News from the xTCA Evaluation program - part 1

9th meeting of the xTCA Interest group

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Outline

PM Test Pad

- Motivation
- Requirements
- Test procedure
- Functional concept
- Test setup
- Summary

New PM product evaluation

- NAT-AC-600 specifications
- Evaluation test summary

IPMC

- Pigeon Point solution
- LAPP and Pigeon Point mezzanines comparison
- Adapter card
- Summary

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PM Test Pad - Motivation

Previous test setup:

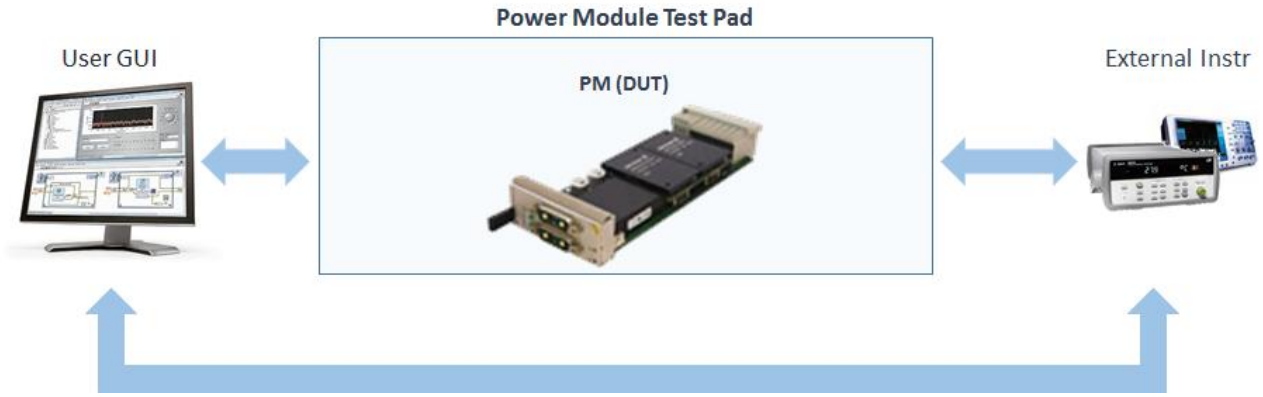
- Commercial crate hosting the power module under test
- CERN Load Modules
- Load sharing:
  - Auxiliary Power module → CU1, CU2, MCH1
  - Power Module Under Test → AMC1 to AMC12
- Load modules and instruments controlled by LabVIEW

Limitations:

- ❑ Shelf components influence the measurements (noisy CUs, Aux PM and MCH)
- ❑ Test limited to the 12 AMC channels (Impossible to test MCH and CU channels)
- ❑ Not suitable for performing EMC measurements
- ❑ Fully automatic test procedure not possible

PM Test Pad - Requirements

Objective: Test platform to perform all tests automatically.

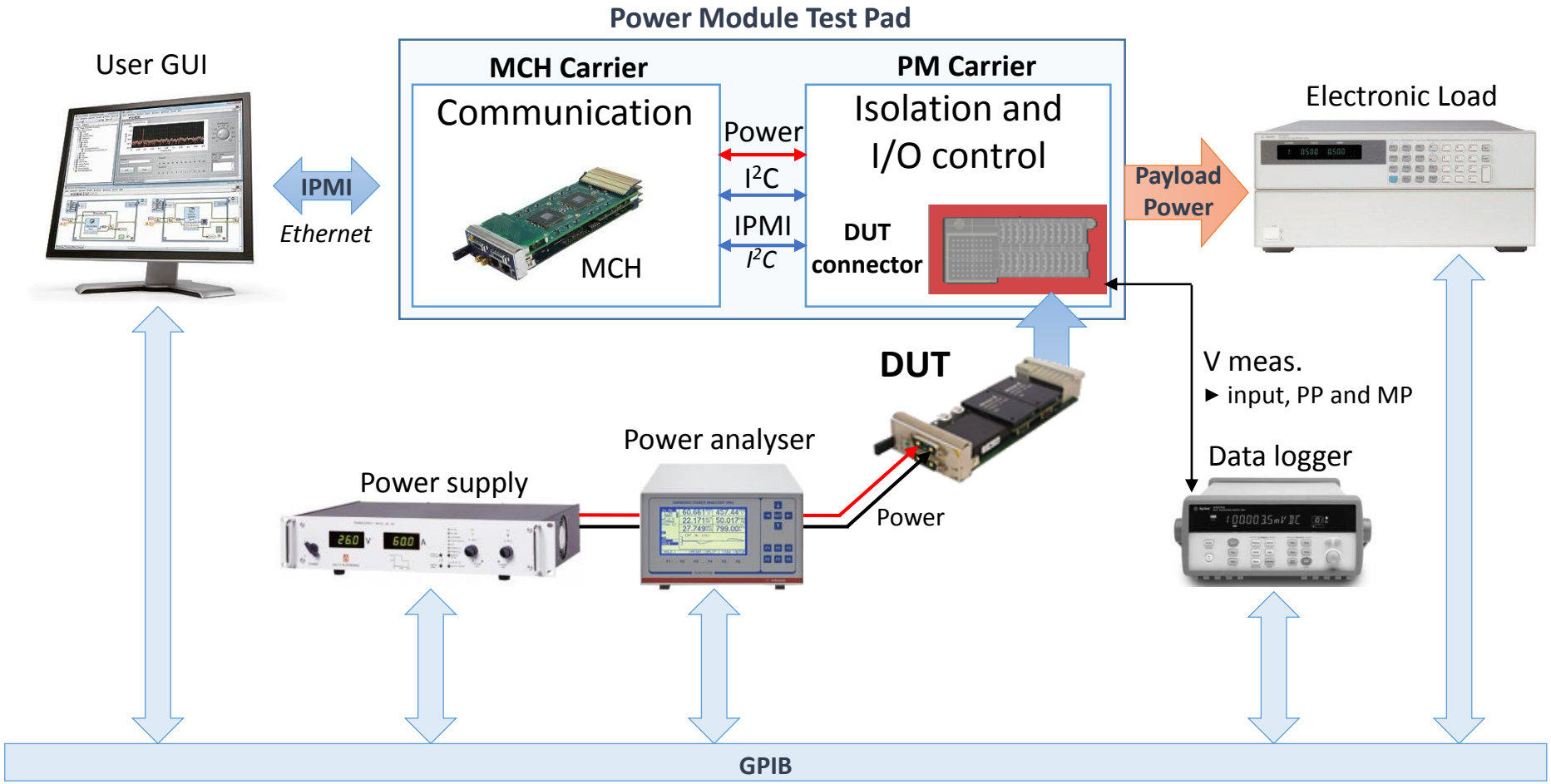


- Full PM I/O (PS, EN#, …) control and monitoring to emulate the MTCA shelf environment
- Full instrumentation connectivity (Electronic load, power analyzer, data logger …)
- Galvanic isolation between PM under test and test control circuitry
- Test pad compatible with different PM topologies (PM physical size, AC or DC input compatible, operating range and specs)
- Sufficient cooling of DUT
- PM test pad layout to accommodate EMI measurement features (LISN, EMI receiver)

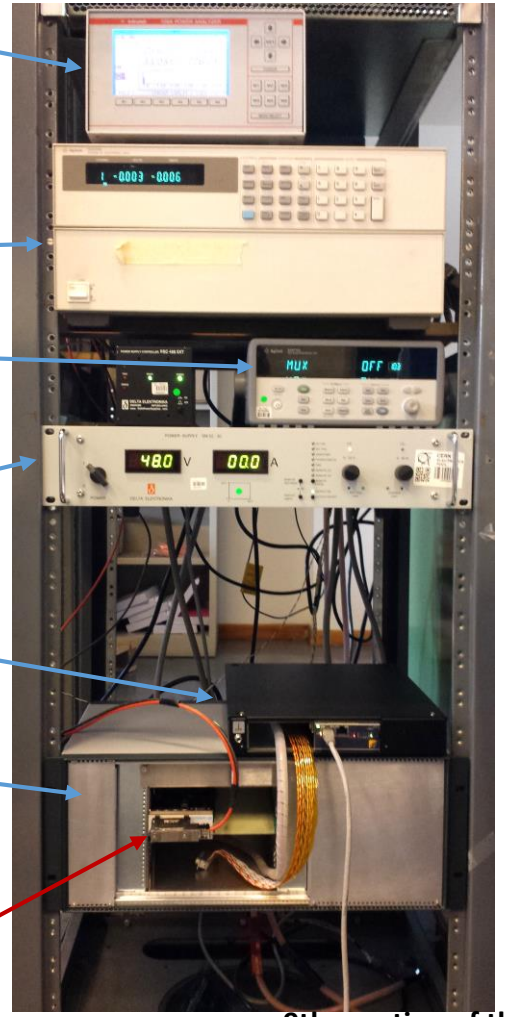
PM Test Pad – Test procedure

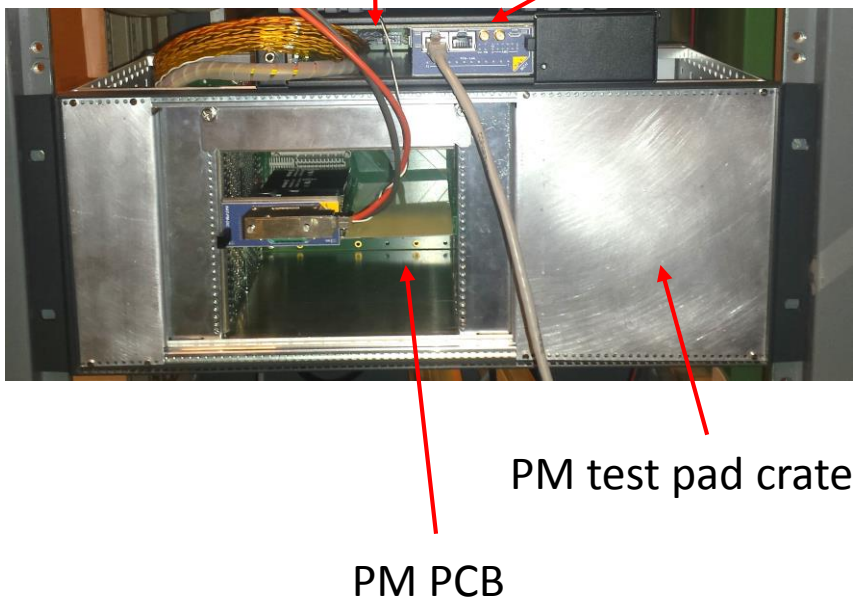
- Init. and Warm up phase — Automatic
  - Active all payload power and wait for 15 minutes monitoring the output voltages
- Functionality — Automatic
  - Validation of PICMG requirement (IPMI commands, autonomous mode …)
- Sensor accuracy — Automatic
  - Measurement of the power module's sensor accuracy
- Soak test — Automatic
  - Heat the device monitoring the output voltages
- Load regulation (Management power and payload power) — Automatic
  - Measurement of the output voltage varying the output power
- Line regulation — Automatic
  - Measurement of the output voltage varying the input voltage
- Efficiency — Automatic
  - Measurement of the power module's efficiency for different output power
- EMI — Semi-automatic
  - Measurement of the power module's electromagnetic interference

PM Test Pad – Functional concept



PM Test Pad – Test setup





PM Test Pad - Summary

Status:

- PCBs proto. produced and tested
- PM Test Pad functional
  - Most of the test features successfully implemented
  - However few HW issues remain to be addressed
- Graphical user interface available
- Test SW easily adaptable through configuration files
  - XML files allow configuring the setup : PM Type (AC/DC), MCH IP address, tests
- Full test report generation
  - XML file save all measurements results
  - DOC file report (verbose)

Plans:

- PCB modifications:
  - Tested hardware fixes to be implemented
  - Layout to be adapted for efficiency test

Goal: PM Test pad fully operational by the end of 2015

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xTCA Evaluation project update: PM NAT-AC-600

Specifications:

- **Single-width**, full-size
- **110-230VAC input**
- 600W output power
- **90% conversion efficiency**
- Support of N+1 and 2+2 redundancy
- 16 power channels
  - 12V @ 6.6A max.
  - 3.3V @ 180 mA max.
- Support of:
  - Up to 12 AMCs, 2CUs, 2MCHs
  - Individual control of PM and PP
  - Individual current sensor
- Full HPM support for field upgrades of firmware

xTCA Evaluation project update: PM NAT-AC-600 (Summary)

Evaluation results summary		
	Measurements	Specifications
Maximum output power	695W	600W
Load regulation	3.09% max	Not specified
Efficiency	87% max	90%
Power factor	0.98 max	Not specified
Ripple	24.9mV pk/pk	35mV max
Current sensor accuracy	2.4% max	Not specified

- Written evaluation report will be added on the SharePoint

  https://espace.cern.ch/ph-dep-ESE-BE-uTCAEvaluationProject

- No need for any additional AC/DC converter

  → Good candidate for lab use

Evaluated PMs comparison					
	NAT DC780	NAT DC840	Vadatech UTC010	Wiener MTCA PM	NAT AC-600
Mechanical					
Form factor	single-width, full-size	single-width, full-size	single-width, full-size	double-width, full-size (x2)	**single-width, full-size**
Electrical					
Type	DC/DC	DC/DC	DC/DC	AC/DC	**AC/DC**
Maximum Power	780W	840W	792W	1000W	600W
Power Factor	NA	NA	NA	0.99	0.98
Efficiency	95%	94%	92%	88%	**87%**
Input voltage	-40V to -60V	-40V to -60V	-36V to -75V	Not tested	Not tested
Ripple (Pk-Pk)	100mV	100mV	32mV	8mV	**25mV**
Load Regulation	8.60%	8%	1.50%	3%	3%
Management software					
Current measurements and Overcurrent protection	Yes	Yes	Yes	Yes	Yes
USB connection	No	No	Yes	Yes	No
Load sharing	Yes	Yes	Yes	Yes	Yes
HPM.1	Yes	Yes	Yes	Not tested	Not tested
PM over temperature protection	Yes	Yes	Yes	Not tested	Yes
PM input voltage protection	Yes	Yes	Yes	Not tested	Not tested

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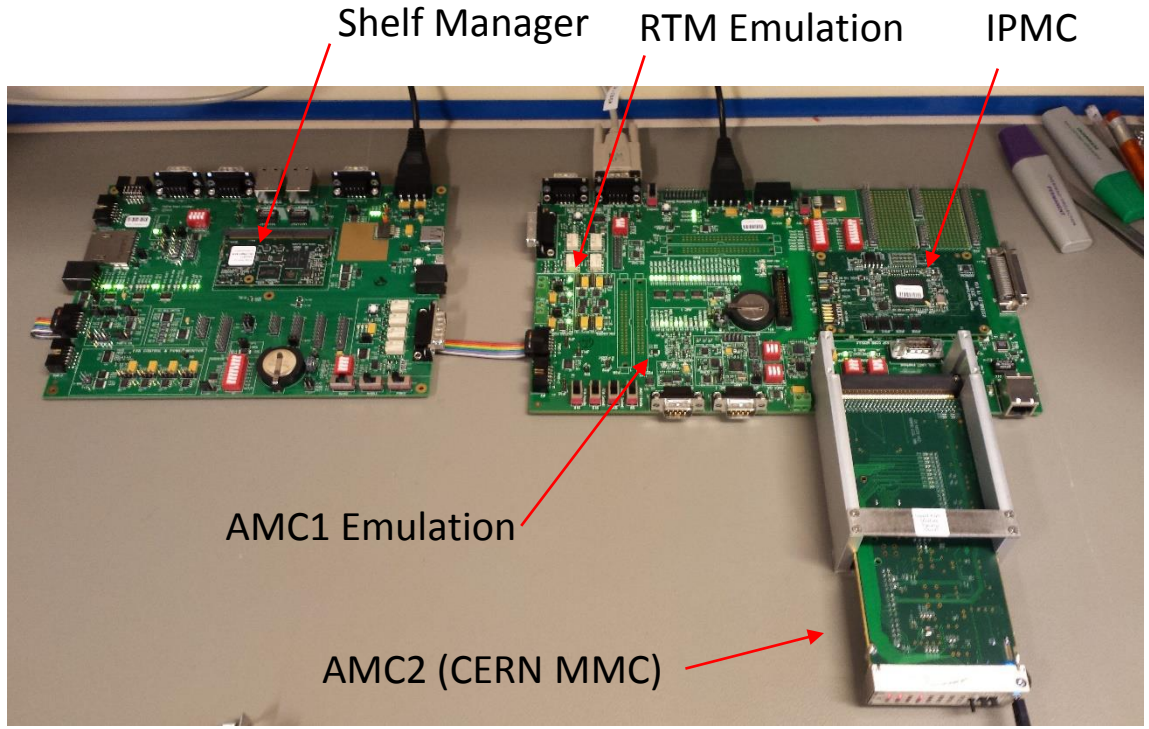
Pigeon Point solution : Presentation (Starter kit)

- Licence : PH-ESE-BE (xTCA Evaluation Project)
- Starter kit : Received and installed
  - Start-up: **OK**
    - Detection / State M4
    - FRU Information
    - Sensors
  - AMC: **OK**
    - Detection / State M4
    - FRU Information
    - Sensors
  - Communication: **OK**
    - Shelf manager's shell (RS232)
    - IPMC's debug interface (RS232)
    - Ethernet interface (IPMI)

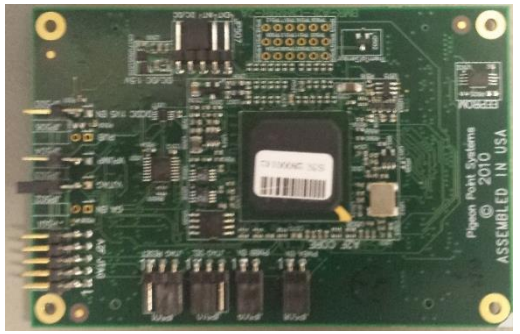


- Next evaluation phase: ease of use and adaptability to an ATCA blade

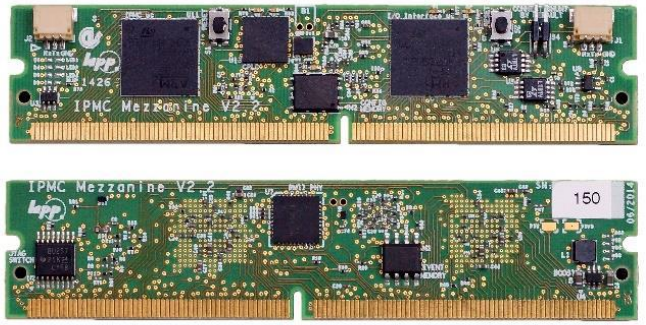
LAPP and Pigeon Point mezzanines comparison

Pigeon Point Evaluation board features:

- Up to 2 AMCs (Due to evaluation board limitation)
- RTM (Managed by the IPMC core)
- 35 User IOs
- Debug interface (RS232)
- Ethernet interface (IPMI commands)
- Payload / E-keying
- IPMB-L : point to point connectivity



Pigeon Point evaluation mezzanine



LAPP IPMC mezzanine

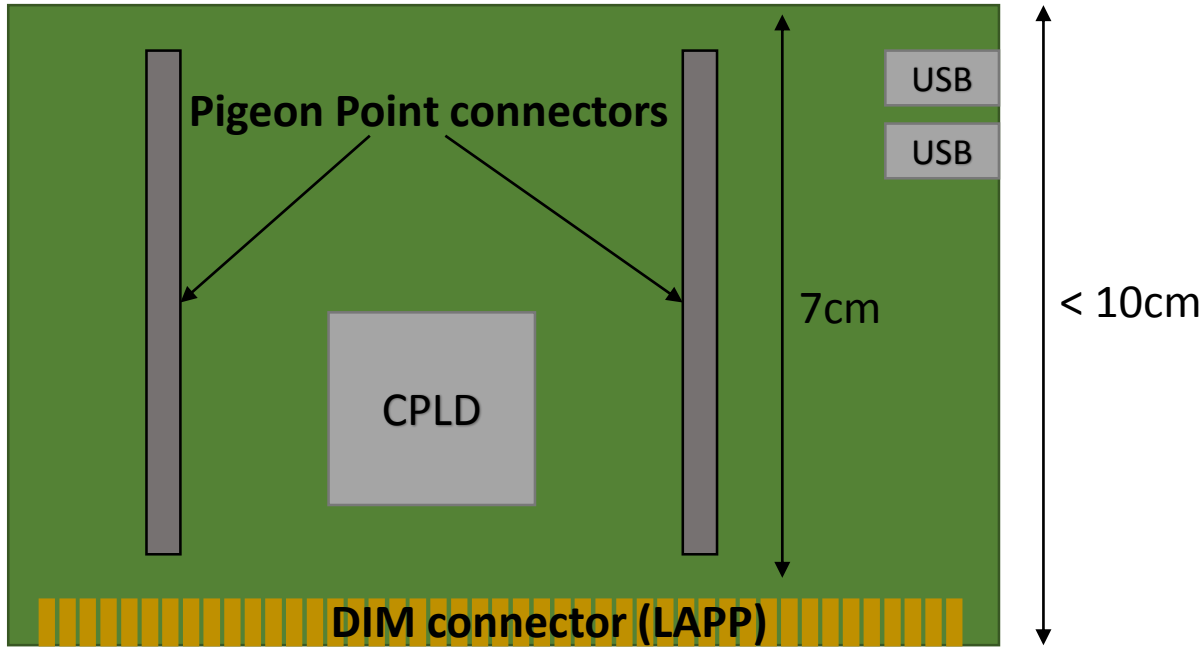
LAPP's IPMC connector pinout:

- Up to 8 AMCs
- RTM (Managed like AMC)
- 35 User IOs
- RS232 Interface
- Ethernet interface (IPMI commands)
- Payload / E-keying
- IPMB-L: bus connectivity
- Gigabit Ethernet
- Master JTAG

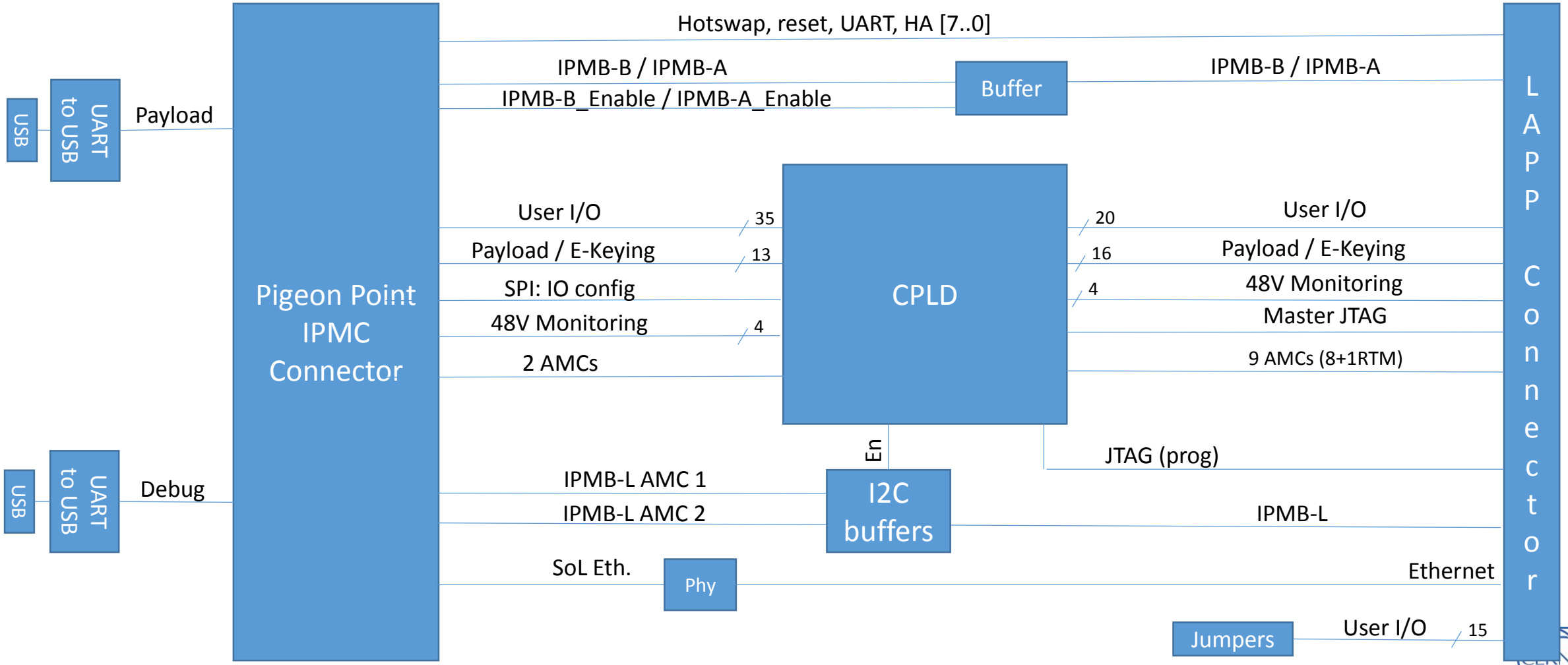
Open points to be addressed		
	Pigeon Point	**LAPP**
IPMB-L	Point to point connectivity	Bus connectivity
RTM	Managed by the IPMC core	Managed like an AMC
Gigabit Ethernet	Not implemented	foreseen
Master JTAG	Not implemented	foreseen

Adapter Card: Presentation

- Design of an adapter card
  - Goal: Evaluate Pigeon Point IPMC on a custom ATCA blade featuring the LAPP footprint



Adapter Card: Block diagram



IPMC: Summary

- Status:
  - First Pigeon Point IPMC evaluation successful (Starter kit + AMC support, CERN MMC compatible)
  - Design of the Adapter card is on going

- Plans:
  - Adapter Card prototyping and hardware debugging
  - Software study: IPMC core + FRU/SDR
  - Test with LAPP's ATCA IPMC test board

Thanks for your attention !

Any question ?