SALT128 Testing

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SALT128 Test setups

Two main branches:

- SALT128 prototype testing
  - PCB similar to the existing one
  - General purpose
  - Compatible with VLDB, COMET, Flex, standalone
  - Immediate production, first priority
- SALT128 production testing
  - To be used with a probe station in the wafer (before dicing)
  - Automate testing as much as possible
  - Specific purpose
  - Intend to construct it around COMET board
  - Interaction with probe station, analysis software, results database, etc
  - Need to design tests (analogue performance, digital functionality, switching coverage, pll performance, PSRR, ADC performance, etc)

SALT128 Prototype TB

Input I need:

- ASIC: New pinout, exact dimensions, detailed pin functionality ✓
- Detailed list of tests to be done: sort out the changes if any (I heard common mode?)
- Feedback: is there anything we would like to change/improve? ✓
- List of cards to deliver: Who wants them? How many? When?

Production process only when all input is available: Today t=0.

- 3 or 4 weeks for design (inc. circulation, review, …). Depends on the changes to make
  - 1st or 2nd week of June ?
- 2 weeks for PCB production (standard procedure) 3rd or 4th week of June ?
  - ~~1 week express: need to check for availability, very expensive (x2)~~
  - ~~Component sourcing in parallel. It can be slower than 1 week.~~
- 1 week for component soldering (once they start...)
  - Yes, but be aware of availability issues. 1/2 weeks waiting? Outsourcing it?
- 2 days for wire bonding (once they start...)
  - Outsourcing/Volunteers? Marina volunteered yesterday.
  - Ship to Syracuse by mid-July?

SALT128 Prototype TB

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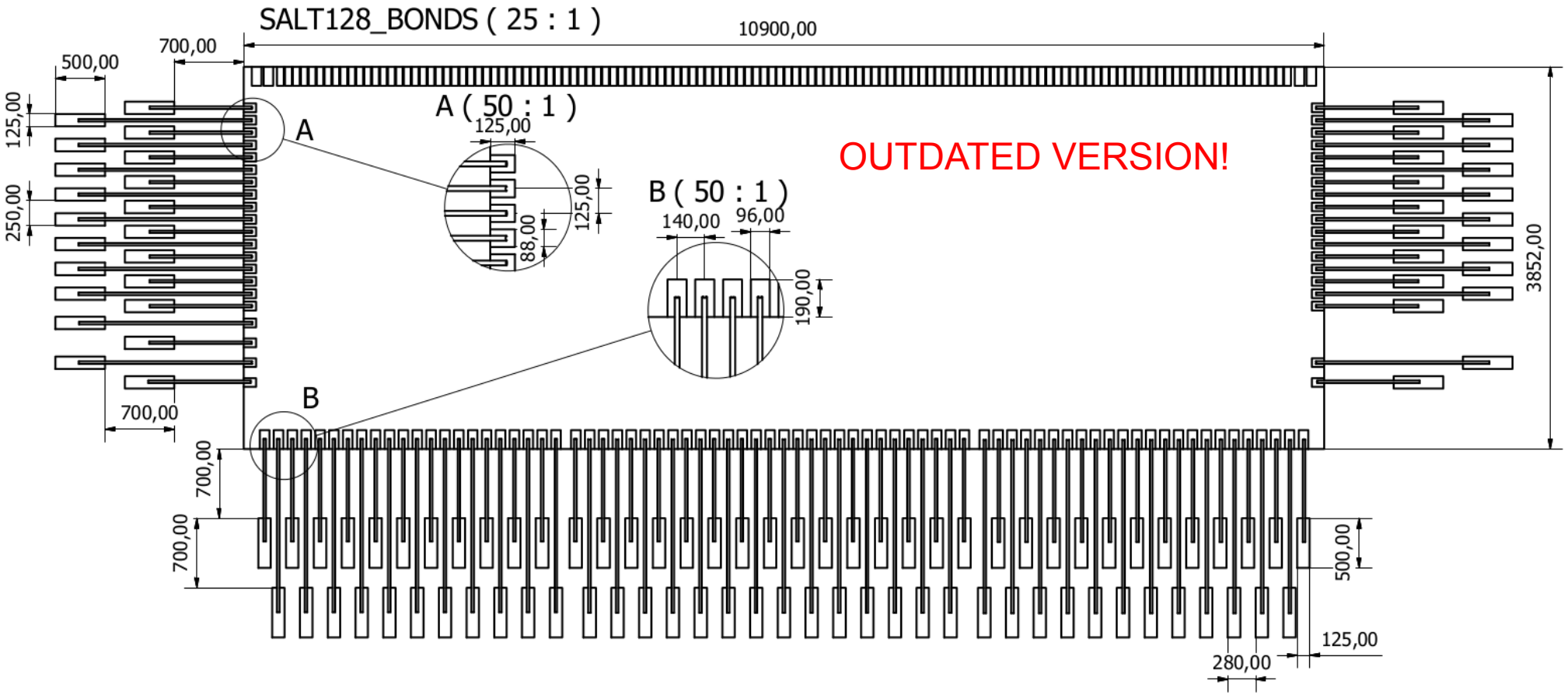

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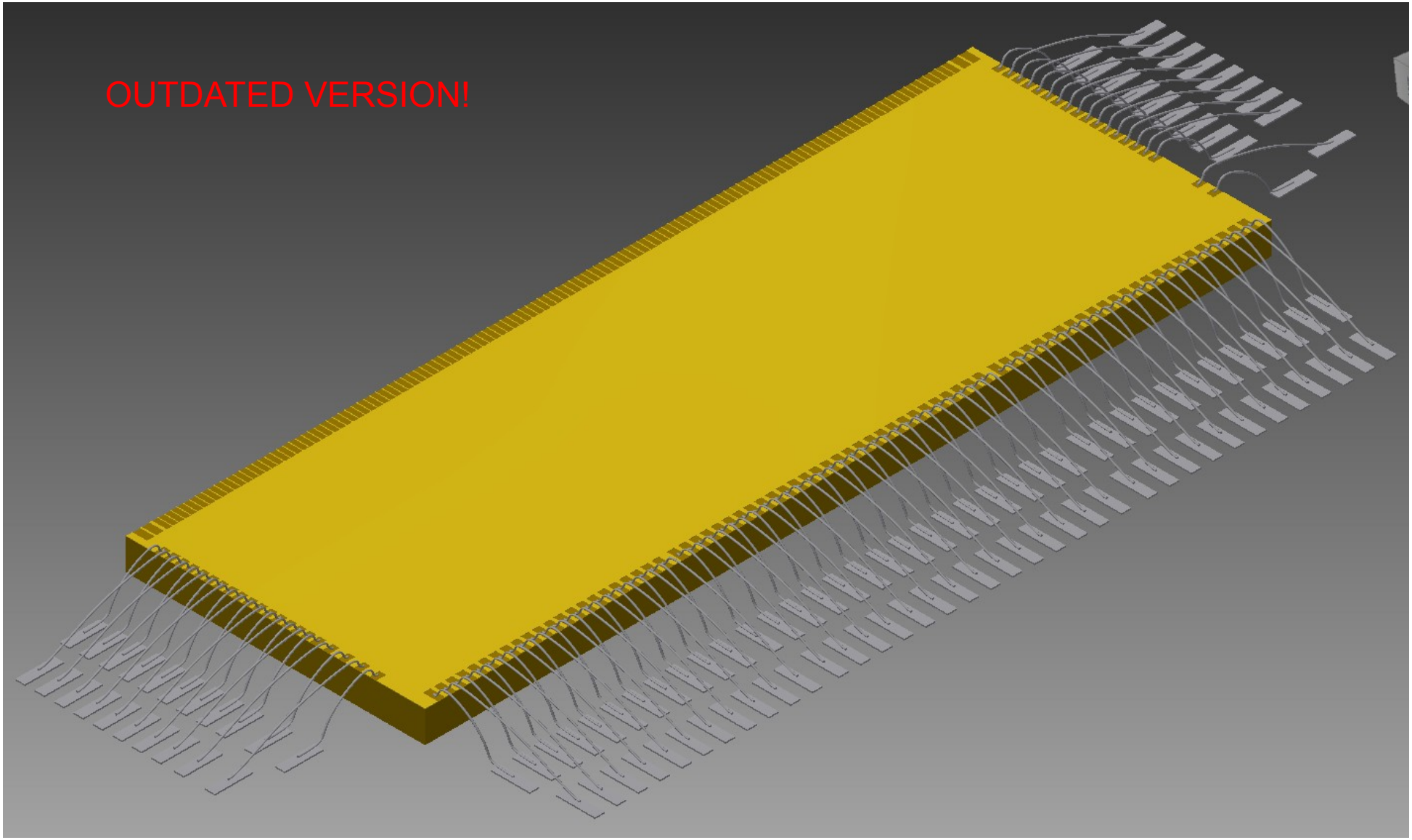
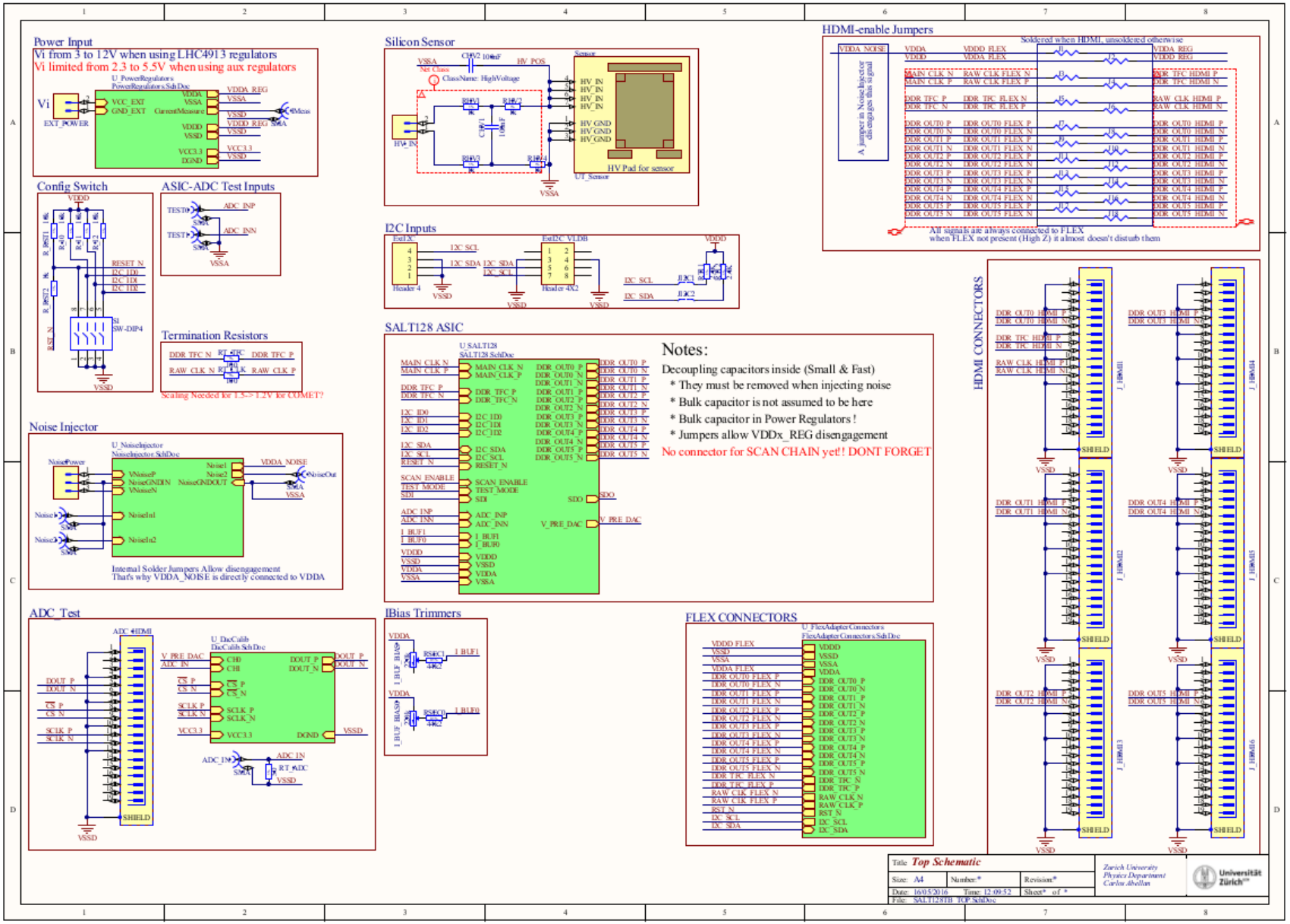


SALT128 Prototype TB

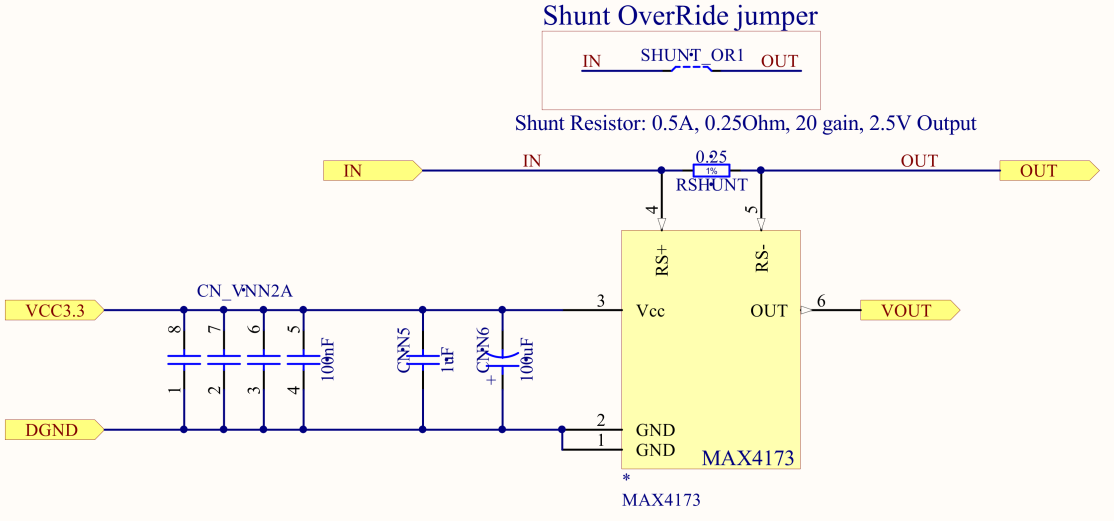
Schematics well advanced:



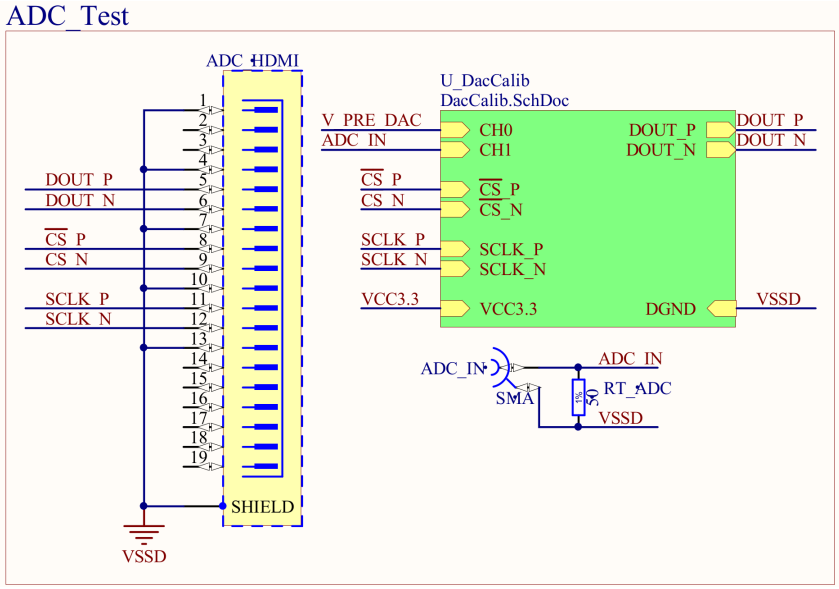
SALT128 Prototype TB

Schematics well advanced. Main changes:

- Less regulators: no one used them anyway...
- Power consumption reading now COTS (MAX4173)



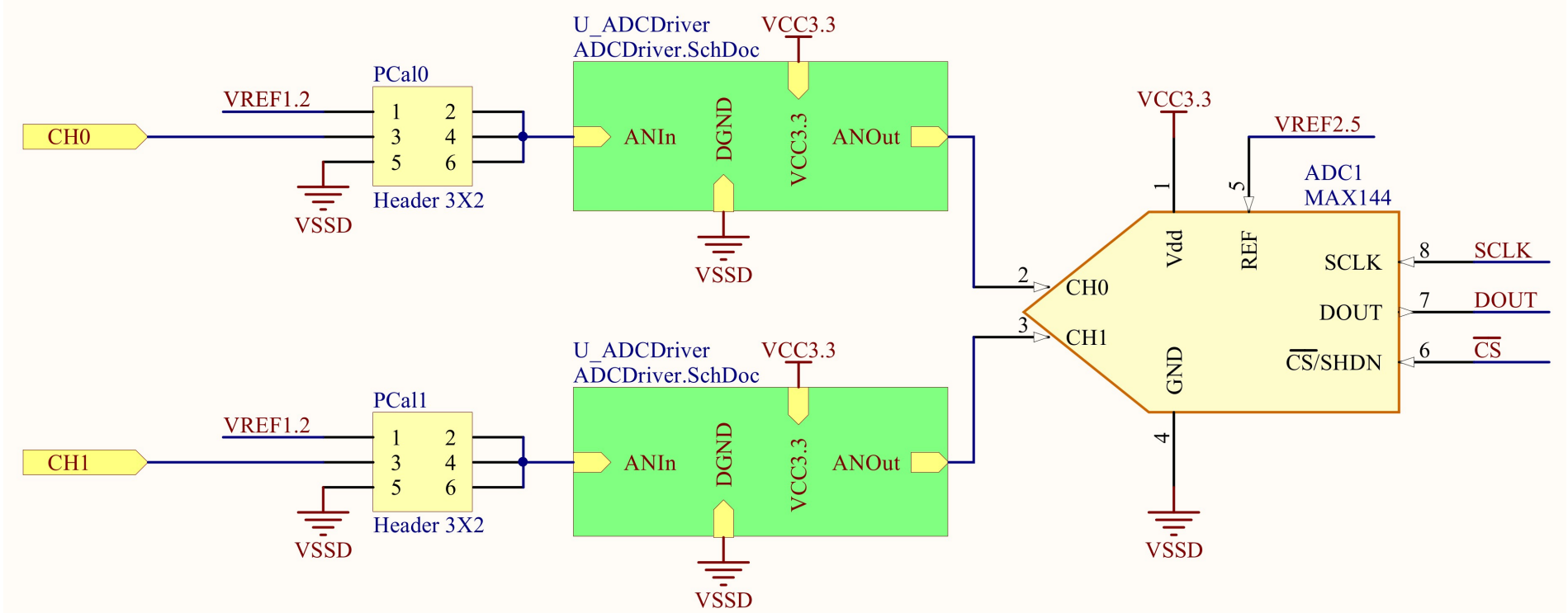
- ASIC now uses 6 e-links instead of 3: where should I map them?
- Profit to test the ADC that will be used for production testing. The e-link configuration is compatible with the ones for SALT.
  - We need to sample 12 channels!!
    - Since it's DC, maybe a relay?



SALT128 Prototype TB

ADC Testing:

- We use a MAX144 2 channel 12 bit @ 100KSPS ADC to sample a 5 bit DAC (could seem like an overkill)



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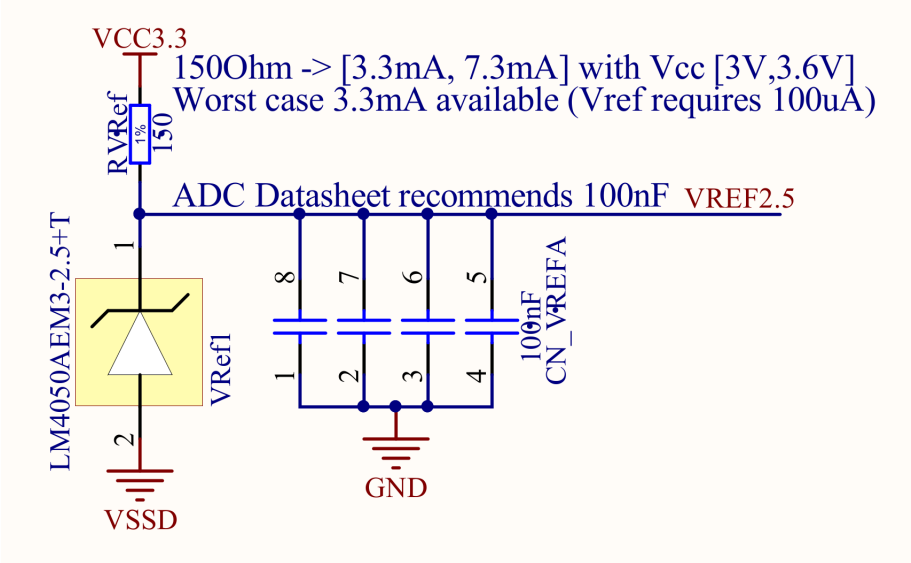
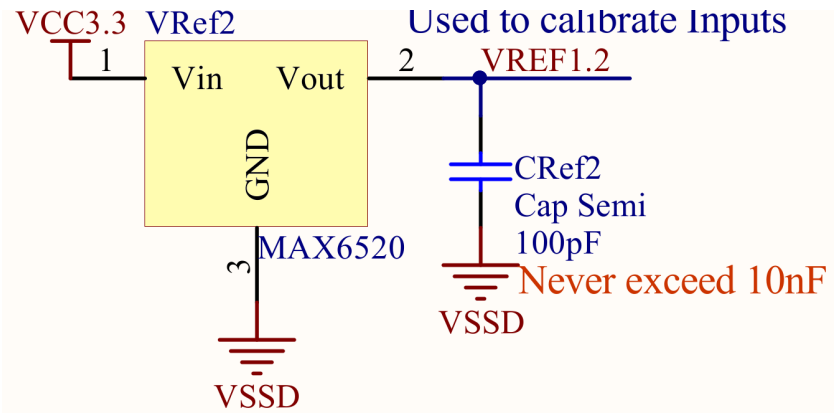
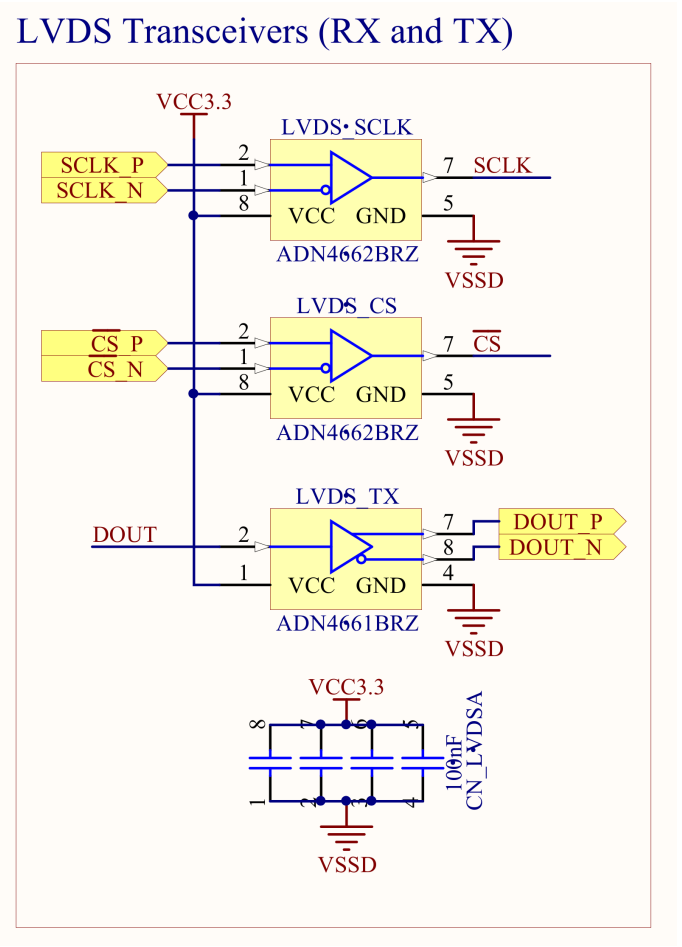


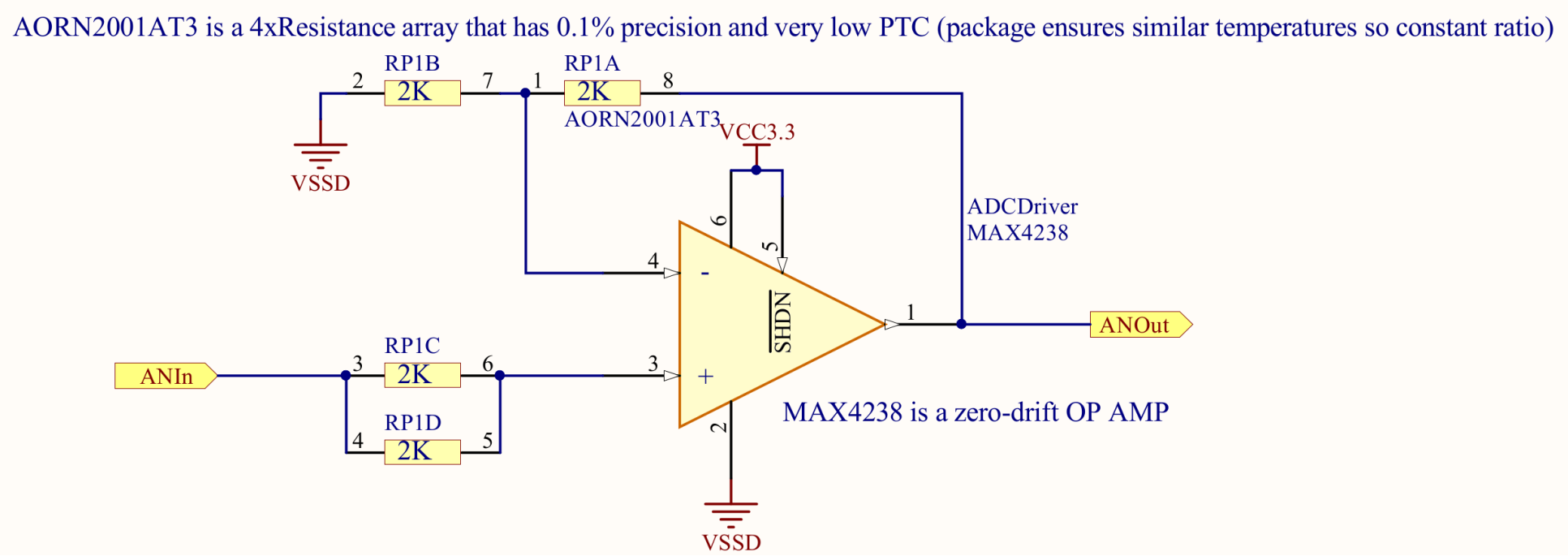




SALT128 Prototype TB

ADC Testing:

- We use a MAX4238 (Zero drift) together with precision resistors.
- x2 gain and only used from 0.2V to 0.8V gives better linearity. Uses a compensated V source to calibrate it further.
  - This gives a [0.4, 1.6] output range (smaller than ADC dynamics, but we have many bits left).



SALT128 Production TB

Production process similar to the proto_TB one:

- [New design (I don't dare guesstimating) + 2 weeks for PCB production (standard procedure)+1/2 weeks for component soldering (once they start...)] * 1.5 safety factor
  - Prototype Test Board (a big part can be reused) +
    - ADC to sample and calibrate internal DACs (+ OP amps, + ...)
    - Precise power consumption measurement ✓
    - Any other requests? (Depends on what you want to t✓) Now or never?

- Probe card: I never designed one. I need to learn the basics, find a company that does it, get time and price estimations, … Anyone with experience can help me with that?
  - I talked to the people who designed the test system for, some conclusions:
    - Their card has 110 needles (to have an order of magnitude): (We want 247!!)
      - 5x Boards = around 12k€
        - We really want to be sure it's perfect before submitting
      - Delivery time estimated in 9 weeks **once everything is accepted**
        - We have to foresee a pipeline not to be stopped while we wait
      - The manufacturer keeps some manufacturing information private
        - We give instructions and they give back closed products, will require several iterations to make sure there is no communication failure (we only want to do it once!)

SALT128 Production TB

Input I need:

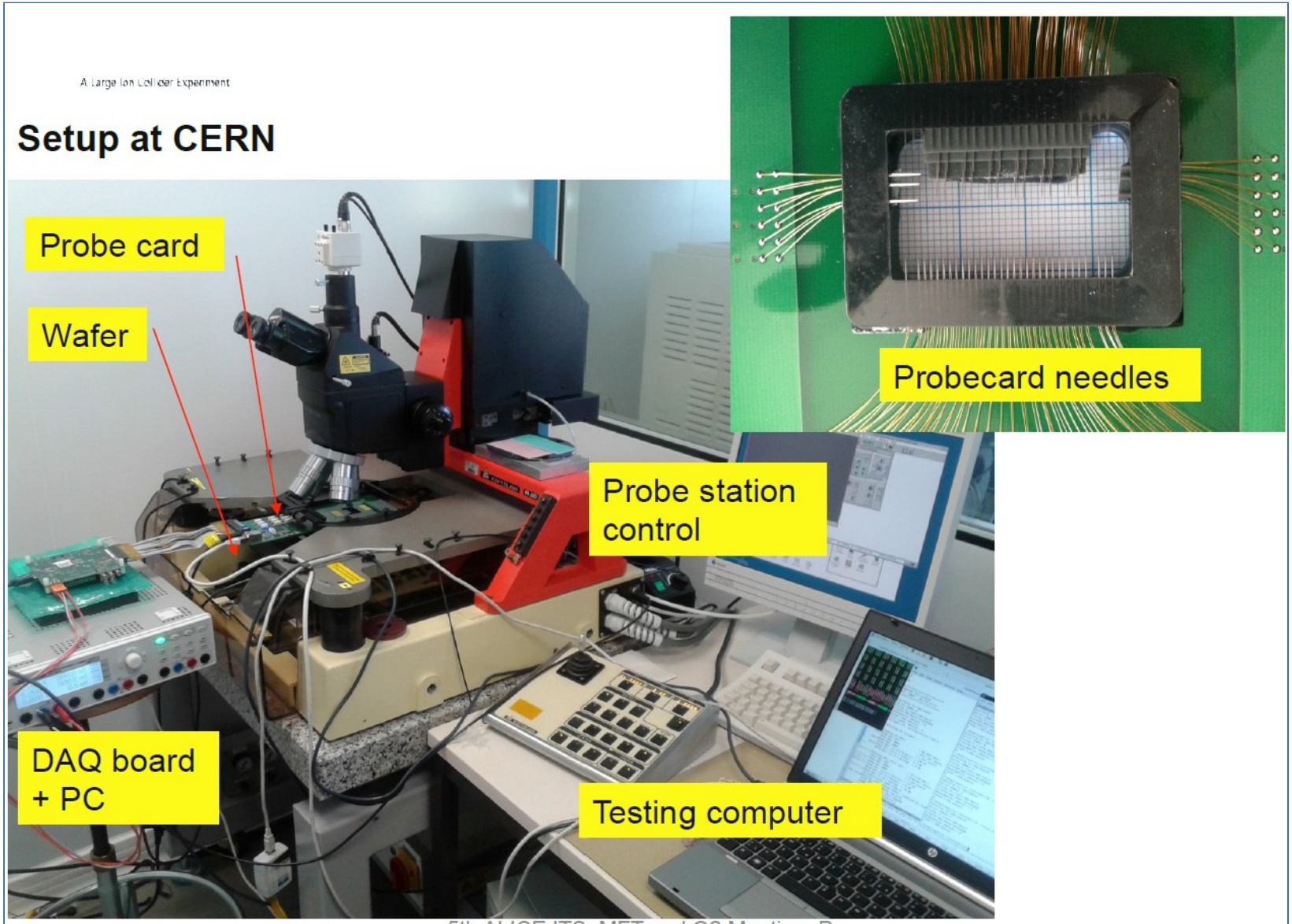
- Results of the prototype testing: will drive the production tests
- Full-featured COMET board + adequate mini-HDMI daughter boards.
- **Detailed list of tests to be done**, to plan for:
  - Analysis software: Chris Betancourt, Iaroslava Bezshyiko (from Zurich). Online data analysis, report generation, result management, ...
  - Hardware design: automate the measurements (Carlos)
    - Probe card + reuse as much as possible the proto_TB design
  - Probe station interface (MariaPilar)
    - We never operated one. Will require some time to learn.
  - System wide design:
    - Chuck? Wafer manipulation? Clean room equipment? ESD cautions?
  - **HHRR**, logistics, coordination with stave production...
    - Fact: 1 second of test/ ASIC x 6kASICs = 1.67h of testing
      - 10 mins of test / ASIC = 25 working weeks = 6.25 months
        (8h/day, 5 day/week)

SALT128 Production TB

What we're aiming for:

A Large Ion Collider Experiment

Setup at CERN



5th ALICE ITS, MFT and O2 Meeting, P. Riedler

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SALT128 Production TB

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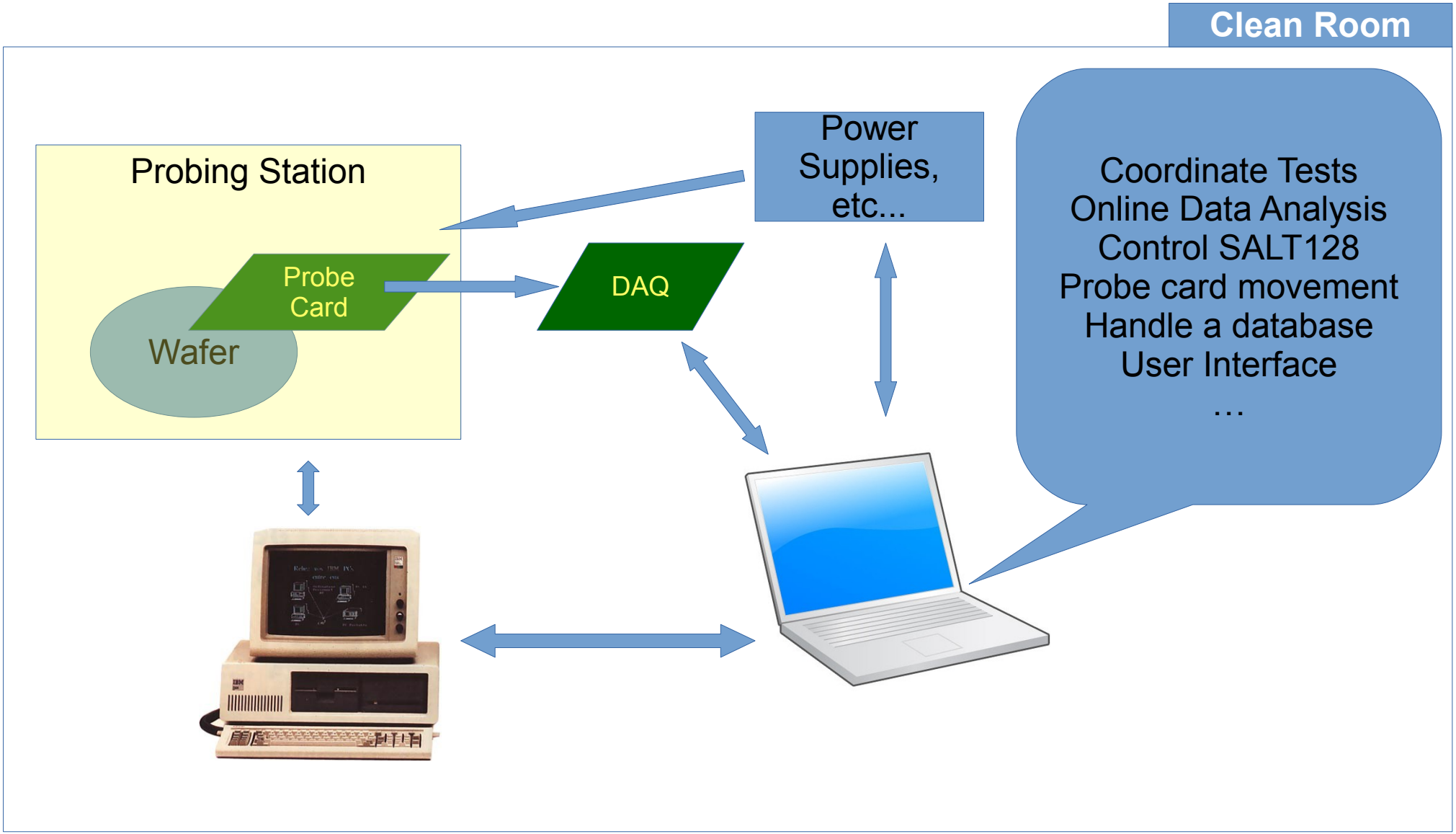

Conclusions

For the prototype testing:

- Where should I put the extra pairs? (Fit cable mapping, ...)
  - Will upload schematics to Twiki.
- Need to fix a date for the schematic review.
- A couple of weeks for routing + PCB review
- Production delays

For the production testing:

- Any help from experienced people will be highly appreciated
- I already contacted other groups at CERN who did it, looks like it will take some work
  - 9 weeks production delay!!
  - Very expensive, no room for failure... (will be even slower)
- Full system design: analysis SW, control SW, HW tools, procedures, …

– **Detailed list of tests to be done**

- We're going to be busy quite some time with that.