

# **HYTEC Monthly Progress Report – Submitted to SLAC**

**October 31, 2000**

This document contains the monthly progress report for work performed by HYTEC. A progress report was not issued to SLAC in September, because the final contract arrived around the end of September. This progress report includes work for the current contract and includes all work beginning September 1, 2000 through October 31, 2000.

## **1. Monthly Management Review**

Monthly progress report submitted October 31, 2000 for work performed beginning September 1, 2000 through October 31, 2000.

## **2. Schedule**

The HYTEC baseline schedule for the tracker mechanical structures work was completed in September. The low-level baseline schedule is currently being updated and a higher-level schedule is being generated for SLAC. This high-level schedule is expected to be completed and delivered to SLAC early in November, 2000.

## **3. Tracker Tower Level Modeling**

### *Standard Tray Modeling*

The standard tray FEM has been updated to include the simplified closeout frame and updated dimensions. This model can simulate the actual payload attachment configuration, when available. The attachment configuration will be included in this model when the payload attachment configuration has been selected.

A variation of the standard tray FEM was generated where all payload elements (converter, bias, silicon) are simulated as mass elements, i.e. added as a single layer of elements to the face sheet with negligible stiffness. The mass correctly represents the mass of each side of the tray, one with converters and one without. Resonant frequencies and the RMS response to the random vibration environment have been calculated.

A series of simplified FEM were generated for the various tray configurations, to be used in the tower model. Five different models were built, which include the base, lower, SuperGLAST, standard and top trays. These models included beam elements to represent the closeout frame and shell elements were used to represent the tray sandwich structure with the payload included. The stiffness and mass will be represented in the tower model.

### *Tower Level Modeling*

An FEM of a single tracker tower, simulating all 19 trays has been completed. This model uses the tray models described above and includes the latest material selection for the sidewalls.

Resonant frequencies have been calculated using fixed-base boundary conditions. Two base tray configurations have been investigated and compared.

#### **4. Tracker Documentation**

##### *Update Dimensions*

The tracker CAD models have been updated to include the dimensional changes to the LAT instrument. The trays and tower were resized to fit the new silicon wafer size.

##### *Drawing Package*

The tracker mechanical structures drawing package at HYTEC is currently being completed to include all components. This includes assembly drawing as well as constitutive parts to fabricate all mechanical structures. HYTEC drawing numbers have been assigned and will follow the drawings after project-level drawing numbers are assigned.

HYTEC is currently using English units as the primary dimensions and SI units as the secondary. There will be fabrication issues if this is changed. A decision will need to be made and the impact will need to be discussed. A meeting at SLAC in November is expected to address this issue.

HYTEC's goal is to solidify the drawing package and tray structures by the end of November. At this time, all drawings will be released and placed under REV control. It will be essential to get the drawings up to speed before this date so that paper work is minimized.

##### *CAD Model Transfer*

A CAD model was sent to SLAC to verify the transfer efficiency from SolidWorks to SolidEdge formats. It is believed that this transfer was successful, however I have not been given feedback.

#### **5. Tracker Tray Closeout Development**

##### *Particulate Pollution Issues*

Evaluated contamination issues for the GLAST tracker and arrived at a test plan for evaluating resin impregnation vs metallic vs parylene coatings. We began designing test fixtures to perform evaluation tests.

Various coating facilities were contacted to begin receiving preliminary cost estimates to coat prototype hardware and test pieces. A report has been started, which summarizes key coating characteristics for all the coating choices.

##### *Simplified Closeout Frame Development*

The simplified closeout frame detailed design is currently being completed. The tray has been re-sized and critical design features, such as venting holes, have been incorporated into the design. Future dimensional changes are expected and the design is expected to be nearly complete by the end of November.

### *Tray Assembly*

The tray sandwich structure assembly process is currently being studied. The tolerance stackup is being investigated and compared to the allowable envelopes received from SLAC. The assembly procedure is currently being documented and assembly fixture concepts are being generated. A trip to PCI is scheduled for November 9<sup>th</sup> to discuss the assembly procedure and address key issues such as bonding unbalanced face sheets to the closeout frame.

## **6. Face Sheet Material Selection**

### *Face Sheet Material Selection*

A number of carbon fibers and resins were selected from a material library that best met the requirements of the GLAST program. Stiffness, strength and cost were preliminary drivers in the material selection. Using these criteria, the initial list was reduced to a handful of fiber/resin combinations to be considered for the face sheet material selection.

Remaining GFRP combinations were used in the FEA to determine which materials met the design requirements. Four-ply vs six-ply laminates were considered in this study to further optimize the trays for mass and radiation length.

A summary report was written which selected the YS-50 fiber as the baseline face sheet laminate for the standard trays. A quick FEA study of the SuperGLAST trays revealed that the thicker 6-ply face sheets were required for the heavier converters.

### *Face Sheet Material Testing*

A decision was made to eliminate the material testing of the face sheets. This was decided because the vendor was able to provide test data from various sources and was willing to sign-up for a minimum value of lamina elastic modulus. This test data was used to determine the minimum allowable value for elastic modulus, which meets the design requirements. Witness coupons from the face sheet material will be used to verify that the material properties exceed the minimum values.

## **7. Tracker Tray Sidewall Design**

A summary report of the sidewall material selection is currently being written. This report summarizes the analysis and design process used to reduce the number of materials to two, as well as describe the laminate lay-up configuration.

### *Sidewall Prototype Delivery*

Three sidewall prototypes were received during this time period. Two YSH-90 panels were received from YLA and one P30 carbon-carbon panel was received from Allcomp. All panels looked great upon receipt.

### *Material Property Testing*

One of each panel was delivered to a machine shop to be cut up into coupons for material testing.

Material tests will be performed in the coming month to determine the conductivity, modulus, strength, CTE and pullout/shearout allowables for each material. Currently, we are finalizing quotes and finishing the design of test fixtures for tests that will be performed in-house.

## **8. Tracker Meetings and Tracker Technical Discussions**

### *Engineering Meetings*

HYTEC hosted a tracker level engineering meeting in September with Robert Johnson and Tom Borden. This meeting included an overview of the current design concepts and materials selected for the tracker structural components.

### *Weekly Meetings*

HYTEC participated in all weekly tracker technical meetings with SLAC and UCSC, during the months of September and October.

## **9. Core Material Selection (Not in Statement of Work)**

### *Material Selection*

The testing of the YLA GFRP honeycomb core was completed in September. Shear and elastic modulus results were put into the FEM and the fundamental frequencies were computed. A decision was made to use the aluminum core material because of the inexpensive cost and availability of this core. The aluminum core material will meet the design requirements.

A summary report was released which selected the thin-walled aluminum core to be used in the standard tray sandwich structures.

A quick FEA study of the SuperGLAST trays indicated that the 3.0 lb/ft<sup>3</sup> core would be required to support the heavier converter material.

### *Samples*

Samples of the aluminum core material were received from YLA and SLAC to inspect the core to ensure that handling of this thin walled material will be acceptable.