JGW-T1809078

October 9, 2018
(Added O3-15Mpc on May 5, 2019)

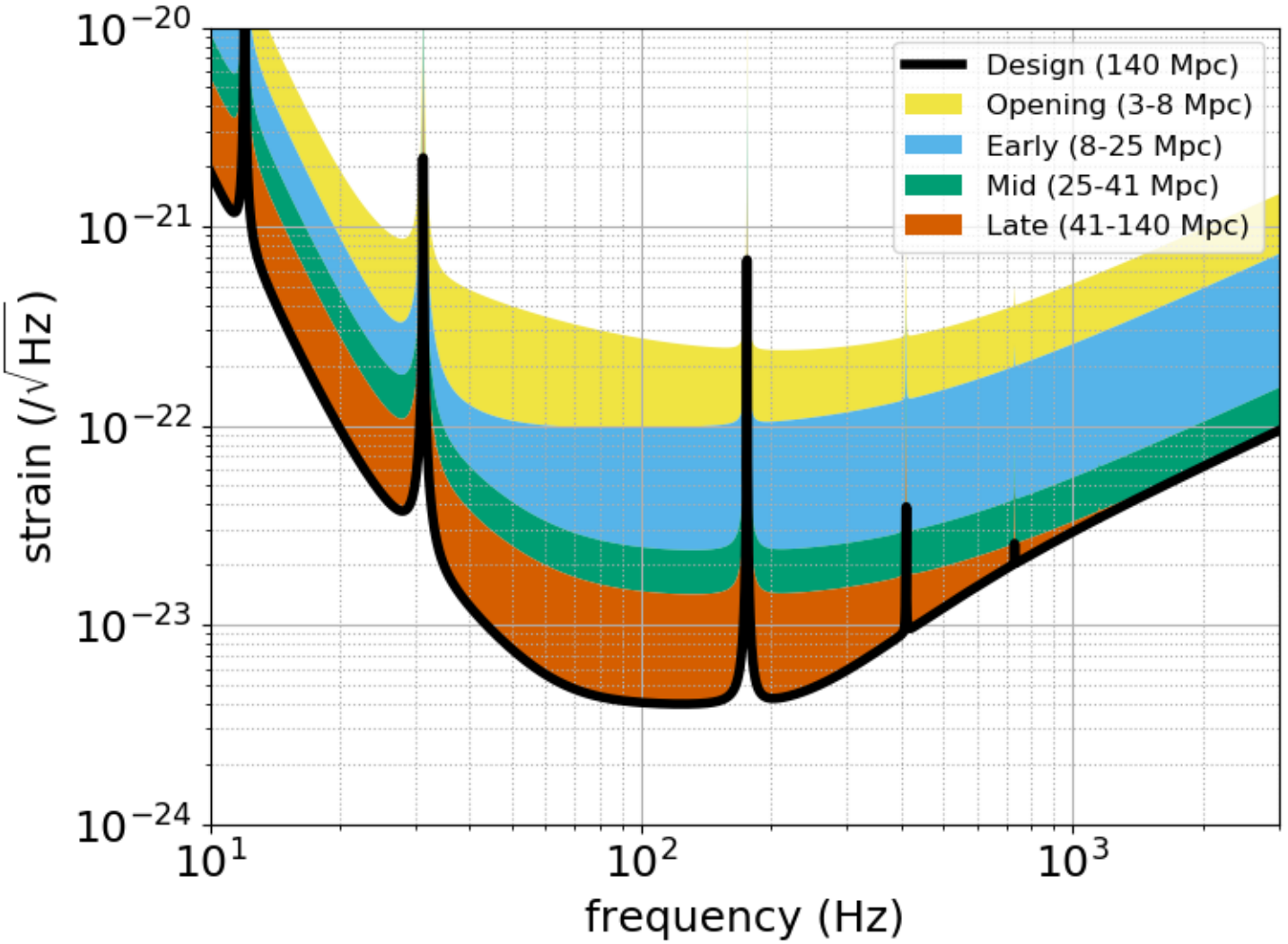
KAGRA Sensitivity for Observation Scenario Paper 2018

Yuta Michimura

Department of Physics, University of Tokyo

Previous Version

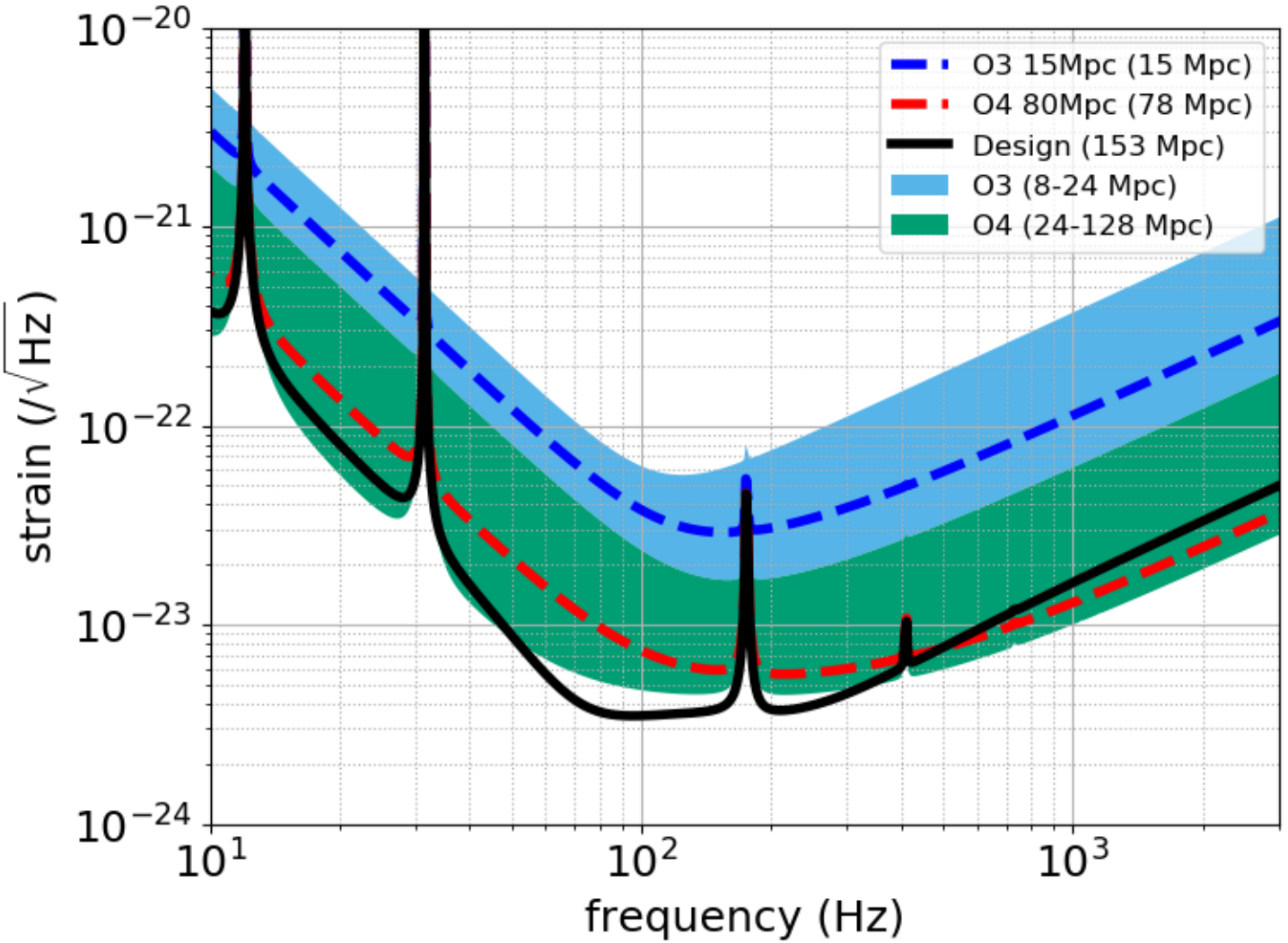
- See JGW-G1706116 for explanations



Opening
2018.4-2019.3
Early
2019.4-2020.3
Mid
2020-2021
Late
2021-2022
Design
2022

Proposal for Update

- Reflect recent discussions on O3 sensitivity (JGW-T1707556, JGW-T1808172) and latest estimated sensitivity (JGW-T1707038)



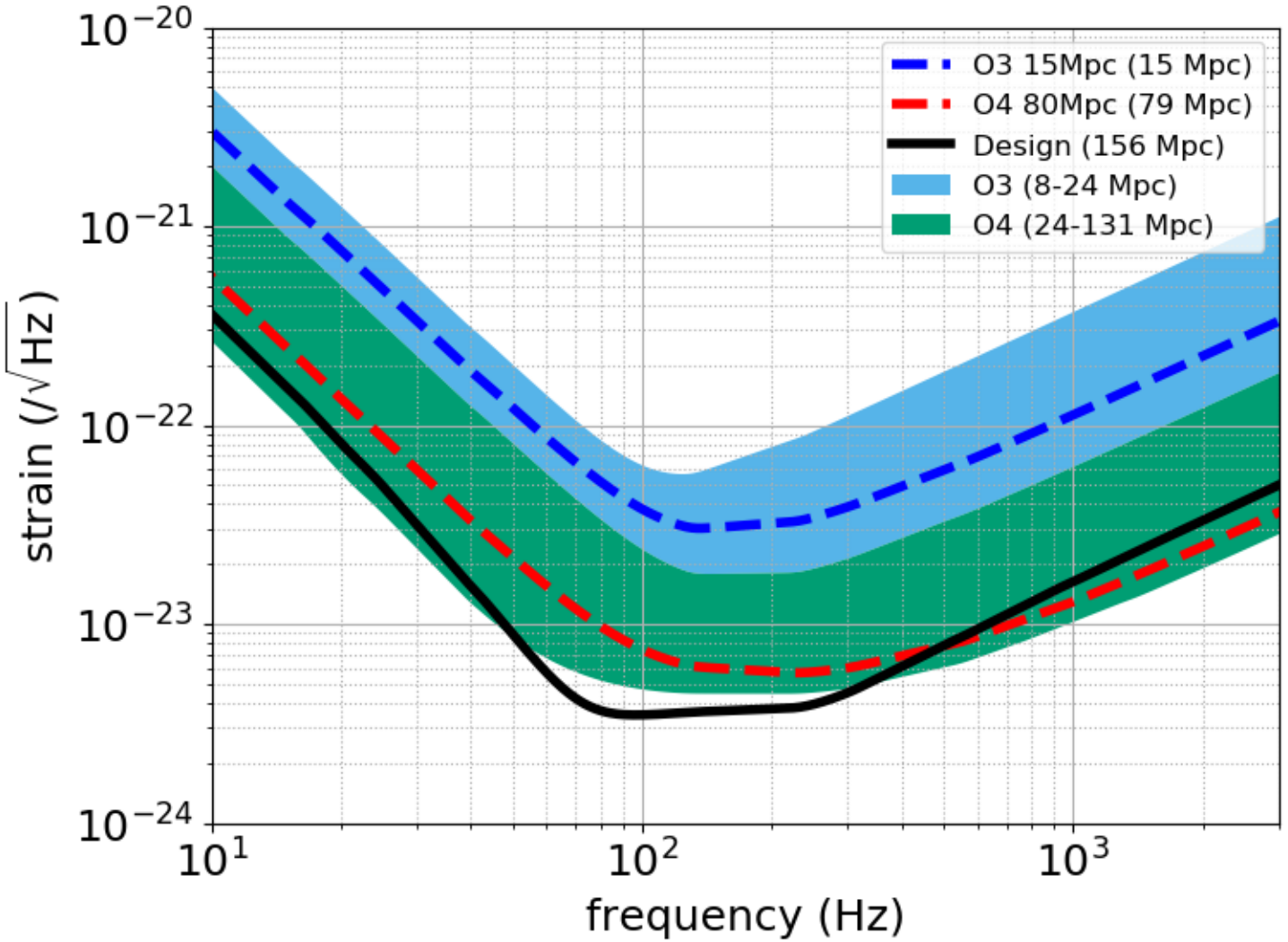
O3
2019-2020
O4
2021-2022
O5
2024

O4-80Mpc as "most probable" O4 sensitivity

O3-15Mpc for our use

Smooth Version w/o Peaks

- Reflect recent discussions on O3 sensitivity (JGW-T1707556, JGW-T1808172) and latest estimated sensitivity (JGW-T1707038)



O3
2019-2020
O4
2021-2022
O5
2024

O4-80Mpc as "most probable" O4 sensitivity

O3-15Mpc for our use

Details of the Update

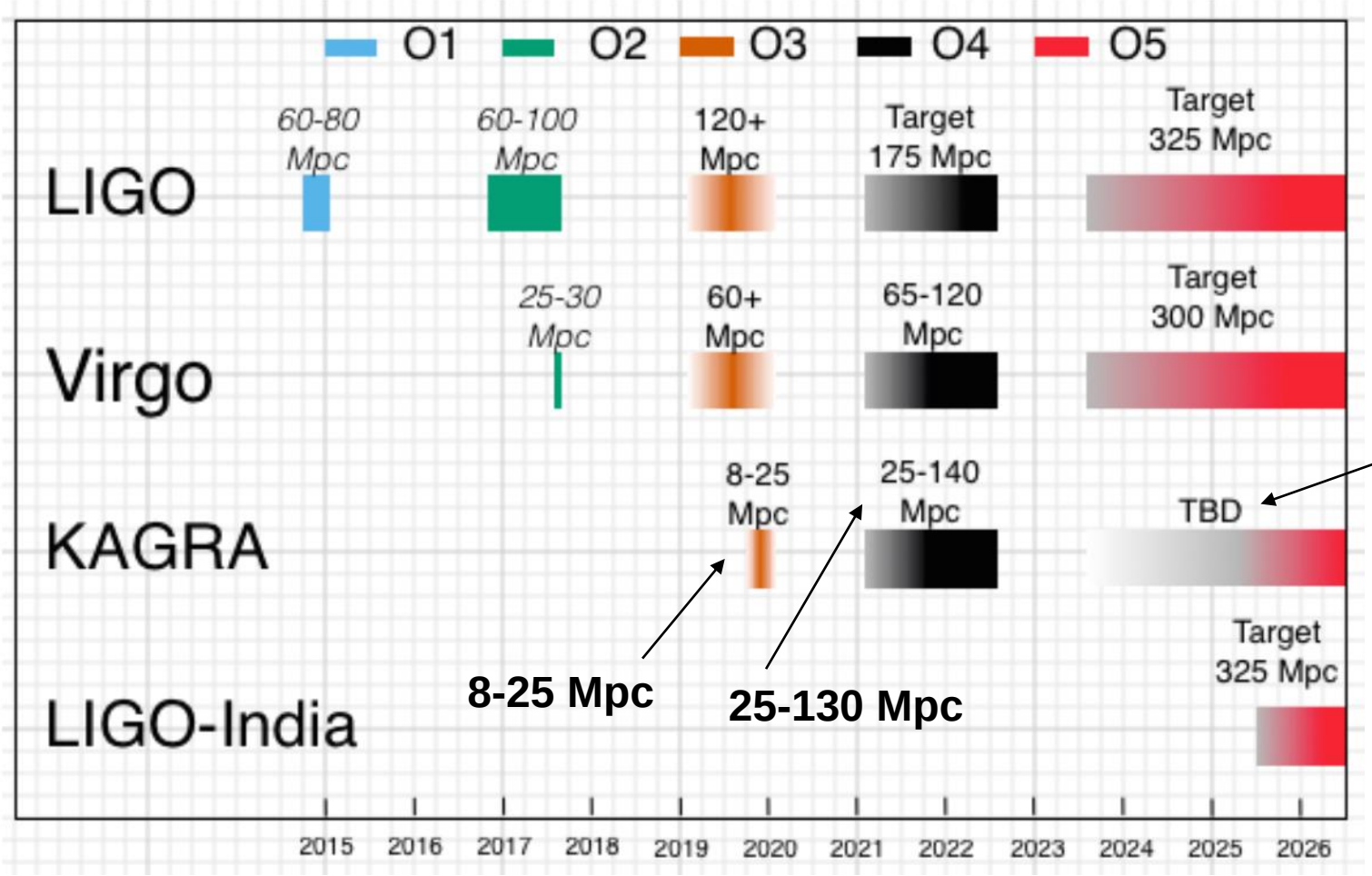
- Calculated with the approved latest estimated sensitivity code in JGW-T1707038, with following parameters

	Mirror temp.	Power at BS	SRM reflectivity	Detuning angle	Homodyne angle	Excess noise
O3 low	22 K	10 W	0 %	90 deg (PRFPMI)	90 deg (conventional)	O1 x 20
O3-15Mpc	22 K	10 W	70 %	90 deg	90 deg	O1 x12
O3 high / O4 low	22 K	33 W	70 %	90 deg (BRSE)	90 deg (conventional)	O1 x 8
O4 80Mpc	22 K	404 W	85 %	90 deg	90 deg	O1 x 2
O4 high	22 K	673 W	85 %	90 deg (BRSE)	90 deg (conventional)	no excess
Design	22 K	673 W	85 %	86.5 deg	135.1 deg	no excess

- O3 low and O3 high similar to sensitivities in JGW-T1707556 (but with different excess noise level to get ~8-25 Mpc, without 60 Hz line noise)
- O1 excess noise is modeled with $2.5e\text{-}20*(f / 1\ Hz)^{-2}$
- O4 high same as BRSE (conventional readout) in JGW-T1707038

Preliminary Timeline from JRPC

- Prof. Kajita says “EO asks to plan the same period for the O5 run. The KAGRA upgrade should be made between O4 and O5.”



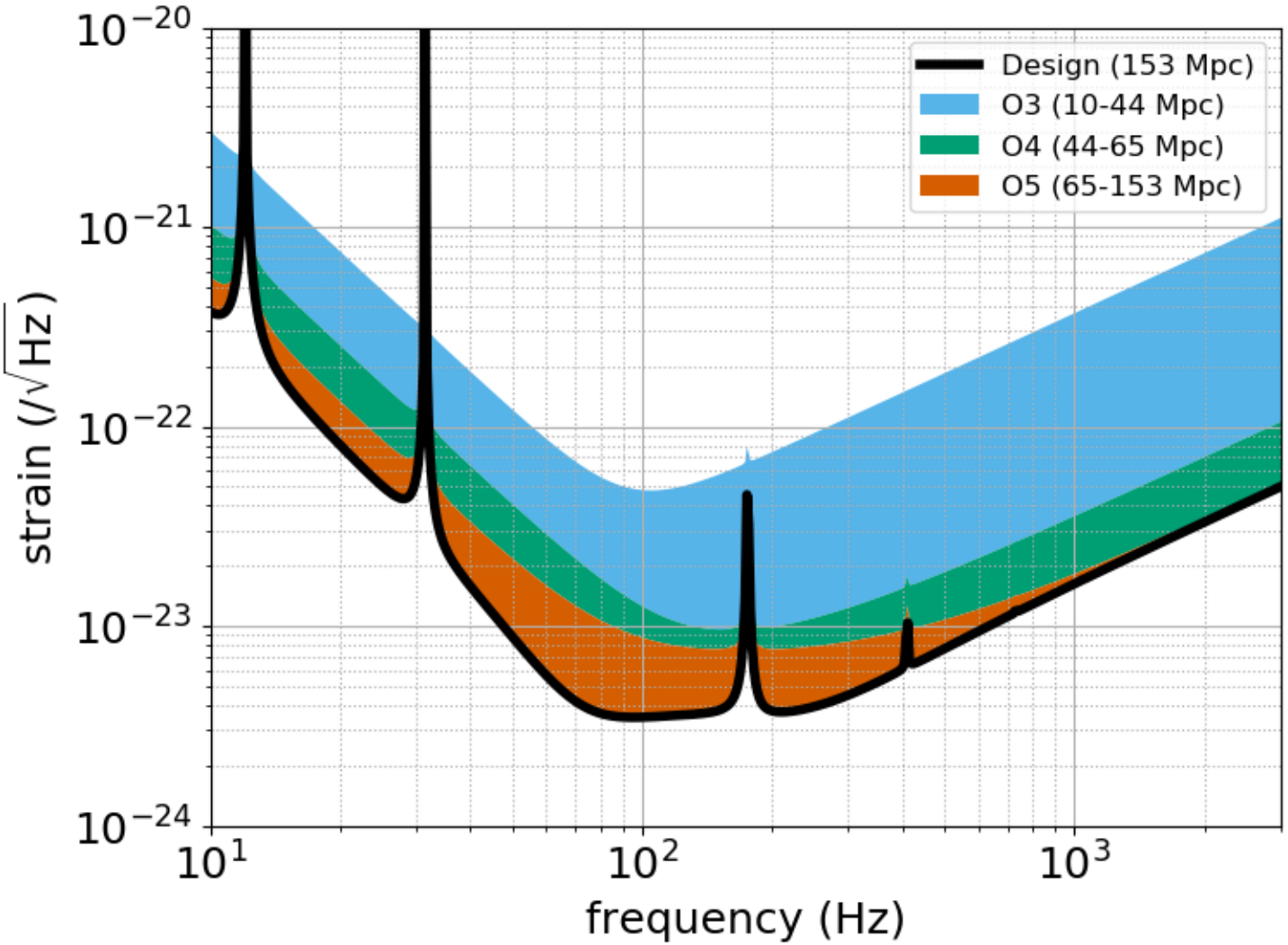
This will be **130+ Mpc** (upgrades should happen between O4 and O5)

Preliminary timeline from JRPC report 20180913

Older Versions

Proposal for Update v20181005

- Reflect recent discussions on O3 sensitivity (JGW-T1707556, JGW-T1808172) and latest estimated sensitivity (JGW-T1707038)



Details of the Update v20181005

- Calculated with the approved latest estimated sensitivity code in JGW-T1707038, with following parameters

	Mirror temp.	Power at BS	SRM reflectivity	Detuning angle	Homodyne angle	Excess noise
O3 low	22 K	10 W	0 %	90 deg (BRSE)	90 deg (conventional)	O1 x 12
O3 high / O4 low	22 K	101 W	70 %	90 deg (BRSE)	90 deg (conventional)	O1 x 4
O4 high / O5 low	22 K	202 W	85 %	90 deg (BRSE)	90 deg (conventional)	O1 x 2
O5 high / Design	22 K	673 W	85 %	86.5 deg	135.1 deg	no excess

- O3 low and O3 high same as 10Mpc and 40Mpc sensitivities, respectively, in JGW-T1707556 (but without 60 Hz line noise)
- O1 excess noise is modeled with $2.5e\text{-}20*(f / 1\ Hz)^{-2}$

Comments on v20181005

- 44 Mpc for O3 high sounds a bit too ambitious compared with 25 Mpc for Early high (2019.4-2020.3) in previous version
- People might think we should aim for the design sensitivity for O4
- DRSE in O4 might be too ambitious