Guide Star Checking from RPS2

Abstract

An enhanced version of RPS2 that has the capability of checking for guide stars has been developed. How to Run the Guide Star Check from RPS2 describes how to process your proposal through guide star checking before submitting it to STScI. Installing RPS2 with Guide Stars describes how to install the software.

If there is inadequate guide star coverage for some of the visits in your proposal, Trouble Shooting Problems with Guide Stars offers some possible remedies.

1. RPS2 Schedulability and Guide Stars

While RPS2 has, at its heart, the same software that is used at STScI to evaluate and prepare a proposal, not all of its capabilities are used. As HST observers know, RPS2 has a serious "blind spot" when processing a Phase 2 proposal for schedulability: before submitting your proposal, you did not know if guide stars would be available in the visit scheduling windows. Guide star availability was determined only after the proposal had been submitted to STScI and processed by a Program Coordinator (PC).

1.1 Old RPS2 without Guide Star Checking

If no guide stars were available for a visit, you and your PC had to iterate (usually several times) to a solution in the following manner:
• The PC ran the Guide Star system at STScI and then reported the results to the PI.
• The PI would suggest changes for the PC to make to the proposal, or resubmit the proposal with the changes.
• Then the PC checked in the proposal and reprocessed it.

1.2 RPS2 with Guide Star Checking

Clearly, both the observer and STScI would save time (and increase their efficiency) if the Guide Star system could be run directly by the person writing and processing the proposal in RPS2. Just the reduction time spent on iterating back and forth between the PI and the PC would lead to faster convergence to truly schedulable observations.

Accordingly, a version of RPS2 has been developed which has the capability to check for available guide stars. This enhanced version of RPS2 is described in the following sections, including instructions on how to install (see “Installing RPS2 with Guide Stars” on page 8) and use it (see “How to Run the Guide Star Check from RPS2” on page 2).

2. Incorporating Guide Star Checking into RPS2

The Guide Star Selection System itself is too large and unportable to be incorporated directly into RPS2, but it can be run as a server at STScI. After an observer requests guide star processing from the RPS2 User Interface (described below), it goes into a batch queue on one of two machines at STScI and is processed in the order received. If the queue is full, you will receive a message immediately, telling you to try again in 30 minutes.

Guide star processing can take as little as one or two minutes per visit with a fast network connection with no other user requests in front of you, or it can take much longer, depending on the number and size of requests users submit to STScI. This will especially be the case near the Phase 2 deadline when more proposers than usual will be submitting guide star requests.

3. How to Run the Guide Star Check from RPS2

Finish writing your program and process it without guide star checking first. We recommend you follow these steps:

1. As you modify and correct your proposal, use only the "Process" and "Display Output" buttons on the user interface to process it (both feasibility and schedulability) and examine the reports (see Chapter 4 of the RPS2 User’s Guide).
2. When you are finished adjusting exposure times and/or any timing special requirements, and all major errors have been corrected,
   • click on the "Guide Stars" button on the RPS2 User Interface.
Before doing this, make sure you have the routing configuration (set from the “Configure ...” button; see section 3.7 of the RPS2 User’s Guide) set to “Remote Hosts.”

RPS2 User Interface after clicking on “Guide Stars”

This will start a process that generates some special files in your RPS2 directory and then transmits these files to STScI where they are used for guide star checking. This process then waits to receive the results, which may take some time, depending on the speed of your connection and machine loads at STScI.

3. Relax and take a coffee break. Or tea if you prefer.

4. When STScI finishes with your guide star request and returns the results to you,
   • click on "Process" again to incorporate the new guide star data.
   After your proposal has been reprocessed, display it and go to a Visit Analysis Report. You should see a new line for Guide Stars in the “SCHEDulability” section, showing the times when there is adequate guide star coverage for that visit. These guide star windows are intersected with any other constraints. If the Total Schedulability line shows adequate scheduling windows, you are ready to submit your proposal.
   If no guide stars are found, the visit will be marked “unschedulable” in the DIAGnostics section.

If for any reason the guide star data are out of date, the guide star and total schedulability windows will be gray instead of black.

3.1 Special Considerations when Checking for Guide
**Stars**

- **Reprocess through “Guide Stars” and “Process” any visit that has been changed.**

If you make any changes to a target or a visit, the guide star data will be marked out of date. You can see this by reprocessing the proposal (without rerunning guide stars) and then displaying the visit. The Visit Analysis report will show that the guide star and schedulability windows have changed to gray with a schedulability diagnostic, “Guide star data needs to be regenerated.”

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*After any visit changes, you must reprocess the proposal, then rerun guide stars and then process it again.*

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RPS2 is not able to judge if changes to a visit are significant or not, and we have found that very small, seemingly "insignificant" target changes can render a guide star unusable, particularly if it happens to be near the edge of the FGS aperture. Changes to PATTERN specifications and POS TARGs will also have a similar effect, since they affect guide star availability.

- **“Guide Stars” does not support moving or generic targets.**

Guide star processing *does not* support these target types yet. This capability may be added in the future, but for the present please do not use the "Guide Star" button for a proposal that contains either of these target types.

- **Check the roll range report on any ORIENT special requirements**

At the bottom of the scheduling section of the Visit diagnostic report,

  - click on the U3 "Roll range information for Visit ..." to obtain a display of usable ORIENTs as a function of time.
After guide star processing, this table lists as a function of date not only the available geometric U3 roll ranges (taking into consideration the allowed sun incidence angle, antenna shadowing, thermal constraints and so on), but also the available roll ranges with guide stars.

- **Check the roll range report on any time constraint special requirements**

Effectively, time constraints are equivalent to orient constraints, since nominal roll and the allowable off-nominal roll is a function of time of year and target coordinates. After you have run “Guide Stars”, this table will include guide star roll ranges, marking the times when guide stars are located in the FGS apertures. Although the FGS apertures are about four arc-minutes wide, a two arc-minute criterion is used to decide if multiple pointings can be supported on a single set of guide stars.

### 3.2 Trouble Shooting Problems with Guide Stars

If you have inadequate guide star coverage for one (or more) of your visits, try some of the changes described in the following sections.

- **Relax constraints such as BETWEEN and ORIENT.**

The U3 "Roll range information for Visit ..." table in the Visit Report will tell you at what orients and times the constraints will be satisfied. The table includes data for the entire cycle, and the guide star search is done for all possible orients, not just the range...
specified in the visit (Note: You can specify multiple acceptable BETWEEN and ORIENT ranges).

- **Restrict the small angle maneuvers (due to POS TARGs, PATTERNS, and Multiple Targets) within a visit.**

The larger the range of motions, the harder it is to find guide stars that will stay within the FGS apertures as the telescope slews. For large patterns (e.g. background subtraction with NICMOS) there is a special requirement, Drop to Gyro if Necessary, which will "release" the guide stars and carry on the observation under gyro control.

If you have several nearby targets in a visit, consider putting them into separate ones, if it’s scientifically feasible.

- **Use single FGS guiding.**

Please contact your PC if you want to use this guiding mode.

This mode uses only one guide star that will control the guiding in Right Ascension and Declination. The gyros will control the spacecraft roll axis. Gyro drift is of order one milli-arc second per second, so in this guiding mode the science aperture will drift in roll around the guide star by this amount, resulting in small displacements in RA and Declination. For relatively short exposures (less than one orbit long,) and with a large aperture (one of the cameras, for example) this drift can be negligible. For a sub-arc second aperture or any observation where an onboard acquisition is performed, this might not be so good.

(Note: Except for the STIS MAMA detectors, SNAPS are always done on single FGS guiding.)

Usually it is easier to find single guide stars than guide star pairs, especially in sparse fields. In crowded fields it is more difficult to find singles because the so-called spoiler radius is much larger for singles than for pairs. A spoiler is a nearby star of similar magnitude that the FGS could lock on instead of the intended star.

- **Use gyros only.**

For very short exposures—a few seconds or less—guiding can be done on gyros only. Contact your PC if you wish to use this guiding mode. Gyro guiding is to be used advisedly and only as a last resort, since there may be some not-so-obvious complications that could adversely affect your data.

- **Change target coordinates.**

Sometimes a very small change in target coordinates will bring a guide star into range. RPS2 is not equipped to help much with this, since it only gets guide stars that support a given target position.
4. Installing RPS2 with Guide Stars

Most Cycle 9 HST observers will not need to use this enhanced version of RPS2. Observers whose programs have been identified by STScI to have guide star problems will be notified that they need to install and use this software.

4.1 Software Directory

The FTP URL for this directory is:

http://www.stsci.edu/ftp/software/rps2/ngss/

This directory contains an enhanced version of RPS2 9.0, having the added capability of providing guide star constraint information. This information is folded into determining the schedulability of each visit in an observing proposal.

4.2 Installation Instructions

• Stop the old servers

Old versions of the RPS2 servers are not compatible with this new release. Before downloading the new RPS2, you should stop any RPS2 servers you have running. To do this, use the command,

• “stop-RPS2-servers” from the directory where RPS2 is installed.

The new servers will start automatically when you start RPS2 after installing the new version.

• Download the file

The enhanced RPS2 is currently available only for Solaris 2.x machines. If your platform is not Solaris 2.x, and you have been advised to download the enhanced RPS2, contact your PC to make other arrangements for resolving your guide star problems.

This directory contains the enhanced RPS2 file, solaris-RPS2bin.tar.Z

This file is for Solaris 2.x users and requires the Solaris Binary Compatibility package to be installed. To install the enhanced RPS2, download the file into your installation directory.

• Unpack the file

After the file is downloaded, use the command,

• “zcat solaris-RPS2bin.tar.Z | tar -xf -”

If your ftp or web client uncompressed the file for you, use the command,

• “tar -xf solaris-RPS2bin.tar”
This will unpack all the archived files. Read the files named README and INSTALL before installing the software.

If you have any problems installing or using the RPS2 software, please contact your Program Coordinator.