OTA & FGS

- OTA Focus
- FGS Performance - Operations
- FGS Performance - Science Instrument
OTA FOCUS

- Requirement J.10.4.7.1.1
  - HST’s Secondary mirror shall only be moved to compensate for desorption in the graphite epoxy structure.

- Requirement J.10.4.7.1.2
  - A check of the OTA focus shall be made.
FGS Operations

Requirement J.10.4.7.2.1

- The distortions, plate scale, alignment, and S-curve morphology and amplitude in all three FGSs shall be measured after the completion of SM3B. These data are to be compared to pre-SM3B observations to verify the validity of the operational calibration database for each FGS.

- Selected stars in M35 were observed by each FGS in Position mode. The stars were observed before (prop 8946) and after (prop 8995) SM3B. The measured relative positions of the stars were compare from each epoch.

- Data provides a sensitive monitor of the FGS distortions and plate scale.
FGS Operations

Requirement J.10.4.7.2.1

- Standard star Upgren69 was observed before and after SM3B by each FGS in Transfer mode (proposals 8946 & 8995). These data provide a sensitive monitor of the interferometric characteristics of each FGS.

- Data from these observations indicated that the operational calibration data base for each FGS remains within tolerance, i.e., the FGSs could continue to be used to guide HST without needing to be re calibrated.
FGS1r S-curves before (dashed) and after (solid) SM3B
FGS2r F583W S-curves before (dashed) and after (solid) SM3B
FGS2r Pupil S-curves before (dashed) and after (solid) SM3B
FGS3 F583W S-curves before (dashed) and after (solid) SM3B
FGS1r distortions before and after SM3B
FGS2r distortions before and after SM3B
FGS

Requirement J.10.4.7.2.2

- If necessary, as indicated by the results of J.10.4.7.3.1, the optical field angle distortion (OFAD) will be re-calibrated for a given FGS. The appropriate onboard flight software tables and PDB shall be updated as necessary.

- Contingency proposal 8996.

- Proposal not activated. Calibration data base for all 3 FGSs determined to be valid for reliable guiding of HST.
FGS

Requirement J.10.4.7.2.3

- If necessary, as indicated by the results of J.10.4.7.2.1, the FGS-to-FGS alignment calibration shall be performed as the appropriate alignment matrices will be computed. On board tables and the PDB shall be updated with the new calibrations parameters.

- Contingency proposal 8997

- The results of proposal 8995 suggest FGS alignments changed by less than 1 arcsecond after SM3B. This is consistent with no change (the limit of the sensitivity of 8995 for FGS-FGS alignment monitoring). 8997 not activated.
FGS

Requirement J.10.4.7.2.4

- If necessary, as indicated by the results of J.10.4.7.2.1, the S-curves in a given FGS will be obtained at 5 locations in the FGS FOV. These data will be used to update the FGS commanding database so that appropriate K-factor values used to the acquisition of guide stars can be computed.

- Contingency proposal 8998

- S-curve changes across SM3B were not significant. Values used to compute acquisition parameters remained valid after SM3B.
FGS

Requirement J.10.4.7.2.5

- The FGS will be used to measure the jitter experience by HST during the operation of NCS.

- Proposal 8999

- FGS1r was used to monitor the position of a star at the center of its FOV for 90 minutes while FGS2r and FGS3 guided HST in finelock. Four epochs of data were gathered.
FGS

- The first epoch of FGS data indicated the presence of a 0.5 HZ oscillation of HST. This was traced to an error in the pointing control law.

- Later epoch data verified the revised PCS control law to be correct.

- Terminator induced pointing disturbances no longer present.

- HST jitter with NCS not worse than pre-SM3B.
FGS

Requirement J.10.4.7.3.1

- The photometric response, distortions, plate scale, and S-curve morphology and amplitude will be measured in the Astrometer FGS1r. These data will be used to recertify the Astrometer for scientific observations.

- Results of proposal 8995 indicated no harm to FGS1r calibration database as a result of SM3B.

- FGS1r resumed science operations after BEA.
FGS BEA Science

- DD proposal approved to use FGS1r in high angular resolution observing mode to study some of the Galaxy’s most massive stars for binaries while HST’s pointing would be restricted to BEA.

  - 80 targets, all OB stars in Carinae Nebula (Trumpler 14 & 16)
  - Due to concerns about high voltages during NCS cool down, only 22 targets were observed (before NCS turn on).
FGS BEA Science

- Of the 22 OB stars observed, 7 were found to be binary or multiple systems.

- This includes HD93128, the only known Galactic O2.5 star.

- Observations of HD93128 suggest that the upper mass cut off of the IMF is about 75 $M_\odot$, not 120 $M_\odot$ as previously thought (on the basis of HD93128).

- $\eta$ Carinae was also observed, and than again with a follow-up DD proposal. FGS data indicates the central core to be about 60 mas in extent, and contributes only about 35% of the light in the central 200 mas.
FGS and SM4

- SM3B’s FGS phase2 proposals can be used for SM4.
  - FGS-FGS alignment
  - FGS mini-OFADsblue12day
  - FGS S-curve updates
  - FGS jitter monitor

- Only restriction for OFAD and FGS-FGS alignments, target field not usable during summer months.