TS-DEM

Development of Electronic Modules
Group

Erik van der Bij
CERN
Agenda

- Services and organisation of TS-DEM
- Organisation of files in EDMS (AB/PO)
- Reliability engineering
MANDATE

Turn schematics into boards (standard + special)

- PCB design
- Manufacture of special circuits and PCBs
- Assembly
Circuit Manufacturing DEM-PMT

Industry

Circuit Manufacturing DEM-PMT

Assembly Workshop DEM-WS

Request Circuit or module

Planning Office

Design Office

Subcontracting

invoicing

Design Office

Technological and commercial choices

Subcontracting

ordering, collecting components, tracking

Industry

Circuit Manufacturing DEM-PMT

Assembly Workshop DEM-WS
BE – Design office
Betty Magnin

- Layout of PCB, flexible circuit, hybrid or fine-pitch detectors
- Design of associated small mechanics (front-panels, crates)
- Creation of schematic and padstack symbols
  - Cadence and PCAD/Altium libraries
- Storage of manufacturing files
  - PCB production, assembly, bill of material all in EDMS (EDA-xxxxx)
- Organisation of production and assembly
  - prototype quantities: in-house or local industry
  - larger quantities: European industry
- Component purchasing service *(new!)*
- Technical advice on manufacturing

Easy way to save time!
Example of mechanics
Special circuits
- flex-rigid boards
- multi-layer boards with integrated metal or pyrolytic carbon
- high-definition circuits (traces and isolation 5 to 10 μm)

Thick-film hybrids
- serigraphy of conducting paste on ceramic substrates (aluminium, aluminium nitride, berillyumoxide)

Chemical treatment
- thin metal sheets (copper, inox, nickel, aluminium, titanium)

Standard printed circuit boards (halogen free!)
- single side to multi-layer boards (upto 14 layers, class 6)
- flexible circuits (kapton)

Technical advice on material selection and processes
Transfer Image
Electrical test
Mounting of components
  – through-hole
  – BGA down to 0.8 mm pitch
  – resistors and capacitors down to 0201 size

Replacing of components, including BGA

Production of cables (coax, flat cables, twisted pair)

Wiring of crates

30-minute express service for small interventions

Cleaning of boards

Technical advice
  – component selection and manufacturing
Condensation oven

Brasage écran
Cleaning of circuits

Before cleaning

After cleaning
## CERN TS -DEM

**Erik van der Bij**

### Turn-around time

Prototype electronics production

**multi-layer PCB, standard priority**

<p>| | | | | |</p>
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Layout (and queue)</td>
<td>4 weeks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCB fabrication</td>
<td>3 weeks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assembly</td>
<td>2 weeks</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Margin</td>
<td>1 week</td>
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This time can be reduced if necessary!

- PCB fabrication can handle 2 urgencies per week
  - e.g. double sided PCB in 1 day, single sided 0.5 day

- Replacement of component: 30 minute service
### PCB Delivery times

<table>
<thead>
<tr>
<th>Type</th>
<th>Urgent [days]</th>
<th>Standard [days]</th>
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<tbody>
<tr>
<td>Single sided</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Double sided with metallised vias</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>4 and 6 layer with metallised vias</td>
<td>3 or 6</td>
<td>10</td>
</tr>
<tr>
<td>&gt; 8 layers with metallised vias</td>
<td>3 or 6</td>
<td>15</td>
</tr>
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**Fast track PCB layout (since July 2007):**

Small jobs (estimated ≤ 2 days) will be started immediately or on next day.

*Erik van der Bij*
Example:
Urgent full project for PH

- Layout and PCBs needed ASAP
- Received request 7 March 2007
- Same day layout finished!
- 4 PCBs ready on Friday 9 March, rest on Monday after
- Assembled 1 PCB on Friday 9 in evening, second finished on the 12th.
Example: Urgent project for AB/CO

- Layout ready: three different PCBs needed ASAP
- Needed really fast:
  - no solder maks or silkscreen finish needed
- Design files given Friday 30 March 7:00
- PCBs ready same day at 15:00!
- Could have assembled connectors if needed
- Two weeks later tests finished, production of series requested
Conclusions

DEM provides you a turn-key solution
- from your schematics to assembled boards
- all services close to the engineers
- production in small to medium quantities
- advice on manufacturing (material, components, processes)

DEM has contracts with industry
- local industry for prototyping
- in other CERN member states for medium scale production

The service can save you a lot of time and cost
CERN TS - DEM

Erik van der Bij

DEM on the web!

http://cern.ch/dem

DEM on the web!

Layout, production and assembly of printed circuit boards, flexible circuits, ceramic hybrids and fine pitch detectors are the fields for which the DEM Group in the TS Department provides CERN-wide support. The group concentrates on the development of prototype modules and can also manage small scale productions that are outsourced to industry.

General Information

- News
- Overview and mandate
- Organisation chart (pdf)
- Contact us

Services

- Layout
- Production
- Assembly and cabling

Products

- Patents & technologies
- GEM detectors
- Examples

Other

- Other CERN support for electronics

Rui de Oliveira, section leader of DEM-PMT explaining PCB fabrication technology at CERN Training program

Erik van der Bij - 03 February 2005
Storage of design files in EDMS

Files stored in EDMS since 2002
http://edms.cern.ch/nav/eda-xxxxx

BE: Schematics, PCB design & production, BOM & assembly files, mechanics
User: specification, images, supplier info

Handling of 'executions' since 2006
project with AB/PO
Enregistrement des cartes fabriquées par TS/DEM

Selon convention signée par AB-PO et TS-DEM
(Document EDMS 801714 v1)

1 carte: HCRBSxxxxx = EDA-yyyyy-Vx-x
Un dossier de fabrication unique

Code de fabrication TS-DEM: EDA-xxxxx-Vx-x
Code d'exploitation AB-PO : HCRBSxxxxx

Christophe Mugnier : Présentation du 16 Juin 2006
Dossiers de fabrication TS/DEM - Identification d'une carte

La sérigraphie de la face avant :
Elle comporte le code EDA et la désignation de la carte.

Etiquette apposée par l’assembleur sur le connecteur dans le cas d’une exécution.

La sérigraphie du print :
Elle comporte le code EDA+la version et la désignation de la carte.
La sérigraphie de la face avant :
Elle comporte le code EDA et la désignation du chassis.

Etiquette apposée par l’assembleur pour spécifier la version.
Dossiers de fabrication TS/DEM - Example en EDMS

Example: http://edms.cern.ch/nav/eda-01586