SPRAT on LT works from 4000 - 8000 Angstroms. This "https://topswiki.saao.ac.zaone-octave"https://topswiki.saao.ac.za range is the most one can get before order overlap in a non cross dispersed spectrograph.

A possible design option is to combine SHOC and SPRAT into one instrument. The following describes some testing of this concept on the Liverpool Telescope (LT) version of SPRAT.

Wavelength Range

On the afternoon of 2017 12 17 the 85mm f/1.8 Nikon camera lens on the LT SPRAT spectrograph was swapped for a 50mm f/1.4 lens. Both lenses are used wide open. This was to test what spectral range we could get on a smaller SHOC type EMCCD detector which has 1024 x 13 micron pixels as opposed to the current SPRAT iDus detector which has 1024 x 26 micron pixels.

The length of the SHOK detector would therefore correspond to 512 SPRAT pixels. This means we have to use a wider angle lens to capture the same wavelength range spectrum on a smaller physical length (half the size). The current 85mm lens actually on the SPRAT CCD has an unused portion on the left hand side, and it was calculated that the 50mm lens should "https://topswiki.saao.ac.zajust"https://topswiki.saao.ac.za work. This test is independent of the final collimator focal length chosen for the instrument, as the spectral range on the detector is just a function of the grating lines per mm, the camera focal length and the detector length.

Subsetting a region 512 pixels long (numbers 298-810) from the SPRAT detector with the 50mm lens and taking a Xenon arc we found the following 2nd order fit:

```
Mean dispersion    =    7.70 angstroms/channel
Start wavelength   = 4073.64 angstroms
End wavelength     = 8018.33 angstroms
Central wavelength = 6009.04 angstroms
```

	Line	Wavelength	Calculated Wavelength	Discrepancy	RMS if omitted
1	57.717	4500.980	4498.411	-2.569	3.411
2	74.249	4624.280	4622.838	-1.441	3.500
3	80.635	4671.230	4670.978	-0.252	3.534
4	88.689	4734.150	4731.747	-2.403	3.443
5	128.755	5027.280	5035.034	7.754	2.445
6	232.592	5823.890	5828.632	4.742	3.090
7	340.583	6668.920	6665.565	-3.354	3.335
8	348.130	6728.010	6724.497	-3.513	3.319
9	398.201	7119.600	7116.941	-2.659	3.424
10	457.434	7584.680	7584.477	-0.204	3.534
11	464.812	7642.020	7642.967	0.947	3.519
12	495.944	7887.400	7890.354	2.954	3.319

RMS error: 3.384 Angstroms

This can be tweaked slightly (e.g. to go from 4000 to 7950 Angstroms) by titling the camera slightly. A range of 3950 Angstroms is available, which basically meets the design requirement to cover one full octave.

Optical Quality

Comparisons of the extracted arcs using either lens show essentially identical optical quality:

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The 50mm lens version looks slightly softer in images, but remember the pixel sampling is half what it would be using the SHOK camera, so its not really a fair comparison.

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