Tracker Construction Database

GLAST Ground Software Workshop
January 2001 - SLAC

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DB requirements
relevant info for subsystems integration
implementation: custom or available products
DataBase Requirements

Level structure
wafer->ladder->tray->tower - hybrids/detectors/mechanics

data flow
parallel levels with interface+crosschecks
series of test operations with data input (workflow)

Distributed - repeated access

input

<- industry
<- different institutes
  (italy:pisa,trieste,roma2,perugia,bari)
<- different steps of production/selection
  (ex. working chans before/after bonding,
   VI measurement before/after irradiation)

output

-> data flow between levels
-> data crosschecks
  (ex. badchans=(hybrids)OR(sensors))
-> easy interface to allow
  statistics for quality production
-> interface to geometry files
  for calibration and science analysis

central repository +WEB / local servers+WEB
need backup at each update/logfiles to register access
SSD

**ID**
- series number
- tester/place/date

**geometrical** *(manufacturer/pre-rad)*
- global: wafer thickness, length, pitch
- cut/mask alignment
- strip x strip: implant/metal width

**electrical** *(manufacturer/pre-rad/post-rad)*
- C (global): $C_{\text{depletion}}$
- C (strip x strip): $C_{\text{coupling}}$, $C_{\text{interstrip}}$ -> bad chans list
- R (strip x strip): $R_{\text{bias}}$
- V-I (global): $V_{\text{depletion}}$, $I_{\text{leakage}}$
**Ladder**
- ID-SSD
- $I_{\text{leakage}}$
- **bad chans list**
  OR(SSID) - before/after bonding
- alignment

**Tray**
- thermal/mechanical test from manufacturer
- converter specs
- ID-ladders
- **bad chans list**
  (ladders)OR(hybrids)
  before/after assembly
- DAQ lab test (cosmic rays)
  occupancy/noise/efficiency

**Tower**
- ID-trays
- **bad chans list**
- alignment
- integration with CAL data
- calibration
- interface to analysis software
Implementation - Custom solution

SSD data sheet from Hartmut template

<table>
<thead>
<tr>
<th>Detector ID &amp;</th>
<th>GLAST Value (Pre-Mod)</th>
<th>GLAST Value (Post-Mod) 100mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>detector</td>
<td>detector</td>
</tr>
<tr>
<td>Date</td>
<td>shifly</td>
<td>shifly</td>
</tr>
<tr>
<td>s(150v)</td>
<td>bad</td>
<td>bad</td>
</tr>
<tr>
<td>t(120v)</td>
<td>bad</td>
<td>bad</td>
</tr>
<tr>
<td>V(deg)</td>
<td>bad</td>
<td>bad</td>
</tr>
<tr>
<td>C(deg,MHz)</td>
<td>bad</td>
<td>bad</td>
</tr>
</tbody>
</table>

Bad chans list

<table>
<thead>
<tr>
<th>Bias Width</th>
<th>[cm]</th>
<th>[cm]</th>
<th>A1</th>
<th>A2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bias Length</td>
<td>[cm]</td>
<td>[cm]</td>
<td>A1</td>
<td>A2</td>
</tr>
<tr>
<td>Width Distance</td>
<td>[mm]</td>
<td>[mm]</td>
<td>A1</td>
<td>A2</td>
</tr>
<tr>
<td>Length Distance</td>
<td>[mm]</td>
<td>[mm]</td>
<td>A1</td>
<td>A2</td>
</tr>
<tr>
<td>Pitch</td>
<td>[mm]</td>
<td>[mm]</td>
<td>A1</td>
<td>A2</td>
</tr>
<tr>
<td>Implant width</td>
<td>[mm]</td>
<td>[mm]</td>
<td>A1</td>
<td>A2</td>
</tr>
<tr>
<td>Vertical Width</td>
<td>[mm]</td>
<td>[mm]</td>
<td>A1</td>
<td>A2</td>
</tr>
<tr>
<td>Alignment First</td>
<td>[mm]</td>
<td>[mm]</td>
<td>A1</td>
<td>A2</td>
</tr>
<tr>
<td>Alignment Last</td>
<td>[mm]</td>
<td>[mm]</td>
<td>A1</td>
<td>A2</td>
</tr>
</tbody>
</table>

| Bonding Pad Location | [mm] | [mm] | A1 | A2 |
| Fiducial Marks Location | [mm] | [mm] | A1 | A2 |

Text Structures

| Align with Table 9.1 in Spec? | [Yes] | [No] |
| Agree with Figure LAT-00-0007? | [Yes] | [No] |

Colour code
Custom solution: SSD database prototype

Access from Pisa GLAST home page
http://www.pi.infn.it/glast
developed by me and Gloria Spandre
already used for small productions

I/O from web through perl scripts on Pisa w³ server
data to ASCII files
I/O Excel compatible

Detectors Database

1 – Insert a new detector in the database:
   a) input data from web
   b) download Data Sheet Excel template (we must agree)

2 – Available data:
   a) view or update data sheet
   b) extract data
   c) extract data to Excel (Web Query)
SSD database prototype INPUT: view/update

**Detectors Database**

Available data (*)

Select the SSD Data Sheet you want to update:

[View/Update]

extract data to Excel [Web Query]

(*) Press the Reload button on your browser to visualize newly introduced detectors
SSD database prototype: Excel INPUT

Download data sheet to Excel for update *(web query)*
(get blank template for fresh data)

Ftp server or e-mail to pisa - we run a script for conversion
how directly update Excel data to a server?
really need a script to decode Excel into ASCII/html?
### SSD database prototype: OUTPUT for statistics

**Detectors Database**

**Available data (*)&:**

Display the desired information following steps a) and b):

a) Select detectors:

b) Select parameters:

<table>
<thead>
<tr>
<th>Detector ID &quot;#&quot;</th>
<th>Manufacturer's test values</th>
<th>List Value (Pre-Rad)</th>
<th>List Value (Post-Rad) 100 Gy</th>
</tr>
</thead>
<tbody>
<tr>
<td>T (150V)</td>
<td>[nA]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T (175V)</td>
<td>[nA]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V (dep)</td>
<td>[V]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G (deg, kHz)</td>
<td>[pF]</td>
<td></td>
<td></td>
</tr>
<tr>
<td># of bad channels</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R (ave)</td>
<td>[Mohm]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R (High)</td>
<td>[Mohm]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R (Low)</td>
<td>[Mohm]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R (Al Strip)</td>
<td>[Ohm]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R (Int-neighbor)</td>
<td>[Mohm]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Bonding pads location**

**Positional Marks location**

**Test Structures**

[Extract Info]  [Clear]

(*) Press the **Reload** button on your browser to visualize newly introduced detectors
SSD database prototype: OUTPUT for statistics

Selection from Silicon Detectors Database

Manufacturer’s Test values

<table>
<thead>
<tr>
<th>Glast SSD</th>
<th>V(Depl.)[V]</th>
<th>I(@175V)[nA]</th>
<th>I(@150V)[nA]</th>
</tr>
</thead>
<tbody>
<tr>
<td>12345</td>
<td>132</td>
<td>231</td>
<td>2312</td>
</tr>
<tr>
<td>test</td>
<td>15</td>
<td>8</td>
<td>1</td>
</tr>
</tbody>
</table>

Save as html file to your pc and open it from Excel for further analysis
Custom solution: open questions

Agree on fields to use DB for quality tests of Hamamatsu sensors
Security: add passwords / access logfiles
Backup: now only two copies are stored -> add data sheets history
Move to higher levels (ladders/trays/towers)
Add-ons:
data cross-checks
macros / graphics for statistical analysis

Data format: ASCII

\[
\begin{align*}
1 \text{ data file} & < 1k \\
1 \text{ html table} & \sim 25K
\end{align*}
\rightarrow 25 \text{ k/wafer} \times (2 \times 3 + 2) \sim 200 \text{ k/wafer}
\]

200 k/wafer \times 10k wafer \sim 2GB ok with a dedicated server (PC)
could remove html tables (create/delete selected for Excel web queries)
maybe needed for higher levels
Available products

- Commercial DBs?
- DBs for LHC experiment: CRISTAL
  - developed for CMS ECAL
  - distributed system: central repository and local administrators / stations
    - uses Objectivity (possibly use CERN / SLAC license?)
    - built-in interface to Labview
    - customizable Java macros for data analysis
    - optimized for workflow control that can be customized:
      - now in use for ECAL construction
      - locally in Pisa for Si TKR construction - happy if we also use it
      - we will ask developers a copy to evaluate it