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Enhanced HST Pointing and Calibration Accuracy: Generating HST Jitter Files at ST-ECF

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Abstract. After providing on–the–fly re-calibration of HST data to archive users, ST–ECF has embarked on a new project aiming at grouping, cosmic ray cleaning and drizzling images taken by most HST instruments. To perform this task in an unattended way, very precise pointing information is required.

In addition, several other spacecraft parameters contained in the engineering data stream are required as inputs to new, enhanced calibration algorithms. An example is the estimation of the particle induced background count rate in the FOS digicons using actual HST magnetometer readings to scale geomagnetical shielding models. The production of the missing jitter files combined with the extraction of additional engineering parameters will greatly enhance the homogeneity and the scientific value of the entire archive.

We therefore started the generation of the missing jitter files. In this article we explain the various aspects of the task and we give an example of a project which will take advantage of the results.

1. The Pipeline

In order to generate the missing jitter files a pipeline was set up (Figures 1 and 2).

The heart of the pipeline is the Observation Monitoring System (OMS). It correlates the time-tagged engineering telemetry with the Mission Schedule. The Mission Schedule is a list of all commands and events that drive HST activities. The engineering telemetry is stored in the Astrometry and Engineering Data Processing (AEDP) subset files.

Both the Mission Schedule and the AEDP subset files are retrieved from the Data Archive and Distribution System (DADS) at STScI.

In order to reprocess old AEDP subset files it is necessary to set up OMS according to the spacecraft configuration and telemetry format valid at that time. So, configuration files that change over time such as spacecraft characteristic files are retrieved from the Project Data Base PDB.

OMS runs on a VAX/VMS platform. ECF maintains and operates the pipeline remotely using the Space Telescope Operations Support Cluster (STOSC) at STScI, i.e., ECF and STScI are sharing resources.

The AEDP subset files are used in two ways:

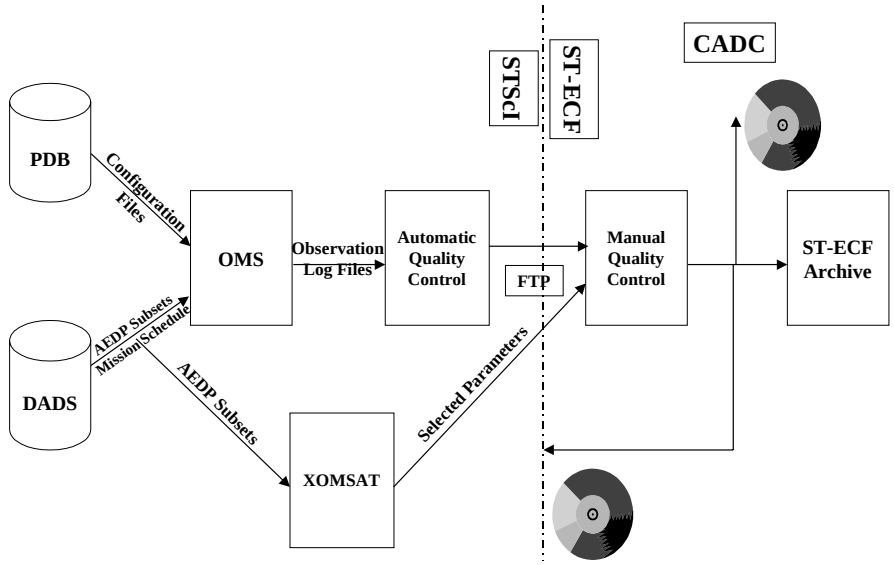

Figure 1. Pipeline reprocessing AEDP Subset Files

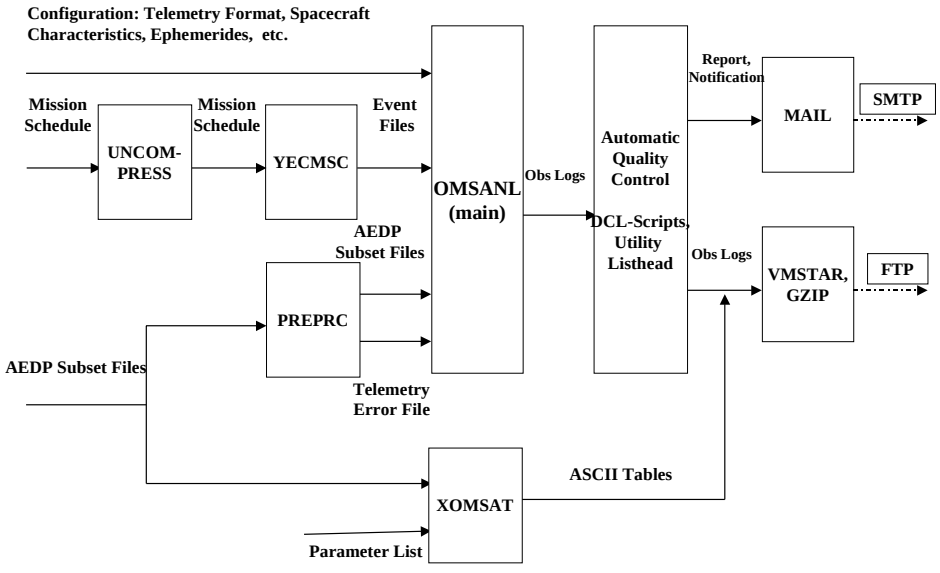

Figure 2. Detailed Data Flow Graph of the Pipeline

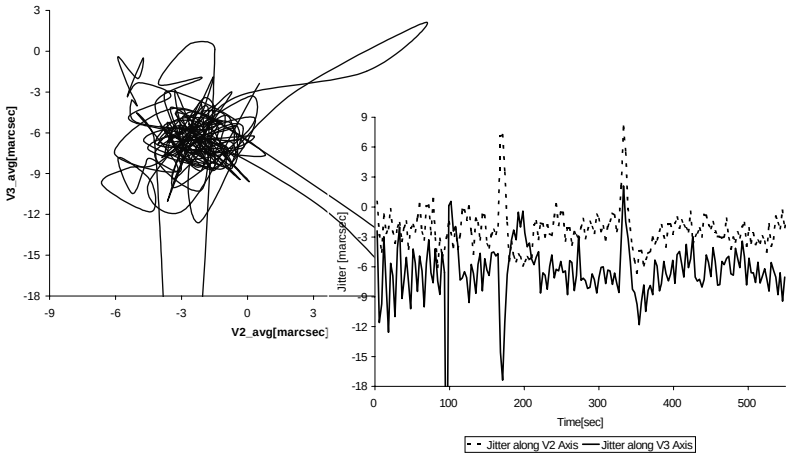

Figure 3. Jitter Ball and Jitter vs. Time for Dataset X22X0103

1.1. Generation of Observation Logs

Observation Logs contain a set of pointing and specialised engineering data (Leitherer et al. 1995; Lupie, Toth & Lallo 1997). The exact pointing of the telescope, also called jitter information (Figure 3), is a prerequisite for further archive services such as grouping, cosmic ray rejection and drizzling HST images (Micol 1998).

1.2. Extraction of Selected Parameters

Xomsat is a stand-alone utility of OMS. Its purpose is to read an AEDP subset file and to extract a user defined set of parameters. Nowadays the new Control Center System (CCS) is used for RT-Analysis of selected parameters. The same capability for historical telemetry is planned for a future release of CCS. It will, however, require more time before it is available.

2. Quality Control

There is a semi-automatic procedure for the quality control of Observation Logs (Figure 3). The automatic part consists of a test series which is performed at STScI. A report is sent to the ECF via e-mail. In order to reduce data volume only the comparatively small jitter files are packed and compressed using vmstar and gzip respectively.

After an additional manual inspection at the ECF the logs finally end up in the archive and become available to the community.

ECF's archive interface includes a Java applet[1] that allows the visualization of any two columns of an obs log as an X/Y plot.

3. Outlook

The pipeline started working in October 97. The first goal is the generation of obs logs for the time period between the first Servicing Mission in Dec. 93 and Oct. 94. In Oct. 94 STScI started producing obs logs on a regular basis. The file format was changed in August 95. For homogeneity the next step is to compute jitter files for the time span until Aug. 95. Finally, the same pipeline could be adapted to get obs logs back to launch in 1990.

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References

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[1] "http://archive.eso.org/archive/jitview.html"