

Virgo Status and plan

GW World Wide Network



aLIGO Hanford, 4 km



aLIGO Livingston, 4 km

LIGO Scientific Collaboration:

- 1400+ collaborators (including GEO)
- 19 countries
- 8 computing centres
- ~1.5 G\$ of total investment



GEO, Hannover, 600 m



AdV, Cascina, 3 km

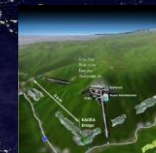
Virgo Collaboration:

- 850 collaborators
- 16 countries
- 4 computing centres
- ~0.5 G€ of total investment



~2026

It will operate as part of the
LIGO Network and
Collaboration



KAGRA Collaboration:

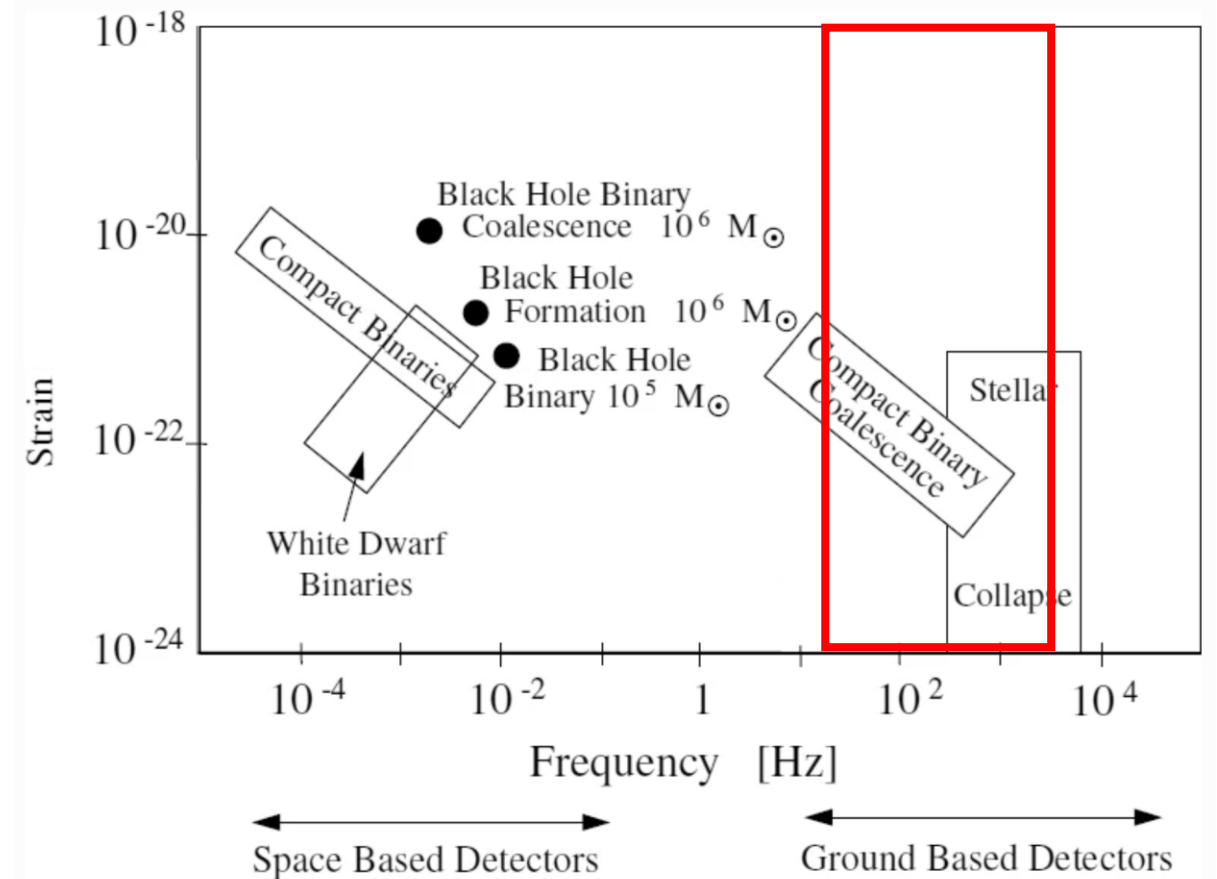
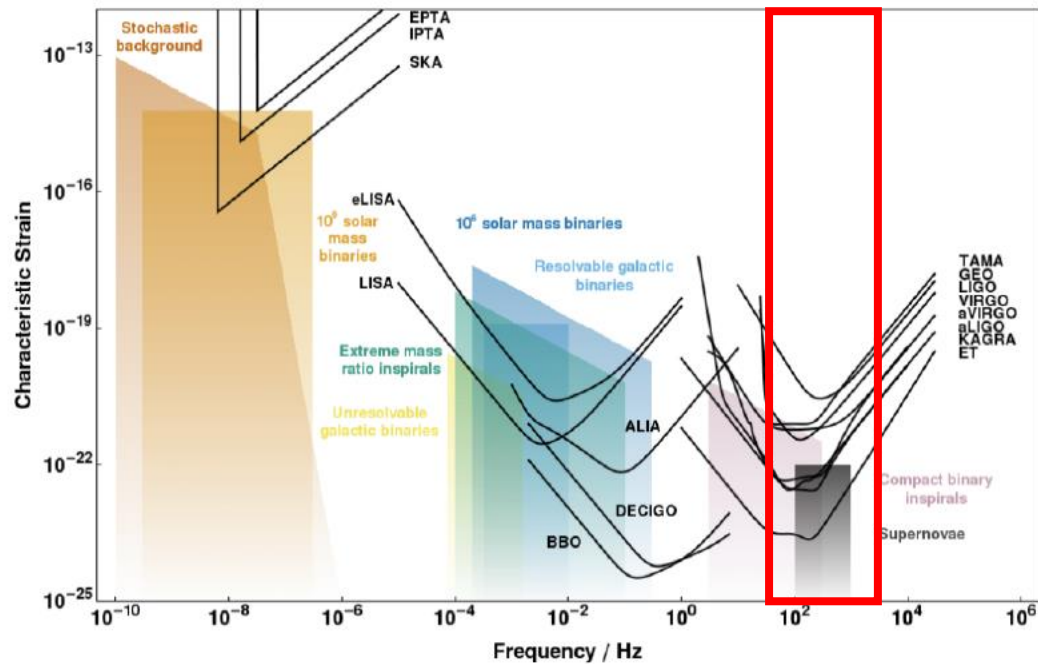
- 410 collaborators
- 14 countries
- 5 computing centres
- ~16.4 G¥ of construction costs

VIRGO and ET

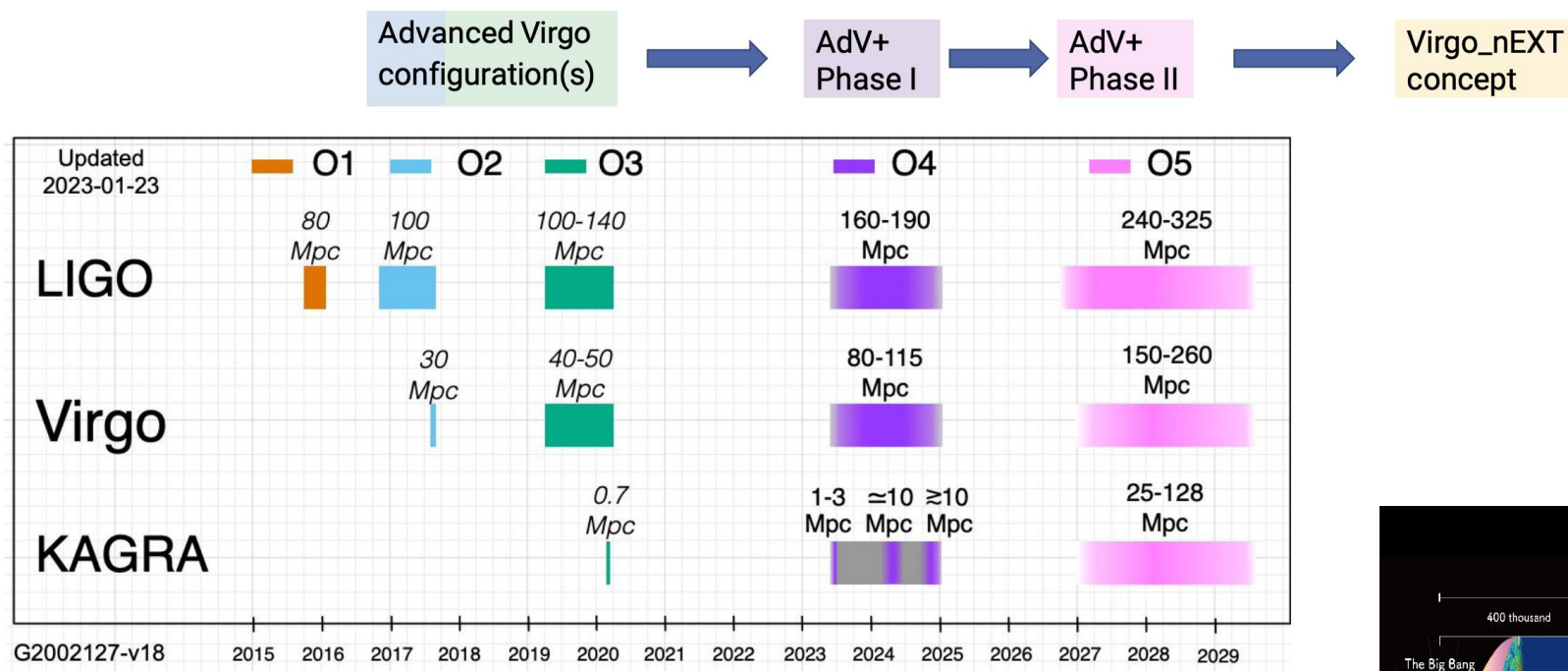


Virgo: 20-2000 Hz

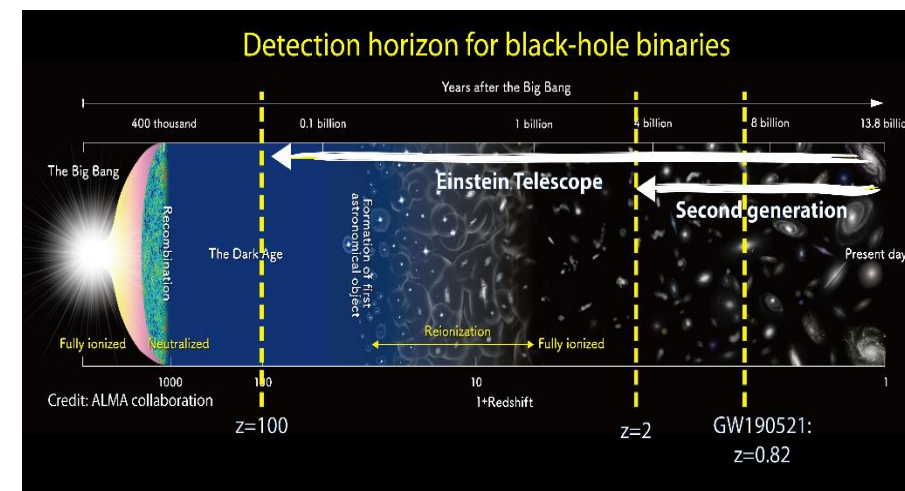
compact binary inspirals (BBH, BNS and BH-NS), supernovae and bursts.



VIRGO Observation runs plans

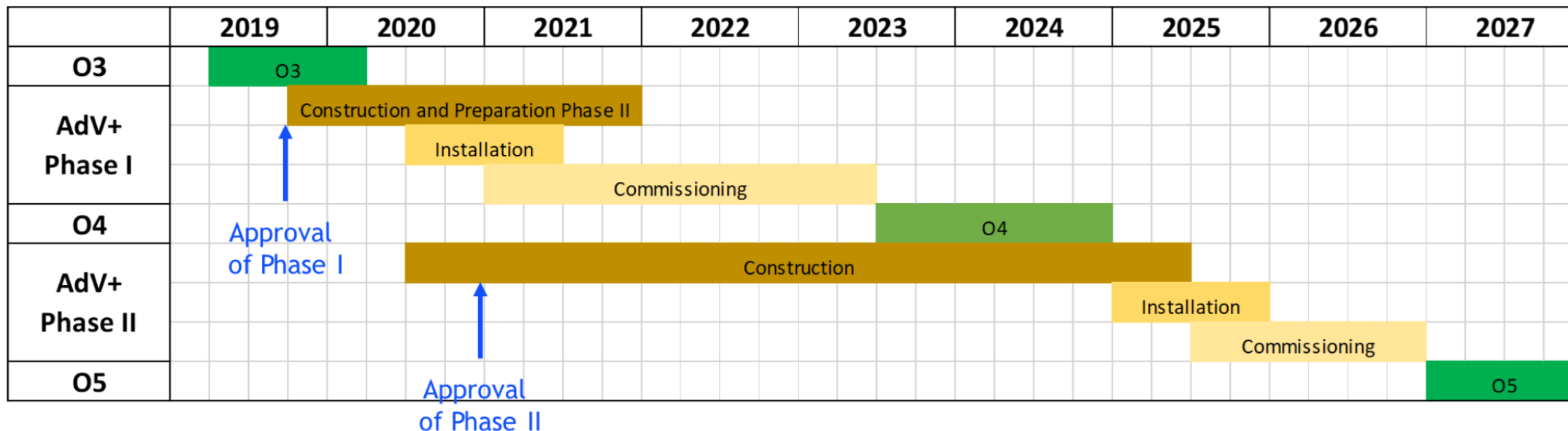


constant increase of observation horizon



VIRGO Advanced + upgrade: two phases

- Phase I (before O4 run/2023-24)
 - Mainly an upgrade to reduce quantum noise: no mirrors change
 - Reduction of technical noises
 - Preparation of Phase II
- Phase II (before O5 run/2027-28)
 - More invasive upgrade to reduce thermal noise: mirrors change



- Stable and reproducible control of interferometer mostly achieved in fall 2022, since then many issues
 - Failure of one test-mass payload
 - Laser amplifier excess noise spoiling high-frequency sensitivity O3 laser amplifier restored
 - Complexity from degeneracy of recycling cavities
 - Mirror thermal noise higher than expected
- Virgo **did not join O4 on May 24th** , but will join few months later
- AdV+ phase 2 and V_nEXT concept must be revised
- Synergies with ET on many crucial aspects

- Burst Multi-messenger events: Search for transient GWs signals associated with GRB and FRB during LIGO-Virgo third observational run
 - ❑ paper “Search for Gravitational Waves Associated with Fast Radio Bursts Detected by CHIME/FRB During the LIGO–Virgo Observing Run O3a” e-Print: [2203.12038](https://arxiv.org/abs/2203.12038) (O3b in preparation)
- Use of machine learning techniques to search for GW events
 - ❑ Implementation of pre-filter trigger to distinguish event candidates by means of machine learning techniques (arXiv:2206.06004) (review paper in preparation)

➤ Search of Continues GW:

- ☐ all sky search of isolated sources: follow-up of candidates from all-sky searches
- ☐ pulsar and narrow-band searches
- ☐ Search for gravitational-wave bursts in O3 LIGO data at the Schenberg antenna sensitivity range [3150-3260] Hz band (<https://arxiv.org/abs/2301.06751>)

- R&D for Virgo_next
 - ❑ New suspension for low frequency GW detection

PREVENTIVI 2024

FTE and request

Personel	ET FTE
Pierluigi Bortignon	???
Andrea Contu	???
Nazanin Davari (da associare)	0.4
Alessandro De Falco	0.2
Domenico D'Urso (RL)	0.4
Lorenzo Mirasola (phd)	0.8
Alessandro Riggio	0.3
Davide Rozza	0.4
Andrea Sanna	0.3
Valeria Sipala	0.4
Tot.	3.2

		(kEuro)
Missioni	N. 6 Meeting Nazionali 1 fisico x 3 gg (meeting di gruppo)	5
	N. 3 Meeting Internazionali 1 fisico x 3 gg (meeting di gruppo e/o 1 conferenza)	7
	3 periodi per Collaborazione con il Gruppo di Roma1 (1p x 5g)	3
Tot		15.0
		(kEuro)
Missioni Conferenze	Conferenze Italia ($1.5 \cdot (1 + 0.2 \cdot \text{FTE})$)	2.5
	Conferenze Estero ($2.5 \cdot (1 + 0.5 \cdot \text{FTE})$)	6.5
Tot		9.0

Linee Guida Preventivi

- Sigle sinergiche: Virgo, ET_Italia, Progetti Fondi Esterni, ..
 - ❑ Creazione di una tabella Virgo/ET con tutte le sigle ed I relative FTE
- FTE ≥ 20 (in step da 10)
- RN FTE ≥ 50 (1 solo esperimento, no over 65)
- Max 2 sigle di CSN2
- Phd, borsisti post-lauream max 2 sigle
- Sigla locale 1.5 FTE

- Bonus [keuro] = 0.3
- Bonus per ruoli di resp. SP, CB, Specific Baord Chair, Div. Chair, WP Chair, RN
- Conferenze Italia (secondo l'algoritmo $1.5 * (1 + 0.2 * \text{FTE})$)
- Conferenze Estero (secondo l'algoritmo $2.5 * (1 + 0.5 * \text{FTE})$)
- Attività