

Technical Review on Beam Screen Heater Electronics

Quality assurance plan:
production, installation and commissioning

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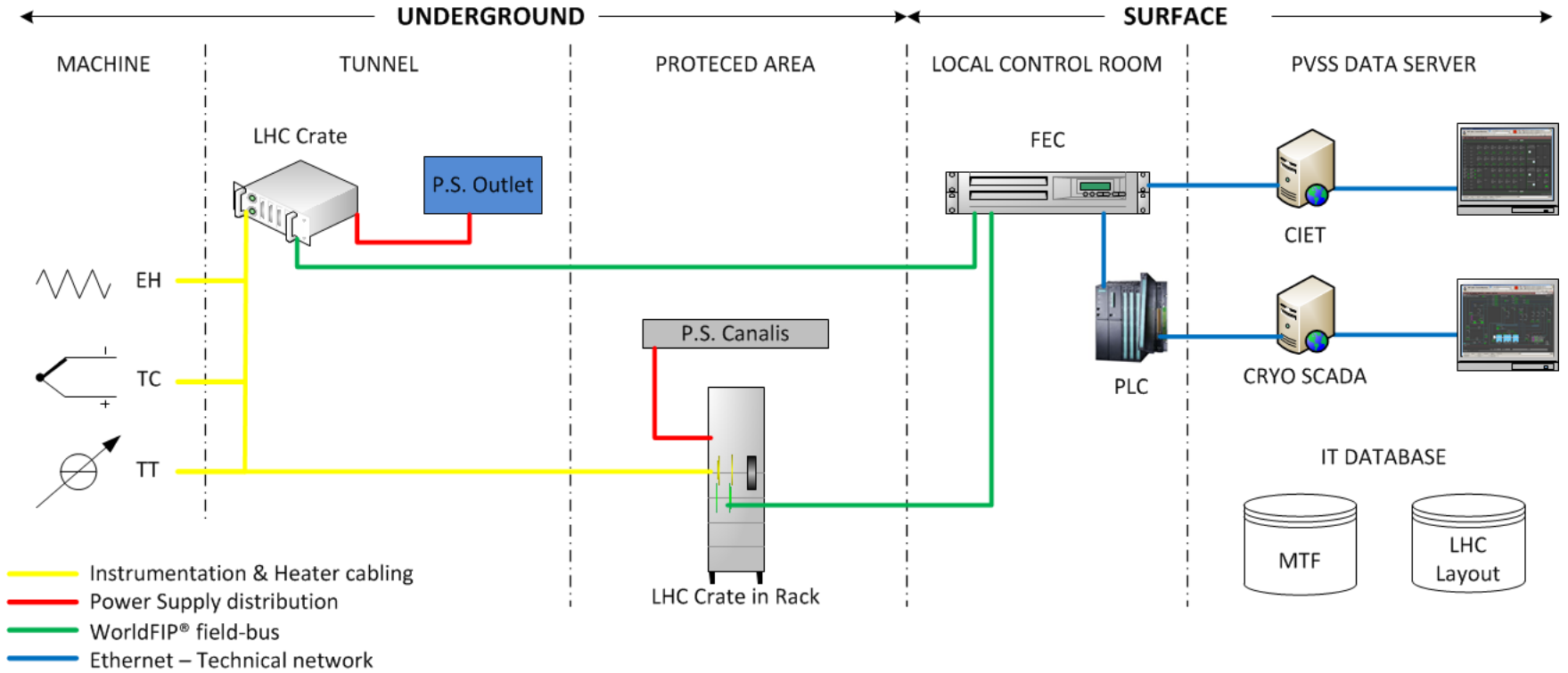
TE-CRG



CONTENTS

- Introduction
- Production
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Introduction



Electronic card

HCQIHTS001-CR000001

Power Supply distribution

230 VAC
P N
142 VAC
Step down
Transformer

Cable

30mA Diff.
Protection

Control Software

MTF data

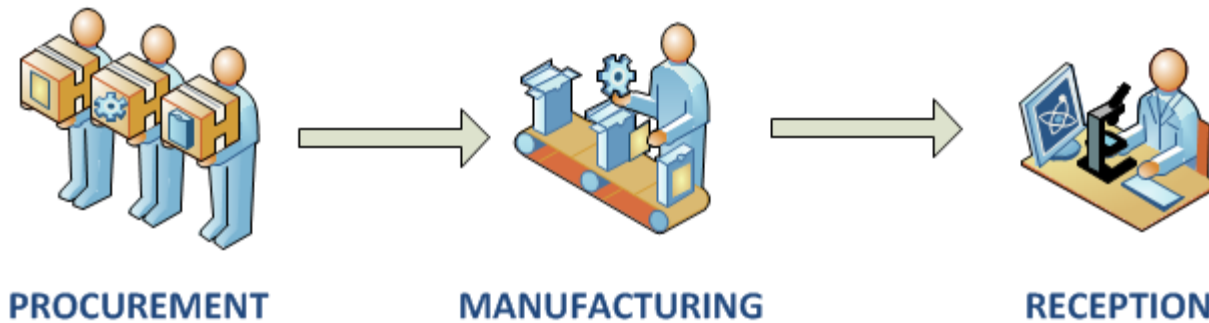
LHC Control
Layout data

Control
Specification

PVSS
Interface

ELECTRONIC CARD PRODUCTION

Due to volume (380 u.), time Schedule, and prototype reviews: **NO PRESERIE**



Procurement:

- TE-CRG is in charge to provide identified critical components (i.e.: FPGA, ADC, DAC, precision resistors)
- TE-MPE Design Office is in charge to select manufacturer, provide standard components, front panel and contract follow-up

Manufacturing requirements:

- QA: card has to be individually identified
- Automatic Optical Inspection mandatory before shipping
- Antistatic box for storage and shipping provide by TE-CRG
- Manufacturing report: AOI results vs equipment ID

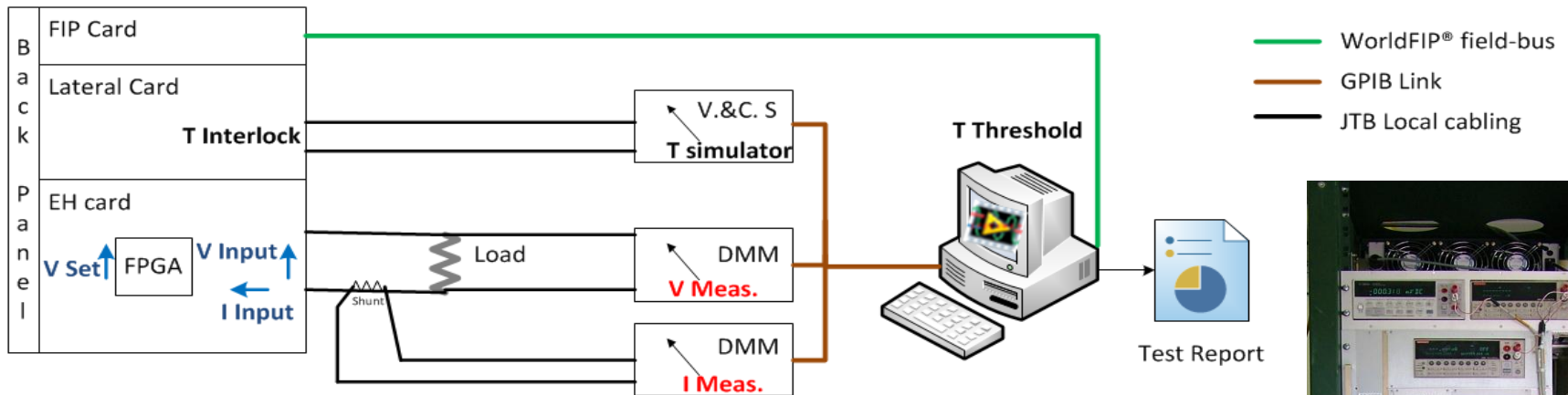
ELECTRONIC CARD PRODUCTION

Reception:

- Visual inspection
- CERN Part-ID labeling according to naming conventions for cryogenic instrumentation specification [LHC-QI-QA-0002 v.1.2](#), EDMS 345385
- MTF registration in collaboration with GS-ASE
- Technical Verification with existing JUTRON Test Bench and based on [User Manual & Test Procedure](#), EDMS 768747 , prepared by E. Gousiou



ELECTRONIC CARD PRODUCTION



Protocol:

Consolidation code to new EH type card

LabVIEW program : Voltage Set and Temperature Threshold



LHC operation	Beam	No Beam
Power [W]	0-25	25-500
Configuration Mode	DC	AC
Load [Ohm]	100	1000
Voltage Input range	0-60 V dc	230 VAC - PWM

ELECTRONIC CARD PRODUCTION

Acceptance criteria:

Performance:

- DC/AC switch and operation modes
- V Input vs V Measured: $\leq 5\%$
- I Input vs I measured: $\leq 5\%$

Power OFF when:

- Enable/Disable mode from control panel
- Simulated Temperature > Interlock Temperature

Resource:

- Estimated time: 10 weeks, 1 FTE

POWER SUPPLY DISTRIBUTION

Cabling Specifications:

From LHC database layout

- 219 cables in LHC tunnel
- 78 cables in protected area

Where

- Maximal Nominal Current = 2.5A
- Main switch: compatible for 2x200VA toroidal transformer
- In protected area: 30mA differential protection
- End point is defined by crate location (DCUM)
- Start point has to be fixed by EN-EL from existing infrastructure taking into account that **UPS connexion is NOT mandatory**

Request forwarded to EN-EL-BT: mid-January 2013

POWER SUPPLY DISTRIBUTION

Step-down transformer:

- Industrial procurement, and specification has to be finalized by end-of march with following requirements
 - Toroidal type of 2x200VA
 - Mechanical housing with tunnel and rack installation
 - Compatible connectors for AC voltage
- Call for tender and order: 1rst april-2013
- Delivery foreseen: 1rst september 2013

CONTROL SOFTWARE

- Update MTF database:
 - Import equipment and test report from template
- Update LHC (controls) layout databases in collaboration with BE-CO
- Update control system in collaboration with EN-ICE
 - New communication specification to be implemented in FEC
 - Update CIET and CRYO interfaces

Start date: march 2013

End date: before mid-Feb 2014

INSTALLATION & COMMISSIONING

Instrumentation:

Establish Thermocouple and heater validation on machine side with local apparatus:

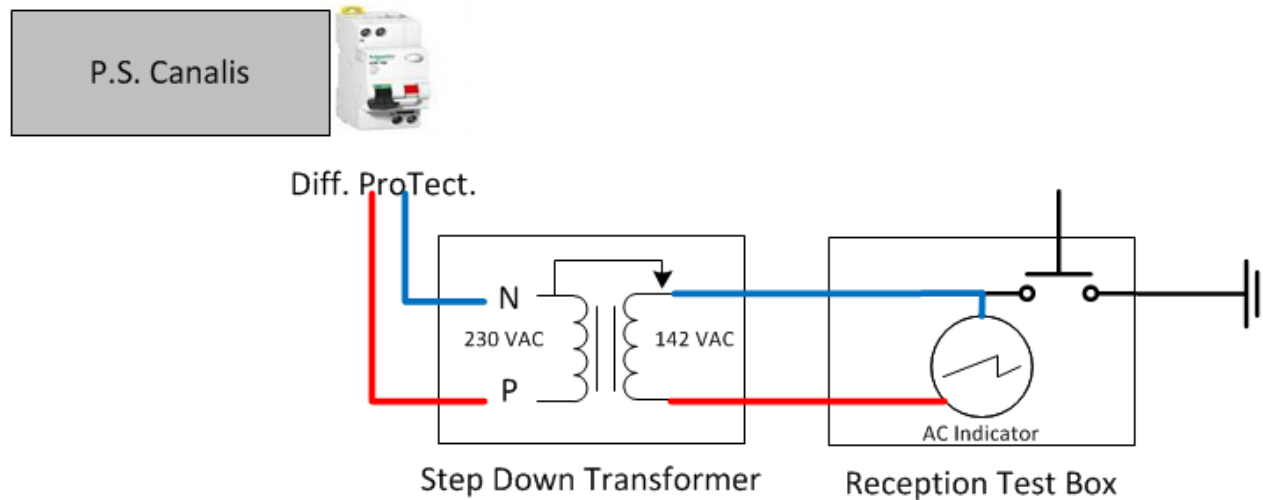
- Physical values conform to LHC installation traveller
- Isolation vs ground
- Check TC polarity using external powering source
- repairs if applicable

This task should be partially done by IC train team

INSTALLATION & COMMISSIONING

Power Supply Distribution:

Protocole reception when cable and step down transformer installation are done:



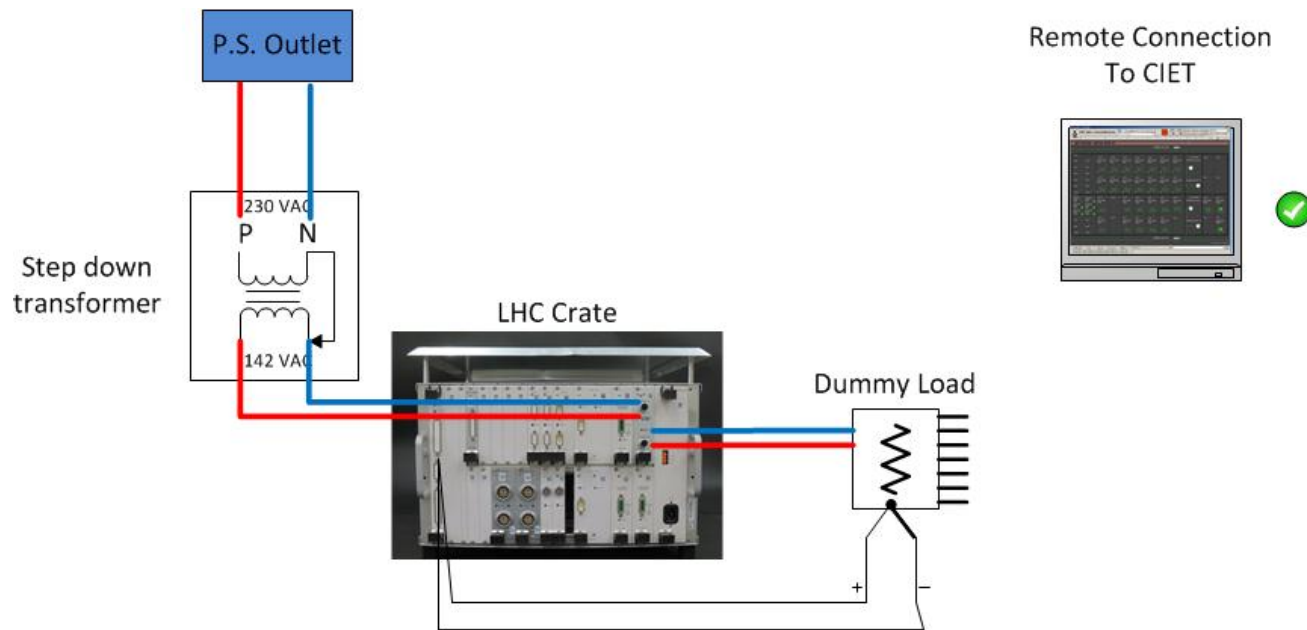
Performance:

- AC indicator conform to 142VAC
- Differential protection operational

INSTALLATION & COMMISSIONING

Electronic card installation and validation protocol:

- Replace previous electronic card
- Using an external dummy load
- Remote connection to set and control heater powering

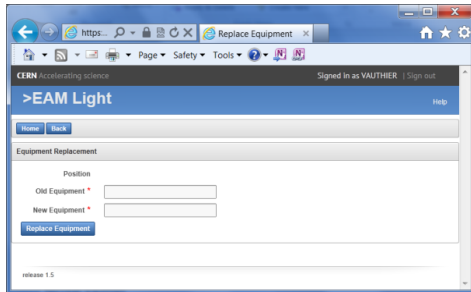


- Plug heater connector to the machine only if previous step is successful

INSTALLATION & COMMISSIONING

Traceability and Quality Assurance :

- Validation of card replacement to update MTF with **EAM-Light** apex



- Handling retired equipment according to RP rules with **TREC** apex



- KDC300i, 2D Terminal Bluetooth

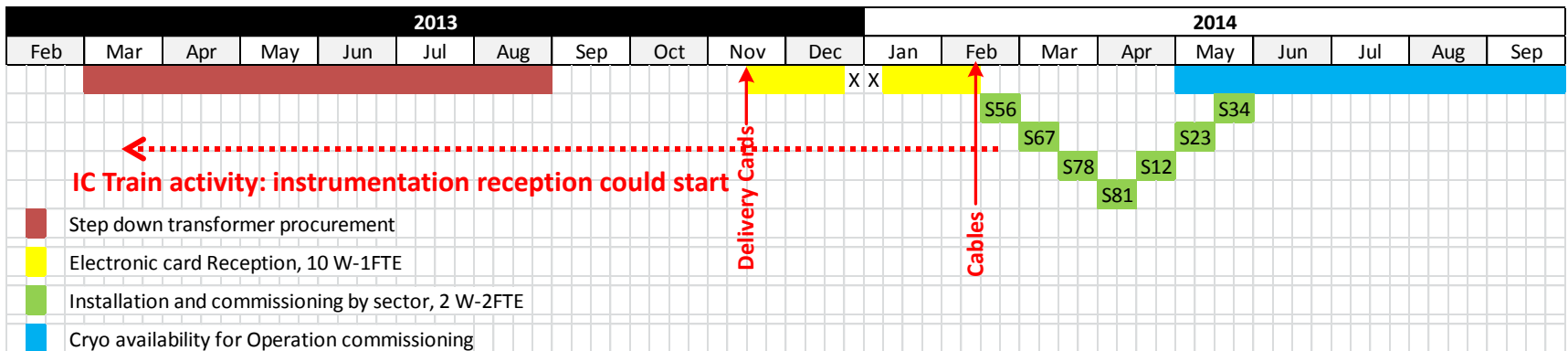


INSTALLATION & COMMISSIONING

Resource:

- Global estimation for Instrumentation, Power Supply distribution, Electronic card and QA procedure is: **2 Weeks /2 FTE by sector**
- Operating every single heater from PVSS in collaboration with Cryo operation team: **2 Days by sector**

Schedule:



CONCLUSION

- Manufacturing, installation and commissioning phases are now identified: QA procedure, Technical specification and resource
- Project compatible with Cryo commissioning if no significant delay in:
 - Critical component procurement
 - Prototype validation
 - Power supply distribution
- Instrumentation validation starts already in 2013, therefore Installation and commissioning could be reduced by 1 month. This additional month would be allocated to prototyping
- Still request EN-MEF validation: LS1 official schedule

Many thanks for your attention.



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