Aim and Objectives
Establish a methodology, involving high resolution optical techniques, that informs a model of the high strain rate behaviour of composite materials:
- Develop an experimental apparatus for high strain rate testing that involves full-field optical techniques.
- Validate the optical techniques strain results.
- Obtain a data-rich stress-strain curve of the tested materials:
  - Extract material information
  - Link the experimental results with the constitutive model equation

Why DIC?
- No mechanical interaction between measurand and sensor: the measurement process does not modify the system.
- Allows full-field measurements of deformation and strain:
  - All the strain components can be determined contemporaneously.
  - The number of experiments and sensors needed to characterise a material is reduced
- The limitations are in the hardware and not in the method: the constant improvement of CCD technology enhances the spatial and temporal resolution of DIC strain measurements.

Experimental apparatus

Test Specimens
- MTMs8-1 epoxy resin reinforced with E-GLASS-200 with 32% fibres content
- Pure MTMs8-1 epoxy resin

Effects of the DIC parameters
- Redlake Motion Pro X3 camera:
  - Resolution: 1280 x 300
  - Frame rate: 7 kHz
- DaVis 7.4 for 2D DIC software:
  - Cells size: 64 x 64 pixel
  - Overlapping: 0%
  - Number of passes: 0
  - Pixel per speckle: 7
  - Strain resolution: 200 µstrains

Test Results

Conclusions
- Experimental methodology and apparatus have been developed.
- The Young’s modulus has been defined for pure resin and fibre reinforced specimens.
- The experimental errors have been identified in the load-strain synchronisation.