

# Summary of Working Group 1 Overall Design

122 participants

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# Main Topics

- Requirements from experiments
- Beam Parameters
- RF frequency
- Optimum gradient for cost
- Commissioning and reliability
  - One vs two tunnels
  - Conventional vs wiggler positron source
  - Damping ring in linac tunnel
- Instrumentation
- Beam dynamics
- Wakefields

# Physics Requirements and Parameters

- Variable centre-of-mass energy 200-500 GeV
- 500 fb<sup>-1</sup> during the first 4 years of operation
- Upgrade to 1 TeV with 1 ab<sup>-1</sup> in 3-4 years
- Or +500 fb<sup>-1</sup> in 2 more years at 500 GeV
- Large energy change in few weeks
- Small changes in few shifts
- Luminosity was felt to be challenging
- Likely will aim for  $2 \times 10^{34} \text{ cm}^{-2}\text{s}^{-1}$
- Need flexibility in parameters
- Define different parameter sets/ranges

# RF Summary

- Cost optimisation attempted
  - models need to be reviewed
  - Assumptions about  $Q(g)$  made
  - No extra cost for high gradient assumed
- Conclusion: cost optimum 35-40 MV/m
- 35 MV/m still needs to be demonstrated (so far 25 MV/m)
- Some people aim for more than 40 MV/m (site length)
- No clear advantage to change RF frequency

# Commissioning/Reliability

- 1, 1.9 and 2 tunnels considered
- Separate damping ring tunnel
  - Dog bone
  - 3 km long damping ring
  - 6 km long damping ring
- Questions:
  - Can the damping ring be in the linac tunnel?
  - How much commissioning time can be gained with 2 tunnels?
  - What is the difference in reliability? What in cost?
- Conventional positron source difficult but preferred (best both options)

# Instrumentation and Beam Dynamics

- BPM resolution is very tight (large beam pipe)
- Emittance and luminosity monitor is beyond state of the art
- Correlation monitors are interesting
- Machine protection is very important
- Beam based alignment should be improved
- Long range wakes need mode variations
- TTF indicates wakes are OK but more work
- 3<sup>rd</sup> passband mode needs mirrored coupler (test soon)
- Characterisation of imperfections needs to continue (e.g. quadrupole vibrations, problems to measure at TTF)

# What Else?

- Different upgrade scenarios exist for 500 GeV to upgrade later to 1 TeV, e.g.
  - Full tunnel, half-filled with cavities at full gradient
  - Full tunnel, fully filled with cavities at half gradient
- Second tunnel can likely be used during beam operation
- Code and data repository
- Synergy with X-FEL (e.g. Klystrons, modules)
- Experimental time at TTF seems limited (reason for more modules/test facilities?)

# Conclusion

- Creation of interim working groups
  - Group to define parameter ranges in the next two months
  - Group on construction schedule, commissioning and availability; positron source, tunnel configurations
  - Group on LET including failure modes
  - Group on instrumentation