IAS conference on HEP 2018 – Panel discussion: "Challenges/Problems yet to be addressed before the construction of an e-e+ collider"

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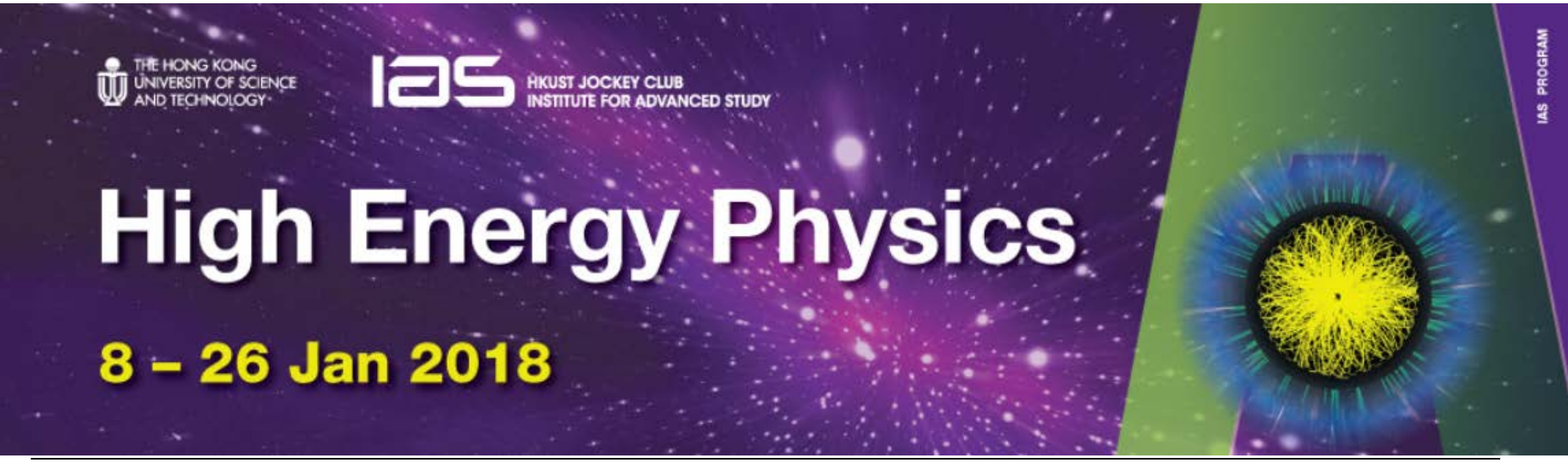
25/1/2018

Warning: the opinions expressed here are my own. They do not necessarily reflect the opinions of the FCC management or of CERN



The brief

- We were asked that "…The challenges/problems to be addressed can be either technical or scientific ones. […] we suggest the project representatives focus on the project represented"
- Please note that **political considerations** are the ones that will make or break a project, if we like it or not…
- So I will try to more or less stick to the brief, with a random collection of comments which I hope will help the discussion. Most of them are, I am afraid, political in nature

On the technical side

FCC-ee has made good progress and only secondary technical problems need to be tackled. These include:

- Engineering design of accelerator components (for the TDR)
- Engineering design of the MDI region (first pass will be done this year)
- Power consumption figures are evolving
- Can the injector chain provide 100% filling efficiency?
- Energy determination using resonant depolarization: define hardware and strategy (underway)
- …

The landscape (or uncomfortable facts of life)

- The period of "guaranteed discoveries" is gone. We need to get used to this new reality, as other branches of physics have already done.
- By 2039, we will all be driving autonomous vehicles.
- Do we chose a mediocre project today or wait for a perfect project tomorrow? How much do we value time as a commodity?
- As tempting as it might seem, keeping facts/issues/problems from the decision makers is a very bad idea. They will find out.

The landscape II (or facts that work to our favour)

- Science in general and CERN in particular has an excellent reputation in society today. We need to use up this capital (before it evaporates)
- Society/local government/industry is our friend. Ideally, they should be doing the lobbying for us. Engage them!

The secret of a successful project

- Needs to be ambitious
- Needs to be better than the competition.
  - (For this we need a set of unambiguous metrics to score each project so as we are able to compare them – this is hard)

At FCC-ee we have worked hard to think big and to deliver as high a performance as possible.

And this is to counterbalance the disadvantage of a project that can be built today.

Circular colliders: the lack of challenge

- I usually start my FCC-ee talks with an apology...

An apology

Q: Synchrotrons have been around for a very long time… do we really need another one, 100 kms long?

A: Synchrotrons today still offer the best price/performance on the market. There are numerous examples in history where simply evolving an idea and making it bigger led to great things.

A good example:

Final point

- A comment about energy consumption

Energy consumption

- The perceived value of energy to society is much higher than its real value – we need to keep this in mind
- Consider the following paradox: Energy consumption of FCC-ee per year is ~1% of its construction cost, yet the point of much discussion
- The energy consumption of an average car compared to its purchase price: ~10%, and perfectly acceptable
- Nevertheless, every effort should be made to do responsible energy management (waste energy recovery, etc.)

FCC-ee: why did we chose 100MW as our baseline SR power consumption?

FCC-ee could run at 60MW SR power, but it would make no sense:
FCC-ee total power consumption at 120GeV: 310MW out of which 145 for RF.
Moving to 60MW power consumption would reduce the total consumption to 250MW
➔ We have saved 20% of energy costs but lost 40% of statistics: this is not a good deal. If you need to save money, consider running for fewer years

In conclusion

The big challenge is to get the project approved. Actually, the challenge for our community is to get *any* project approved.

Thank you