

Minutes of the OX/BER/DESY Strategic Partnership German Institutes Meeting in Zeuthen 25.04.2020

Participants: David Berge, Ingo Bloch, Cigdem Issever, Heiko Lacker, Thomas Lohse, Thorsten Kuhl, Priscilla Pani, Achim Peters, Steve Worm

Agenda Items:

1. Summary of the discussions with Oxford
2. Go over action items (see minutes of last meeting).
3. Discussion of the logistic of a preparing a national GK and an IRTG in parallel in case the UK funding is not being sorted out.
4. Christoph Grojean's suggestion to include theory into the IRTG: "I believe there are nice opportunities of collaboration between DESY-HU and Oxford on theoretical topics, either on the SM side or on more BSM questions connected to astro/cosmo. I would suggest to involve from Oxford G. Salam, F. Caola, S. Sarkar, J. March-Russell, P. Agrawal"

Agenda item 1: Cigdem reported about the different activities Todd Huffman, herself, Ian Shipsey and Garret Cotter hat done in the last weeks, in order to progress the UK funding for this IRTG. Please refer to the slides for more details. The bottom line is that progress has been made in form of getting in touch with relevant funding and governmental agencies. More work is needed. One venue that Oxford is also pursuing is funding through Alumni and in this context Cigdem pointed out that there will be events ([Meeting Minds Berlin](#)) that have been organized by the Oxford-Berlin Strategic Partnership from the 20.03 to the 23.03.2020 where Oxford Alumni will be visiting Berlin and also Adlershof (23.03). It would be good if we could sign up for these events in order to network. Cigdem and Todd and Garret will have presentations and will also use them to advertise our IRTG to the alumni.

Friday 20 - Meeting Minds Berlin 2020 - Dahlem Tour and Lunch, at the Max Planck Institute.
More info and password (Dahlem2020) to book [here](#).

Saturday 21 – This is the day reserved for the central Meeting Minds Oxford events for alumni and guests. More info [here](#).

Sunday 22 - Meeting Minds Berlin 2020 - Brunch and Physics Talk in the fantastic Foyer Berlin Dom ([Radisson Blu Hotel](#)) with breathtaking views of Berliner Dom Cathedral, with guest speaker Head of [Oxford-Berlin Research Partnerships](#).
More info and password (PhysBrunch) to register interest [here](#).

Monday 23 – Meeting Minds Berlin 2020 - Tour of Adlershof Germany's biggest Science & Tech Park + Physics Talks + Lunch/ Professional NETWORKING
More info and password (TechPark2020) to book [here](#).

Abbildung 1: Agenda of the Meeting Minds Berlin 2020 Program.

Cigdem reported about her discussions with Ian Shipsey who is the head of physics in Oxford about possible collaborations in the areas of Quantum Technologies and Detector R&D. More discussions are needed, but Ingo pointed out that it makes a lot of sense to work on strips and to work with RAL and Oxford on this topic.

Action: It was suggested to invite Craig Sawyer from RAL to the Oxford meeting in March. (Cigdem)

Action: It was also decided to get in touch with Saskia Fischer (HUB, Materials), Ted Masselink (HUB, Materials) and Christoph Koch (HUB, Materials) and discussed with them if they would be interested in participating in this IRTG. (Cigdem, Heiko, Steve)

Action: Cigdem agreed to get in touch with the DFG and find out if we can have more than 10 PI on the German side. **Done:** Cigdem got in touch with Astrid Evers in the DFG and outlined to her the scope of the proposal and the interdisciplinary of it. Ms Evers told Cigdem that 15 PI would be also ok, because the project is very interdisciplinary and that we need argue in the proposal for it.

Heiko suggested that we should organize for the winter term a common seminar across the different subject areas that would cover instrumentations, methods and applications. This would help to connect the PIs and would be a preparation for the IRTG training program.

Action: Initiate a seminar or lecture series at HU that covers instrumentation, methods and applications. This should be discussed in the professorium. (Heiko)

Cigdem brought up if it would be possible to exchange Master students with Oxford and start working on projects with Oxford PIs. The question of funding came up. Following action items arose:

Action: Contact International Office at HU and ask for advice. (Cigdem)

Action: Investigate DAAD funding for exchange of HU undergraduates with Oxford. (Cigdem)

Agenda Item 2: Cigdem went over the action items of each task force. Many of the task forces have not worked on their action items.

Action: It was stressed that it is important that the different task forces (see below) meet and work on their action items in the upcoming two weeks in order to be prepared for the meeting in Oxford on the 17./18.03.2020. (ALL)

Agenda Item 3: We decided to focus on preparing an IRTG as we can actually go through the first stage application without having a solution for the UK funding.

Agenda Item 4: We discussed the suggestion of Christoph Grojean and we thought that including theory into the IRTG would increase the number of PIs too much. It was suggested that in case one needs expertise from theory that these can become associated with the IRTG.

Minutes of the OX/BER/DESY Strategic Partnership Meeting in Zeuthen 13.12.2019

Participants: David Berge, Ingo Bloch, Phil Burrows, Garret Cotter, James Frost, Todd Huffman, Cigdem Issever, Heiko Lacker, Thomas Lohse, Marek Kowalski, Thorsten Kuhl, Jacob Nordin, Achim Peters, Frank Stephan, Steve Worm

Agenda: <https://indico.cern.ch/event/867129/timetable/#20191213>

password: strategy19

Introduction, Cigdem(see presentation on agenda)

The meeting started with an introduction by Cigdem who highlighted that one should not just focus on the preparation of International Researcher Training Group (IRTG)¹ proposal, but use these meetings to identify possible areas where we could already start working together and do it. There are many things we can already do without external funding. Furthermore it is important that we have existing links between Oxford, HU and DESY when it comes to applications for external funding.

Cigdem highlighted that the DFG scheme for International Researcher Training Group is not allowing that funds from the DFG are used for British students. Meaning it is crucial that Oxford finds a way to fund the British students. She pointed to a successful example that was announced in November 2019 between Oxford and TU and HU in mathematics where the Oxford counterpart was able to fund the students in the IRTG with funds from the UKRI Centre for Doctoral Training (CDT)². They applied for it in 2018 with Imperial College. It was not clear to Cigdem when the next call for a CDT would be and if Oxford could apply for it. Cigdem met with the German PI and has also a copy of the first stage proposal. The PI gave her some tips that will be important for the preparation of our application.

Action a: Todd will try to find out when the next call for CDTs will be.

Cigdem explained that the application is a two stage process and that in the first stage of the application one has not to go into the details how the British students will be funded. The successful Oxford-HU-TU IRTG in Mathematics used the positive review of their first stage IRTG proposal by the German DPG to argue for the CDT in the UK.

Overview of Oxford Astroparticle Physics, Garret Cotter (see presentation on agenda)

Garret first had a few remarks about the Oxford graduate program in astroparticle physics and its structure. He also gave an introduction into the Oxford University system with its colleges and that fundraising is key for Oxford. Garret pointed out that possible areas where Oxford and DESY/HU could work are CTA (Garret), SKA (Rob Fender in particular transient

¹

https://www.dfg.de/foerderung/programme/koordinierte_programme/graduiererkollegs/formulare_merkblaetter/index.jsp

² <https://www.berlin.de/sen/wissenschaft/aktuelles/pressemitteilungen/2019/pressemitteilung.864263.php>

astronomy) and General Relativity/Modified Gravity (Pedro Ferreira). That there a few former Oxford students/RAs now working in the DESY Astroparticle Group: Paul Morris, Jason Watson.

Overview of DESY/HU Astroparticle Physics, David Berge (see presentation on agenda)

David gave an overview of the HU/DESY activities in Astroparticlephysics: Neutrino Astronomy (Marek), CTA (David), CTA Instrumentation contributions, UltraSat (David) with CMOS 100Mbit Pixel camera, Optical survey Zwicky transients.

After the two Astroparticle presentations we brainstormed a bit. It was mentioned that Rob Fender in Oxford would a person one should talk to since he is working on transient astronomy mainly from the radio end of the spectrum, so possible connections with GRBs, grav wave events and so on.

Action b: Follow this up with Rob Fender (Garret Cotter and David Berge)

We also discussed possible collaborations between Astro and particle physics: for example:

- measurements of the proton nucleus cross sections in the forward region with ATLAS + LHCf was mentioned and
- we also discussed, if ATLAS' cosmic run data could be useful for IceCube.

LSST was also mentioned and that DESY is not part of this, but in this context Achim Peters mentioned that his group's expertise in cryogenic optical detectors could be a venue for collaboration, or optical sensor calibration could be done at DESY.

Overview of the Accelerator Science Activities in Oxford by Phil Burrows, JAI

Phil presented the activities of the John Adams Institute at Oxford. They are

- Electron beams: Linear colliders and Diamond Light Source and a future FEL
- Proton beams: LHC, FCC and Intense hadron beams (ISIS, FETS and IBEX)
- Laser- and beam driven plasma wakefield acceleration
- Advanced accelerator systems: Beam instrumentation, feedback + control, RF systems and metrology/alignment
- Beam Therapy: Proton, ion, electron

It was mentioned that the plasma wakefield acceleration is a priority of the new DESY director Wim.

Phil also highlighted the internationally renowned PhD Accelerator Physics Course at Oxford where students get unique training. Participation in a one term training would correspond to a stay of about 3 months at Oxford. It was discussed if HU and DESY students could take part in this course and the answer was yes. They would not be able to get credit for it, but a certificate. These courses could be also taken remotely as some of the Oxford students connect to them from CERN (not really desired).

Action c1: It should be checked if for participating in the PhD Accelerator Physics Course at Oxford fees have to be paid by the outside students, what is the limit in the number of students participating from outside and what has to be foreseen for accommodation and living costs for a 3 month stay (e.g. is there a cheap hostel or residential school (D: Internat) that can be used ?) (Phil? or ???)

Overview of the Accelerator Science Activities at PITZ (Photo Injector Test facility at DESY Zeuthen) by Frank Stephan

Frank presented the research activities at PITZ. The main goals are to provide optimized electron sources for FLASH and European XFEL and to do general accelerator R&D. The research areas are:

- Basic photo injector R&D
- Specific R&D for FLASH & European XFEL
- Application of high brightness electron beams plus general accelerator R&D for novel accelerator techniques

Key capabilities: Flexible photo cathode laser shaping, test facility with detailed diagnostics, experience in high brightness NC photo injectors with high average power

I refer the reader to Frank's talk for his detailed listing of the projects and will highlight the beam driven plasma wakefield acceleration experiments that are being done at PITZ, because they overlap with JAI's activities. Frank also highlighted the activities in the area of radiation biology where PITZ is investigating if ultra short radiation pulses could help to improve the radiation therapy of cancer patients.

We had a long discussion at this point about possible collaboration between Oxford and PITZ on medical application. Phil mentioned Suzie Sheehy. Key words I noted down, but I am not able to put them into sensible sentences are: Medical applications @ CERN, FLASH therapy, CLIC RF xband and Lausanne CHUV collaboration, Medical Linacs in the 3rd world the UK and CERN are working on a design that is more robust to provide a X-Ray facility.

Frank mentioned in this context that the FLASH radiation therapy at PITZ is on a "Hobby" level and a solid collaboration in this area would be critical and that there would be interest.

Action c2: We should investigate how PITZ and JAI could collaborate on medical applications. (Phil and Frank)

We also discussed how long PITZ will be running. The earlier decision to stop operation of the PITZ accelerator in 2025 is under strong discussion now and there are several signs that the operation can/will continue afterwards. Wim has strong interest in keeping the facility.

Heiko also pointed out that he would be interested in discussing the possibility of a non-collider based dark photon search experiment at PITZ (or BESSY). For this one would need beam energies of 150 MeV and PITZ delivers right now 20 MeV. An upgrade of PITZ could be possible in the context of very high energy electron therapies, but this would cost ~30mil Euros and would probably only be decided after successful tests of FLASH irradiation at lower beam energy.

Overview of the accelerator science activities at HZB in Berlin, Cigdem Issever for Thorsten Kamp and Andreas Jankowiak

Due to the fault of the organizers of this meeting in scheduling, Thorsten Kamp and Andreas Jankowiak were not able to come to the meeting. But they provided slides that summarize the activities of the accelerator physics at HZB in Berlin. HZB is hosting BESSY II that is a storage ring light source for soft to tender X-rays. BESSY II is operated as user facility and pursues a steady development program to increase the quality of the beam for users. They are also planning upgrades, like for example the VSR upgrade and resonant island buckets to drive machine with multiple orbits (TRIBs). For this they work on beam dynamics studies and beam instrumentation development. HZB is also a contractor for the National Metrology Institute of Germany (PTB). They are a test bed for accelerator R&D and education and training for junior accelerator scientists from HU. HZB has also an ERL demonstrator (bERLinPro) that is addressing challenges related to generation, acceleration and recovery of high brightness, high average current beams.

Overview of the Particle Physics Activities at Oxford, Todd Huffman

Oxford has the largest university based particle physics group in the UK with 23 academics (this does not include the academics of the JAI institute). The group participates in ATLAS, LHCb, DUNE, MicroBooNE, MINOS, SNO+, SoLid, T2K and Mu3e and also applications like MARS and TORCH. Todd focused his talk on the ATLAS Group. On the analysis side there are collaborations possible in the areas of Exotics searches with di-Higgs and $X/H \rightarrow b\bar{b} + \text{ISR}$ final states, SUSY and Higgs measurements. On the hardware side Oxford has the OPMD lab for detector R&D and is active in the areas of pixel detectors and CMOS sensor R&D, mechanical construction, services and optoelectronic readout links for the ATLAS tracker. There could be also possibilities to collaborate with RAL via Steve McMahon who has an association with Oxford and is member of RAL.

Overview of the Particle Physics Activities at HU and DESY Zeuthen, Cigdem Issever

Cigdem gave a brief overview of the PP activities at HU and DESY Zeuthen (Theory and Experiment). At HU the activities are focused on ATLAS (top quarks, searches for vector like quarks and Higgs measurements (di-Higgs)) and detector development for the SHIP experiment. The group is also heavily involved in the ATLAS strip detector construction for ATLAS Upgrade (wheels). HU has also a strong PP theory group that covers formal field theory, phenomenology, lattice field theory and gravit. waves.

The DESY Zeuthen group has a big particle physics group with 22 FTEs that consist out of the ATLAS group (top physics, dark matter searches), the ATLAS upgrade, a theory group that works on higher loop corrections, gravitational waves and pp beyond colliders and a lattice group that works on traditional lattice field calculations and applications on quantum computers.

The last contribution was an

Overview of Detector R&D and Labs at DESY Zeuthen and Quantum Opportunities at HU, Oxford and DESY by Achim Peters and Steven Worm

Steve presented the generic detector R&D activities and available lab spaces at DESY Zeuthen that he is leading. This activity is across astroparticle and particle physics and also for spin-offs outside physics. Existing projects are ATLAS, CTA, IceCube. New projects include MeVCube, ULTRASAT and ZTF. The lab has staff with extensive detector expertise and have an excellent working relationship with HU. They have clean room facilities including ~80 m² ISO6 (T stability +- 1 C, humidity controlled, ESD safe, gas media: vacuum, oil-free compressed air, nitrogen), and strong partnerships with other Helmholtz institutes. There is an emphasis on detector developments in extreme environments. Funding has been requested to further expand and develop the lab space for detector development (Helmholtz "Distributed Detector Laboratory" grant).

The second part the presentation switched to possibilities to do fundamental physics with quantum sensors. Achim Peters' research group's activities and facilities were presented, and also opportunities in the UK that Oxford and Steve via Birmingham were/are involved with. Achim works for example on quantum optical metrology that involves atom interferometry (e.g. GAIN) and cold molecules, and uses frequency comb techniques and novel laser systems. His group has extensive experience with space missions and is trying to use these technologies for tests of Lorentz Invariance. His group has cooperation with many international and national universities and space agencies (DLR, NASA...). Steve highlighted with a few slides the growing support in the field of Quantum Tech Research (national and international) and ended the talk with the possibility to use these technologies for the search of light and ultra-light Dark Matter: atomic spectroscopy, laser interferometry or atom interferometry. The particle physics group and optics groups at HU are interested in exploring such collaboration within HU. The possibility of collaboration on this subject with Oxford was also discussed.

Brainstorming Session

After the presentations the group started to brain storm about possible venues of collaboration. There was consensus that the involved parties should try to find ways to collaborate outside the concept of a student training network. This will help us to start on these projects and also would make an application for such a training network more competitive or convincing.

With regard to the International Training Network the common area where all these different fields could work together was thought to be on instrumentation, methods and algorithms. We discussed what the possible drivers for this training network could be and the following points were mentioned:

- Methods
- Projects
- Facilities
- Benefits for students
- Broaden education
- Length for PhD is an issue if we want to provide a broad and competitive studentship
- Aiming for gender balance

Cigdem also pointed out that the funding on the UK side will be important to sort out. The Centre of Doctoral Trainings in the UK were mentioned again.

We continued our brainstorming and the following things with regard to the international student training network were mentioned (see Figure 2):

- Motivation for International Student Training Network
 - Prepare f. Science Future
 - Vaccination against point focus
 - Work on core science questions
- Possible format or content of the training network
 - Interdisciplinary Research from ID team *(I do not know what we meant with "ID team")*
 - Summer schools
 - Block courses
 - Internships
 - Internships should be connected to publications
 - Accelerator course work @ Oxford (and HZB in Berlin?)
 - Place students on different topics w. same (instrumental or methodical) applications
 - Facilities: OPMD, Labs at Zeuthen
- Possible topics/themes to be covered in the training network
 - Precision Instrumentation
 - Silicon Sensors
 - Short-pulse cancer treatment
 - Opto-electronic frontend system readout...
 - MC CHEC Camera
 - IKZ, isotopically pure Si materials, CMOS
 - Data analysis methods
 - Statistical Methods
 - Complementarity
 - Complex Real Time Analysis
 - Astrophysics <-> complex systems

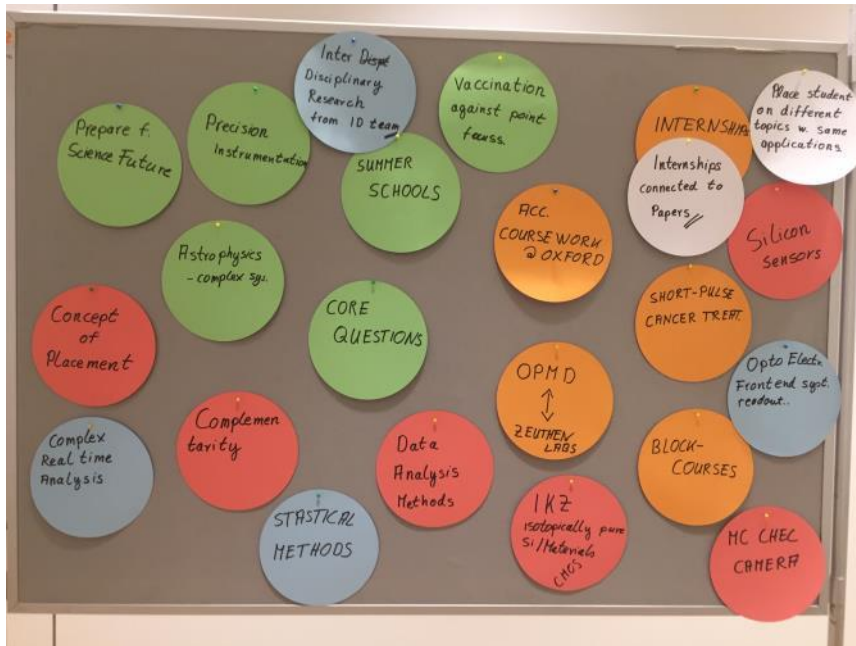


Figure 2: Photo of the board with the points we had collected during the brain storming session.

We agreed that the next meeting should be in the week of the 2nd of March in Oxford. The week after the 5th of April was also discussed, but this is not working with Cigdem anymore.

Here is the doodle link to find a date for our next meeting that includes a few weeks in March:
<https://doodle.com/poll/h9gudq2c3xakm2ss>

Action d: Everybody please fill this by the 27.01.2020.

A possible name for the training network was also discussed and the suggestion is:

“Methods, Instruments and Applications to probe the fabric of the Universe: Matter, Fields and Space Time

Until our next meeting in Oxford it was agreed that we form task forces to address the following topics such we can make progress the proposal.

Task Forces with Action Items:

Astroparticle Physics Task Force (David Berge, Garret Cotter and Steven Worm)

1. **Action: Make a list of methods, instrumentation and laboratory facilities in Astroparticle Physics**
2. **Action: Identify possible collaborations/projects (thesis topics) or training modules across AP in Oxford/DESY and HU**
3. **Action: List possible collaborations/projects (thesis topics) or training modules across AP, PP, QO, Detector R&D and/or Accelerator Science**
4. **Action: Identify possible internship topics that could lead to papers**

Particle Physics Task Force (James Frost, Todd Huffman, Cigdem Issever, Thorsten Kuhl, Steven Worm)

5. **Action: Make a list of methods, instrumentation and laboratory facilities in Particle Physics**
6. **Action: Identify possible collaborations/projects (thesis topics) or training modules in PP across Oxford, DESY and HU**
7. **Action: List possible collaborations/projects (thesis topics) or training modules between PP and AP, QO and Detector R&D or Accelerator Science**
8. **Action: Identify possible internship topics that could lead to papers**

Accelerator Science Task Force (Phil Burrows, Frank Stephan, Thorsten Kamp, Andreas Jankowiak)

9. **Action: Make a list of methods, instrumentation and laboratory facilities**
10. **Action: Identify possible collaborations/projects (thesis topics) or training modules in Accelerator Science across Oxford/DESY and HU**
11. **Action: List possible collaborations/projects (thesis topics) or training modules between Accelerator Science and Astroparticle Physics, Particle Physics, Detector R&D and/or Quantum Optics**
12. **Action: Identify possible internship topics that could lead to papers**

Quantum Technology Task Force (Achim Peters, Heiko Lacker, Cigdem Issever, Steven Worm, Ian Shipsey?)

13. **Action: Make a list of methods, instrumentation and facilities**
14. **Action: Identify possible collaborations/projects (thesis topics) or training modules in Quantum Technologies across Oxford and HU and DESY**
15. **Action: List possible collaborations/projects (thesis topics) or training modules between Quantum Technologies and Astroparticle Physics, Particle Physics, Detector R&D and/or Accelerator Science**
16. **Action: Identify possible internship topics that could lead to papers**

Generic Detector R&D Task Force (Ingo Bloch, Heiko Lacker, Steven Worm, Daniela Bortoletto, Ian Shipsey, Todd Huffman)

17. **Action: Make a list of methods, instrumentation and facilities**
18. **Action: Identify possible collaborations/projects (thesis topics) or training modules in generic detector R&D across Oxford and HU and DESY**
19. **Action: List possible collaborations/projects (thesis topics) or training modules between generic detector R&D and Astroparticle Physics, Particle Physics, Quantum Optics and/or Accelerator Science**
20. **Action Identify possible internship topics that could lead to papers**

UK Funding Task Force (Todd Huffman, Phil Burrows, Garret Cotter)

21. **Action: How could an Alumni funding scheme be setup?(potentially target German alumni)**
22. **Action: Contact Colleges via fellows who are in the list of participants**
 - a. **Brasenose**
 - b. **Cats**
 - c. **Lincoln**
 - d. **LMH**
 - e. **Exeter**
 - f. **Jesus**

23. Action: When will the next CTD run?

24. Action: Could we get other funded STFC studentships?

Development of a preliminary curriculum for the international training network (Cigdem, Heiko, Todd, Garret)

25. Action: Define Training Program (Remote placements, schools, ...etc.)

26. Action: Define potential internship topics (and also point out which ones could lead to papers)

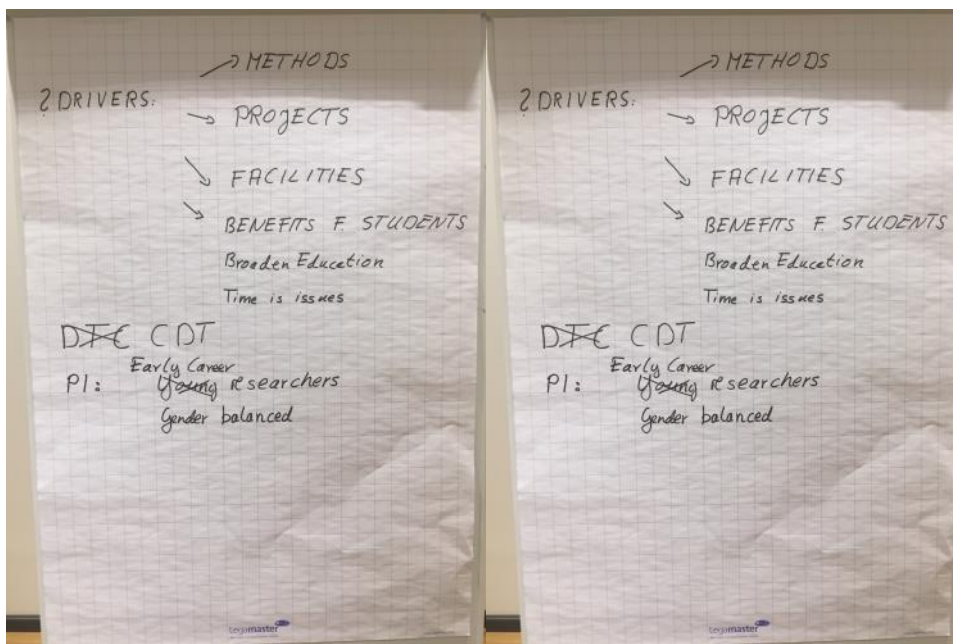
27. Action: What Research topics shall we cover (this depends on input from other tasks forces)

28. Action: How will the supervision be organized

29. Action: How do we ensure gender equality?

Comment to minutes by Christoph Grojean:

“I believe there are nice opportunities of collaboration between DESY-HU and Oxford on theoretical topics, either on the SM side or on more BSM questions connected to astro/cosmo. I would suggest to involve from Oxford G. Salam, F. Caola, S. Sarkar, J. March-Russell, P. Agrawal”



Next meeting?

> 2nd March + April 2020
05.

⇒ doodle ✓

Task Forces

1) Curriculum of Network

- Training (Remote placement, Schools, Internship)
- Research
- Supervision
- Gender equality?

2) ~~PP~~ ~~PP~~ ~~PP~~ Collect methods/instrum. in FP, PP, PC, QO

3) Identify Overlaps in M&I

3. Define Internship Topics

4. Internship topics → Papers

5. UK FUNDING

- ↳ ALUMNI
- ↳ Colleges
- ↳ UKRI SOURCES

Brasenose
Cats
Lincn
LHH
Exeter
Jonus

Ugmen
Alumni

↳ CTD

↳ STFC students →

6. OX/BER Funds Internship? Cigdem

7. Graduate Studentship Interviews

8. Who in Oxford joins in Quantum Optics? Ian Shipsey Steve ↓

Methods & Instruments

to probe the

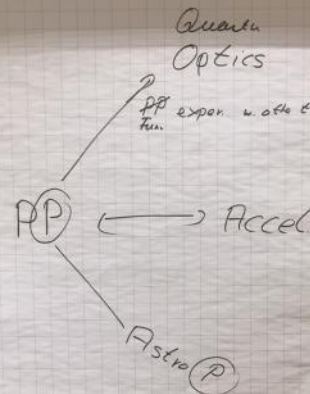
~~fabric~~ of the universe

- matter, fields + space time

Matter, Fields + Space Time

Methods & Instruments

to probe fabric of the Universe



FOUNDATION & PHYSICS

FUNDAMENTAL PHYSICS

