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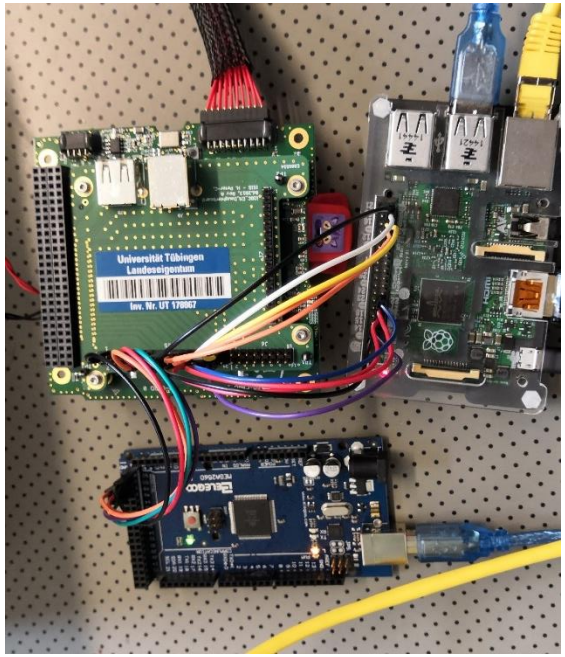
Institute of Astronomy and Astrophysics



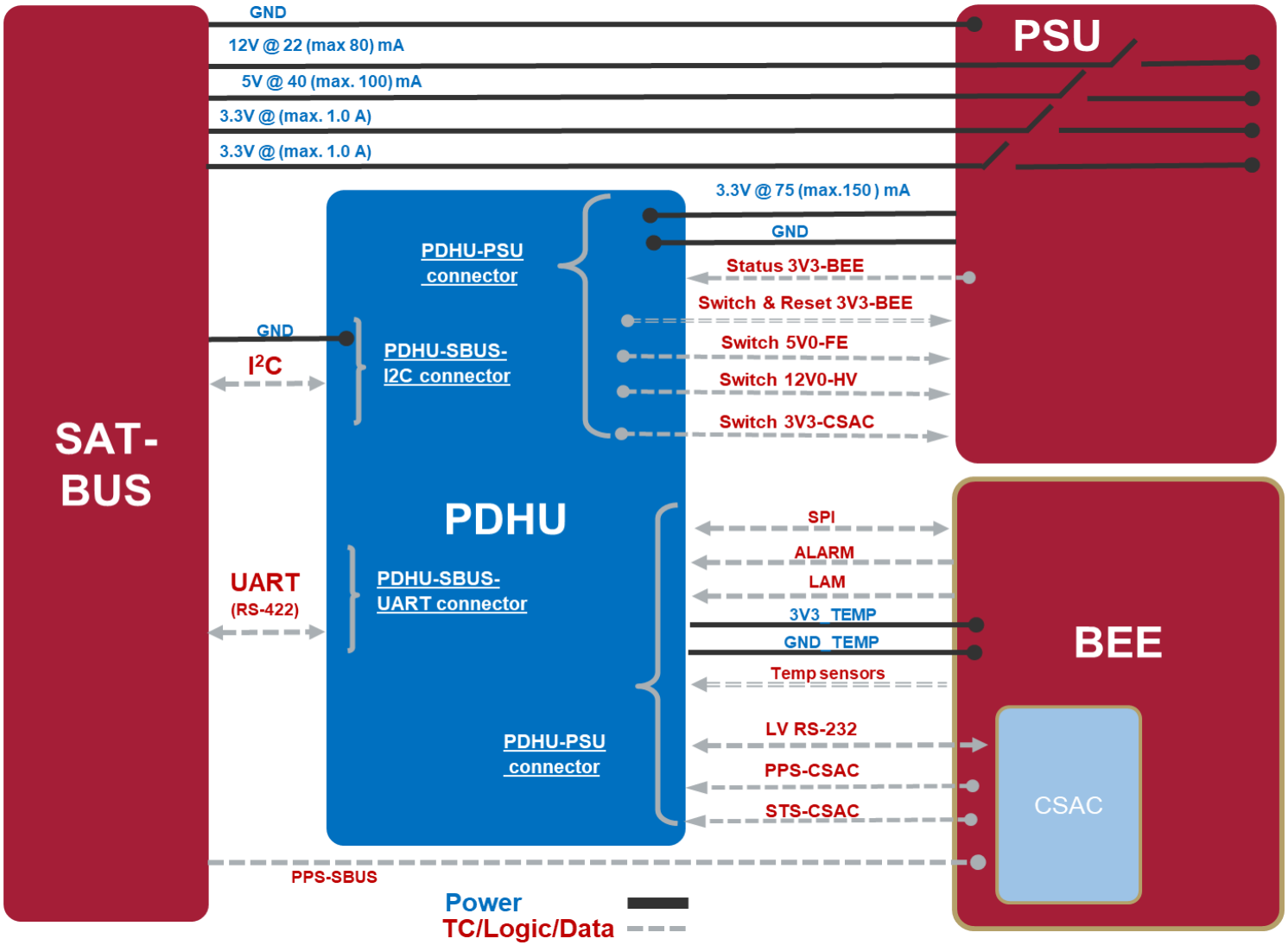
HERMES Payload Data Handling Unit (PDHU)
Firmware & breadboard tests

J. Bayer, A. Guzmán, S. Pliego, A. Santangelo, C. Tenzer

Interfaces

STATUS : FINISHED*

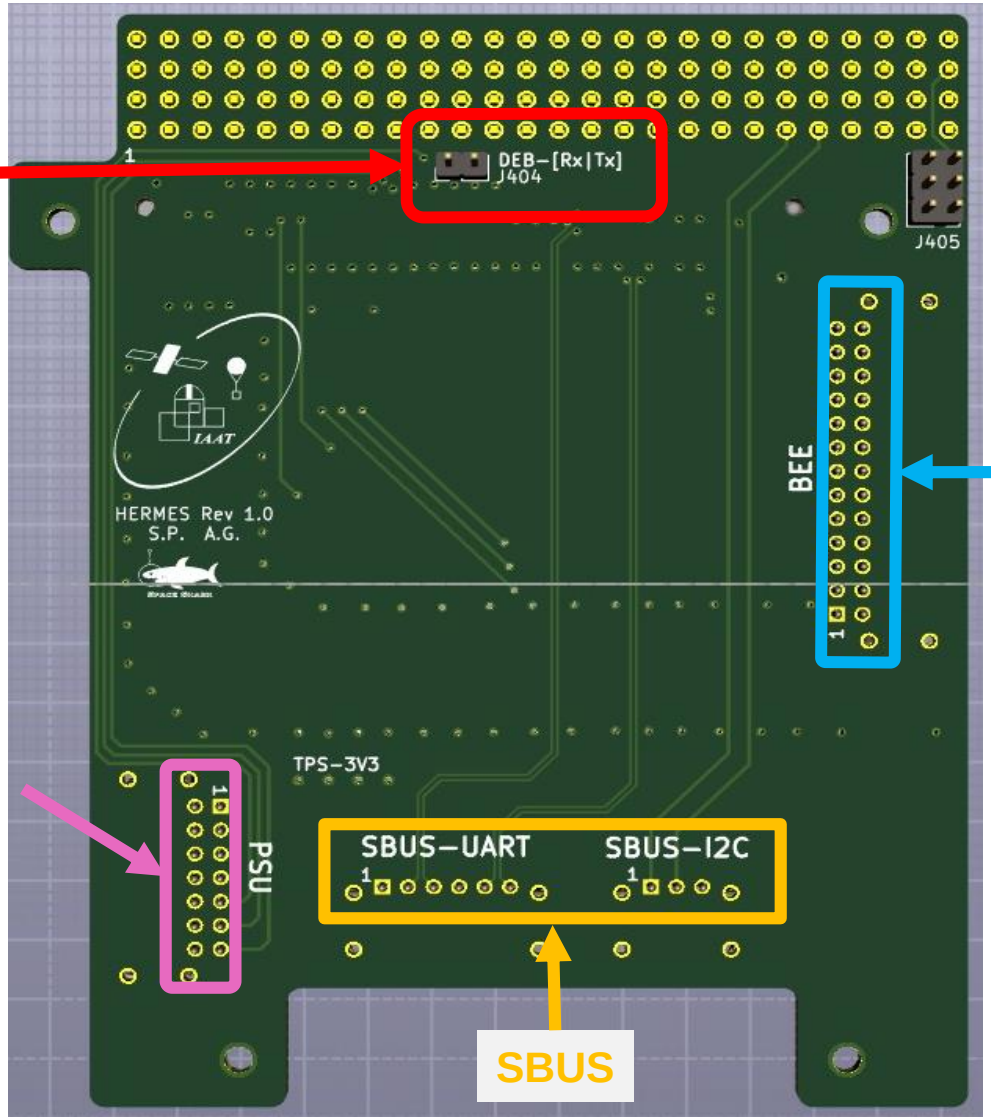
* But we can talk...



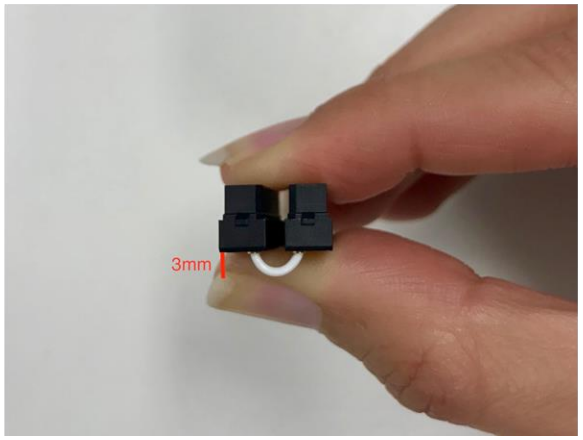
Daughterboard design

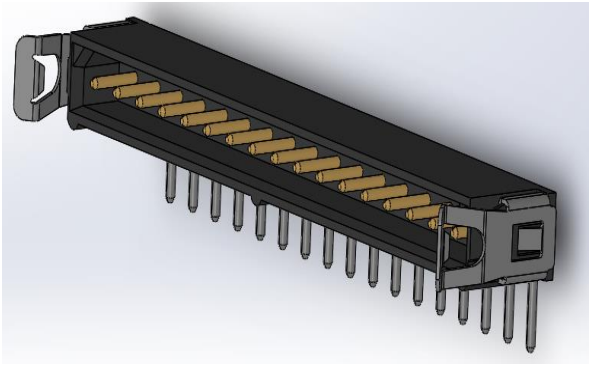
STATUS : FINISHED

Daughterboard design.



* Detailed pin-out of each connector at the P/L ICD





Harwin connectors

SW (Firmware) design

STATUS : ADVANCED

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All Comms & Memory management implemented

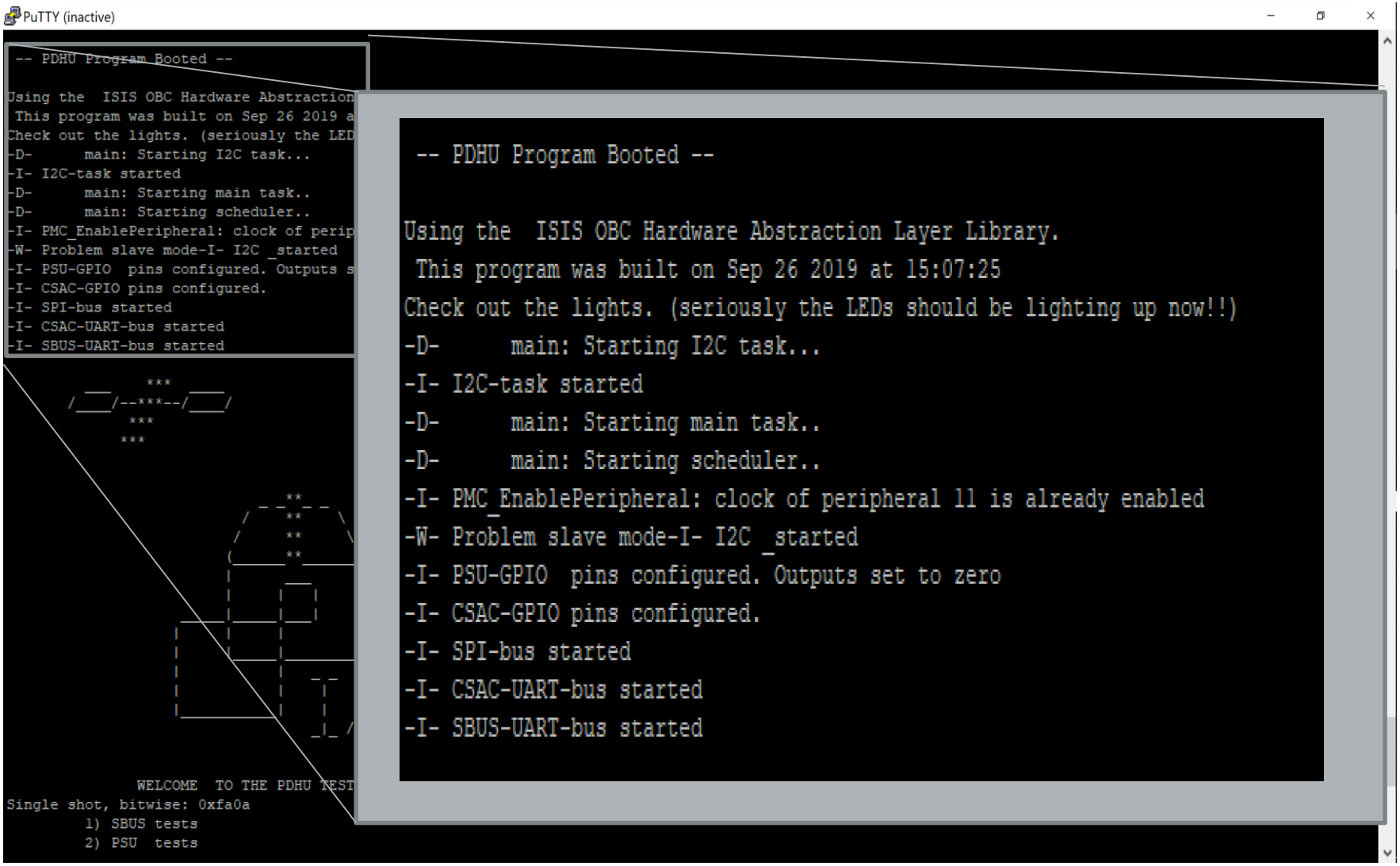
PuTTY (inactive)

```
 -- PDHU Program Booted --

Using the  ISIS OBC Hardware Abstraction Layer Library.
 This program was built on Sep 26 2019 at 15:07:25
Check out the lights. (seriously the LEDs should be lighting up now!!)
-D-      main: Starting I2C task...
-I- I2C-task started
-D-      main: Starting main task..
-D-      main: Starting scheduler..
-I- PMC_EnablePeripheral: clock of peripheral 11 is already enabled
-W- Problem slave mode-I- I2C _started
-I- PSU-GPIO  pins configured. Outputs set to zero
-I- CSAC-GPIO pins configured.
-I- SPI-bus started
-I- CSAC-UART-bus started
-I- SBUS-UART-bus started
```

```
             WELCOME  TO THE PDHU TEST SUITE
Single shot, bitwise: 0xfa0a
        1) SBUS tests
        2) PSU  tests
```

All Comms & Memory management implemented



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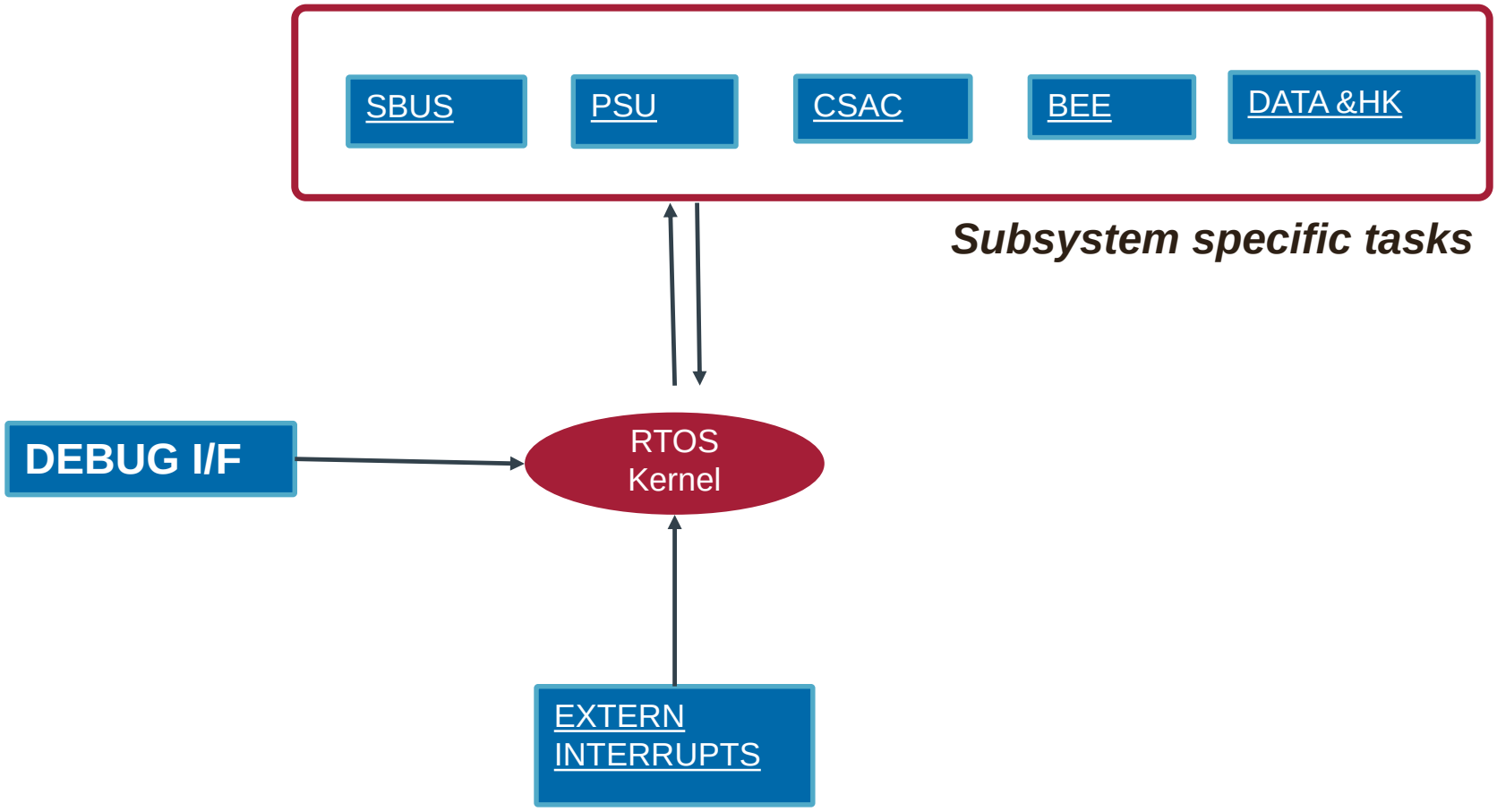
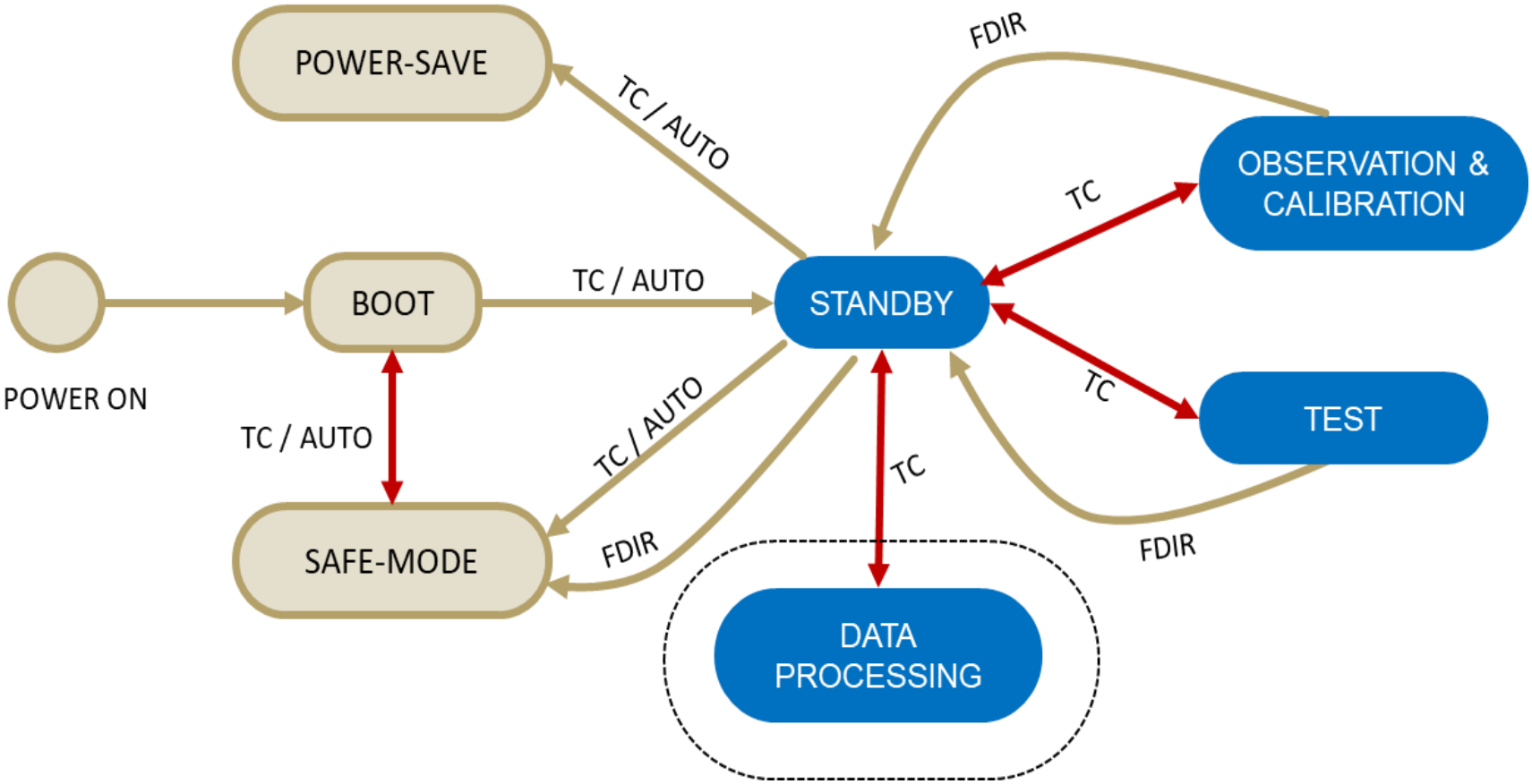
TEST SUITE Architecture



Operational modes

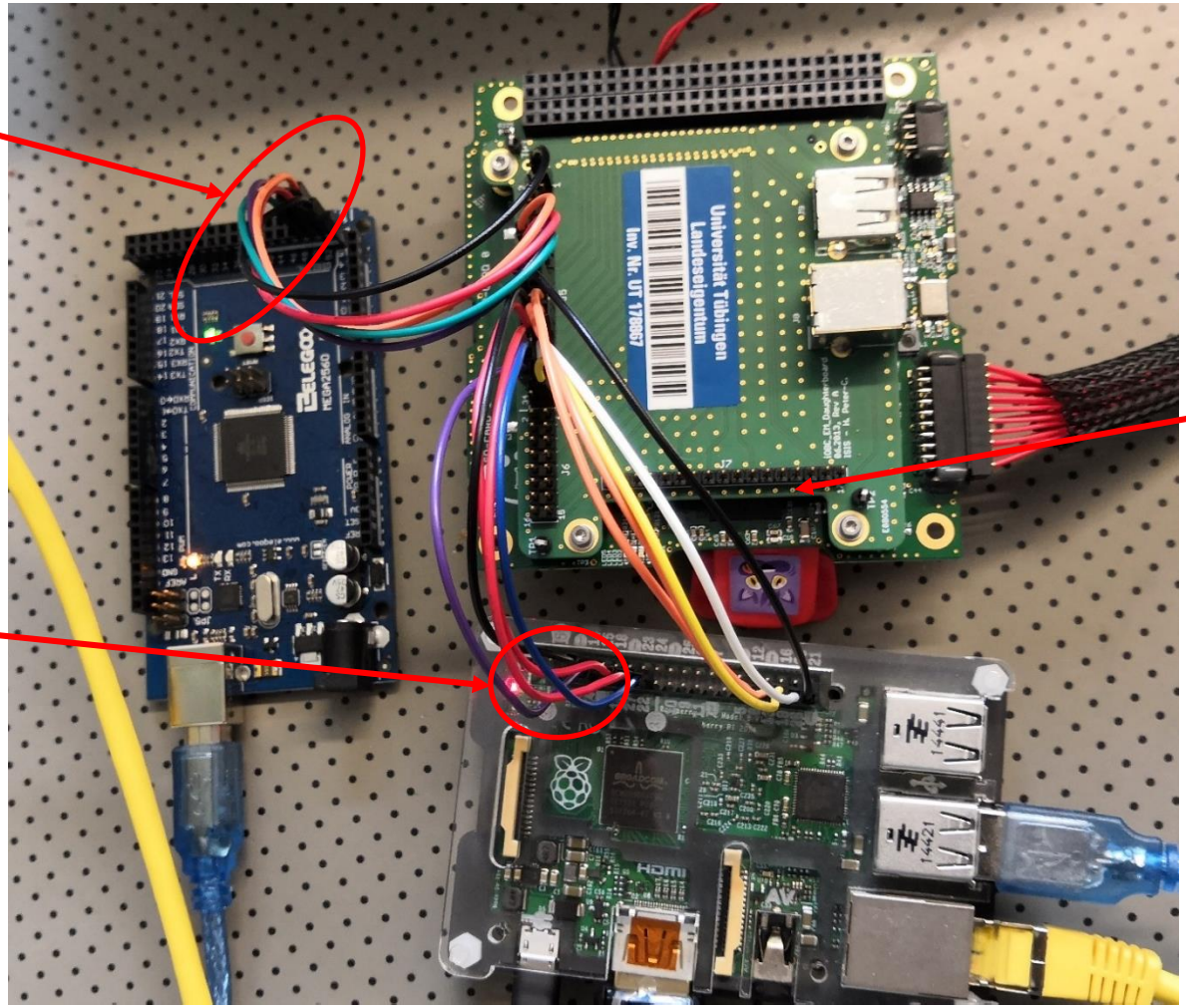


BREADBOARD TESTS

First Configuration

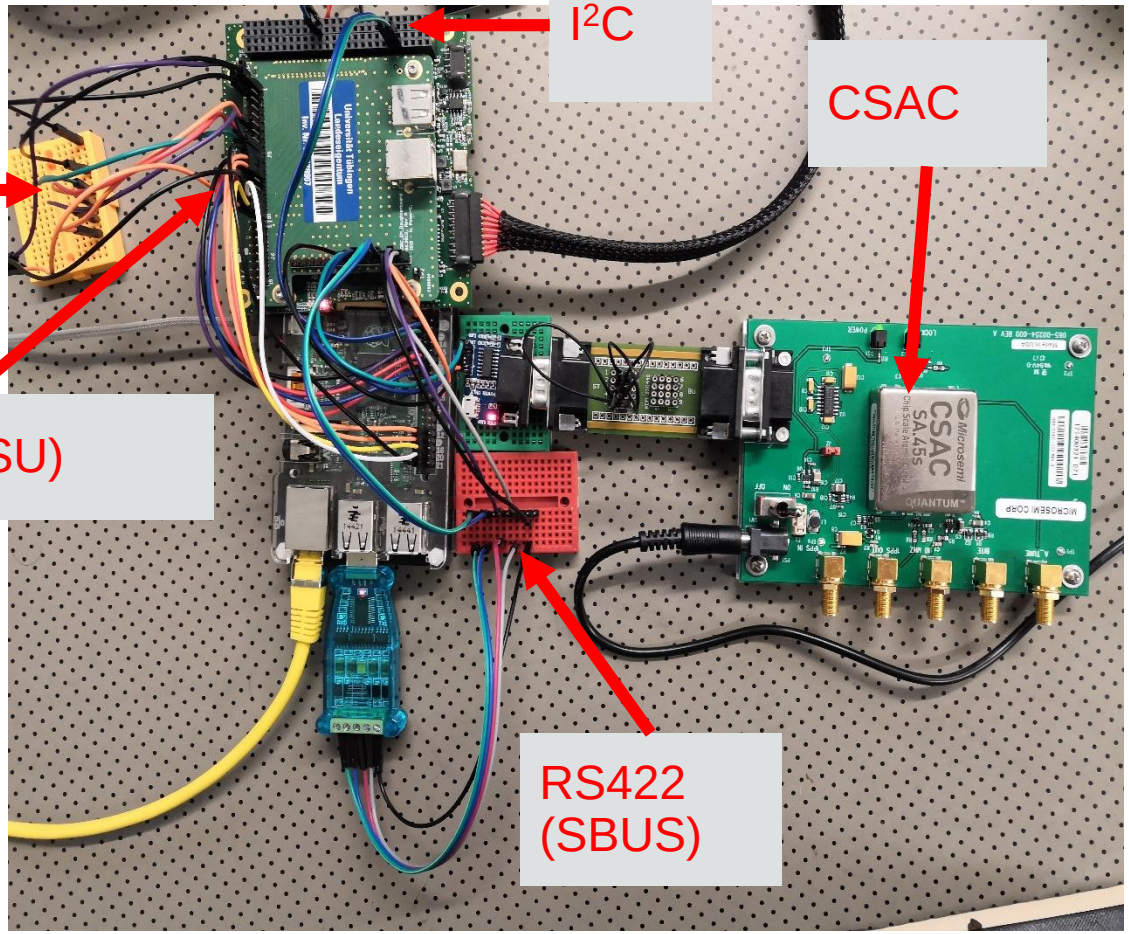
SPI (BEE)

Switches, Resets & Status



UART (CSAC)

Advanced Configuration



SPI TEST RESULTS

- We tested the “default buffer” of the SPI driver at the PDHU. This buffer is big enough to accept the 7800 (~0.5 Mbits), coming from the BEE’s buffer (65 536 bytes or 8192 events).
- After this buffer is filled, we stop the data transmission and save the data to the SD-CARD. This process takes **66 ms**.

Yellow line (CH1) is the Chip select.

Purple line (CH3) is the MISO line.

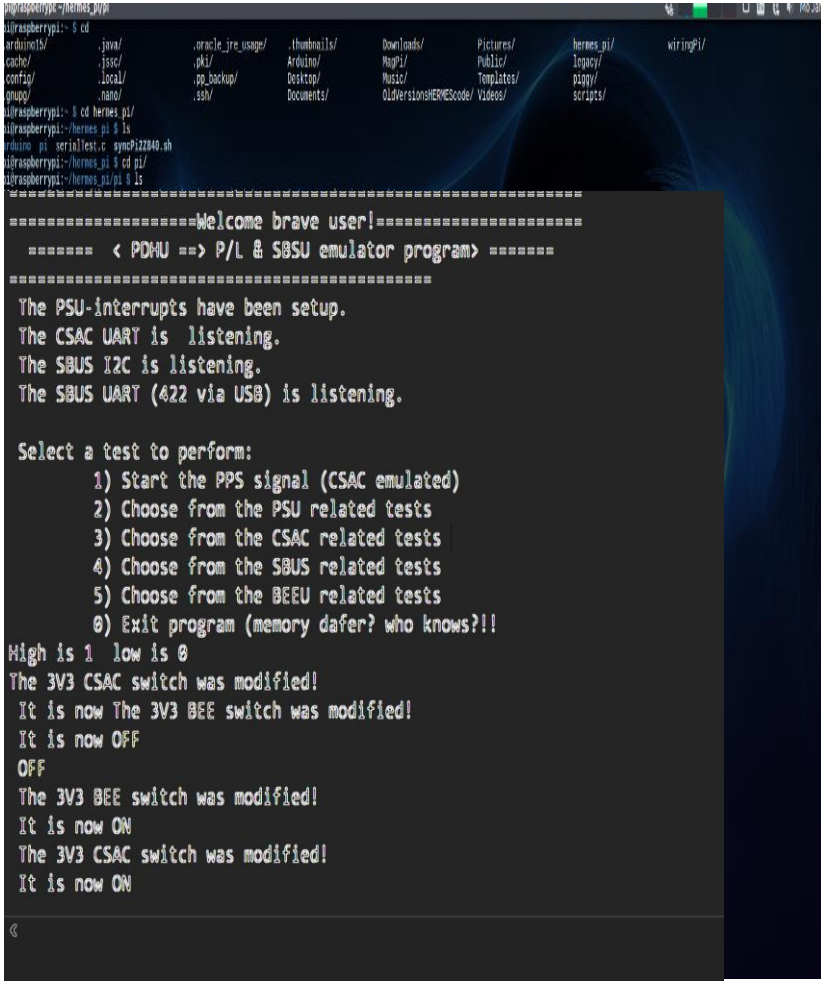
Data Saving to the SD-Card
66 ms

First Data transmission
65 536 Bytes at 10MiBts/s
52.48 ms

Second Data transmission
65 536 Bytes at 10MiBts/s
118.48 ms after beginning of first data transmission

I/F Breadboard Tests

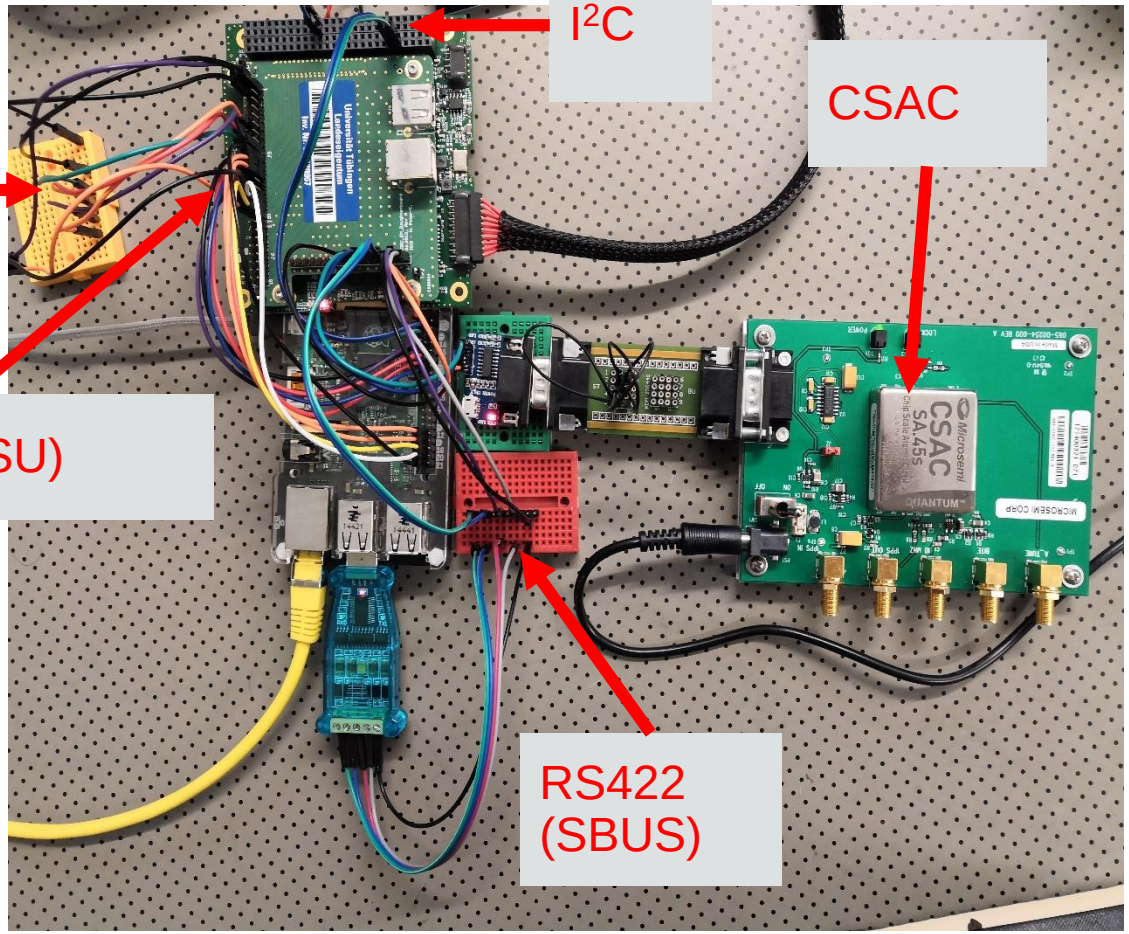
```
              ==== Available PSU-related commands ====
              1) Turn ON (high) all switches
              2) Turn OFF (low) all switches
              3) Toggle the 3V3-RST-BEE  line
              4) Switch SC-3V3-BEE  ON/OFF
              5) Switch SC-3V3-CSAC ON/OFF
              6) Switch SC-5V0-FE   ON/OFF
              7) Switch SC-12V0-HV   ON/OFF
              8) Check the 3V3-STS-BEE line
              0) Print the level of all the PSU-related signals line
1
Perform more tests? (1=Yes, 0=No):
0

-I- PMC_DisablePeripheral: clock of peripheral 13 is not enabled


  ____________________________________


  ____________________________________
-D- Program has ended and (hopefully) there are no more tasks running.
-D- ... going to blinky mode...

  ____________________________________
```



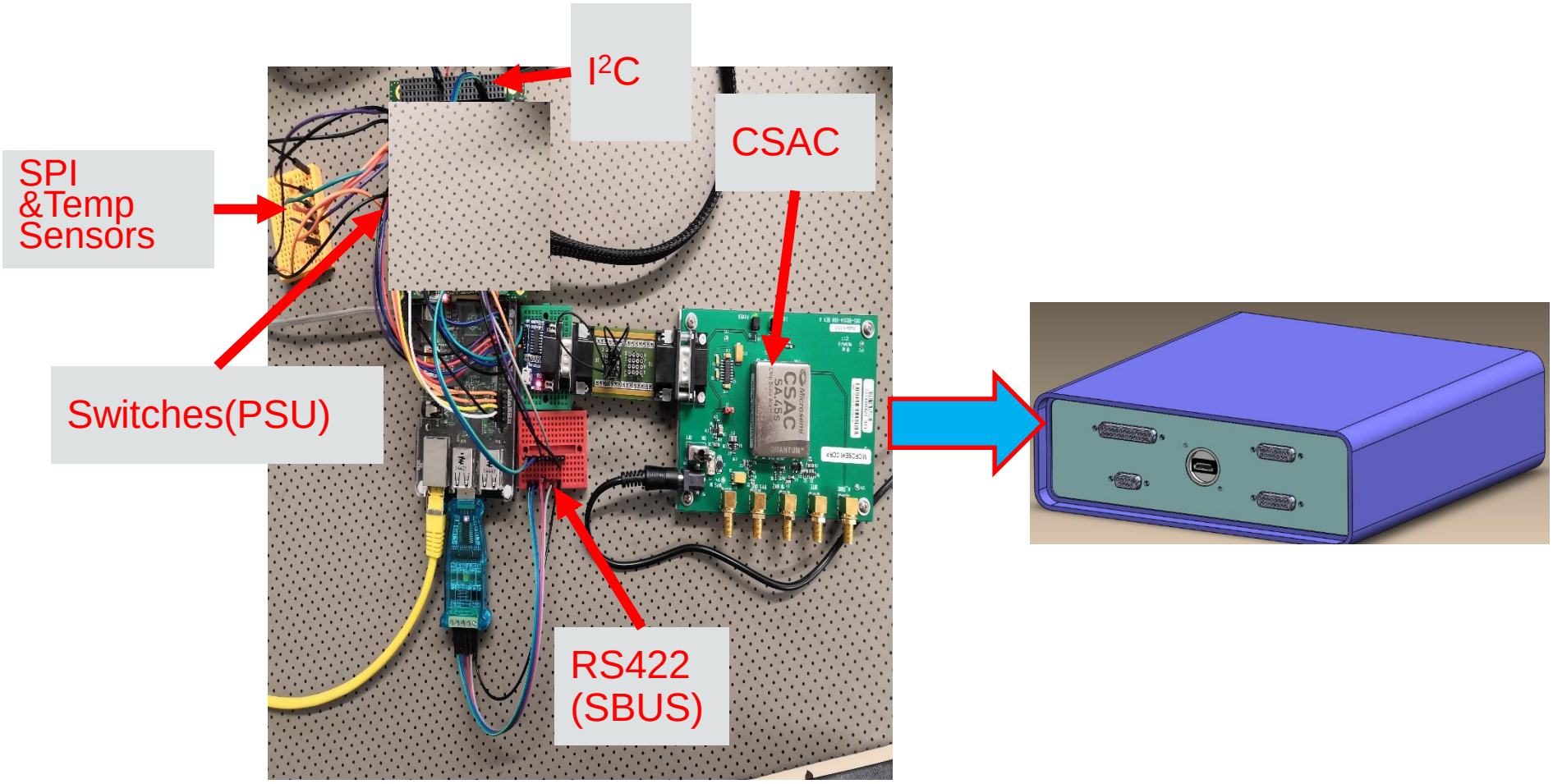
iOBC

P/L & S/C Simulator

Advanced Configuration



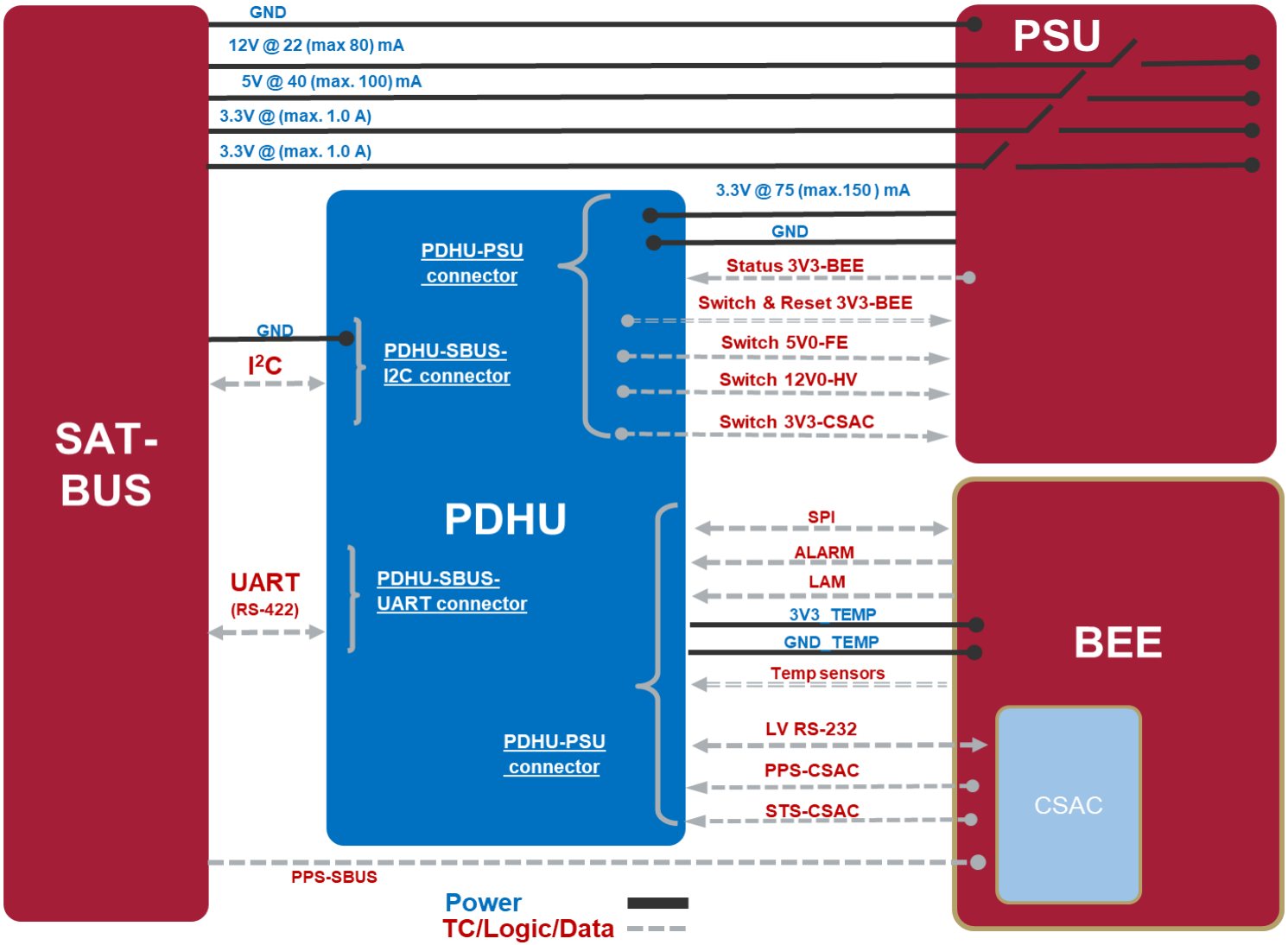
Towards the P/L & S/C Simulator



Next Steps & Status

- Finalize Task definitions per Operation Mode.
- Repeat previously done tests (on EM) now on DM.
- Daughteboard re-issue/ re-placement (if necessary takes a couple of weeks).
- Prepare all the accompanying documentation.
- DM iOBC already in production (ETA mid late February 2020). Re-placement takes **at least 2 months.**
- P/L & S/C Simulator design complete. Finalized unit on late February (Components already in house).

PDHU=>SBUS



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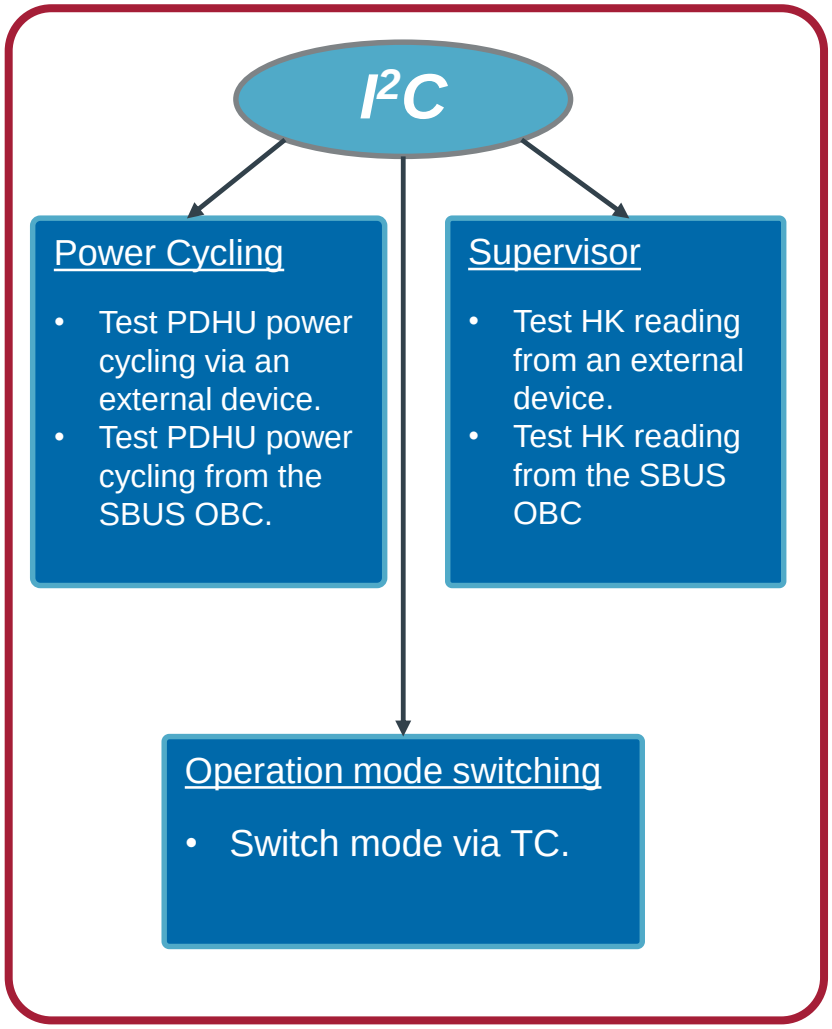
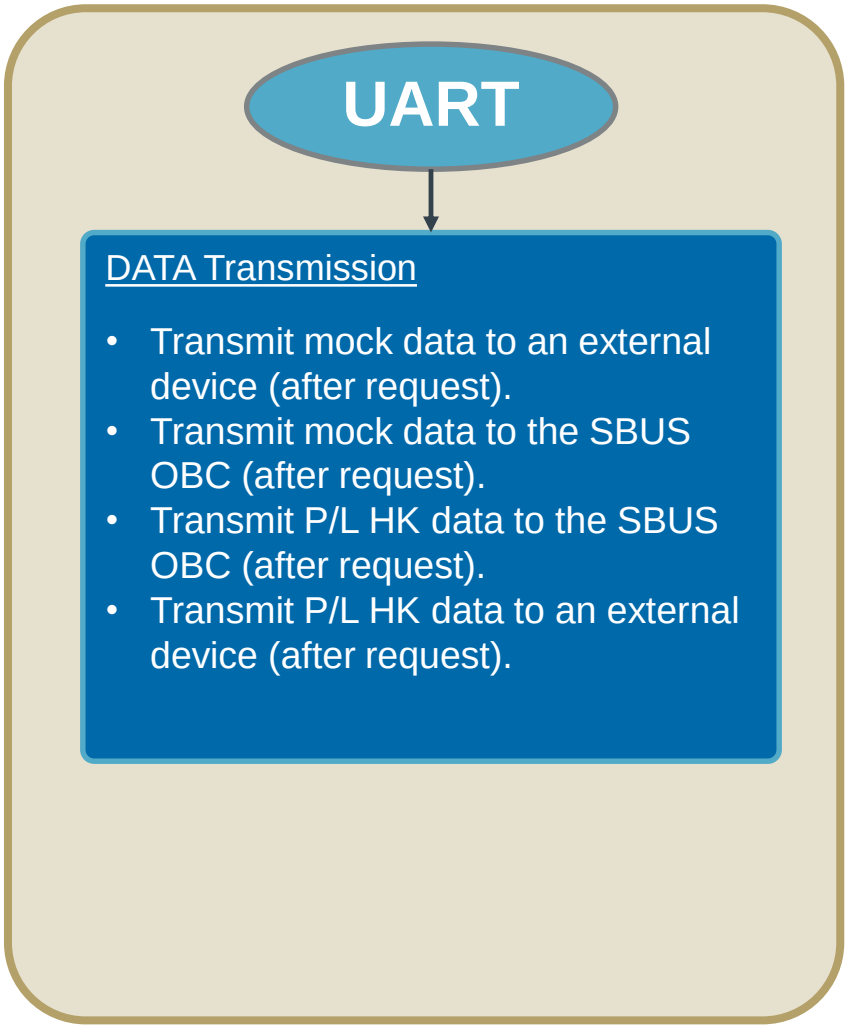
PDHU => SBUS





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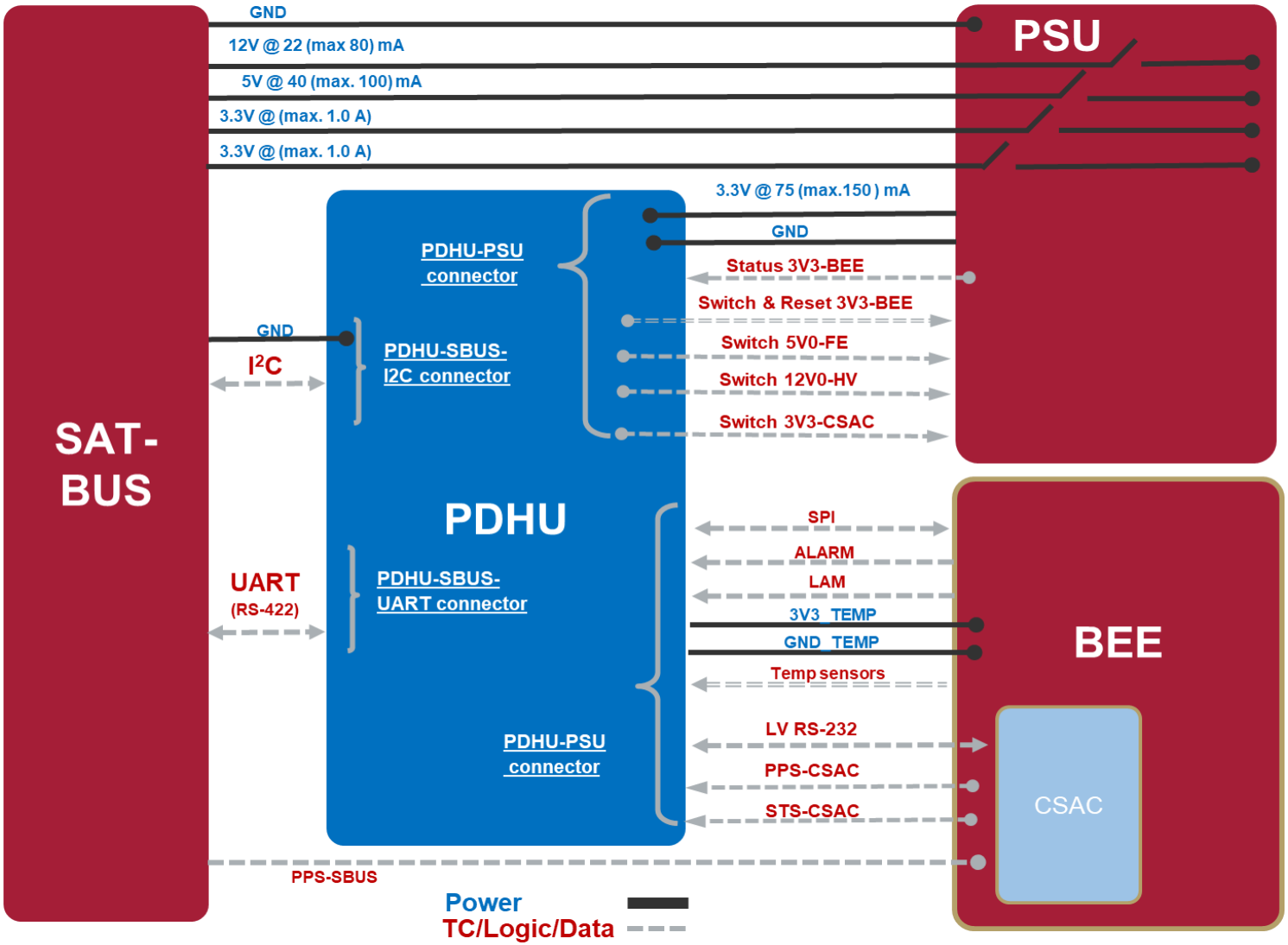
PDHU => SBUS

- Most of the tests can be done without the SBUS OBC.
- Test-harnesses can be re-used.
- Power consumption will be constantly monitored.
- Working on the extended description of the operative modes to identify more necessary tests.

PDHU=>P/L



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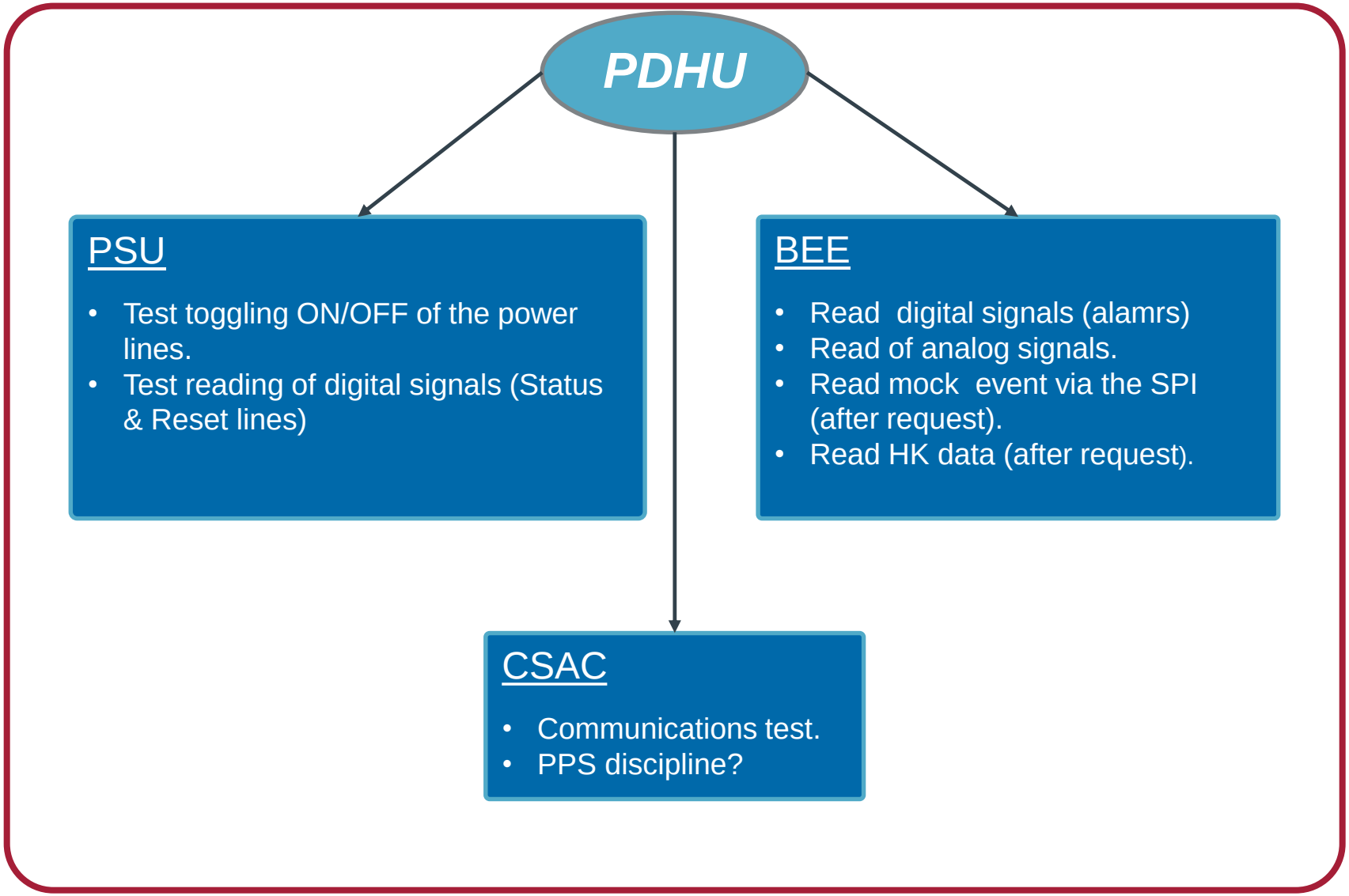
PDHU => P/L



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PDHU => P/L

- Test-harnesses can be re-used.
- Need mock-events to use for the tests.
- Power consumption will be constantly monitored.
- Most of the tests have already been done with the simulator… the "real tests" should follow.
- Dedicated documentation will follow.

Thank you.

Contact:

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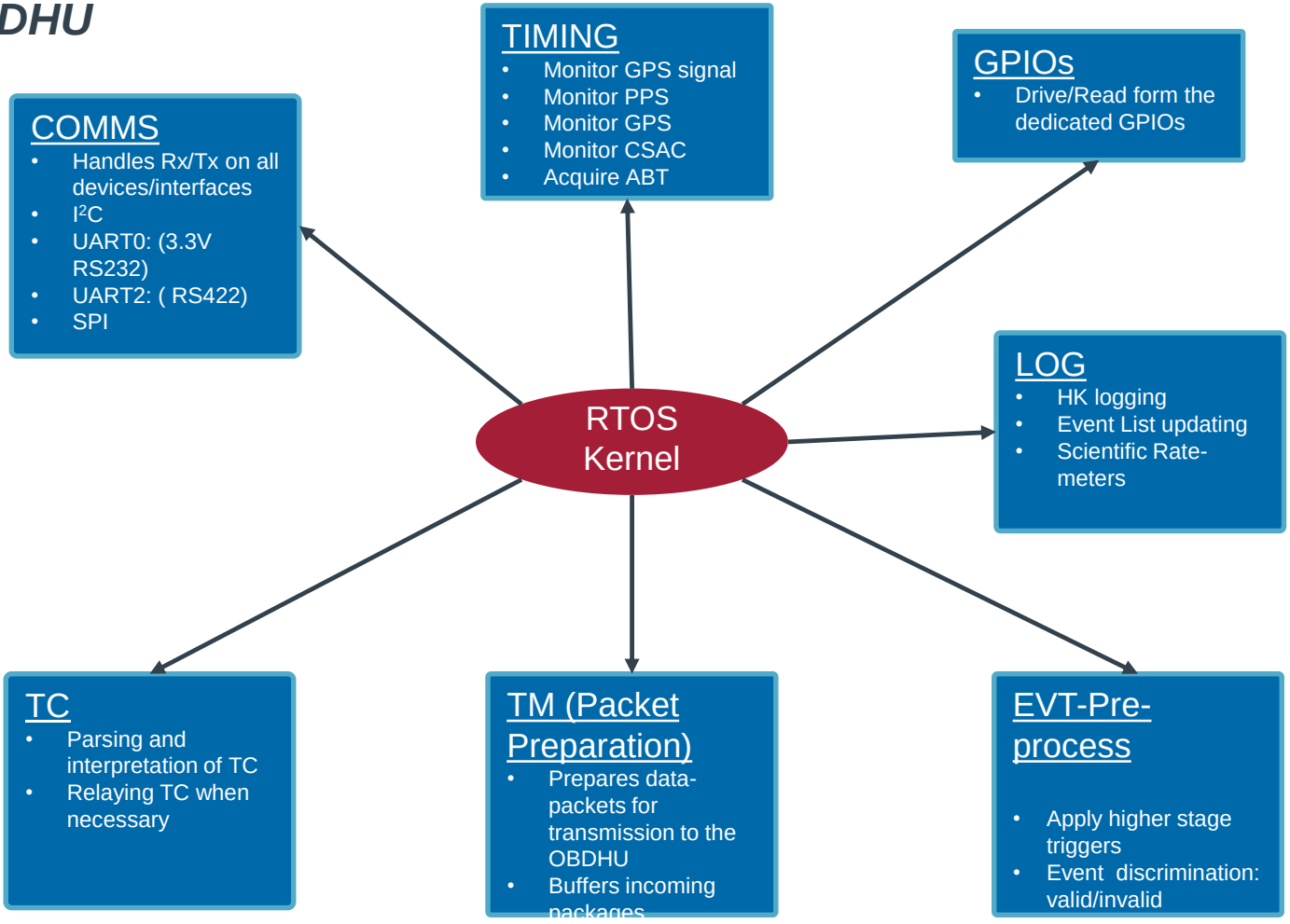
PDHU


TIMING
Monitor GPS signal
Monitor PPS
Monitor GPS
Monitor CSAC
Acquire ABT
GPIOs
Drive/Read form the dedicated GPIOs
COMMS
Handles Rx/Tx on all devices/interfaces
I²C
UART0: (3.3V RS232)
UART2: (RS422)
SPI
RTOS Kernel
LOG
HK logging
Event List updating
Scientific Rate-meters
TC
Parsing and interpretation of TC
Relaying TC when necessary
TM (Packet Preparation)
Prepares data-packets for transmission to the OBDHU
Buffers incoming packages
EVT-Pre-process
Apply higher stage triggers
Event discrimination: valid/invalid