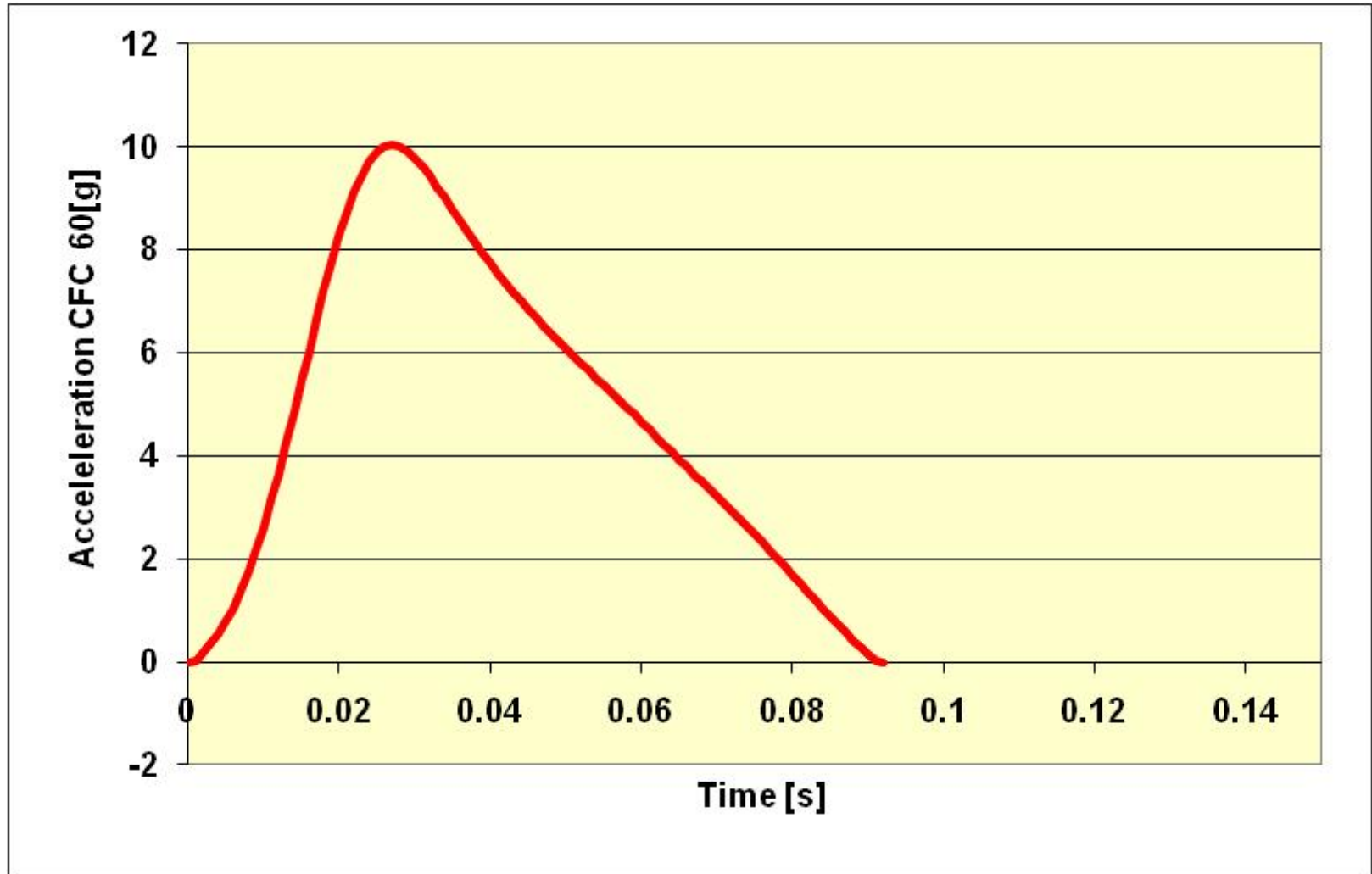


$$= \begin{cases} 0 & t \leq 0 \text{ ms} \\ \frac{A_{\max}}{2} \left\{ 1 - \cos\left(\frac{\pi \cdot t}{27}\right) \right\} & 0 \text{ ms} < t < 27 \text{ ms} \\ -A_{\max} \left\{ \frac{t - 91}{(91 - 27)} \right\} & 27 \text{ ms} < t < 91 \text{ ms} \\ 0 & t \geq 91 \text{ ms} \end{cases} \quad \text{for}$$



$$= \begin{cases} 0 & t \leq 0 \text{ ms} \\ \frac{A_{\max}}{2} \left\{ t - \frac{27}{\pi} \sin\left(\frac{\pi \cdot t}{27}\right) \right\} & 0 \text{ ms} < t < 27 \text{ ms} \\ -A_{\max} \left\{ \frac{\frac{1}{2}t^2 - 91t + C}{(91 - 27)} \right\}, \text{ with } C=1228.5 & 27 \text{ ms} < t < 91 \text{ ms} \\ 16.0 & t \geq 91 \text{ ms} \end{cases} \quad \text{for}$$

Target Sled Pulse



Euro NCAP Pulse Requirements



Euro NCAP Pulse Requirements

- High repeatability and reproducibility of whiplash pulses was required
- High level of pulse control, must be achievable by labs
- Strict sled pulse requirements were developed by Euro NCAP

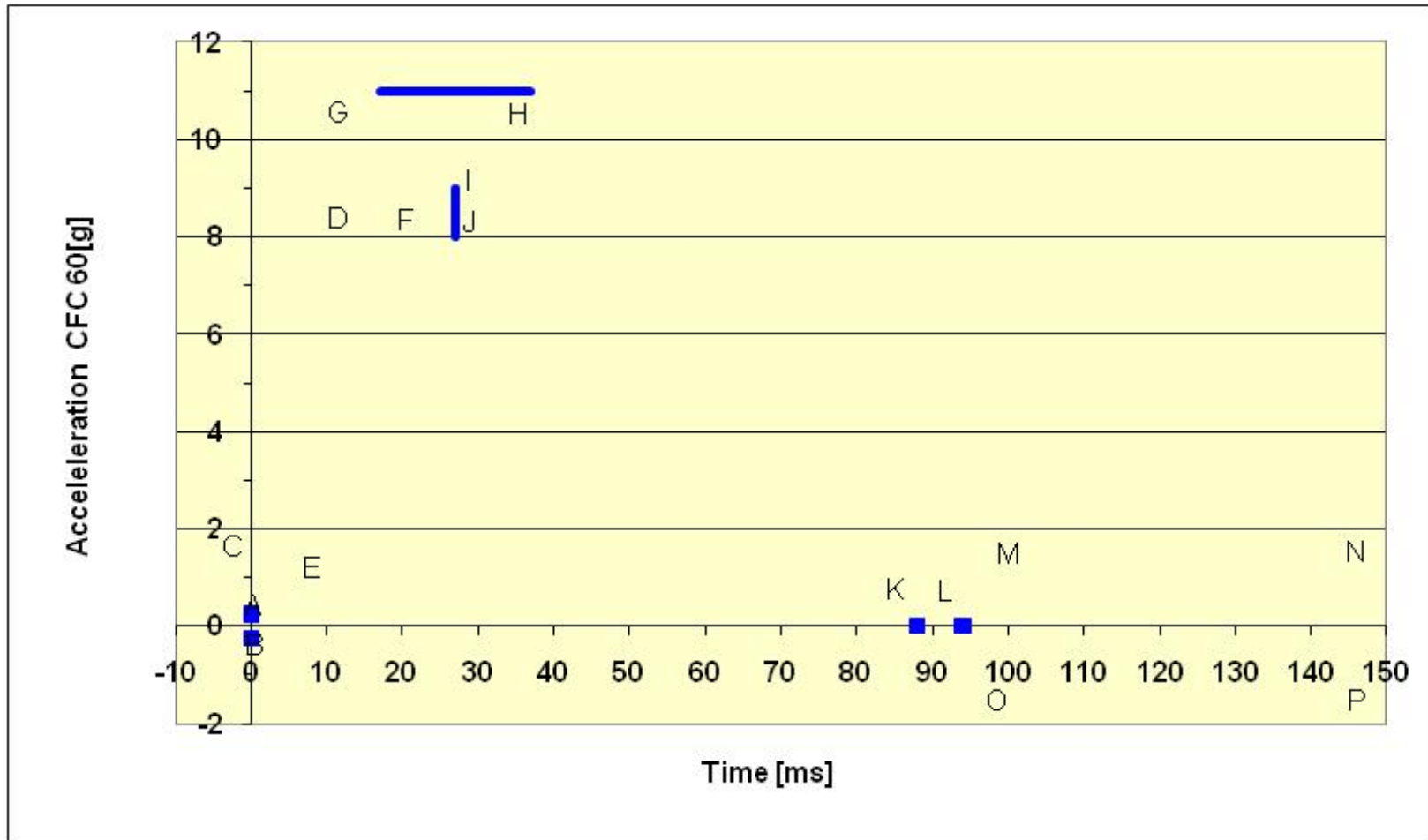
- First step develop boundary conditions

Leading to:

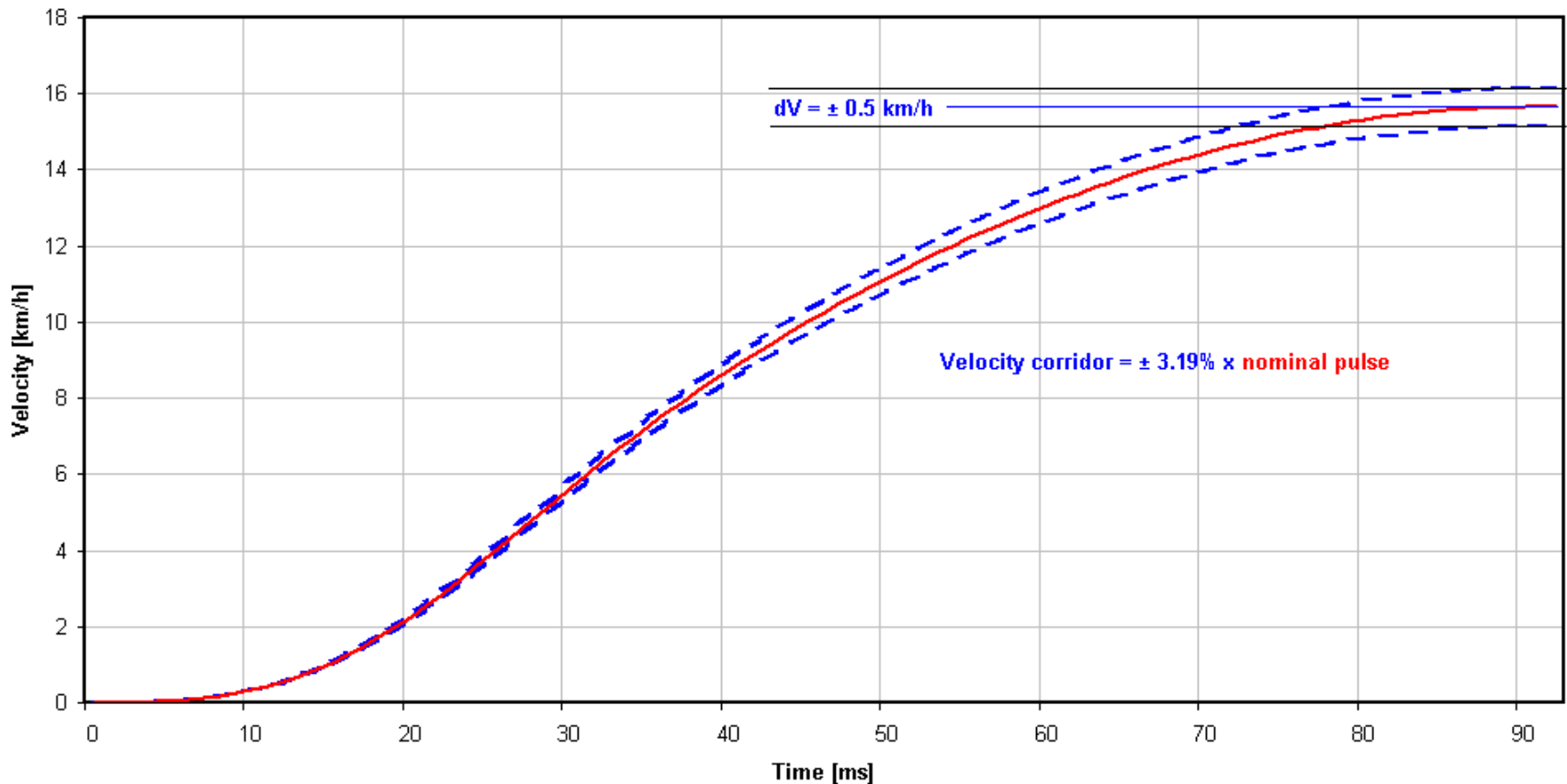
- Delta V
- Mean g



■ Pulse Boundary Conditions

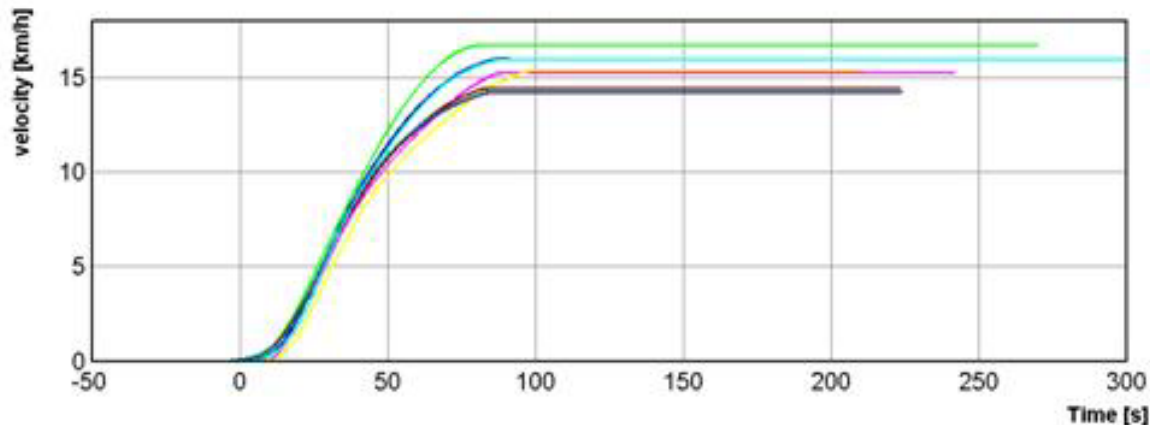
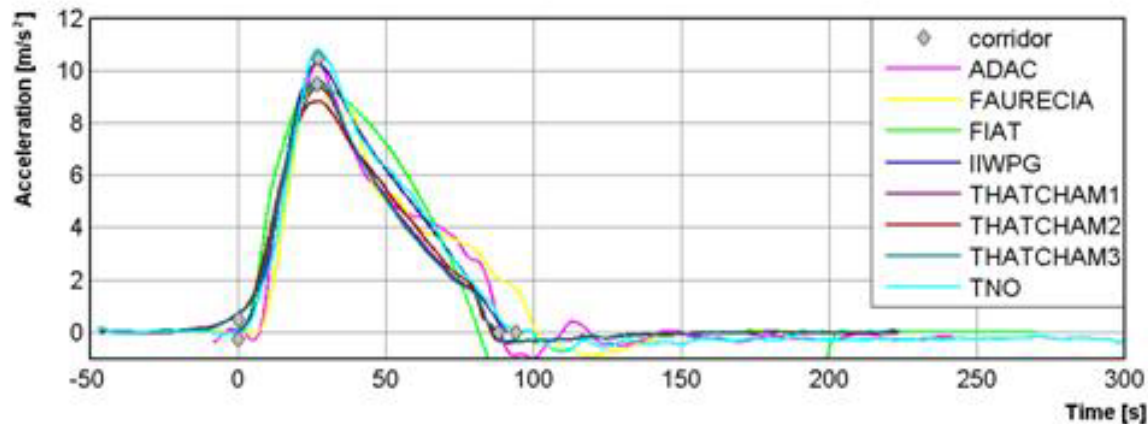


■ Delta V corridor



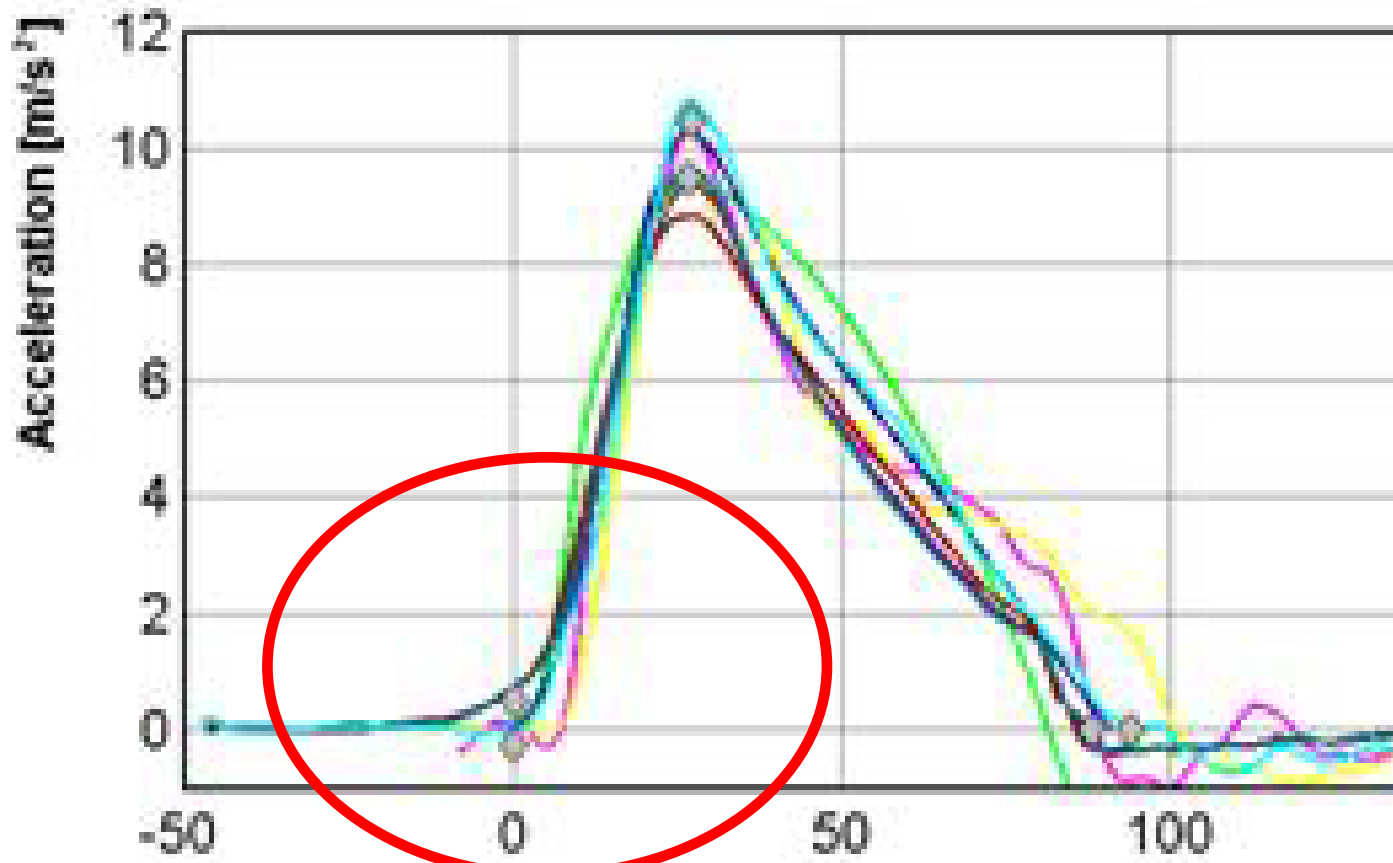
Euro NCAP Pulse Requirements

- Further requirements were necessary for better control of the pulse



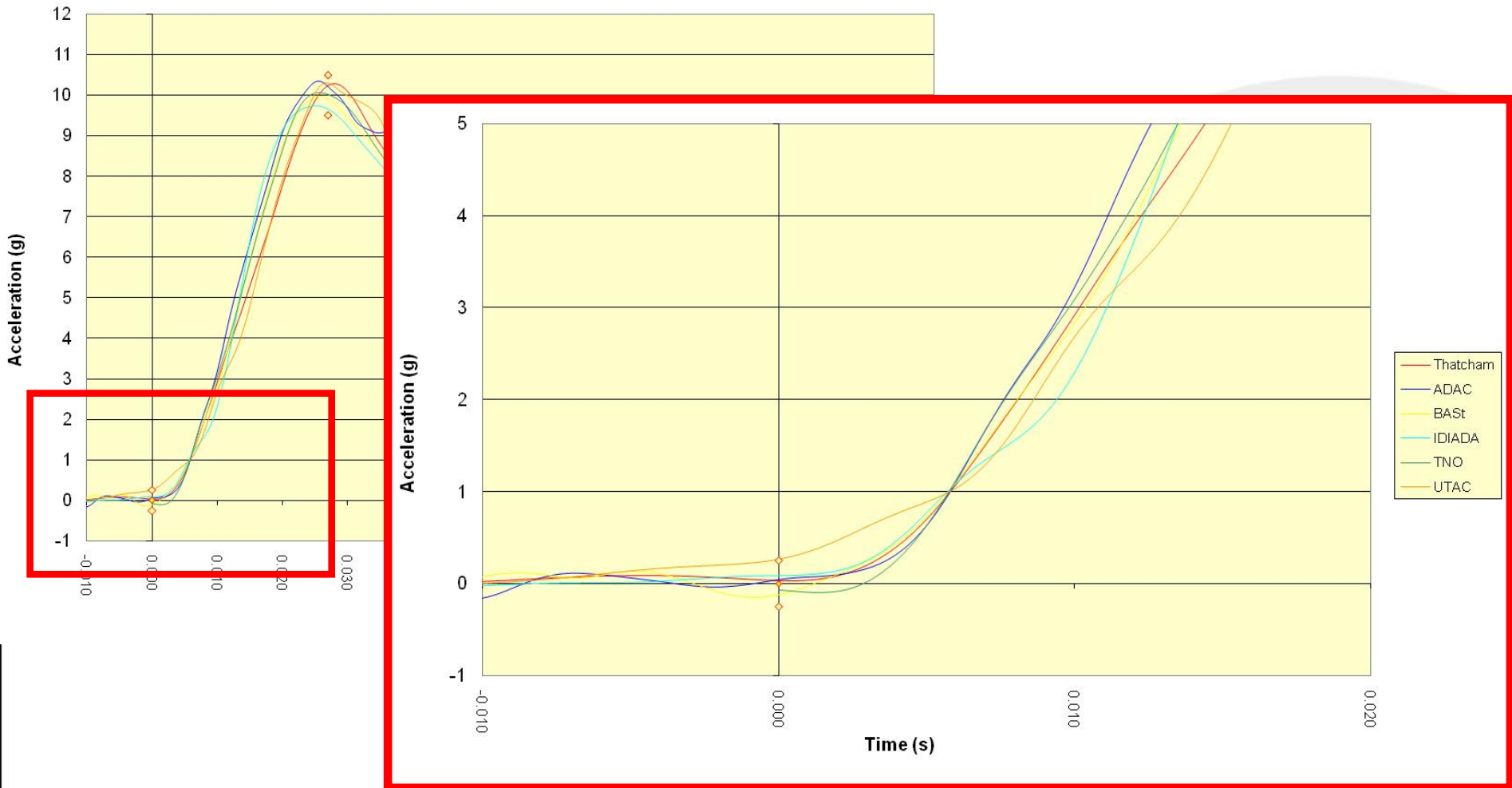
Euro NCAP Pulse Requirements

- Clear definition for T0 required to synchronise pulses



Euro NCAP Pulse Requirements

1g level established



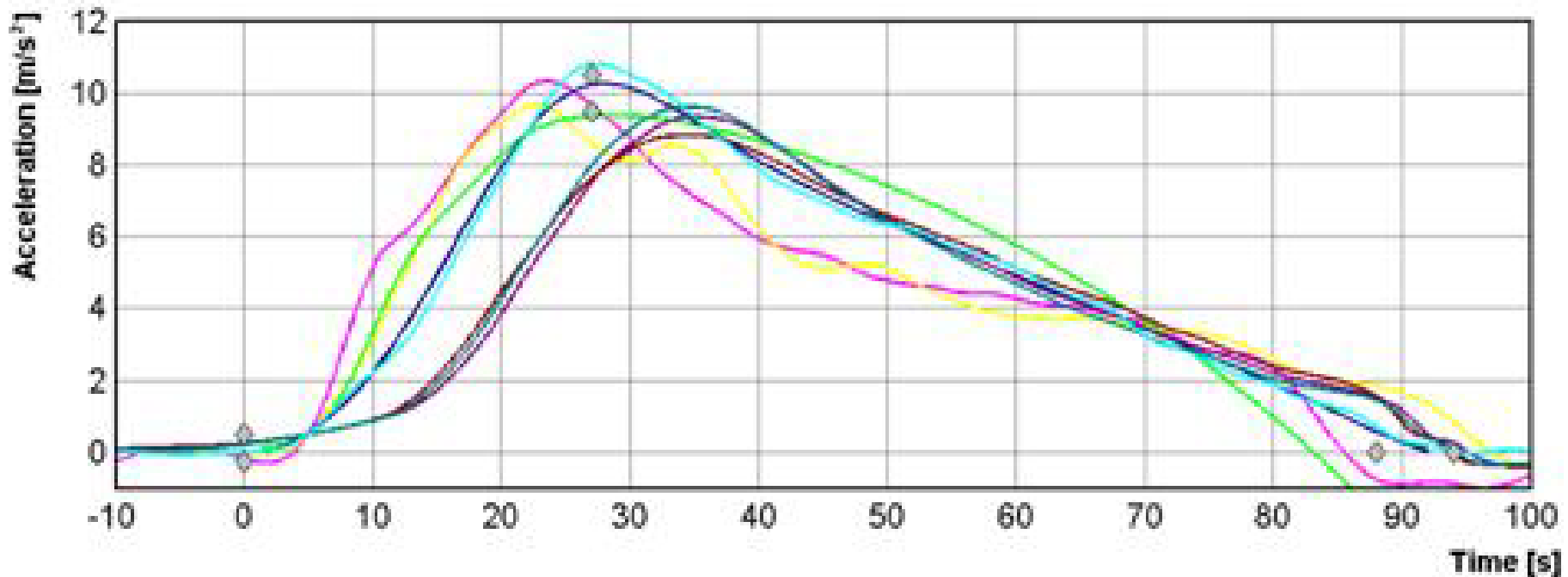
- Additional requirements were added:

Pulse rise rate

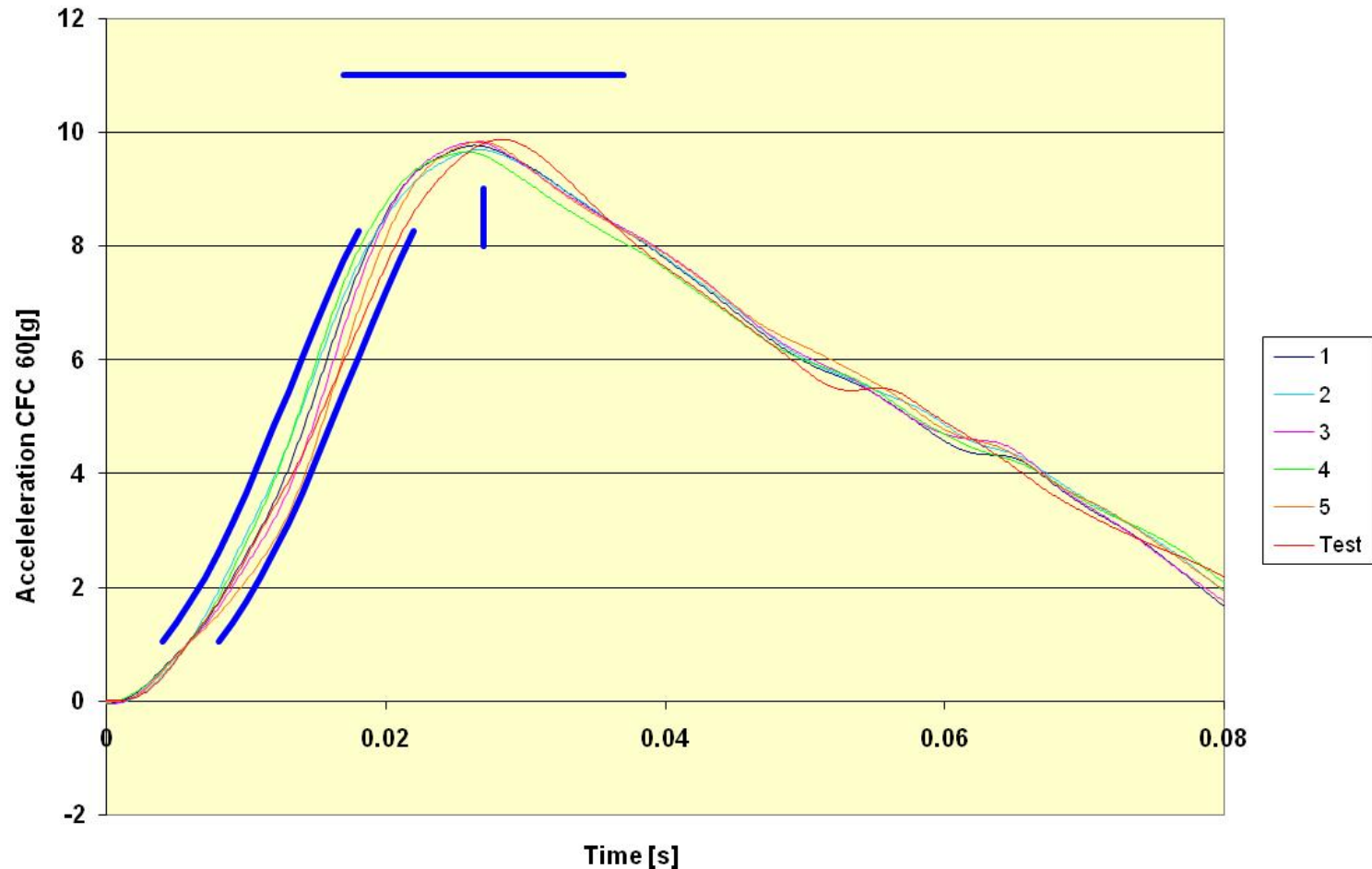
Final 0g corridor



■ Pulse rise rate

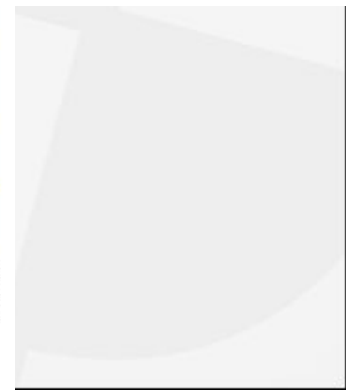
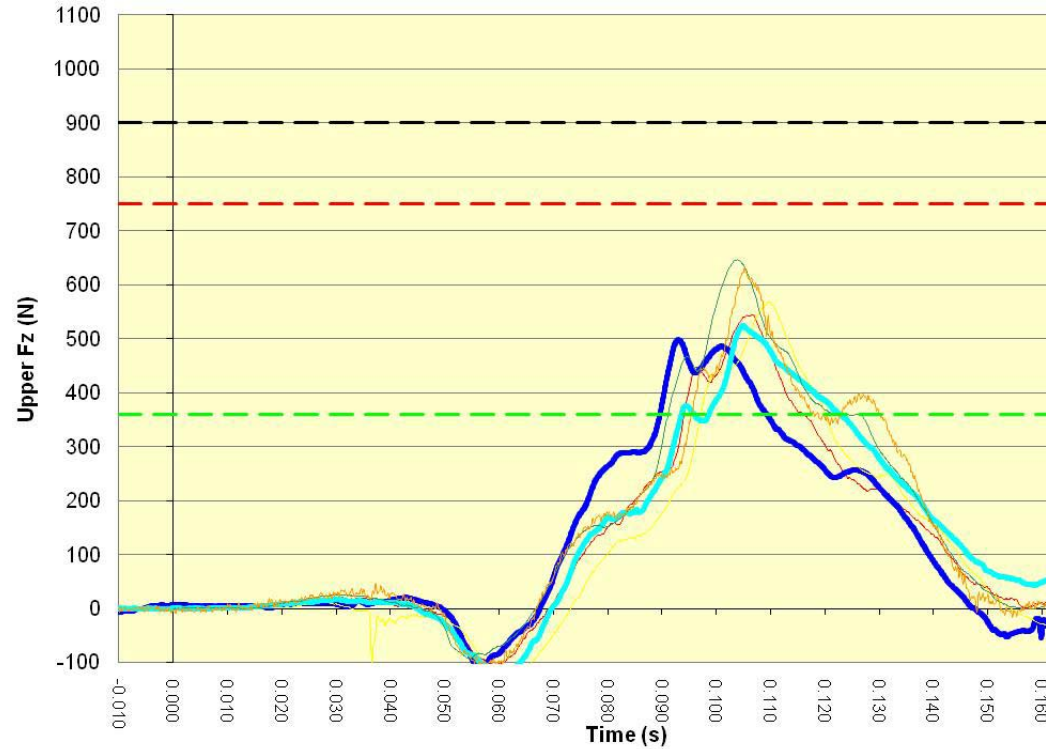
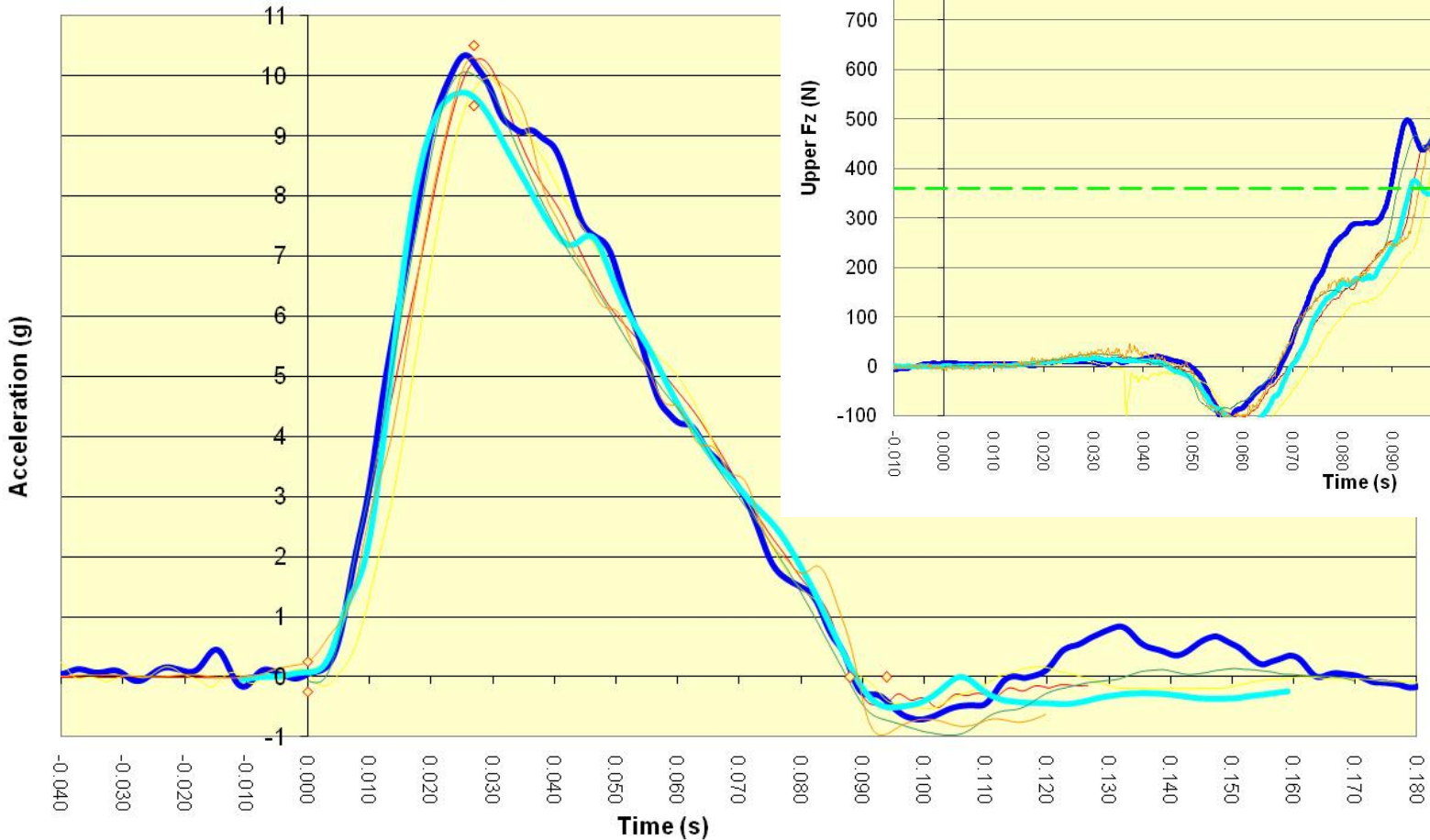


■ Max width 2.4g

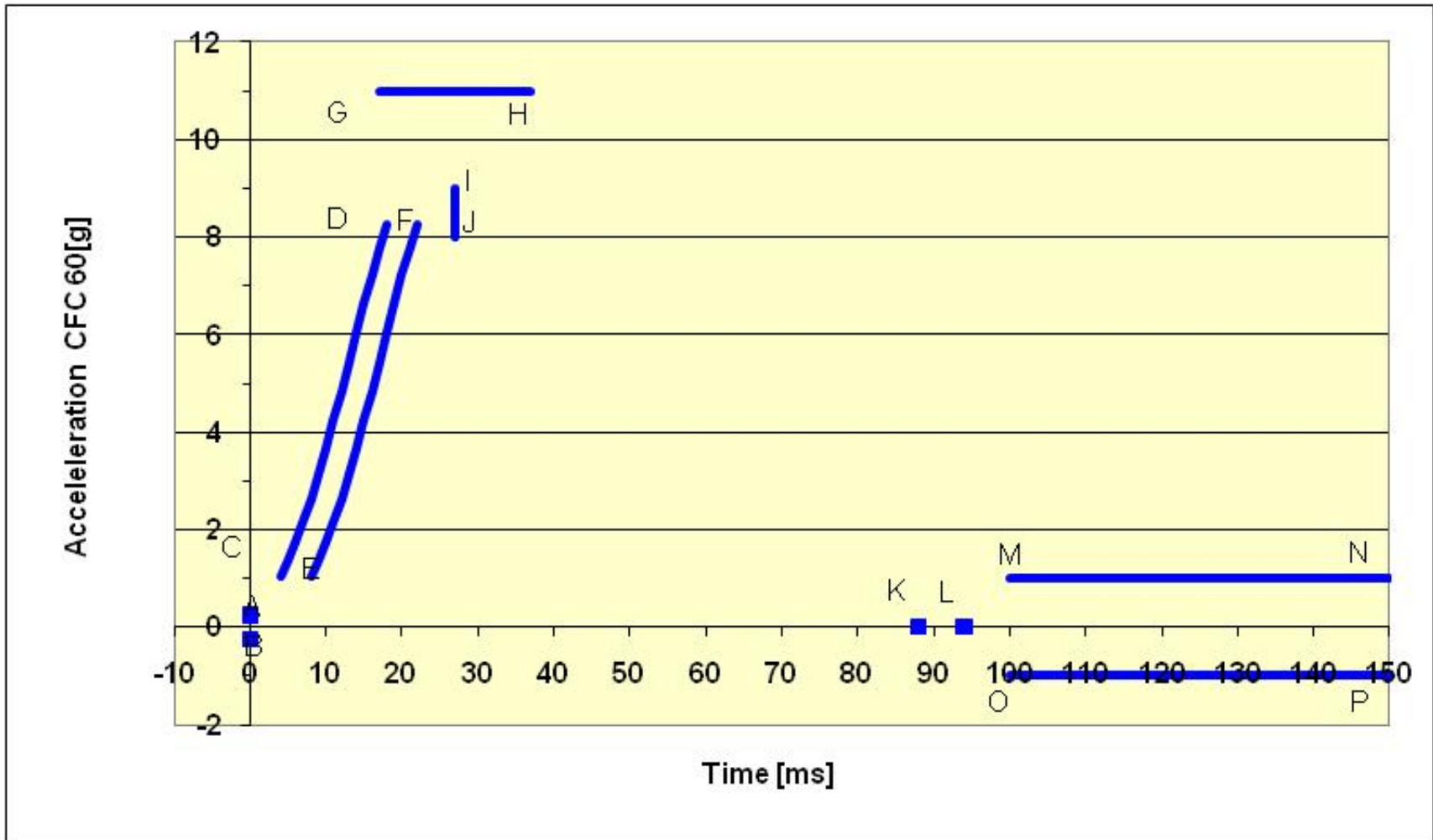


Euro NCAP Pulse Requirements

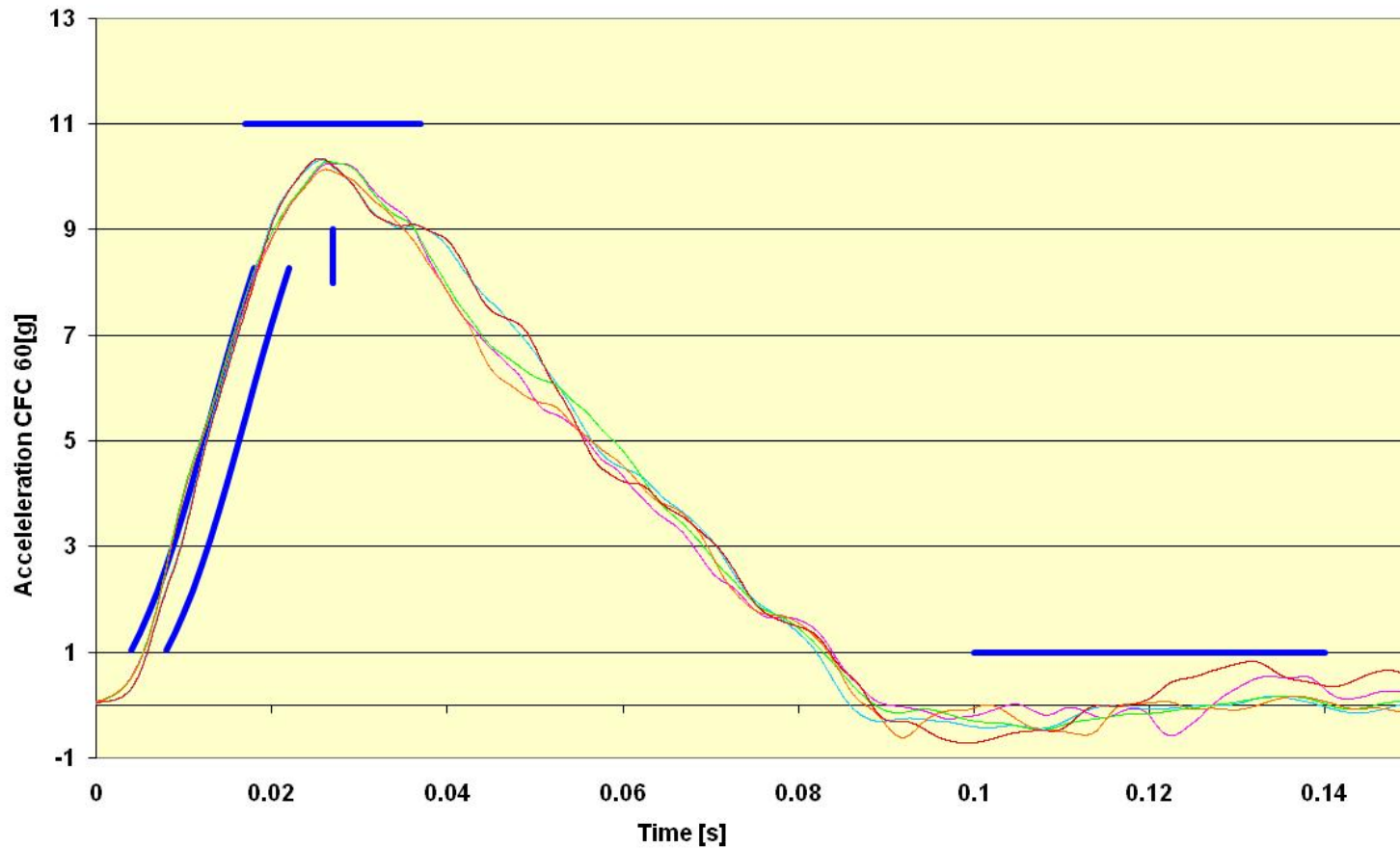
Final 0g corridor



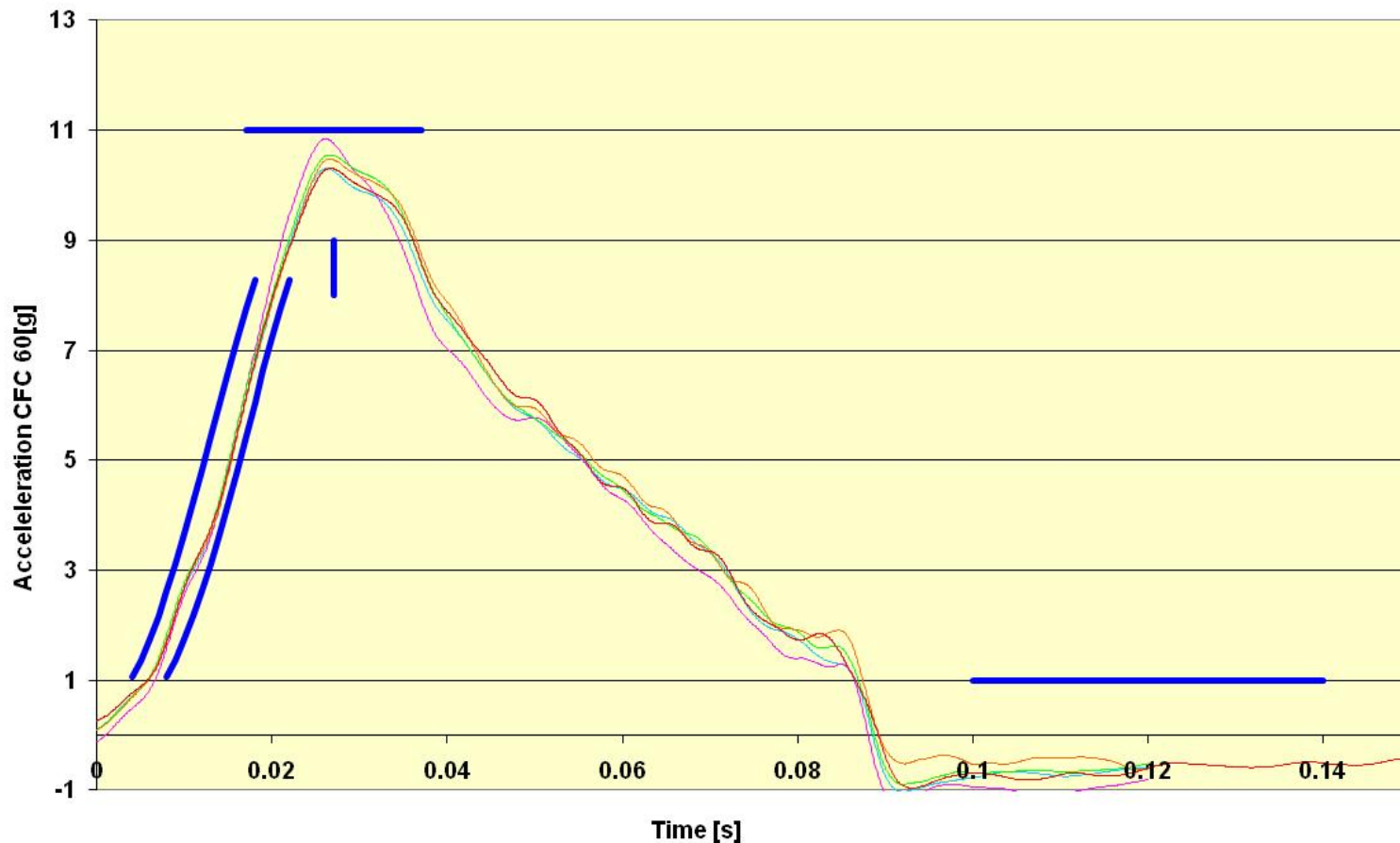
Medium Pulse Requirements



■ Initially, difficult to achieve



■ In depth analysis of sled characteristics



- Simple measures developed to improve repeatability:

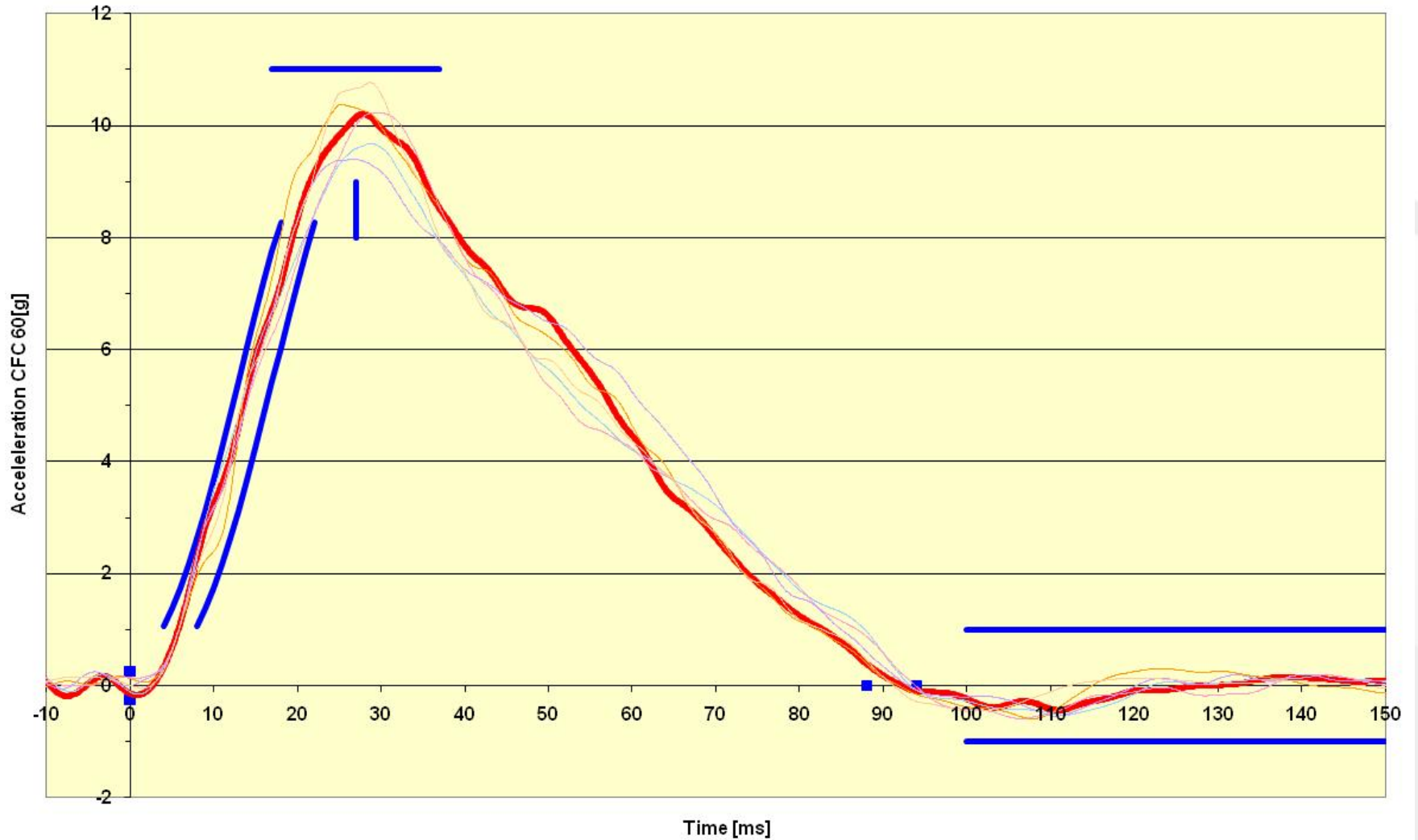
Using maximum sled mass possible

Moving mass on the sled

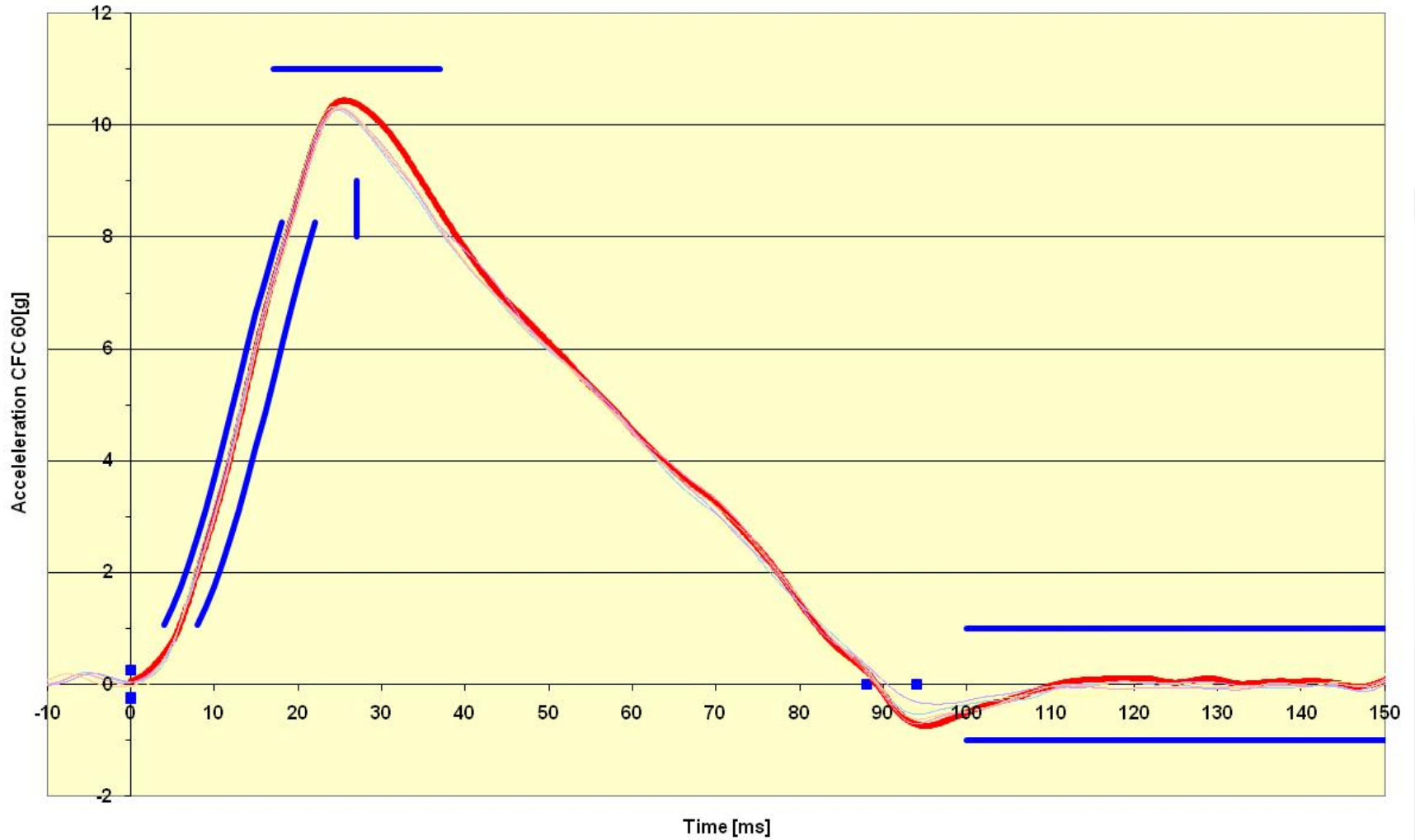
Performing test runs prior to actual test

Even order of test performed

Repeatability and Reproducibility



Repeatability and Reproducibility



Questions?

