Slide Credit: Jeremy Heyl, UBC

Perspectives on Dawn VII

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A# (& Virgo_nEXT)

- There are two compelling rationales for A#
  1. A# is a discovery machine (a la yesterday's science/astro presentations).
  2. It is also an essential step toward realizing CE ('retiring risk'...).
     - CE faces challenges in delivering 10 dB squeezing levels, 1.5MW arm cavity power (with concomitant challenges in coatings, thermal compensation, controls, …), low frequency Newtonian noise cancellation.
       - As well as managing and process large numbers of GW events.
     - A# will have to address these also.
- Time scale for A# likely paced by availability of funding.
  - » I estimate that A# could be online in 2033 based on current schedules for O4, O5.
    - NB: Schedules are beholden to Time's Arrow 😎

Top Level Design Parameters for A+, A#, CE

Design parameter	A+	A♯	CE
Arm length	4 km	4 km	20 km, 40 km
Arm power	750 kW	1.5 MW	1.5 MW
Squeezing level	6 dB	10 dB	10 dB
Mass of test-mass	40 kg	100 kg	320 kg
Test-mass coatings	A+	A+/2	A+
Suspension length	1.6 m	1.6 m	4 m
Newtonian suppression	0 db	6 db	20 db

LIGO Aundha Observatory

- Th current ‘official’ schedule is for LAO to come online in 2030.
  - Using A+ technologies (squeezing/filter cavity, A+ O5 coatings)
- In my opinion, that is optimistic. I would estimate 2032-2033 based on current pace of progress
- What sensitivity? 100 Mpc? 150 Mpc? Anybody’s guess at this point…

Cosmic Explorer (& Einstein Telescope)

- **The LIGO Lab fully supports the CE design effort.**
  - » LIGO Lab has no formal role in the CE Project.
  - » And yet, many key Lab staff are involved in CE design efforts.
    - – Vacuum system, many aspects of IFO design, site identification/evaluation, Education/Public Outreach

- *Maintaining this support while continuing to carry out LIGO-Virgo-KAGRA (→ IGWN) mission will require resource careful management.*
  - » The field GW astrophysics is still growing, limited by i) funding and ii) people

CE is the US pillar of the future of GW astrophysics