

# High Speed Strain and Vibration Measurement from Dantec Dynamics

## Digital Image Correlation

### Strain & Deformation/Vibration measurement



#### • Benefits

- Full field results
- 3D measurement
- Non-Contact
- Flexible FOV, mm<sup>2</sup> - m<sup>2</sup>
- Suitable for all materials
- Up to 1 million FPS and 16MP cameras

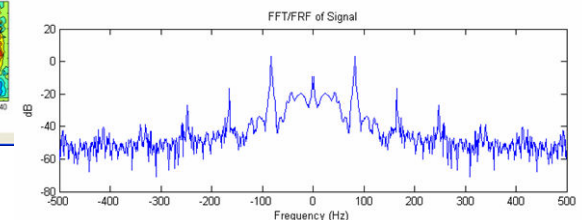
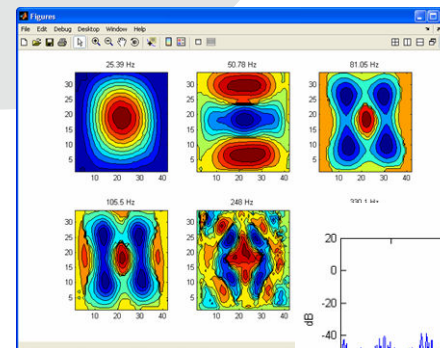
#### • Applications

- FEA Validation
- Vibration analysis:
  - Harmonic excitation
  - Shock excitation
  - Noise excitation
- Modal shape analysis
- impacts, ballistics

- As used by Nottingham, Manchester, Bristol Bradford and Cranfield universities in UK.

#### • Features

- Integrated support for Phantom, Photron and IDT cameras (no need for OEM software!)
- One click evaluation
- Camera timing & triggering control
- Simultaneous logging of analogue channels
- Automated calibration procedure
- Confidence margin for each point in units
- 2D overlay display linked to 3D display
- True multi camera support 'n' cameras
- New faster evaluation algorithms
- Support of windows 7, 64 bit and multi core

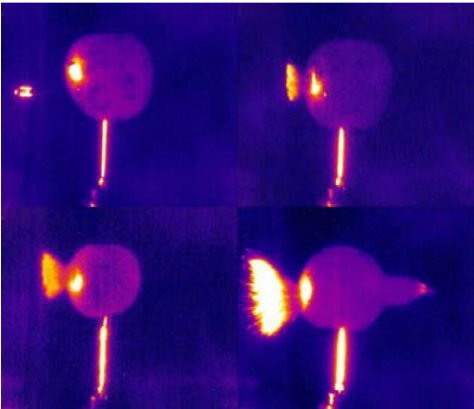
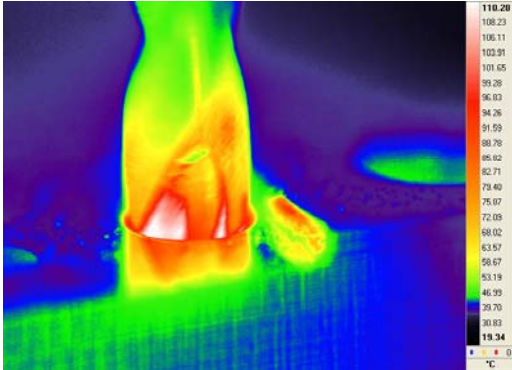




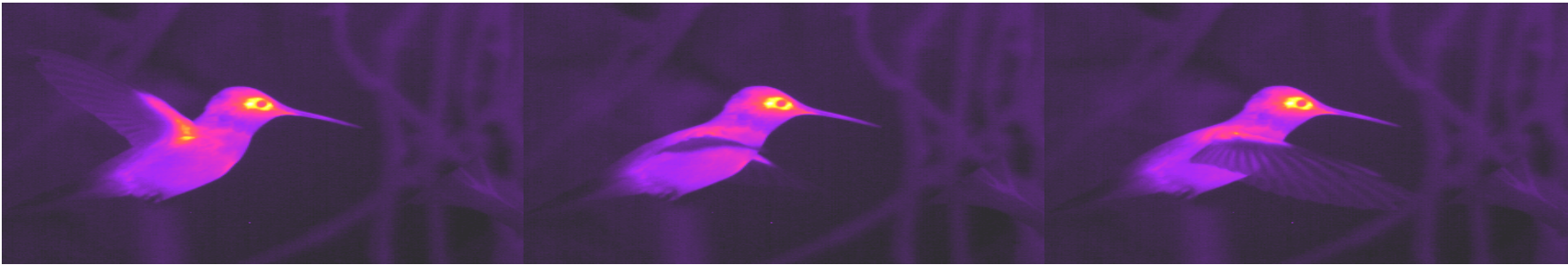
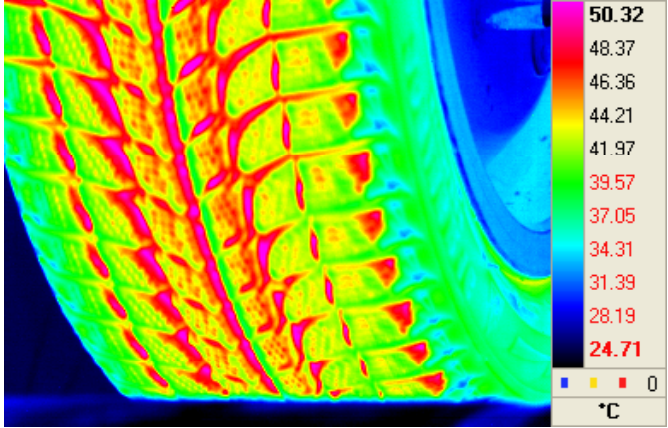
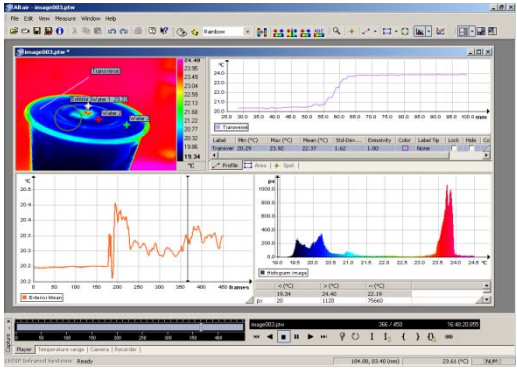
# The World Leader in Thermal Imaging Systems



# High Speed Thermal Imaging From the World Leaders



SC7500 camera  
• Up to 32kHz  
Altair Software



# GOM – Industrial 3D Measurement Techniques Measurement Systems



<b>ATOS</b> Full-field 3D Digitizing		<b>GOM is a global industrial partner for optical 3D coordinate measurement with over 20 years experience</b>  GOM has comprehensive know-how in 3D coordinate measurement, material and component testing, quality control and analysis, digital image processing  <ul style="list-style-type: none"><li>· material testing</li><li>· 3D shape and dimensional inspection</li><li>· dynamic structural tests</li></ul>	
<b>TRITOP<sup>CMM</sup></b> Mobile Optical CMM			
<b>PONTOS</b> Dynamic 3D Analysis			
			
<b>TRITOP<sup>Def</sup></b> Vectorial Deformation Analysis		<b>ARAMIS</b> Full-field 3D strain measurement	<b>ARGUS</b> Deformation Analysis in sheet metal forming

**Thank you  
for your attention**

[a.stanley@gom.com](mailto:a.stanley@gom.com)

[www.gom.com](http://www.gom.com)



**gom**  
Optical Measuring Techniques



## BSSM High Speed Imaging Showcase

Making the invisible visible

- ▶ Invisible Vision is a global leading UK manufacturer of Ultra High Speed Camera Systems to 1 Billion frames per second.
- ▶ Stop Motion Exposure times to nanoseconds at ultra high speeds for impact, crack, discharge & shock wave propagation.
- ▶ Three complimentary product groups – UHSi 200M fps+ ‘Movie’ Camera, UVi intensifier and PiV for maximum resolution.

UVi – Add-On HSV Intensifier.  
 5ns Shuttering.  
 UV & Visible Capability.  
 High Image Intensification.  
 Many diverse applications.  
 New Enhanced SUVi version.



PiV – 10ns with Maximum Resolution.  
 Two 16 Megapixel Images (4872 x 3248).  
 Each Image Gates down to 10ns.  
 UV & Visible Capability.  
 12 bit images, GigE Connection.  
 IVV Imprint® Control & Analysis S/W



UHSi 12/24  
 Ultra High Speed Camera.  
 24 frames, 200 Million+ fps.  
 5ns Exposures.  
 Megapixel Resolution.  
 (400+ TV lines per picture height).  
 12 bit images, GigE Connection,  
 IVV Imprint® Control & Analysis S/W



Custom - Complex Configurations

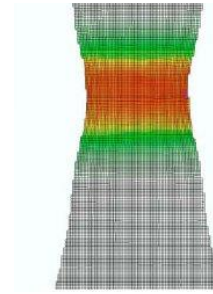
DIC - Solids - Point Measurement

Particle Tracking - Fluids - PIV

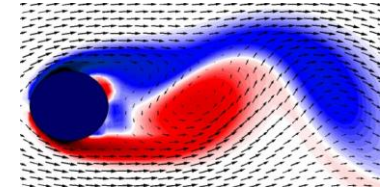
Fully Integrated Systems



LAVISION

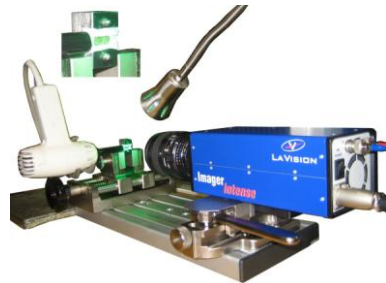


Applicable to various Materials

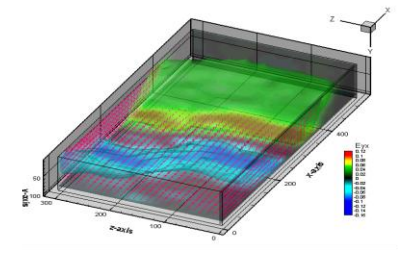
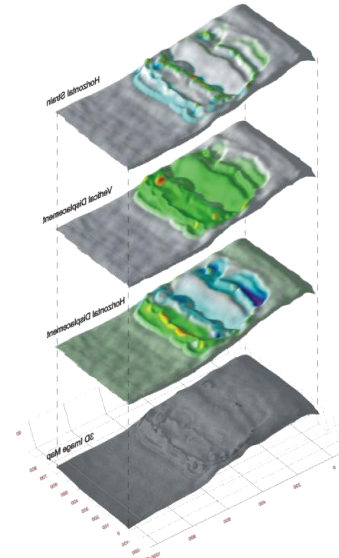
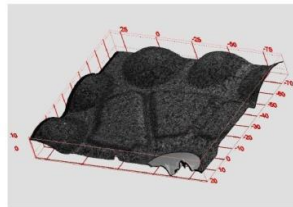
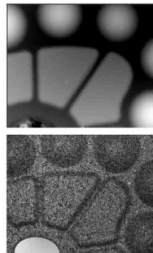


WE COUNT ON PHOTONS

Planar - Surface - Volumes



Across Industry & Academia



Employing Advanced Technology



Aero - Manufacture - Energy

16 MPix - Cameras - 1MHz

Standard - Turn-Key Set-ups

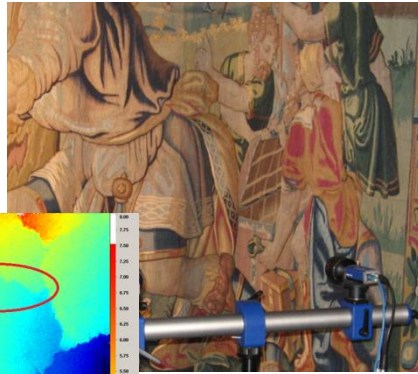
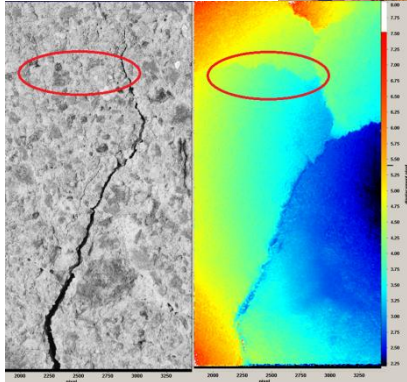
Auto - Geology - Bio

Custom - Complex Configurations

DIC - Solids - Point Measurement

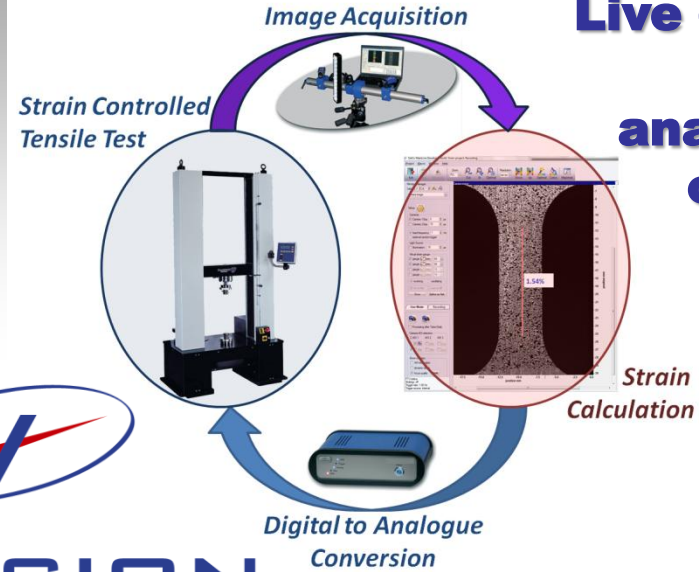
Standard - Turn-Key Set-ups

# DIC using natural patterns



# LA VISION

WE COUNT ON PHOTONS

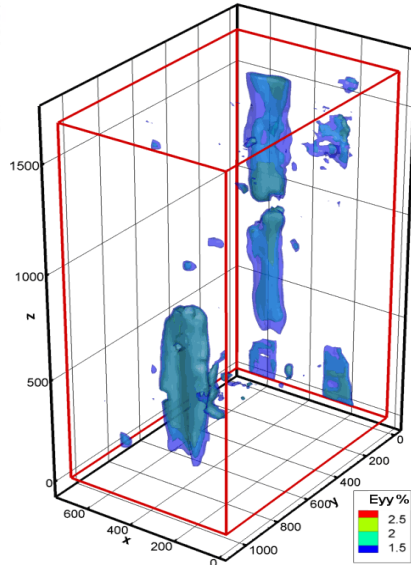
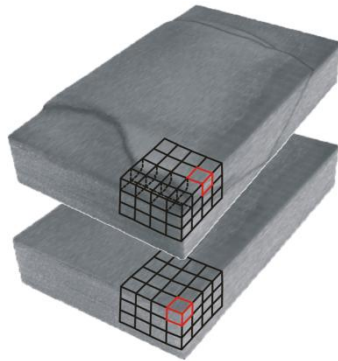


# Live gauge with analogue output

Particle Tracking - Fluids - PIV

Auto - Geology - Bio

# Digital Volume Correlation



Aero - Manufacture - Energy

# DAVIS 8



# Windows 7 and powerful GPUs for fast processing

Planar - Surface - Volumes

16 MPix - Cameras - 1MHz



Wide variety of high speed cameras



IDT/ Redlake

Feature rich, versatile and excellent value for demanding applications



AOS Technologies

Compact cameras for hostile environments and cost effective battery powered cameras



Fastec Imaging

Handheld cameras and long record systems

Specialist Lighting

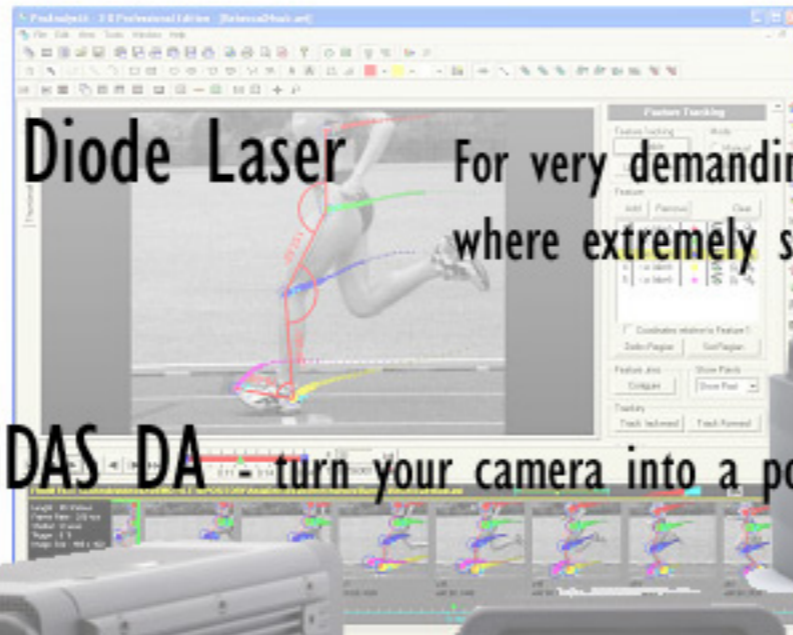
Cavitar HF Pulsed Diode Laser

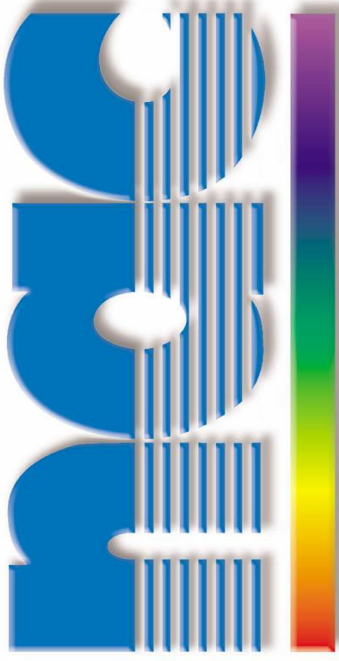
For very demanding applications such as welding and explosions and where extremely short exposure times are required.

Software



ProAnalyst and MiDAS DA - turn your camera into a powerful scientific tool





# Image Technology

Offices in Japan, USA, Germany and UK  
 Distribution Network worldwide

Since 1958 – More than 50 years experience in Imaging Technology




### Memrecam GX8

- 2900fps full res
- 600k fps
- 0.5us shutter
- ISO5000 color; ISO20,000 mono
- 1.3 mega pixel resolution
- 250ns Straddle Time
- < 15ns Jitter
- Synchronisation with Phase shift

Ballistics, combustion, flow visualization, PIV, etc



### Memrecam GX1 & GX3

- Mega Pixel Resolution 1280 x 1024
- 2000 fps full res
- 200k fps
- 1u sec shutter
- ISO 5,000 colour; ISO20,000 Mono
- HyGe / none HyGe
- Affordable price

Car crash, airbag, welding, etc



### Memrecam GX5

- Upto EIGHT Heads per recorder
- Small, light camera heads (25mm Cube)
- 1000 fps
- HyGe
- 3 camera head options

On-Board, Crash & Sled testing

# OLYMPUS

Your Vision, Our Future

Nick Paris

UK High Speed Video Specialist

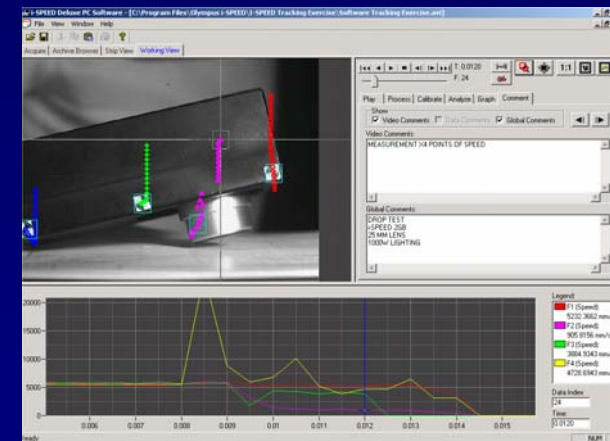
Range of cameras  
reaching 1,000,000 fps  
minimum shutter of 200ns



Ease of use  
Controller Display Unit  
Instant playback



Olympus software  
Auto tracking analysis  
External data logging



# Photo-Sonics International Ltd.

Leaders in specialised instrumentation products.

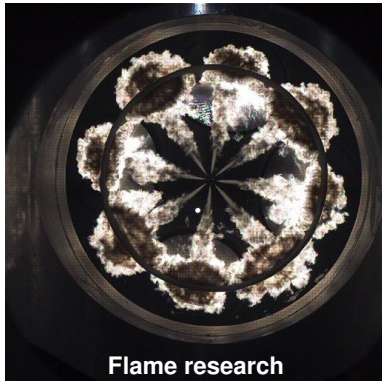
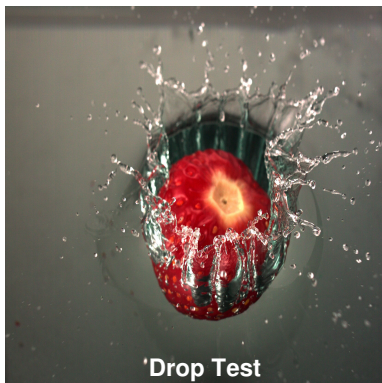


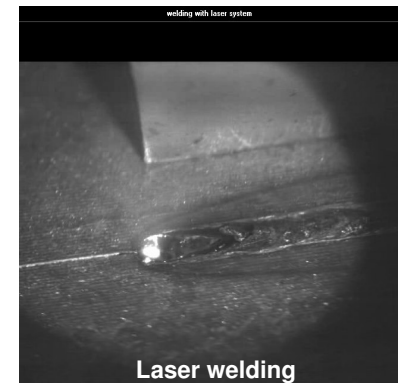
Image Analysis software



Rugged, light weight and portable



Standard and intensified cameras  
Up to 5000FPS at full resolution  
Fast and reliable Ethernet interfaces





# High Speed Imaging Showcase

NPL, 23 November 2010

## High-Speed Imaging Cameras for Research and Development in the field of Experimental Mechanics

With more than 30 years experience designing and manufacturing high speed imaging systems for research and industry, Photron has become known for the performance, reliability and ease of use of it's products, backed up by excellent support in Europe and overseas.

In addition to capture of high quality images Photron cameras can also be integrated with 3<sup>rd</sup> party software and hardware and used with measurement techniques such as Motion Analysis and Digital Image Correlation (DIC)

Photron

1024 x 1024

FASTCAM-1024PCI ... 1000 fps

frame : -252

1/10000 sec

### Applications:

- Automotive Safety Testing
- Split Hopkinson Bar Tests
- Dynamic Tensile Testing
- Drop testing
- Impact Tests
- Ballistics
- Vibration analysis
- Material Characterisation

Fastcam SA-X *New for 2011*  
Worlds highest performance system



1 Mega Pixel  
@ 10,000fps

w w w . p h o t r o n . c o m



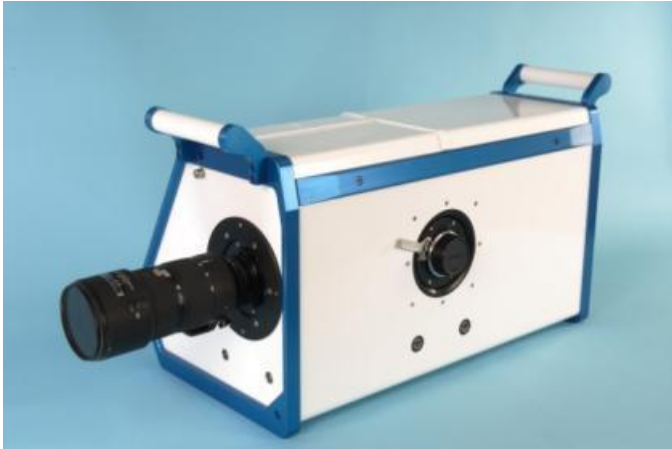
### Products:

- Fastcam SA3  
– 1024 x 1024 pixels @ 2,000fps
- Fastcam SA4  
– 1024 x 1024 pixels @ 3,600fps
- Fastcam SA1  
– 1024 x 1024 pixels @ 5,400fps
- Fastcam SA5  
– 1024 x 1024 pixels @ 7,000fps
- Fastcam SA2  
– 2048 x 2048 pixels @ 1,080fps
- Fastcam MC2  
– 512 x 512 pixels @ 2,000fps



# British Society for Strain Measurement (BSSM) Showcase on High Speed Imaging and Application to Strain Measurement

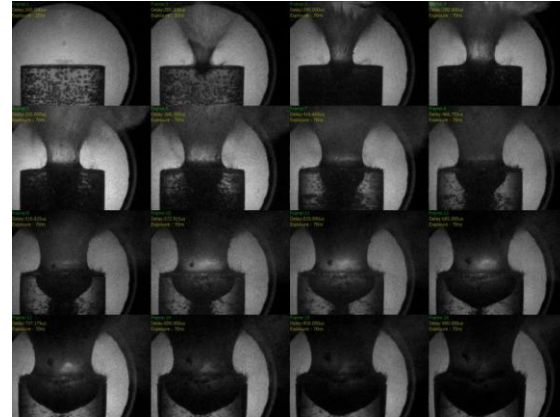
## Ultra High Speed Imaging Systems



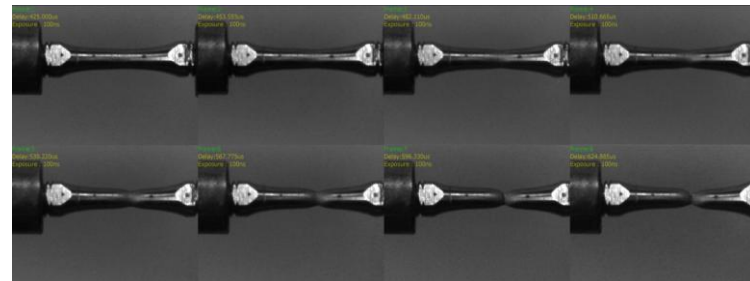


# Framing Cameras

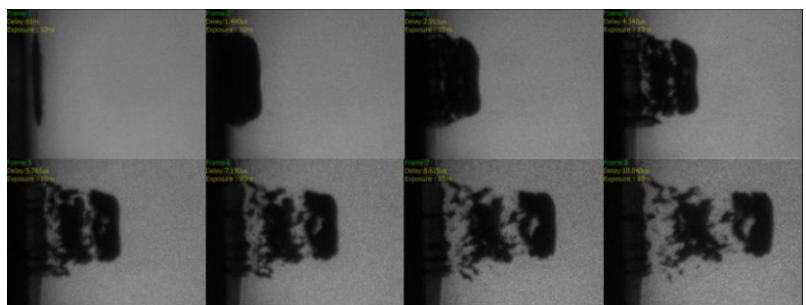
- 330Mfps with 3ns gating
- 1380(H)x1024(V) resolution with 12 bit dynamic range
- Up to 16 optical channels
- Up to 32 images (double shot mode)
- Intensifier uses highly efficient P43 phosphor or fast decay P46 phosphor
- Typical system resolution >50lp/mm
- Innovative beam splitter design
  - Uniform resolution across X and Y axis
  - No parallax or shading
  - f2.8 aperture
- Auxiliary optical port for interfacing HS Video, streak camera or spectral-analyzer.
- Laptop computer control via standard Ethernet
- All metal construction, RFI/EMI and CE approved



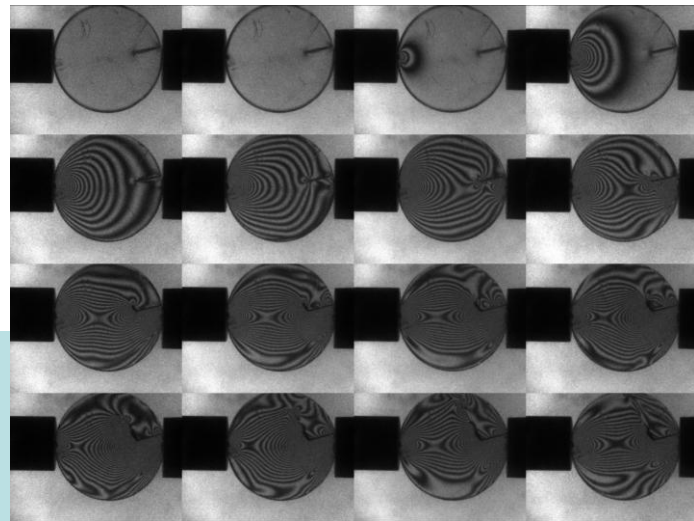
**Application:** Hypervelocity Impact. Projectile travelling at 1000m/s  
**Exposure:** 70ns  
**Interframe:** 40µs



**Application:** Material Research  
**Exposure:** 100ns  
**Interframe:** 28.55µs



**Application:** Ejection of spalled layers from laser shock-loaded metals  
**Exposure:** 10ns  
**Interframe:** 1.425µs



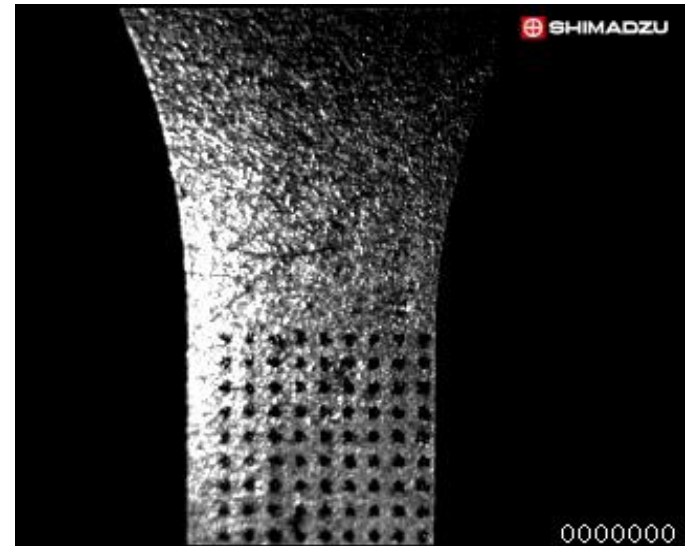
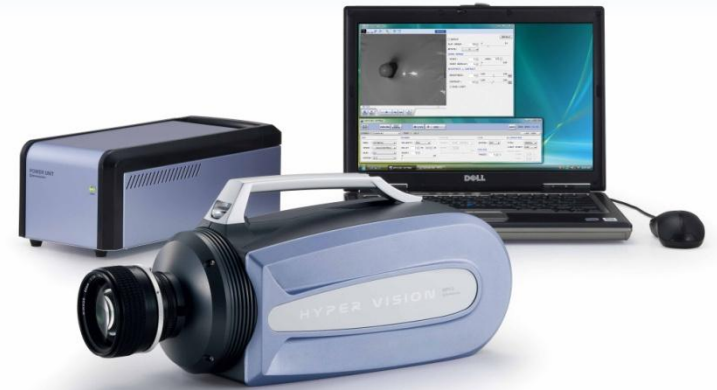
**Application:** Hopkinson Bar experiment to study crack propagation  
**Exposure:** 100ns  
**Interframe:** 7.5µs



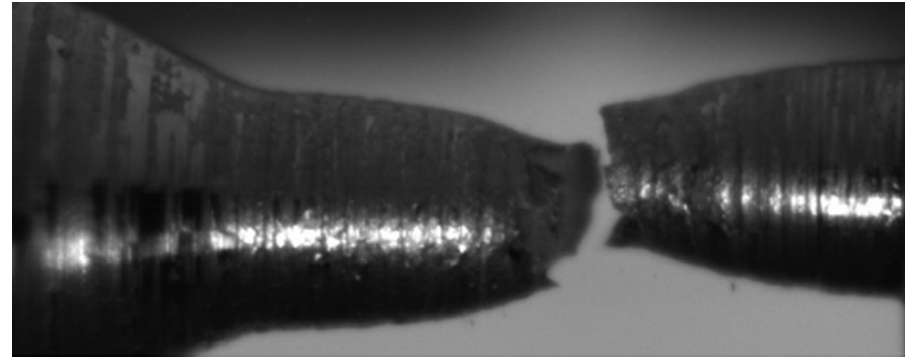
# Speyer Photonics Ltd.

## HPV-2 Ultra high speed video camera

- Up to one million frames per second at full resolution
- Peltier cooled ISIS CCD sensor (312 x 260 pixels)
- 250 nanosecond exposure time
- Rolling memory with pre and post trigger
- Synchronised recording for up to 4 cameras







**V710 – 1.4M picture/second  
300nS exposure**

**V12.1 – 1.0M picture/second  
300nS exposure**

