

DAWN IV – Session 2 summary

Jo van den Brand, Nikhef and VU University Amsterdam, jo@nikhef.nl
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LIGO
Scientific
Collaboration



3G science case

Extensive science cases

Wide range of topics

- Fundamental physics
- Astrophysics, astronomy
- Cosmology and cosmography
- Nuclear science

Need to clearly define a few convincing examples

- Detecting all coalescing binaries in the universe. Cosmology example: EOS of DE
- Precision tests of gravity under extreme circumstances
- Early universe, dark ages

Science team needs to provide input to instrument design

- Importance of low frequency region
- How high in frequency do we need to go?
- ...

Other topics

- Waveforms from alternative theories
- What do we need from the EM community: instruments to maximize MMA
- Gather scope of interest in our Science Document to appeal to various communities

Basic context for 3rd generation GW detectors

A global path forward. Every new phase must be associated with new a scientific target

Realize design sensitivities and proceed towards A+ and AdV+

- Produce increasingly better GW data

Realize ET

- As long as there is no certainty of other 3G instruments, ET will be the best way forward
- Provides access to the entire universe

Realize CE and more

- CE provides the best complement to improve performance (especially for MMA)

Standardize some plots

- CE and ET sensitivity plots
- Redshift versus total source mass range (e.g. extend to 10,000 M_{Solar})
- LISA versus 3G plot: third axis with expected yearly event sample
- ...

R&D (governance) and global progress

A global path forward

Umbrella organization

- Show the global interdependencies
- Show to funding agencies how investments are leveraged: R&D, upgrades, ET/Voyager, ...

Common design

- Common design has various logistical advantages
- Diversity in design may provide advantages in dealing with unexpected
- Consequences for costing need to be assessed

Other topics

- A global collaboration may provide a better chance of getting funding
- However does global collaboration imply a single design?
- R&D facilities for 3G are being considered: de-risk 3G

APPEC and GWs in the 2020 US Astronomy/ Astrophysics Decadal Survey

APPEC

- Roadmap was released early this year
- GWs figure prominently
- APPEC works together with the ET team towards preparing the ESFRI proposal

2020 Decadal Survey

- May be asked to submit a proposal for the 2020-2030 window for consideration and ranking
- Who will be asked? LIGO, GWIC?
- How will Voyager figure in this

Define umbrella entity for global 3G

We are at an important fork in the road right now. Need to take the right way

Global RI

Group of Senior Officials (GSO), part of G7, can propose an ESFRI RI as potential GRI

Define at least an Umbrella for Global 3G

- Address the research needs of world-wide scientific communities
- Combining the best available knowledge, human capital and resources in one specific scientific area with multi-source funding
- Start in a “loose” way, but encourage global R&D, science case, ... and evolve into a structured vehicle later

We need this new entity, new collaboration
For short term to pre-empt questions



Global 3G-related questions

A broad community is relying on detection of gravitational waves

Viewpoint of different continents and countries

- What is the status of GW, and 3G GW in your country?
- What is the composition of your community? How do we grow our community?
- For EU: is ET on a national roadmap (when will there be an opening, and will you pursue that?)
- What is needed to be on your national roadmap? Science case, technical plans, ...?
- What is needed to pave the way in your country to support an ESFRI request? If so, then what is needed from the collaboration, APPEC, your own scientists?

Budget

- Update budget
- Operating cost

CERN

- Can CERN have a role in supporting astro-particle physics. For 3G and Einstein Telescope there is strong scientific overlap, and CERN's existing expertise are valuable resources