Virgo update

Raffaele Flaminio

CNRS/LAPP

for the Virgo Collaboration
Advanced Virgo+ schedule

- New planning with O4 duration = 18 months and O4 start = May 24th

<table>
<thead>
<tr>
<th></th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
<th>2024</th>
<th>2025</th>
<th>2026</th>
<th>2027</th>
</tr>
</thead>
<tbody>
<tr>
<td>O3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

AdV+ Phase I:
- Approval of Phase I
- Construction and Preparation Phase II
- Installation
- Commissioning

AdV+ Phase II:
- Construction
- Installation
- Commissioning

O5 Approval of Phase II

Advanced Virgo+ schedule summary:
- Approval of Phase I: 2023
- Construction and Preparation Phase II: 2023-2025
- Installation: 2025-2026
- Commissioning: 2026-2027

LVKEM call, January 26th 2023
Advanced Virgo+ design sensitivity

- Phase I: reduce quantum noise, hit against thermal noise. BNS range: 100 Mpc’s
- Phase II: lower the thermal noise wall. BNS range: 200 Mpc’s or more
Advanced Virgo+ Phase I

Configuration during O3
Advanced Virgo+ Phase I

- New IMC payload ✓
- Instrumented baffle ✓
- HVAC noise reduction ✓
- Laser Upgrade ✓
- SR mirror ✓
- Newtonian Noise cancellation ✓
- Auxiliary lasers ✓
- Air pressure reduction in CITF ✓
- Frequency Dependent Squeezing (QNR system) ✓
- New Output Mode Cleaner ✓
- Scattered light mitigation ✓
- New photodiode electronics
Reminder

- Installation completed in the first semester of 2021

- First 2-hours operation of signal recycled interferometer in November 2021
  - 33W input power

- Frequency dependent squeezed vacuum source operated for long periods in the first semester of this year
  - Frequency dependent squeezing observed down to 25 Hz

- Main issues until this fall:
  - Reproducibility of interferometer operation
  - Interferometer frequency response
Recent news

The good news

- Reproducible operation with signal recycling cavity achieved
  - Interferometer has the expected larger bandwidth provided by signal recycling
- Able to operate the interferometer over long periods
  - Routinely run at night
  - Two-days engineering run done early November
- First sensitivity curves measured
  - Noise hunting started
Latest news

The less good news

◆ One suspension fiber break mid-November
  » Happened during a venting (understood)
  » Repair completed mid-December
  » One month was needed

◆ Interferometer control recovered last week
  » 5 weeks were needed

Bottom line

◆ About 2 months of delay accumulated due to the fiber incident
◆ Now starting sensitivities measurement again

Working to start O4 on May 24th

◆ Tight planning