Is pulsating subdwarf O SDSSJ160043.6+074802.9 a compact binary?

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Preface

Humanity has been studying the stars for a very long time, and we now know quite a lot about them. For example the power source of most stars is well known: usually hydrogen (or heavier elements) fusing in the core or sometimes in a shell. But one of the gaps in our knowledge is power source for the subdwarf O stars. And this is not the only unanswered question about sdO stars; their formation history, structure and composition are largely unknown. That is why SDSSJ160043.6+074802.9 is such an interesting object; it is a pulsating star. This trait can learn us a lot about the interior of this star using asteroseismology. Spectroscopy revealed SDSSJ160043.6+074802.9 to be a sdO star and a main sequence companion. The relation with this secondary star is also interesting; it is possible that sdO stars are formed by binary evolution. My bachelor research focused on determining if the orbital period of the two stars is in the order of a few hours. As by-product I identified different elements that reside in the atmosphere of the two stars.

Acknowledgements

First of all thanks to Conny Aerst for the fantastic lectures about Astroseismology, giving me a head start understanding all the interesting papers about the pulsating subdwarfs. Thanks to Pim Schellart for the help with some Python programming, the creators of IRAF, IRAF-Group at NOAO, and MOLLY, Tom Marsh, for the very useful software. For the collected data, time to answer my questions and the excellent guidance during this project, thanks to Gijs Nelemans.

Contents

1 Introduction

1.1 Stars and their formation.

A star is an object that is bound by self-gravity and has an internal energy source. This energy source is usually nuclear fusion in the core of the star, and because of self-gravity the star is (almost) always spherical. The most important parameter is the (initial) mass of a star, which ranges between 0.3 and 120 solar masses ($M_\odot$). The mass and to a lesser extent the composition of a star determine the radius, luminosity, surface temperature, density and pressure. Important time scales to changes in these variables are the dynamical time scale (basically the free-fall time from the surface of the star) indicates how fast the star can change it's radius, which is in the order of a 1000 seconds. The thermal time scale is defined as the internal energy divided by the luminosity, which can be seen as the time it takes to radiate away all potential energy upon contracting. For the sun this is about 30 million years, still much shorter than the lifetime of a star. The lifetime of a star is in the order of the nuclear time scale: $\epsilon Mc^2/L$: the time it takes to radiate away all energy produced by nuclear fusion. This results in lifetimes of star in the order of billion years ($10 \cdot 10^9$ year for the Sun). The evolution of a star can be describe best by looking at a

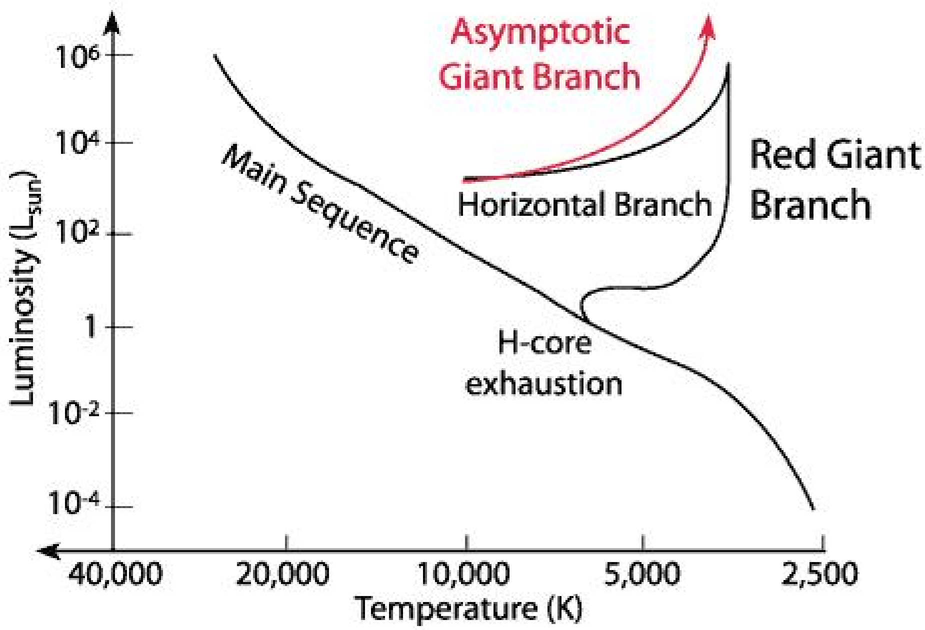


Figure 1: Schematic HRdiagram, the evolutionary path of a $1M_\odot$ is shown, credit NOAO.

Herzsprung-Russel diagram (HR diagram). This is a graph which plots $log(L)$ versus $-log(T_{eff})$, see figure[1] 1 and 2. Lets start a the beginning of a stars life: a cloud of hydrogen and helium gas with some metals[2] that contracts. If the object is heavier than $\sim 0.3 M_{\odot}$ it will start to fuse hydrogen in its core. Core hydrogen fusing stars are called Main Sequence (MS) stars, because they are located in the most prominent 'sequence' in the HR-diagram. Stars remain in this state for $\sim 90\%$ of their lifetime, for stars with a mass of $0.9 M_{\odot}$ this is about the age of the universe, and for massive stars it's just a few million years. After fusing all hydrogen different things can happen, depending on the mass of the star. For low mass stars ($\sim 0.7 - 2.0 M_{\odot}$) the star will start to contract because the pressure from the core will decrease and the core will become degenerate. Gravitational energy is released and this will cause a layer around the core to start fusing hydrogen, which causes the outer layers to expand and cool, and will add Helium to the inert core. If the Hydrogen layer is large and hot enough thermal equilibrium will be restored. The star is now called a red giant, because the expansion of the outer layers decrease the surface temperature. Because of the low temperature in the outer layers, these will start to transport energy by convection, which transports fusion products to the surface, 'dredge-up'. This cannot continue forever: the Helium core has become degenerate, but after reaching a critical mass ($\sim 0.5 M_{\odot}$) the temperature and pressure will be high enough to start fusing Helium. Fusion in a degenerate core will result in a runaway: the Helium flash. During a few second the temperature will rise steeply and the luminosity will become $10^{11} L_{\odot}$. However all this energy is absorb by the cold envelope, and after a few seconds the degeneracy will be lifted and the Helium fusion will become stable. It is possible for red giants to lose a lot of their mass and have insufficient to start Helium fusion and these will become Helium white dwarfs. Stars heavier than $2 M_{\odot}$ will already have a core more massive than $0.5 M_{\odot}$ and will not have a Helium flash, but will gradually change from H to He fusion. Important to note is that all stars

with a mass lower than $2 M_{\odot}$ all have the same core mass after the Helium flash, and thus will 'look' more or less the same. These stars are located in the HR-diagram on Horizontal branch, a more or less horizontal strip on the HR diagram. The position on the branch is determined by the remaining Hydrogen shell and the amount of metals in the star. Stars with a large envelope will look red-ish (low surface temperature) and stars with an exposed Helium core will look blueish (a high temperature). The lifetime of a star in this phase is much shorter because of two reasons: Helium fusion into Oxygen and Carbon only supplies one tenth of the energy of Hydrogenfusion, and stars in this phase are much brighter than MSstars. Fusion of Helium in these cores will only occur in the centre of the star, but the rest of the Heliumcore is convective, so all Helium will be fused to Carbon and Oxygen. If all Helium is burned, the same thing will happen as with a Helium core: the core will decrease in size,

[1] A very nice interactive HRD can be viewed at `http://www.astro.uni-bonn.de/~javahrd/v071/index.html` by C. Carazo

[2] metals: elements other than Hydrogen and Helium.

Hydrogen- and Helium shell burning will start and a convective envelope will from, dredging up Helium and other materials to the surface. The star will again decrease in surface temperature and increase in luminosity and will 'ascend' the so called Asymptotic Giant Branch (AGB). For stars with mass lower then $8M_{\odot}$, the core will (again) become degenerate. This time the star will have two shells, one burning Helium and the other on top of that burning Hydrogen. This configuration is unstable (because of a large difference in burning rates) and will result pulsations (by Helium shell flashes) and together with the strong radiation pressure from these shells, the star will lose much of the outer envelope. These low mass stars will not have enough mass for C-O fusion to start, and after losing much of their shell, will become C-O white dwarfs with a mass ranging between $0.6M_{\odot}$ and $1.1M_{\odot}$. Heavier stars ($> 8M_{\odot}$ will not become degenerate

until the final burning stage. Heavy stars will lose much of their outer envelope during the Main Sequence phase, which is only a few million years. The high mass loss ratio will result in a configuration composed mainly of Helium with a thin Hydrogen shell ($5 - 10M_{\odot}$). After Helium burning, Carbon and Oxygen will be used as an energy source. This will go on until the core is made of iron. Surrounding this core will be many layers, fusing elements like Si, O, C, He and H. The contraction of the Fe core will result in a supernova explosion, because fusion iron doesn't produce energy and thus the core cannot support the layers above. Depending on the core mass of the star, the remainder will either be a neutron star (core of degenerate neutrons) or a black hole.

1.2 Asteroseismology.

Stars are three-dimensional spheres and can, like a drum in 2D, oscillate. The oscillation modes can be defined by three numbers, usually n,l and m; n is related to the number of radial nodes; l is the number of surface nodes; and m is the number of azimuthal nodes, where m is the number longitudinal surface nodes. The simplest manner in swelling and contraction, heating and cooling, in a spherical symmetric manner called radial mode, $l = 0$. For $n = 0$ the whole interior of the star will move outwards and inwards, and for $n = 1$, the centre of the star will contract and the upper layer expand and vice versa. For $l = 1$ modes one hemisphere will move in anti phase with the other. This seems to defy Newtons laws (its seems to bounce up and down), but because the star is compressible the centre of mass will not move (see Christensen-Dalsgaard 1976). Further explanation see appendix A. This is also the reason

why astroseismology is useful; the modes detected on the surface depend on the speed of sound, which again relates to density, temperature, composition etc. within the star. So measuring the pulsation frequency, modes and amplitudes can reveal much about the interior of a star. Two different kinds of waves can be distinguished; p modes and g modes. Pressure modes (p modes) have pressure as the restoring force for perturbations and are usually in the vertical direction and are sensitive to the surface conditions of a star. Gravity modes (g modes)

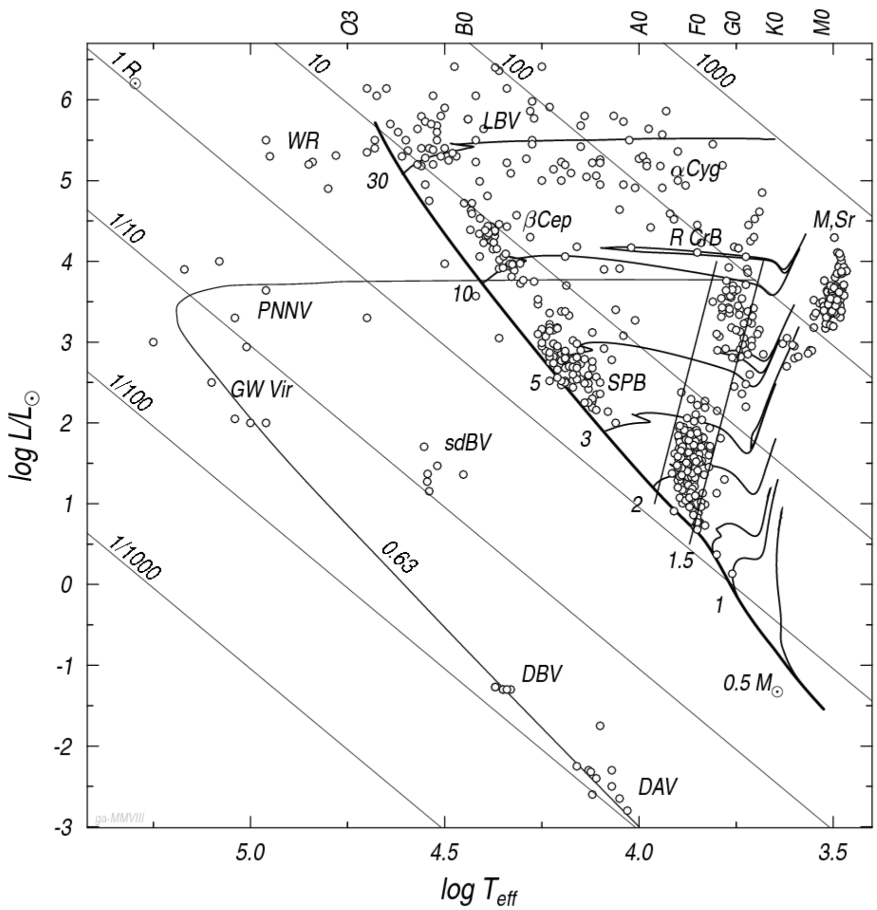


Figure 2: HRdiagram for pulsating stars, sdBV are subdwarf B pulsators, sdO pulsators not indicated on this graph, but are positioned slightly to the left of the sdBV.

have buoyancy as restoring force and move mostly in the horizontal direction and are sensitive to the conditions in the core of a star. This answers the

question of how but not why stars pulsate. Not all stars pulsate, but a possible driving mechanisms is the heat-engine mechanism; a radial layer gains thermal energy during contraction. For this to work the lower layer needs lots of energy, which is supplied by opacity, called κ mechanism: during compression the cool layer consisting of usually H or He (but this can be any elements as long as the opacity is high enough) blocks radiation. This will heat the layer and pressure will expand this layer beyond equilibrium. But the heating will also result in ionisation, which makes the layer more transparent, and thus remove its energy source. The layer will cool down again and start contracting, completing the cycle. Another mechanism is stochastic driving, which is simply put resonances of the natural oscillation frequency because of convection, like noise can make an instruments strings oscillate. Also possible is a variation in energy production in the core (ϵ mechanism), but no stars are known that oscillate solely because of this mechanism. For further information see 'Asteroseismology' by C. Aerts, J Christensen-Dalsgaard, D.W. Kurtz.

1.3 Hot subdwarf stars.

Subdwarf stars are called 'subdwarf' because they are less bright than Main Sequence stars of the same temperature. The difference in magnitude is about 5 mag, which is caused by the smaller radius of these stars. Although they are small, they are very hot, ~ 40000 K, which makes these stars appear blue. The mass of these stars is about half a solar mass, because they are most likely the remaining 'naked' cores of a star. Hot subdwarfs are usually put into 2 groups

based on spectral type: sdB, stars which do not display any Helium lines and the hotter ($\sim$ 60000 K) sdO stars, which do show Helium lines. SdB stars have been identified as extreme horizontal branch (EHB) stars (Heber 1986): core Helium burning stars with a Hydrogen envelope that is too thin to sustain hydrogen burning, see figure 3. Therefore they skip the asymptotic giant branch (no shell to take over the energy production) and go directly to the white-dwarf cooling stage. Important to note is that many sdB stars are found in close-orbit binaries, indicating binary evolution plays an important role in sdB evolution. Spectroscopic analysis indicate most of the sdB stars are Helium-poor and have the same spectral features. SdO stars however have a large variety of spectra and a wide range in Helium abundance.

1.4 Subdwarf O stars.

This group is defined by the high temperature and the existence of ionised Helium lines. SdO stars can be divided in two groups, Helium rich and Helium poor. The Helium poor stars are likely the successors of the sdB stars, however transformation from Helium-poor to Helium-rich does not seem to be possible. Wesemale et al. (1982) and Groth et all. (1985) investigated transformation by convection, which mixes Helium from the core with the surface. But convection only occurs if the atmosphere is already Heliumrich and thus cannot explain the existence of Helium-rich stars.

1.4.1 Formation

The evolution of a subdwarf O star is still a matter of debate. Possible single star evolution models indicate sdO stars as 'Extended Horizontal Branch stars' (see figure 3), stars that have a (inert) Helium core and a thin Hydrogen shell. The mass of this star is determined by the onset of the Helium flash, ($\sim 0.5 M_{\odot}$).

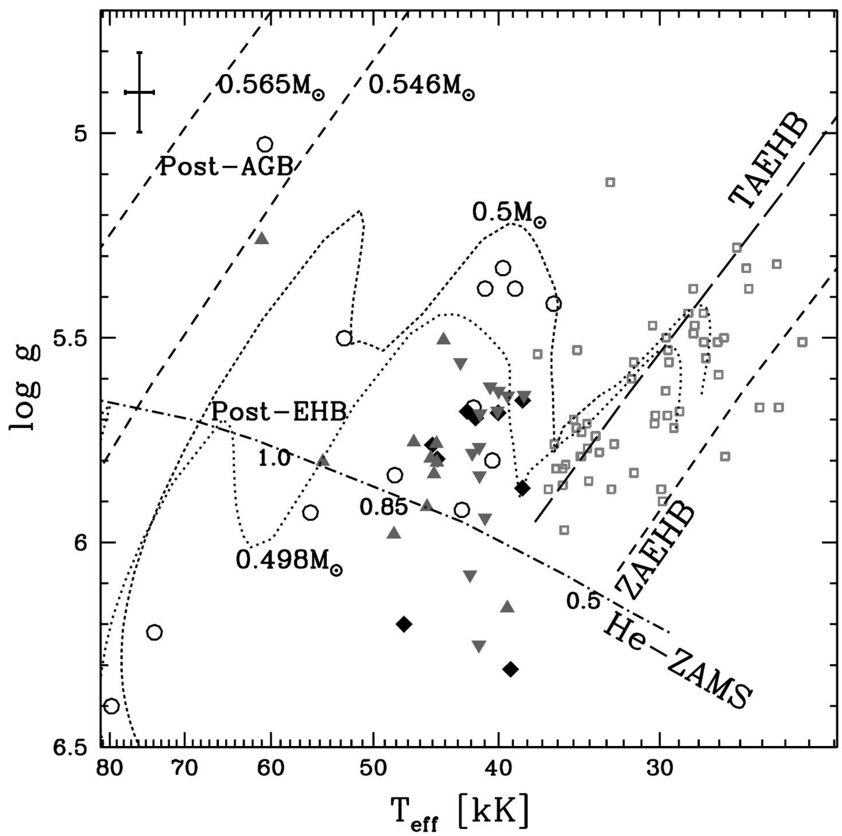


Figure 3: surface gravity (log (g) in cgs), vs effective temperature (kK) of Helium-rich sdO stars. TAEHB=Terminal Age Extended Horizontal Branch, ZAEHB=Zero Age Extended Horizontal Branch and He-ZAMS is the Helium Zero Age Main Sequence stars (what a pure Helium star would look like)with numbers indicating mass in solar units. On the upper left post-AGB evolution tracks are shown in dashed lines, and the dotted lines indicate post-EHB evolution tracks. Open squares are sdB stars, circles Helium-deficient sdO stars and the rest are Helium-rich sdO stars with up-pointing triangles showing C-lines, down-pointing triangles showing N-lines and a filled diamond both. Taken from A.Stroeer (2006).

Because of the lack of a hydrogen envelope it does not ascend the RGB, and will move directly to the white dwarf phase, the same way as sdB stars. Problems with this theory is the fact that the entire envelope has to be lost at the same time the Helium flash occurs. Enhanced mass loss during or after the RGB fase have been investigated, but no mechanism for this mass loss have been found. This theory also doesn't explain the similar temperatures and surface gravity of the Helium enriched sdO stars (see figure 3), and also cannot explain the Helium, Nitrogen and Carbon abundances in the atmosphere of these stars. However it can explain the helium poor sdO stars, they are just sdB stars which evolved (lost more hydrogen shell which results in a higher surface temperature) and became sdO stars. Another possibility is the post-AGB evolution. A star

that instead of a inert Helium core, has a inert C-O core, which is 'moving' toward the white dwarf phase (see figure 3). However the short time stars are in this phase makes it unlikely to find these kind of sdO stars. An other single

star evolution scenario is the so called 'late hot flasher'. This theory states that a Helium flash occurs after the star left the RGB phase (post RGB star has a inert Helium core and no shell burning, on its way to become a Helium white dwarf). During this flash Carbon and Helium is dredged up to the surface, and would explain the prominent He and C lines. Models by Sweigart (1997a) agree with the observed temperature and surface gravity (log(g)) of many He-sdO stars. But the problem with this theory is the short timespan the model stars are in this phase, and thus don't explain the large clustering of sdO stars in T-log(g) diagrams, see figure 3. Because none of the single star evolutionary

models work well, binary evolution is also considered. Possibilities are 'common envelope ejection', which means that 2 stars have a common envelope which is blown away. The result of this would be 2 stars that are very close to each other, and thus have a very short orbital period. A wider binary is created by the 'stable Roche-Lobe overflow' method. The stripping of the envelope by another star of AGB stars before the Helium flash has been investigated by Driebe et all. (1998). The result is a star which consists of purely Helium and would end up as a Helium white dwarf. The predicted path (on the HR-diagram and T-log(g) diagram) agrees very well with the properties of the Helium enriched sdO stars. Problems with this scenario are too thick Hydrogen shells, no explanation for the Carbon-lines and a very narrow mass range $0.3 - 0.33 M_{\odot}$. Another possibility is the merger of 2 Helium white dwarfs. This means that two Helium white dwarfs (basically the remaining He-core of a star) merge and create a new star with a very thin hydrogen envelope. This newly formed star now has enough mass to fuse Helium, and would be very hot because its an almost 'naked' core. The merging of these two dwarf also explains the Helium and Nitrogen at the surface of this star.

1.5 J1600+0748

1.5.1 Discovery and first results.

SDSSJ160043.6+074802.9 (J1600+0748 from now on) was discovered in a search for AM CVn stars by Woudt et al. (2006) The reason is that the colours of J1600+0748 are very similar to that of an AM CVn star. To gather more

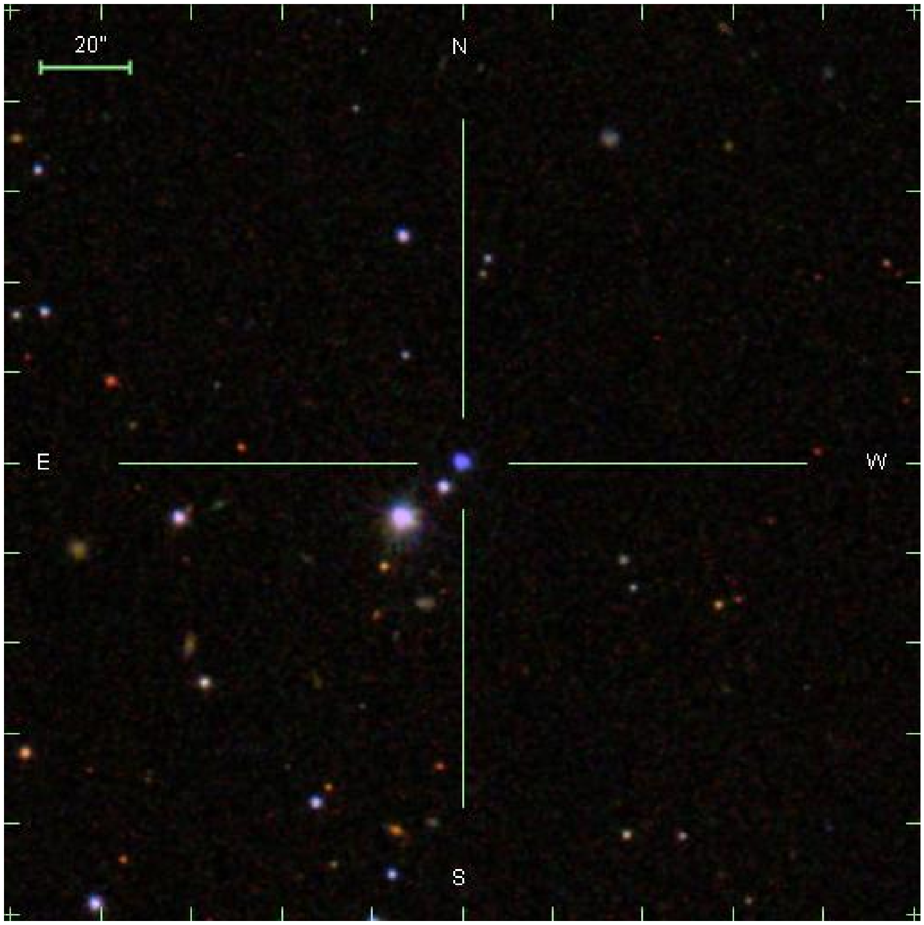


Figure 4: J1600+0748 from the SDSS database.

information about J1600+0748 a high-speed photometry run was carried out. This revealed J1600+0748 to be a very rapid pulsating star with a number of frequencies with periods between 120s en 60s. This makes J1600+0748 one of the fastest pulsating star detected. Because of the rapid pulsations and the blue colour (indication of high temperature) J1600+0748 was suspected to be a sdB star. But spectra revealed only He-II and not He-I lines, which is one of the main differences between a B and O spectrum and thus Woudt et al. concluded is has to be an sdO star. This surprised the asteroseismologist because models made a year earlier did not predict any pulsation in sdO stars. The shift of the

He-II lines at 4686Å and 5411Å indicated a heliocentric speed of $\sim -12km/s$. The other lines however were more blue shifted but probably because of line mixing with H and He. Besides the H and He lines a Na D line was detected. This line is undetectable in hot stars and Woudt et. al. suggested J1600+0748 is a spectroscopic binary. To verify this Woudt et al. measured J1600+0748 again 2 months later. This second observation confirmed the presence of the Na D line, but the H and He lines were shifted by about -100km/s. This large difference also hints at J1600+0748 to be a short period binary.

1.5.2 Further investigation and modelling of spectra.

To answer the question how J1600+0748's pulsations are driven, Fontaine et al. (2008) investigated the possibility of iron levitation into the atmosphere of J1600+0748. For cool stars this is unlikely, but because of the high flux in sdO stars a significant amount of iron can be levitated into the atmosphere. This will result in regions of higher opacity, important for the κ mechanism. A model of J1600+0748 resulted in $l = 0, 1, 2$ p-modes (g-modes do not have such short periods in compact objects) with period between ~ 60 and ~ 105 seconds, in agreement with observed frequencies, although a narrower range. This is possibly an effect of the simplified model of radiative levitation. Other interesting results are that for model stars with a lower temperature (60000K) no pulsations where found and for a higher temperature (80000K) less modes are exited. This suggests a separate 'area' on the log(g)-T diagram, distinct from sdB pulsators (which have lower temperatures). Fontaine et al. also attempted to model the spectrum using non-Local Thermal Equilibrium models including H and He. The best fit resulted in T=71.070 $\pm$ $2725K$, log g = 5.93 $\pm$ 0.11 log N(He)/N(H) = -0.85 ± 0.08. Rodriguez-Lopez et al.(2010) investigated

J1600+0748 further by fitting model spectra to one observed spectrum. The best fit is a sdO star with T=70000 K and the companion is a K3 V star with T=4690 K. Interesting is that the speed derived by Rodriguez et. al. is -66 $\pm$ 26 km/s for the sdO star and -67 $\pm$ 32 km/s for the companion star. Because the velocity of both components is about the same, they also think J1600+0748 is a physical binary, although with a long orbital period. NLTE models indicate T=70000$\pm$5000K, log g = 5.25$\pm$0.30 and N(He)/N(H) = -0.51 ± 0.16. Possible formation scenarios that would result in a star with these parameters are the post-RGB star, the post-AGB or the 'late hot flasher' scenario. But because of uncertain luminosity and mass no final conclusion was possible. Investigation

of the pulsation frequencies were a bit disappointing; although Rodriguez et al. did find the first 6 frequencies (or one and two day aliases of these frequencies), they could not confirm the other 8 despite better data. They think these frequencies are variable, either because of amplitude variation or binary motion of the system (or a combination of both). Modelling these pulsations in an sdO star was not successful, however higher temperatures and log(g) have a higher tendency to drive oscillations. The reason for not obtaining stable oscillations was, according to Rodriguez et al., due to an uniform metallicity; other studies (like Fontaine et al.) used a non-uniform distribution of iron with depth to obtain models for pulsating sdB stars. The latest paper about J1600+0748 used 4 different datasets from 4 different telescopes. Latour et al. (2011) tried to determine the spectral type of the companion, finally concluding it is a G0V type star. Interesting to note is that a K0V star gave a slightly less good match, but the spectral type in between were worse. This could be explained by the spectral standard stars used for comparison, which are binaries themselves; consisting of a G and K star. It is possible for the secondary of J1600+0748 to be a G+K binary itself, and explain why other papers concluded it was a K3V type star (instead of a G0). Unfortunately not enough information was available to determine if this is the case. For the analysis of the sdO spectrum it doesn't really matter because the spectra of a K and G star is about the same. After empirically choosing the best spectrum for the secondary it was used to clean the obtained spectra of the influences of the secondary. The best fitting models by Latour et al. (which include H,He,C,N,O and Fe) indicate T=$68500 \pm 1770K$, log g $=6.09 \pm 0.07$ and log $N(\mathrm{He})/N(\mathrm{H}) = -0.64 \pm 0.05$.

1.5.3 Summary

J1600+0748 is a sdO star showing very rapid pressure-mode pulsations. It is currently the only sdO stars which is known to do this. Spectra revealed J1600+0748 to be a binary consisting of the sdO star and a cool MS (G-K) companion. The rapid pulsations in the sdO star can be explained by the κ mechanism by Fe, which is levitated by the high radiation flux. However many things are still unknown; magnitude, metal abundance, mass and radius for both components are very difficult to determine due to the fact that it is a binary. But this is also a source of information, because the orbital period can reveal the mass fraction of both stars. Furthermore combining spectra to gain a higher S/N ratio would not be possible if J1600+0748 is a compact binary, because the lines of the stars would be shifted differently. The goal of this thesis is to determine this orbital period, by looking at shifts in absorption lines.

2 Method and used Instruments

2.1 Telescope and Detector

The datafiles (see appendix B) used were obtained with the William Herschell Telescope (WHT) located on the island La Palma. The used instrument was Intermediate dispersion Spectrograph and Imaging System (ISIS), which consist of a red and blue detector.

2.1.1 WHT

The mirror diameter is 4.2 m and the telescope has a focal length of 10.5 m (f/2.5). In addition to a secondary mirror used in the Cassegrain configuration, the optics also include a corrector plate to reduce coma effects. The efficiency of the optics is about 85% for the Cassegrain focal point.

2.1.2 ISIS

At the Cassegrain focal point the Intermediate dispersion Spectrograph and Imaging System (ISIS) is mounted. This instrument consists of two intermediate dispersion spectrographs which can be operated one at a time or simultaneously, and are separately optimized for the blue and red spectral regions, see figure 5. The CCD currently in use on the blue arm of ISIS is a thinned, blue-sensitive

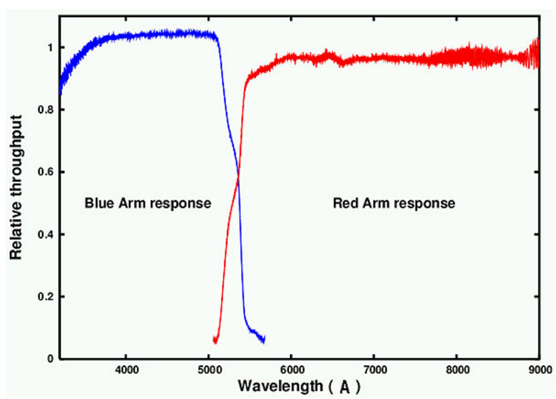


Figure 5: Sensivity of the two detectors of the ISIS intrument.

EEV12, an array of 4096x2048 (13.5 micron) pixels. This is the default device for the ISIS blue arm which has a gain of 1.2 e/ADU and noise of 3.5-4.5 ADU and almost zero dark current. The default chip for ISIS red is RED+. It is a red-sensitive array of 4096x2048 (15.0 micron) pixels with a gain of 0.98 e/ADU and noise of 3.5-4.5 ADU.

2.2 Data reduction

The raw data used were obtained by G. Nelemans on the nights of May 29 and 30 2009. A total of 50 measurements were obtain from SDSS J1600+0748, and the usual bias and flat frames were obtained. For a full list of the files see appendix B. As usual the acquired data is not directly usable for analysis. To convert the 2D photos to 1D spectra require a reasonable amount of processing: First the raw fit files[3] need to be corrected for telescope and detector influences. After this the data can be converted from 2D photo's, which have a spectral axis and a spatial axis, to 1D spectra. Finally the spectra have to be calibrated from pixels to Angstroms. All these operations were done using the IRAF software package [4].

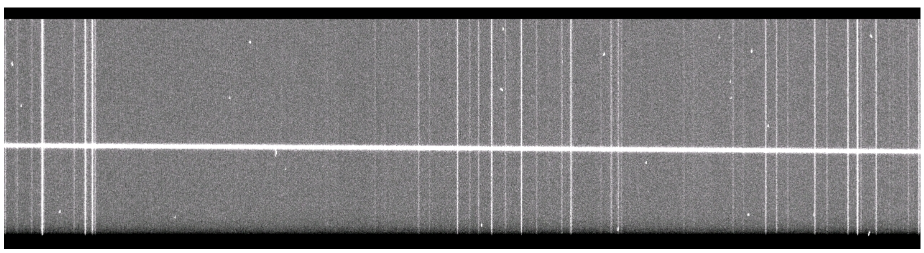


Figure 6: Raw fits file of the spectrum, in this case the spectral-axis is horizontal and the spatial-axis is vertical.

2.2.1 Bias, Flat

To remove all the influences by the telescope and detector, bias and flat frames have to be obtained[5]. A bias frame is a essentially a 0 second exposed photo. The purpose of this bias is to remove a readout value; a CCD adds a standard number (although this can vary due to random static) to every pixel in order to read that pixel (an A/D converter cannot read negative values). The median per pixel of all bias frames (masterbias) is then subtracted from all other images. The next step is to correct for different sensitivity of the detector-telescope

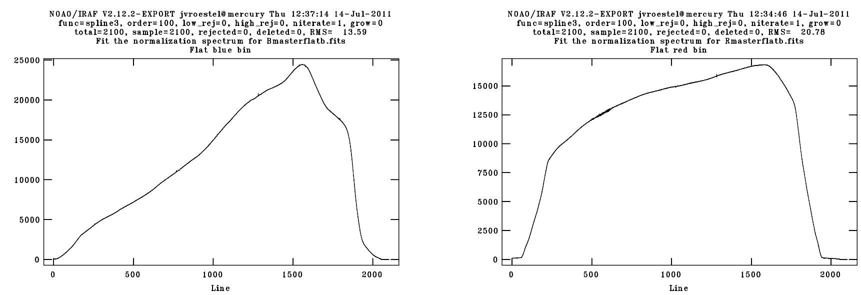
setup. Dust on any of optics will influence of the light throughput of an entire area of the final picture. Also not all pixels on the CCD-chip have exactly the same sensitivity. To correct this a photo is taken of a lamp with a continues spectrum. The result is a picture with on the spectral axis the spectrum of the

[3]FITS=Flexible Image Transport System.

[4]`http://iraf.noao.edu/`

[5] The software packs used for these operations are CCDPROC, FLATCOMBINE and ZEROCOMBINE found in NOAO/IMRED/CCDRED. CCDPROC options used are FLATCOR, ZEROCOR and TRIM (the last 100 pixels were cut because it didn't contain information). FLATCOMBINE option COMBINE was set to average combination, and the appropriate gain and rdnoise as indicated by the tech info page of ISIS. The same for ZEROCOMBINE except median combination was used.

lamp combined with the sensitivity of the detector. A cubicspline is fitted in the spectral direction, see figure 7, and the actual spectrum is divided by this fit. The result is a picture with sensitive pixels have a value of higher than 1, and insensitive pixels lower than 1 (the difference is only $\sim .01$), see figure figure 8.



(a) Blue.

(b) Red.

Figure 7: Response function fitted to the masterflatfile.

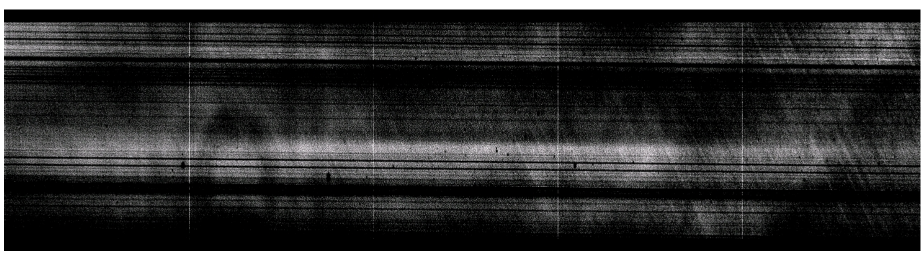
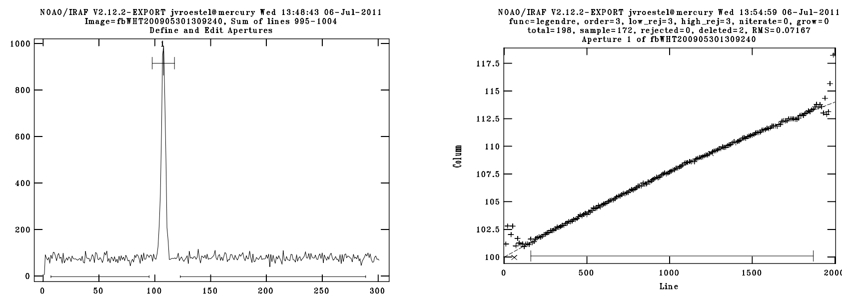


Figure 8: The masterflat, indicating detector sensivity differences.

2.2.2 2D to 1D

The next step is to combine all pixels that are exposed to the same wavelength, and make a 1D image (using the APALL package). This isn't as easy a it seems: the spectral axis is of course not perfectly along the x axis. To determine the maximum of the spectrum, every vertical pixel line is fitted to a Gaussian, see figure 11a. When this is done the x-value the peak of every Gaussian is plotted, see figure 11b. This shows a difference of 5 pixels between the left and right side of the detector (2100 pixels), which means the difference between the x-axis and spectral axis is (almost) negligible. After fitting a line to these peaks to determine the maximum per colum, the pixels in the y-direction (which is almost the same as the spatial direction) are added up, weighted by the S/N ratio per pixel.



(a) Profile of the spectrum.

(b) Position of the maximum over the whole detector.

Figure 9: Apall package.

2.2.3 Calibration

The last step is to determine the correlation between pixel and wavelength. For this purpose spectra have been taken from a NeAr-NeCu lamp (ARC files), see 10. All lines have already been measured before and thus have a known wavelength. The position of these lines on the pixel scale thus add a wavelength value to that pixel. If the CCDchip was perfectly flat two lines are sufficient, unfortunately it isn't. This will result in a non-lineair relation between wavelength and pixel and although this is not a large effect, it is certainly significant. To find the Angstroms/pixels relation I fitted the position of as many lines as possible with a cubicspline, which resulted in a RMS$\simeq$ 0.08Å. Unfortunately it didn't work perfectly: the pixels at the end of the detector were not correctly assigned to the right wavelength because of the high order of the cubicspline. To improve this I tried a 4th order Legendre polynomial (see figure 11), which was a slight improvement (RMS$\simeq$ 0.05Å). But because these effects only occurred at the ends of the detector the first and last $\sim$ 100 Angstroms might be off. But these ranges where not really usable because of the low sensitivity of the detector in these ranges.

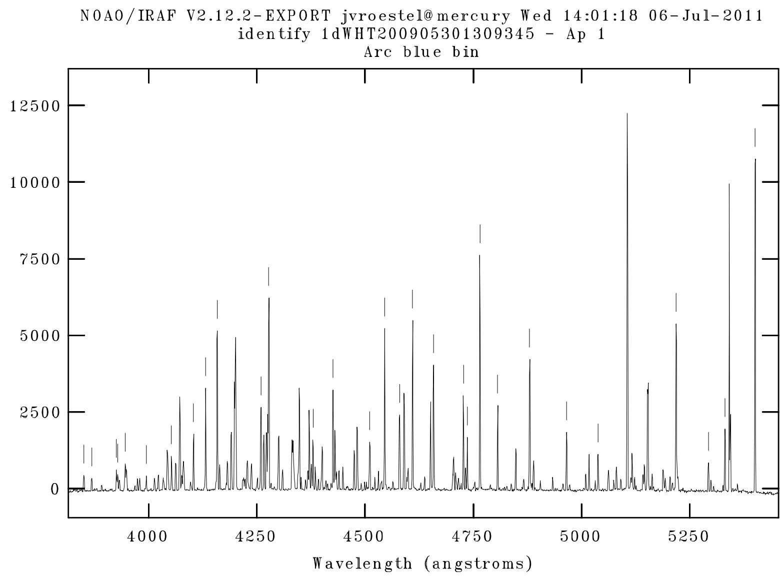
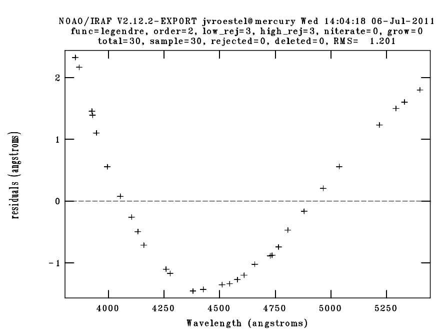
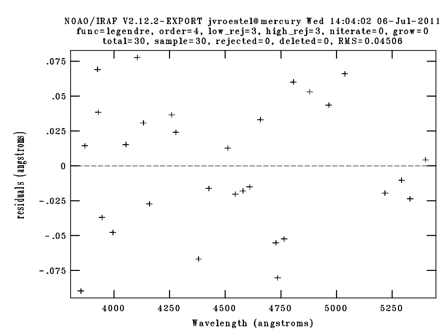


Figure 10: Emission lines of Cu-Ne Cu-Ar lamp used for calibration.



(a) Legendre fit of order 2, clearly not sufficient, RMS≃ 1.2Å.



(b) Legendre fit of order 4, RMS≃ 0.05Å.

Figure 11: Fitting of the calibrationlines of the blue files.

3 Analysis

For analysis I normalised the individual spectra and compared the absorption line position to the theoretical value using two different methods. For this I used the software package MOLLY [6].

3.1 Normalising the spectra

The spectra are a convolution of the stars spectrum and sensivity of the optics and CCD. But to measure the radial velocity the absolute spectrum is not needed. Because of this the spectra are normalised by fitting a cubicspline to them (see figure 12, and dividing the spectrum by the fit. To avoid affecting the absorption lines these were excluded from the fit and thus only the continuum was used. Again this resulted in side effects: the ends of the spectrum were not properly normalised, because of the low pixel values in these ranges. But as mentioned before these wavelength ranges are unusable anyway.

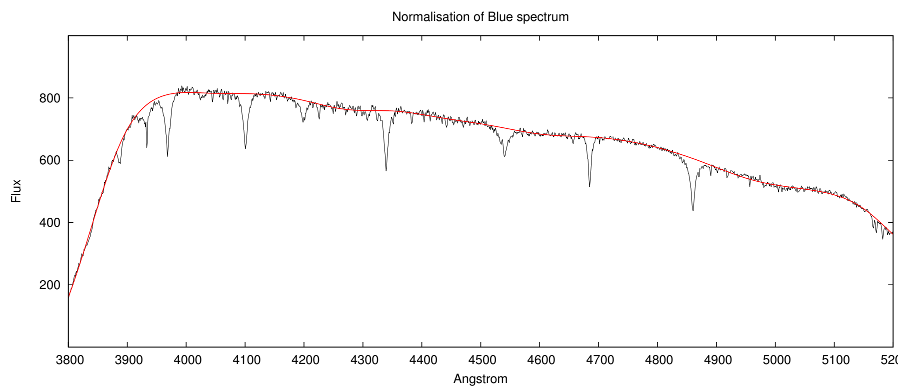


Figure 12: Black is the spectrum (blue) and the red line indicates the fit to normalise it.

3.2 Measure radial velocity

The movement of the individual stars will cause the spectrum to shift to red or blue (relativistic dopplershift). This can be measured by looking at absorption lines, which occur at given wavelengths, and measure the shift of these lines per individual spectrum. The expected shift would form a sine pastern (as a function of time): the star is moving in circle, from our perspective forward and backward (at least if the inclination isn't for 'above' the circle). The conversion from wavelength to speed is simple, and was done using the option 'vbin' in MOLLY.

[6] `http://www2.warwick.ac.uk/fac/sci/physics/research/astro/people/marsh/software/`

To measure the shift, two different methods were used, Crosscorrelation and Linefitting.

3.2.1 Crosscorrelation

Crosscorrelation, XCOR in MOLLY, will do a standard cross-correlation computation. What this method does is multiply the average with one individual spectrum that is shifted with a certain wavelength, and integrate to obtain a total value; $(f \star g)(t) = \int_{-\infty}^{\infty} f^*(t)g(t+\tau)$, where f^* denotes the complex conjugate of f. Were the two spectra match best, the integral gives a maximum value, which is calculated by MOLLY using a parabolic approximation. The errors given by MOLLY are purely statistical errors. A disadvantage of this method is that it only shows the relative shift to the average, and thus cannot determine the velocity of the star, only the variation in velocity.

3.2.2 Linefitting

A more obvious method is the fit a (double[7]) Gaussian to the absorption lines and find the relative shift between in wavelength between the minimum of the Gaussian and the theoretical value of the lines (MGFIT in MOLLY). MGFIT uses Levenberg-Marquadt's algorithm to do a least-squares curve fitting procedure. It is a combination of the steepest decent method (move 'down' on the steepest slope) and the Gauss-Newton algorithm (which uses a matrix of derivatives) to find the minimum. The χ^2 found for most fits were slightly above or below 1. The fits also 'looked good' and the values below 1 are likely an underestimation of the errors. To be sure the speedoffset was only due to a

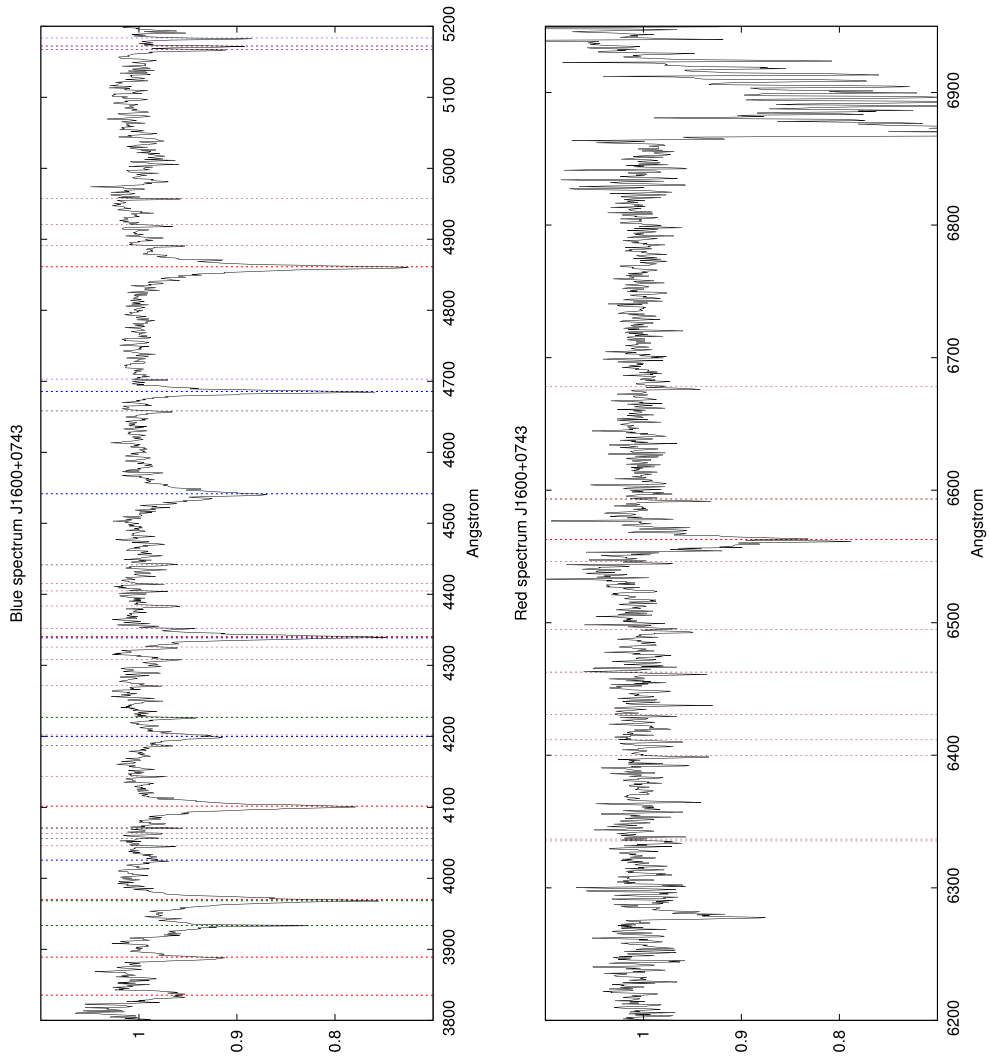
shift of the absorption line and not due a change off shape, the width and depth of the lines was determined from the total average of all spectra. A possible other method investigated was measuring the width and depth of all individual spectra and averaging these, but this revealed almost identical numbers. Fixing the width and depth off all lines (at least the most prominent and unblended 6) and which left only one variable, the total offset. To measure the shift per line (to compare my data to data obtained by Woudt et all (2006), the lines were also individually measured per day. For this the spectra were combined, which was only possible because no shift is measured between the individual spectra (other than static that is).

[7]Because of different line broadening effects a double Gaussian is used.

4 Results

Name	Wavelength (Å)	Transition	Velocity (km/s)			Note
			May 29	May 30	Difference	
Hη	3835.397	$2-9$				
Hζ	3889.055	$2-8$				
Ca II (Ca K)	3933.67	$4s-4p, J1/2-3/2$	-29.6 ± 6.2	-20.3 ± 3.8	-9.3	
Ca II (Ca H)	3968.47	$4s-4p, J1/2-1/2$	-15.9 ± 6.9	$+5.3 \pm 4.5$	-21.2	Blended
Hϵ	3970.074	$2-7$	-136.7 ± 6.9	-115.5 ± 4.4	-21.2	Blended
Hδ	4101.735	$2-6$	-89.3 ± 8.1	-68.0 ± 4.4	-21.3	
He-II	4199.83	$4-11$	-111.3 ± 21.4	-22.4 ± 14.7	+88.9	
He-II	4338.8	$4-10$				Blended
Hγ	4340.465	$2-5$	-63.1 ± 6.5	-68.9 ± 4.4	+5.8	Blended
He-II	4541.7	$4-9$	-76.3 ± 14.1	-52.9 ± 9.7	-23.4	
He-II	4685.7	$4-3$	-58.0 ± 5.8	-50.8 ± 4.0	-7.2	
He-II	4859.3	$4-8$				Blended
Hβ	4861.327	$4-2$	-88.7 ± 6.5	-70.2 ± 4.2	-18.5	Blended
Mg-I	5183.60	$3s3p-3s4s$	-84.7 ± 9.8	-76.5 ± 5.9	+8.2	
Hα	6562.79	$2-3$	-60.7 ± 3.4	70.6 ± 3.1	+9.9	

Table 1: The most prominent lines from the blue part of the spectrum, average velocity per day.



(a) Blue spectrum (b) Red spectrum

Figure 13: Average spectra, dotted lines are theoretical absorpsionlines; H=red, He-II=blue, Ca-I/II=green, Mg-I=purple, C-IV=black and Fe-I=brown.

4.1 Detected lines

Lines which are common in sdO stars are H and He-II lines. The data, see figure 13 and table 1, shows 7 lines at predicted H-line frequencies and 4 lines of He-II. Most of these lines were already detected by Woudt et al. (2006). They also found Na lines, which indicate a cool MS star, however these lines are not within range of this dataset. But Ca-II lines are also common in cool MS star (strongest in G-2) as are many metal lines (Fe-I, Mg-I). Very strong Ca-II lines (Fraunhofer Ca K and Ca H lines), almost as strong as the H and He lines can be seen at 3933Å and 3968Å , the latter blended with an H line. Further investigation reveals many Fe-I and three Mg-I lines. Al these lines originate from the MS star, but there are also a few lines that can only be produced by very hot stars. O spectral type stars (thus also in sdO type stars) can also produce C-III/C-IV and N-III lines, of which four C-IV lines can be traced in the data, see appendix C. The red spectrum has a few 'features' which are not caused by either star. The prominent 'static' near 6870Åand the absorption line near 6280Å are caused by atmospheric water and oxygen. The emission lines which can be seen (i.e. at $6820 - 6840$Å) are also caused by the earth's atmosphere and were not properly removed from the original spectra (they can be seen as vertical lines in figure 6).

4.2 Radial velocity

As mentioned above I used two different methods to determine the velocity variation of J1600+0748; crosscorrelation and Gaussianfitting. In figure 16 the crosscorrelation is given and in figure 14 and 15 the Gaussianfitting result is shown. As no clear shift in velocity is found I combined all spectra of both days to the speed offset per line, and compared this to results found by Woudt et al. (2006), shown in figure 19.

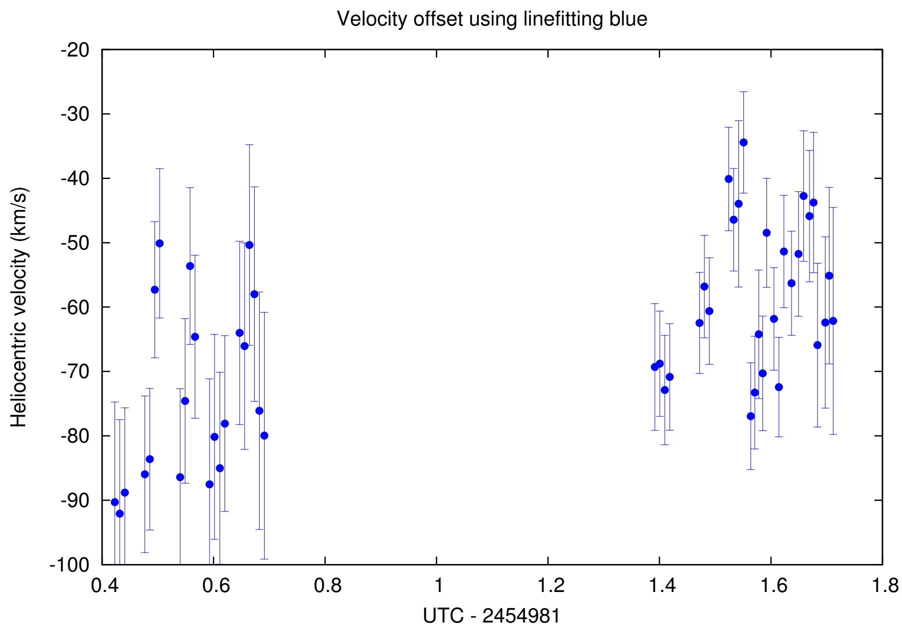


Figure 14: Linefitting result for blue data.

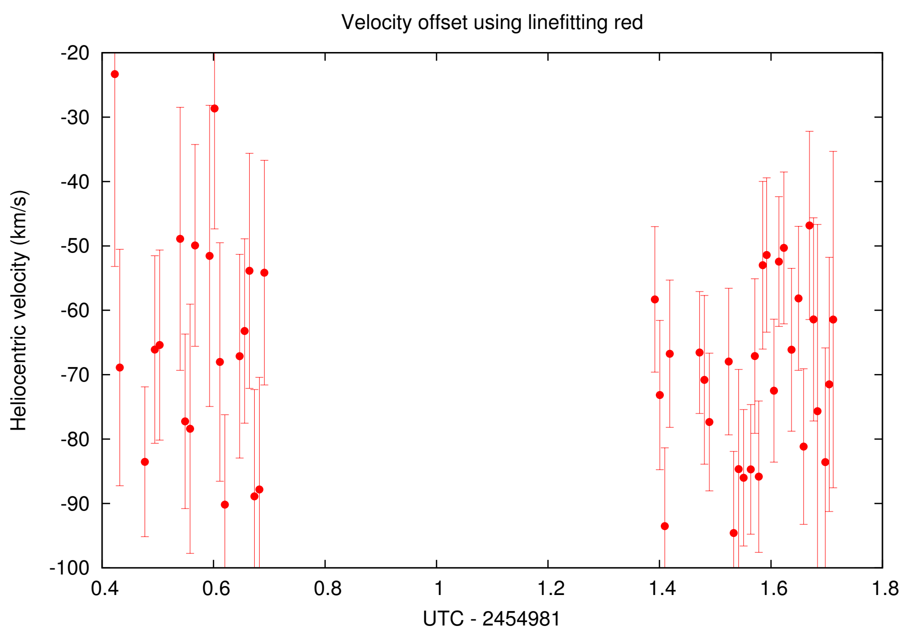


Figure 15: Linefitting result for red data.

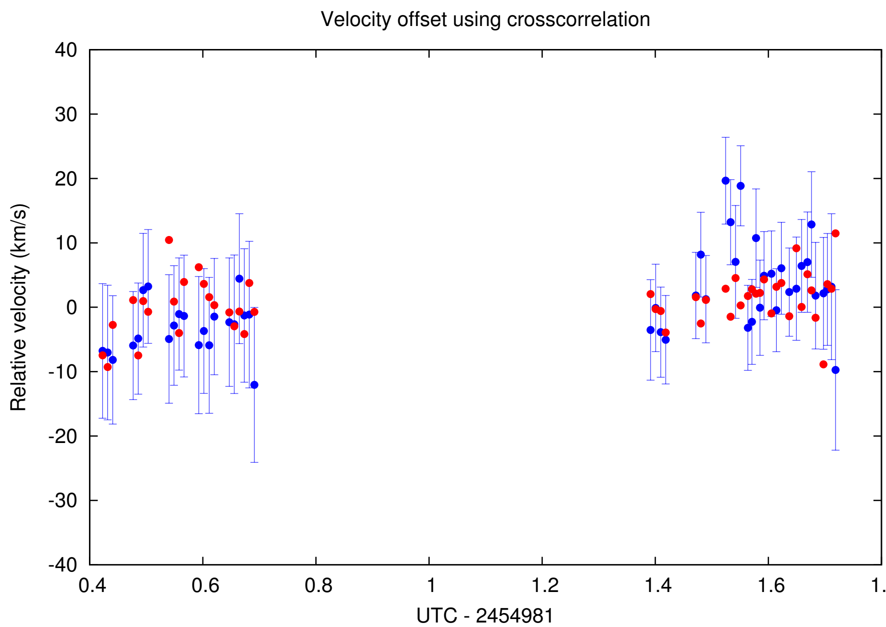


Figure 16: crosscorrelation result for red and blue, errors on red are ±40 and thus are not shown.

5 Conclusion and discussion

The large velocity offset combined with the spectral lines of an sdO star and a MS star as noted by Woudt et al. (2006), indicate J1600+0748 to be a physical binary. The first measurement by Woudt et al. resulted in a speed of ~ -100km/s and the second, 2 months later, ~ -20km/s. Rodriguez-Lopez et al (2010) measured a velocity roughly in between these two values; -68 ± 34km/s. If these values are correct J1600+0748 could have a maximum orbital period of ~ 150 days, see figure 17. In this figure the relation between the velocity of a star of different masses (diffent lines) is rotating around a $0.8 M_\odot$ star at variable inclination (different colours) is shown. This can be calculated using Newtons and Keplers law. With a velocity amplitude of 40km/s, the orbital period would be ~ 150d. However this requires a inclination of 90 degrees, which is highly improbable. More likely is a larger velocity (which just looks lower because of the inclination), which would result in a shorter orbital period of days possibly hours. The data from this paper however does not show any sign of a orbital

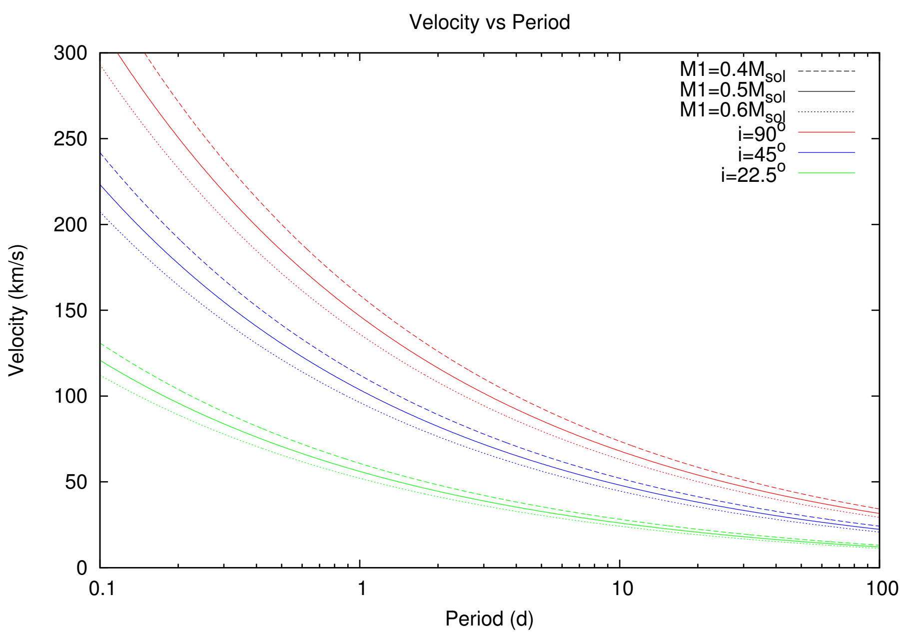


Figure 17: Velocity (km/s) as function of the orbital period (days), assumed mass for companion is $0.8 M_\odot$

period of hours or a few days. The crosscorrelation result, see figure 16, does not show any period change in velocity in the order of $80 km/s$. The blue point do seem to rise slightly, but this change is lower than the error on the points.

Notable are the points at UTC 1.5, which stand out. This probably caused by a change in the CCD-chip, which suddenly changes a few Angstroms, which could not properly be corrected for by the ARC files, see figure 18. The red data shows the same as blue, but the error is much larger than the scatter would indicate ($\sim$ 40km/s). The linefitting measurements however show lots of scatter, higher

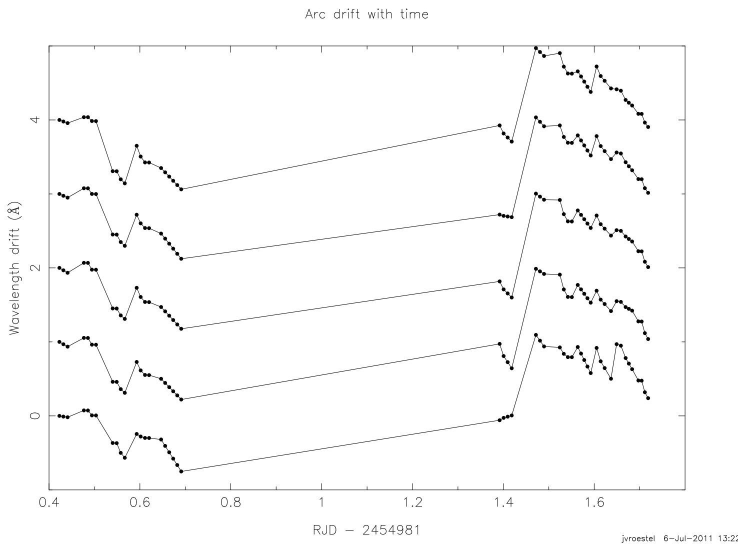


Figure 18: The difference of the calibration files, the 5 lines are point on the detector at regular intervals.

than the errors indicate. It could be that the errors are underestimated. The fit of the Gaussian lines is very sensitive around the minimum, and because data points are $\sim$ 60km/s apart, choosing the wrong minimum could result in a very large velocity shift. The range of the first day is between -50 and -90km/s and the second day -40 and -80km/s, with errors of ± 15 km/s. This suggests the errors are underestimated. This does not change the conclusion though, since a orbital period of $\sim$ 30 minutes (time between measurements) would have a velocity shift of more than 600 km/s. There are two explanations

for not detecting any shift in velocity. One is that the inclination is near zero, but this would suggest the measured difference by Woudt et al. is just an error. The second explanation is that the orbital period is in the order of weeks, which wouldn't show any velocity shift two days apart, but would show up if the measurements are two months apart. But this would suggest that Woudt et al. just got 'lucky' and measured the maximum and minimum velocity. To

compare my data with the numbers obtained by Woudt et al., all spectra form each day were averaged to gain a high S/N ratio. These average spectra were then used to measure the speed per line, which can be seen in 1 and in figure 19. The line at 3970Å is a combination of Hϵ and Ca H, which makes this measurement unreliable. But the shift of this line should not change, and the difference between my data points and the one by Woudt et al. is puzzling. An other line which is unreliable is He-II at 4199ÅThe reason is its relative shallowness, and the error is likely to be an underestimate. The general trend is clear though, with averages (in descending order) ~ -20; -72.5; -62.9; and ~ -100. The differences between all measurements can not be explained by errors. Although the difference between May 29 and 30 2009 is small, all points of the 29th, except 4340Å, have a lower velocity then the velocity of the day later. Unfortunately the difference is about 10km/s which is more or less the same as the errors on the measurements.

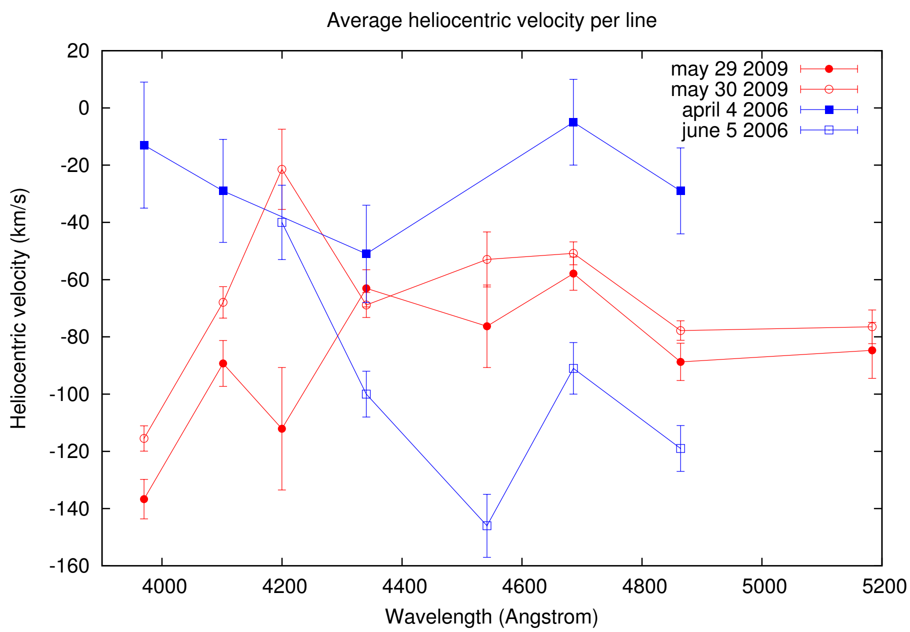


Figure 19: Speed per absorpsionline, red is my data, blue is from Woudt et al. (2006).

Outlook

The fact that the spectrum is composed of two stars does indicate a physical binary and the velocity shift measured by Woudt et al. suggest that J1600+0748 is a physical binary, whit a orbital period shorter than half a year. The data shown in this paper only show that the orbital period is not in the order of a few days or hours. To find the orbital period of the system I suggest measurements taken once or twice a week for a few months.

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A Asteroseismology

The displacement for a spherically symmetric star (in the r, θ, ϕ directions) is given by:

$$\xi_r(r,\theta,\phi,t) = a(r)Y_l^m(\theta,\phi)exp(-i2\pi\nu t) \tag{1}$$

$$\xi_\theta(r,\theta,\phi,t) = b(r)\frac{\partial Y_l^m(\theta,\phi)}{\partial\theta}exp(-i2\pi\nu t) \tag{2}$$

$$\xi_r(r,\theta,\phi,t) = \frac{b(r)}{\sin\theta}\frac{\partial Y_l^m(\theta,\phi)}{\partial\phi}exp(-i2\pi\nu t) \tag{3}$$

ξ_r, ξ_θ and ξ_ϕ are displacements, $a(r)$ and $b(r)$ are amplitudes, ν is the oscillation frequency and Y_l^m are the spherical harmonics given by

$$Y_l^m = (-1)^m\sqrt{\frac{2l+1}{4\pi}\frac{(l-m)!}{(l+m)!}}P_l^m(\cos\theta)exp(im\theta) \tag{4}$$

P_l^m are the legendre polynomials and the factor $\sqrt{\frac{2l+1}{4\pi}\frac{(l-m)!}{(l+m)!}}$ is just a normalization constant. An example is shown in figure 20.

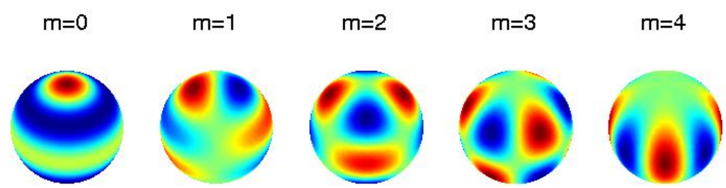

Figure 20: Example of spherical harmonics, l=4.

B Observationlogs

B.1 Log 29-05-2009

WHT OBSERVING LOG (ISAAC NEWTON GROUP, LA PALMA)

generated on 2009 05 30 06:41

TELESCOPE	WHT
DATE	20090529
OBSERVER/S	Gijs Nelemans
PROGRAMME	Using sdB stars to study common-envelope ev
PROPOSAL REF	N9
TELESCOPE OPERATOR	Riddick
SUPPORT ASTRONOMER	Rix
TEL STATION / FOCUS	/ 97.85
INSTRUMENT/S	ISIS
SUNSET (UT)	20:11
EVENING TWILIGHT (UT)	21:35
MORNING TWILIGHT (UT)	04:42
SUNRISE (UT)	06:06
%ILLUM. LUNAR DISK	37
DARK TIME (HRS)	07:07
TWILIGHT TIME (HRS)	02:48
MOONRISE (UT)	No moonrise within sunset-sunrise
MOONSET (UT)	00:58

UT	AirT degC	Hum %	Wspd km/s	Gust km/s	Wdir deg	Press mbar	LocT degC	wht.T degC	Mirr degC	LocRH %	wht.RH %
21:00	9.1	1	37.5	39.2	142	767.5	9.1	10.	10.	1	8
22:00	8.7	2	38.4	41.2	0	767.6	8.7	10.	10.	2	7
23:00	8.5	5	33.1	37.9	142	768.0	8.5	9.	10.	5	9
00:00	8.8	7	32.1	37.1	78	768.7	8.8	9.	10.	7	11
01:00	9.7	6	29.0	29.5	29	769.0	9.7	9.	10.	6	12
02:00	9.8	4	22.7	24.5	30	768.5	9.8	9.	10.	4	11
03:00	9.9	0	20.9	21.8	51	768.1	9.9	9.	10.	0	7
04:00	10.2	0	19.3	20.4	46	767.4	10.2	9.	10.	0	6
05:00	11.3	1	18.2	18.6	53	767.9	11.3	9.	10.	1	7
06:00	10.8	2	19.1	21.0	55	767.6	10.8	9.	10.	2	8

TIME LOST weather: 00:00
TIME LOST Technical: 00:00
TIME LOST Other: 00:00
WEATHER CONDITIONS (eg transparancy, dust, %cloud cover, seeing):
variable seeing
COMMENTS (causes of time lost, setup information eg CCD windows):
Some noise on the red detector.

Run	Object	RA	Dec	Equinox	UT	Airm	Instr	Texp sec	Sky PA	Filters etc.	Slit	Grat Grism	CenwA	– NAOMI – INGR Comments L WM Twfs l Co M
1308268	Arc red	0 00 00.00	+00 00 00.0	2000.00	12:54	1.00	ISISR	2.0	0	Out +Out	0.72	R600R	6502	
1308269	Arc blue	0 00 00.00	+00 00 00.0	2000.00	12:54	1.00	ISISB	30.0	0	Out +Out	0.72	R600B	4647	
1308270	Arc blue	0 00 00.00	+00 00 00.0	2000.00	12:56	1.00	ISISB	30.0	0	Out +Out	0.72	R600B	4647	
1308271	Arc red	0 00 00.00	+00 00 00.0	2000.00	12:56	1.00	ISISR	2.0	0	Out +Out	0.72	R600R	6502	
1308273	Arc blue	0 00 00.00	+00 00 00.0	2000.00	13:30	1.00	ISISB	30.0	0	Out +Out	0.72	R600B	4647	
1308274	Bias	4 00 00.00	+39 59 59.9	2000.00	13:51	1.05	AUX	0.0	0	HARV3				
1308275	Bias	4 00 00.00	+39 59 59.9	2000.00	13:51	1.05	ISISR	0.0	0	Out +Out	0.72	R1200	6500	
1308276	Bias	3 59 59.99	+40 00 00.0	2000.00	13:51	1.05	ISISB	0.0	0	Out +Out	0.72	R600B	4647	
1308277	Arc	4 00 00.00	+39 59 59.9	2000.00	14:12	1.07	ISISB	10.0	0	Out +Out	0.72	R600B	4647	
1308278	Arc	4 00 00.00	+40 00 00.0	2000.00	14:12	1.07	ISISR	10.0	0	Out +Out	0.72	R1200	6500	
1308279	Arc red	0 00 00.00	+00 00 00.0	2000.00	14:18	1.00	ISISR	2.0	0	Out +Out	0.72	R1200	6500	
1308280	Arc blue	0 00 00.00	+00 00 00.0	2000.00	14:18	1.00	ISISB	30.0	0	Out +Out	0.72	R600B	4647	
1308281	rhart l	0 00 00.00	+00 00 00.0	2000.00	14:32	1.00	ISISR	2.0	0	Out +Out	0.72	R1200	6500	
1308282	bhart l	0 00 00.00	+00 00 00.0	2000.00	14:32	1.00	ISISB	30.0	0	Out +Out	0.72	R600B	4647	
1308283	bhart r	0 00 00.00	+00 00 00.0	2000.00	14:33	1.00	ISISB	30.0	0	Out +Out	0.72	R600B	4647	
1308284	rhart r	0 00 00.00	+00 00 00.0	2000.00	14:33	1.00	ISISR	2.0	0	Out +Out	0.72	R1200	6500	
1308285	Red rotation	0 00 00.00	+00 00 00.0	2000.00	14:47	1.00	ISISR	2.0	0	Out +Out	0.72	R1200	6500	
1308286	rhart l	0 00 00.00	+00 00 00.0	2000.00	14:50	1.00	ISISR	2.0	0	Out +Out	0.72	R1200	6500	
1308287	rhart r	0 00 00.00	+00 00 00.0	2000.00	14:50	1.00	ISISR	2.0	0	Out +Out	0.72	R1200	6500	
1308288	rhart l	0 00 00.00	+00 00 00.0	2000.00	14:56	1.00	ISISR	2.0	0	Out +Out	0.72	R1200	6500	
1308289	rhart r	0 00 00.00	+00 00 00.0	2000.00	14:56	1.00	ISISR	2.0	0	Out +Out	0.72	R1200	6500	
1308290	Red rotation	0 00 00.00	+00 00 00.0	2000.00	15:00	1.00	ISISR	2.0	0	Out +Out	0.72	R1200	6500	Lamps off
1308291	Red rotation	0 00 00.00	+00 00 00.0	2000.00	15:00	1.00	ISISR	2.0	0	Out +Out	0.72	R1200	6500	
1308292	Red rotation	0 00 00.00	+00 00 00.0	2000.00	15:06	1.00	ISISR	2.0	0	Out +Out	0.72	R1200	6500	
1308293	rhart l	0 00 00.00	+00 00 00.0	2000.00	15:08	1.00	ISISR	2.0	0	Out +Out	0.72	R1200	6500	
1308294	rhart r	0 00 00.00	+00 00 00.0	2000.00	15:08	1.00	ISISR	2.0	0	Out +Out	0.72	R1200	6500	
1308295	rhart l	0 00 00.00	+00 00 00.0	2000.00	15:17	1.00	ISISR	2.0	0	Out +Out	0.72	R1200	6500	
1308296	rhart r	0 00 00.00	+00 00 00.0	2000.00	15:17	1.00	ISISR	2.0	0	Out +Out	0.72	R1200	6500	
1308297	rhart l	0 00 00.00	+00 00 00.0	2000.00	15:19	1.00	ISISR	2.0	0	Out +Out	0.72	R1200	6500	
1308298	rhart r	0 00 00.00	+00 00 00.0	2000.00	15:20	1.00	ISISR	2.0	0	Out +Out	0.72	R1200	6500	
1308299	Arc red	0 00 00.00	+00 00 00.0	2000.00	15:21	1.00	ISISR	2.0	0	Out +Out	0.72	R1200	6500	
1308300	Blue rotation	0 00 00.00	+00 00 00.0	2000.00	15:27	1.00	ISISB	30.0	0	Out +Out	0.72	R600B	4647	
1308301	Blue rotation	0 00 00.00	+00 00 00.0	2000.00	15:32	1.00	ISISB	30.0	0	Out +Out	0.72	R600B	4647	
1308302	bhart l	0 00 00.00	+00 00 00.0	2000.00	15:36	1.00	ISISB	30.0	0	Out +Out	0.72	R600B	4647	
1308303	bhart r	0 00 00.00	+00 00 00.0	2000.00	15:37	1.00	ISISB	30.0	0	Out +Out	0.72	R600B	4647	
1308304	bhart l	0 00 00.00	+00 00 00.0	2000.00	15:45	1.00	ISISB	30.0	0	Out +Out	0.72	R600B	4647	
1308305	bhart r	0 00 00.00	+00 00 00.0	2000.00	15:46	1.00	ISISB	30.0	0	Out +Out	0.72	R600B	4647	
1308306	bhart l	0 00 00.00	+00 00 00.0	2000.00	15:54	1.00	ISISB	30.0	0	Out +Out	0.72	R600B	4647	
1308307	bhart r	0 00 00.00	+00 00 00.0	2000.00	15:54	1.00	ISISB	30.0	0	Out +Out	0.72	R600B	4647	
1308308	bhart l	0 00 00.00	+00 00 00.0	2000.00	15:58	1.00	ISISB	30.0	0	Out +Out	0.72	R600B	4647	
1308309	bhart r	0 00 00.00	+00 00 00.0	2000.00	15:59	1.00	ISISB	30.0	0	Out +Out	0.72	R600B	4647	
1308310	Arc blue	0 00 00.00	+00 00 00.0	2000.00	16:01	1.00	ISISB	30.0	0	Out +Out	0.72	R600B	4647	
1308311	bias blue	0 00 00.00	+00 00 00.0	2000.00	16:04	1.00	ISISB	0.0	0	Out +Out	0.72	R600B	4647	
1308312	bias red	0 00 00.00	+00 00 00.0	2000.00	16:04	1.00	ISISR	0.0	0	Out +Out	0.72	R1200	6500	problems with red bias
1308313	Bias	0 00 00.00	+00 00 00.0	2000.00	16:25	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	
1308314	Bias	0 00 00.00	+00 00 00.0	2000.00	16:26	1.00	ISISB	0.0	0	Out +Out	0.98	R600B	4647	
1308315	Bias	0 00 00.00	+00 00 00.0	2000.00	16:26	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	
1308316	Bias	0 00 00.00	+00 00 00.0	2000.00	16:26	1.00	ISISB	0.0	0	Out +Out	0.98	R600B	4647	
1308317	Bias	0 00 00.00	+00 00 00.0	2000.00	16:26	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	
1308318	Bias	0 00 00.00	+00 00 00.0	2000.00	16:26	1.00	ISISB	0.0	0	Out +Out	0.98	R600B	4647	
1308319	Bias	0 00 00.00	+00 00 00.0	2000.00	16:26	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	
1308320	Bias	0 00 00.00	+00 00 00.0	2000.00	16:26	1.00	ISISB	0.0	0	Out +Out	0.98	R600B	4647	
1308321	Bias	0 00 00.00	+00 00 00.0	2000.00	16:26	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	
1308322	Bias	0 00 00.00	+00 00 00.0	2000.00	16:26	1.00	ISISB	0.0	0	Out +Out	0.98	R600B	4647	
1308323	Bias	0 00 00.00	+00 00 00.0	2000.00	16:26	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	

Run	Object	RA	Dec	Equinox	UT	Airm	Instr	Texp sec	Sky PA	Filters etc.	Slit	Grat Grism	CenwA	– NAOMI – INGR Comments L WM Twfs l Co M
1308324	Bias	0 00 00.00	+00 00 00.0	2000.00	16:27	1.00	ISISB	0.0	0	Out +Out	0.98	R600B	4647	
1308325	Bias	0 00 00.00	+00 00 00.0	2000.00	16:27	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	
1308326	Bias	0 00 00.00	+00 00 00.0	2000.00	16:27	1.00	ISISB	0.0	0	Out +Out	0.98	R600B	4647	
1308327	Bias	0 00 00.00	+00 00 00.0	2000.00	16:27	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	
1308328	Bias	0 00 00.00	+00 00 00.0	2000.00	16:27	1.00	ISISB	0.0	0	Out +Out	0.98	R600B	4647	
1308329	Bias	0 00 00.00	+00 00 00.0	2000.00	16:27	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	
1308330	Bias	0 00 00.00	+00 00 00.0	2000.00	16:27	1.00	ISISB	0.0	0	Out +Out	0.98	R600B	4647	
1308331	Bias	0 00 00.00	+00 00 00.0	2000.00	16:27	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	
1308332	Bias	0 00 00.00	+00 00 00.0	2000.00	16:27	1.00	ISISB	0.0	0	Out +Out	0.98	R600B	4647	
1308333	Bias	0 00 00.00	+00 00 00.0	2000.00	16:27	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	
1308334	Bias	0 00 00.00	+00 00 00.0	2000.00	16:27	1.00	ISISB	0.0	0	Out +Out	0.98	R600B	4647	
1308335	Bias	0 00 00.00	+00 00 00.0	2000.00	16:33	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	
1308336	Bias	0 00 00.00	+00 00 00.0	2000.00	16:33	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	
1308337	Bias	0 00 00.00	+00 00 00.0	2000.00	16:34	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	
1308338	Bias	0 00 00.00	+00 00 00.0	2000.00	16:34	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	
1308339	Bias	0 00 00.00	+00 00 00.0	2000.00	16:34	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	
1308340	Bias	0 00 00.00	+00 00 00.0	2000.00	16:34	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	
1308341	Bias	0 00 00.00	+00 00 00.0	2000.00	16:34	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	
1308342	Bias	0 00 00.00	+00 00 00.0	2000.00	16:35	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	
1308343	Bias	0 00 00.00	+00 00 00.0	2000.00	16:35	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	
1308344	Bias	0 00 00.00	+00 00 00.0	2000.00	16:35	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	
1308345	Bias	0 00 00.00	+00 00 00.0	2000.00	16:35	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	
1308346	Bias	0 00 00.00	+00 00 00.0	2000.00	16:35	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	
1308347	test	0 00 00.00	+00 00 00.0	2000.00	16:39	1.00	ISISR	5.0	0	Out +Out	0.98	R1200	6500	
1308348	test	0 00 00.00	+00 00 00.0	2000.00	16:41	1.00	ISISR	3.0	0	Out +Out	0.98	R1200	6500	
1308349	test	0 00 00.00	+00 00 00.0	2000.00	16:41	1.00	ISISB	15.0	0	Out +Out	0.98	R600B	4647	
1308350	Arc red nobin	0 00 00.00	+00 00 00.0	2000.00	16:43	1.00	ISISR	3.0	0	Out +Out	0.98	R1200	6500	
1308351	Arc blue nobin	0 00 00.00	+00 00 00.0	2000.00	16:43	1.00	ISISB	15.0	0	Out +Out	0.98	R600B	4647	
1308352	test	0 00 00.00	+00 00 00.0	2000.00	16:44	1.00	ISISR	1.0	0	Out +Out	0.98	R1200	6500	
1308353	test	0 00 00.00	+00 00 00.0	2000.00	16:44	1.00	ISISB	2.0	0	Out +Out	0.98	R600B	4647	
1308354	Flat red	0 00 00.00	+00 00 00.0	2000.00	16:46	1.00	ISISR	1.0	0	Out +Out	0.98	R1200	6500	
1308355	Flat red	0 00 00.00	+00 00 00.0	2000.00	16:46	1.00	ISISR	1.0	0	Out +Out	0.98	R1200	6500	
1308356	Flat blue	0 00 00.00	+00 00 00.0	2000.00	16:46	1.00	ISISB	2.0	0	Out +Out	0.98	R600B	4647	
1308357	Flat red	0 00 00.00	+00 00 00.0	2000.00	16:46	1.00	ISISR	1.0	0	Out +Out	0.98	R1200	6500	
1308358	Flat blue	0 00 00.00	+00 00 00.0	2000.00	16:46	1.00	ISISB	2.0	0	Out +Out	0.98	R600B	4647	
1308359	Flat red	0 00 00.00	+00 00 00.0	2000.00	16:46	1.00	ISISR	1.0	0	Out +Out	0.98	R1200	6500	
1308360	Flat blue	0 00 00.00	+00 00 00.0	2000.00	16:46	1.00	ISISB	2.0	0	Out +Out	0.98	R600B	4647	
1308361	Flat red	0 00 00.00	+00 00 00.0	2000.00	16:46	1.00	ISISR	1.0	0	Out +Out	0.98	R1200	6500	
1308362	Flat blue	0 00 00.00	+00 00 00.0	2000.00	16:46	1.00	ISISB	2.0	0	Out +Out	0.98	R600B	4647	
1308363	Flat red	0 00 00.00	+00 00 00.0	2000.00	16:47	1.00	ISISR	1.0	0	Out +Out	0.98	R1200	6500	
1308364	Flat blue	0 00 00.00	+00 00 00.0	2000.00	16:47	1.00	ISISB	2.0	0	Out +Out	0.98	R600B	4647	
1308365	Flat red	0 00 00.00	+00 00 00.0	2000.00	16:47	1.00	ISISR	1.0	0	Out +Out	0.98	R1200	6500	
1308366	Flat blue	0 00 00.00	+00 00 00.0	2000.00	16:47	1.00	ISISB	2.0	0	Out +Out	0.98	R600B	4647	
1308367	Flat red	0 00 00.00	+00 00 00.0	2000.00	16:47	1.00	ISISR	1.0	0	Out +Out	0.98	R1200	6500	
1308368	Flat blue	0 00 00.00	+00 00 00.0	2000.00	16:47	1.00	ISISB	2.0	0	Out +Out	0.98	R600B	4647	
1308369	Flat red	0 00 00.00	+00 00 00.0	2000.00	16:47	1.00	ISISR	1.0	0	Out +Out	0.98	R1200	6500	
1308370	Flat blue	0 00 00.00	+00 00 00.0	2000.00	16:47	1.00	ISISB	2.0	0	Out +Out	0.98	R600B	4647	
1308371	Flat red	0 00 00.00	+00 00 00.0	2000.00	16:47	1.00	ISISR	1.0	0	Out +Out	0.98	R1200	6500	
1308372	Flat blue	0 00 00.00	+00 00 00.0	2000.00	16:48	1.00	ISISB	2.0	0	Out +Out	0.98	R600B	4647	
1308373	Flat red	0 00 00.00	+00 00 00.0	2000.00	16:48	1.00	ISISR	1.0	0	Out +Out	0.98	R1200	6500	
1308374	Flat blue	0 00 00.00	+00 00 00.0	2000.00	16:48	1.00	ISISB	2.0	0	Out +Out	0.98	R600B	4647	
1308375	Flat blue	0 00 00.00	+00 00 00.0	2000.00	16:48	1.00	ISISB	2.0	0	Out +Out	0.98	R600B	4647	
1308376	Bias	0 00 00.00	+00 00 00.0	2000.00	17:41	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	binned problems in red again
1308377	Bias	0 00 00.00	+00 00 00.0	2000.00	17:41	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	
1308378	Bias	0 00 00.00	+00 00 00.0	2000.00	17:41	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	

Run	Object	RA	Dec	Equinox	UT	Airm	Instr	Texp sec	Sky PA	Filters etc.	Slit	Grat Grism	CenwA	– NAOMI – INGR Comments L WM Twfs l Co M
1308379	Bias	0 00 00.00	+00 00 00.0	2000.00	17:42	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	
1308380	Bias	0 00 00.00	+00 00 00.0	2000.00	17:42	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	
1308381	Bias	0 00 00.00	+00 00 00.0	2000.00	17:42	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	
1308382	bias bi	0 00 00.00	+00 00 00.0	2000.00	17:42	1.00	ISISB	0.0	0	Out +Out	0.98	R600B	4647	
1308383	Bias	0 00 00.00	+00 00 00.0	2000.00	17:42	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	
1308384	bias bi	0 00 00.00	+00 00 00.0	2000.00	17:42	1.00	ISISB	0.0	0	Out +Out	0.98	R600B	4647	
1308385	Bias	0 00 00.00	+00 00 00.0	2000.00	17:42	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	
1308386	bias bi	0 00 00.00	+00 00 00.0	2000.00	17:42	1.00	ISISB	0.0	0	Out +Out	0.98	R600B	4647	
1308387	Bias	0 00 00.00	+00 00 00.0	2000.00	17:42	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	
1308388	bias bi	0 00 00.00	+00 00 00.0	2000.00	17:42	1.00	ISISB	0.0	0	Out +Out	0.98	R600B	4647	
1308389	Bias	0 00 00.00	+00 00 00.0	2000.00	17:42	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	
1308390	bias bi	0 00 00.00	+00 00 00.0	2000.00	17:42	1.00	ISISB	0.0	0	Out +Out	0.98	R600B	4647	
1308391	Bias	0 00 00.00	+00 00 00.0	2000.00	17:42	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	
1308392	bias bi	0 00 00.00	+00 00 00.0	2000.00	17:42	1.00	ISISB	0.0	0	Out +Out	0.98	R600B	4647	
1308393	bias bi	0 00 00.00	+00 00 00.0	2000.00	17:42	1.00	ISISB	0.0	0	Out +Out	0.98	R600B	4647	
1308394	bias bi	0 00 00.00	+00 00 00.0	2000.00	17:43	1.00	ISISB	0.0	0	Out +Out	0.98	R600B	4647	
1308395	bias bi	0 00 00.00	+00 00 00.0	2000.00	17:43	1.00	ISISB	0.0	0	Out +Out	0.98	R600B	4647	
1308396	bias bi	0 00 00.00	+00 00 00.0	2000.00	17:43	1.00	ISISB	0.0	0	Out +Out	0.98	R600B	4647	
1308397	bias bi	0 00 00.00	+00 00 00.0	2000.00	17:43	1.00	ISISB	0.0	0	Out +Out	0.98	R600B	4647	
1308398	Bias	0 00 00.00	+00 00 00.0	2000.00	17:44	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	
1308399	bias binned	0 00 00.00	+00 00 00.0	2000.00	17:44	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	
1308400	bias binned	0 00 00.00	+00 00 00.0	2000.00	17:45	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	
1308401	bias binned	0 00 00.00	+00 00 00.0	2000.00	17:45	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	
1308402	bias binned	0 00 00.00	+00 00 00.0	2000.00	17:45	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	
1308403	bias binned	0 00 00.00	+00 00 00.0	2000.00	17:45	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	
1308404	bias binned	0 00 00.00	+00 00 00.0	2000.00	17:45	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	
1308405	bias binned	0 00 00.00	+00 00 00.0	2000.00	17:45	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	
1308406	bias binned	0 00 00.00	+00 00 00.0	2000.00	17:45	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	
1308407	bias binned	0 00 00.00	+00 00 00.0	2000.00	17:45	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	
1308408	bias binned	0 00 00.00	+00 00 00.0	2000.00	17:45	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	
1308409	bias binned	0 00 00.00	+00 00 00.0	2000.00	17:46	1.00	ISISR	0.0	0	Out +Out	0.98	R1200	6500	
1308410	test	0 00 00.00	+00 00 00.0	2000.00	17:46	1.00	ISISR	3.0	0	Out +Out	0.98	R1200	6500	
1308411	test	0 00 00.00	+00 00 00.0	2000.00	17:46	1.00	ISISB	15.0	0	Out +Out	0.98	R600B	4647	
1308412	Arc red bin	0 00 00.00	+00 00 00.0	2000.00	17:47	1.00	ISISR	1.0	0	Out +Out	0.98	R1200	6500	
1308413	Arc blue bin	0 00 00.00	+00 00 00.0	2000.00	17:48	1.00	ISISB	15.0	0	Out +Out	0.98	R600B	4647	
1308414	test	0 00 00.00	+00 00 00.0	2000.00	17:48	1.00	ISISR	1.0	0	Out +Out	0.98	R1200	6500	
1308415	test	0 00 00.00	+00 00 00.0	2000.00	17:48	1.00	ISISB	2.0	0	Out +Out	0.98	R600B	4647	
1308416	test	0 00 00.00	+00 00 00.0	2000.00	17:50	1.00	ISISB	5.0	0	Out +Out	0.98	R600B	4647	
1308417	test	0 00 00.00	+00 00 00.0	2000.00	17:50	1.00	ISISR	1.0	0	Out +Out	0.98	R1200	6500	
1308418	Flat blue bin	0 00 00.00	+00 00 00.0	2000.00	17:51	1.00	ISISB	10.0	0	Out +Out	0.98	R600B	4647	
1308419	Flat red bin	0 00 00.00	+00 00 00.0	2000.00	17:51	1.00	ISISR	2.0	0	Out +Out	0.98	R1200	6500	
1308420	Flat blue bin	0 00 00.00	+00 00 00.0	2000.00	17:51	1.00	ISISB	10.0	0	Out +Out	0.98	R600B	4647	
1308421	Flat red bin	0 00 00.00	+00 00 00.0	2000.00	17:51	1.00	ISISR	2.0	0	Out +Out	0.98	R1200	6500	
1308422	Flat red bin	0 00 00.00	+00 00 00.0	2000.00	17:51	1.00	ISISR	2.0	0	Out +Out	0.98	R1200	6500	
1308423	Flat blue bin	0 00 00.00	+00 00 00.0	2000.00	17:52	1.00	ISISB	10.0	0	Out +Out	0.98	R600B	4647	
1308424	Flat red bin	0 00 00.00	+00 00 00.0	2000.00	17:52	1.00	ISISR	2.0	0	Out +Out	0.98	R1200	6500	
1308425	Flat red bin	0 00 00.00	+00 00 00.0	2000.00	17:52	1.00	ISISR	2.0	0	Out +Out	0.98	R1200	6500	
1308426	Flat blue bin	0 00 00.00	+00 00 00.0	2000.00	17:52	1.00	ISISB	10.0	0	Out +Out	0.98	R600B	4647	
1308427	Flat red bin	0 00 00.00	+00 00 00.0	2000.00	17:52	1.00	ISISR	2.0	0	Out +Out	0.98	R1200	6500	
1308428	Flat red bin	0 00 00.00	+00 00 00.0	2000.00	17:52	1.00	ISISR	2.0	0	Out +Out	0.98	R1200	6500	
1308429	Flat blue bin	0 00 00.00	+00 00 00.0	2000.00	17:52	1.00	ISISB	10.0	0	Out +Out	0.98	R600B	4647	
1308430	Flat red bin	0 00 00.00	+00 00 00.0	2000.00	17:52	1.00	ISISR	2.0	0	Out +Out	0.98	R1200	6500	
1308431	Flat red bin	0 00 00.00	+00 00 00.0	2000.00	17:52	1.00	ISISR	2.0	0	Out +Out	0.98	R1200	6500	
1308432	Flat blue bin	0 00 00.00	+00 00 00.0	2000.00	17:52	1.00	ISISB	10.0	0	Out +Out	0.98	R600B	4647	
1308433	Flat red bin	0 00 00.00	+00 00 00.0	2000.00	17:52	1.00	ISISR	2.0	0	Out +Out	0.98	R1200	6500	

Run	Object	RA	Dec	Equinox	UT	Airm	Instr	Texp sec	Sky PA	Filters etc.	Slit	Grat Grism	CenwA	– NAOMI – INGR Comments L WM Twfs l Co M
1308434	Flat red bin	0 00 00.00	+00 00 00.0	2000.00	17:53	1.00	ISISR	2.0	0	Out +Out	0.98	R1200	6500	
1308435	Flat blue bin	0 00 00.00	+00 00 00.0	2000.00	17:53	1.00	ISISB	10.0	0	Out +Out	0.98	R600B	4647	
1308436	Flat blue bin	0 00 00.00	+00 00 00.0	2000.00	17:53	1.00	ISISB	10.0	0	Out +Out	0.98	R600B	4647	
1308437	Flat blue bin	0 00 00.00	+00 00 00.0	2000.00	17:53	1.00	ISISB	10.0	0	Out +Out	0.98	R600B	4647	
1308438	Flat blue bin	0 00 00.00	+00 00 00.0	2000.00	17:53	1.00	ISISB	10.0	0	Out +Out	0.98	R600B	4647	
1308439	Flat blue bin	0 00 00.00	+00 00 00.0	2000.00	17:54	1.00	ISISB	10.0	0	Out +Out	0.98	R600B	4647	
1308440	Arc blue nobin	0 00 00.00	+00 00 00.0	2000.00	20:00	1.00	ISISB	15.0	0	Out +Out	0.98	R600B	4647	
1308441	Arc red nobin	0 00 00.00	+00 00 00.0	2000.00	20:00	1.00	ISISR	3.0	0	Out +Out	0.98	R1200	6500	
1308442	test	11 59 45.57	+14 59 28.9	2000.00	20:34	1.03	ISISR	5.0	0	Out +Out	7.98	R1200	6500	
1308443	FOCRUN-1/9	11 59 45.57	+14 59 29.0	2000.00	20:35	1.03	ISISR	5.0	0	Out +Out	7.98	R1200	6500	
1308444	FOCRUN-2/9	11 59 45.57	+14 59 29.0	2000.00	20:36	1.03	ISISR	5.0	0	Out +Out	7.98	R1200	6500	
1308445	FOCRUN-3/9	11 59 45.57	+14 59 29.0	2000.00	20:36	1.03	ISISR	5.0	0	Out +Out	7.98	R1200	6500	
1308446	FOCRUN-4/9	11 59 45.57	+14 59 29.0	2000.00	20:36	1.03	ISISR	5.0	0	Out +Out	7.98	R1200	6500	
1308447	FOCRUN-5/9	11 59 45.57	+14 59 28.9	2000.00	20:36	1.03	ISISR	5.0	0	Out +Out	7.98	R1200	6500	
1308448	FOCRUN-6/9	11 59 45.57	+14 59 28.9	2000.00	20:37	1.03	ISISR	5.0	0	Out +Out	7.98	R1200	6500	
1308449	FOCRUN-7/9	11 59 45.57	+14 59 29.0	2000.00	20:37	1.03	ISISR	5.0	0	Out +Out	7.98	R1200	6500	
1308450	FOCRUN-8/9	11 59 45.57	+14 59 28.9	2000.00	20:37	1.03	ISISR	5.0	0	Out +Out	7.98	R1200	6500	
1308451	FOCRUN-9/9	11 59 45.57	+14 59 28.9	2000.00	20:38	1.03	ISISR	5.0	0	Out +Out	7.98	R1200	6500	
1308453	FOCRUN-1/5	11 59 45.57	+14 59 29.0	2000.00	20:41	1.03	ISISR	5.0	0	Out +Out	7.98	R1200	6500	
1308454	FOCRUN-2/5	11 59 45.57	+14 59 29.1	2000.00	20:41	1.03	ISISR	5.0	0	Out +Out	7.98	R1200	6500	
1308455	FOCRUN-3/5	11 59 45.57	+14 59 29.0	2000.00	20:42	1.03	ISISR	5.0	0	Out +Out	7.98	R1200	6500	
1308456	FOCRUN-4/5	11 59 45.57	+14 59 28.9	2000.00	20:42	1.03	ISISR	5.0	0	Out +Out	7.98	R1200	6500	
1308457	FOCRUN-5/5	11 59 45.57	+14 59 29.0	2000.00	20:42	1.03	ISISR	5.0	0	Out +Out	7.98	R1200	6500	
1308458	Arc blue nobin	11 29 18.90	+18 16 40.0	2000.00	20:47	1.03	ISISB	15.0	35	Out +Out	1.02	R600B	4647	
1308459	Arc red nobin	11 29 18.90	+18 16 39.9	2000.00	20:47	1.03	ISISR	3.0	35	Out +Out	1.02	R1200	6500	
1308460	Arc blue nobin	11 29 18.89	+18 16 39.9	2000.00	20:48	1.03	ISISB	15.0	35	Out +Out	1.02	R600B	4647	
1308461	Arc red nobin	11 29 18.89	+18 16 39.9	2000.00	20:48	1.03	ISISR	3.0	35	Out +Out	1.02	R1200	6500	
1308462	PG1126+186	11 29 18.23	+18 16 44.9	2000.00	20:56	1.03	ISISB	60.0	35	Out +Out	1.02	R600B	4647	
1308463	PG1126+186	11 29 18.23	+18 16 44.9	2000.00	20:56	1.03	ISISR	60.0	35	Out +Out	1.02	R1200	6500	bias messed up
1308464	PG1126+186	11 29 18.24	+18 16 44.9	2000.00	20:59	1.04	ISISR	30.0	35	Out +Out	1.02	R1200	6500	
1308465	PG1126+186	11 29 18.23	+18 16 44.8	2000.00	20:59	1.04	ISISB	30.0	35	Out +Out	1.02	R600B	4647	
1308466	PG1126+186	11 29 18.23	+18 16 44.8	2000.00	21:01	1.04	ISISB	30.0	35	Out +Out	1.02	R600B	4647	
1308467	PG1126+186	11 29 18.23	+18 16 44.9	2000.00	21:01	1.04	ISISR	30.0	35	Out +Out	1.02	R1200	6500	
1308468	PG1126+186	11 29 18.24	+18 16 44.9	2000.00	21:04	1.05	ISISR	600.0	35	Out +Out	1.02	R1200	6500	
1308469	PG1126+186	11 29 18.23	+18 16 44.8	2000.00	21:04	1.05	ISISB	600.0	35	Out +Out	1.02	R600B	4647	
1308470	Bias	11 29 18.23	+18 16 44.9	2000.00	21:20	1.06	ISISR	0.0	35	Out +Out	1.02	R1200	6500	
1308471	SDSSJ1129+1511	11 29 00.99	+15 11 33.6	2000.00	21:26	1.09	ISISB	573.7	48	Out +Out	1.02	R600B	4647	
1308472	SDSSJ1129+1511	11 29 00.97	+15 11 18.6	2000.00	21:26	1.09	ISISR	571.5	48	Out +Out	1.02	R1200	6500	
1308473	Arc red nobin	11 29 18.89	+18 16 39.9	2000.00	21:40	1.09	ISISR	3.0	58	Out +Out	1.02	R1200	6500	
1308474	Arc blue nobin	11 29 18.90	+18 16 40.0	2000.00	21:40	1.09	ISISB	15.0	58	Out +Out	1.02	R600B	4647	
1308475	Bias	11 29 18.90	+18 16 40.0	2000.00	21:42	1.09	ISISR	0.0	58	Out +Out	1.02	R1200	6500	
1308476	PG1126+186	11 29 18.89	+18 16 39.9	2000.00	21:44	1.10	ISISR	600.0	58	Out +Out	1.02	R1200	6500	
1308477	PG1126+186	11 29 18.89	+18 16 39.9	2000.00	21:44	1.11	ISISB	600.0	58	Out +Out	1.02	R600B	4647	
1308478	Arc blue bin	16 00 43.59	+07 48 02.9	2000.00	21:58	1.39	ISISB	15.0	304	Out +Out	1.01	R600B	4647	
1308479	Arc red bin	16 00 43.59	+07 48 02.9	2000.00	21:58	1.39	ISISR	1.0	304	Out +Out	1.01	R1200	6500	
1308480	SDSSJ1600+0748	16 00 43.60	+07 48 02.8	2000.00	22:02	1.31	ISISB	750.0	304	Out +Out	1.01	R600B	4647	
1308481	SDSSJ1600+0748	16 00 43.59	+07 48 02.9	2000.00	22:02	1.34	ISISR	750.0	304	Out +Out	1.01	R1200	6500	
1308482	SDSSJ1600+0748	16 00 43.59	+07 48 02.9	2000.00	22:15	1.29	ISISR	750.0	304	Out +Out	1.02	R1200	6500	
1308483	SDSSJ1600+0748	16 00 43.59	+07 48 02.9	2000.00	22:15	1.27	ISISB	750.0	304	Out +Out	1.02	R600B	4647	
1308484	SDSSJ1600+0748	16 00 43.59	+07 48 02.9	2000.00	22:28	1.25	ISISR	750.0	304	Out +Out	1.02	R1200	6500	
1308485	SDSSJ1600+0748	16 00 43.60	+07 48 02.8	2000.00	22:28	1.23	ISISB	750.0	304	Out +Out	1.02	R600B	4647	
1308486	Arc blue bin	16 00 43.59	+07 48 02.9	2000.00	22:42	1.22	ISISB	15.0	304	Out +Out	1.01	R600B	4647	
1308487	Arc red bin	16 00 43.59	+07 48 02.9	2000.00	22:42	1.22	ISISR	1.0	304	Out +Out	1.01	R1200	6500	
1308488	Arc red nobin	11 29 18.89	+18 16 39.9	2000.00	22:48	1.26	ISISR	3.0	66	Out +Out	1.02	R1200	6500	
1308489	Arc blue nobin	11 29 18.89	+18 16 39.9	2000.00	22:48	1.26	ISISB	15.0	66	Out +Out	1.02	R600B	4647	

Run	Object	RA	Dec	Equinox	UT	Airm	Instr	Texp sec	Sky PA	Filters etc.	Slit	Grat Grism	CenwA	– NAOMI – INGR Comments L WM Twfs l Co M
1308490	PG1126+186	11 29 18.89	+18 16 39.9	2000.00	22:50	1.29	ISISR	600.0	66	Out +Out	1.02	R1200	6500	
1308491	PG1126+186	11 29 18.90	+18 16 40.0	2000.00	22:50	1.31	ISISB	600.0	66	Out +Out	1.02	R600B	4647	
1308492	PG1126+186	11 29 18.90	+18 16 40.0	2000.00	23:00	1.33	ISISB	600.0	66	Out +Out	1.02	R600B	4647	
1308493	PG1126+186	11 29 18.90	+18 16 39.9	2000.00	23:00	1.35	ISISR	600.0	66	Out +Out	1.02	R1200	6500	
1308494	Arc blue nobin	0 00 00.00	+00 00 00.0	2000.00	23:12	1.32	ISISB	15.0	318	Out +Out	1.02	R600B	4647	
1308495	Arc red nobin	11 29 18.90	+18 16 40.0	2000.00	23:12	1.36	ISISR	3.0	66	Out +Out	1.02	R1200	6500	
1308496	Arc blue bin	16 00 43.60	+07 48 02.8	2000.00	23:15	1.15	ISISB	15.0	323	Out +Out	1.02	R600B	4647	
1308497	Arc red bin	16 00 43.59	+07 48 02.9	2000.00	23:15	1.15	ISISR	1.0	323	Out +Out	1.02	R1200	6500	object is right one
1308498	SDSSJ1600+0748	16 00 43.60	+07 48 02.8	2000.00	23:20	1.13	ISISR	750.0	323	Out +Out	1.02	R1200	6500	
1308499	SDSSJ1600+0748	16 00 43.59	+07 48 02.9	2000.00	23:20	1.12	ISISB	750.0	323	Out +Out	1.02	R600B	4647	
1308500	SDSSJ1600+0748	16 00 43.59	+07 48 02.9	2000.00	23:33	1.11	ISISB	750.0	323	Out +Out	1.02	R600B	4647	
1308501	SDSSJ1600+0748	16 00 43.60	+07 48 02.8	2000.00	23:33	1.10	ISISR	750.0	323	Out +Out	1.02	R1200	6500	
1308502	SDSSJ1600+0748	16 00 43.60	+07 48 02.8	2000.00	23:45	1.10	ISISR	750.0	323	Out +Out	1.02	R1200	6500	
1308503	SDSSJ1600+0748	16 00 43.60	+07 48 02.8	2000.00	23:45	1.09	ISISB	750.0	323	Out +Out	1.02	R600B	4647	
1308504	SDSSJ1600+0748	16 00 43.59	+07 48 02.9	2000.00	23:58	1.08	ISISB	750.0	323	Out +Out	1.02	R600B	4647	
1308505	SDSSJ1600+0748	16 00 43.60	+07 48 02.8	2000.00	23:58	1.08	ISISR	750.0	323	Out +Out	1.02	R1200	6500	
1308506	Arc blue bin	16 00 43.60	+07 48 02.8	2000.00	00:12	1.08	ISISB	15.0	323	Out +Out	1.02	R600B	4647	
1308507	Arc red bin	16 00 43.60	+07 48 02.9	2000.00	00:12	1.08	ISISR	1.0	323	Out +Out	1.02	R1200	6500	
1308508	Arc blue nobin	11 29 18.90	+18 16 40.0	2000.00	00:15	1.81	ISISB	15.0	67	Out +Out	1.02	R600B	4647	
1308509	Arc red nobin	11 29 18.90	+18 16 40.0	2000.00	00:15	1.81	ISISR	3.0	67	Out +Out	1.02	R1200	6500	
1308510	PG1126+186	11 29 18.89	+18 16 40.0	2000.00	00:20	1.92	ISISR	600.0	67	Out +Out	1.02	R1200	6500	
1308511	PG1126+186	11 29 18.90	+18 16 40.0	2000.00	00:20	1.98	ISISB	600.0	67	Out +Out	1.02	R600B	4647	
1308512	PG1126+186	11 29 18.90	+18 16 40.0	2000.00	00:31	2.13	ISISB	600.0	67	Out +Out	1.02	R600B	4647	
1308513	PG1126+186	11 29 18.90	+18 16 39.9	2000.00	00:31	2.06	ISISR	600.0	67	Out +Out	1.02	R1200	6500	
1308514	Arc blue nobin	11 29 18.89	+18 16 40.0	2000.00	00:42	2.15	ISISB	15.0	67	Out +Out	1.02	R600B	4647	
1308515	Arc red nobin	11 29 18.89	+18 16 39.9	2000.00	00:42	2.15	ISISR	3.0	67	Out +Out	1.02	R1200	6500	
1308516	Arc blue bin	16 00 43.60	+07 48 02.8	2000.00	00:44	1.07	ISISB	15.0	1	Out +Out	1.02	R600B	4647	
1308517	Arc red bin	16 00 43.59	+07 48 02.9	2000.00	00:44	1.07	ISISR	1.0	1	Out +Out	1.02	R1200	6500	
1308518	SDSSJ1600+0748	16 00 43.59	+07 48 02.8	2000.00	00:51	1.07	ISISR	750.0	12	Out +Out	1.01	R1200	6500	
1308519	SDSSJ1600+0748	16 00 43.60	+07 48 02.9	2000.00	00:51	1.08	ISISB	750.0	12	Out +Out	1.01	R600B	4647	
1308520	SDSSJ1600+0748	16 00 43.60	+07 48 02.8	2000.00	01:04	1.08	ISISB	750.0	12	Out +Out	1.02	R600B	4647	
1308521	SDSSJ1600+0748	0 00 00.00	+00 00 00.0	2000.00	01:04	1.08	ISISR	750.0	12	Out +Out	1.02	R1200	6500	
1308522	SDSSJ1600+0748	16 00 43.60	+07 48 02.9	2000.00	01:17	1.09	ISISR	750.0	12	Out +Out	1.02	R1200	6500	
1308523	SDSSJ1600+0748	16 00 43.59	+07 48 02.9	2000.00	01:17	1.09	ISISB	750.0	12	Out +Out	1.02	R600B	4647	
1308524	SDSSJ1600+0748	16 00 43.60	+07 48 02.8	2000.00	01:29	1.10	ISISR	750.0	12	Out +Out	1.02	R1200	6500	
1308525	SDSSJ1600+0748	16 00 43.59	+07 48 02.8	2000.00	01:29	1.11	ISISB	750.0	12	Out +Out	1.02	R600B	4647	
1308526	Arc blue bin	16 00 43.60	+07 48 02.9	2000.00	01:43	1.11	ISISB	15.0	12	Out +Out	1.02	R600B	4647	
1308527	Arc red bin	16 00 43.59	+07 48 02.9	2000.00	01:43	1.11	ISISR	1.0	12	Out +Out	1.02	R1200	6500	
1308528	SDSSJ1722+2505	17 22 52.79	+25 05 54.0	2000.00	01:48	1.00	ISISR	600.0	311	Out +Out	1.02	R1200	6500	
1308529	SDSSJ1722+2505	17 22 52.79	+25 05 54.0	2000.00	01:48	1.00	ISISB	600.0	311	Out +Out	1.02	R600B	4647	
1308530	Arc blue bin	16 00 43.60	+07 48 03.0	2000.00	02:01	1.13	ISISB	15.0	48	Out +Out	1.02	R600B	4647	
1308531	Arc red bin	16 00 43.60	+07 48 02.9	2000.00	02:01	1.13	ISISR	1.0	48	Out +Out	1.02	R1200	6500	
1308532	SDSSJ1600+0748	16 00 43.60	+07 48 02.9	2000.00	02:07	1.16	ISISB	750.0	48	Out +Out	1.02	R600B	4647	
1308533	SDSSJ1600+0748	16 00 43.60	+07 48 02.9	2000.00	02:07	1.17	ISISR	750.0	48	Out +Out	1.02	R1200	6500	
1308534	SDSSJ1600+0748	16 00 43.60	+07 48 02.9	2000.00	02:20	1.18	ISISR	750.0	48	Out +Out	1.02	R1200	6500	
1308535	SDSSJ1600+0748	16 00 43.60	+07 48 02.9	2000.00	02:20	1.20	ISISB	750.0	48	Out +Out	1.02	R600B	4647	
1308536	SDSSJ1600+0748	16 00 43.60	+07 48 02.9	2000.00	02:34	1.22	ISISR	750.0	48	Out +Out	1.02	R1200	6500	
1308537	SDSSJ1600+0748	16 00 43.60	+07 48 02.9	2000.00	02:34	1.24	ISISB	750.0	48	Out +Out	1.02	R600B	4647	
1308538	SDSSJ1600+0748	16 00 43.60	+07 48 02.9	2000.00	02:46	1.26	ISISB	750.0	48	Out +Out	1.02	R600B	4647	
1308539	SDSSJ1600+0748	16 00 43.59	+07 48 02.8	2000.00	02:46	1.28	ISISR	750.0	48	Out +Out	1.02	R1200	6500	
1308540	Arc blue bin	16 00 43.60	+07 48 02.9	2000.00	03:00	1.28	ISISB	15.0	48	Out +Out	1.02	R600B	4647	
1308541	Arc red bin	16 00 43.60	+07 48 02.9	2000.00	03:00	1.28	ISISR	1.0	48	Out +Out	1.02	R1200	6500	
1308542	SDSSJ1813+2229	18 13 11.06	+22 29 00.1	2000.00	03:05	1.01	ISISB	600.0	14	Out +Out	1.02	R600B	4647	
1308543	SDSSJ1813+2229	18 13 11.07	+22 29 00.2	2000.00	03:05	1.01	ISISR	600.0	14	Out +Out	1.02	R1200	6500	
1308544	Arc blue bin	16 00 43.60	+07 48 02.9	2000.00	03:23	1.38	ISISB	15.0	56	Out +Out	1.02	R600B	4647	

Run	Object	RA	Dec	Equinox	UT	Airm	Instr	Texp sec	Sky PA	Filters etc.	Slit	Grat Grism	CenwA	– NAOMI – INGR Comments L WM Twfs l Co M
1308545	Arc red bin	16 00 43.59	+07 48 02.8	2000.00	03:23	1.38	ISISR	1.0	56	Out +Out	1.02	R1200	6500	
1308546	SDSSJ1600+0748	16 00 43.60	+07 48 02.9	2000.00	03:25	1.41	ISISR	750.0	56	Out +Out	1.02	R1200	6500	
1308547	SDSSJ1600+0748	16 00 43.60	+07 48 03.0	2000.00	03:25	1.45	ISISB	750.0	56	Out +Out	1.02	R600B	4647	
1308548	SDSSJ1600+0748	16 00 43.59	+07 48 02.8	2000.00	03:37	1.49	ISISR	750.0	56	Out +Out	1.01	R1200	6500	
1308549	SDSSJ1600+0748	16 00 43.60	+07 48 02.9	2000.00	03:37	1.52	ISISB	750.0	56	Out +Out	1.01	R600B	4647	
1308550	SDSSJ1600+0748	16 00 43.59	+07 48 02.8	2000.00	03:50	1.57	ISISR	750.0	56	Out +Out	1.01	R1200	6500	
1308551	SDSSJ1600+0748	16 00 43.60	+07 48 02.8	2000.00	03:50	1.61	ISISB	750.0	56	Out +Out	1.01	R600B	4647	
1308552	SDSSJ1600+0748	16 00 43.60	+07 48 02.9	2000.00	04:03	1.72	ISISB	750.0	56	Out +Out	1.01	R600B	4647	
1308553	SDSSJ1600+0748	16 00 43.60	+07 48 02.9	2000.00	04:03	1.67	ISISR	750.0	56	Out +Out	1.01	R1200	6500	
1308554	SDSSJ1600+0748	16 00 43.59	+07 48 02.8	2000.00	04:16	1.78	ISISR	750.0	56	Out +Out	1.01	R1200	6500	
1308555	SDSSJ1600+0748	16 00 43.59	+07 48 02.8	2000.00	04:16	1.84	ISISB	750.0	56	Out +Out	1.01	R600B	4647	
1308556	SDSSJ1600+0748	16 00 43.60	+07 48 02.9	2000.00	04:28	1.92	ISISR	750.0	56	Out +Out	1.01	R1200	6500	
1308557	SDSSJ1600+0748	16 00 43.60	+07 48 02.9	2000.00	04:28	2.00	ISISB	750.0	56	Out +Out	1.01	R600B	4647	
1308558	Arc blue bin	16 00 43.60	+07 48 02.8	2000.00	04:42	2.01	ISISB	15.0	56	Out +Out	1.01	R600B	4647	
1308559	Arc red bin	16 00 43.60	+07 48 02.9	2000.00	04:42	2.01	ISISR	1.0	56	Out +Out	1.01	R1200	6500	
1308560	SDSSJ2041+1622	20 41 25.87	+16 22 42.5	2000.00	04:50	1.03	ISISR	600.0	326	Out +Out	1.01	R1200	6500	
1308561	SDSSJ2041+1622	20 41 25.86	+16 22 42.4	2000.00	04:50	1.03	ISISB	600.0	326	Out +Out	1.01	R600B	4647	
1308562	SDSSJ2048+0516	20 48 15.19	+05 16 28.3	2000.00	05:03	1.09	ISISR	600.0	346	Out +Out	1.02	R1200	6500	
1308563	SDSSJ2048+0516	20 48 15.18	+05 16 28.3	2000.00	05:03	1.09	ISISB	600.0	346	Out +Out	1.02	R600B	4647	
1308564	SDSSJ2055+0431	20 55 12.20	+04 30 59.9	2000.00	05:16	1.10	ISISB	600.0	349	Out +Out	1.02	R600B	4647	
1308565	SDSSJ2055+0431	20 55 12.20	+04 30 59.9	2000.00	05:16	1.10	ISISR	600.0	349	Out +Out	1.02	R1200	6500	
1308566	Arc red bin	20 55 12.19	+04 31 00.0	2000.00	05:27	1.10	ISISR	1.0	349	Out +Out	1.02	R1200	6500	
1308567	Arc blue bin	20 55 12.20	+04 30 59.9	2000.00	05:27	1.10	ISISB	15.0	349	Out +Out	1.02	R600B	4647	
1308568	Flat blue bin	20 55 12.20	+04 30 59.9	2000.00	05:30	1.10	ISISB	10.0	349	Out +Out	1.02	R600B	4647	
1308569	Flat blue bin	20 55 12.20	+04 31 00.0	2000.00	05:30	1.10	ISISB	10.0	349	Out +Out	1.02	R600B	4647	
1308570	Flat red bin	20 55 12.19	+04 30 59.9	2000.00	05:30	1.10	ISISR	2.0	349	Out +Out	1.02	R1200	6500	
1308571	Flat red bin	20 55 12.19	+04 30 59.9	2000.00	05:30	1.10	ISISR	2.0	349	Out +Out	1.02	R1200	6500	
1308572	Flat blue bin	20 55 12.20	+04 31 00.0	2000.00	05:30	1.10	ISISB	10.0	349	Out +Out	1.02	R600B	4647	
1308573	Flat red bin	20 55 12.20	+04 30 59.9	2000.00	05:30	1.10	ISISR	2.0	349	Out +Out	1.02	R1200	6500	
1308574	Flat red bin	20 55 12.20	+04 30 59.9	2000.00	05:30	1.10	ISISR	2.0	349	Out +Out	1.02	R1200	6500	
1308575	Flat blue bin	20 55 12.19	+04 31 00.0	2000.00	05:31	1.10	ISISB	10.0	349	Out +Out	1.02	R600B	4647	
1308576	Flat red bin	20 55 12.20	+04 30 59.9	2000.00	05:31	1.10	ISISR	2.0	349	Out +Out	1.02	R1200	6500	
1308577	Flat red bin	20 55 12.19	+04 31 00.0	2000.00	05:31	1.10	ISISR	2.0	349	Out +Out	1.02	R1200	6500	
1308578	Flat blue bin	20 55 12.19	+04 30 59.9	2000.00	05:31	1.10	ISISB	10.0	349	Out +Out	1.02	R600B	4647	
1308579	Flat red bin	20 55 12.19	+04 31 00.0	2000.00	05:31	1.10	ISISR	2.0	349	Out +Out	1.02	R1200	6500	
1308580	Flat red bin	20 55 12.20	+04 30 59.9	2000.00	05:31	1.10	ISISR	2.0	349	Out +Out	1.02	R1200	6500	
1308581	Flat blue bin	20 55 12.19	+04 31 00.0	2000.00	05:31	1.10	ISISB	10.0	349	Out +Out	1.02	R600B	4647	
1308582	Flat red bin	20 55 12.20	+04 31 00.0	2000.00	05:31	1.10	ISISR	2.0	349	Out +Out	1.02	R1200	6500	
1308583	Flat red bin	20 55 12.20	+04 31 00.0	2000.00	05:31	1.10	ISISR	2.0	349	Out +Out	1.02	R1200	6500	
1308584	Flat blue bin	20 55 12.19	+04 31 00.0	2000.00	05:31	1.10	ISISB	10.0	349	Out +Out	1.02	R600B	4647	
1308585	Flat red bin	20 55 12.20	+04 31 00.0	2000.00	05:31	1.10	ISISR	2.0	349	Out +Out	1.02	R1200	6500	
1308586	Flat blue bin	20 55 12.19	+04 30 59.9	2000.00	05:32	1.10	ISISB	10.0	349	Out +Out	1.02	R600B	4647	
1308587	Flat blue bin	20 55 12.20	+04 30 59.9	2000.00	05:32	1.10	ISISB	10.0	349	Out +Out	1.02	R600B	4647	
1308588	Flat blue bin	20 55 12.20	+04 31 00.0	2000.00	05:32	1.10	ISISB	10.0	349	Out +Out	1.02	R600B	4647	
1308589	Flat blue bin	20 55 12.20	+04 31 00.0	2000.00	05:32	1.10	ISISB	10.0	349	Out +Out	1.02	R600B	4647	

B.2 Log 30-05-2009

WHT OBSERVING LOG (ISAAC NEWTON GROUP, LA PALMA)

generated on 2009 05 31 06:33

TELESCOPE	WHT
DATE	20090530
OBSERVER/S	Gijs Nelemans
PROGRAMME	Using sdB stars to study common-envelope ev
PROPOSAL REF	N9
TELESCOPE OPERATOR	Riddick
SUPPORT ASTRONOMER	Rix
TEL STATION / FOCUS	/ 97.95
INSTRUMENT/S	ISISB
SUNSET (UT)	20:12
EVENING TWILIGHT (UT)	21:36
MORNING TWILIGHT (UT)	04:42
SUNRISE (UT)	06:06
%ILLUM. LUNAR DISK	48
DARK TIME (HRS)	07:06
TWILIGHT TIME (HRS)	02:48
MOONRISE (UT)	No moonrise within sunset-sunrise
MOONSET (UT)	01:32

UT	AirT degC	Hum %	Wspd km/s	Gust km/s	Wdir deg	Press mbar	LocT degC	wht.T degC	Mirr degC	LocRH %	wht.RH %
21:00	9.8	1	22.4	23.0	34	768.3	9.8	11.	10.	1	8
22:00	10.6	1	11.1	13.2	109	768.8	10.6	11.	10.	1	4
23:00	10.9	0	12.9	13.9	98	769.3	10.9	11.	10.	0	2
00:00	10.4	1	10.2	12.2	57	768.8	10.4	10.	10.	1	3
01:00	10.4	1	9.1	9.8	64	769.2	10.4	10.	10.	1	3
02:00	10.6	1	8.0	8.7	151	768.0	10.6	10.	10.	1	4
03:00	10.4	0	3.2	3.2	157	768.7	10.4	10.	10.	0	3
04:00	10.0	1	3.7	3.6	174	767.6	10.0	10.	10.	1	4
05:00	10.5	1	4.5	4.5	207	767.4	10.5	9.	10.	1	5
06:00	10.3	1	9.5	10.4	284	768.3	10.3	9.	10.	1	6

TIME LOST weather: 00:00

TIME LOST Technical: 00:15
TIME LOST Other: 00:00
WEATHER CONDITIONS (eg transparancy, dust, %cloud cover, seeing):
quite good seeing COMMENTS (causes of time lost, setup information eg CCD windows):
some minor problems with instrument. Overall good night

Run	Object	RA	Dec	Equinox	UT	Airm	Instr	Texp sec	Sky PA	Filters etc.	Slit	Grat Grism	CenwA	– NAOMI – INGR Comments L WM Twfs l Co M
1308601	bias red 1 1	0 00 00.00	+40 00 00.0	2009.41	10:10	1.08	ISISR	0.0	349	Out +Out	1.02	R1200	6500	
1308602	bias red 1 1	0 00 00.00	+39 59 59.9	2009.41	10:10	1.08	ISISR	0.0	349	Out +Out	1.02	R1200	6500	
1308603	bias red 1 1	0 00 00.00	+39 59 59.9	2009.41	10:12	1.08	ISISR	0.0	349	Out +Out	1.02	R1200	6500	
1308604	bias red 1 1	0 00 00.00	+40 00 00.0	2009.41	10:14	1.08	ISISR	0.0	349	Out +Out	1.02	R1200	6500	
1308605	bias red 1 1 AG	0 00 00.00	+40 00 00.0	2009.41	10:15	1.08	ISISR	0.0	349	Out +Out	1.02	R1200	6500	
1308606	bias red 1 1 noA	23 59 59.99	+40 00 00.0	2009.41	10:16	1.08	ISISR	0.0	349	Out +Out	1.02	R1200	6500	
1308607	bias red 1 1 AG	23 59 59.99	+40 00 00.0	2009.41	10:16	1.09	ISISR	0.0	349	Out +Out	1.02	R1200	6500	0.1s
1308608	bias red11 AG 5s	23 59 59.99	+40 00 00.0	2009.41	10:22	1.09	ISISR	0.0	349	Out +Out	1.02	R1200	6500	
1308609	bias red11 AG 0.	0 00 00.00	+00 00 00.0	2009.41	10:27	1.00	ISISR	0.0	349	Out +Out	1.02	R1200	6500	
1308610	bias red 1 1 noA	0 00 00.00	+00 00 00.0	2009.41	10:28	1.00	ISISR	0.0	349	Out +Out	1.02	R1200	6500	
1308611	Bias	3 00 00.00	+44 59 59.9	2009.41	13:20	1.11	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308612	Bias	3 00 00.00	+44 59 59.9	2009.41	13:21	1.11	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308613	Bias	2 59 59.99	+45 00 00.0	2009.41	13:24	1.12	AUX	0.0	0	RGOZ3				
1308614	Arc	2 59 59.99	+45 00 00.0	2009.41	13:33	1.13	ISISR	3.0	0	Out +Out	1.03	R1200	6500	
1308615	Arc	3 00 00.00	+44 59 59.9	2009.41	13:33	1.13	ISISB	5.0	0	Out +Out	1.03	R600B	4647	
1308616	Bias	0 00 00.00	+00 00 00.0	2009.41	15:59	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308617	Bias	0 00 00.00	+00 00 00.0	2009.41	15:59	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308618	Bias	0 00 00.00	+00 00 00.0	2009.41	15:59	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308619	Bias	0 00 00.00	+00 00 00.0	2009.41	15:59	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308620	Bias	0 00 00.00	+00 00 00.0	2009.41	15:59	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308621	Bias	0 00 00.00	+00 00 00.0	2009.41	15:59	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308622	Bias	0 00 00.00	+00 00 00.0	2009.41	15:59	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308623	Bias	0 00 00.00	+00 00 00.0	2009.41	15:59	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308624	Bias	0 00 00.00	+00 00 00.0	2009.41	15:59	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308625	Bias	0 00 00.00	+00 00 00.0	2009.41	15:59	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308626	Bias	0 00 00.00	+00 00 00.0	2009.41	16:00	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308627	Bias	0 00 00.00	+00 00 00.0	2009.41	16:00	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308628	Bias	0 00 00.00	+00 00 00.0	2009.41	16:00	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308629	Bias	0 00 00.00	+00 00 00.0	2009.41	16:00	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308630	Bias	0 00 00.00	+00 00 00.0	2009.41	16:00	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308631	Bias	0 00 00.00	+00 00 00.0	2009.41	16:00	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308632	Bias	0 00 00.00	+00 00 00.0	2009.41	16:00	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308633	Bias	0 00 00.00	+00 00 00.0	2009.41	16:00	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308634	Bias	0 00 00.00	+00 00 00.0	2009.41	16:00	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308635	Bias	0 00 00.00	+00 00 00.0	2009.41	16:00	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308636	Bias	0 00 00.00	+00 00 00.0	2009.41	16:01	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308637	Bias	0 00 00.00	+00 00 00.0	2009.41	16:01	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308638	Bias	0 00 00.00	+00 00 00.0	2009.41	16:01	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308639	Bias	0 00 00.00	+00 00 00.0	2009.41	16:01	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308640	Bias	0 00 00.00	+00 00 00.0	2009.41	16:01	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308641	Bias	0 00 00.00	+00 00 00.0	2009.41	16:01	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308642	Bias	0 00 00.00	+00 00 00.0	2009.41	16:01	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308643	Bias	0 00 00.00	+00 00 00.0	2009.41	16:01	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308644	Bias	0 00 00.00	+00 00 00.0	2009.41	16:01	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308645	Bias	0 00 00.00	+00 00 00.0	2009.41	16:01	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308646	Bias	0 00 00.00	+00 00 00.0	2009.41	16:02	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308647	Bias	0 00 00.00	+00 00 00.0	2009.41	16:02	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308648	Bias	0 00 00.00	+00 00 00.0	2009.41	16:02	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308649	Bias	0 00 00.00	+00 00 00.0	2009.41	16:02	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308650	Bias	0 00 00.00	+00 00 00.0	2009.41	16:02	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308651	Bias	0 00 00.00	+00 00 00.0	2009.41	16:02	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308652	Bias	0 00 00.00	+00 00 00.0	2009.41	16:02	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308653	Bias	0 00 00.00	+00 00 00.0	2009.41	16:02	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308654	Bias	0 00 00.00	+00 00 00.0	2009.41	16:02	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308655	Bias	0 00 00.00	+00 00 00.0	2009.41	16:02	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	

Run	Object	RA	Dec	Equinox	UT	Airm	Instr	Texp sec	Sky PA	Filters etc.	Slit	Grat Grism	CenwA	– NAOMI – INGR Comments L WM Twfs l Co M
1308656	Bias	0 00 00.00	+00 00 00.0	2009.41	16:02	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308657	Bias	0 00 00.00	+00 00 00.0	2009.41	16:03	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308658	Arc blue nobin	0 00 00.00	+00 00 00.0	2009.41	16:03	1.00	ISISB	15.0	0	Out +Out	1.02	R600B	4647	START CRAP
1308659	Arc red nobin	0 00 00.00	+00 00 00.0	2009.41	16:03	1.00	ISISR	3.0	0	Out +Out	1.02	R1200	6500	
1308661	Flat blue nobin	0 00 00.00	00 00 00.0		16:03		UNK	1.0						
1308662	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:04	1.00	ISISB	1.0	0	Out +Out	1.02	R600B	4647	
1308663	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:04	1.00	ISISB	1.0	0	Out +Out	1.02	R600B	4647	
1308664	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:04	1.00	ISISB	1.0	0	Out +Out	1.02	R600B	4647	
1308665	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:04	1.00	ISISB	1.0	0	Out +Out	1.02	R600B	4647	
1308667	binas bin	0 00 00.00	00 00 00.0		16:04		UNK	1.0						
1308668	bias bin	0 00 00.00	+00 00 00.0	2009.41	16:04	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308669	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:04	1.00	ISISB	1.0	0	Out +Out	1.02	R600B	4647	
1308670	bias bin	0 00 00.00	+00 00 00.0	2009.41	16:04	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308671	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:05	1.00	ISISB	1.0	0	Out +Out	1.02	R600B	4647	
1308672	bias bin	0 00 00.00	+00 00 00.0	2009.41	16:05	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308673	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:05	1.00	ISISB	1.0	0	Out +Out	1.02	R600B	4647	
1308674	bias bin	0 00 00.00	+00 00 00.0	2009.41	16:05	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308675	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:05	1.00	ISISB	1.0	0	Out +Out	1.02	R600B	4647	
1308676	bias bin	0 00 00.00	+00 00 00.0	2009.41	16:05	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308677	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:05	1.00	ISISB	1.0	0	Out +Out	1.02	R600B	4647	
1308678	bias bin	0 00 00.00	+00 00 00.0	2009.41	16:05	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308679	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:05	1.00	ISISB	1.0	0	Out +Out	1.02	R600B	4647	
1308680	bias bin	0 00 00.00	+00 00 00.0	2009.41	16:05	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308681	bias bin	0 00 00.00	+00 00 00.0	2009.41	16:05	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308682	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:05	1.00	ISISB	1.0	0	Out +Out	1.02	R600B	4647	
1308683	bias bin	0 00 00.00	+00 00 00.0	2009.41	16:05	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308684	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:05	1.00	ISISB	1.0	0	Out +Out	1.02	R600B	4647	
1308685	bias bin	0 00 00.00	+00 00 00.0	2009.41	16:05	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308686	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:05	1.00	ISISB	1.0	0	Out +Out	1.02	R600B	4647	
1308687	bias bin	0 00 00.00	+00 00 00.0	2009.41	16:05	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308688	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:06	1.00	ISISB	1.0	0	Out +Out	1.02	R600B	4647	
1308689	bias bin	0 00 00.00	+00 00 00.0	2009.41	16:06	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308690	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:06	1.00	ISISB	1.0	0	Out +Out	1.02	R600B	4647	
1308691	bias bin	0 00 00.00	+00 00 00.0	2009.41	16:06	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308692	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:06	1.00	ISISB	1.0	0	Out +Out	1.02	R600B	4647	
1308693	bias bin	0 00 00.00	+00 00 00.0	2009.41	16:06	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308694	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:06	1.00	ISISB	1.0	0	Out +Out	1.02	R600B	4647	
1308695	bias bin	0 00 00.00	+00 00 00.0	2009.41	16:06	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308696	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:06	1.00	ISISB	1.0	0	Out +Out	1.02	R600B	4647	
1308697	bias bin	0 00 00.00	+00 00 00.0	2009.41	16:06	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308698	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:06	1.00	ISISB	1.0	0	Out +Out	1.02	R600B	4647	
1308699	bias bin	0 00 00.00	+00 00 00.0	2009.41	16:06	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308700	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:06	1.00	ISISB	1.0	0	Out +Out	1.02	R600B	4647	
1308701	bias bin	0 00 00.00	+00 00 00.0	2009.41	16:06	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308702	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:06	1.00	ISISB	1.0	0	Out +Out	1.02	R600B	4647	
1308703	bias bin	0 00 00.00	+00 00 00.0	2009.41	16:06	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308704	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:06	1.00	ISISB	1.0	0	Out +Out	1.02	R600B	4647	
1308705	bias bin	0 00 00.00	+00 00 00.0	2009.41	16:06	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308706	bias bin	0 00 00.00	+00 00 00.0	2009.41	16:07	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308707	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:07	1.00	ISISB	1.0	0	Out +Out	1.02	R600B	4647	
1308708	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:07	1.00	ISISB	1.0	0	Out +Out	1.02	R600B	4647	
1308709	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:07	1.00	ISISB	1.0	0	Out +Out	1.02	R600B	4647	
1308710	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:07	1.00	ISISB	1.0	0	Out +Out	1.02	R600B	4647	
1308711	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:07	1.00	ISISB	1.0	0	Out +Out	1.02	R600B	4647	
1308712	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:07	1.00	ISISB	1.0	0	Out +Out	1.02	R600B	4647	

Run	Object	RA	Dec	Equinox	UT	Airm	Instr	Texp sec	Sky PA	Filters etc.	Slit	Grat Grism	CenwA	– NAOMI – INGR Comments L WM Twfs l Co M
1308713	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:07	1.00	ISISB	1.0	0	Out +Out	1.02	R600B	4647	END CRAP
1308714	Bias	0 00 00.00	+00 00 00.0	2009.41	16:08	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308715	Bias	0 00 00.00	+00 00 00.0	2009.41	16:09	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308716	Bias	0 00 00.00	+00 00 00.0	2009.41	16:11	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308717	Bias	0 00 00.00	+00 00 00.0	2009.41	16:11	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308718	Bias	0 00 00.00	+00 00 00.0	2009.41	16:12	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308719	Bias	0 00 00.00	+00 00 00.0	2009.41	16:13	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308720	Bias	0 00 00.00	+00 00 00.0	2009.41	16:17	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308721	Bias	0 00 00.00	+00 00 00.0	2009.41	16:17	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308722	Bias	0 00 00.00	+00 00 00.0	2009.41	16:17	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308723	Bias	0 00 00.00	+00 00 00.0	2009.41	16:17	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308724	Bias	0 00 00.00	+00 00 00.0	2009.41	16:17	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308725	Bias	0 00 00.00	+00 00 00.0	2009.41	16:17	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308726	Bias	0 00 00.00	+00 00 00.0	2009.41	16:17	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308727	Bias	0 00 00.00	+00 00 00.0	2009.41	16:17	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308728	Bias	0 00 00.00	+00 00 00.0	2009.41	16:17	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308729	Bias	0 00 00.00	+00 00 00.0	2009.41	16:17	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308730	Bias	0 00 00.00	+00 00 00.0	2009.41	16:18	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308731	Bias	0 00 00.00	+00 00 00.0	2009.41	16:18	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308732	Bias	0 00 00.00	+00 00 00.0	2009.41	16:18	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308733	Bias	0 00 00.00	+00 00 00.0	2009.41	16:18	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308734	Bias	0 00 00.00	+00 00 00.0	2009.41	16:18	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308735	Bias	0 00 00.00	+00 00 00.0	2009.41	16:18	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308736	Bias	0 00 00.00	+00 00 00.0	2009.41	16:18	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308737	Bias	0 00 00.00	+00 00 00.0	2009.41	16:18	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308738	Bias	0 00 00.00	+00 00 00.0	2009.41	16:18	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308739	Bias	0 00 00.00	+00 00 00.0	2009.41	16:18	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308740	Bias	0 00 00.00	+00 00 00.0	2009.41	16:19	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308741	Bias	0 00 00.00	+00 00 00.0	2009.41	16:19	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308742	Bias	0 00 00.00	+00 00 00.0	2009.41	16:19	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308743	Bias	0 00 00.00	+00 00 00.0	2009.41	16:19	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308744	Bias	0 00 00.00	+00 00 00.0	2009.41	16:19	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308745	Bias	0 00 00.00	+00 00 00.0	2009.41	16:19	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308746	Bias	0 00 00.00	+00 00 00.0	2009.41	16:19	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308747	Bias	0 00 00.00	+00 00 00.0	2009.41	16:19	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308748	Bias	0 00 00.00	+00 00 00.0	2009.41	16:19	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308749	Bias	0 00 00.00	+00 00 00.0	2009.41	16:19	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308750	Bias	0 00 00.00	+00 00 00.0	2009.41	16:20	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308751	Bias	0 00 00.00	+00 00 00.0	2009.41	16:20	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308752	Bias	0 00 00.00	+00 00 00.0	2009.41	16:20	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308753	Bias	0 00 00.00	+00 00 00.0	2009.41	16:20	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308754	Bias	0 00 00.00	+00 00 00.0	2009.41	16:20	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308755	Bias	0 00 00.00	+00 00 00.0	2009.41	16:20	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308756	Bias	0 00 00.00	+00 00 00.0	2009.41	16:20	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308757	Bias	0 00 00.00	+00 00 00.0	2009.41	16:20	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308758	Bias	0 00 00.00	+00 00 00.0	2009.41	16:20	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308759	Bias	0 00 00.00	+00 00 00.0	2009.41	16:20	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308760	Bias	0 00 00.00	+00 00 00.0	2009.41	16:21	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308761	Bias	0 00 00.00	+00 00 00.0	2009.41	16:21	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308762	Arc red nobin	0 00 00.00	+00 00 00.0	2009.41	16:24	1.00	ISISR	3.0	0	Out +Out	1.02	R1200	6500	
1308763	Arc blue nobin	0 00 00.00	+00 00 00.0	2009.41	16:24	1.00	ISISB	15.0	0	Out +Out	1.02	R600B	4647	
1308764	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:25	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1308765	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	16:25	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1308766	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:25	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1308767	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	16:25	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	

Run	Object	RA	Dec	Equinox	UT	Airm	Instr	Texp sec	Sky PA	Filters etc.	Slit	Grat Grism	CenwA	– NAOMI – INGR Comments L WM Twfs l Co M
1308768	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:25	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1308769	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	16:25	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1308770	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:25	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1308771	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	16:25	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1308772	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:25	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1308773	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	16:26	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1308774	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:26	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1308775	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	16:26	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1308776	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:26	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1308777	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	16:26	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1308778	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:26	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1308779	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	16:26	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1308780	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:26	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1308781	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	16:26	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1308782	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:26	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1308783	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	16:27	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1308784	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:27	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1308785	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	16:27	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1308786	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:27	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1308787	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	16:27	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1308788	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:27	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1308789	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:27	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1308790	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	16:27	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1308791	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:27	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1308792	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	16:28	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1308793	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:28	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1308794	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	16:28	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1308795	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:28	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1308796	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	16:28	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1308797	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:28	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1308798	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	16:28	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1308799	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:28	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1308800	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	16:28	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1308801	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:28	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1308802	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	16:29	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1308803	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:29	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1308804	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	16:29	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1308805	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:29	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1308806	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	16:29	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1308807	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:29	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1308808	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	16:29	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1308809	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:29	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1308810	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	16:29	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1308811	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:29	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1308812	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	16:30	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1308813	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:30	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1308814	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:30	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1308815	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	16:30	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1308816	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:30	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1308817	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	16:30	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1308818	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:30	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1308819	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	16:30	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1308820	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:31	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1308821	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	16:31	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1308822	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	16:31	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	

Run	Object	RA	Dec	Equinox	UT	Airm	Instr	Texp sec	Sky PA	Filters etc.	Slit	Grat Grism	CenwA	– NAOMI – INGR Comments L WM Twfs l Co M
1308823	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	16:31	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1308824	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	16:31	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1308825	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	16:31	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1308826	binas bin	0 00 00.00	+00 00 00.0	2009.41	16:33	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308827	bias bin	0 00 00.00	+00 00 00.0	2009.41	16:33	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308828	binas bin	0 00 00.00	+00 00 00.0	2009.41	16:33	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308829	bias bin	0 00 00.00	+00 00 00.0	2009.41	16:33	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308830	binas bin	0 00 00.00	+00 00 00.0	2009.41	16:34	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308831	bias bin	0 00 00.00	+00 00 00.0	2009.41	16:34	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308832	binas bin	0 00 00.00	+00 00 00.0	2009.41	16:34	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308833	bias bin	0 00 00.00	+00 00 00.0	2009.41	16:34	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308834	binas bin	0 00 00.00	+00 00 00.0	2009.41	16:34	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308835	bias bin	0 00 00.00	+00 00 00.0	2009.41	16:34	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308836	binas bin	0 00 00.00	+00 00 00.0	2009.41	16:34	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308837	bias bin	0 00 00.00	+00 00 00.0	2009.41	16:34	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308838	binas bin	0 00 00.00	+00 00 00.0	2009.41	16:34	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308839	bias bin	0 00 00.00	+00 00 00.0	2009.41	16:34	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308840	binas bin	0 00 00.00	+00 00 00.0	2009.41	16:34	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308841	bias bin	0 00 00.00	+00 00 00.0	2009.41	16:34	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308842	binas bin	0 00 00.00	+00 00 00.0	2009.41	16:34	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308843	bias bin	0 00 00.00	+00 00 00.0	2009.41	16:34	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308844	binas bin	0 00 00.00	+00 00 00.0	2009.41	16:34	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308845	bias bin	0 00 00.00	+00 00 00.0	2009.41	16:34	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308846	binas bin	0 00 00.00	+00 00 00.0	2009.41	16:34	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308847	bias bin	0 00 00.00	+00 00 00.0	2009.41	16:34	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308848	binas bin	0 00 00.00	+00 00 00.0	2009.41	16:35	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308849	bias bin	0 00 00.00	+00 00 00.0	2009.41	16:35	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308850	binas bin	0 00 00.00	+00 00 00.0	2009.41	16:35	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308851	bias bin	0 00 00.00	+00 00 00.0	2009.41	16:35	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308852	binas bin	0 00 00.00	+00 00 00.0	2009.41	16:35	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308853	bias bin	0 00 00.00	+00 00 00.0	2009.41	16:35	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308854	binas bin	0 00 00.00	+00 00 00.0	2009.41	16:35	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308855	bias bin	0 00 00.00	+00 00 00.0	2009.41	16:35	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308856	binas bin	0 00 00.00	+00 00 00.0	2009.41	16:35	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308857	bias bin	0 00 00.00	+00 00 00.0	2009.41	16:35	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308858	binas bin	0 00 00.00	+00 00 00.0	2009.41	16:35	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308859	bias bin	0 00 00.00	+00 00 00.0	2009.41	16:35	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308860	binas bin	0 00 00.00	+00 00 00.0	2009.41	16:35	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308861	bias bin	0 00 00.00	+00 00 00.0	2009.41	16:35	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308862	binas bin	0 00 00.00	+00 00 00.0	2009.41	16:35	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308863	bias bin	0 00 00.00	+00 00 00.0	2009.41	16:35	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308864	binas bin	0 00 00.00	+00 00 00.0	2009.41	16:35	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308865	bias bin	0 00 00.00	+00 00 00.0	2009.41	16:35	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308866	binas bin	0 00 00.00	+00 00 00.0	2009.41	16:36	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1308867	bias bin	0 00 00.00	+00 00 00.0	2009.41	16:36	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308868	Arc blue bin	0 00 00.00	+00 00 00.0	2009.41	16:36	1.00	ISISB	15.0	0	Out +Out	1.02	R600B	4647	
1308869	Arc red bin	0 00 00.00	+00 00 00.0	2009.41	16:36	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1308870	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	16:36	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1308871	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	16:36	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1308872	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	16:36	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1308873	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	16:37	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1308874	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	16:37	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1308875	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	16:37	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1308876	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	16:37	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1308877	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	16:37	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	

Run	Object	RA	Dec	Equinox	UT	Airm	Instr	Texp sec	Sky PA	Filters etc.	Slit	Grat Grism	CenwA	– NAOMI – INGR Comments L WM Twfs l Co M
1308878	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	16:37	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1308879	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	16:37	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1308880	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	16:37	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1308881	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	16:37	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1308882	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	16:37	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1308883	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	16:37	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1308884	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	16:38	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1308885	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	16:38	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1308886	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	16:38	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1308887	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	16:38	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1308888	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	16:38	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1308889	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	16:38	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1308890	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	16:38	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1308891	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	16:38	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1308892	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	16:38	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1308893	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	16:38	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1308894	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	16:38	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1308895	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	16:38	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1308896	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	16:39	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1308897	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	16:39	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1308898	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	16:39	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1308899	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	16:39	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1308900	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	16:39	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1308901	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	16:39	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1308902	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	16:39	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1308903	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	16:39	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1308904	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	16:39	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1308905	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	16:39	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1308906	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	16:40	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1308907	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	16:40	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1308908	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	16:40	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1308909	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	16:40	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1308910	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	16:40	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1308911	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	16:40	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1308912	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	16:40	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1308913	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	16:40	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1308914	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	16:40	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1308915	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	16:40	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1308916	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	16:40	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1308917	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	16:41	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1308918	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	16:41	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1308919	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	16:41	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1308920	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	16:41	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1308921	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	16:42	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1308922	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	16:42	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1308923	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	16:42	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1308924	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	16:42	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1308925	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	16:43	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1308926	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	16:43	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1308927	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	16:43	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1308928	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	16:44	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1308929	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	16:44	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1308930	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	16:44	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1308931	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	16:44	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1308932	Bias	0 00 00.00	+00 00 00.0	2009.41	17:01	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	better biases

Run	Object	RA	Dec	Equinox	UT	Airm	Instr	Texp sec	Sky PA	Filters etc.	Slit	Grat Grism	CenwA	– NAOMI – INGR Comments L WM Twfs l Co M
1308933	Bias	0 00 00.00	+00 00 00.0	2009.41	17:01	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308934	Bias	0 00 00.00	+00 00 00.0	2009.41	17:01	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308935	Bias	0 00 00.00	+00 00 00.0	2009.41	17:01	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308936	Bias	0 00 00.00	+00 00 00.0	2009.41	17:01	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308937	Bias	0 00 00.00	+00 00 00.0	2009.41	17:01	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308938	Bias	0 00 00.00	+00 00 00.0	2009.41	17:01	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308939	Bias	0 00 00.00	+00 00 00.0	2009.41	17:01	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308940	Bias	0 00 00.00	+00 00 00.0	2009.41	17:01	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308941	Bias	0 00 00.00	+00 00 00.0	2009.41	17:02	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308942	Bias	0 00 00.00	+00 00 00.0	2009.41	17:02	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308943	Bias	0 00 00.00	+00 00 00.0	2009.41	17:03	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308944	Bias	0 00 00.00	+00 00 00.0	2009.41	17:03	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308945	Bias	0 00 00.00	+00 00 00.0	2009.41	17:03	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308946	Bias	0 00 00.00	+00 00 00.0	2009.41	17:04	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308947	Bias	0 00 00.00	+00 00 00.0	2009.41	17:04	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308948	Bias	0 00 00.00	+00 00 00.0	2009.41	17:04	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308949	Bias	0 00 00.00	+00 00 00.0	2009.41	17:04	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308950	Bias	0 00 00.00	+00 00 00.0	2009.41	17:04	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308951	Bias	0 00 00.00	+00 00 00.0	2009.41	17:04	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308952	Bias	0 00 00.00	+00 00 00.0	2009.41	17:04	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308953	Bias	0 00 00.00	+00 00 00.0	2009.41	17:12	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308954	Bias	0 00 00.00	+00 00 00.0	2009.41	17:12	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308955	Bias	0 00 00.00	+00 00 00.0	2009.41	17:13	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308956	Bias	0 00 00.00	+00 00 00.0	2009.41	17:13	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308957	Bias	0 00 00.00	+00 00 00.0	2009.41	17:13	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308958	Bias	0 00 00.00	+00 00 00.0	2009.41	17:13	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308959	Bias	0 00 00.00	+00 00 00.0	2009.41	17:13	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308960	Bias	0 00 00.00	+00 00 00.0	2009.41	17:13	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308961	Bias	0 00 00.00	+00 00 00.0	2009.41	17:13	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308962	Bias	0 00 00.00	+00 00 00.0	2009.41	17:13	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308963	Bias	0 00 00.00	+00 00 00.0	2009.41	17:15	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308964	Bias	0 00 00.00	+00 00 00.0	2009.41	17:16	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308965	Bias	0 00 00.00	+00 00 00.0	2009.41	17:16	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308966	Bias	0 00 00.00	+00 00 00.0	2009.41	17:16	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308967	Bias	0 00 00.00	+00 00 00.0	2009.41	17:16	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308968	Bias	0 00 00.00	+00 00 00.0	2009.41	17:24	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308969	Bias	0 00 00.00	+00 00 00.0	2009.41	17:24	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308970	Bias	0 00 00.00	+00 00 00.0	2009.41	17:24	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308971	Bias	0 00 00.00	+00 00 00.0	2009.41	17:24	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308972	Bias	0 00 00.00	+00 00 00.0	2009.41	17:25	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308973	Bias	0 00 00.00	+00 00 00.0	2009.41	17:32	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308974	Bias	0 00 00.00	+00 00 00.0	2009.41	17:32	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308975	Bias	0 00 00.00	+00 00 00.0	2009.41	17:32	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308976	Bias	0 00 00.00	+00 00 00.0	2009.41	17:32	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308977	Bias	0 00 00.00	+00 00 00.0	2009.41	17:32	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308978	Bias	0 00 00.00	+00 00 00.0	2009.41	17:37	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308979	Bias	0 00 00.00	+00 00 00.0	2009.41	17:37	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308980	Bias	0 00 00.00	+00 00 00.0	2009.41	17:38	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308981	Bias	0 00 00.00	+00 00 00.0	2009.41	17:38	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308982	Bias	0 00 00.00	+00 00 00.0	2009.41	17:38	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308983	Bias	0 00 00.00	+00 00 00.0	2009.41	17:41	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308984	Bias	0 00 00.00	+00 00 00.0	2009.41	17:41	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308985	Bias	0 00 00.00	+00 00 00.0	2009.41	17:41	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308986	Bias	0 00 00.00	+00 00 00.0	2009.41	17:41	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308987	Bias	0 00 00.00	+00 00 00.0	2009.41	17:41	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	

Run	Object	RA	Dec	Equinox	UT	Airm	Instr	Texp sec	Sky PA	Filters etc.	Slit	Grat Grism	CenwA	– NAOMI – INGR Comments L WM Twfs l Co M
1308988	Bias	0 00 00.00	+00 00 00.0	2009.41	17:43	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308989	Bias	0 00 00.00	+00 00 00.0	2009.41	17:43	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308990	Bias	0 00 00.00	+00 00 00.0	2009.41	17:43	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308991	Bias	0 00 00.00	+00 00 00.0	2009.41	17:45	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308992	Bias	0 00 00.00	+00 00 00.0	2009.41	17:45	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308993	Bias	0 00 00.00	+00 00 00.0	2009.41	17:45	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308994	Bias	0 00 00.00	+00 00 00.0	2009.41	17:48	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308995	Bias	0 00 00.00	+00 00 00.0	2009.41	17:48	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308996	Bias	0 00 00.00	+00 00 00.0	2009.41	17:48	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308997	Bias	0 00 00.00	+00 00 00.0	2009.41	17:51	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308998	Bias	0 00 00.00	+00 00 00.0	2009.41	17:51	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1308999	Bias	0 00 00.00	+00 00 00.0	2009.41	17:51	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	noise on red ccd fixed
1309000	Bias	0 00 00.00	+00 00 00.0	2009.41	17:53	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	Redo whole calibration
1309001	Bias	0 00 00.00	+00 00 00.0	2009.41	17:53	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309002	Bias	0 00 00.00	+00 00 00.0	2009.41	17:53	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1309003	Bias	0 00 00.00	+00 00 00.0	2009.41	17:53	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309004	Bias	0 00 00.00	+00 00 00.0	2009.41	17:53	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1309005	Bias	0 00 00.00	+00 00 00.0	2009.41	17:53	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309006	Bias	0 00 00.00	+00 00 00.0	2009.41	17:53	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1309007	Bias	0 00 00.00	+00 00 00.0	2009.41	17:53	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309008	Bias	0 00 00.00	+00 00 00.0	2009.41	17:53	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1309009	Bias	0 00 00.00	+00 00 00.0	2009.41	17:53	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309010	Bias	0 00 00.00	+00 00 00.0	2009.41	17:54	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1309011	Bias	0 00 00.00	+00 00 00.0	2009.41	17:54	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309012	Bias	0 00 00.00	+00 00 00.0	2009.41	17:54	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1309013	Bias	0 00 00.00	+00 00 00.0	2009.41	17:54	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309014	Bias	0 00 00.00	+00 00 00.0	2009.41	17:54	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1309015	Bias	0 00 00.00	+00 00 00.0	2009.41	17:54	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309016	Bias	0 00 00.00	+00 00 00.0	2009.41	17:54	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1309017	Bias	0 00 00.00	+00 00 00.0	2009.41	17:54	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309018	Bias	0 00 00.00	+00 00 00.0	2009.41	17:54	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1309019	Bias	0 00 00.00	+00 00 00.0	2009.41	17:54	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309020	Bias	0 00 00.00	+00 00 00.0	2009.41	17:55	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1309021	Bias	0 00 00.00	+00 00 00.0	2009.41	17:55	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309022	Bias	0 00 00.00	+00 00 00.0	2009.41	17:55	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1309023	Bias	0 00 00.00	+00 00 00.0	2009.41	17:55	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309024	Bias	0 00 00.00	+00 00 00.0	2009.41	17:55	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1309025	Bias	0 00 00.00	+00 00 00.0	2009.41	17:55	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309026	Bias	0 00 00.00	+00 00 00.0	2009.41	17:55	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1309027	Bias	0 00 00.00	+00 00 00.0	2009.41	17:55	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309028	Bias	0 00 00.00	+00 00 00.0	2009.41	17:55	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1309029	Bias	0 00 00.00	+00 00 00.0	2009.41	17:55	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309030	Bias	0 00 00.00	+00 00 00.0	2009.41	17:56	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1309031	Bias	0 00 00.00	+00 00 00.0	2009.41	17:56	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309032	Bias	0 00 00.00	+00 00 00.0	2009.41	17:56	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1309033	Bias	0 00 00.00	+00 00 00.0	2009.41	17:56	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309034	Bias	0 00 00.00	+00 00 00.0	2009.41	17:56	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1309035	Bias	0 00 00.00	+00 00 00.0	2009.41	17:56	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309036	Bias	0 00 00.00	+00 00 00.0	2009.41	17:56	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1309037	Bias	0 00 00.00	+00 00 00.0	2009.41	17:56	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309038	Bias	0 00 00.00	+00 00 00.0	2009.41	17:56	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1309039	Bias	0 00 00.00	+00 00 00.0	2009.41	17:56	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309040	Bias	0 00 00.00	+00 00 00.0	2009.41	17:56	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1309041	Bias	0 00 00.00	+00 00 00.0	2009.41	17:56	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309042	Arc blue nobin	0 00 00.00	+00 00 00.0	2009.41	17:57	1.00	ISISB	15.0	0	Out +Out	1.02	R600B	4647	ND0.8 in!

Run	Object	RA	Dec	Equinox	UT	Airm	Instr	Texp sec	Sky PA	Filters etc.	Slit	Grat Grism	CenwA	– NAOMI – INGR Comments L WM Twfs l Co M
1309043	Arc red nobin	0 00 00.00	+00 00 00.0	2009.41	17:57	1.00	ISISR	3.0	0	Out +Out	1.02	R1200	6500	
1309044	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	17:57	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1309045	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	17:57	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1309046	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	17:57	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1309047	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	17:57	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1309048	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	17:58	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1309049	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	17:58	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1309050	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	17:58	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1309051	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	17:58	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1309052	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	17:58	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1309053	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	17:58	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1309054	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	17:58	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1309055	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	17:58	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1309056	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	17:58	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1309057	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	17:59	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1309058	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	17:59	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1309059	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	17:59	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1309060	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	17:59	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1309061	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	17:59	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1309062	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	17:59	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1309063	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	17:59	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1309064	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	17:59	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1309065	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	17:59	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1309066	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	17:59	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1309067	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	18:00	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1309068	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	18:00	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	ND out
1309069	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	18:00	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1309070	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	18:00	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1309071	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	18:00	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1309072	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	18:00	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1309073	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	18:00	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1309074	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	18:00	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1309075	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	18:00	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1309076	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	18:01	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1309077	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	18:01	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1309078	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	18:01	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1309079	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	18:01	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1309080	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	18:01	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1309081	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	18:01	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1309082	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	18:01	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1309083	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	18:01	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1309084	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	18:01	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1309085	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	18:01	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1309086	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	18:02	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1309087	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	18:02	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1309088	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	18:02	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1309089	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	18:02	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1309090	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	18:02	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1309091	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	18:02	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1309092	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	18:02	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1309093	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	18:02	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1309094	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	18:02	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1309095	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	18:02	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1309096	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	18:03	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1309097	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	18:03	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	

Run	Object	RA	Dec	Equinox	UT	Airm	Instr	Texp sec	Sky PA	Filters etc.	Slit	Grat Grism	CenwA	– NAOMI – INGR Comments L WM Twfs l Co M
1309098	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	18:03	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1309099	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	18:03	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1309100	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	18:03	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1309101	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	18:03	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1309102	Flat red nobin	0 00 00.00	+00 00 00.0	2009.41	18:03	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1309103	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	18:03	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1309104	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	18:04	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1309105	Flat blue nobin	0 00 00.00	+00 00 00.0	2009.41	18:04	1.00	ISISB	2.0	0	Out +Out	1.02	R600B	4647	
1309106	bias bin	0 00 00.00	+00 00 00.0	2009.41	18:04	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309107	binas bin	0 00 00.00	+00 00 00.0	2009.41	18:04	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1309108	bias bin	0 00 00.00	+00 00 00.0	2009.41	18:04	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309109	binas bin	0 00 00.00	+00 00 00.0	2009.41	18:04	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1309110	bias bin	0 00 00.00	+00 00 00.0	2009.41	18:04	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309111	binas bin	0 00 00.00	+00 00 00.0	2009.41	18:04	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1309112	bias bin	0 00 00.00	+00 00 00.0	2009.41	18:04	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309113	binas bin	0 00 00.00	+00 00 00.0	2009.41	18:04	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1309114	bias bin	0 00 00.00	+00 00 00.0	2009.41	18:05	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309115	binas bin	0 00 00.00	+00 00 00.0	2009.41	18:05	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1309116	bias bin	0 00 00.00	+00 00 00.0	2009.41	18:05	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309117	binas bin	0 00 00.00	+00 00 00.0	2009.41	18:05	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1309118	bias bin	0 00 00.00	+00 00 00.0	2009.41	18:05	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309119	binas bin	0 00 00.00	+00 00 00.0	2009.41	18:05	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1309120	bias bin	0 00 00.00	+00 00 00.0	2009.41	18:05	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309121	binas bin	0 00 00.00	+00 00 00.0	2009.41	18:05	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1309122	bias bin	0 00 00.00	+00 00 00.0	2009.41	18:05	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309123	binas bin	0 00 00.00	+00 00 00.0	2009.41	18:05	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1309124	bias bin	0 00 00.00	+00 00 00.0	2009.41	18:05	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309125	binas bin	0 00 00.00	+00 00 00.0	2009.41	18:05	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1309126	bias bin	0 00 00.00	+00 00 00.0	2009.41	18:05	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309127	binas bin	0 00 00.00	+00 00 00.0	2009.41	18:05	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1309128	bias bin	0 00 00.00	+00 00 00.0	2009.41	18:05	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309129	binas bin	0 00 00.00	+00 00 00.0	2009.41	18:05	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1309130	bias bin	0 00 00.00	+00 00 00.0	2009.41	18:05	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309131	binas bin	0 00 00.00	+00 00 00.0	2009.41	18:05	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1309132	bias bin	0 00 00.00	+00 00 00.0	2009.41	18:06	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309133	binas bin	0 00 00.00	+00 00 00.0	2009.41	18:06	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1309134	bias bin	0 00 00.00	+00 00 00.0	2009.41	18:06	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309135	binas bin	0 00 00.00	+00 00 00.0	2009.41	18:06	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1309136	bias bin	0 00 00.00	+00 00 00.0	2009.41	18:06	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309137	binas bin	0 00 00.00	+00 00 00.0	2009.41	18:06	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1309138	bias bin	0 00 00.00	+00 00 00.0	2009.41	18:06	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309139	binas bin	0 00 00.00	+00 00 00.0	2009.41	18:06	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1309140	bias bin	0 00 00.00	+00 00 00.0	2009.41	18:06	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309141	binas bin	0 00 00.00	+00 00 00.0	2009.41	18:06	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1309142	bias bin	0 00 00.00	+00 00 00.0	2009.41	18:06	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309143	binas bin	0 00 00.00	+00 00 00.0	2009.41	18:06	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1309144	bias bin	0 00 00.00	+00 00 00.0	2009.41	18:06	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309145	binas bin	0 00 00.00	+00 00 00.0	2009.41	18:06	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1309146	bias bin	0 00 00.00	+00 00 00.0	2009.41	18:06	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309147	binas bin	0 00 00.00	+00 00 00.0	2009.41	18:06	1.00	ISISB	0.0	0	Out +Out	1.02	R600B	4647	
1309148	Arc red bin	0 00 00.00	+00 00 00.0	2009.41	18:06	1.00	ISISR	1.0	0	Out +Out	1.02	R1200	6500	
1309149	Arc blue bin	0 00 00.00	+00 00 00.0	2009.41	18:06	1.00	ISISB	15.0	0	Out +Out	1.02	R600B	4647	
1309150	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	18:07	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1309151	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	18:07	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1309152	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	18:07	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	

Run	Object	RA	Dec	Equinox	UT	Airm	Instr	Texp sec	Sky PA	Filters etc.	Slit	Grat Grism	CenwA	– NAOMI – INGR Comments L WM Twfs l Co M
1309153	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	18:07	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1309154	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	18:07	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1309155	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	18:07	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1309156	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	18:08	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1309157	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	18:08	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1309158	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	18:08	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1309159	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	18:08	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1309160	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	18:08	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1309161	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	18:08	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1309162	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	18:08	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1309163	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	18:08	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1309164	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	18:08	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1309165	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	18:08	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1309166	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	18:08	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1309167	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	18:09	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1309168	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	18:09	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1309169	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	18:09	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1309170	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	18:09	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1309171	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	18:09	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1309172	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	18:09	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1309173	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	18:09	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1309174	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	18:09	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1309175	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	18:09	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1309176	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	18:09	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1309177	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	18:09	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1309178	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	18:09	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1309179	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	18:10	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1309180	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	18:10	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1309181	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	18:10	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1309182	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	18:10	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1309183	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	18:10	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1309184	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	18:10	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1309185	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	18:10	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1309186	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	18:10	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1309187	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	18:10	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1309188	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	18:10	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1309189	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	18:11	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1309190	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	18:11	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1309191	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	18:11	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1309192	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	18:11	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1309193	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	18:11	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1309194	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	18:11	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1309195	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	18:11	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1309196	Flat red bin	0 00 00.00	+00 00 00.0	2009.41	18:11	1.00	ISISR	2.0	0	Out +Out	1.02	R1200	6500	
1309197	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	18:11	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1309198	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	18:12	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1309199	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	18:12	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1309200	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	18:12	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1309201	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	18:12	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1309202	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	18:13	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1309203	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	18:13	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1309204	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	18:13	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1309205	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	18:13	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1309206	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	18:14	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1309207	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	18:14	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	

Run	Object	RA	Dec	Equinox	UT	Airm	Instr	Texp sec	Sky PA	Filters etc.	Slit	Grat Grism	CenwA	– NAOMI – INGR Comments L WM Twfs l Co M
1309208	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	18:14	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1309209	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	18:15	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1309210	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	18:15	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1309211	Flat blue bin	0 00 00.00	+00 00 00.0	2009.41	18:15	1.00	ISISB	10.0	0	Out +Out	1.02	R600B	4647	
1309212	Bias	0 00 00.00	+00 00 00.0	2009.41	19:44	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309213	Bias	0 00 00.00	+00 00 00.0	2009.41	19:44	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309214	Bias	0 00 00.00	+00 00 00.0	2009.41	19:44	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309215	Bias	0 00 00.00	+00 00 00.0	2009.41	19:45	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309216	Bias	0 00 00.00	+00 00 00.0	2009.41	19:45	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309217	Bias	0 00 00.00	+00 00 00.0	2009.41	19:46	1.00	ISISR	0.0	0	Out +Out	1.02	R1200	6500	
1309218	Bias	0 00 00.00	+00 00 00.0	2009.41	20:19	1.00	AUX	0.0	0	HARR4				
1309219	FOCRUN-1/9	12 56 54.72	+23 04 25.6	2000.00	20:35	1.03	ISISR	5.0	0	Out +Out	1.02	R1200	6500	
1309220	FOCRUN-2/9	12 56 54.72	+23 04 25.5	2000.00	20:35	1.03	ISISR	5.0	0	Out +Out	1.02	R1200	6500	
1309221	FOCRUN-3/9	0 00 00.00	+00 00 00.0	2000.00	20:35	1.03	ISISR	5.0	250	Out +Out	1.02	R1200	6500	
1309222	FOCRUN-4/9	12 56 54.72	+23 04 25.5	2000.00	20:35	1.03	ISISR	5.0	250	Out +Out	1.02	R1200	6500	
1309223	FOCRUN-5/9	12 56 54.71	+23 04 25.6	2000.00	20:36	1.03	ISISR	5.0	250	Out +Out	1.02	R1200	6500	
1309224	FOCRUN-6/9	12 56 54.72	+23 04 25.5	2000.00	20:36	1.03	ISISR	5.0	250	Out +Out	1.02	R1200	6500	
1309225	FOCRUN-7/9	12 56 54.72	+23 04 25.5	2000.00	20:36	1.03	ISISR	5.0	250	Out +Out	1.02	R1200	6500	
1309226	FOCRUN-8/9	12 56 54.71	+23 04 25.6	2000.00	20:36	1.03	ISISR	5.0	250	Out +Out	1.02	R1200	6500	
1309227	FOCRUN-9/9	12 56 54.71	+23 04 25.6	2000.00	20:37	1.03	ISISR	5.0	250	Out +Out	1.02	R1200	6500	
1309228	Arc red nobin	11 29 18.90	+18 16 40.0	2000.00	20:45	1.03	ISISR	3.0	34	Out +Out	1.02	R1200	6500	
1309229	Arc blue nobin	11 29 18.90	+18 16 40.0	2000.00	20:45	1.03	ISISB	15.0	34	Out +Out	1.02	R600B	4647	
1309230	PG1126+186	11 29 18.90	+18 16 40.0	2000.00	20:47	1.03	ISISB	600.0	34	Out +Out	1.02	R600B	4647	
1309231	PG1126+186	11 29 18.89	+18 16 39.9	2000.00	20:47	1.04	ISISR	600.0	34	Out +Out	1.02	R1200	6500	
1309232	PG1126+186	11 29 18.89	+18 16 39.9	2000.00	20:57	1.04	ISISB	600.0	34	Out +Out	1.02	R600B	4647	
1309233	PG1126+186	11 29 18.90	+18 16 40.0	2000.00	20:57	1.05	ISISR	600.0	34	Out +Out	1.02	R1200	6500	
1309234	Arc red nobin	11 29 18.90	+18 16 40.0	2000.00	21:08	1.05	ISISR	3.0	34	Out +Out	1.02	R1200	6500	
1309235	Arc blue nobin	11 29 18.90	+18 16 40.0	2000.00	21:08	1.05	ISISB	15.0	34	Out +Out	1.02	R600B	4647	
1309236	Arc blue bin	16 00 43.60	+07 48 02.8	2000.00	21:16	1.62	ISISB	15.0	302	Out +Out	1.02	R600B	4647	
1309237	Arc red bin	16 00 43.60	+07 48 02.8	2000.00	21:16	1.62	ISISR	1.0	302	Out +Out	1.02	R1200	6500	
1309238	SDSSJ1600+0748	16 00 43.59	+07 48 02.9	2000.00	21:17	1.56	ISISB	750.0	302	Out +Out	1.02	R600B	4647	
1309239	SDSSJ1600+0748	16 00 43.59	+07 48 02.9	2000.00	21:17	1.52	ISISR	750.0	302	Out +Out	1.02	R1200	6500	
1309240	SDSSJ1600+0748	16 00 43.59	+07 48 03.0	2000.00	21:30	1.48	ISISR	750.0	302	Out +Out	1.02	R1200	6500	
1309241	SDSSJ1600+0748	16 00 43.59	+07 48 02.9	2000.00	21:30	1.44	ISISB	750.0	302	Out +Out	1.02	R600B	4647	
1309242	SDSSJ1600+0748	16 00 43.59	+07 48 02.9	2000.00	21:43	1.41	ISISR	750.0	302	Out +Out	1.02	R1200	6500	
1309243	SDSSJ1600+0748	16 00 43.60	+07 48 02.8	2000.00	21:43	1.38	ISISB	750.0	302	Out +Out	1.02	R600B	4647	
1309244	SDSSJ1600+0748	16 00 43.60	+07 48 02.8	2000.00	21:56	1.35	ISISR	750.0	302	Out +Out	1.02	R1200	6500	
1309245	SDSSJ1600+0748	16 00 43.60	+07 48 02.9	2000.00	21:56	1.32	ISISB	750.0	302	Out +Out	1.02	R600B	4647	
1309246	Arc red bin	16 00 43.60	+07 48 02.9	2000.00	22:09	1.32	ISISR	1.0	302	Out +Out	1.02	R1200	6500	
1309247	Arc blue bin	16 00 43.59	+07 48 02.9	2000.00	22:09	1.32	ISISB	15.0	302	Out +Out	1.02	R600B	4647	
1309248	2009Y field R	14 42 23.85	-17 14 48.4	2000.00	22:28	1.48	AUX	120.0	135	HARI1				
1309249	2009Y field R	14 42 23.85	-17 14 48.3	2000.00	22:32	1.48	AUX	120.0	135	HARI1				
1309250	Arc red nobin	11 29 18.90	+18 16 40.0	2000.00	22:41	1.25	ISISR	3.0	66	Out +Out	1.00	R1200	6500	
1309251	Arc blue nobin	11 29 18.90	+18 16 40.0	2000.00	22:41	1.25	ISISB	15.0	66	Out +Out	1.00	R600B	4647	
1309252	PG1126+186	11 29 18.89	+18 16 39.9	2000.00	22:42	1.27	ISISR	600.0	66	Out +Out	1.00	R1200	6500	
1309253	PG1126+186	11 29 18.89	+18 16 39.9	2000.00	22:42	1.29	ISISB	600.0	66	Out +Out	1.00	R600B	4647	
1309254	PG1126+186	11 29 18.90	+18 16 40.0	2000.00	22:53	1.31	ISISR	600.0	66	Out +Out	1.01	R1200	6500	
1309255	PG1126+186	11 29 18.90	+18 16 40.0	2000.00	22:53	1.33	ISISB	600.0	66	Out +Out	1.01	R600B	4647	
1309256	Arc red nobin	11 29 18.89	+18 16 39.9	2000.00	23:04	1.34	ISISR	3.0	66	Out +Out	1.01	R1200	6500	
1309257	Arc blue nobin	11 29 18.89	+18 16 40.0	2000.00	23:04	1.34	ISISB	15.0	66	Out +Out	1.01	R600B	4647	
1309258	Arc blue bin	16 00 43.59	+07 48 02.9	2000.00	23:11	1.15	ISISB	15.0	324	Out +Out	1.01	R600B	4647	
1309259	Arc red bin	16 00 43.60	+07 48 02.8	2000.00	23:11	1.15	ISISR	1.0	324	Out +Out	1.01	R1200	6500	
1309260	SDSSJ1600+0748	16 00 43.60	+07 48 02.8	2000.00	23:13	1.13	ISISR	750.0	324	Out +Out	1.01	R1200	6500	
1309261	SDSSJ1600+0748	16 00 43.59	+07 48 02.9	2000.00	23:13	1.12	ISISB	750.0	324	Out +Out	1.01	R600B	4647	
1309262	SDSSJ1600+0748	16 00 43.59	+07 48 02.9	2000.00	23:25	1.11	ISISR	750.0	324	Out +Out	1.01	R1200	6500	

Run	Object	RA	Dec	Equinox	UT	Airm	Instr	Texp sec	Sky PA	Filters etc.	Slit	Grat Grism	CenwA	– NAOMI – INGR Comments L WM Twfs l Co M
1309263	SDSSJ1600+0748	16 00 43.59	+07 48 02.9	2000.00	23:25	1.11	ISISB	750.0	324	Out +Out	1.01	R600B	4647	
1309264	SDSSJ1600+0748	16 00 43.59	+07 48 02.9	2000.00	23:38	1.10	ISISR	750.0	324	Out +Out	1.01	R1200	6500	
1309265	SDSSJ1600+0748	16 00 43.60	+07 48 02.8	2000.00	23:38	1.09	ISISB	750.0	324	Out +Out	1.01	R600B	4647	
1309266	Arc blue bin	16 00 43.60	+07 48 02.8	2000.00	23:52	1.09	ISISB	15.0	324	Out +Out	1.01	R600B	4647	
1309267	Arc red bin	16 00 43.60	+07 48 02.9	2000.00	23:52	1.09	ISISR	1.0	324	Out +Out	1.01	R1200	6500	
1309268	Arc red nobin	11 29 18.90	+18 16 40.0	2000.00	23:58	1.69	ISISR	3.0	67	Out +Out	1.01	R1200	6500	
1309269	Arc blue nobin	11 29 18.89	+18 16 39.9	2000.00	23:58	1.69	ISISB	15.0	67	Out +Out	1.01	R600B	4647	
1309270	PG1126+186	11 29 18.90	+18 16 40.0	2000.00	00:00	1.74	ISISB	600.0	67	Out +Out	1.01	R600B	4647	
1309271	PG1126+186	11 29 18.90	+18 16 40.0	2000.00	00:00	1.79	ISISR	600.0	67	Out +Out	1.01	R1200	6500	
1309272	PG1126+186	11 29 18.89	+18 16 39.9	2000.00	00:10	1.85	ISISR	600.0	67	Out +Out	1.01	R1200	6500	
1309273	PG1126+186	11 29 18.90	+18 16 40.0	2000.00	00:10	1.91	ISISB	600.0	67	Out +Out	1.01	R600B	4647	
1309274	Arc blue nobin	11 29 18.90	+18 16 40.0	2000.00	00:21	1.92	ISISB	15.0	67	Out +Out	1.01	R600B	4647	
1309275	Arc red nobin	11 29 18.90	+18 16 40.0	2000.00	00:21	1.92	ISISR	3.0	67	Out +Out	1.01	R1200	6500	
1309276	Arc blue bin	16 00 43.59	+07 48 02.8	2000.00	00:27	1.07	ISISB	15.0	15	Out +Out	1.00	R600B	4647	
1309277	Arc red bin	16 00 43.60	+07 48 02.9	2000.00	00:27	1.07	ISISR	1.0	15	Out +Out	1.00	R1200	6500	
1309278	SDSSJ1600+0748	16 00 43.59	+07 48 02.9	2000.00	00:28	1.07	ISISB	750.0	15	Out +Out	1.00	R600B	4647	
1309279	SDSSJ1600+0748	16 00 43.60	+07 48 02.8	2000.00	00:28	1.07	ISISR	750.0	15	Out +Out	1.00	R1200	6500	
1309280	SDSSJ1600+0748	16 00 43.59	+07 48 02.8	2000.00	00:41	1.07	ISISR	750.0	15	Out +Out	1.00	R1200	6500	
1309281	SDSSJ1600+0748	16 00 43.60	+07 48 02.8	2000.00	00:41	1.07	ISISB	750.0	15	Out +Out	1.00	R600B	4647	
1309282	SDSSJ1600+0748	16 00 43.60	+07 48 02.8	2000.00	00:54	1.08	ISISR	750.0	15	Out +Out	1.01	R1200	6500	
1309283	SDSSJ1600+0748	16 00 43.59	+07 48 02.8	2000.00	00:54	1.08	ISISB	750.0	15	Out +Out	1.01	R600B	4647	
1309284	SDSSJ1600+0748	16 00 43.60	+07 48 02.8	2000.00	01:07	1.08	ISISB	750.0	15	Out +Out	1.01	R600B	4647	
1309285	SDSSJ1600+0748	16 00 43.59	+07 48 02.8	2000.00	01:07	1.09	ISISR	750.0	15	Out +Out	1.01	R1200	6500	
1309286	Arc blue bin	16 00 43.60	+07 48 02.8	2000.00	01:20	1.09	ISISB	15.0	15	Out +Out	1.01	R600B	4647	
1309287	Arc red bin	16 00 43.59	+07 48 02.8	2000.00	01:20	1.09	ISISR	1.0	15	Out +Out	1.01	R1200	6500	
1309288	Arc blue bin	16 00 43.60	+07 48 02.9	2000.00	01:25	1.09	ISISB	15.0	40	Out +Out	1.01	R600B	4647	
1309289	Arc red bin	16 00 43.59	+07 48 02.8	2000.00	01:25	1.09	ISISR	1.0	40	Out +Out	1.01	R1200	6500	
1309290	SDSSJ1600+0748	16 00 43.60	+07 48 02.9	2000.00	01:26	1.10	ISISR	600.0	40	Out +Out	1.01	R1200	6500	
1309291	SDSSJ1600+0748	16 00 43.60	+07 48 02.8	2000.00	01:26	1.10	ISISB	600.0	40	Out +Out	1.01	R600B	4647	
1309292	SDSSJ1600+0748	16 00 43.59	+07 48 02.8	2000.00	01:37	1.11	ISISR	600.0	40	Out +Out	1.01	R1200	6500	
1309293	SDSSJ1600+0748	16 00 43.59	+07 48 02.8	2000.00	01:37	1.12	ISISB	600.0	40	Out +Out	1.01	R600B	4647	
1309294	SDSSJ1600+0748	16 00 43.60	+07 48 02.9	2000.00	01:47	1.13	ISISR	600.0	40	Out +Out	1.01	R1200	6500	
1309295	SDSSJ1600+0748	16 00 43.59	+07 48 02.8	2000.00	01:47	1.13	ISISB	600.0	40	Out +Out	1.01	R600B	4647	
1309296	SDSSJ1600+0748	16 00 43.60	+07 48 02.9	2000.00	01:57	1.14	ISISR	600.0	40	Out +Out	1.01	R1200	6500	
1309297	SDSSJ1600+0748	16 00 43.59	+07 48 02.8	2000.00	01:57	1.15	ISISB	600.0	40	Out +Out	1.01	R600B	4647	
1309298	SDSSJ1600+0748	16 00 43.59	+07 48 02.8	2000.00	02:07	1.16	ISISR	600.0	40	Out +Out	1.01	R1200	6500	
1309299	SDSSJ1600+0748	16 00 43.60	+07 48 02.9	2000.00	02:07	1.17	ISISB	600.0	40	Out +Out	1.01	R600B	4647	
1309300	Arc blue bin	16 00 43.60	+07 48 02.9	2000.00	02:18	1.18	ISISB	15.0	40	Out +Out	1.01	R600B	4647	
1309301	Arc red bin	16 00 43.59	+07 48 02.8	2000.00	02:18	1.18	ISISR	1.0	40	Out +Out	1.01	R1200	6500	
1309302	Arc red bin	16 00 43.59	+07 48 02.8	2000.00	02:23	1.19	ISISR	1.0	54	Out +Out	1.01	R1200	6500	
1309303	Arc blue bin	16 00 43.60	+07 48 02.9	2000.00	02:23	1.19	ISISB	15.0	54	Out +Out	1.01	R600B	4647	
1309304	SDSSJ1600+0748	16 00 43.59	+07 48 02.8	2000.00	02:25	1.21	ISISB	750.0	54	Out +Out	1.01	R600B	4647	
1309305	SDSSJ1600+0748	16 00 43.60	+07 48 02.9	2000.00	02:25	1.22	ISISR	750.0	54	Out +Out	1.01	R1200	6500	
1309306	SDSSJ1600+0748	16 00 43.60	+07 48 02.8	2000.00	02:38	1.24	ISISR	750.0	54	Out +Out	1.01	R1200	6500	
1309307	SDSSJ1600+0748	16 00 43.60	+07 48 02.9	2000.00	02:38	1.26	ISISB	750.0	54	Out +Out	1.01	R600B	4647	
1309308	SDSSJ1600+0748	16 00 43.59	+07 48 02.8	2000.00	02:50	1.29	ISISR	750.0	54	Out +Out	1.01	R1200	6500	
1309309	SDSSJ1600+0748	16 00 43.60	+07 48 02.9	2000.00	02:50	1.31	ISISB	750.0	54	Out +Out	1.01	R600B	4647	
1309310	SDSSJ1600+0748	16 00 43.60	+07 48 02.9	2000.00	03:03	1.32	ISISR	319.7	54	Out +Out	1.00	R1200	6500	star moved out of slit
1309311	SDSSJ1600+0748	16 00 43.60	+07 48 02.9	2000.00	03:03	1.33	ISISB	325.2	54	Out +Out	1.00	R600B	4647	star moved out of slit
1309312	SDSSJ1600+0748	16 00 43.60	+07 48 03.0	2000.00	03:10	1.37	ISISR	750.0	54	Out +Out	1.01	R1200	6500	
1309313	SDSSJ1600+0748	16 00 43.59	+07 48 02.9	2000.00	03:10	1.40	ISISB	750.0	54	Out +Out	1.01	R600B	4647	
1309314	Arc red bin	16 00 43.59	+07 48 02.8	2000.00	03:24	1.40	ISISR	1.0	54	Out +Out	1.01	R1200	6500	
1309315	Arc blue bin	16 00 43.60	+07 48 02.9	2000.00	03:24	1.40	ISISB	15.0	54	Out +Out	1.01	R600B	4647	
1309316	Arc blue bin	16 00 43.60	+07 48 03.1	2000.00	03:28	1.42	ISISB	15.0	59	Out +Out	1.01	R600B	4647	
1309317	Arc red bin	16 00 43.60	+07 48 02.9	2000.00	03:28	1.42	ISISR	1.0	59	Out +Out	1.01	R1200	6500	

Run	Object	RA	Dec	Equinox	UT	Airm	Instr	Texp sec	Sky PA	Filters etc.	Slit	Grat Grism	CenwA	– NAOMI – INGR Comments L WM Twfs l Co M
1309318	SDSSJ1600+0748	16 00 43.60	+07 48 02.9	2000.00	03:30	1.46	ISISR	600.0	59	Out +Out	1.01	R1200	6500	
1309319	SDSSJ1600+0748	16 00 43.60	+07 48 02.9	2000.00	03:30	1.49	ISISB	600.0	59	Out +Out	1.01	R600B	4647	
1309320	SDSSJ1600+0748	16 00 43.60	+07 48 02.9	2000.00	03:43	1.54	ISISB	600.0	59	Out +Out	1.00	R600B	4647	
1309321	SDSSJ1600+0748	16 00 43.60	+07 48 02.9	2000.00	03:43	1.57	ISISR	600.0	59	Out +Out	1.00	R1200	6500	
1309322	Arc red bin	16 00 43.60	+07 48 02.9	2000.00	03:57	1.60	ISISR	1.0	59	Out +Out	1.00	R1200	6500	
1309323	Arc blue bin	16 00 43.60	+07 48 02.9	2000.00	03:57	1.60	ISISB	15.0	59	Out +Out	1.00	R600B	4647	
1309324	SDSSJ1600+0748	16 00 43.59	+07 48 02.8	2000.00	03:58	1.69	ISISB	600.0	59	Out +Out	1.00	R600B	4647	
1309325	SDSSJ1600+0748	16 00 43.59	+07 48 02.8	2000.00	03:58	1.65	ISISR	600.0	59	Out +Out	1.00	R1200	6500	
1309326	SDSSJ1600+0748	16 00 43.59	+07 48 02.8	2000.00	04:08	1.74	ISISR	600.0	59	Out +Out	1.00	R1200	6500	
1309327	SDSSJ1600+0748	16 00 43.59	+07 48 02.8	2000.00	04:08	1.78	ISISB	600.0	59	Out +Out	1.00	R600B	4647	
1309328	SDSSJ1600+0748	16 00 43.60	+07 48 02.9	2000.00	04:19	1.84	ISISR	600.0	59	Out +Out	1.00	R1200	6500	
1309329	SDSSJ1600+0748	16 00 43.59	+07 48 02.8	2000.00	04:19	1.89	ISISB	600.0	59	Out +Out	1.00	R600B	4647	
1309330	Arc blue bin	16 00 43.59	+07 48 02.8	2000.00	04:30	1.91	ISISB	15.0	59	Out +Out	1.01	R600B	4647	
1309331	Arc red bin	16 00 43.60	+07 48 02.9	2000.00	04:30	1.91	ISISR	1.0	59	Out +Out	1.01	R1200	6500	
1309332	SDSSJ1600+0748	16 00 43.60	+07 48 02.9	2000.00	04:31	1.97	ISISB	233.2	59	Out +Out	1.01	R600B	4647	no slit
1309333	SDSSJ1600+0748	16 00 43.59	+07 48 02.8	2000.00	04:31	1.95	ISISR	229.4	59	Out +Out	1.01	R1200	6500	no slit
1309335	SDSSJ1600+0748	16 00 43.60	+07 48 02.9	2000.00	04:36	1.99	ISISR	6.4	59	Out +Out	1.01	R1200	6500	no slit
1309336	SDSSJ1600+0748	16 00 43.60	+07 48 03.1	2000.00	04:39	2.16	ISISB	600.0	59	Out +Out	1.01	R600B	4647	
1309337	SDSSJ1600+0748	16 00 43.60	+07 48 02.9	2000.00	04:39	2.09	ISISR	600.0	59	Out +Out	1.01	R1200	6500	
1309338	SDSSJ1600+0748	16 00 43.60	+07 48 02.8	2000.00	04:49	2.25	ISISB	600.0	59	Out +Out	1.01	R600B	4647	
1309339	SDSSJ1600+0748	16 00 43.60	+07 48 02.9	2000.00	04:49	2.34	ISISR	600.0	59	Out +Out	1.01	R1200	6500	
1309340	SDSSJ1600+0748	16 00 43.60	+07 48 02.9	2000.00	04:59	2.55	ISISB	600.0	59	Out +Out	1.01	R600B	4647	
1309341	SDSSJ1600+0748	16 00 43.60	+07 48 02.9	2000.00	04:59	2.45	ISISR	600.0	59	Out +Out	1.01	R1200	6500	
1309342	SDSSJ1600+0748	16 00 43.60	+07 48 02.9	2000.00	05:09	2.68	ISISR	600.0	59	Out +Out	1.01	R1200	6500	
1309343	SDSSJ1600+0748	16 00 43.59	+07 48 02.6	2000.00	05:10	2.82	ISISB	600.0	59	Out +Out	1.01	R600B	4647	
1309344	Arc red bin	16 00 43.57	+07 48 02.0	2000.00	05:21	2.87	ISISR	1.0	59	Out +Out	1.00	R1200	6500	
1309345	Arc blue bin	16 00 43.59	+07 48 02.8	2000.00	05:21	2.87	ISISB	15.0	59	Out +Out	1.00	R600B	4647	
1309346	Flat red bin	16 00 43.59	+07 48 02.8	2000.00	05:22	2.89	ISISR	2.0	59	Out +Out	1.00	R1200	6500	
1309347	Flat blue bin	16 00 43.59	+07 48 02.8	2000.00	05:22	2.90	ISISB	10.0	59	Out +Out	1.00	R600B	4647	
1309348	Flat red bin	16 00 43.60	+07 48 02.9	2000.00	05:22	2.89	ISISR	2.0	59	Out +Out	1.00	R1200	6500	
1309349	Flat red bin	16 00 43.60	+07 48 02.9	2000.00	05:22	2.90	ISISR	2.0	59	Out +Out	1.00	R1200	6500	
1309350	Flat blue bin	16 00 43.59	+07 48 02.8	2000.00	05:22	2.90	ISISB	10.0	59	Out +Out	1.00	R600B	4647	
1309351	Flat red bin	16 00 43.59	+07 48 02.8	2000.00	05:22	2.90	ISISR	2.0	59	Out +Out	1.00	R1200	6500	
1309352	Flat red bin	16 00 43.60	+07 48 02.9	2000.00	05:23	2.91	ISISR	2.0	59	Out +Out	1.00	R1200	6500	
1309353	Flat blue bin	16 00 43.60	+07 48 02.9	2000.00	05:23	2.91	ISISB	10.0	59	Out +Out	1.00	R600B	4647	
1309354	Flat red bin	16 00 43.59	+07 48 02.9	2000.00	05:23	2.91	ISISR	2.0	59	Out +Out	1.00	R1200	6500	
1309355	Flat red bin	16 00 43.59	+07 48 02.8	2000.00	05:23	2.91	ISISR	2.0	59	Out +Out	1.00	R1200	6500	
1309356	Flat blue bin	16 00 43.59	+07 48 02.9	2000.00	05:23	2.92	ISISB	10.0	59	Out +Out	1.00	R600B	4647	
1309357	Flat red bin	16 00 43.59	+07 48 02.9	2000.00	05:23	2.92	ISISR	2.0	59	Out +Out	1.00	R1200	6500	
1309358	Flat red bin	16 00 43.60	+07 48 02.8	2000.00	05:23	2.92	ISISR	2.0	59	Out +Out	1.00	R1200	6500	
1309359	Flat blue bin	16 00 43.61	+07 48 02.9	2000.00	05:23	2.93	ISISB	10.0	59	Out +Out	1.00	R600B	4647	
1309360	Flat red bin	16 00 43.60	+07 48 02.9	2000.00	05:23	2.93	ISISR	2.0	59	Out +Out	1.00	R1200	6500	
1309361	Flat red bin	16 00 43.60	+07 48 02.9	2000.00	05:23	2.93	ISISR	2.0	59	Out +Out	1.00	R1200	6500	
1309362	Flat blue bin	16 00 43.60	+07 48 02.9	2000.00	05:23	2.93	ISISB	10.0	59	Out +Out	1.00	R600B	4647	
1309363	Flat blue bin	16 00 43.60	+07 48 02.9	2000.00	05:24	2.94	ISISB	10.0	59	Out +Out	1.00	R600B	4647	
1309364	Flat blue bin	16 00 43.60	+07 48 02.9	2000.00	05:24	2.95	ISISB	10.0	59	Out +Out	1.00	R600B	4647	
1309365	Flat blue bin	16 00 43.59	+07 48 02.9	2000.00	05:24	2.96	ISISB	10.0	59	Out +Out	1.00	R600B	4647	
1309366	Flat blue bin	16 00 43.59	+07 48 02.9	2000.00	05:25	2.97	ISISB	10.0	59	Out +Out	1.00	R600B	4647	
1309367	Flat blue bin	16 00 43.60	+07 48 02.9	2000.00	05:25	2.98	ISISB	10.0	59	Out +Out	1.00	R600B	4647	
1309368	bias bin	16 00 43.60	+07 48 02.9	2000.00	05:25	2.99	ISISR	0.0	59	Out +Out	1.00	R1200	6500	
1309369	binas bin	16 00 43.59	+07 48 02.8	2000.00	05:25	2.99	ISISB	0.0	59	Out +Out	1.00	R600B	4647	
1309370	bias bin	16 00 43.59	+07 48 02.8	2000.00	05:25	2.99	ISISR	0.0	59	Out +Out	1.00	R1200	6500	
1309371	binas bin	16 00 43.59	+07 48 02.9	2000.00	05:25	2.99	ISISB	0.0	59	Out +Out	1.00	R600B	4647	
1309372	bias bin	16 00 43.59	+07 48 02.8	2000.00	05:26	3.00	ISISR	0.0	59	Out +Out	1.00	R1200	6500	
1309373	binas bin	16 00 43.60	+07 48 02.9	2000.00	05:26	3.00	ISISB	0.0	59	Out +Out	1.00	R600B	4647	

Run	Object	RA	Dec	Equinox	UT	Airm	Instr	Texp sec	Sky PA	Filters etc.	Slit	Grat Grism	CenwA	– NAOMI – INGR Comments L WM Twfs l Co M
1309374	bias bin	16 00 43.60	+07 48 02.9	2000.00	05:26	3.00	ISISR	0.0	59	Out +Out	1.00	R1200	6500	
1309375	binas bin	16 00 43.60	+07 48 02.9	2000.00	05:26	3.00	ISISB	0.0	59	Out +Out	1.00	R600B	4647	
1309376	binas bin	16 00 43.60	+07 48 02.9	2000.00	05:26	3.00	ISISB	0.0	59	Out +Out	1.00	R600B	4647	
1309377	bias bin	16 00 43.60	+07 48 02.9	2000.00	05:26	3.00	ISISR	0.0	59	Out +Out	1.00	R1200	6500	
1309378	binas bin	16 00 43.59	+07 48 02.8	2000.00	05:26	3.01	ISISB	0.0	59	Out +Out	1.00	R600B	4647	
1309379	bias bin	16 00 43.59	+07 48 02.8	2000.00	05:26	3.01	ISISR	0.0	59	Out +Out	1.00	R1200	6500	
1309380	binas bin	16 00 43.59	+07 48 02.8	2000.00	05:26	3.01	ISISB	0.0	59	Out +Out	1.00	R600B	4647	
1309381	bias bin	16 00 43.59	+07 48 02.8	2000.00	05:26	3.01	ISISR	0.0	59	Out +Out	1.00	R1200	6500	
1309382	binas bin	16 00 43.59	+07 48 02.9	2000.00	05:26	3.01	ISISB	0.0	59	Out +Out	1.00	R600B	4647	
1309383	bias bin	16 00 43.59	+07 48 02.8	2000.00	05:26	3.02	ISISR	0.0	59	Out +Out	1.00	R1200	6500	
1309384	binas bin	16 00 43.60	+07 48 02.9	2000.00	05:26	3.02	ISISB	0.0	59	Out +Out	1.00	R600B	4647	
1309385	bias bin	16 00 43.59	+07 48 02.8	2000.00	05:26	3.02	ISISR	0.0	59	Out +Out	1.00	R1200	6500	
1309386	binas bin	16 00 43.59	+07 48 02.8	2000.00	05:26	3.02	ISISB	0.0	59	Out +Out	1.00	R600B	4647	
1309387	bias bin	16 00 43.59	+07 48 02.8	2000.00	05:26	3.02	ISISR	0.0	59	Out +Out	1.00	R1200	6500	
1309388	binas bin	16 00 43.60	+07 48 02.8	2000.00	05:26	3.03	ISISB	0.0	59	Out +Out	1.00	R600B	4647	
1309389	bias bin	16 00 43.60	+07 48 02.9	2000.00	05:26	3.03	ISISR	0.0	59	Out +Out	1.00	R1200	6500	
1309390	bias nobin	16 00 43.60	+07 48 02.9	2000.00	05:27	3.04	ISISR	0.0	59	Out +Out	1.00	R1200	6500	
1309391	binas nobin	16 00 43.60	+07 48 02.9	2000.00	05:27	3.04	ISISB	0.0	59	Out +Out	1.00	R600B	4647	
1309392	bias nobin	16 00 43.59	+07 48 02.9	2000.00	05:27	3.05	ISISR	0.0	59	Out +Out	1.00	R1200	6500	
1309393	binas nobin	16 00 43.59	+07 48 02.9	2000.00	05:27	3.05	ISISB	0.0	59	Out +Out	1.00	R600B	4647	
1309394	bias nobin	16 00 43.60	+07 48 02.9	2000.00	05:27	3.05	ISISR	0.0	59	Out +Out	1.00	R1200	6500	
1309395	binas nobin	16 00 43.59	+07 48 02.8	2000.00	05:27	3.06	ISISB	0.0	59	Out +Out	1.00	R600B	4647	
1309396	bias nobin	16 00 43.59	+07 48 02.9	2000.00	05:27	3.06	ISISR	0.0	59	Out +Out	1.00	R1200	6500	
1309397	binas nobin	16 00 43.59	+07 48 02.8	2000.00	05:28	3.06	ISISB	0.0	59	Out +Out	1.00	R600B	4647	
1309398	bias nobin	16 00 43.60	+07 48 02.9	2000.00	05:28	3.07	ISISR	0.0	59	Out +Out	1.00	R1200	6500	
1309399	binas nobin	16 00 43.60	+07 48 02.9	2000.00	05:28	3.07	ISISB	0.0	59	Out +Out	1.00	R600B	4647	
1309400	bias nobin	16 00 43.60	+07 48 02.9	2000.00	05:28	3.07	ISISR	0.0	59	Out +Out	1.00	R1200	6500	
1309401	binas nobin	16 00 43.60	+07 48 02.9	2000.00	05:28	3.08	ISISB	0.0	59	Out +Out	1.00	R600B	4647	
1309402	bias nobin	16 00 43.60	+07 48 02.8	2000.00	05:28	3.08	ISISR	0.0	59	Out +Out	1.00	R1200	6500	
1309403	binas nobin	16 00 43.60	+07 48 02.9	2000.00	05:28	3.08	ISISB	0.0	59	Out +Out	1.00	R600B	4647	
1309404	bias nobin	16 00 43.60	+07 48 02.9	2000.00	05:28	3.09	ISISR	0.0	59	Out +Out	1.00	R1200	6500	
1309405	binas nobin	16 00 43.59	+07 48 02.8	2000.00	05:28	3.09	ISISB	0.0	59	Out +Out	1.00	R600B	4647	
1309406	bias nobin	16 00 43.59	+07 48 02.8	2000.00	05:28	3.09	ISISR	0.0	59	Out +Out	1.00	R1200	6500	
1309407	binas nobin	16 00 43.59	+07 48 02.8	2000.00	05:29	3.10	ISISB	0.0	59	Out +Out	1.00	R600B	4647	
1309408	bias nobin	16 00 43.60	+07 48 02.9	2000.00	05:29	3.10	ISISR	0.0	59	Out +Out	1.00	R1200	6500	
1309409	binas nobin	16 00 43.60	+07 48 02.9	2000.00	05:29	3.10	ISISB	0.0	59	Out +Out	1.00	R600B	4647	
1309410	bias nobin	16 00 43.60	+07 48 02.9	2000.00	05:29	3.11	ISISR	0.0	59	Out +Out	1.00	R1200	6500	
1309411	binas nobin	16 00 43.60	+07 48 02.9	2000.00	05:29	3.11	ISISB	0.0	59	Out +Out	1.00	R600B	4647	
1309412	Flat red nobin	16 00 43.59	+07 48 02.8	2000.00	05:29	3.12	ISISR	1.0	59	Out +Out	1.00	R1200	6500	
1309413	Flat blue nobin	16 00 43.59	+07 48 02.8	2000.00	05:29	3.12	ISISB	2.0	59	Out +Out	1.00	R600B	4647	
1309414	Flat red nobin	16 00 43.59	+07 48 02.8	2000.00	05:29	3.13	ISISR	1.0	59	Out +Out	1.00	R1200	6500	
1309415	Flat blue nobin	16 00 43.60	+07 48 02.8	2000.00	05:29	3.13	ISISB	2.0	59	Out +Out	1.00	R600B	4647	
1309416	Flat red nobin	16 00 43.60	+07 48 02.9	2000.00	05:30	3.13	ISISR	1.0	59	Out +Out	1.00	R1200	6500	
1309417	Flat blue nobin	16 00 43.59	+07 48 02.9	2000.00	05:30	3.14	ISISB	2.0	59	Out +Out	1.00	R600B	4647	
1309418	Flat red nobin	16 00 43.60	+07 48 02.9	2000.00	05:30	3.14	ISISR	1.0	59	Out +Out	1.00	R1200	6500	
1309419	Flat blue nobin	16 00 43.60	+07 48 02.9	2000.00	05:30	3.14	ISISB	2.0	59	Out +Out	1.00	R600B	4647	
1309420	Flat red nobin	16 00 43.60	+07 48 02.9	2000.00	05:30	3.15	ISISR	1.0	59	Out +Out	1.00	R1200	6500	
1309421	Flat blue nobin	16 00 43.60	+07 48 02.9	2000.00	05:30	3.15	ISISB	2.0	59	Out +Out	1.00	R600B	4647	
1309422	Flat red nobin	16 00 43.60	+07 48 02.9	2000.00	05:30	3.16	ISISR	1.0	59	Out +Out	1.00	R1200	6500	
1309423	Flat blue nobin	16 00 43.60	+07 48 02.9	2000.00	05:30	3.16	ISISB	2.0	59	Out +Out	1.00	R600B	4647	
1309424	Flat red nobin	16 00 43.59	+07 48 02.8	2000.00	05:30	3.16	ISISR	1.0	59	Out +Out	1.00	R1200	6500	
1309425	Flat blue nobin	16 00 43.60	+07 48 02.9	2000.00	05:31	3.17	ISISB	2.0	59	Out +Out	1.00	R600B	4647	
1309426	Flat red nobin	16 00 43.60	+07 48 02.9	2000.00	05:31	3.17	ISISR	1.0	59	Out +Out	1.00	R1200	6500	
1309427	Flat blue nobin	16 00 43.60	+07 48 02.9	2000.00	05:31	3.17	ISISB	2.0	59	Out +Out	1.00	R600B	4647	
1309428	Flat red nobin	16 00 43.59	+07 48 02.8	2000.00	05:31	3.18	ISISR	1.0	59	Out +Out	1.00	R1200	6500	

Run	Object	RA	Dec	Equinox	UT	Airm	Instr	Texp sec	Sky PA	Filters etc.	Slit	Grat Grism	CenwA	– NAOMI – INGR Comments L WM Twfs l Co M
1309429	Flat blue nobin	16 00 43.59	+07 48 02.8	2000.00	05:31	3.18	ISISB	2.0	59	Out +Out	1.00	R600B	4647	
1309430	Flat red nobin	16 00 43.59	+07 48 02.9	2000.00	05:31	3.18	ISISR	1.0	59	Out +Out	1.00	R1200	6500	
1309431	Flat blue nobin	16 00 43.59	+07 48 02.8	2000.00	05:31	3.19	ISISB	2.0	59	Out +Out	1.00	R600B	4647	
1309432	Flat red nobin	16 00 43.60	+07 48 02.9	2000.00	05:31	3.19	ISISR	1.0	59	Out +Out	1.00	R1200	6500	
1309433	Flat blue nobin	16 00 43.59	+07 48 02.9	2000.00	05:31	3.20	ISISB	2.0	59	Out +Out	1.00	R600B	4647	

C Absorptionlines

Element	Wavelength (Å)	Note
H	3835.397	
H	3889.055	
Ca-II	3933.67	
Ca-II	3968.47	Blended
H	3970.074	Blended
Fe-I	4045.81	
C-IV	4056.06	
Fe-I	4063.59	
C-IV	4070.26	
Fe-I	4071.73	
H	4101.735	
C-IV	4186.90	
Fe-I	4143.86	
He-II	4199.83	
Fe-I	4202.02	
Ca-I	4226.73	
Fe-I	4271.76	
Fe-I	4307.90	
Fe-I	4325.76	
H	4340.465	
Mg-I	4351.90	
Fe-I	4383.54	
Fe-I	4404.75	
Fe-I	4415.12	
C-IV	4441.50	
He-II	4541.7	
C-IV	4658.30	
He-II	4685.7	
Mg-I	4702.99	
He-II	4859.3	Blended
H	4861.327	Blended
Fe-I	4891.49	
Fe-I	4920.50	
Fe-I	4957.59	
Mg-I	5167.32	
Fe-I	5167.48	
Fe-I	5171.59	
Mg-I	5172.68	
Mg-I	5183.60	