

## Question and Answers 10/26/10

Question #1: Please refer to Question #2 on 10/01/10 and Question #3 on 10/11/10. Based on the answers to those questions, it appears Pan-STARRS requires servo control of the rigid body position of M1 along the y-axis (x-axis servo control is optional but manual adjustment is required) and rigid body orientation of the M1 in tilt about the y-axis and x-axis.

Answer: That is correct. (10/26/10)

Question #2: It is understood that the supplier is not responsible for collimation of the optics or writing the code to adjust the primary mirror position.

Answer#2: That is correct. (10/26/10)

Question #3: How often is rigid body servo control used?

Answer: Once a collimation solution is found, the mirror must be set and maintained in a certain position, and that position must be monitored and available for control at a rate of no slower than 1 Hz (the servo loop itself may be running at ~kHz rates, but the 1 Hz is a minimum rate for user command/monitor). We do not know how often the PS2 telescope will require moving M1, but the capability must exist for the operators to move M1 remotely during a night if such moves are indicated as necessary to maintain optimum image quality. (10/26/10)

Question #4:

Is rigid body servo control only intended to provide a convenient function during collimation?

Answer: This capability is not a convenience, it is required as we've explained previously. This is an active optics system for which we have specified the active control of the primary mirror in order to maintain optimum image quality. Even small shifts in the collimation and alignment solution can degrade portions of a wide field image, and there are many sources/causes of these shifts. Collimation does not occur once and then remain constant, it is a required ongoing command and control capability. (10/26/10)

Question #5: Is rigid body control used during observations? If so, what feedback is being used to determine where to move the M1?

Answer: Yes, we use it during observations. Feedback is achieved through real-time image processing of both all in-focus images as well as out-of-focus images collected periodically throughout each night of observing. (10/26/10)

Question #6: Is it the expectation that rigid body servo control of M1 is required to correct for gravity induced misalignment of L1, L2, and L3?

Answer: There are multiple sources/causes affecting the collimation and alignment solutions. Gravity-induced effects are only one type, not only gravity-induced changes to the alignments of the optical elements but also to gravity-induced effects on the camera focal plane. Temperature differentials are also a concern. (10/26/10)

Question #7: Is rigid body servo control still needed if the M1 support system, by design and through autonomous local control, automatically keeps the M1 in the same position at any elevation angle by virtue of force balance?

Answer: During the proposal evaluation period, we will evaluate any proposed solution that a proposer has included in their proposal. (10/26/10)