Telemetry Explanations & SISPI Comparison Plots

Snapshot 11/07/2012

Contents

1 Introduction

DECam Observers will want to know that the instrument is functioning properly. We have many sources of information available from instrumentation and from computer processes that allows us to monitor that. One of the sources is the history of instrument paramaters, which we call the "Telemetry". Some of the telemetry information is provided in the DECam Observer GUIs at the Observer1 SISPI Console. This note provides "comparison plots" of that information, and explanations of them, to the DECam Observers.

In addition to the SISPI Observer1 Console, you can access the telemetry information at http://system1.ctio.noao.edu:7001/apps/telemetry_viewer/ using a web-browser other than IE.

2 Focal Plane Cooling

2.1 CCD Temperature, DECam Vacuum, & DECam Total Heater Power

There are four RTD's that measure the temperature of the DECam Focal Plane. Three of them are plotted in the first chart in units: degrees Centigrade. They should be at a constant temperature within a couple degrees of -100 deg C. It is important that they don't vary by as much as ½ deg C as that could affect the QE at the red end of the sensitivity.

An ion gauge measures the gas pressure within the DECam Dewar. It's very important that the vacuum be maintained at all times that the Focal Plane is cold. The chart shows the ion gauge reading in units: Torr. The pressure is normally less than 2×10^{-7} Torr and is very steady.

The DECam Total Heater Power is the sum in Watts of the power deposited by the temperature controls system onto 10 Cu heater braids. It should be steady within about five Watts. Turning off the power to

the RO Crates will cause it to drop quickly; it will take a couple hours for the control loop to settle down if the temperature has varied by more than a couple degrees C.

2.2 LN2 Pump Speed, LN2 Tank Level, and LN2 Pressure

The DECam Focal Plane is cooled using LN2 pumped from a tank on the roof of the old Console Room (C-floor) to the camera. It is a closed-loop system so the nitrogen returns to the tank as a mixture of liquid and gas. We have been operating the pump at 80 RPM. The chart seems to jump around from 50 to 120 RPMs during normal operation.

The LN2 Tank liquid level chart shows the tank level in unit percent. It varies by 1% to 3% over the course of a day. As this is a closed-loop system, we would be concerned if there was a steady loss of LN2 product.

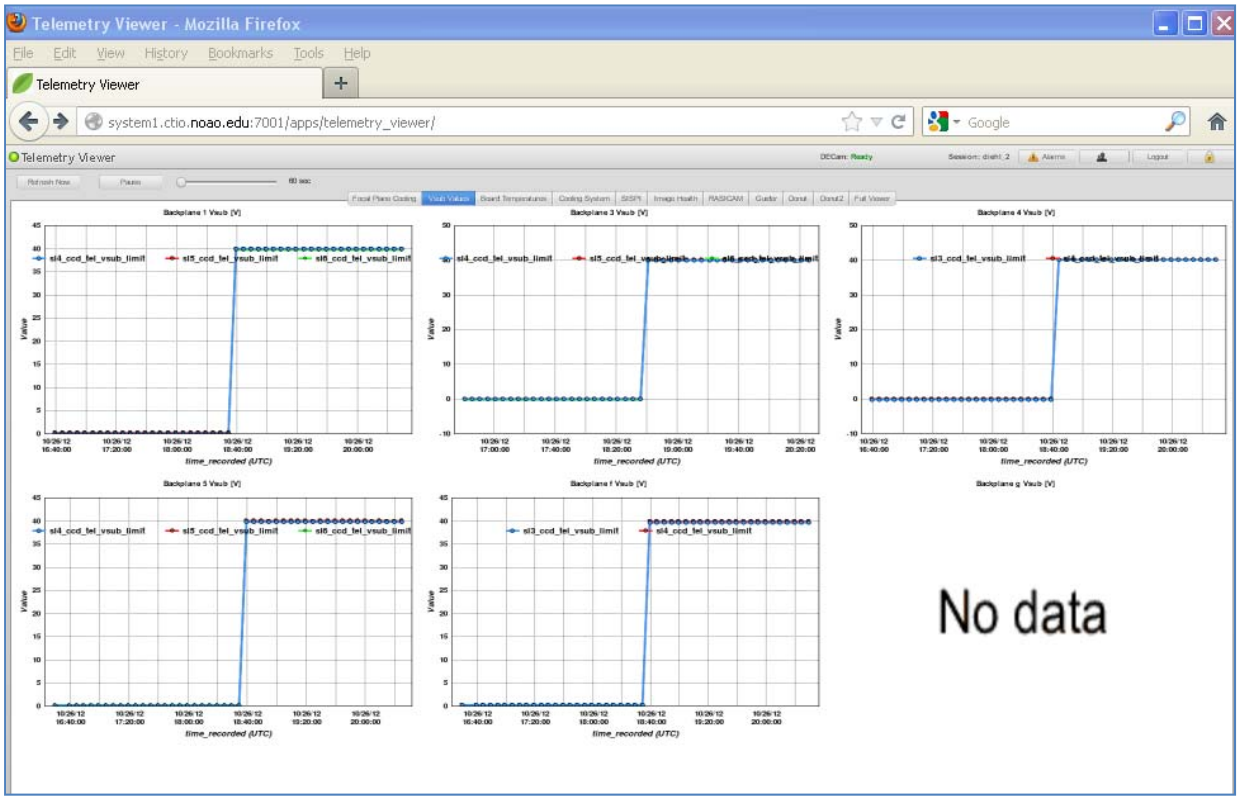
The LN2 Tank pressure chart has units PSI. The pressure is controlled by heaters within the tank. The pressure should be steady. A variation of a few % is expected.

Since this is a closed-system, there is a relation between the Tank Level and the Tank Pressure. If the pressure goes up the level tends to drop. Heaters within the tank receive less power. The LN2 gets colder and more LN2 is made by the two cryo-coolers. The pressure goes down and the level goes up.

2.3 DECam Cage Temperatures

These monitors are not implemented as of October 29, 2012.

3 VSUB Values



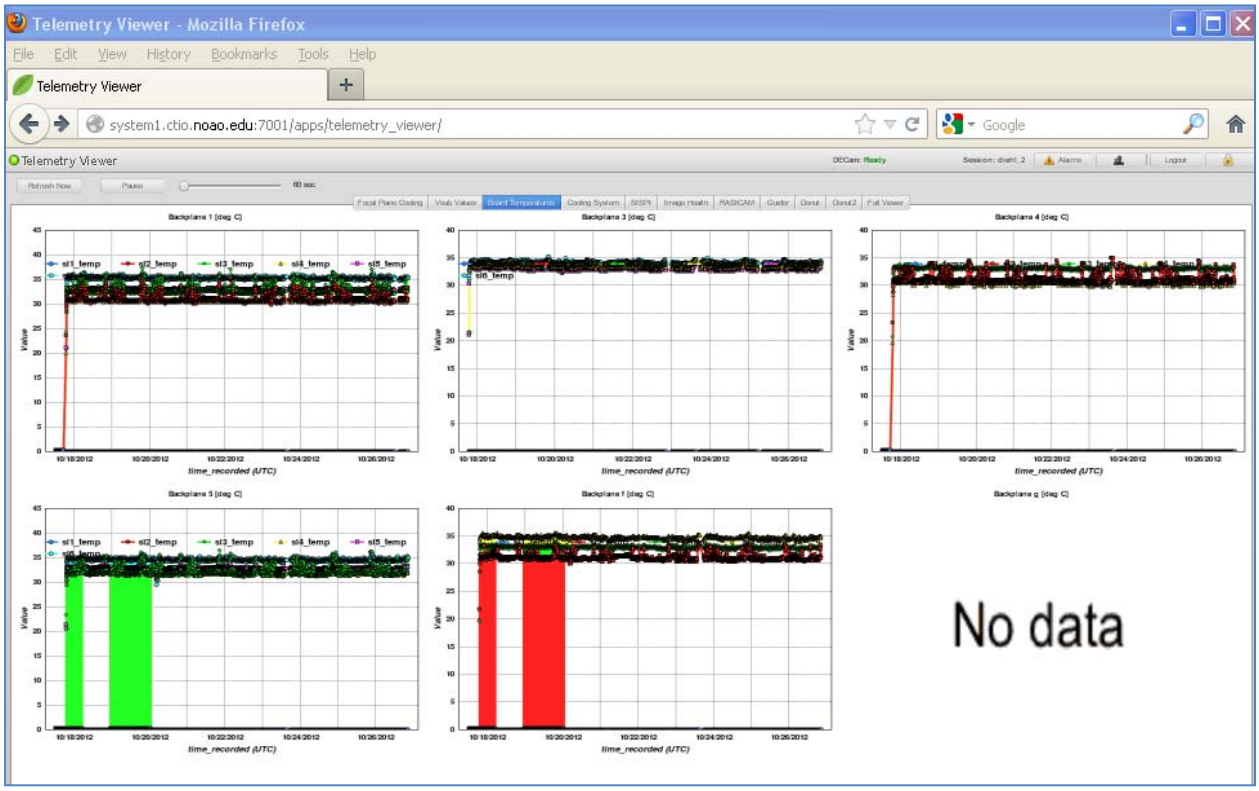
3.1 Backplane 1, 3-5, F, & G

Photons that hit the CCDs create electron-hole pairs in the silicon substrate. The CCD substrate voltage (Vsub) drives the holes onto the nearest pixel and eats the electrons. The charts are Vsub for the 2kx4k CCD RO crate backplanes (1 and 3-5) and for the guide and focus CCD backplanes (2 and 6, respectively). The units of the plots are volts. Vsub should be at 40V for observing. The first image after Vsub is turned-up will be a trashed image.

Vsub slew is related to how fast Vsub transitions up or down. We usually set it at the maximum value, which is 10V. In the telemetry this has a factor of 4 applied. It takes about 1 second to make a transition.

Vsub limit is the maximum voltage swing, set to either 0 or 40V.

4 Board Temperatures

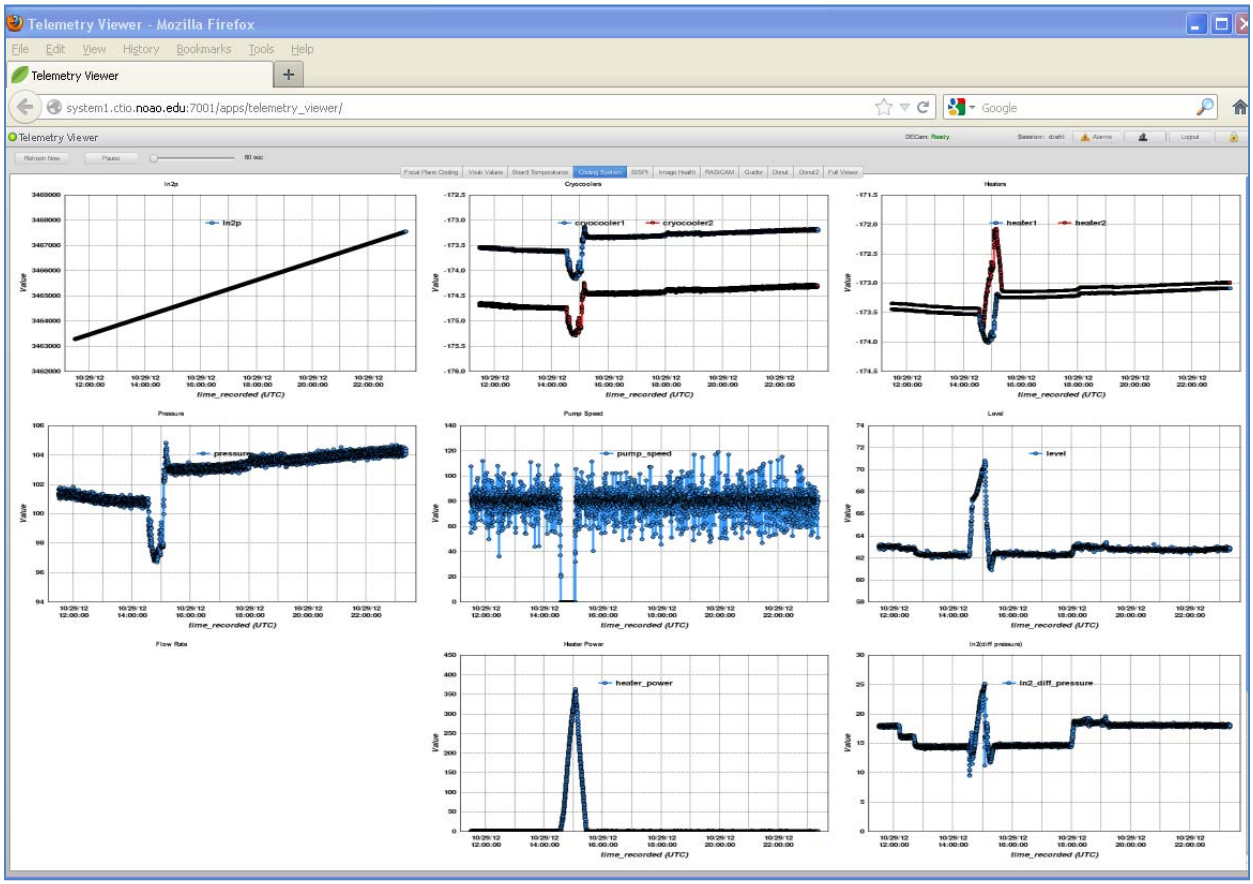


4.1 Backplane 1, 3-5, F, & G

We monitor the temperature on various boards within each backplane. The charts are the temperatures for the 2kx4k CCD RO crate backplanes (1 and 3-5) and for the guide and focus CCD backplanes (2 and 6, respectively). It is normal for them to be in the range 30-37 deg C. If these start to climb it is possible that the electronics crate cooling system (NESLab chiller) has stopped pumping cold glycol to the crates.

“No Data” is probably a bad thing.

5 Cooling System (LN2 Recirculation System)



5.1 LN2P, CryoCoolers, Heaters, & Pump Speed

LN2P seems to be a time counter. It monotonically increases.

Cryocoolers displays the temperature of the cold head of each of the two cryocoolers in the LN2 Tank on the Old Console roof. These should be in the neighborhood of -173 deg C during normal operation. They tend to move around together.

There are two heaters in the LN2 Tank. The chart shows the temperature of the block that the heaters are embedded-in.

Pump Speed indicates the rate in units RPM. We have been operating the pump at 80 RPM. The chart seems to jump around from 50 to 120 RPMs during normal operation.

5.2 Pressure, LN2 Differential Pressure, Heater Power, & Level

The pressure chart shows the pressure, in units PSI, in the LN2 Tank. The two cryocoolers are so cold that they can condense the N2 gas in the tank, raising the liquid level, and lowering the pressure. We are maintaining the pressure at 100 PSI using two heaters in the tank. Under normal circumstances the pressure is steady within a few PSI.

The LN2 differential pressure chart shows the difference between the pressure on the return and pressure in the supply line of the LN2 system. Some of the Ln2 will have vaporized to cool the focal plane, so the return pressure is typically 10 PSI higher.

The Heater Power chart is the total power, in units Watts, deposited by the two heaters in the LN2 tank into the N2 in the tank. Typically is 80 Watts.

The LN2 Tank liquid level chart shows the tank level in unit percent. It varies by 1% to 3% over the course of a day. As this is a closed-loop system, we would be concerned if there was a steady loss of LN2 product.

Since this is a closed-system, there is a relation between the Tank Level and the Tank Pressure. If the pressure goes up the level tends to drop. Heaters within the tank receive less power. The LN2 gets colder and more LN2 is made by the two cryo-coolers. The pressure goes down and the level goes up.

In the circumstance that is shown in the figure in this section, something is going on that is causing extra heat to be deposited into the LN2, either in the circulation system. As a consequence the Heater Power is down to close to zero Watts. Then, as we can see from the Pump Speed chart, the pump was turned off for a while. As a consequence, the two cryo-coolers started to re-condense N2 at a greater rate. The pressure dropped. The heaters spiked on. The cryo-coolers got a little warmer. Then when the pump was turned back on the system was restored to previous condition.

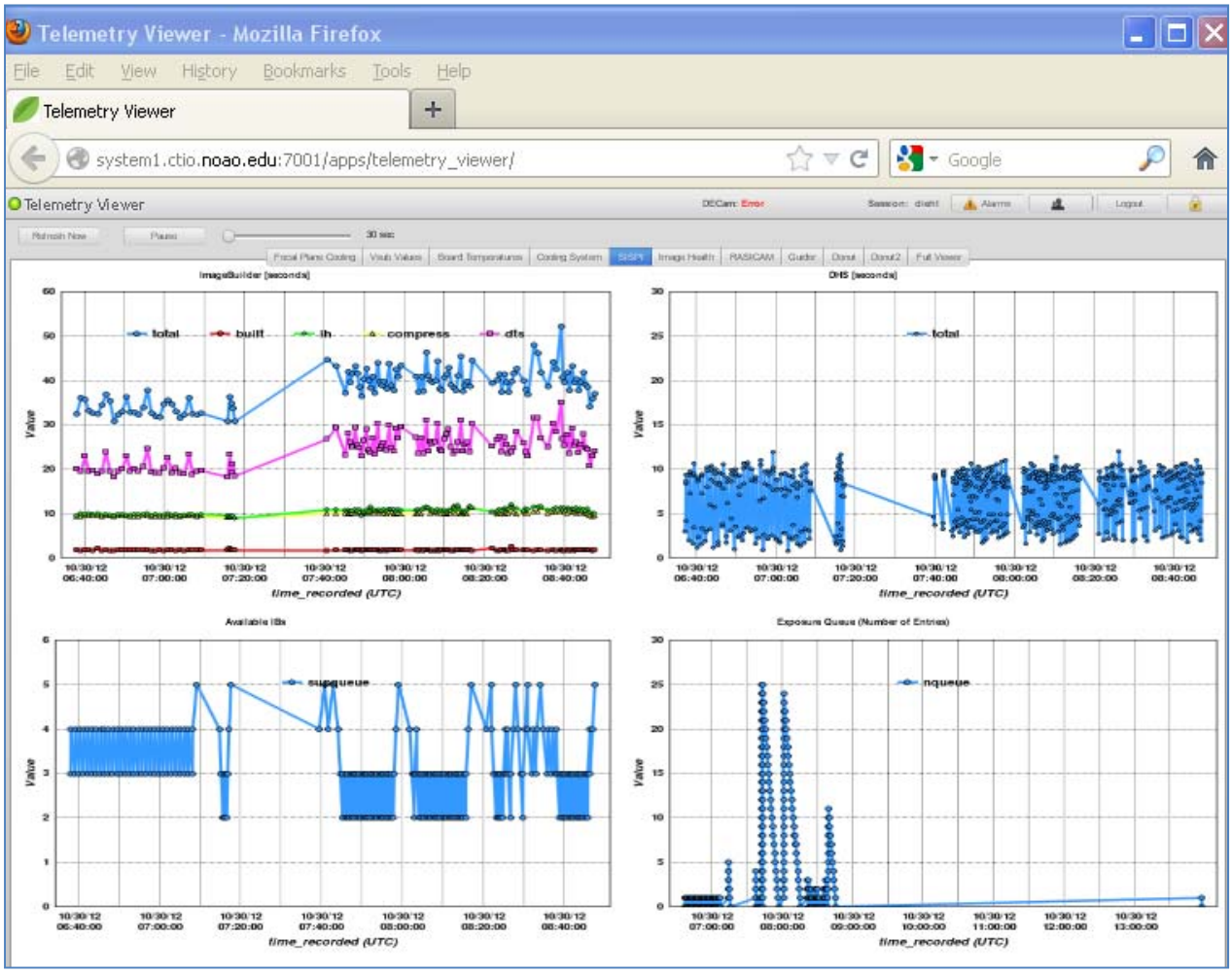
We will replace the plot for this section when the system is restored to normal conditions.

5.3 Ion Gauge & Flow Rate

An ion gauge measures the gas pressure within the DECam Dewar. It's very important that the vacuum be maintained at all times that the Focal Plane is cold. The chart shows the ion gauge reading in units: Torr. The pressure is normally less than 2×10^{-7} Torr and is very steady. The Ion Gauge plot seems to be missing from this screen capture.

Flow Rate is probably the flow in units gallons-per-minute for one of the chillers. But in order to be sure we need to actually see the plot work.

6 SISPI



6.1 Image Builder (seconds) & Exposure Queue

The chart records the amount of processing time required for the different stages of Image Handling. It starts with time to build the image (put together the pieces from the different backplanes), perform Image Health, perform the data compression, and transfer the data. The total is the sum of the components.

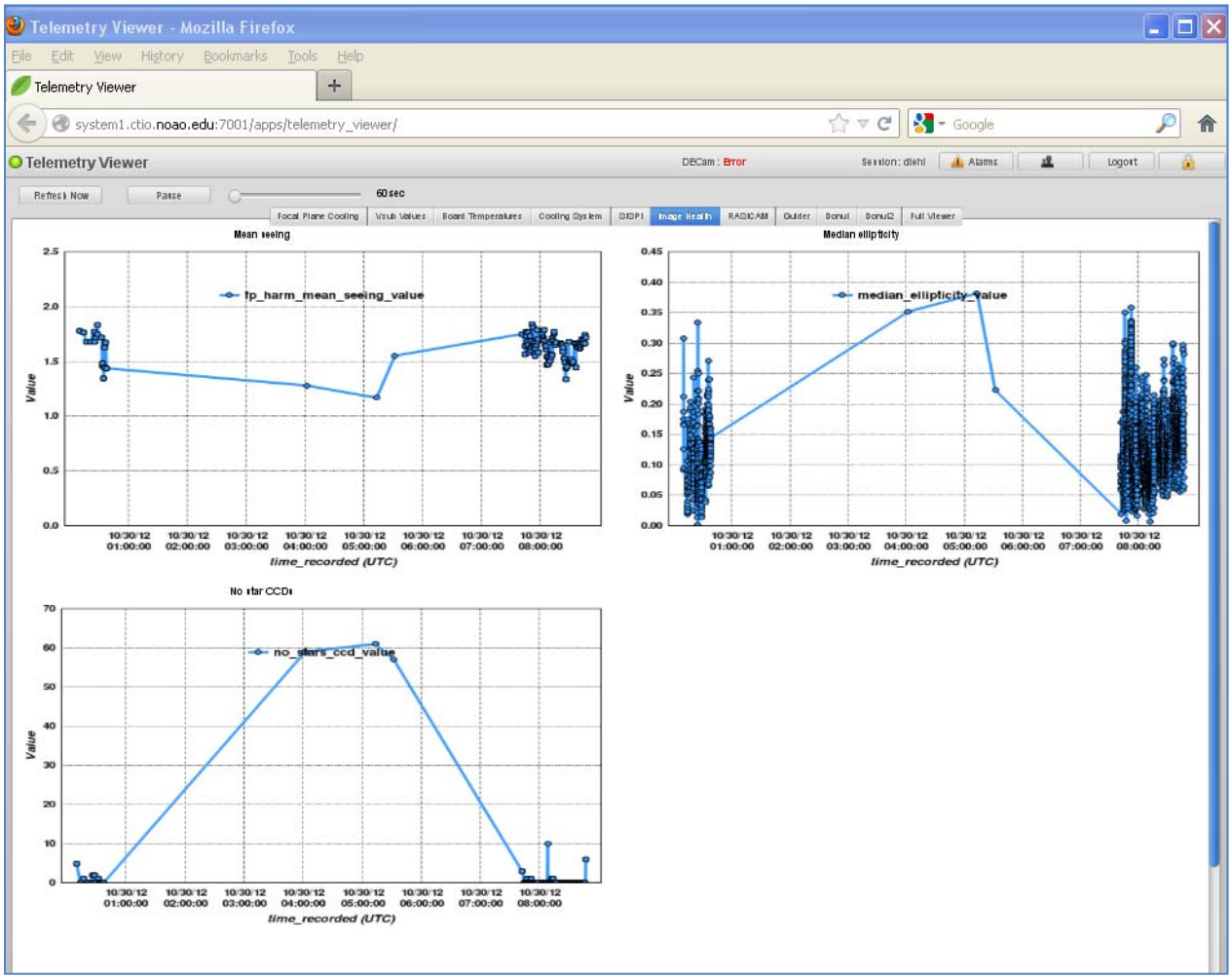
The chart showing the exposure queue is simply indicating the depth of the queue that is currently in-place. Naturally, as long as we are taking exposure from the queue it will decrease.

6.2 DHS & Image Builders

The DHS chart shows how long it takes to get the images off of the PANVIEWs.

The Image Builder chart shows the available number of those. Typically that runs from two to five.

7 Image Health



7.1 Mean Seeing & Median Ellipticity

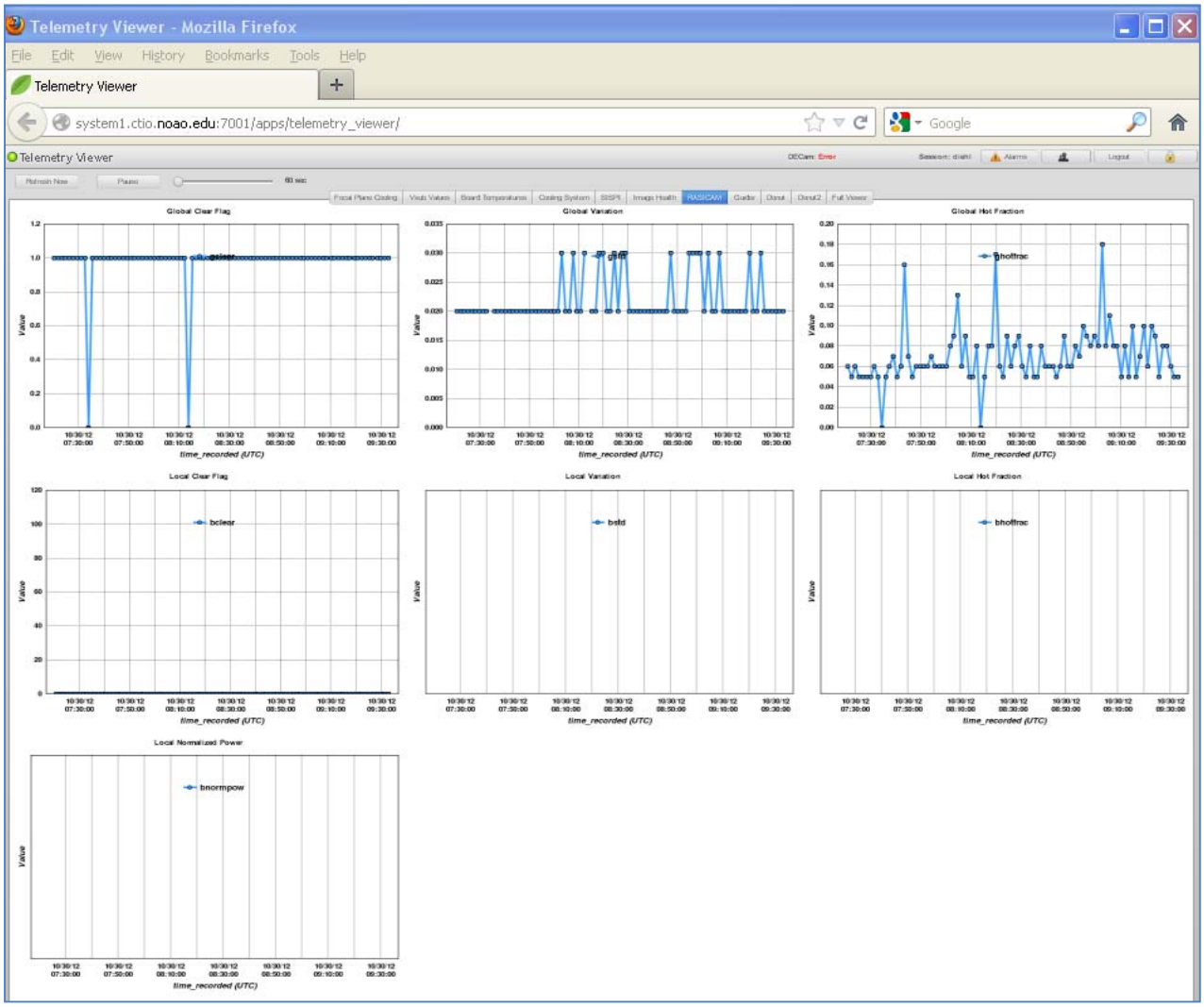
The Mean Seeing chart displays the mean of the calculated seeing based on analysis of the images. The units are FWHM in arc-seconds.

The Median Ellipticity chart shows the ellipticity of stars in the image. This should be close to zero because stars should be round.

7.2 No Star CCDs

Image Health identifies stars in the image. The CCDs should have stars. Flat-fields and Bias images won't have stars.

8 RASICAM



8.1 Global Clear Flag & Local Clear Flag

The Global Clear Flag chart provides a single bit, a 0 or a 1, to describe whether-or-not the sky is clear. It is based on the overall standard deviation of the RASICAM image. A score of 1 means the sky is clear.

The Local Clear Flag chart provides a single bit, a 0 or a 1, to describe whether-or-not the sky is clear in the field where the Blanco Telescope is pointing. It is based on the overall standard deviation of the RASICAM image. A score of 1 means the sky is clear.

8.2 Local Hot Fraction & Global Hot Fraction

The Local Hot Fraction is the fraction of pixels that exceed the threshold for cloudy in the region of sky where the Blanco Telescope is pointing. Changes in this quantity indicate whether clouds are “inbound” or “outbound”.

The Global Hot Fraction is the fraction of pixels that exceed the threshold for cloudy in the whole sky.

8.3 Local Variation & Global Variation

These quantities are sensitive indicators of the presence of clouds.

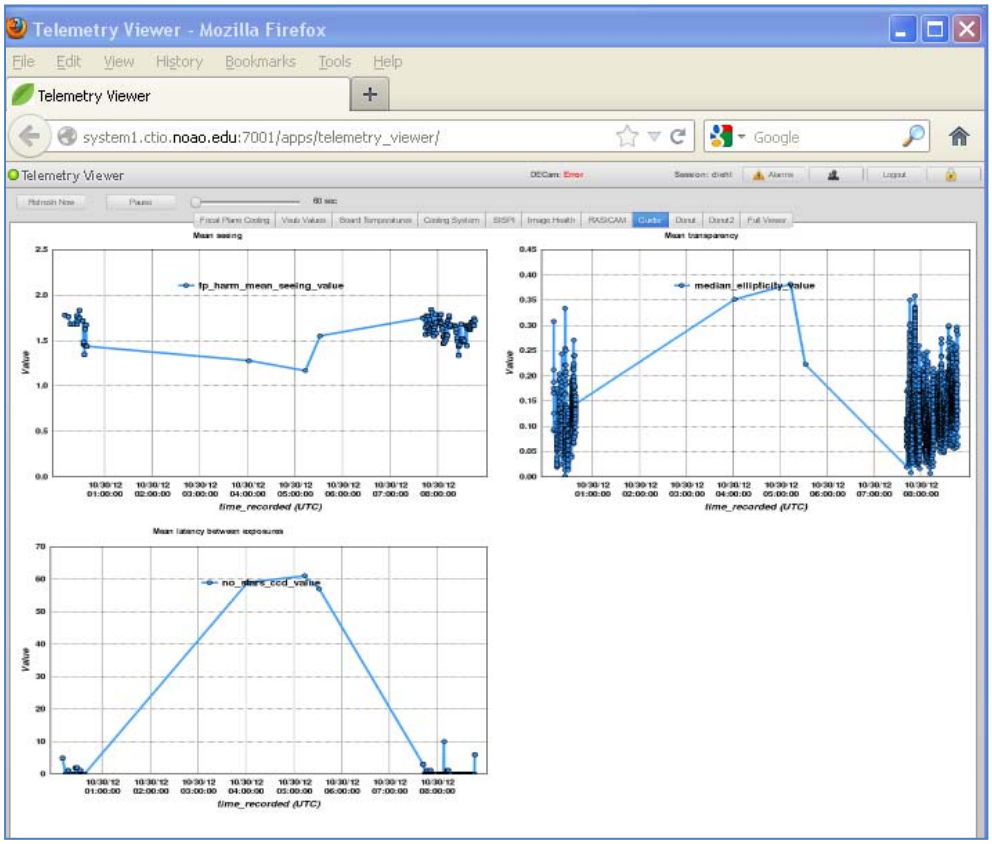
The Local Variation chart shows the standard deviation of the counts in the RASICAM image in the field where the Blanco telescope is pointing, normalized for position on the focal surface. In clear sky conditions this is a small number.

The Global Variation chart shows the standard deviation of the counts in the RASICAM image, normalized for position on the focal surface. In clear sky conditions this is a small number.

8.4 Normalized Power

A unit-less quantity unique to RASICAM, nominally any value above zero indicates a source of thermal radiance. This value can be used to quantify the cloud radiance. The image shown on the RASICAM display is a false-color representation of this quantity.

9 Guider



9.1 Mean Seeing, Median Ellipticity, No Stars CCDs

These charts are from Image Health.

10 DONut Summary 1

10.1 DONut Summary 1 & DONut Summary 2

The DONut plots for this will say “No Data” until the observing has begun.

Four CCDs are 1500 microns above the nominal focal plane and four are 1500 microns below the nominal focal plane. Unfocused stars appear as “DoNut” images of the primary mirror.

10.2 Hexapod Summary

This has no data at this time.

11 DONut2

11.1 FS1 to FS4 and FN1 to FN4

The DONut plots for this will say “No Data” until the observing has begun.

The 2kx2k CCDs that are 1500 microns lower than the nominal focal plane are FS1, FN2, FS3, and FN4.
The 2kx2k CCDs that are 1500 microns higher than the nominal focal plane are FN1, FS2, FN3, and FS4.

Z5 & Z6 are related to the two possible components of astigmatism.

Z4 looks like it is related to focus.

12 Full Viewer

This page is the front page for the full telemetry viewer.