AMS Data Acquisition System

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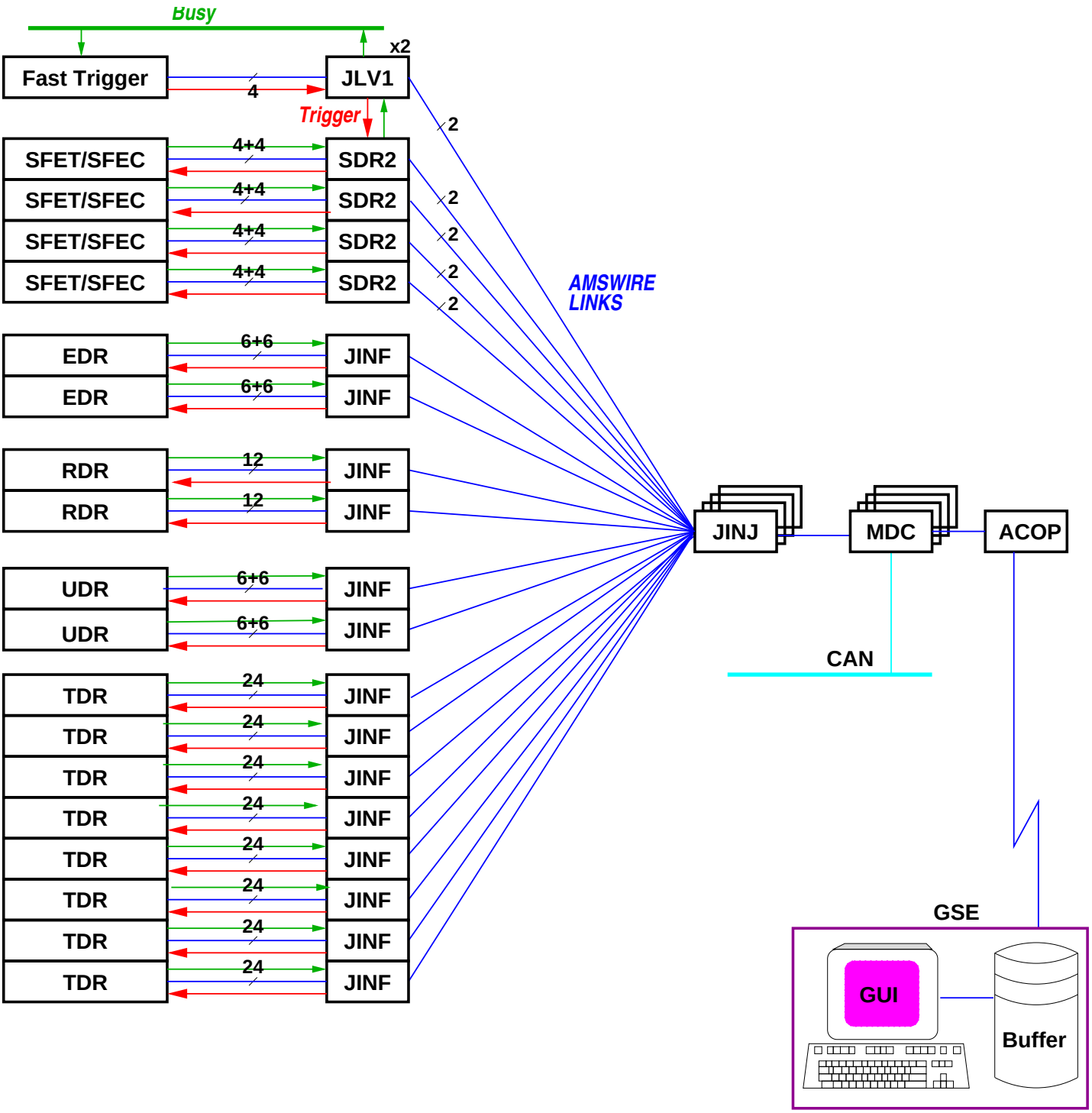
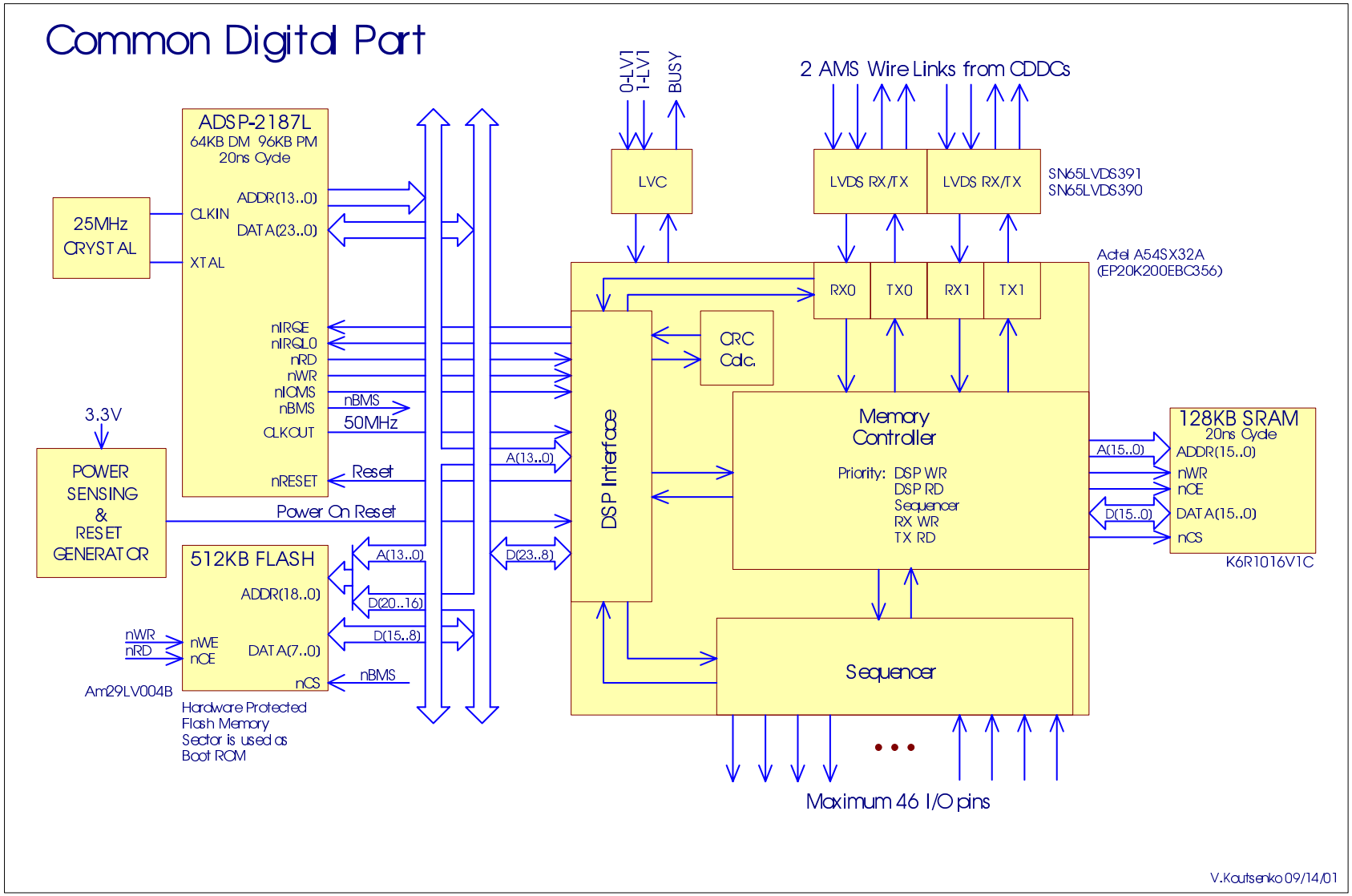
OUTLINE:

- DAQ structure
- CDP-CDDC block diagram
- MDC block diagram
- ACOP block diagram
- Test setups
- Performance

DAQ tree


Busy
Fast Trigger
4
JLV1
x2
Trigger
2
SFET/SFEC
SFET/SFEC
SFET/SFEC
SFET/SFEC
4+4
4+4
4+4
4+4
SDR2
SDR2
SDR2
SDR2
2
2
2
2
AMSWIRE
LINKS
EDR
EDR
6+6
6+6
JINF
JINF
RDR
RDR
12
12
JINF
JINF
UDR
UDR
6+6
6+6
JINF
JINF
TDR
TDR
TDR
TDR
TDR
TDR
TDR
TDR
24
24
24
24
24
24
24
24
JINF
JINF
JINF
JINF
JINF
JINF
JINF
JINF
JINJ
MDC
ACOP
CAN
GSE
GUI
Buffer

CDP block diagram



CDP/CDDC software

Ingredients:

Detector independent:

1. Boot procedure;
2. FLASH operations;
3. Data protection;
4. AMSWIRE operations;
5. Event building;
6. In-situ test procedures;

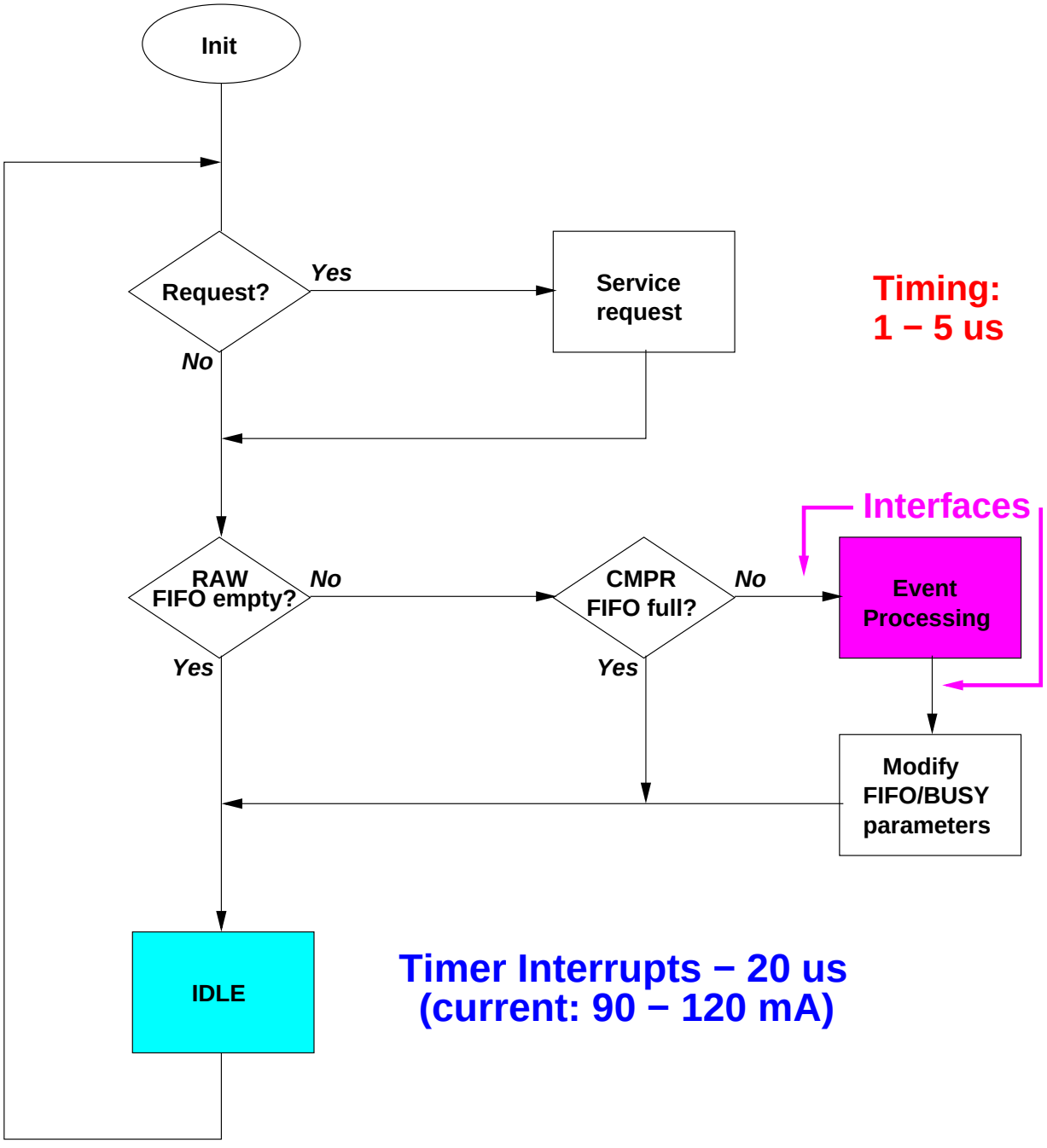
Detector dependent:

7. Data reduction;
8. Calibration procedures.

Subdetectors:

1. LV1 Trigger (C.H.Lin);
2. Silicone Tracker (D.Haas);
3. Ring–Imaging Cerenkov Detector (G.Martinez);
4. Transition Radiation Detector (F.Hauler);
5. Electromagnetic Calorimeter (F.Spinella).
6. Time–of–Flight and Anti–Coincidence Counters (F.Cindolo);

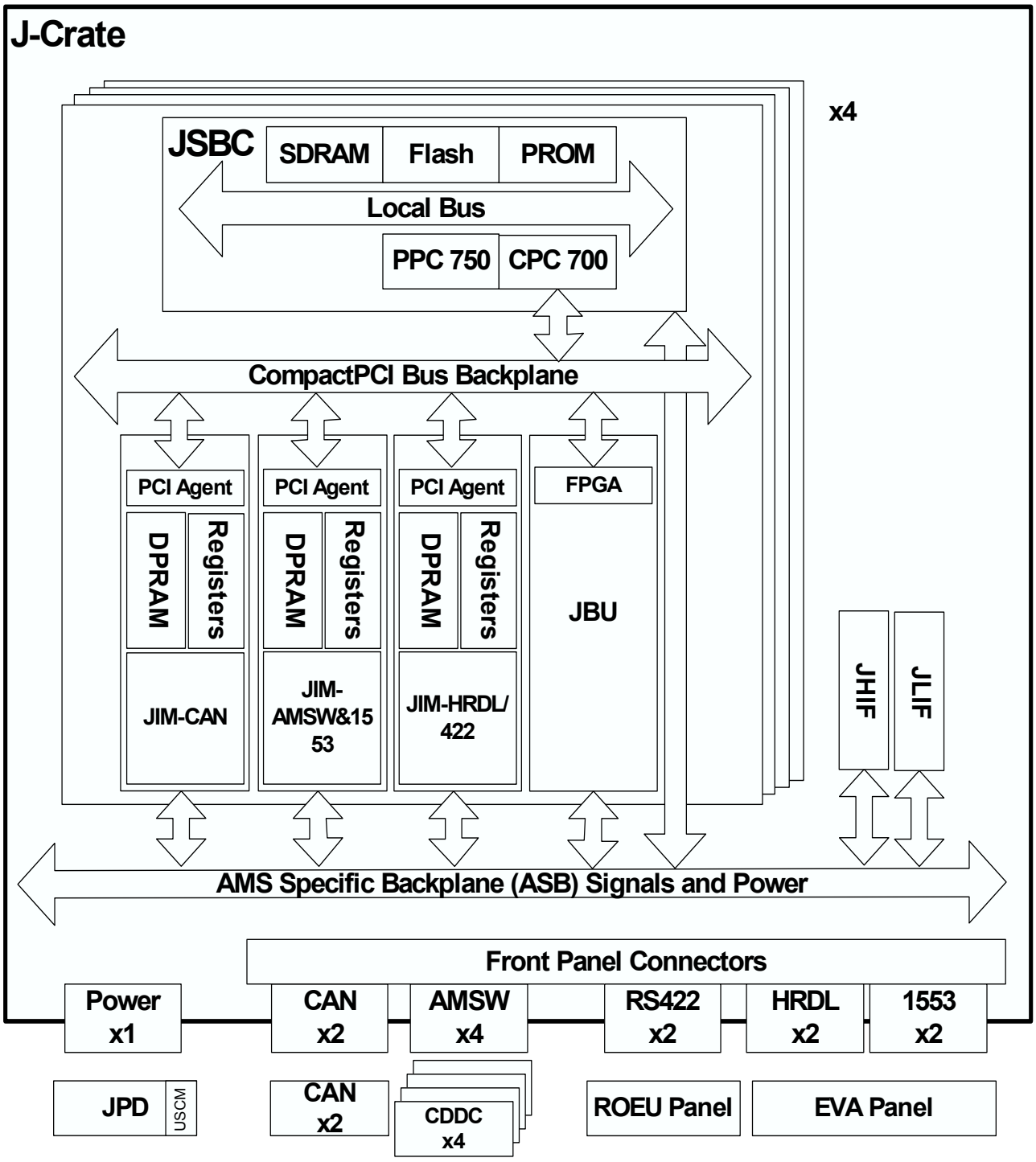
CDP Program Flow



- ROM Monitor - all functions, but no event building

X-Crate Engineering Model

JMDC block diagram



JMDC elements

Data processing:

– JSBC – 400MHz CPU, 256 MByte memory, cPCI bus;

Intermediate data buffering:

– JBU – 2GByte memory;

Interfaces to AMS Detector:

– Housekeeping data – CAN Bus;

– Science data – AMSWire net;

Interfaces to Shuttle:

– Commanding – 1553 Bus;

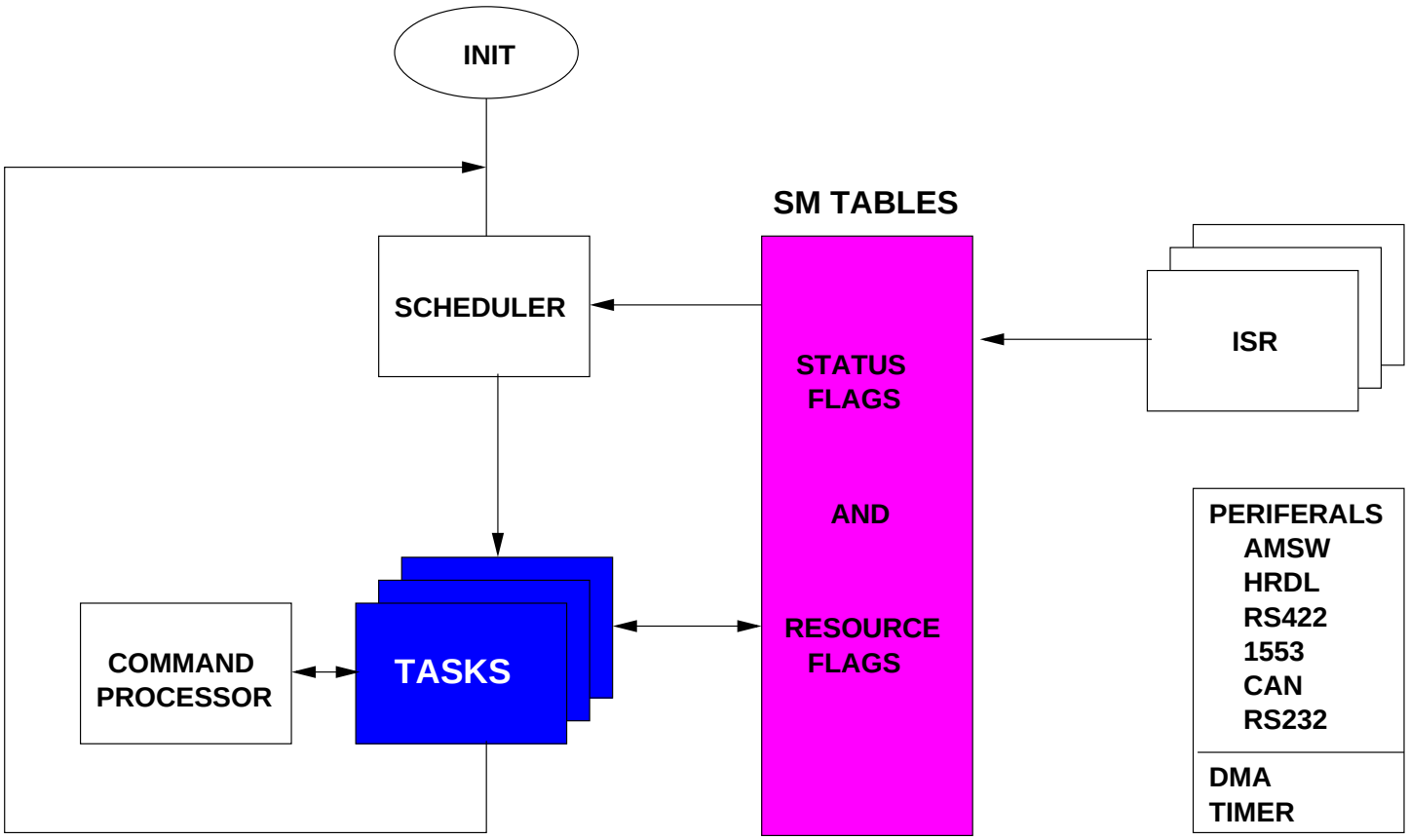
– Telemetry data – RS422;

Interfaces to the Space Station:

– Commanding – 1553 Bus;

– Telemetry data – HRDL (via ACOP);

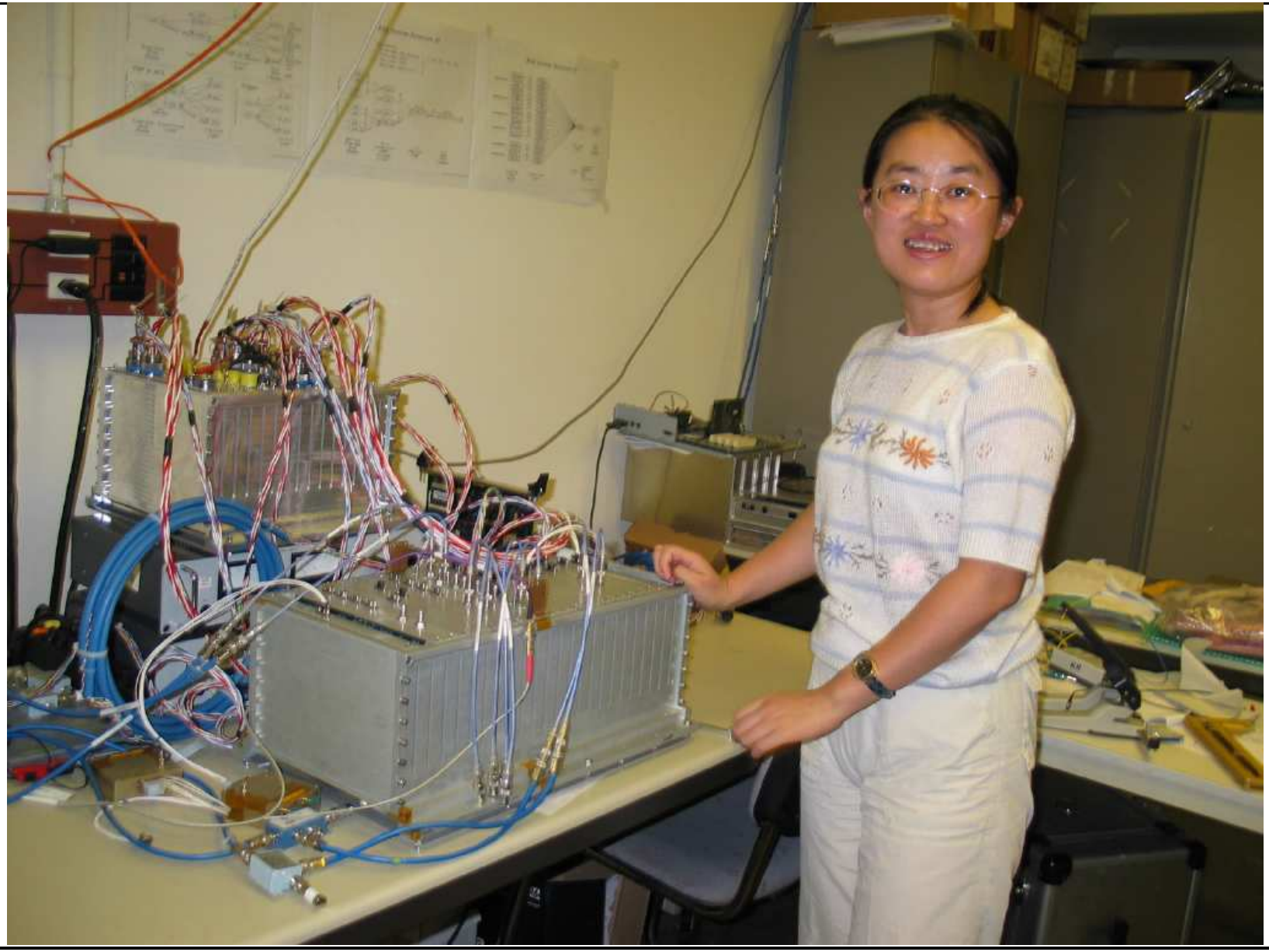
MDC Program Flow



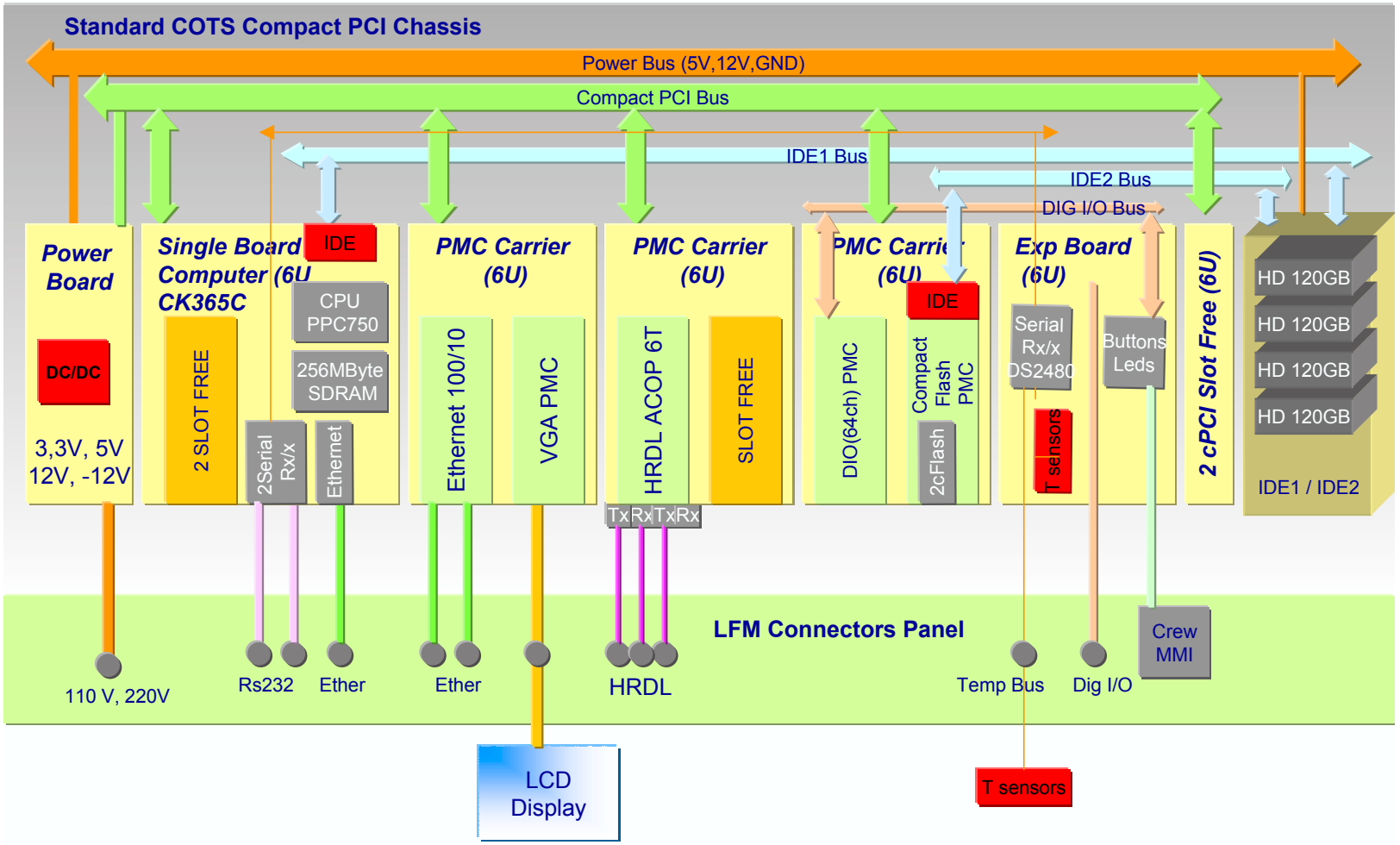
Tasks:

- Physics Event collection:
  - Request event ($< 1\mu s$, wait $\sim 260\mu s$);
  - Event reading from PCI (60μ)
  - Event processing ($< 250\mu$s)
  - Event writing to PCI (50μ)
- Other internal operations (Science Data downlink, Monitoring and Control ...);
- External Command Processing

J-Crate Qualification Model



ACOP block diagram



ACOP elements

Data processing:

– SBC – 400MHz CPU, 256 MByte memory, cPCI bus;

Intermediate data buffering:

– Disk Mass Storage – ~ 500 GByte;

Interfaces to AMS:

– Commanding – HRDL;

– Telemetry data – HRDL;

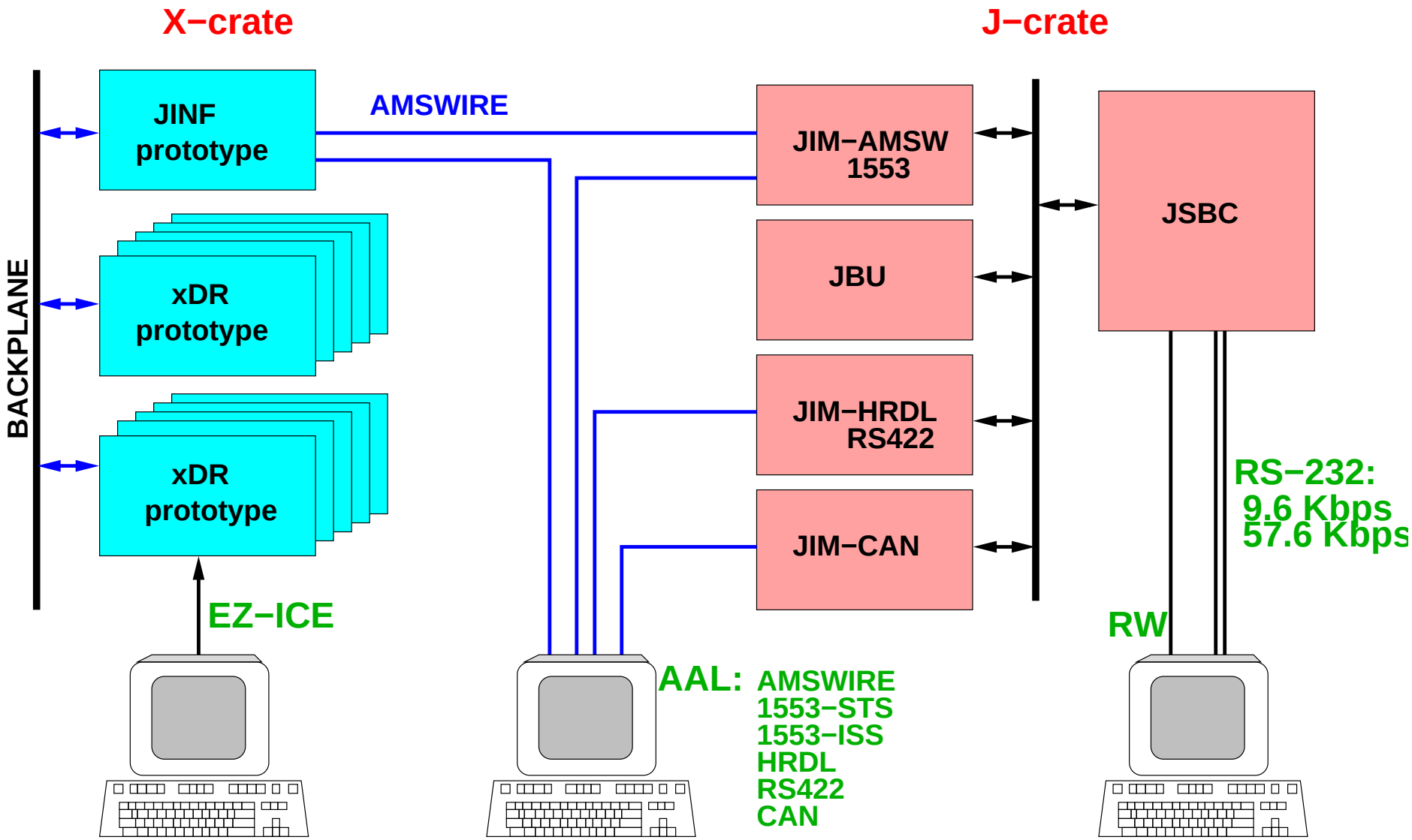
Interfaces to the Space Station:

– Commanding – Ethernet (RS422);

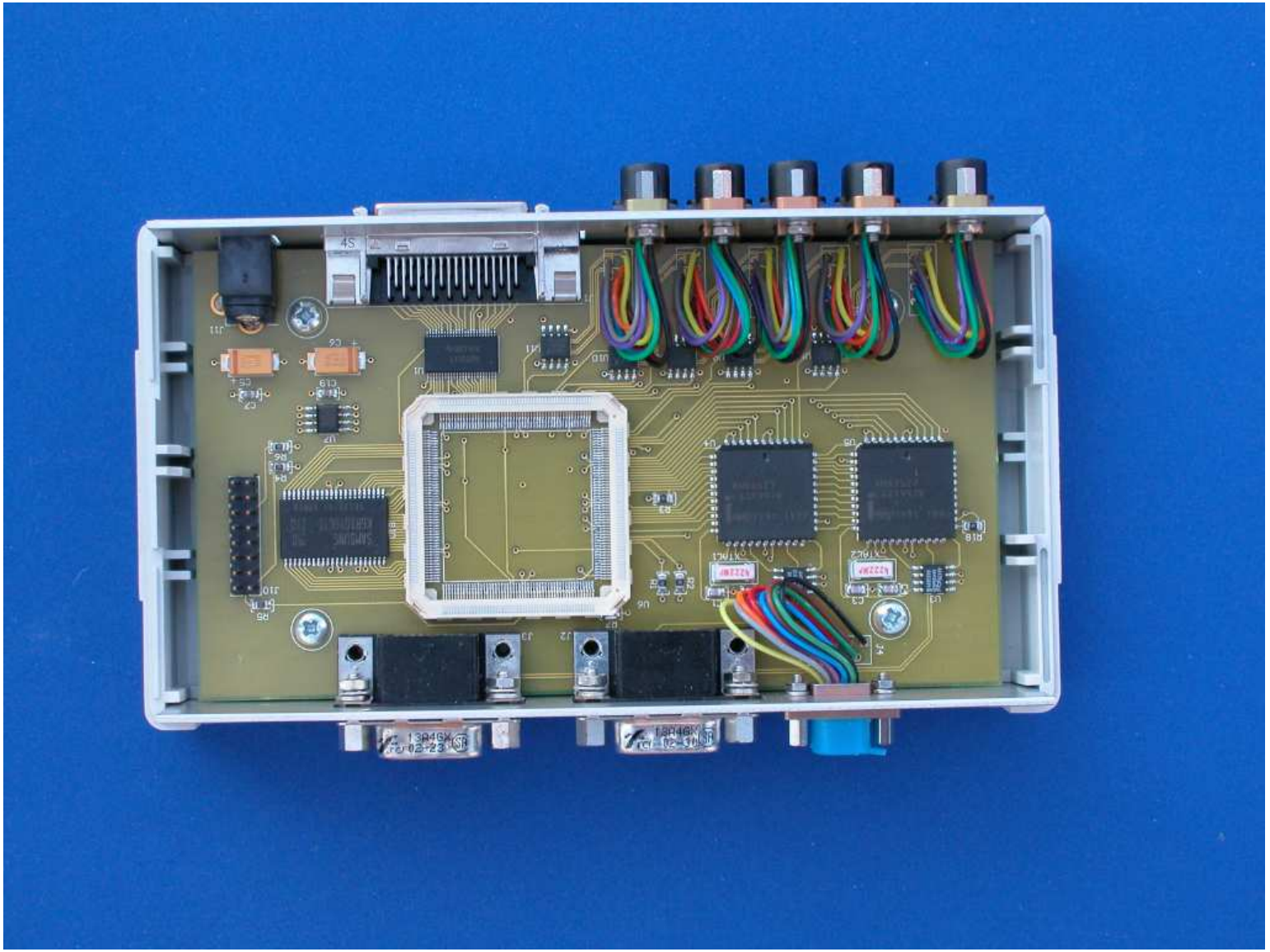
– Telemetry data – HRDL + Shuttle;

Validation tests of JMDC and ACOP at LMSO/Boeing

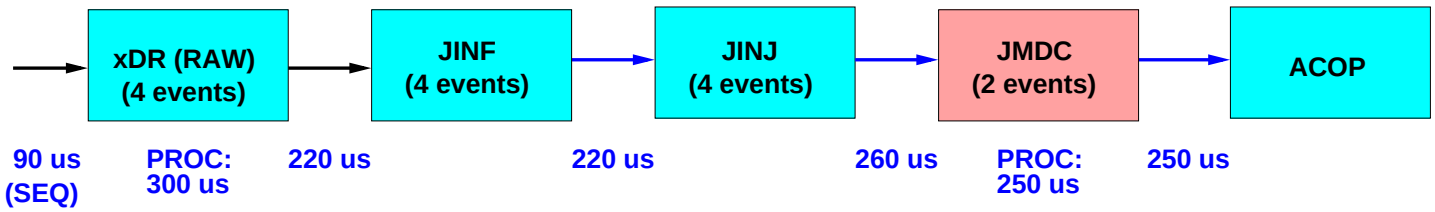
Development setups

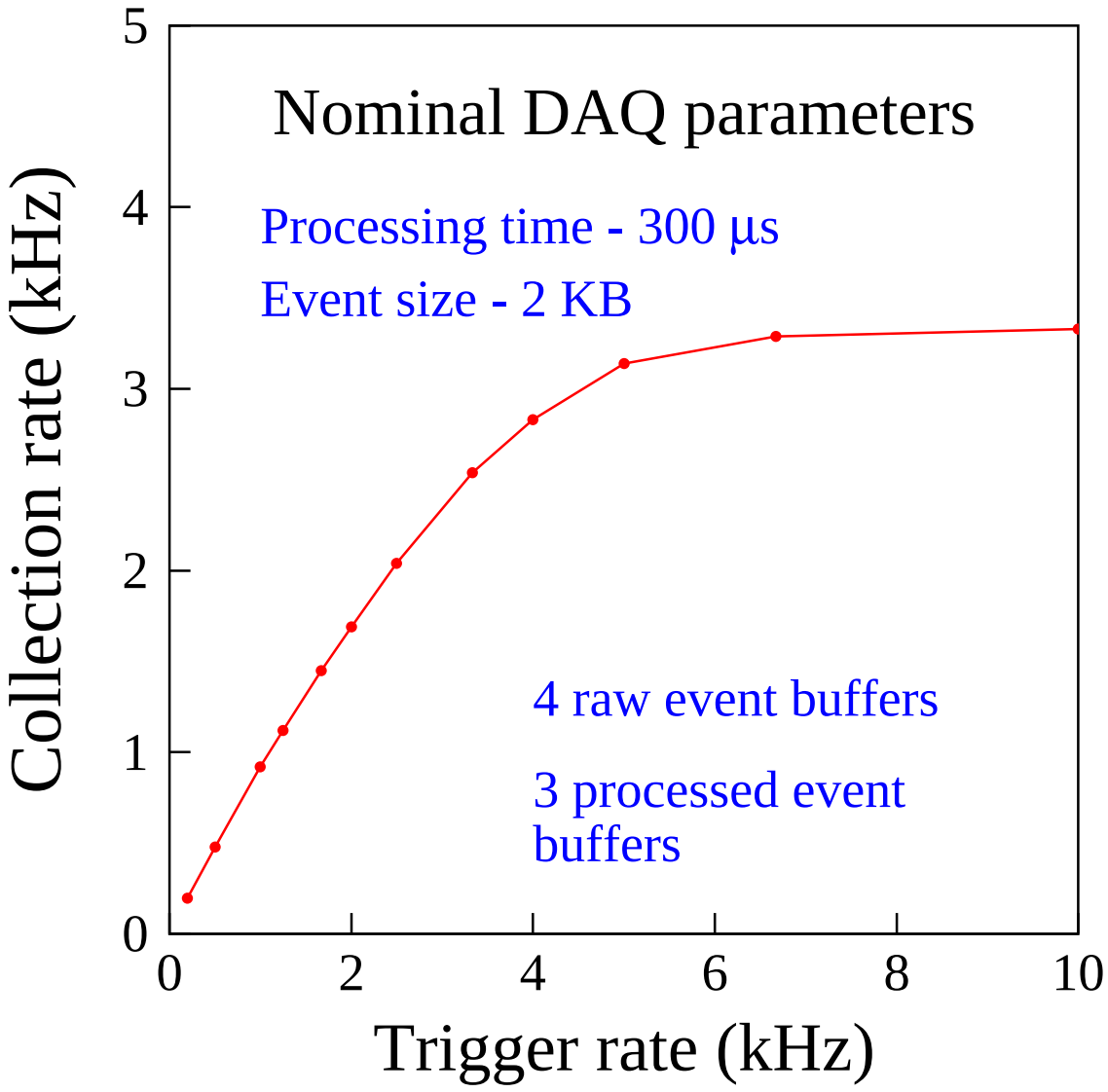


AAL: EPP – CAN/AMSWIRE Interface



DAQ Performance - measurements





Dead time at 2 kHz – 16%

(Expected Trigger rate: 200 – 2000 Hz)