CAL MiniEM Specifications

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CAL MiniEM Objectives

- Support T&DF nonflight hardware and nonflight software development and test
  - Provide flight-like electrical interface to TEM
  - Provide fully populated GCRC – GCRC5
  - Provide fully (?) populated GCFE – GCFE7
  - Provide two layers of CDEs with DPD attached to AFEE boards.
  - Provide MGSE to support CAL with TEM/PS mounted below.
  - MiniEM assembly and test will use good engineering practice but will not be performed using flight controlled procedures and methods.

- Limitations
  - Will not support environmental testing (or will not be verified prior to delivery)
    - No vibration testing (other than shipping) permitted
    - Thermal testing is possible, but will add no value to this structure.
  - Form and dimensions do not meet CAL EM/Flight IDD
  - Potential restriction on orientations: +Z vertical only
MiniEM Structure – VM2

- Reuse CAL verification model 2 (VM2) as base structure for MiniEM
  - GFRP structure with 96 cells to individually support the CDE
  - Aluminum shell to close the cells and provide the interfaces with the AFFE boards and the grid

- Differences VM2 – EM
  - Base plate has no GRID mounting tabs
  - Closeout plates have large sqr holes for DPD wires
  - Carbon structure designed for CDE crystal length of 333 mm (vs 326 mm for EM/Flt)
  - Structure does not meet flight quality requirement and shall not be used for demo or presentation.

- Issues:
  - Required orientations?
  - Handling MGSE and fixtures?

VM2 structure
MiniEM Content

Populate the top two rows with prototype nonflight CDEs (24 total)
- Consist of EM nonflight spares, Swales bonding tests.
- VM2 structure designed for 333 mm CsI length, EM crystal length is short by 7mm – shim with extra bumpers if necessary.
- Install without elastic bands (reworked prototype crystals don’t have correct chamfers).
  - CDEs will not be held as securely as in EM.
- Issues:
  - What orientations are required, +Z up only – possibly makes assembly easier

Install EM AFEE cards (4)
- These are the remaining 4 cards to be delivered to SLAC
- Issues
  - There are no GCRC5’s to populate these cards
  - There are insufficient GCFE7s or 9s to populate these cards.
- Proposals
  - Package more GCFE7s from T31D wafers at OSE
  - Steal flight GCRC5s from T31D packaging at ASAT
MiniEM Environmental Requirements

- MiniEM is intended for support of laboratory testing at room temperature only.
  - Performance over CAL temperature range will not be tested or guaranteed.
  - Since the CDE population of the structure is incomplete, MiniEM should not be subjected to vibration testing or excessive dynamic loading (except for shipping).
  - AFEE boards will NOT be staked or conformal coated.

- Humidity requirements for MiniEM are no different than for flight CAL units.
  - However, risk of long term exposure to air-conditioned laboratory environment is probably not a significant performance risk for the short useful life of the MiniEM.
## Schedule

<table>
<thead>
<tr>
<th>Activity</th>
<th>Date</th>
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<tbody>
<tr>
<td>Receive VM2 Structure and Al parts</td>
<td>15 Aug</td>
</tr>
<tr>
<td>Adapt base plate, etc to MGSE and support fixtures</td>
<td>1 Sep</td>
</tr>
<tr>
<td>Install CDE</td>
<td>8 Sep</td>
</tr>
<tr>
<td>Install AFEE boards</td>
<td>15 Sep</td>
</tr>
<tr>
<td>Functional Testing</td>
<td>21 Sep</td>
</tr>
<tr>
<td>Ship to SLAC</td>
<td>Oct 6</td>
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<tr>
<td>Arrive at SLAC</td>
<td>Oct 10</td>
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- The schedule is contingent upon the availability of VM2 structure and ASICs are on time.
- GCRC5 and GCFE7 ASICs will not be tested at the part level but will be tested after assembly at the board level.
- Challenge may be 24 CDEs by 8 Sep, possibilities are being investigated – including contribution of CERN beam test CDEs from CEA/France
Issues / Decisions

- Package T31D GCFE7s at OSE
- Dedicate potential flight GCRC5s from T31D to MiniEM
- Requirements for support of orientations other than +Z vertical
- Requirements on CAL support stand for mounting and access to TEM/PS
- Requirements, if any, on CAL support stand for mounting of TRK.
- Requirements for loading GCFE7s on AFEE layers without CDEs
- Shipping Container? Adapt to and borrow EM container or try to use BTEM container.

EM CAL on support stand w/ upper lifting fixtures attached