

Introduction (Ingrid)

Deliverable of DESY for ITk.

Q on FTE → this are what we think we need, and what we think we have

Modules (Serhat)

Module production will always drive the production

Clean water → we need bigger system, new filter for current machine.

- It is needed for ultrasound bath. Need to ask Adam and Carina.
- Marcel: Maybe something left over.
- Sergio: need to do this in proper channel, may have felt through the cracks when Uwe retired

Dustmeter:

- Sergio: It's the way the measurement is done: Grafana shows average over 3 minutes. Need to improve readout, maybe not doable with current system.
- Ingrid: ask Ingo, we have the same, he wanted to help a long time ago

Temperature in cleanroom:

- Sergio: Probably depends on the external temperature
- Celine: MKK still not delivered the regulator

Vacuum in 25c:

- Sergio: in Zeuthen there should be more parallelisation, they have a single pump. We may have many small leaks.
- Carl: we don't have problems with vacuum system, one pump. We had issues with previous pump, but this one works.
 - Sarah: how many modules glued in parallel?
 - Carl: 2, maybe 3
 - Ingrid: we should get Ingo here to help us with this

Visual inspection with photobox should become much faster

- Christian: most difficult part is to get sensor back from chuck to envelope. Is there any way to use tools to pick-up tools and place them back?
- Celine: use vacuum pen, not the one with silicone cup, but one Naomi uses one
- Ingrid: but she is not using large sensors, create statics
- Christian: with manual pick-up tools there is no space to use these
- Sergio: you can lower the chuck as low as possible
- To be discussed with Ingo/Carl

HV tabbing

- Celine: Optimisation of parameters still to be done
- Ingrid: can Eric actually work one day per week? Can Eric do this task once per week? Eric can do this

- Sarah: yes, but his name appears elsewhere
- Ingrid: let's put Eric on this task and find other people for other tasks
- Celine: Things change over time and power cycles of machine. In principle it's 2 days, but...
- Christian: potential for descope. Ingo thinks it's too much, maybe descope.
 - Ingrid: we need to descope, to go through production
 - Sergio: reality will kick-in
 - Sarah: we need to say it in the community, other institutes may have many many people and can afford not to descope

Pull testing

- Sarah: this is a topic that needs to be cover by some person that we don't have yet
- Sergio: how easy for a non-highly trained person to do this?
- Celine: this is very easy.
- Ingrid: is the person from Belle ok?
- Celine: could be also done by other personnel
- Sergio: bond pull testing is a big topic.
 - Early arrival of EoS w.r.t. rest will help a lot here

Gluing:

- Sergio: have we optimised our setup for true blue?
 - Yes, we can
 - Sergio: How long does parametrisation with ages take?
 - Serhat: 2 afternoons
 - Christian: getting the calibration was a long process
 - Sarah: we saw discrepancies between batches. We can check expiration date and adjust calibration depending on age
 - Sergio: this sounds ok in theory, is it ok in practise?
 - Sarah: easy to use
 - Sergio: you see the same pattern using this approach?
 - Serhat: comparing 2 batches, it looked ok
- **Not enough people** for production. 1 technician, 1 fellow more

Metrology

- Easy to do, we need to train one person extra
- Sergio: are all programs ready?
 - Serhat: yes. To be updated because of different powerboards, but easy

Bonding

- **Single person is not enough, more person power is absolutely needed.**
- Sergio: only from module side, with production in mind (6 sensors), how much time does it require?
 - Celine: we currently plan 4 days for 6 modules, excluding pull test which is 1 day
 - Sergio: petal also needs wirebonding
 - Celine: this is day 5.
 - Sarah: parallelisation can be done, but we need people.
 - Sergio: person power is obvious, machine is also an issue: the wirebonder may break etc. This is tight.
 - Celine: we need time (months) to speed things up.
 - Sarah: wirebonds: 2 days, other 2 days are handling. It is tight, I don't think it's impossible.

- Marcel: we need back-up machine
- Sarah: Celine does not have time to program the G5 machine. Wirebonder is sensitive process, then debugging is non-trivial and can take a looong time.
- Ingrid: very difficult, but we have a bit of a solution. Dia coming in February (maybe in November already), plus another person in November. Eric could be extended in his 1day/week. There is a Bell electrical technician to be hired 1day/week. Doesn't know wirebonding, but he's experienced.
- Sarah: helpful, because we do have small tasks. We need another core bonder, but one-day person is helpful.
- Ingrid: so hard to find someone.
- Sarah: person has been contacted, has not replied yet. This is worrisome.
- Sarah: parameters change on bonder. Do we want to buy a tool to calibrate force? Ingo suggested to contact the company, but this could be too long.
 - Celine: the force change will imply a re-optimisation of the parameters (because they change)
 - Celine: the cost is 5-10kEuro.
 - Marcel: if 10kEuro can help to save a lot of time, we should buy it.
 - Ingrid: 10kEuro is not a problem

Planning:

- Sergio: expected rate: 6 crystals built per week. How realistic is this?
 - Sarah: it depends on person power, if speed things up. We have to do it.
 - Sergio: at least one person for wirebonding needs to show up.
 - Sarah: bonding is not limiting factor in 1 module/week. We have 2 part-time people on gluing (this includes optimisation). For example next 3 weeks there is no one that glues (because of workshops etc). We need person power.
 - Sergio: this is the usual problem of postdocs and phd students working on these
 - Sarah: it costs time to optimise procedure, but it will help in the future. Gluing at the moment takes so much time. By the time you get to glue, 3 hours are gone. We need to optimise procedures, beside personpower injection
 - Sarah: preliminary production plan, needs to be updated, after discussing with Celine and Christian.
 - Sergio: how long is production, then?
 - Sarah: 2.5 years

Module cold cycling

- Lisa: I may be available for helping with stuff on module building. 50% detector, cold box will be over at some time.
- What our problem is: we don't have the latest version of ITSDAQ, to be merged.
 - Sergio: this has been discussed this week. Is it harder than expected to progress?
 - Lisa: maybe even easier.
 - Lukas: surprising amount of progress this week. Merging of ITSDAQ locally, we need to do back fixing of both ITSDAQ and coldjiglib.
 - Ingrid: don't we also use it at testbeam and everywhere? Are you communicating with other people that use it?
 - Sergio: we have specific hardware that only Dortmund also has, so communication is different. This is sorted out, but things change in ITSDAQ and in parallel (separately) here on coldbox.

- Lisa: time needed to finish setup depends on what you mean: automated setup will not (should not) take several months.

Production readiness in Zeuthen and Humboldt (Carl)

- Ingrid: problem with wirebonding company, agreed date for calibration for wirebonding machine, the people did not show up twice. Ingrid will complain to the boss of the company, we pay and are relying on this service. We cannot have technicians in idle waiting for the person to show up
 - Sarah: is it only a calibration service?
 - Carl: I think it's just standard service
- Sarah: this (slide 6) is interesting: about 1 module/week to start with, similar to us. Doubling because you get better at it, but you can hit a threshold (e.g. amount of people). Interesting to discuss with Ingo
 - Ingrid: we don't have to ramp up as much as Zeuthen
 - Sarah: not sure every process can speed up by a factor 3
 - Carl: I'll make comment later in talk
- Sarah: outsourcing powerboards to Canada?
 - Carl: yes
 - Sergio: is it placing a new contract with Celestica, or just add more
 - Ingrid: discuss with Ingo
- Sarah: 4.56 modules per day. What is current production?
 - Carl: 3.5 modules/day is our current production goal.
 - Sarah: request to speed up is unrealistic
 - Ingrid: these numbers are already the absolute number. WE had reviews 2 years ago and Ingo was claiming that numbers needed are unrealistic with the personpower. Also for the Fraunhofer review, we can also achieve these rates if we get personpower, but who will have to work during the night...
- Sarah: we need a module production day to nail down what is realistic in terms
 - Sergio: I don't see contingency, and you need contingency
 - Ingrid: double personpower wrt us, but I don't see this. They do 4 times the number of modules than HH.
 - Sarah: plus hybrids
 - Ingrid: we need to discuss.
- Sarah: presenting the slides from ITk week was a good format, thanks!
- Christian: hybrid back-up site. How to tackle the question. We can't do it right now. Used to think R2 and R4 back-up, now it looks like we are expected to be backup site for all hybrid types. We are not qualified for burn-in. We have to come up with strong statement.
 - Sarah: we will not continue being a back-up site. Definitely not for other types, maybe only for R2 and R4.
 - Christian: will not be well received

- Sergio: tough luck
- Sarah: Luise said it's ok if we can be only R2 and R4.
- Ingrid: if we are forced to do this, we need personpower from many other tasks we need to do. Luise & Co tend to forget that we have many other tasks.
- Sergio: we won't be forced. We were supposed to be a back-up module site. In general, we are assuming too much power from certain people to force us doing things. This is not the case, people can say what they want, but it doesn't matter. We can do what we can do, and we know this better than anyone.
- Ingrid: if you feel you are being pushed to do something that you shouldn't, please let me know, I'll help you push back. In ATLAS we don't even know if people are pushed and are super stressed and there is no reason for it. Let Sergio and I know.
- Sergio: I have a coordination role, so I have weight on this too. I will be at the production meeting.

EoS (Stefan)

- Ingrid: slide 2 is a good slide for PRC to explain EoS
- Ingrid: who is working in ZE to help us?
 - Peter: the two usual people
 - Ingrid: use instrumentation, but use another person
 - Peter: sometimes other people are busy.
 - Sergio: go back for a second: 1600 boards, 700 coupons. Insane. Descope it!
 - Marcel: We argued it is nonsense to have 700 coupons.
 - Ingrid: we cannot do it, we must go a factor 4 smaller. At ILFA, the big panel is then split in 4. On the other side, 20 wirebonds are too little statistics, usually it's 100.
 - Ingrid: we are putting in danger module building
 - Marcel: if you find out during petal production, EoS is "easy" to remove it if it doesn't work. Schedule-wise, the initial production plan with ILFA was different, but we have to spend money this year. ILFA said it's a very complicated board to produce, so we want to produce them all at once. External dependencies: pull testing and x-rays. Then almost no external constraints
 - Sergio: if you want to descope coupons, take first 10-20, show results and since they will be good
 - Ingrid/Sarah: we will plan for a factor 4 smaller.
 - Marcel: we can be quicker if we push harder. We don't know yet weekly throughput. We could do 400/months.
 - Sergio: why would you do that?
 - Marcel: 200 is comfortable. Once we do qc for one batch, ZE can do other things
 - Ingrid: we possibly want to have the EoS out of the way and re-shuffle personnel.
 - Stefan: 100/week, we'll need 10 hours/day.

- Sergio: so this is a no, we cannot do it.
- Stefan: 200/month can be done, so done in 8 months.
- Peter: uncertainties: when ILFA delivers, SMD population will go fast, then bonding. After first effort, there is some buffer. We can say to Craig we are going to slower rate and try to go faster internally
- Sarah: everything arrives at same time (
 - Marcel: in next 3 months
 - Stefan: we will need to have some pull test results
 - Celine: is it clear who will pull test these 6 coupons at the beginning?
 - Peter: whoever does it, do it at ZE to test the instrumentation
 - Sarah: it shouldn't be done by Celine or Eric
 - Stefan: Celine teaches how to do the pull tests to ZE people
 - Celine: I don't know how to use ZE machine
- Sarah: we were discussing potential candidates. If we find them, who will teach them in ZE lab?
 - Ingrid must be done in ZE lab because of environmental chamber and pull tester are in the same room
 - Sarah: so we don't have to worry about boxes that were in the oven.
 - Sergio: perfect job for a student (IVI?)
 - Sarah: maybe we can get expert in ZE to train someone to do that, without relying on their availability
- Sergio: stave VTRx+ cover is in Dario's Todo list
 - Dario: in theory, but something I can't proceed with because lack of info.
 - Ingrid when needed?
 - Peter: Feb/March, otherwise there is more work to do, at assembly sites
 - Sergio: they want additional clamp
 - Dario: and that there is no space
 - Peter: they want clamp, but it increases size. No info for the moment
 - Sergio: we don't get answer, we don't deliver. Once design is done, we have a company. They are expensive (10k euro).
- Sergio: opto-holder for petal is trivial. Just indicate what glue to use. Use Isol. I don't know who we should communicate this to, 24h curing, 1 year expiration date, hand mixing
- Ingrid: Dario do you have everything you need?
 - Dario: petal yes, we know constraints (we still have 1-2 mm, highest point is DCDC).
 - Sergio: VTRx+ closest item to the next petal
 - Peter: with glue, 200-300 um increased height.
 - Ingrid: before too much technical detail, we need to understand what to do for stave, Dario can design secondary side
- Sergio: screws to be exchanged: super simple
 - Marcel: I'm getting tired of fixing problems from RAL.
 - Sergio: they did not forget that, they did not want to bring it up because they were during contract with Glenair (it was complicated enough). I think it's very simple, very low risk, let's just do it, it's 1 min/connector.
- Ingrid: student for QC?
 - Marcel: yes
 - Ingrid: this cannot be done by existing team?

- Marcel: it's matter of shuffling people around
- Ingrid: checking person power in EoS and in Module building.... Let's talk offline

Cores (Sergio)

- Sarah: have we done test coupon pull testing?
 - Celine: once
 - Sarah: Are they part of the core?
 - Sergio: they were cut from the core.
- Marcel: how many bonds do you do?
 - Sergio: ~20 coupons
 - Marcel: are you thermal cycling?
 - Sergio: no. Also because CTE = 0
 - Peter: ageing 100C = 20 years time life
 - Sergio: we did ageing test in the past, no longer needed
- Sarah: could core metrology be an IVI task?
 - Sergio: it should be, as soon as programs are finished, you need to understand how to align and run
 - Ingrid: can master student do?
 - Sergio: yes, but there are a lot of petal cores, and it's time consuming
- Marcel: 10 cores/months, rough estimate says you cannot cope with this rate
 - Sergio: true, there is discussion if we can remove some steps. This is even more machine than person power issue (e.g. shared MARTA with petal testing)
- Sergio: we are in a good situation with person power/
 - Ingrid: we need to find people outside this room.
- Marcel: we need bond pull testing, so worth having ZE machine going and having someone who knows how to do that, also when bonding machine is busy for modules. Also if machine dies.
 - Sergio: there is also CMS machine
 - Peter: manual bonding machine is also available in ZE (?)
 - Celine: manual machine is much slower and unreliable.
 - Marcel: Ordering spare parts, the more machines we get our hands on, the better
 - Celine: it may be good to start to push **to get machine calibrated again**, it's been too long time, to be able to compare the results
 - Sergio: is ZE machine a Systech (?) machine?
 - Celine: yes, but it's too old.
 - Peter: cost of calibration?
 - Ingrid: does not matter
- Lennart: personnel to do bond pull test?
 - Peter: only one FE technician left, the good one has left.

Module Loading (Laura)

- See slides
- Not all tasks which are currently on the pre-tests will be done during production as they are partially in for understanding the early breakdown issue (e.g. bow measurement)
- Picture taken of the full petal with the existing camera
- Module loading for one person in the order of 70 hours - excluding part of QC
- For many steps at least 2 people are needed
- If there would be a person "only" doing loading - you can not do more than 4 crystals a day -> one week per petal ?
- Need to quickly understand how to do more than one module with one glue step
Do the metrology with wire-bonds to optimise
Question to Celine: how long does wire bonding of a petal take ? 4h - 8h
- Currently implementing some optimisations to improve the placement accuracy and the number of modules per glue syringe
- Marcel: is the QC already defined ? Yes, we know how to do it as it was done for the Vancouver setup. Works!
- Need to make sure that the cold testing of all petals are covered!!
- Sergio thinks that it is not as bad as shown in the slides
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Test beam (Yajun)

- Sarah: let's chat about noise offline
- Ingrid: stick to Corryvreckan people's recommendation! Don't go to another branch, because it's not useful nor maintained.
- Marcel:
 - things we pulled for you guys to get module from Vancouver in 2 weeks it was a one-time event. Please plan beforehand.
 - Shift training is better to do it once for all the ATLAS group, let's do it at ATLAS weekly meeting.
- Marcel: test beam availability will go down worldwide. Also at DESY we should shut down in 2027. Make a plan which tests are needed when, because beam time will be precious.
 - Lennart: we won't hopefully do test beam for ITk in 2027
 - Ingrid: how many modules from production that will be tested in test beam. There is a foreseen number of modules that will be diverted from production that will go to test beam. I'd like to see the number. We will always have to help with the testbeams everytime there is a test beam.
 - Ingrid: it makes me angry that we developed the test beam infrastructure and software, but as a group we are the worst at doing test beams

System tests (Max)

- Peter: I got nervous when you switch it on and it overheats. EoS has NTC that is added for this.
 - Max: on the powerboard itself is where the problem is. If heat goes on silicon this is a problem. EoS NTC excess temperature determines the cut off of the LV. Currently LISSY is not connected so
 - Max: we need interlock for petal cold box, not done yet
 - Marcel: commercial T-interlock can be bought
- Peter: experience in ITk that EoS are not needed during tests.
 - Max: So far EoS has not given issues, so we haven't needed EoS experts.
 - Ingrid: the idea is that the EoS is well tested and understood.
 - Max: there may be questions when something is not understood

Integration (Ingrid)

- Dario: When is the ping test done?
 - Lennart: Whenever it is needed. When the petal arrives in 26, before it's put in the end cap, and before any pipe welding.
- Ingrid: the integration schedule starts being busy when other things are completed at DESY, but we have a few things to be done now to be ready for the hotter phase.
- Max: petal cold box: for externally received petals we only do cool (not cold) reception, why not cold?
 - Laura: because it's done at module loading sites
 - Ingrid: maybe we will only have to do only ping test
 - Lennart: maybe for the first tests we can do all tests
 - Marcel: this depends on what happens during transport
- Dario: do we know order of petal insertion?
 - Ingrid: yes, Sergio's talk from Integration meeting in November 2022
 - Marcel: Sergio has all figured out, trust him
- Laura: one more missing thing: the heating system for PP1 area below the EC

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Final words (Ingrid)

Very good meeting.

We have a lot of things to do.

We see huge gaps in which people are needed. I will probably find the solution.

I'd like to have a follow-up with staff at the beginning of the week. Tuesday looks good.

Marcel: we should get in the habit of doing it more than once a year, check every few months.

Person power and other needs:

Modules - slides on indico

- Slide 12 - photo box
- Slide 13: HV tabbing -> one day per week - Eric?
- Slide 15: Pull testing -> someone else - simple task for HiWi
- Slide 19: Glueing -> more part time technician + postdoc
- Slide 23: more people needed to get to 6 modules per week !!

Additional people: Dia, Jasper (one day)

EoS (all on Slide 7)

- Test coupon bonding - one day ?
- Test coupon pull tests - one day?
- Design of covers for mirrored Petal one -> Dario ok
- and four stave covers -> Dario ?
- QC - Lukas Bauckhage?

Cores

- Visual inspection, thickness, weight of co-cured bus tapes
- Users of BTTR for co-cured tapes and cores
- Knowledge transfer of BTTR software to a C++ expert
- Metrology of the core
- Thermal cycling of cores
- Get ZE bond puller calibrated (Julia)
- Ingrid - have chat with Karsten Hansen

Module Loading

- Look careful at person power as it seems to be too much for the team
- Consider having one more single module setup or deployment of cold box in 25c (?)
- Need to make sure that the cold testing of all petals are covered

Testbeam

- More overview and coordination to avoid doubling things

System Test

- Make sure you don't blow up the petals -> interlock

Integration

- Currently person power ok