The LLTF Contrast is a non-dispersive tunable bandpass filter that transmits a single laser line while blocking unwanted lines. It delivers the highest signal throughput in the industry. Output pointing is very stable, removing the need to realign optical setup. It is also ideal as a premonochromator for triple spectrograph. The LLTF Contrast is compatible with any VIS-NIR broadband source, but is optimized to fit Fianium’s supercontinuum sources. Depending on the application, a series of options are available.

**TECHNICAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>CONTRAST VIS</th>
<th>CONTRAST SWIR</th>
<th>NEW CONTRAST X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spectral Range</td>
<td>400-1000 nm</td>
<td>1000-2300 nm (2500 nm optimal*)</td>
</tr>
<tr>
<td>Bandwidth (FWHM)</td>
<td>1.0 - 2.5 nm</td>
<td>2.0 - 5.0 nm</td>
</tr>
<tr>
<td>Out of Band Rejection**</td>
<td>&lt; -60 dB @ ± 40 nm</td>
<td>&lt; -60 dB @ ± 80 nm (measured up to 1.7 µm)</td>
</tr>
<tr>
<td>Maximum input average power</td>
<td>HP8 (up to 8W), HP20 (up to 20W)</td>
<td>HP8 (up to 8W), HP20 (up to 20W)</td>
</tr>
<tr>
<td>Peak Efficiency</td>
<td>typically around 65%</td>
<td></td>
</tr>
<tr>
<td>Optical Density (OD)</td>
<td>&gt; OD6 (measured at 1064 nm)</td>
<td></td>
</tr>
<tr>
<td>Damage Threshold</td>
<td>&lt; 5 GW/cm² peak power @ 1064 nm, 8 ns</td>
<td></td>
</tr>
<tr>
<td>Input Aperture Diameter</td>
<td>5 mm</td>
<td></td>
</tr>
<tr>
<td>Input Beam Divergence Requirement</td>
<td>FWHM</td>
<td></td>
</tr>
<tr>
<td>Wavelength Resolution (Relative)</td>
<td>FWHM / 8</td>
<td></td>
</tr>
<tr>
<td>Pointing Stability</td>
<td>&lt; 1 mm lateral displacement @ 1 m from filter</td>
<td></td>
</tr>
<tr>
<td>Scanning speed (multiple step)</td>
<td>45 ms stabilization time for 0.2 nm step, 55 ms stabilization time for 1 nm step, 60 ms stabilization time for 2 nm step, 65 ms stabilization time for 5 nm step, 70 ms stabilization time for 10 nm step</td>
<td></td>
</tr>
<tr>
<td>Operating System (OS)</td>
<td>Windows Vista (32 &amp; 64 bits), Windows 7 (32 &amp; 64 bits), Windows 8 (32 &amp; 64 bits)</td>
<td></td>
</tr>
<tr>
<td>Software</td>
<td>PHySpec™ included (SDK available)</td>
<td></td>
</tr>
<tr>
<td>Computer Connection</td>
<td>USB 2.0 (compatible 1.1)</td>
<td></td>
</tr>
<tr>
<td>Dimensions (L x W x H)</td>
<td>9” x 6.3” x 6.7”</td>
<td></td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>0 to 50°C</td>
<td></td>
</tr>
<tr>
<td>Power Supply</td>
<td>100 - 240 V, 50 - 60 Hz</td>
<td></td>
</tr>
</tbody>
</table>

**OPTIONS & ACCESSORIES**

- Enhance SWIR
- Fibered Output
- Storage Temperature
- Harmonic Filter
- Background Suppressor
- Alignment Kit (for free space)

**NOTE:** Photon etc reserves the right to change the design and specification of the product at any time, without notice.

**Enhance SWIR**

- N/A

**Fibered Output**

- 400-1000 nm

**Storage Temperature**

- 5°C to 40°C

**Harmonic Filter**

- Blocks the harmonics coming from the region 400-500 nm

**Background Suppressor**

- Removes unwanted reflections of light coming from the inside of the LLTF

**Alignment Kit (for free space)**

- In free-space (input/output) configuration, the alignment kit allows the user to rapidly find the correct alignment

**OUT OF BAND REJECTION**

- VIS
  - < -60 dB @ ± 40 nm
  - < -80 dB @ ± 60 nm
- SWIR
  - < -60 dB @ ± 80 nm (measured up to 1.7 µm)

**SPECTRAL RANGE**

- VIS-NIR broadband source
- SWIR
  - 800-1100 nm

**STANDARD PRODUCT**

- FWHM / 8

**TUNABLE BANDPASS FILTER**

- Transmits a single laser line while blocking unwanted lines

**HIGH RESOLUTION**

- 0.15 nm - 0.9 nm

Illustration of the out-of-band rejection of a volume holographic grating at λc = 632 nm. Bands of ±45 nm are presented and an out-of-band rejection of -60 dB is obtained.

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DETECTING BREAST CANCER CELLS USING GOLD NANOPARTICLES

Gold plasmonic nanoparticles (AuNPs) are used extensively as biomarkers, and are a viable candidate for a variety of other biological applications. However, it has been proven that their small size and the complex environment in which they navigate make their observation and characterization quite a challenge. In order to address this issue Patskovsky et al.¹ used a hyperspectral dark field microscope in backscattering configuration, replacing the usual white light illumination with a tunable laser source. With this set-up, the group of researchers was able to sweep the illumination over the range 400nm to 1000nm. The wide range of wavelengths and high output power of the source were essential parameters for this study. They could indeed follow the spatial position and distribution along the z axis of the AuNPs targeting CD44 (see figure 1), a cell surface receptor actively expressed in cancer stem cells. The hyperspectral imaging set-up described here can also be helpful in a wide range of biological applications requiring a combination of spatial and spectral information.

TESTING THE GEMINI PLANET IMAGER’S CORONAGRAPH

The Gemini Planet Imager (GPI) is an astronomical instrument made to detect giant planets in nearby star system. The GPI uses a coronagraph in order to eliminate 99% of the coherent starlight. Before sending the GPI at Gemini South (located in Chilean Andes), it was crucial to test the coronagraph by reproducing the experimental conditions in which it would serve. The light source required to measure its performances had to be nearly achromatic, tunable across the GPI’s wavelength domain (near-IR 0.95-2.4µm), in addition to being powerful and collimated. Most of the light sources match one or two of these requirements but only Photon etc’s unequalled and efficient tunable laser source combines all three above. The wide spectral range of the TLS and its high output power were exploited for sensitivity measurements of the imager. Figure 2 illustrates the sensitivity measurements of GPI’s coronagraph across the astronomical H band (1.50-1.80 µm). At the wavelengths it is most efficient (i.e. 1.60 and 1.65 µm), GPI’s coronagraph allows the detection of a source less than a million times fainter that the diffraction core of the unmasked star at a separation of only 0.35”. This would be sufficient to detect a planet only slightly more massive than Jupiter around a 100 million year old Sun-like star.

SOLAR CELL EXTERNAL QUANTUM EFFICIENCY MAPPING

In the race for higher solar cell efficiency, a better understanding of their fundamental electronic properties is paramount. With that in mind, Lombez et al.² investigated the spatial variations in the spectral response of CuInGa(S,Se)₂ solar cells. In this study, Photon etc’s TLS served as the illumination source for measurements of light beam induced current (LBIC) at different excitation wavelengths. The LBIC experiment allowed an estimation of the external quantum efficiency (EQE) at different positions of the sample (see figure 3). The LBIC measurements at enough positions on the sample allowed a map reconstruction of EQE. To carry out successfully this experiment, the illumination source needed both a wide spectral range and a high output power, delivered in a diffraction limited point source to achieve the best spatial resolution. Combining all of the above requirements, Photon etc’s TLS was chosen to excite the sample, mounted on a piezoelectric stage, to map the EQE for a large range of wavelengths.

[SOLAR CELL EXTERNAL QUANTUM EFFICIENCY MAPPING](#)