

**Observation of different windscreen glass fracture modes
during headform impactor tests**

5 identical tests carried out at the same impact point

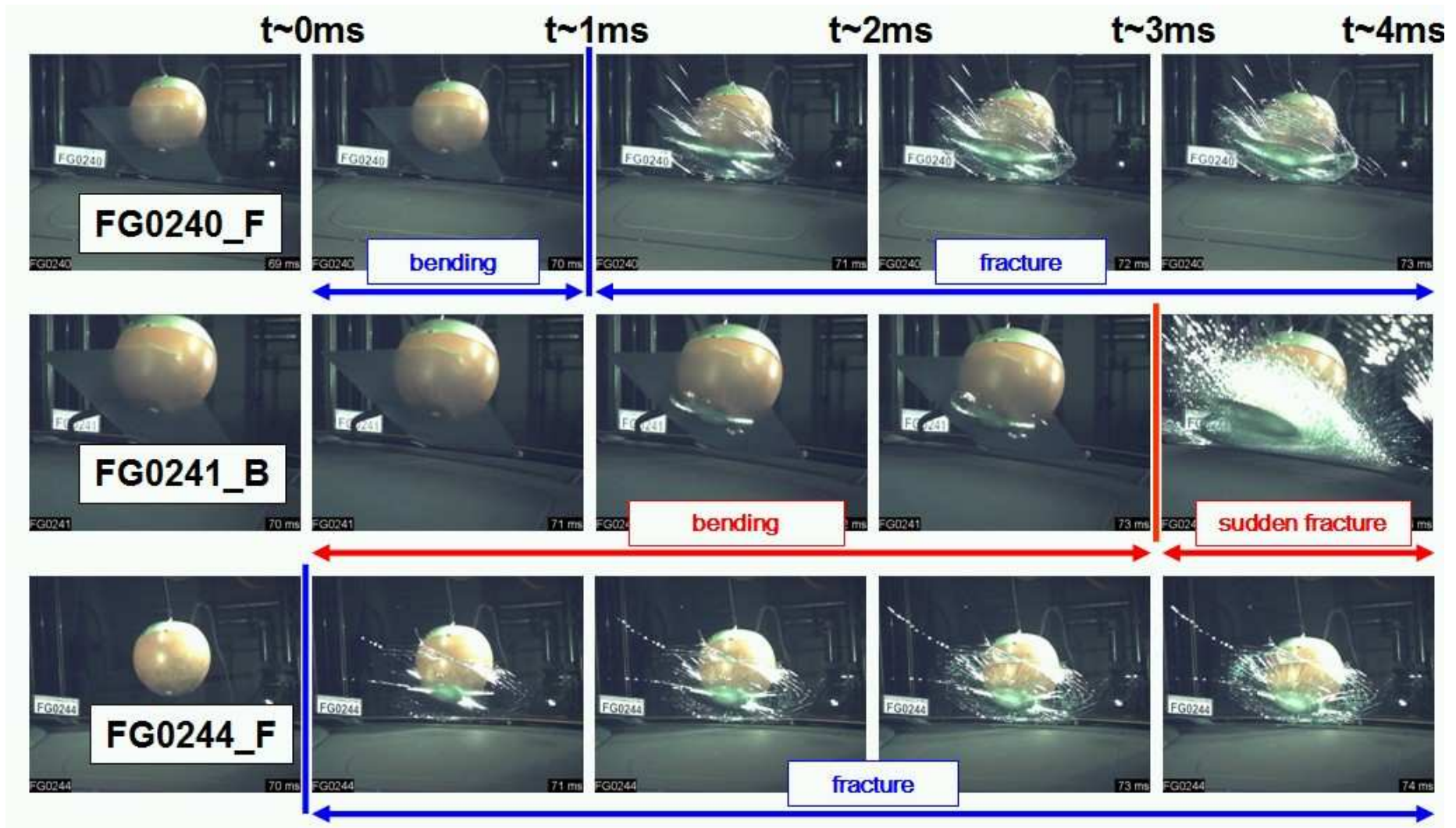
- 82.5mm rearward of the lower windscreen reference line
- adult headform impactor 4.5kg
- impact velocity 35km/h
- 3 tests at 65° impact angle
- 2 tests at 35° impact angle

Windscreen glass thickness around 4.5mm

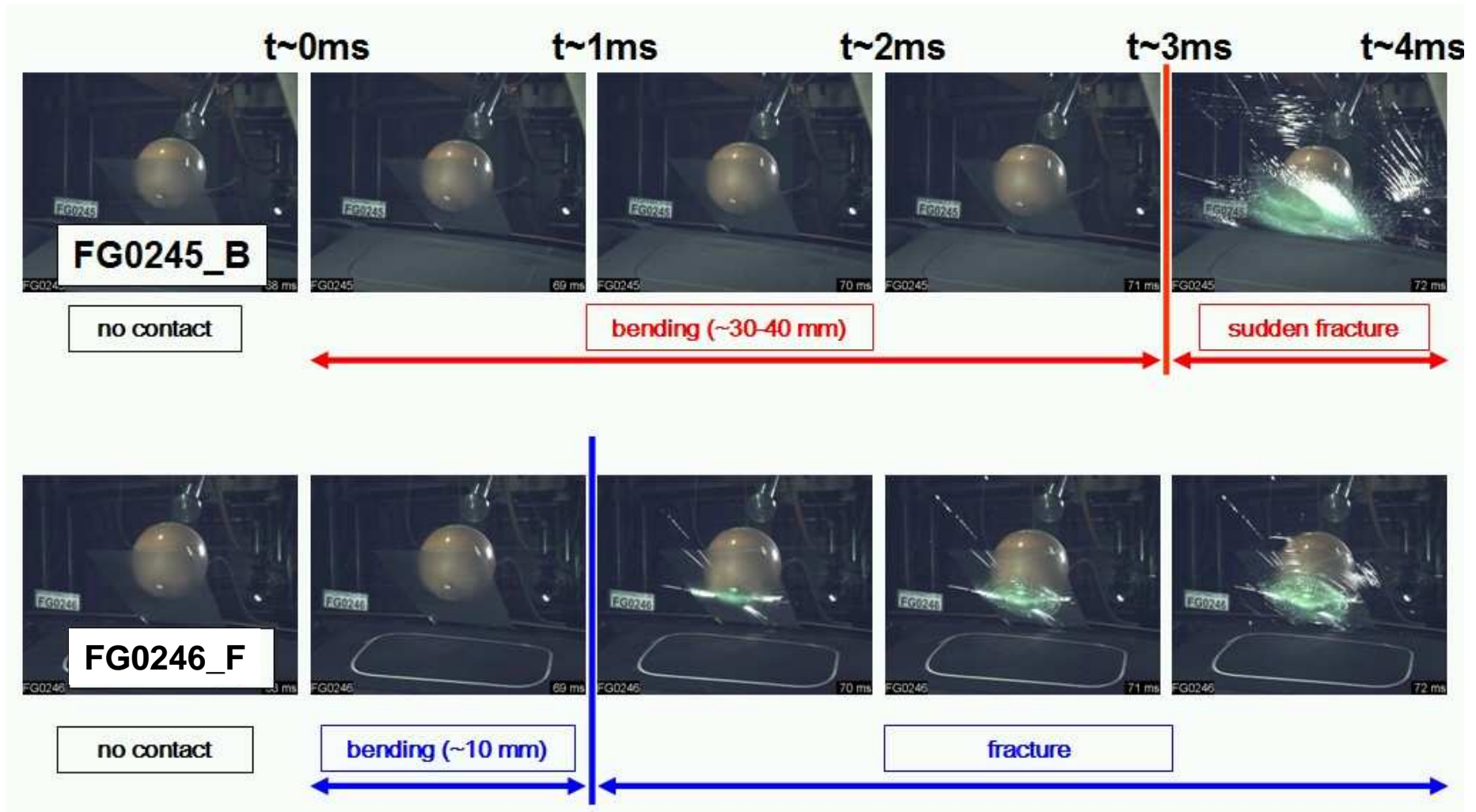
Windscreen angle at impact point around 57°

Observation of two different fracture modes:

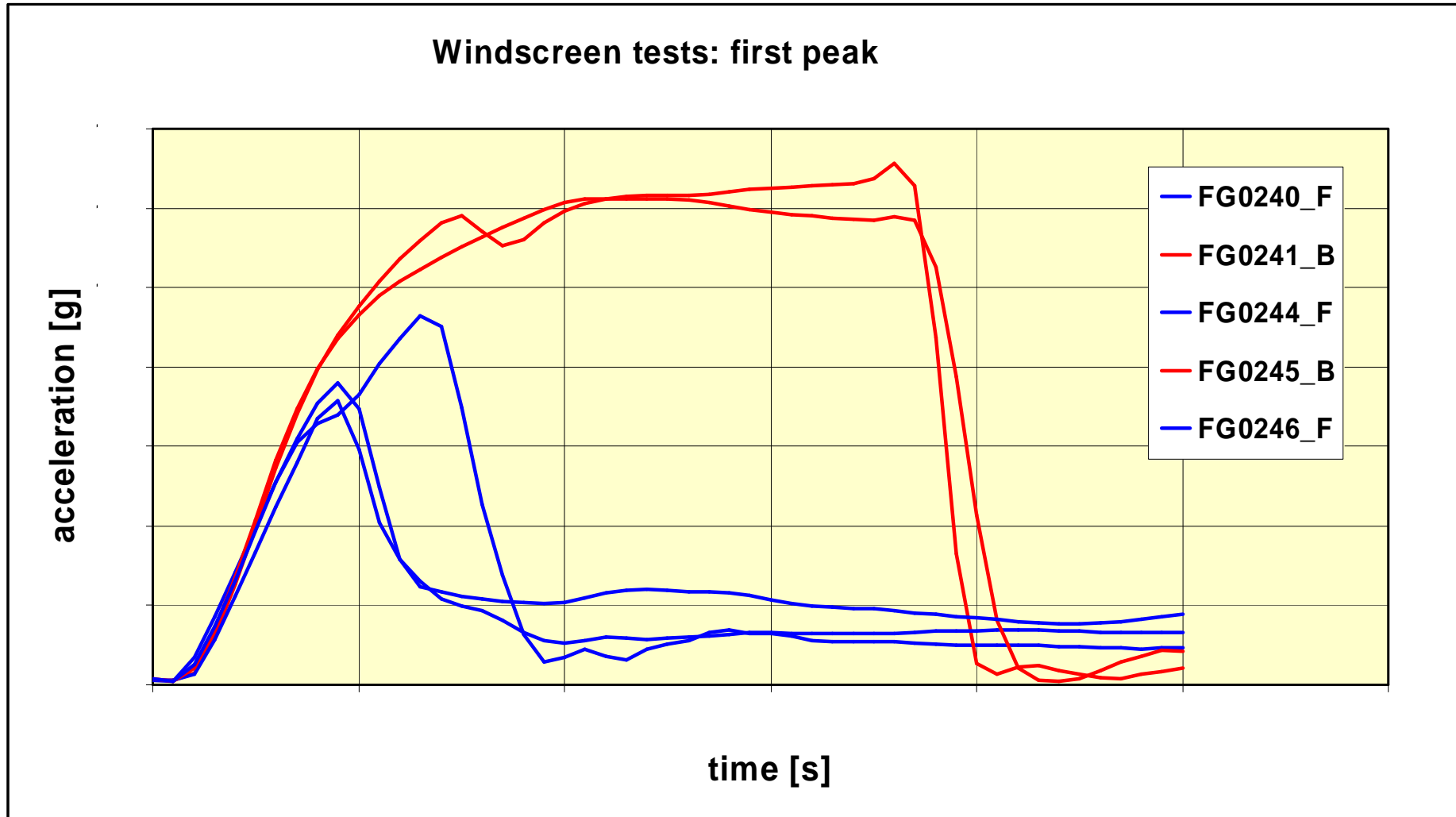
1. **Fracture** begins **after contact** of impactor on windscreen
short bending phase
2. **Sudden fracture** occurs after a **longer bending phase**

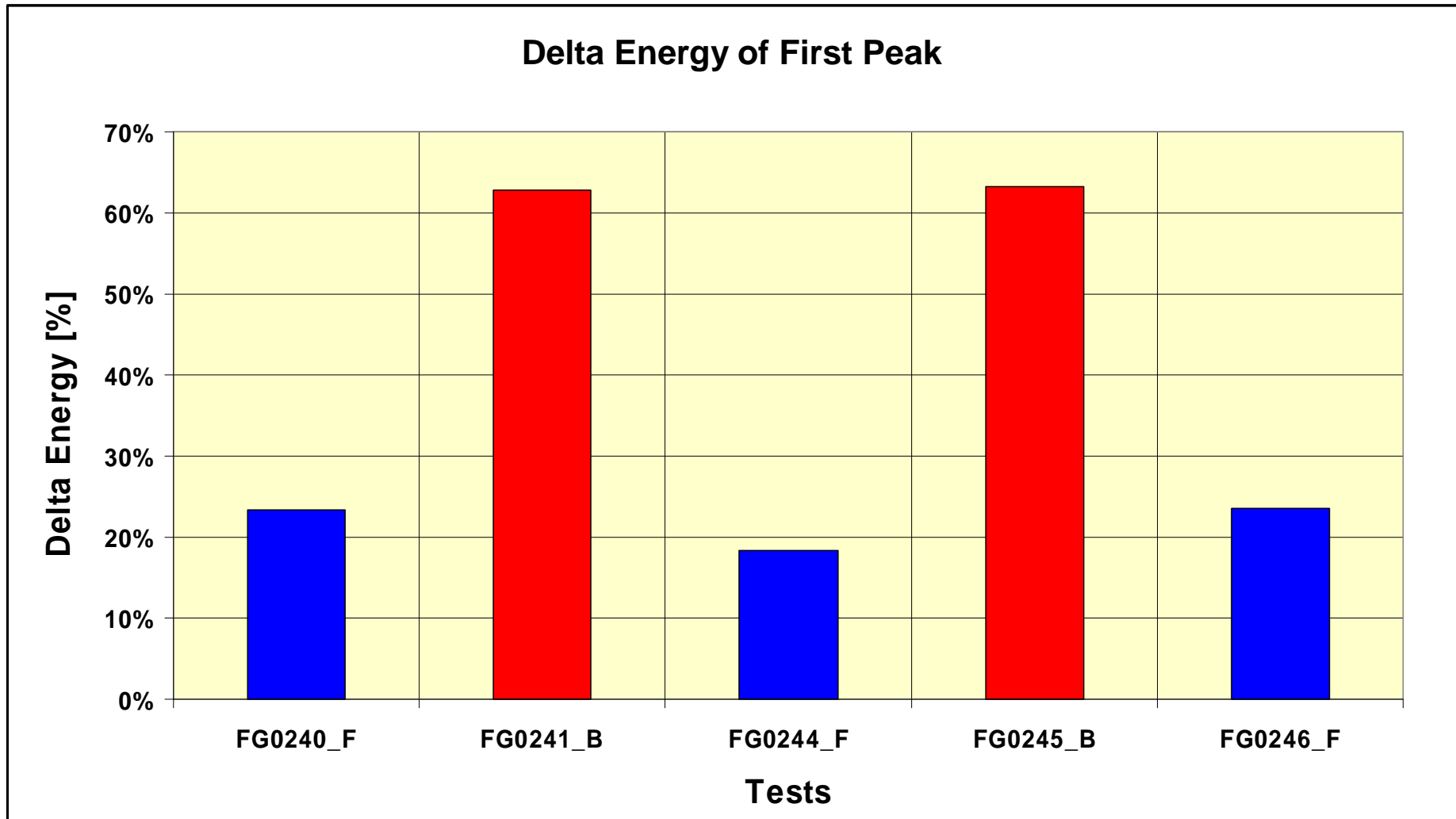


Impact angle = 65°

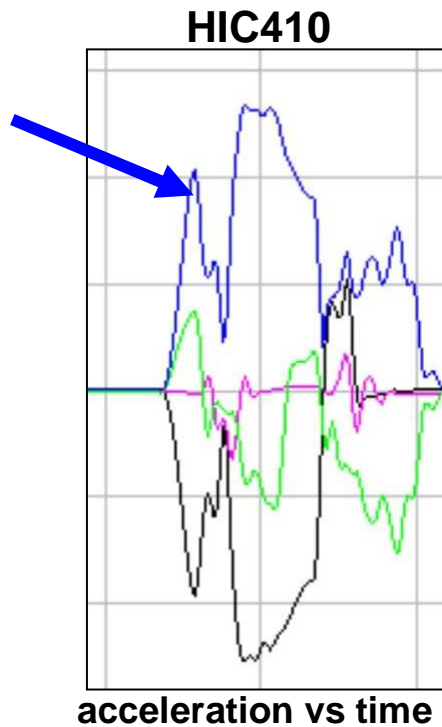


Impact angle = 35°

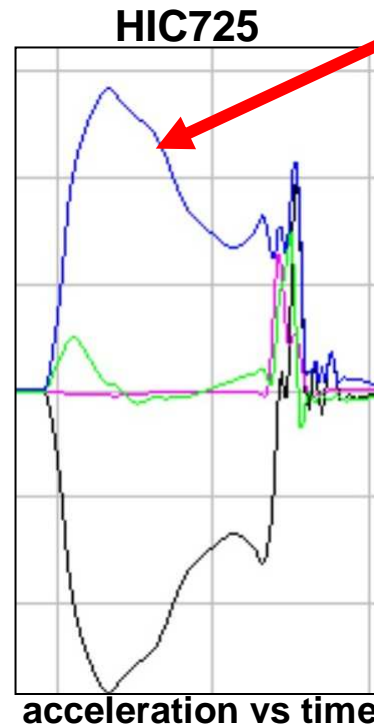




Reference to INF GR PS 134: “Head impact tests in the centre of the windscreen”
 Three identical tests with different first peaks and big scatter of HIC
 (EU Phase 1, 4.8kg impactor, 35km/h, 35°)



First peak indicates
immediate fracture
 short bending phase



First peak indicates
long bending phase
sudden fracture



First peak indicates
long bending phase
sudden fracture

Conclusions:

Different fracture modes occur independent of impact angle

Fracture modes are not predictable

Fracture modes result in different shapes of the first acceleration peak

Energy absorption is up to three time higher for long bending / sudden fracture

Fracture behaviour is probably dependent on internal stress of the glass, micro scratches etc.

Fracture modes influence the scatter of HIC results

Currently no design solutions available

More research of glass manufacturing process etc. needed

These observations give evidence we are far from having demonstrated feasibility of windscreen compliance with pedestrian regulation

Recommendation:

- **Do not include windscreen testing in the GTR at this stage**
- **Continue investigations on the windscreen behaviour**
- **Justify in the preamble, possibly with a suggested deadline for further review of studies (e.g. observation of the results from the EU APROSYS research project expected in 2009)**