Newton SY
High Energy Spectroscopy
Light Tight, -100°C
Direct Detection

Features and Benefits

- ‘Standalone’ Beryllium window
  200 µm thick Beryllium foil window as standard
- TE cooling down to -100°C
  Critical for elimination of dark current
- UltraVac™
  Critical for sustained vacuum integrity and to maintain unequalled cooling, year after year
- Hermetic vacuum seal
  Maximum protection of sensor QE performance over time, no inconvenient sensor chamber maintenance
- Multi-Megahertz readout
  High repetition rates achievable with low noise electronics
- Down to 13.5 x 13.5 µm pixel size
  Optimal balance of dynamic range and resolution
- Crop mode operation
  Specialized acquisition mode for continuous imaging with fast temporal resolution
- USB 2.0 connection
  USB plug and play – no controller box
- Enhanced baseline clamp
  Quantitative accuracy of dynamic measurements
- Software-selectable pre-amplifier gain
  Choice of best SNR performance or dynamic range at the touch of a button
- Software Development Kit (SDK)
  Ease of control integration into complex setups: Linux, Matlab, Labview, Visual Basic or C/C++
- Integrated in EPICS
  Platform is fully integrated into the EPICS control software

‘Standalone’ Soft X-Ray Spectroscopy @ -100°C

Andor’s Newton SY series features high-QE sensors ideal for direct detection of low flux and low energy photons such as soft X-Rays. A convenient thin Beryllium foil window blocks visible wavelengths with minimal ‘Beam Hardening’ of X-Ray energies. The maintenance free vacuum design allows for long exposures at the highest sensitivity. Variable readout rates enable data readout at up to 3 Megahertz, through the plug and play USB interface.

The camera utilizes a 1024 x 255 (1024 x 256 for BR-DD model) or 2048 x 512 array of 26 x 26 µm or 13.5 x 13.5 µm pixels, with thermoelectric cooling down to -100°C, resulting in negligible dark current and provides unrivalled performance for spectroscopic applications.

Specifications Summary

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active pixels</td>
<td>1024 x 255 (1024 x 256 for BR-DD model) or 2048 x 512</td>
</tr>
<tr>
<td>Pixel size (W x H)</td>
<td>26 x 26 or 13.5 x 13.5 µm</td>
</tr>
<tr>
<td>Image area</td>
<td>Up to 27.6 x 6.9 mm</td>
</tr>
<tr>
<td>Register well depth</td>
<td></td>
</tr>
<tr>
<td>Standard mode</td>
<td>1,000,000 e-</td>
</tr>
<tr>
<td>High Capacity mode</td>
<td>600,000 e-</td>
</tr>
<tr>
<td>High Sensitivity mode</td>
<td>150,000 e-</td>
</tr>
<tr>
<td>Maximum cooling</td>
<td>-100°C</td>
</tr>
<tr>
<td>Maximum spectra rate</td>
<td>1,612 spectra/sec</td>
</tr>
<tr>
<td>Read noise</td>
<td>2.5 e-</td>
</tr>
<tr>
<td>Dark current</td>
<td>As low as 0.0001 e/pixel/sec</td>
</tr>
<tr>
<td>Beryllium foil thickness</td>
<td>200 µm</td>
</tr>
</tbody>
</table>

Photon Energy | 10eV | 100eV | 1keV | 10keV | 100keV |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Soft X-rays</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hard X-rays</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

YEAR VACUUM WARRANTY
# System Specifications

<table>
<thead>
<tr>
<th>Model number</th>
<th>DY920P</th>
<th>DY920P BR-DD</th>
<th>DY940P</th>
</tr>
</thead>
</table>
| Sensor options | • BN: Back Illuminated CCD  
• Fi: Front Illuminated CCD | • BR-DD: Back Illuminated, Deep Depletion CCD | • BN: Back Illuminated CCD  
• Fi: Front Illuminated CCD |
| Active pixels | 1024 x 255 | 1024 x 256 | 2048 x 512 |
| Pixel size | 26 x 26 μm | 26 x 26 μm | 13.5 x 13.5 μm |
| Image area | 26.7 x 6.7 mm  
with 100% fill factor | 26.7 x 6.7 mm  
with 100% fill factor | 27.6 x 6.9 mm  
with 100% fill factor |
| Minimum temperatures | -80°C  
-95°C  
-100°C | -80°C  
-95°C  
-100°C | -80°C  
-95°C  
-100°C |

# Advanced Performance Specifications

<table>
<thead>
<tr>
<th>Dark current, e/pixel/sec @ max cooling</th>
<th>BN</th>
<th>BR-DD</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard mode</td>
<td>0.0002</td>
<td>-</td>
<td>0.00003</td>
</tr>
<tr>
<td>High Sensitivity mode</td>
<td>0.0003</td>
<td>-</td>
<td>0.0001</td>
</tr>
<tr>
<td>High Capacity mode</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Register well depth</th>
<th>BN</th>
<th>BR-DD</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard mode</td>
<td>1,000,000 e-</td>
<td>1,000,000 e-</td>
<td>-</td>
</tr>
<tr>
<td>High Sensitivity mode</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>High Capacity mode</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Read noise (e-)</th>
<th>50 kHz</th>
<th>1 MHz</th>
<th>3 MHz</th>
<th>50 kHz</th>
<th>1 MHz</th>
<th>3 MHz</th>
<th>50 kHz</th>
<th>1 MHz</th>
<th>3 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard mode:</td>
<td>4 (8)</td>
<td>12 (18)</td>
<td>17 (25)</td>
<td>4 (8)</td>
<td>12 (18)</td>
<td>17 (25)</td>
<td>2.5 (4)</td>
<td>7 (12)</td>
<td>11 (15)</td>
</tr>
<tr>
<td>High Sensitivity mode:</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>9 (12)</td>
<td>27 (32)</td>
<td>37 (50)</td>
</tr>
<tr>
<td>High Capacity mode:</td>
<td>Adjustable from 2.5 - 10</td>
<td>Adjustable from 2.5 - 10</td>
<td>Adjustable from 1 - 4</td>
<td>Adjustable from 4 - 16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sensitivity (e-/count)</th>
<th>Standard mode</th>
<th>High Sensitivity mode</th>
<th>High Capacity mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard mode:</td>
<td>Adjustable from 2.5 - 10</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>High Sensitivity mode:</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>High Capacity mode:</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vertical clock speed</th>
<th>Software selectable between 2 - 179 µs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linearity</td>
<td>Better than 99%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Digitization</th>
<th>16-bit</th>
</tr>
</thead>
</table>
Quantum Efficiency Curves

![Quantum Efficiency Curves Graph]

Key:
- VUV: Vacuum Ultraviolet
- EUV: Extreme Ultraviolet
- XUV: Extreme Ultraviolet (X-ray)

For more information about Andor solutions for ‘indirect’ detection please go to [www.andor.com/scientific-cameras/high-energy-detection](http://www.andor.com/scientific-cameras/high-energy-detection)

Beryllium Foil Transmission

![Beryllium Foil Transmission Graph]

Andor gives 8% higher transmission @ 3 keV

Photoelectrons v Incident X-Rays
Creating The Optimum Product for You

**Step 1. Choose the sensor array size**

<table>
<thead>
<tr>
<th>Description</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1024 x 256 pixel array (BR-DD)</td>
<td>920</td>
</tr>
<tr>
<td>1024 x 255 pixel array (FL, BN)</td>
<td>920</td>
</tr>
<tr>
<td>2048 x 512 pixel array (FL, BN)</td>
<td>940</td>
</tr>
</tbody>
</table>

**Step 2. Choose the sensor type option**

<table>
<thead>
<tr>
<th>Sensor Type</th>
<th>Description</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>ccd</td>
<td>Back Illuminated CCD, with no AR coating</td>
<td>BN</td>
</tr>
<tr>
<td></td>
<td>Front Illuminated CCD</td>
<td>FI</td>
</tr>
<tr>
<td></td>
<td>Back Illuminated, Deep Depletion CCD with fringe suppression (920P only)</td>
<td>BR-DD</td>
</tr>
</tbody>
</table>

**Step 3. Select the required accessories and adapters**

<table>
<thead>
<tr>
<th>Accessories &amp; Adapters</th>
<th>Description</th>
<th>Order Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coolant re-circulator</td>
<td>for enhanced cooling performance</td>
<td>XW-RECR</td>
</tr>
<tr>
<td>Oasis 160 Ultra Compact Chiller Unit</td>
<td>(tubing to be ordered separately)</td>
<td>ACC-XW-CHIL-160</td>
</tr>
<tr>
<td>6 mm tubing options</td>
<td>for ACC-XW-CHIL-160 (2x2.5 m or 2x5 m lengths)</td>
<td>ACC-6MM-TUBING-2X2.5/ACC-6MM-TUBING-2X5M</td>
</tr>
<tr>
<td>USB Extender: Icron USB 2.0</td>
<td>Ranger 2201 (100 m) - EU/UK/US</td>
<td>ACC-USBX-EU ACC-USBX-UK ACC-USBX-US</td>
</tr>
<tr>
<td>30 m Ethernet cable</td>
<td>(for use with the above ACC-USBX-** USB extenders)</td>
<td>ACC-ELC-13295</td>
</tr>
</tbody>
</table>

**Step 4. Select the required software**

The Newton SY also requires at least one of the following software options:

**Solis Imaging** A 32-bit and fully 64-bit enabled application for Windows (7, 8, 8.1 and 10) offering rich functionality for data acquisition and processing. AndorBasic provides macro language control of data acquisition, processing, display and export.

**Andor SDK** A software development kit that allows you to control the Andor range of cameras from your own application. Available as 32/64-bit libraries for Windows (7, 8, 8.1 and 10), compatible with C/C++, C#, Delphi, VB.NET, LabVIEW and Matlab. Linux SDK compatible with C/C++.

**Have you found what you are looking for?**

**Need a square field of view?** Andor’s iKon-M SY 934 boasts a 13.3 x 13.3 mm active image area.

**Need to detect harder X-Rays?** Andor offers a range of Indirect Detection cameras (HH/HF range) that are compatible with industry-standard scintillators.

**Need a specific mounting?** Contact our experienced design team so we can make the perfect fit.

**Need a customized version?** Please contact us to discuss our Customer Special Request options.
Product Drawings
Dimensions in mm [inches]

Rear connector panel

Weight: 2.7 kg [5 lb 15 oz]

Best Practice Guidelines

✓ When not in use the window should be covered and protected.
✓ Not suitable for mounting to vacuum chamber.
✓ Handle the camera with care - due to the exposed nature of the window, damage can easily occur through mishandling or by contamination.
✓ If due to accident or misuse the window becomes contaminated, please contact Andor immediately for advice on cleaning.
✗ Avoid shock damage as the Beryllium foil window is very brittle. If the foil is broken there is a health risk. Please contact Andor for further information if required.

Connecting to the Newton SY

Camera Control
Connector type: USB 2.0

TTL / Logic
Connector type: SMB, provided with SMB - BNC cable
Fire (Output), External Trigger (Input), Shutter (Output)

I2C connector
Compatible with Fischer SC102A054-130
Shutter (TTL), I2C Clock, I2C Data, +5 Vdc, Ground

Minimum cable clearance required at rear of camera
90 mm

Applications Guide

✓ X-Ray Source Development
✓ X-Ray Plasma Diagnostics
✓ X-Ray Diffraction (XRD)
✓ X-Ray Fluorescence (XRF)
✓ X-Ray Spectroscopy
Newton SY
High Energy Spectroscopy
Light Tight, -100°C
Direct Detection

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: www.andor.com/contact

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Fax +44 (28) 9031 0792

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Fax +81 (3) 6732 8939

**North America**
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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:
- 1 x 2 m SMB-BNC connection cable
- 1 x 3 m USB 2.0 cable Type A to Type B
- 1 x PS-25 power supply with mains cable
- 1 x CD containing Andor user guides
- 1 x Individual system performance booklet

Footnotes:

1. **IMPORTANT**: Due to the Be window there is a limited warranty on the sensor. For full details of Andor’s Warranty Policy please refer to our webpage at http://www.andor.com/contact_us/support_request/. For key information on handling precautions for SY/HY systems, please refer to the Best Practice Guidelines on page 5. Note permanent damage can easily occur due to misuse.

2. Figures are typical unless otherwise stated.

3. Based on a 920 camera with a horizontal pixel readout rate of 3 MHz, a vertical shift speed of 12.9 μs and in crop mode for 20 Rows. Achievable spectral rates will vary with selected trigger mode.

4. Edge pixels may exhibit a partial response.

5. Stabilized cooling temperatures are given for slowest readout speed. Use of faster readout speeds (in order to achieve faster frame rates) may require a higher cooling temperature to be selected. Specified minimum air cooled temperature assumes ambient temperature of 25°C. Specified minimum temperature with coolant assumes coolant temperature of 10°C.

6. Dark current measurement is averaged over the CCD area excluding any regions of blemishes.

7. Readout noise is for the entire system and is taken as a mean over the sensor area excluding any regions of blemishes. It is a combination of sensor readout noise and A/D noise.

8. Linearity is measured from a plot of counts vs exposure time under constant photon flux up to the saturation point of the system.

9. Vertical speeds are software selectable. All sensors are designed to give optimum Charge Transfer Efficiency (CTE) at 12.9 μs (920 models) and 14.5 μs (940 models).

10. Quantum efficiency of the sensor at 20°C, as supplied by the sensor manufacturer.

11. The graph shows photoelectrons generated as a function of photon energy of incident X-Ray.

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**Minimum Computer Requirements:**
- 3.0 GHz single core or 2.4 GHz dual or quad core processor
- 2 GB RAM
- 100 MB free hard disc to install software (at least 1GB recommended for data spooling)
- USB 2.0 High Speed Host Controller capable of sustained rate of 40 MB/s
- Windows (7, 8, 8.1 and 10) or Linux

**Operating & Storage Conditions**
- Operating Temperature: 0°C to 30°C ambient
- Relative Humidity: < 70% (non-condensing)
- Storage Temperature: -25°C to 50°C

**Power Requirements**
- 100 - 240 VAC, 50 - 60 Hz
- Power consumption: 48W max

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Windows is a registered trademark of Microsoft Corporation. Labview is a registered trademark of National Instruments. Matlab is a registered trademark of The MathWorks Inc.