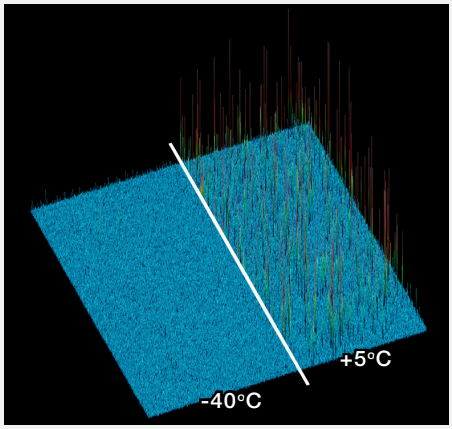
Neo 5.5 sCMOS

5.5 Megapixel, -40ºC, 1 e⁻ Noise
Rolling and Global Shutter
Scientific CMOS

ANDOR
an Oxford Instruments company



-40ºC Vacuum Cooling

- ✓ **Lowest dark current**
- ✓ **Lowest hot pixels**
- ✓ **Fan-off capability**

Features and Benefits

- **TE cooling to -40°C**
  Minimization of dark current and pixel blemish
- **1 e⁻ read noise**
  Lower detection limit than any CCD
- **5.5 megapixel sensor format and 6.5 µm pixels**
  Extremely sharp resolution over a 22 mm field of view: Ideal for cell microscopy and astronomy
- **Rolling and Global (Snapshot) shutter**
  Maximum flexibility across all applications
- **Rapid frame rates**
  Sustained: 30 fps full frame
  Burst: 100 fps full frame
- **Dual-Gain amplifiers**
  Extensive dynamic range of 30,000:1 @ 30 fps
- **UltraVac™** [•1]
  Sustained sensor protection and unequalled cooling with 5 year warranty
- **ROI and pixel binning**
  User-defined ROI (1 pixel granularity) and hardware binning
- **NEW GPU Express**
  Simplify and optimize data transfers from camera to Graphical Processing Unit (GPU) card to facilitate accelerated GPU processing as part of the acquisition pipeline.
- **4 GB on-head memory**
  Acquire data bursts at frame rates faster than PC write speed
- **Dynamic Baseline Clamp**
  Ensures quantitative stability
- **Software Exposure Events**
  Rapid software notification via SDK of start / end of exposure synchronization
- **iCam**
  Fast exposure switching
- **Fan-off capability**
  Turn off fan for extended periods for zero vibration

Vacuum cooled Scientific CMOS with 1 e⁻ read noise - Rolling and Snapshot exposure

In a unique -40°C vacuum cooled platform, loaded with FPGA intelligence, Andor's Neo 5.5 sCMOS camera is designed exclusively to drive highest possible sensitivity from this exciting and innovative new technology development.

Unlike any CMOS or CCD technology to come before it, Neo 5.5 sets radical new benchmarks in its unique ability to simultaneously deliver highest specifications in sensitivity, resolution, speed, dynamic range and field-of-view: true scientific imaging, without compromise. Choice of Rolling and Global (Snapshot) exposure mechanisms ensure maximum application flexibility, the latter providing a 'freeze frame' capture capability that emulates that of an interline CCD.

Specifications Summary [•2]

Active pixels (W x H)	**2560 x 2160 (5.5 Megapixel)**
Sensor size	**16.6 x 14.0 mm (21.8 mm diagonal)**
Pixel size (W x H)	**6.5 µm**
Pixel well depth (typical)	**30,000 e⁻**
Pixel readout rate (MHz)	**560, 200**
Read noise (min)	**1 e⁻**
Maximum cooling	**-40°C**
Maximum burst frame rate	**100 fps @ full frame**
Readout Modes	**Rolling and Snapshot shutter**

System Specifications[*2]

Sensor type	Front Illuminated Scientific CMOS	
Active pixels (W x H)	2560 x 2160 (5.5 Megapixel)	
Sensor size	16.6 x 14.0 mm, 21.8 mm diagonal	
Pixel size (W x H)	6.5 µm	
Pixel readout rate (MHz)	560 (280 MHz x 2 sensor halves) 200 (100 MHz x 2 sensor halves)	
Read noise (e-) Median [rms] [*3]	**Rolling Shutter**	**Global Shutter**
200 MHz	1.0 [1.5]	2.3 [2.6]
560 MHz	1.3 [1.7]	2.5 [2.8]
Minimum temperature air cooled [*4] **Minimum temperature coolant**	-30ºC -40ºC	
Dark current, e-/pixel/sec [*5]		
@ -30°C	0.015	
@ -40°C	0.007	
Data range	12-bit and 16-bit	
Peak Quantum Efficiency	60 %	
Readout modes	Rolling Shutter and Global (Snapshot) Shutter	
System window type	UV-grade fused silica, 'Broadband VUV-NIR', unwedged	
Internal memory buffer size	4 GB	
Maximum burst frame rates		
2560 x 2160 (full frame)	100 fps Rolling Shutter, 49 fps Global (Snapshot) Shutter	
128 x 128 ROI	1,639 fps Rolling Shutter, 716 fps Global (Snapshot) Shutter	
Pixel well depth (e-)	30,000	

Advanced Performance Specifications[*2]

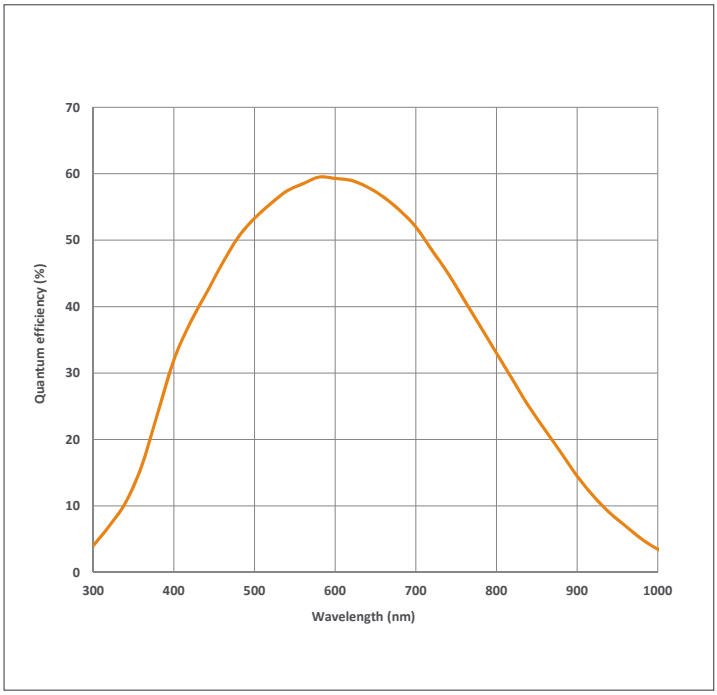
Maximum dynamic range	30,000:1
Linearity (%, maximum) [*6]	Better than 99%
MTF (Nyquist @ 555 nm)	45%
Photon Response Non-Uniformity (PRNU)	< 0.5%
Pixel binning	Hardware binning: 2 x 2, 3 x 3, 4 x 4, 8 x 8
Pre-defined Region of Interest	2560 x 2160, 2048 x 2048, 1920 x 1080, 512 x 512, 128 x 128
User defined ROI granularity	1 pixel *
I/O	External Trigger, Fire, Fire n, Fire All, Fire Any, Arm
Trigger modes	Internal, External, External Start, External Exposure, Software Trigger
System Exposure Events[*7]	Start / End exposure (row 1), Start / End exposure (row n)
Hardware timestamp accuracy	25 ns
Anti-blooming factor	x 10,000

* Minimum ROI size possible is as follows: 16 x 12 in 12-bit mode and 12 x 12 in 16-bit mode.

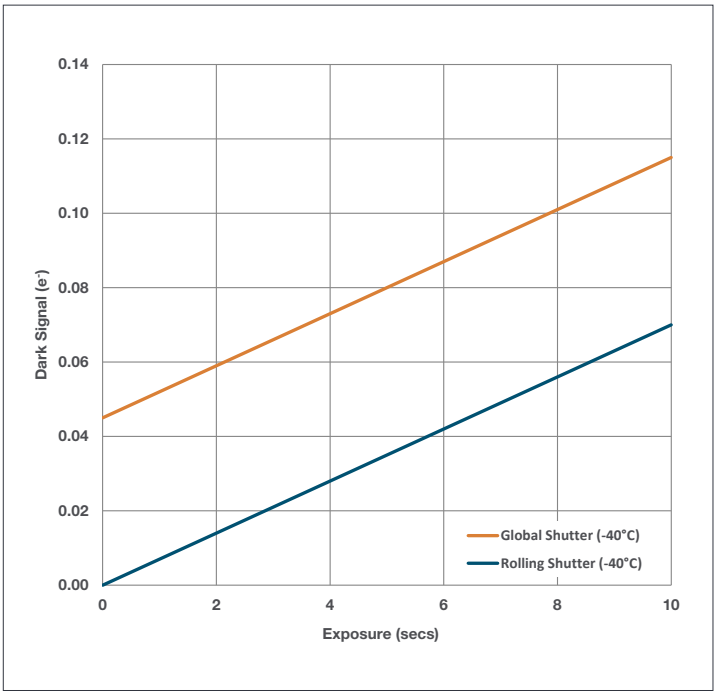
Maximum Frame Rate Table[*8]

Array Size	Cameralink - 3-tap		Burst to 4 GB Internal Memory	
	Rolling Shutter	Global (Snapshot) Shutter	Rolling Shutter	Global (Snapshot) Shutter
2560 x 2160 (full frame)	**30**	**30**	**100**	**49**
2048 x 2048	**39**	**39**	**105**	**52**
1920 x 1080	**79**	**79**	**199**	**97**
1392 x 1040	**115**	**101**	**206**	**101**
512 x 512	**374**	**201**	**419**	**201**
128 x 128	**1,470**	**716**	**1,639**	**716**

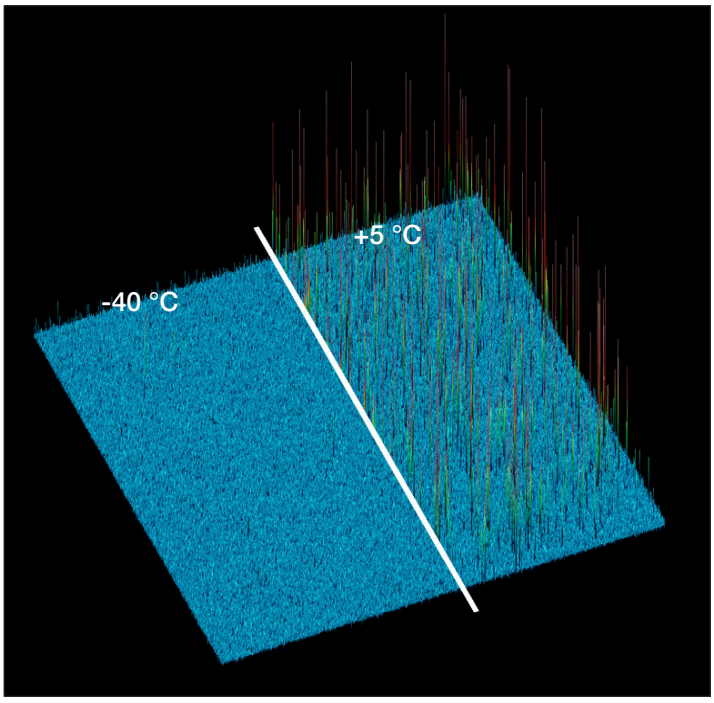
Quantum Efficiency (QE) Curve[9]



Dark Signal vs Exposure Time (Rolling and Global Shutter Modes)[10]

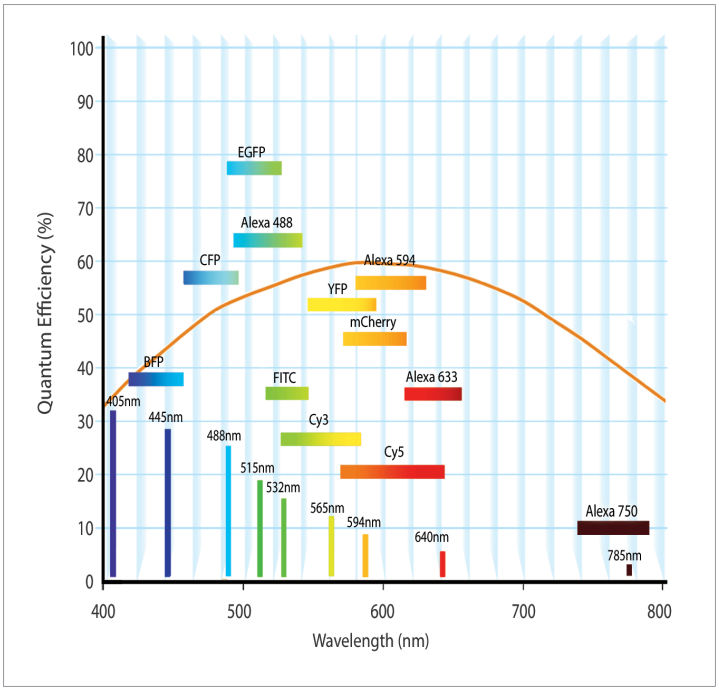


Hot Pixels vs Cooling Temperature



Comparison of hot pixel blemishes at cooling temperatures of +5°C and -40°C @ 1s exposure time; rolling shutter readout mode.

QE vs Fluorophore Emissions



Creating The Optimum Product for You

Step 1. Select the camera type and required mounting option

Camera Type & Mounting

Camera Description	Lens Mount	Part Code
Neo 5.5 Megapixel sCMOS with 3-tap Camera Link	C-mount	**NEO-5.5-CL3**
Neo 5.5 Megapixel sCMOS with 3-tap Camera Link	F-mount	**NEO-5.5-CL3-F**

Step 2. Select an alternative camera window (optional)

Camera Window

The standard window has been selected to satisfy most applications. However, other options are available. The alternative camera window code must be specified at time of ordering.

To view and select other window options please refer to the '**Camera Windows Supplementary Specification Sheet**' which gives the transmission characteristics, product codes and procedure for entering the order. Further detailed information on the windows can be found in the Technical note – **'Camera Windows: Optimizing for Different Spectral Regions'**.

Step 3. Select the required accessories and adapters

Accessories & Adapters

Description	Order Code
Re-circulator for enhanced cooling performance	**XW-RECR**
Oasis 160 Ultra compact chiller unit	**ACC-XW-CHIL-160**
C-mount to Nikon F-mount adapter	**OA-CNAF**
C-mount to Olympus F-mount adapter	**OA-COFM**
C-mount to T-mount adapter	**OA-CTOT**
Auto extension tubes (set of 3) for Canon AF	**OA-ECAF**
Auto extension tubes (set of 3) for C-mount	**OA-ECMT**
OA-ENAF Auto extension tubes (set of 3) for Nikon AF	**OA-ENAF**
5 meter Camera Link connector cable.	**ACC-ASE-02992**
10 meter active Camera Link connector cable, including power supply.	**ACC-ASE-06931**
30 meter fibre-optic extender solution for use with Neo 5.5	**ACC-NEOFOX-3TAP-30M**
100 meter fibre-optic extender solution for use with Neo 5.5	**ACC-NEOFOX-3TAP-100**
PC Workstation for up to 100 fps continuous spooling to hard drives, acquiring up to 120,000 12-bit full resolution images: Dell T7910XL, 2.6 GHz Eight Core, 8 GB RAM, 4 x 250GB SSD hard drive configured in RAID 0.	**WKST-1 WIN**
PC Workstation for up to 100 fps continuous spooling to RAM, acquiring up to 6,000 12-bit full resolution images: Dell T5810, 3.5 GHz Quad Core, 64 GB RAM.	**WKST-3 WIN**

For further information on PC workstations for the Neo, please refer to the technical note PC Specifications for sCMOS

Step 4. Select the required software

Software

The Neo 5.5 also requires at least one of the following software options:

Solis Imaging A 32-bit and fully 64-bit enabled application for Windows (XP, Vista, 7 and 8) offering rich functionality for data acquisition and processing. AndorBasic provides macro language control of data acquisition, processing, display and export.

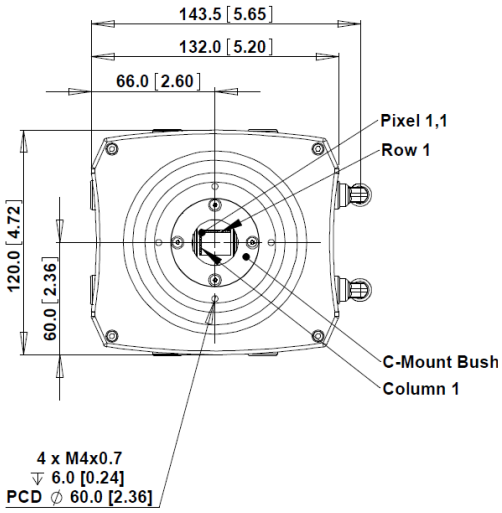
Andor iQ A comprehensive multi-dimensional imaging software package. Offers tight synchronization of camera with a comprehensive range of microscopy hardware, along with comprehensive rendering and analysis functionality. Modular architecture for best price/performance package on the market. Compatible with 32-bit Windows (XP, Vista, 7 and 8).

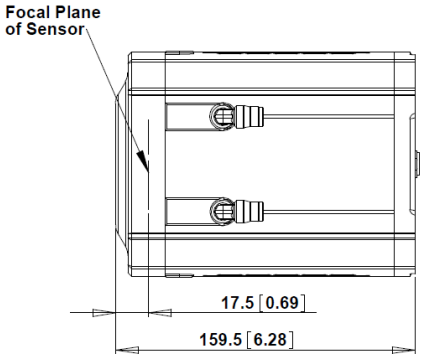
Andor SDK3 Andor's 32-bit and 64-bit Software Developers Kit DLL allows you to control Andor sCMOS cameras from your own application. Available for 32-bit and 64-bit Windows (XP, Vista, 7 and 8) and Linux.

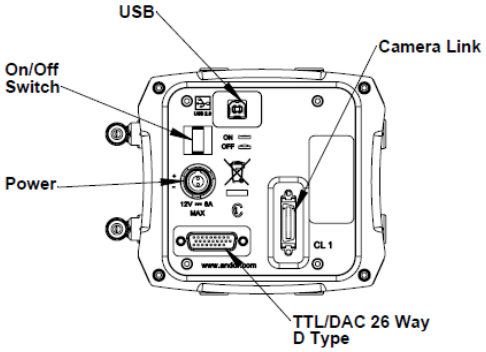
GPU Express Andor GPU Express library has been created to simplify and optimize datatransfers from camera to a CUDA-enabled NVidia Graphical Processing Unit (GPU) card to facilitate accelerated GPU processing as part of the acquisition pipeline. Integrates easily with Andor SDK3 for Windows.

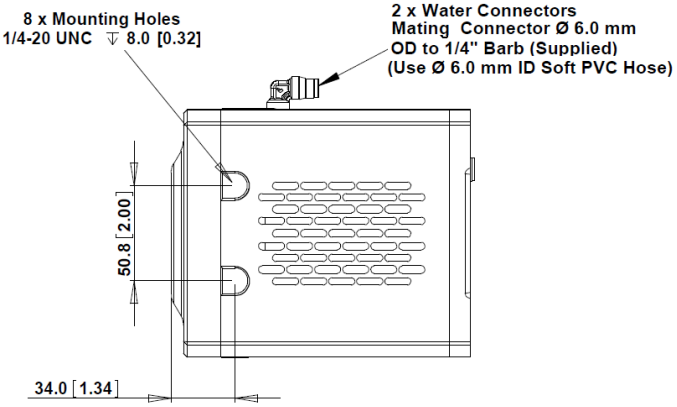
Product Drawings

Dimensions in mm [inches]
Weight: 3.4 kg [7 lb 8 oz]









Connecting to the Neo 5.5

Camera Control
Connector type: 3 meter Camera Link 3-tap (longer cable lengths available as accessories).

TTL / Logic
Connector type: 26 way D Type with TTL I/Os for External Trigger, Fire Pulse and Arm

Firmware updates through USB

Minimum cable clearance required at rear of camera 90 mm

Regulatory Compliance

Compliant with the requirements of the EU EMC and LV Directives through testing to EN 61326-1 and EN 61010-1

External power supply PSE-approved

26-way D-type pinouts

1	External Trigger
2	Reserved
3	GND
4	Reserved
5	Reserved
6	GND
7	Reserved
8	Fire
9	AUX_OUT_1
10	Reserved
11	Reserved
12	Reserved
13	Reserved
14	Reserved
15	Reserved
16	Reserved
17	Reserved
18	GND
19	+5V Output
20	GND
21	Reserved
22	Reserved
23	AUX_OUT_2
24	Arm
25	GND
26	GND

*Aux_Out_1 is configurable as Fire, Fire n, Fire All or Fire Any. Refer to the Neo 5.5 hardware manual.

Order Today

Need more information? At Andor we are committed to finding the correct solution for you. With a dedicated team of technical advisors, we are able to offer you one-to-one guidance and technical support on all Andor products. For a full listing of our regional sales offices, please see: andor.com/contact

Our regional headquarters are:

Europe
Belfast, Northern Ireland
Phone +44 (28) 9023 7126
Fax +44 (28) 9031 0792

Japan
Tokyo
Phone +81 (3) 6732 8968
Fax +81 (3) 6732 8939

North America
Concord, USA
Phone +1 (860) 290 9211
Fax +1 (860) 290 9566

China
Beijing
Phone +86 (10) 8271 9066
Fax +86 (10) 8271 9055

Items shipped with your camera

1x Camera Link card and 3 meter connector cable.
1x Andor ACZ-02991: 3m Multi I/O timing cable, offering External Trigger, Arm, Fire, Aux_Out_1 and Aux_Out_2
1x 3m USB 2.0 cable Type A to Type B
1x Power supply with mains cable
1x Quick launch guide
1x CD containing Andor user guides
1x Individual system performance sheet

Footnotes: Specifications are subject to change without notice

1. Assembled in a state-of-the-art Class 1,000 clean room facility, Andor's UltraVac™ vacuum process combines a permanent hermetic vacuum seal (no o-rings), with a stringent protocol to minimize out-gassing, including use of proprietary materials. Outgassing is the release of trapped gases that would otherwise prove highly problematic for sensor longevity.
2. Figures are typical unless otherwise stated.
3. Readout noise is defined as the median over the sensor area excluding any regions of blemishes. It is a combination of sensor readout noise and A/D noise.
4. Specified minimum air cooled temperature assumes ambient temperature of 25°C. Specified minimum temperature with coolant assumes coolant temperature of 16°C.
5. Dark current measurement is taken as a median over the sensor area excluding any regions of blemishes in Rolling Shutter mode.
6. Linearity is measured from a plot of Signal vs. Exposure Time over the full dynamic range.
7. Software Exposure Events provide rapid software notification (SDK only) of the start and end of acquisition, useful for tight synchronization to moving peripheral devices e.g. Z-stage.
8. Maximum speed at which the camera can acquire images at full resolution and a range of sub-array sizes. The tables present (a) frame rates which can be sustained until the limit imposed by the storage capacity; (b) frame rates achieved during burst to 4 GB on-head camera memory. Note that the write speed of hard drive and additional processing overheads can impact these figures. See technical note entitled *'PC Specifications for sCMOS'* for further detail on speed tests, PC recommendations and sustained acquisition performance.
9. Quantum efficiency of the sensor at 20°C as supplied by the sensor manufacturer.
10. Total darksignal in Global Shutter mode carries an additional fractional fixed 'Global Shutter Darksignal' (GSD) contribution that is imposed during readout and is therefore independent of exposure time. GSD is equal to 0.11 e⁻ @ -30°C; 0.045 e⁻ @ -40°C. Darksignal for a given exposure time in Global Shutter mode is thus calculated by (dark current x exposure) + GSD. GSD represents the offset between the two curves shown for -40°C.

OXFORD INSTRUMENTS
The Business of Science®

Minimum Computer Requirements:

- 2.4 GHz Quad Core + 4 GB RAM (1600MHz DDR3)
- Hard drive: Minimum 250 MB/sec continuous write for Spooling
- PCIe x4 slot for Frame Grabber card
- Windows (7 or 8) or Linux
- USB 2.0 (for future firmware upgrades): Intel 82801 (or equivalent) I/O controller hub to provide interface for USB 2.0

* Refer to technical note: '*PC Specifications for sCMOS*'
** Note: Andor supply PC workstations for Neo, see page 4

Operating and Storage Conditions

- Operating Temperature: 0°C to 40°C ambient
- Relative Humidity: <70% (non-condensing)
- Storage Temperature: -25°C to 55°C

Power Requirements

- 100 - 240 VAC, 50 - 60 Hz
- Power Consumption:
  Camera alone (Typ./Max): 30 W/60 W
  Camera and external PSU (Typ./Max): 34 W/71 W

Project part financed by the European Regional Development Fund under the European Sustainable Competitiveness Programme for Northern Ireland.