TS-DEM

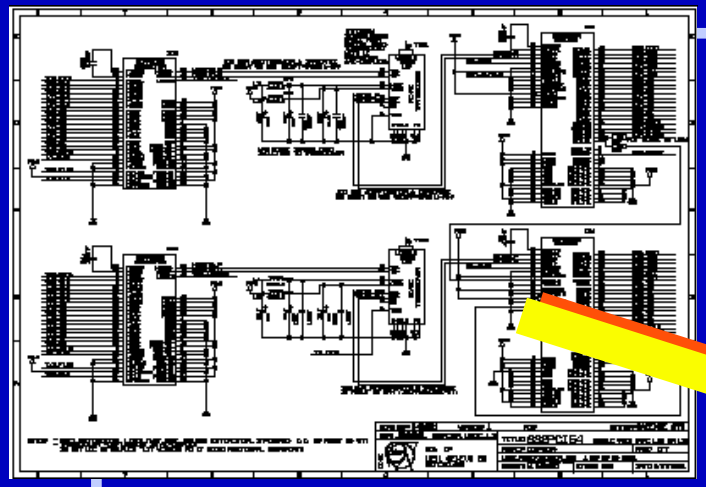
Development of Electronic Modules Group

Erik van der Bij

CERN

Agenda

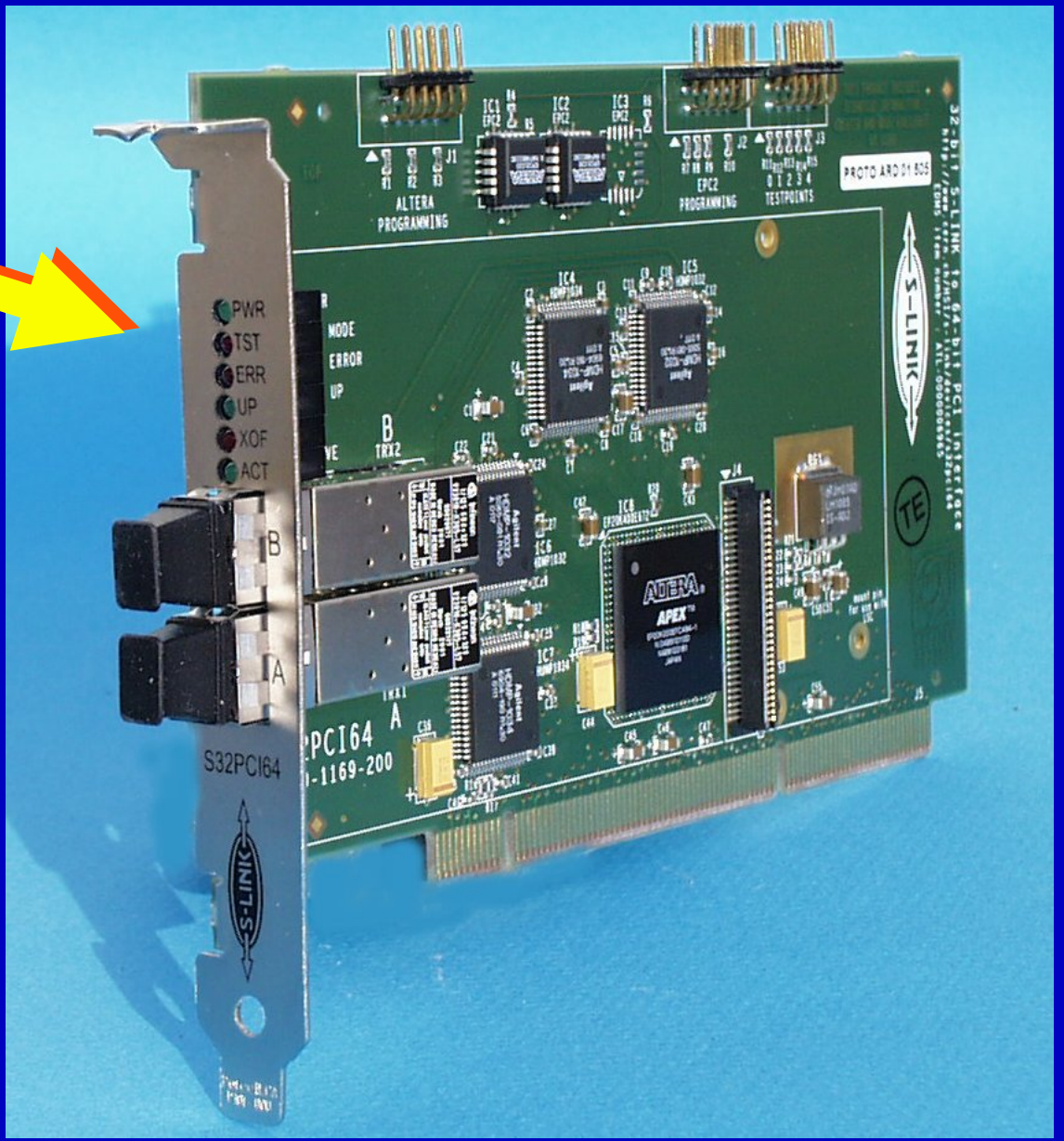
- Services and organisation of TS-DEM
- Organisation of files in EDMS (AB/PO)
- Reliability engineering



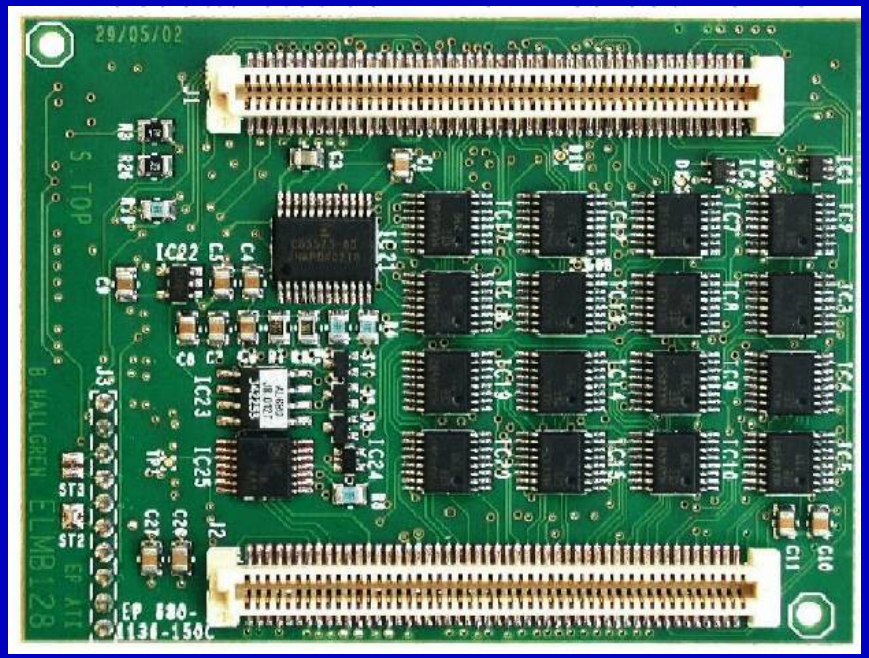
MANDATE

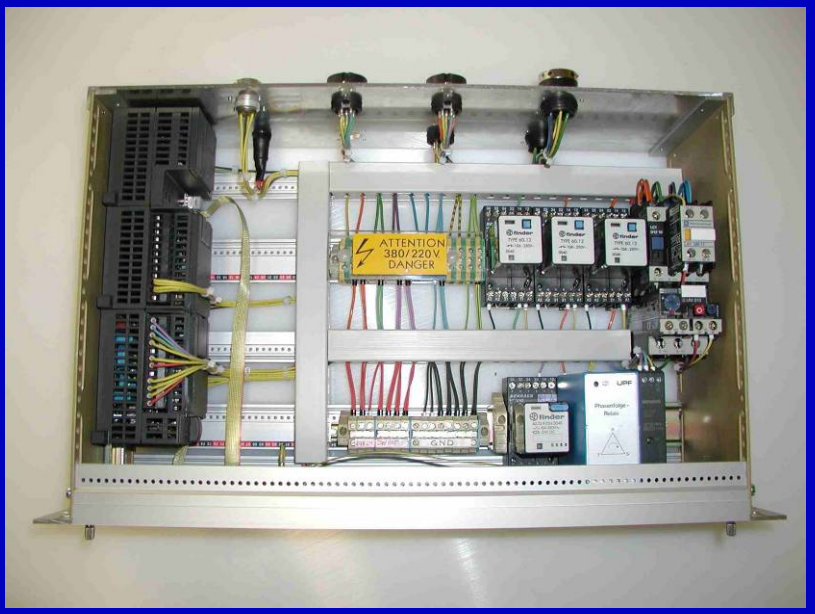
Turn schematics into boards (standard + special)

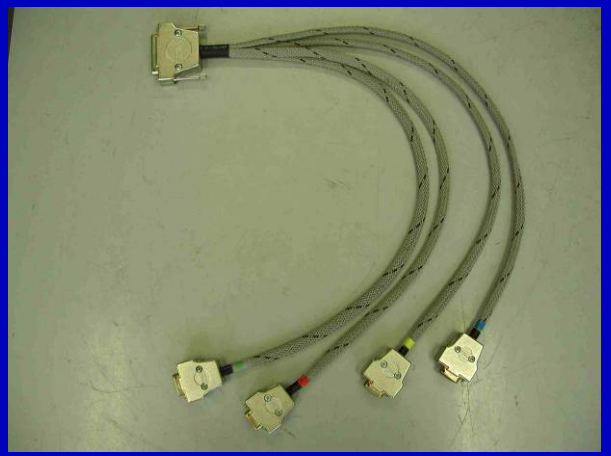
- PCB design
- Manufacture of special circuits and PCBs
- Assembly

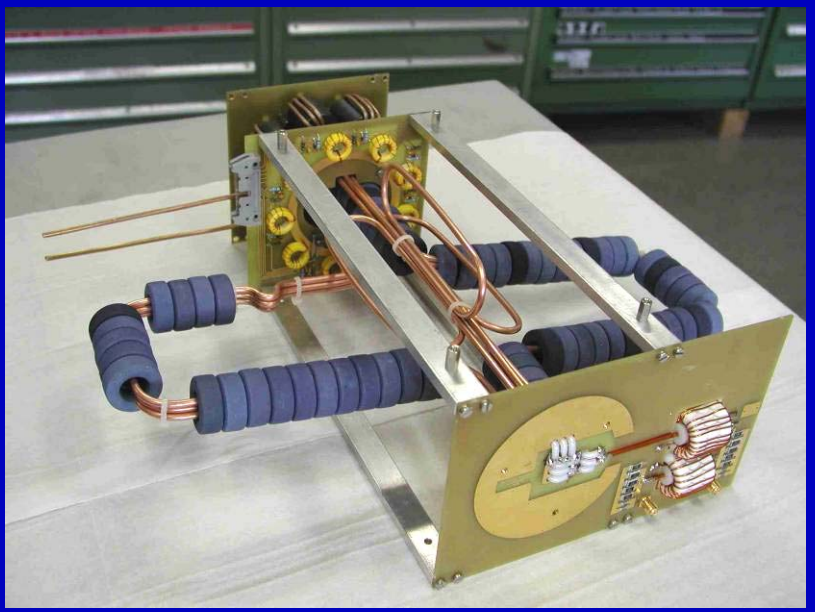


Examples of ‘standard’ work









TS-DEM

Request

Circuit or module

Planning Office

technological and commercial choices

invoicing

DEM-BE

Design Office

DEM-BE

Subcontracting

ordering, collecting components, tracking

DEM-BE

Industry

Circuit Manufacturing

DEM-PMT

Assembly Workshop

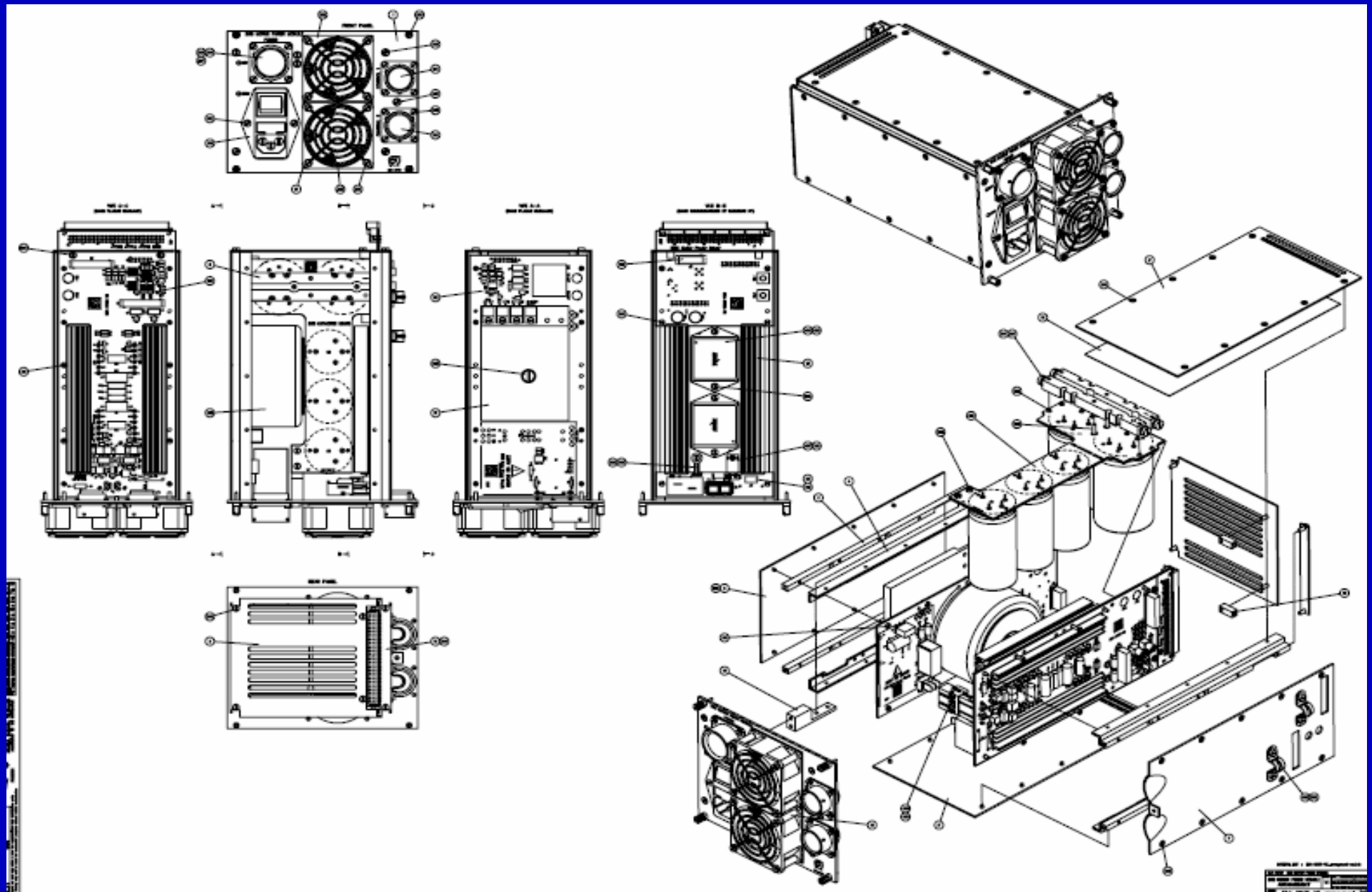
DEM-WS

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

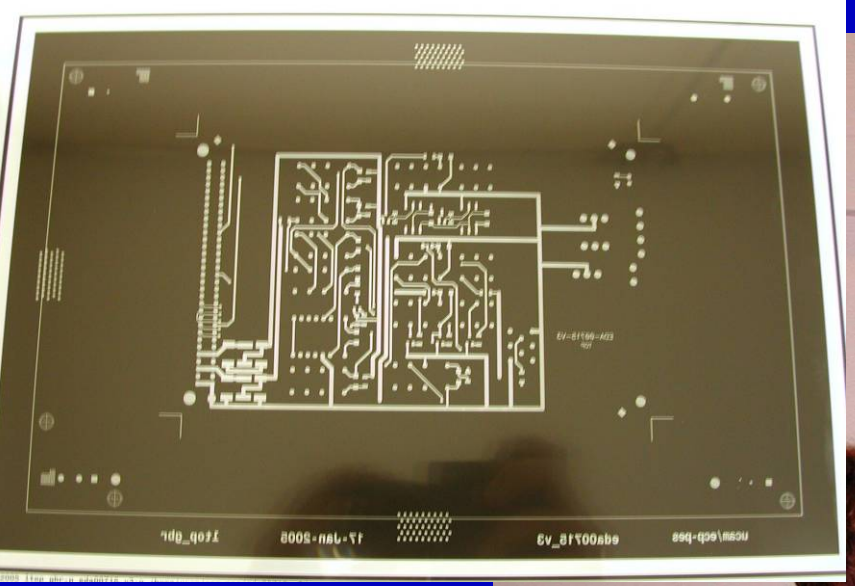
Easy way to save time!

Example of mechanics



PMT – Fabrication
Rui de Oliveira

- **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**
  - seriegraphy 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**



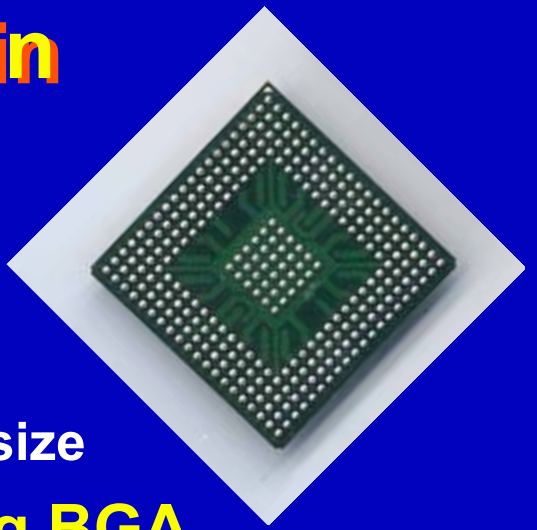
Transfer Image

Percage

Electrical test

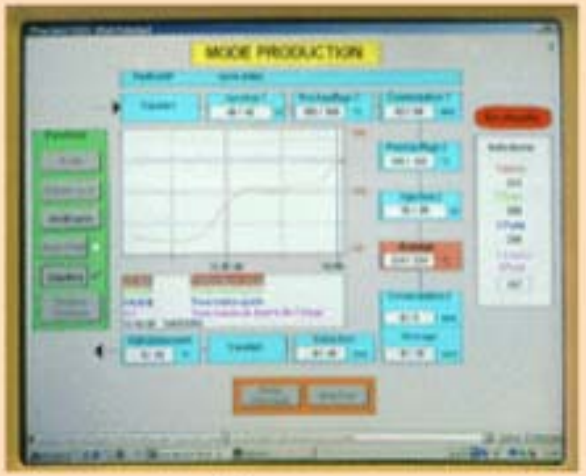
WS – Assembly workshop

Betty Magnin



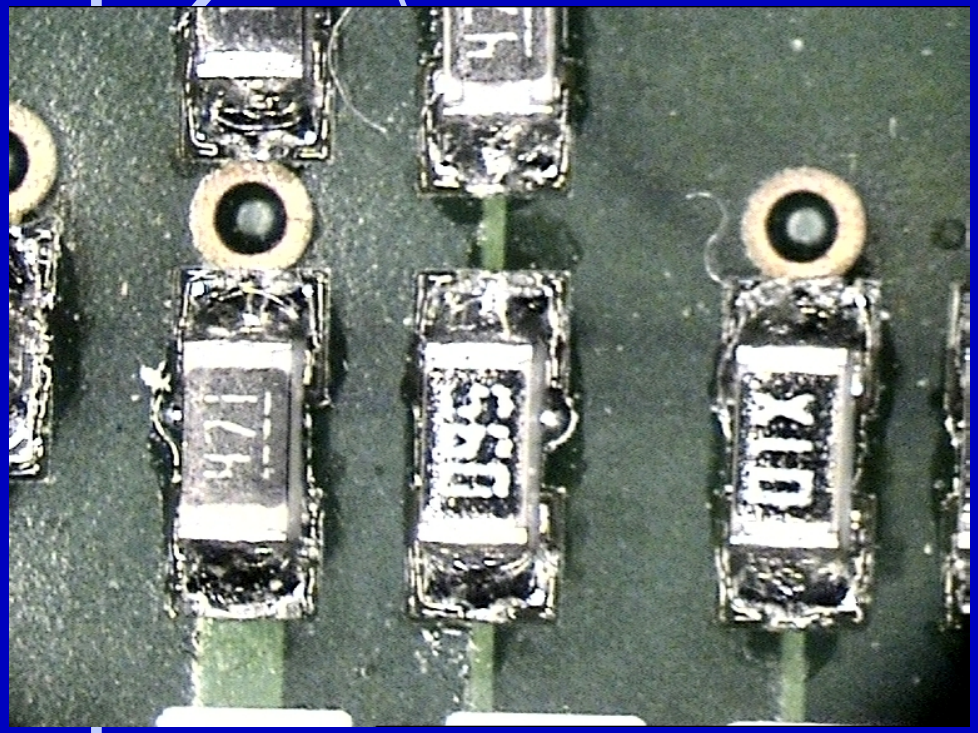
- Mounting of components
  - through-hole
  - BGA downto 0.8 mm pitch
  - resistors and capacitors downto 0201 size
- Replacing of components, including BGA
- Production of cables (coax, flatcables, twisted pair)
- Wiring of crates
- 30-minute express service for small interventions
- Cleaning of boards
- Technical advice
  - component selection and manufacturing

Condensation oven



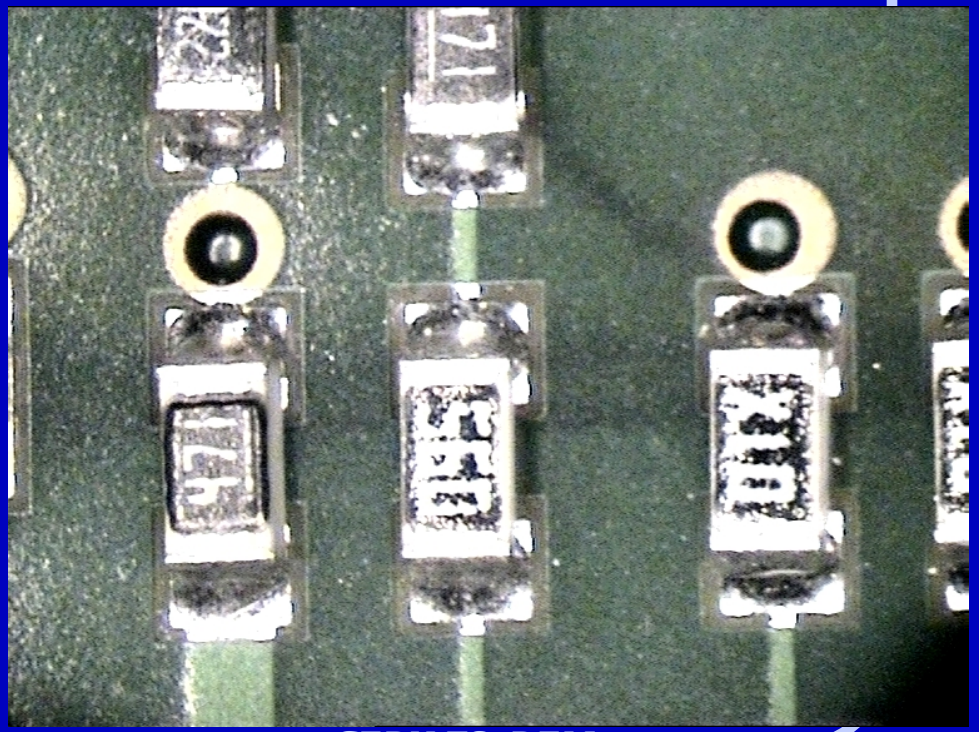
Brasage écran

Cleaning of circuits



Before cleaning

After cleaning



Turn-around time

Prototype electronics production
multi-layer PCB, standard priority

Layout (and queue)	PCB fabrication	Assembly	Margin
4 weeks	3 weeks	2 weeks	1 week

- 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

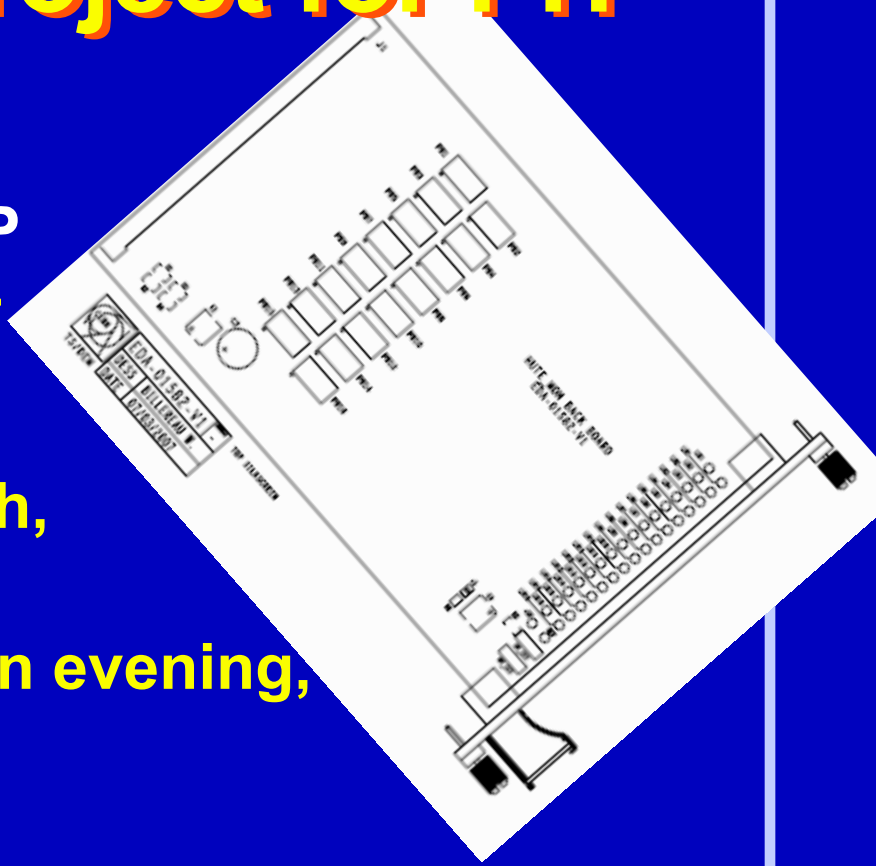
PCB Delivery times

Type	Urgent [days]	Standard [days]
Single sided		1
Double sided with metallised vias	1	5
4 and 6 layer with metallised vias	3 or 6	10
> 8 layers with metallised vias	3 or 6	15

- **Fast track PCB layout (since July 2007):**
- **Small jobs (estimated ≤ 2 days) will be started immediately or on next day**

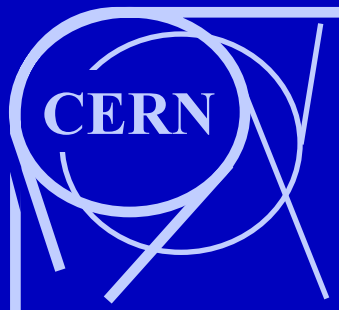
Example: Urgent full project for PH

- 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

http://cern.ch/dem

DEM on the web!

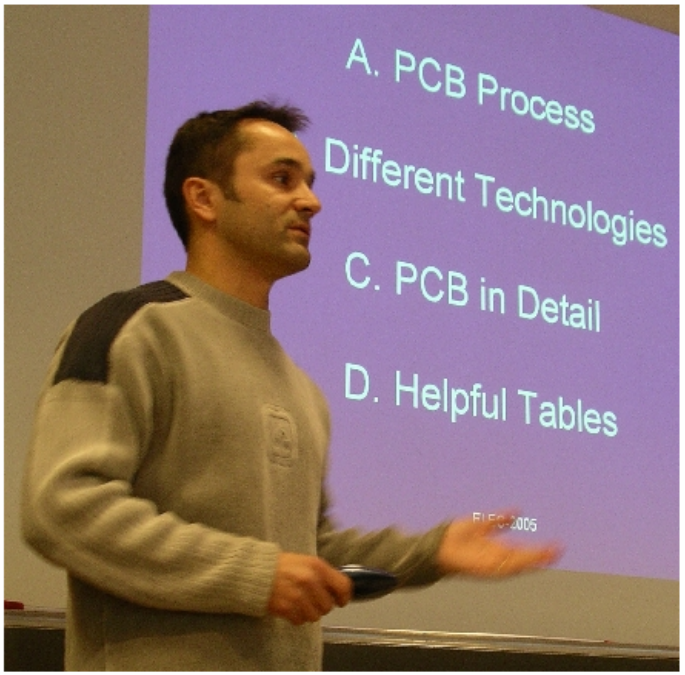
Erik van der Bij

CERN — European Organization for Nuclear Research

TECHNICAL SUPPORT DEPARTMENT TS

DEM Development of Electronic Modules

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.



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

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

Storage of design files in EDMS

Files stored in EDMS since 2002

http://edms.cern.ch/nav/eda-xxxxx

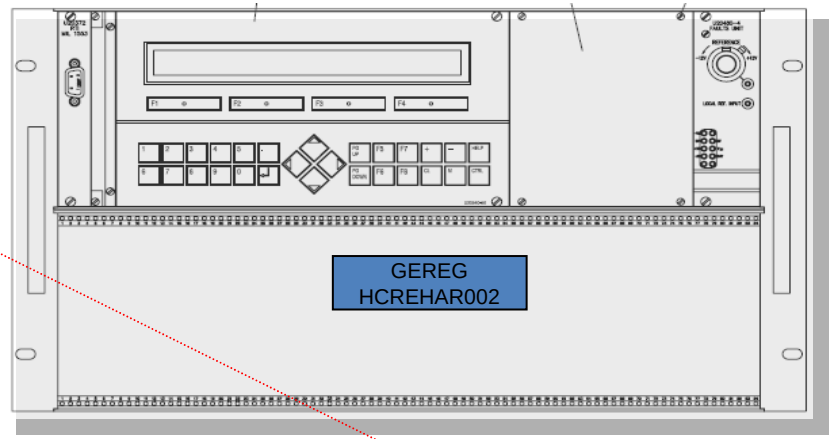
BE: Schematics, PCB design & production, BOM & assembly files, mechanics
User: specification, images, supplier info

Handling of 'executions' since 2006

project with AB/PO

Enregistrement des cartes fabriquées par TS/DEM

- HCREHAR002 : GEREG
  - HCRBSCD00A : 14617P : Interface Micro-Term
  - HCRNDAA000 : Clavier - Afficheur 50TE
  - HCRBABH000 : Supervision CPU Mitsubishi
  - HCRBSEI00A : 0310P : PIA-OPTO
  - HCRBSEI00B : 0310P : PIA-OPTO
  - HCRBSCO001 : DC-DC Relays
  - HCRBSCP001 : Interface Burndy (8p) to Flat Cable
  - HCRBSCQ001 : Interface Burndy (12p) to Flat Cable
  - HCRBSCR001 : Interface Burndy (19p) to Flat Cable
  - HCRBSCS001 : Interface Burndy (28p) to Flat Cable
  - HCRBSCT002 : Backplane
  - HCRBSCU00D : 24743P : Analog Measures (Protecti
  - HCRBSCV00C : Faults Unit
  - HCRBSCW003 : Supervision Interface
  - HCRBSCX003 : Multianalogue
  - HCRBSCY003 : Interface G64 to Multianalogue
  - HCRBSCZ002 : Loop for PWM
  - HCRBSDA002 : PWM
  - HCRBSDB001 : DSP
  - HCRBSDC003 : Loop Thyristor
  - HCRBSDD003 : Gate Control
  - HCRBSDS001 : G64 Bus / 6 Positions
  - HCRBSDT001 : Electronics for DCCT
  - HCRBSBW000 : MDRTI-CMIG 1553




CERN
CH-1211 Geneva 23
Switzerland

AB - PO

801714 v.1

Documentation management

TS-DEM

Date: 10/11/2006

CONVENTION

ORGANISATION ET GESTION DES DOSSIERS DE FABRICATION DES CHASSIS ET DES CARTES ÉLECTRONIQUES PRODUITS PAR TS/DEM

OBJET

Cette convention, produite dans le cadre d'une collaboration entre TS-DEM et AB-PO définit l'organisation et la gestion des dossiers de fabrication des châssis et des cartes électroniques produites par le bureau d'étude TS-DEM de manière à ce que les documents qu'ils contiennent puissent être directement réutilisés comme Documentation Technique de Maintenance. TS/DEM a entrepris la généralisation de cette convention à l'ensemble de leurs dossiers de fabrication.

Préparé par :	Vérifié par :	Approuvé par :
GENKAIN-BONNE Ludovic VIOLAIN Anthony GOLDSTEIN Solomon BAILLY Patrice MAGNIN Betty MUGNIER Christophe BOMONT Marc	MAGNIN Betty MUGNIER Christophe	VAN DER ELI Erik THIESEN Hugues BORDRY Frederick

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

Dossiers de fabrication TS/DEM

PROJET EDA-99999

VERSIONS

EXECUTIONS

DOSSIER DE FABRICATION

DOCUMENTS
ITEM EDMS: EDA-99999_V1-0
ITEM HC: HCRZZZZ00A
PCB: EDA-99999-V1-PCB
SCHEMA: EDA-99999-V1-0-SCH
BOM: EDA-99999-V1-0-BOM
MECANIQUE: 451176_V1[libre]

ABC

HCRZZZZ00A
ADC 16 BIT
EDA-99999-V1

DOCUMENTS
ITEM EDMS: EDA-99999_V2-0
ITEM HC: HCRZZZZ00B
PCB: EDA-99999-V2-PCB
SCHEMA: EDA-99999-V2-0-SCH
BOM: EDA-99999-V2-0-BOM
MECANIQUE: 451176_V2[libre]

ABC

HCRZZZZ00B
ADC 16 BIT
EDA-99999-V2

DOCUMENTS
ITEM EDMS: EDA-99999-V2-1
ITEM HC: HCRZZZZ00B
PCB: EDA-99999-V2-PCB
SCHEMA: EDA-99999-V2-1-SCH
BOM: EDA-99999-V2-1-BOM
MECANIQUE: 451176_V1[libre]

AB

HCRZZZZ00B
ADC 16 BIT
EDA_99999_V2

DOCUMENTS
ITEM EDMS: EDA-99999-V2-2
ITEM HC: HCRZZZZ00B
PCB: EDA-99999-V2-PCB
SCHEMA: EDA-99999-V2-2-SCH
BOM: EDA-99999-V2-2-BOM
MECANIQUE: 451176_V1[libre]

BC

HCRZZZZ00B
ADC 16 BIT
EDA-99999-V2

DOCUMENTS
ITEM EDMS: EDA-99999-V3-0
ITEM HC: HCRZZZZ00C
PCB: EDA-99999-V3-PCB
SCHEMA: EDA-99999-V3-0-SCH
BOM: EDA-99999-V3-0-BOM
MECANIQUE: 451176_V3[libre]

ABC

HCRZZZZ00C
ADC 16 BIT
EDA-99999-V3

PROJET EDA-99991

DOCUMENTS
ITEM EDMS: EDA-99991-V1-0
ITEM HC: HCRZZZY00A
PCB: EDA-99991-V1-PCB
SCHEMA: EDA-99991-V1-0-SCH
BOM: EDA-99991-V1-0-BOM
MECANIQUE: 451177_V1[libre]

ABCD

HCRZZZY00A
ADC 16 BIT
EDA-99991-V1

EDA-99999

RAPPORT: EDA-99999-REP (IN WORK)
MATRICE: EDA-99999-MAT (IN WORK)
DTravaux: EDA-99999-DT (REALEASED)

(DOSSIERS DE FABRICATION)

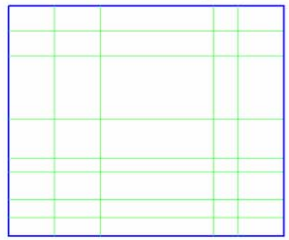
- EDA-99999-V1-0
- EDA-99999-V2-0
- EDA-99999-V2-1
- EDA-99999-V2-2
- EDA-99999-V3-0

ETAT DOCUMENTS

IN WORK: AVANT PRODUCTION
RELEASED: POUR MAINTENANCE
OBSOLETE: RETIRE EXPLOITATION

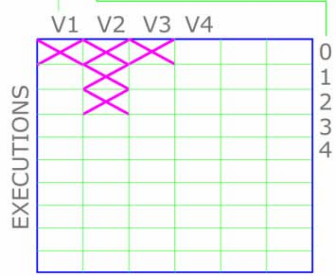
DOCUMENTS PROJET

HISTORIQUE



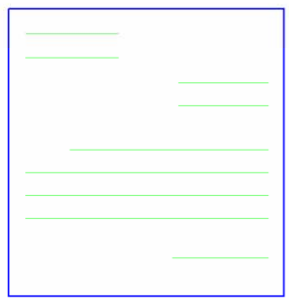
MATRICE VERSIONS ET EXECUTIONS

EDA-99999- - -v.0



COMPATIBILITE NECESSAIRE

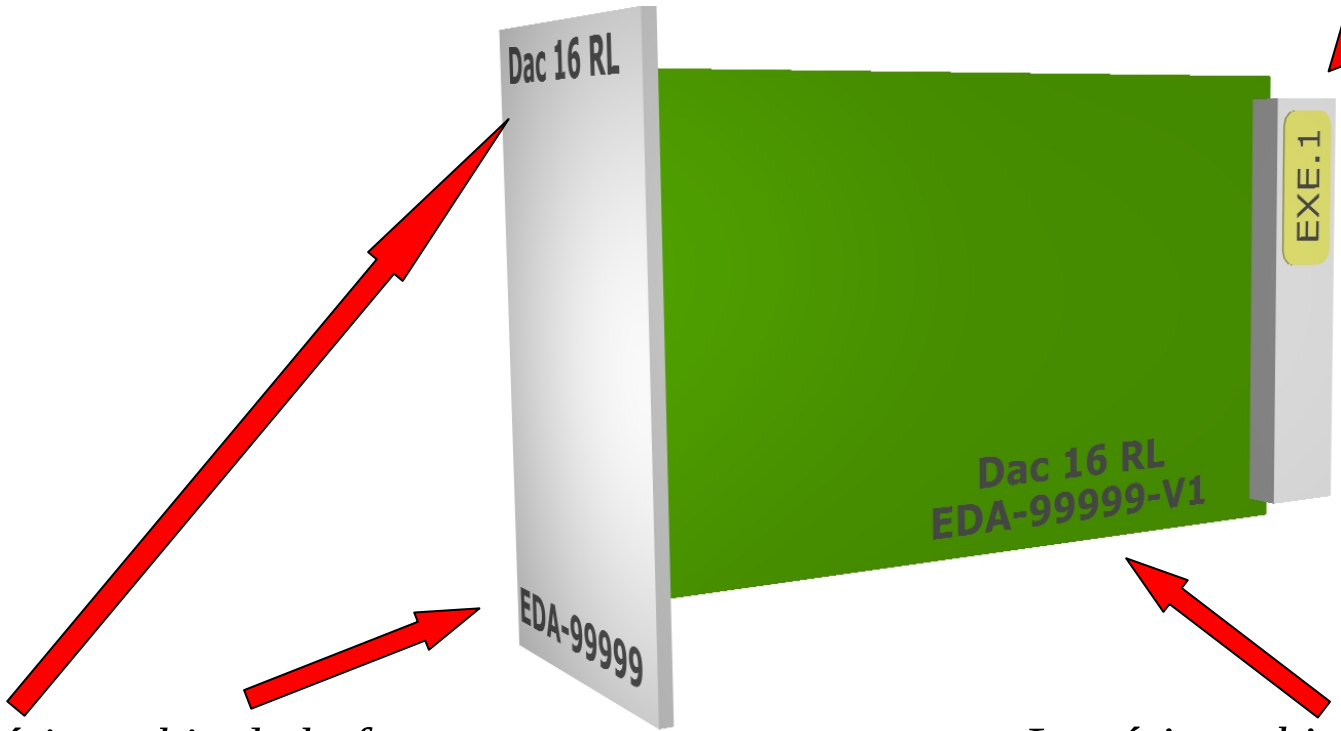
DEMANDE DE TRAVAIL



abp methodes
TS DEM 2005-11-04

Dossiers de fabrication TS/DEM - Identification d'une carte

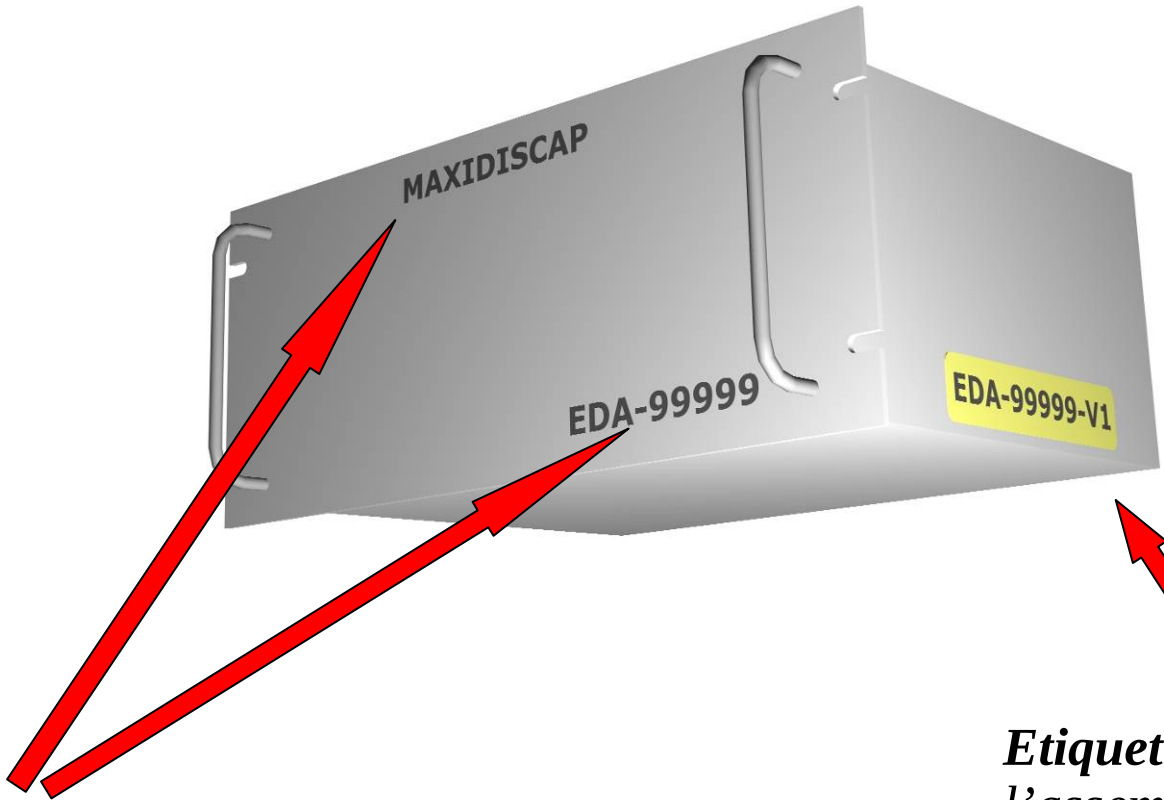
***Etiquette** apposée par l'assembleur sur le connecteur dans le cas d'une exécution.*



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

<u>La sérigraphie du print</u>: Elle comporte le code EDA+la version et la désignation de la carte.

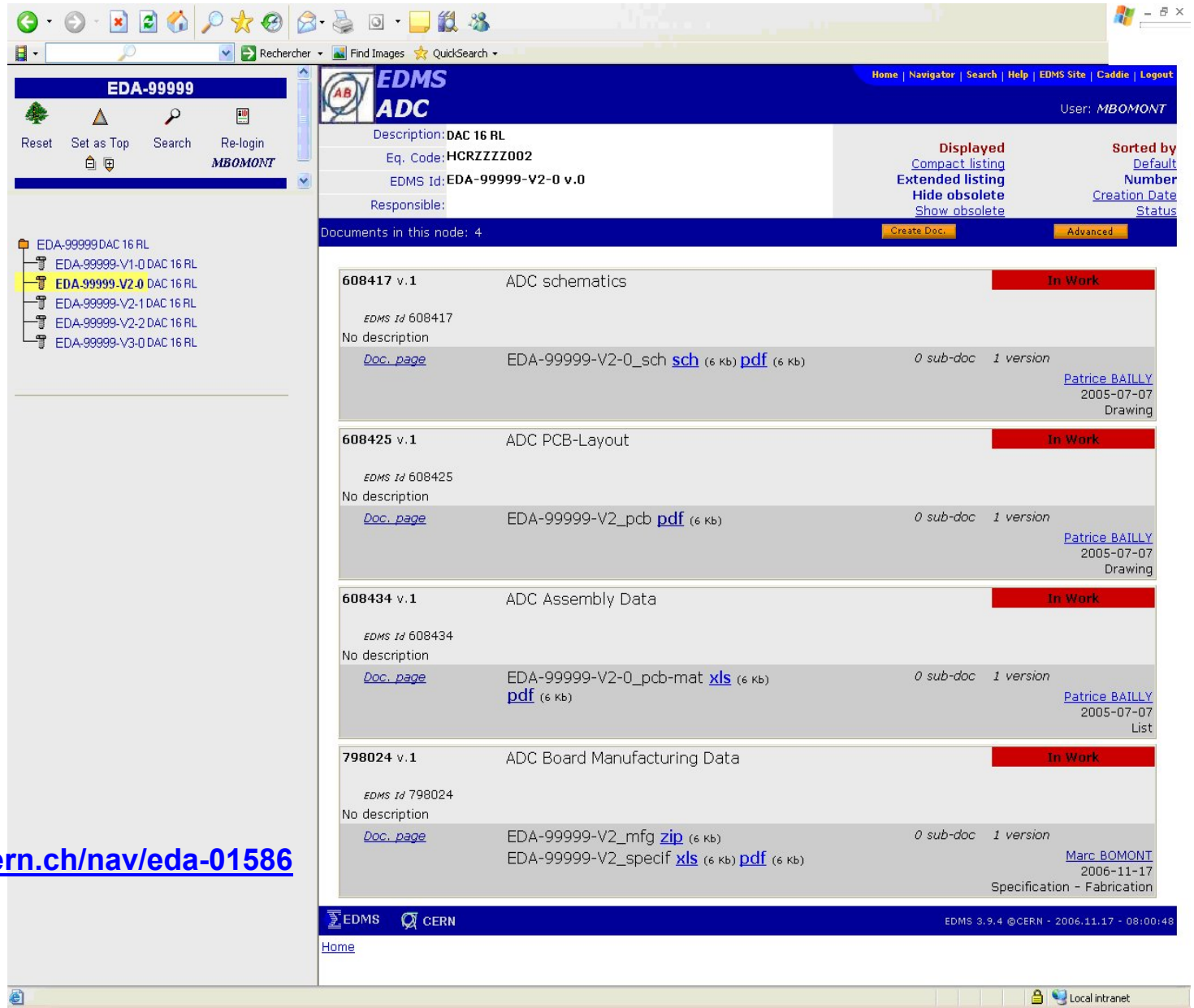
Dossiers de fabrication TS/DEM - Identification d'un chassis



<u>La sérigraphie de la face avant</u> : 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