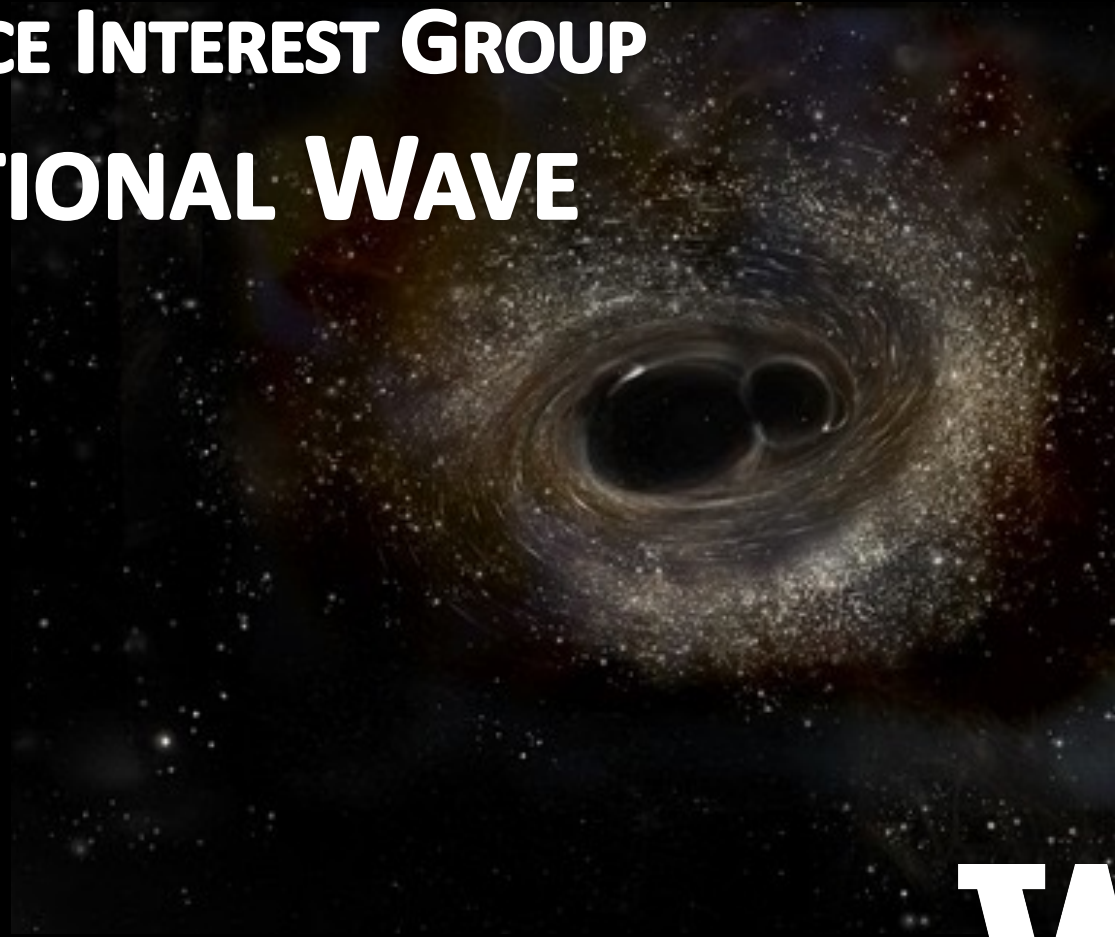
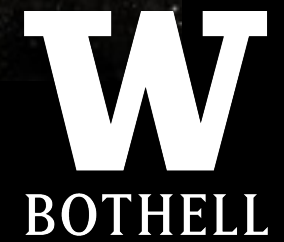


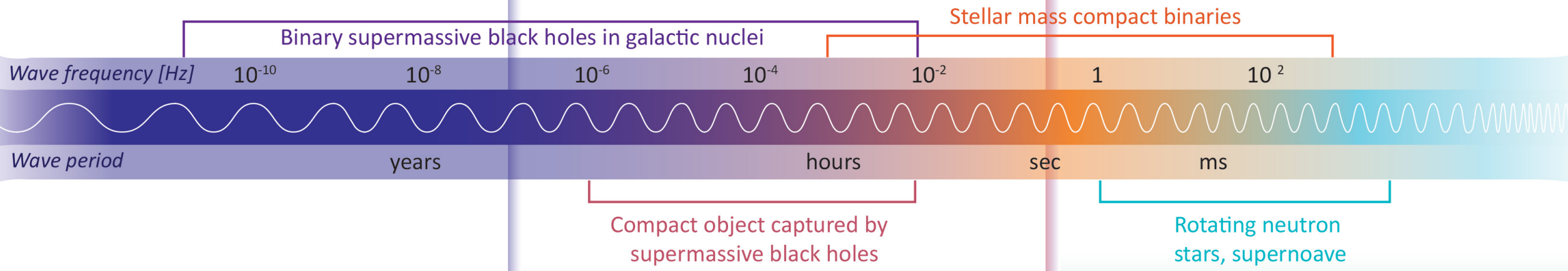
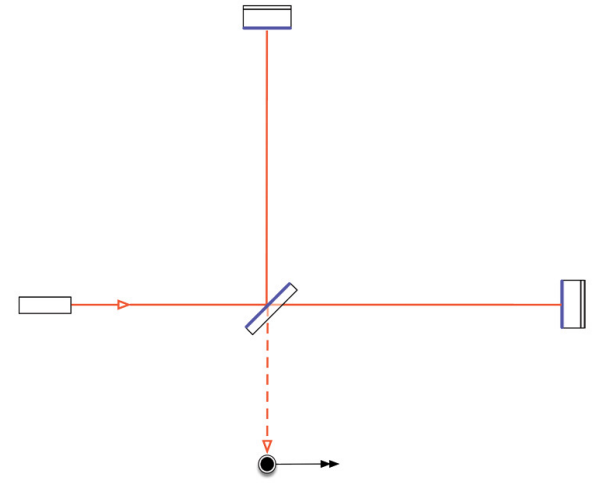
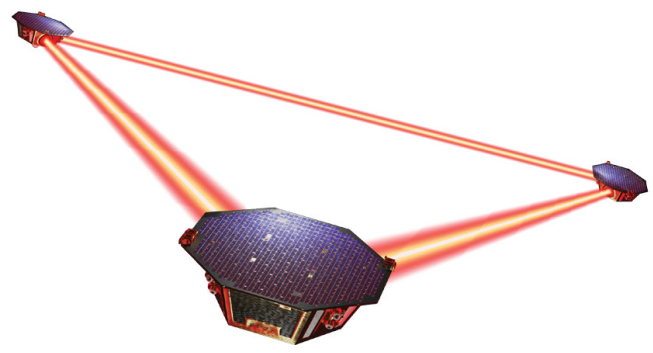
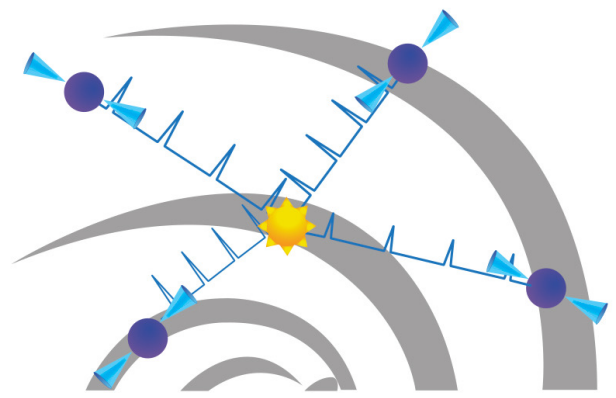
**GRAVITATIONAL WAVE SCIENCE INTEREST GROUP**  
**MULTIBAND GRAVITATIONAL WAVE**  
**ASTROPHYSICISTS**

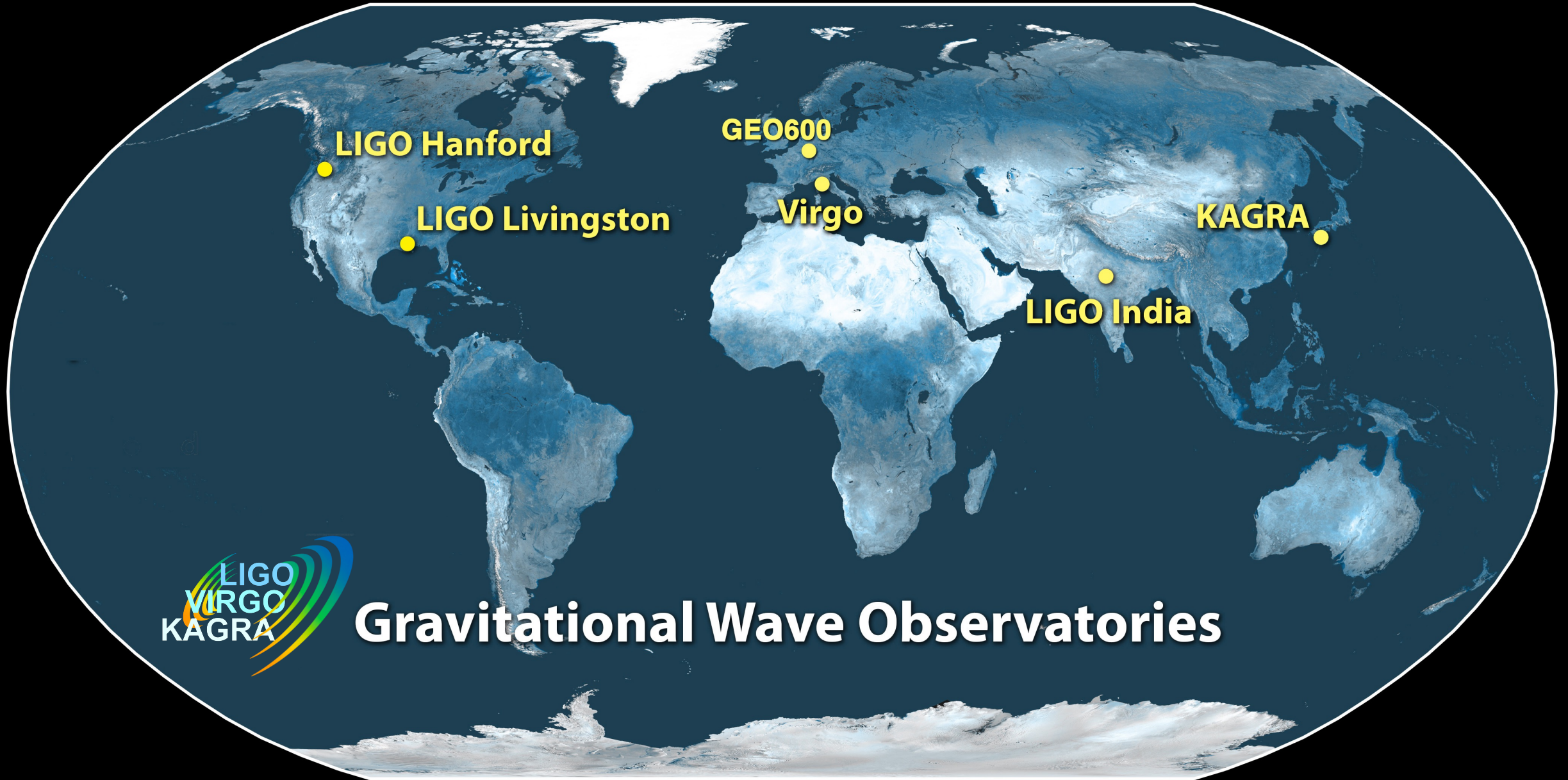


Joey Shapiro Key  
University of Washington Bothell

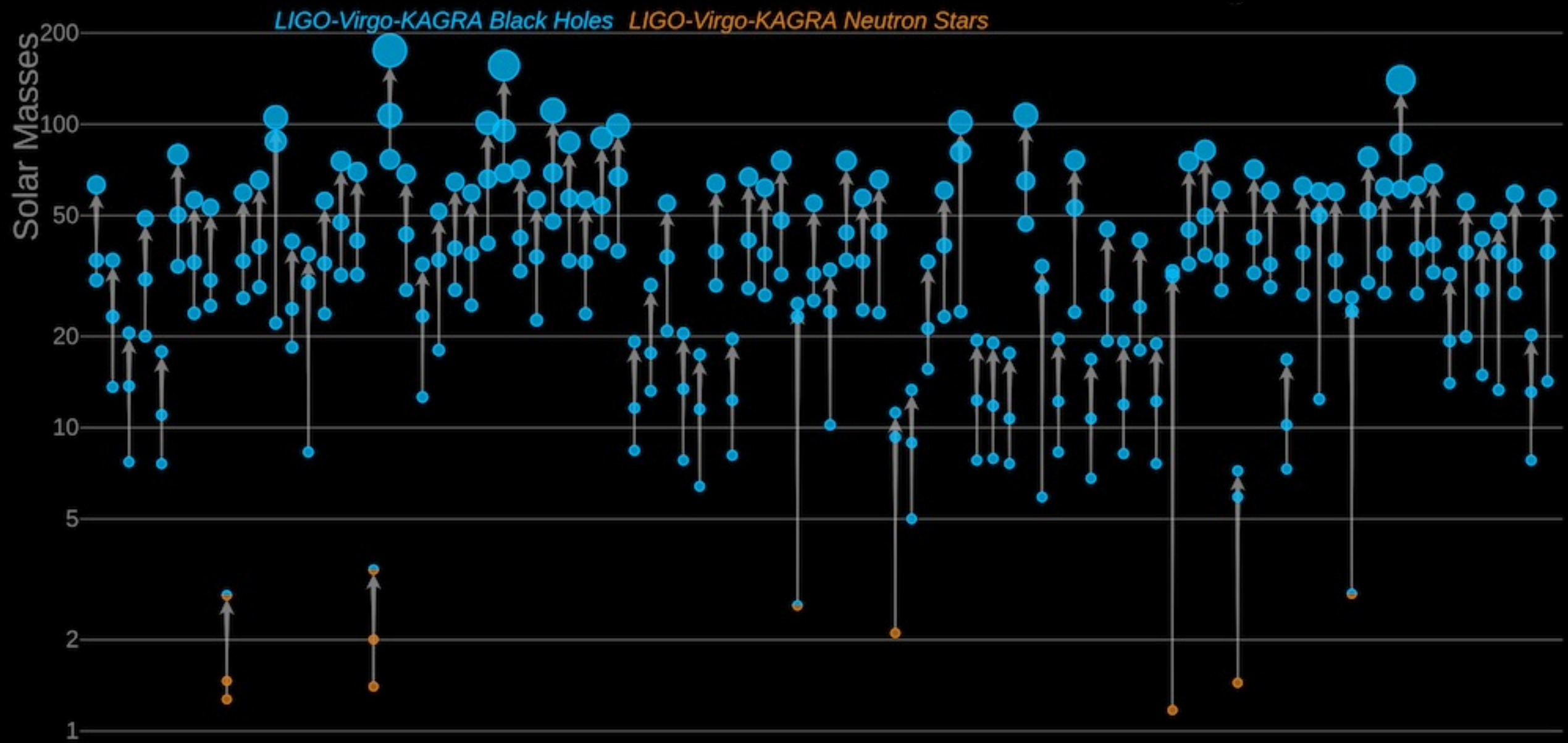


# Gravitational Wave Observatories





# Gravitational Wave Observatories

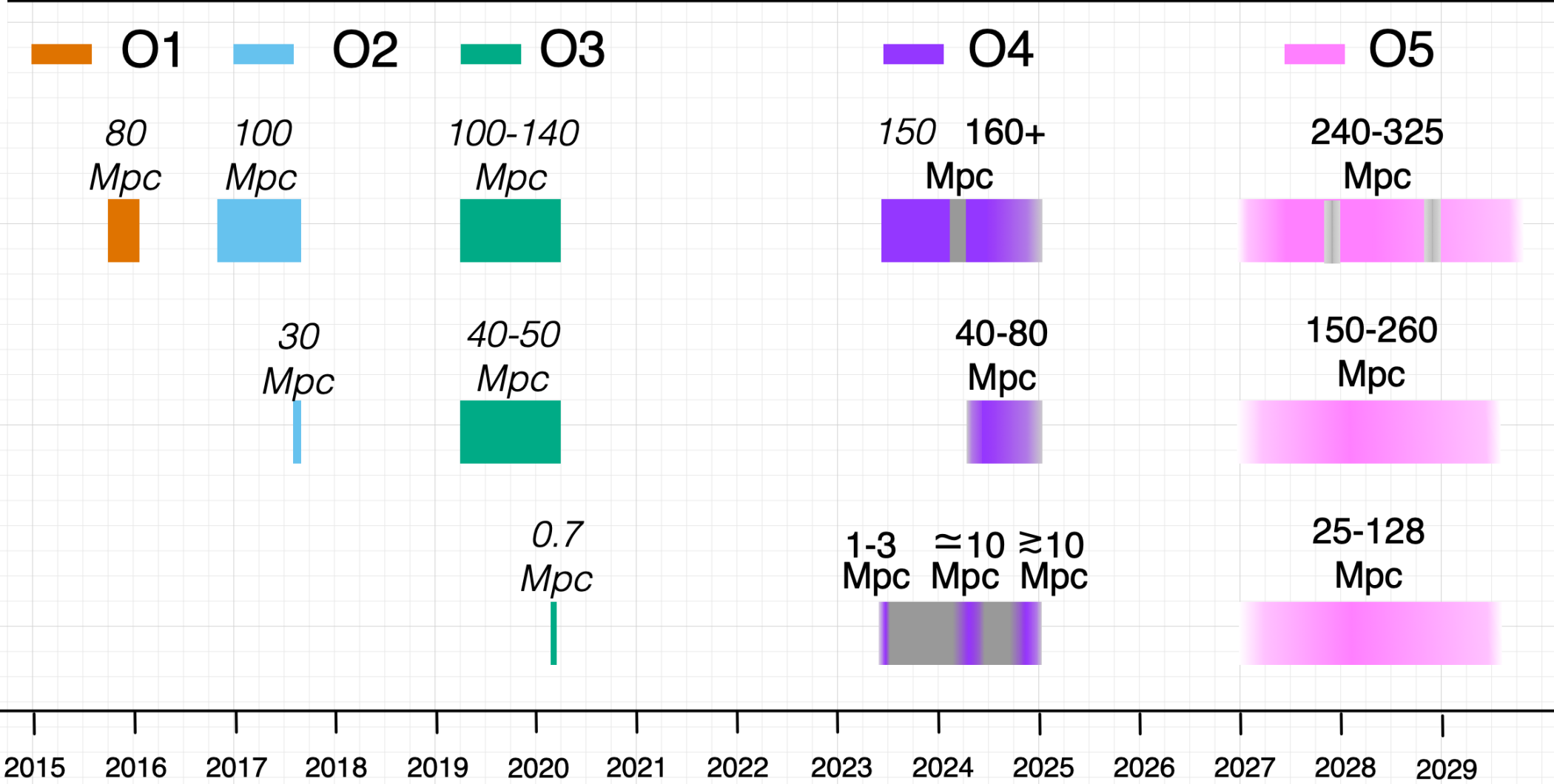


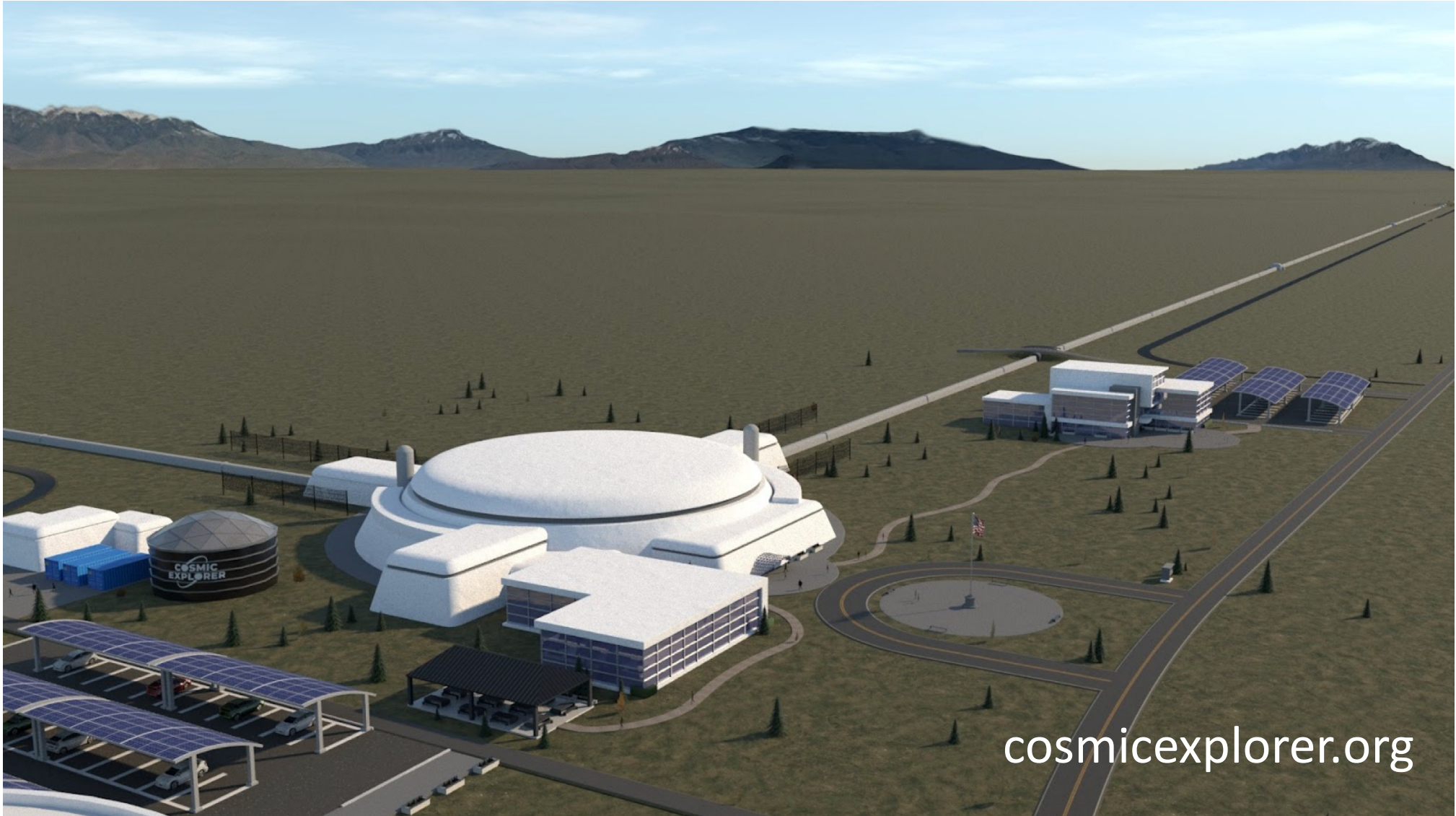


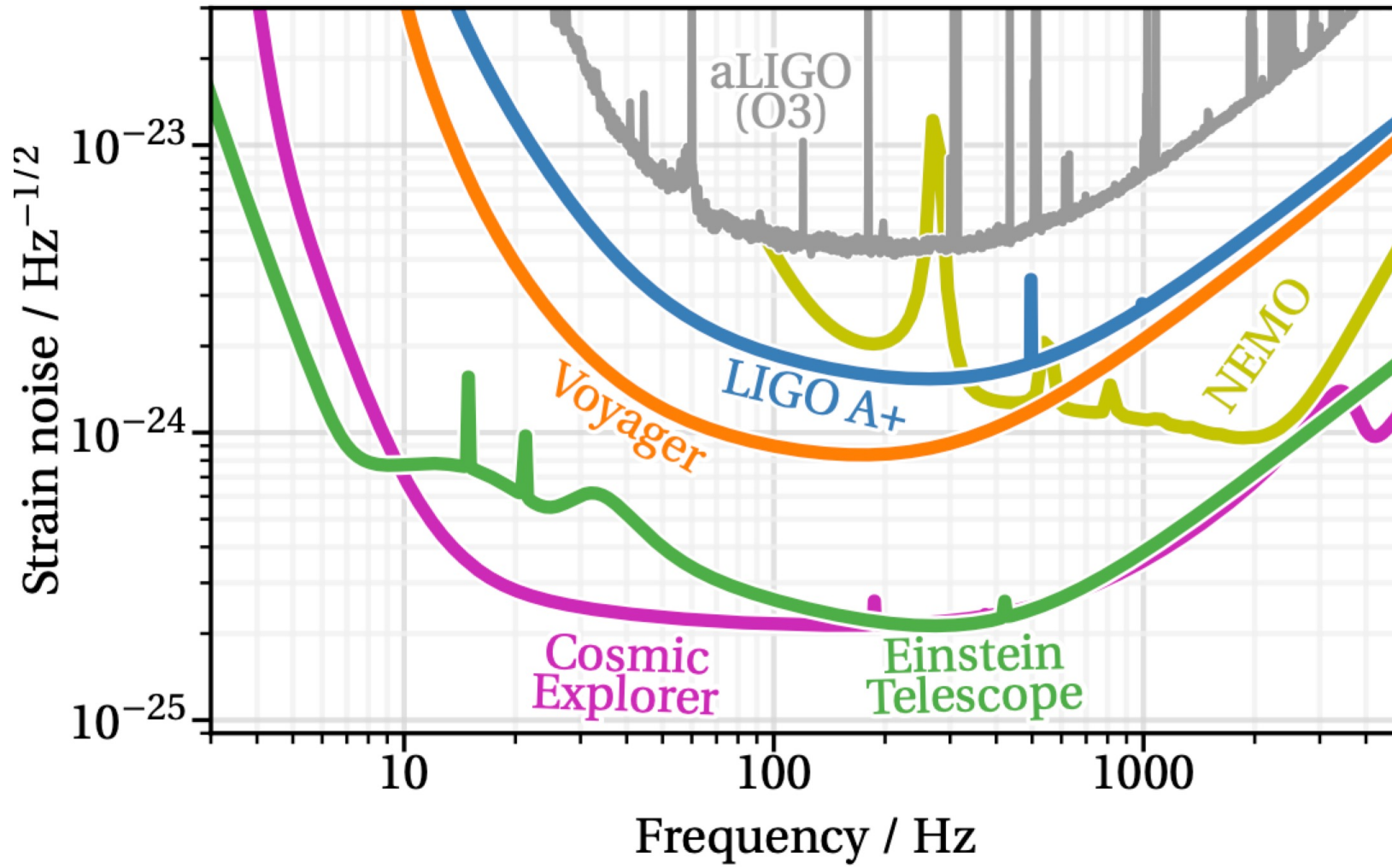
LIGO

Virgo

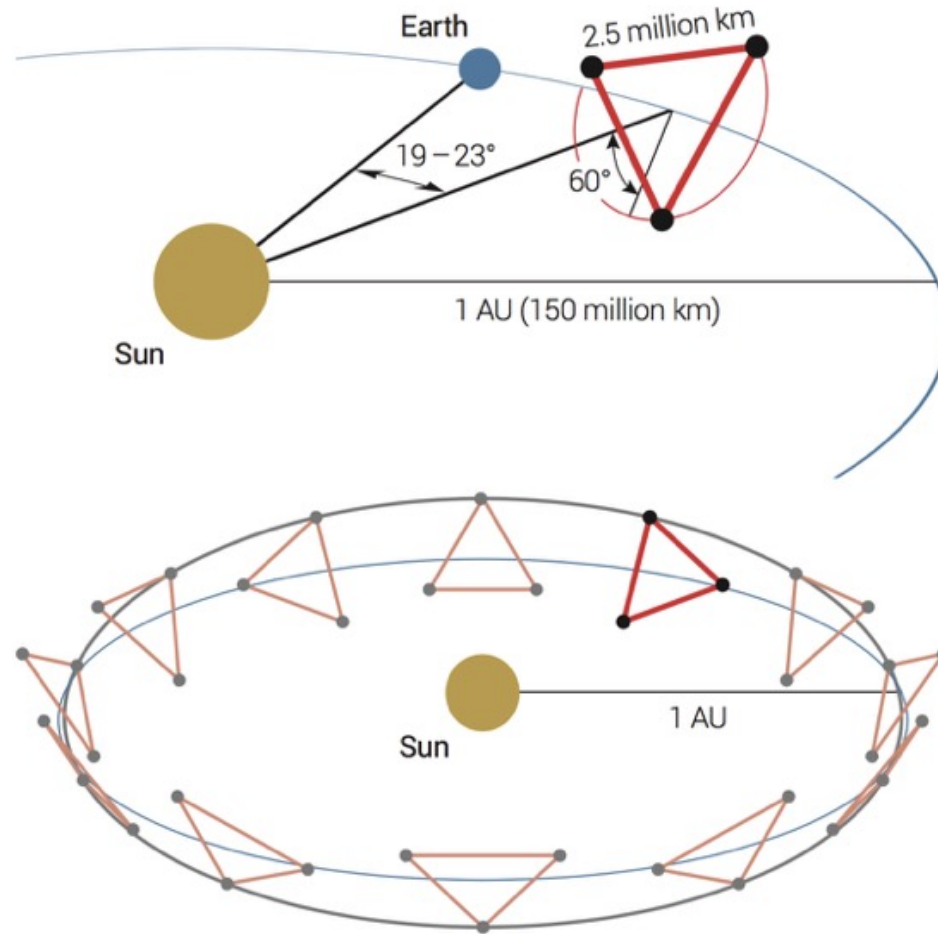
KAGRA



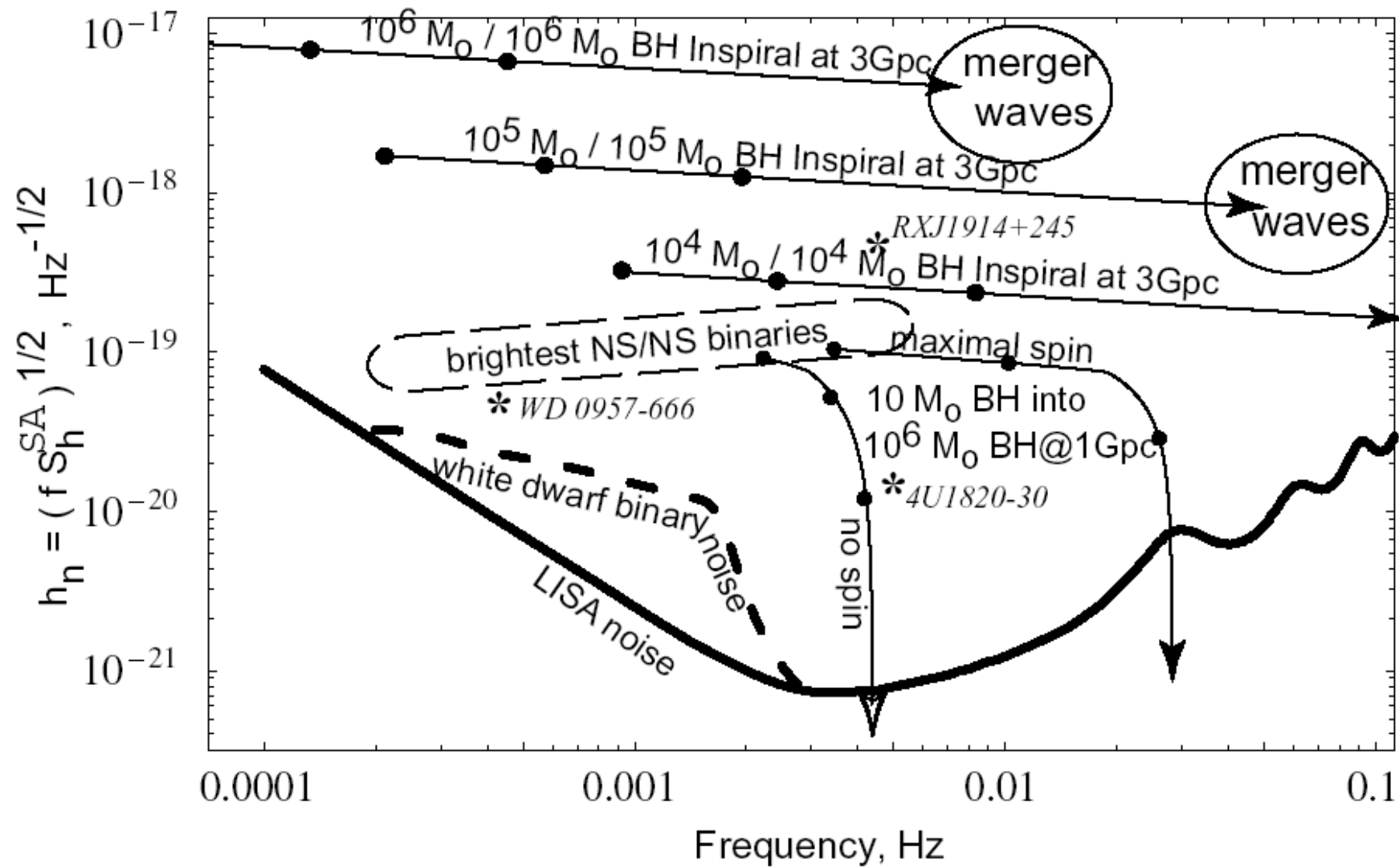


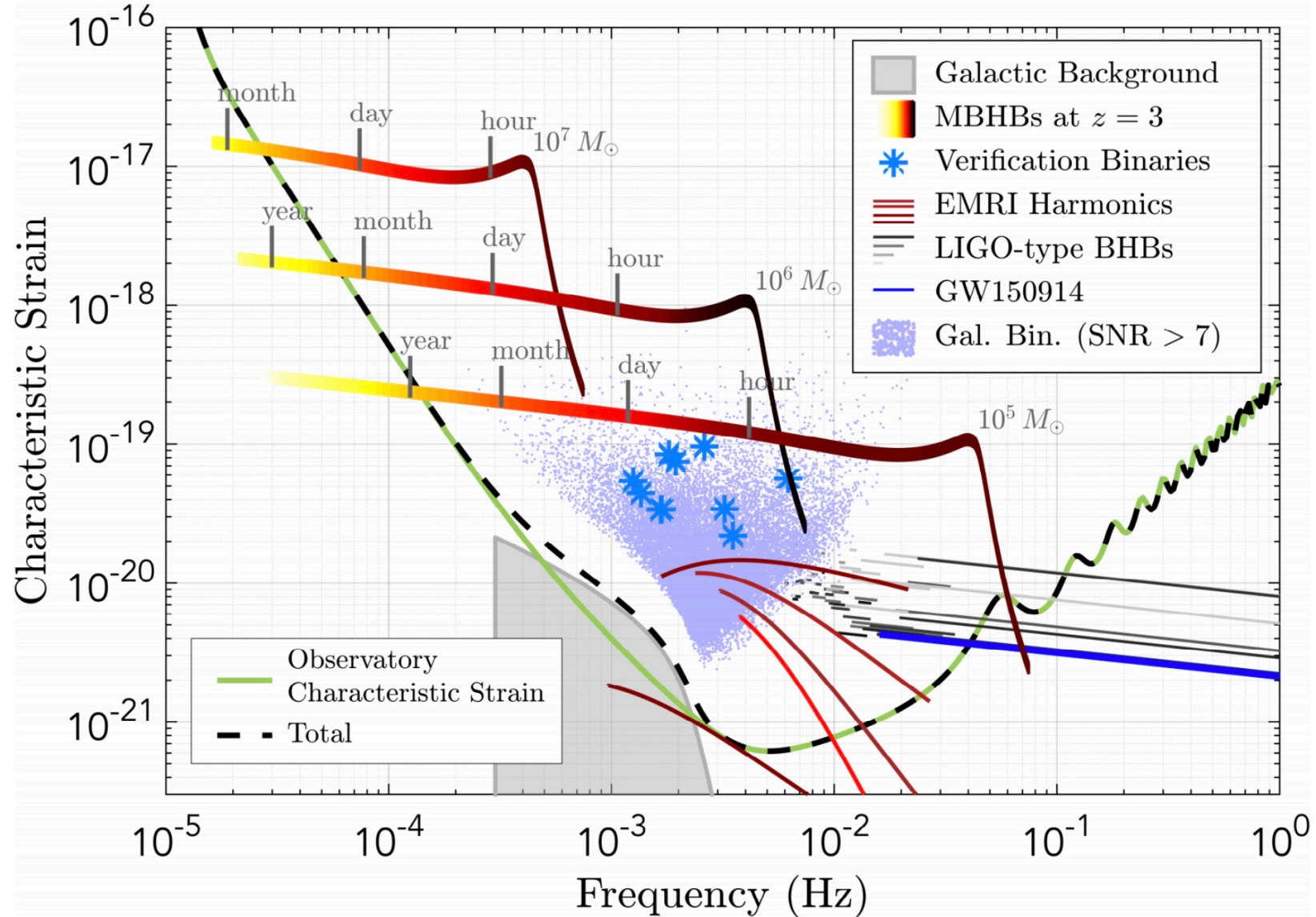


# Laser Interferometer Space Antenna (LISA)

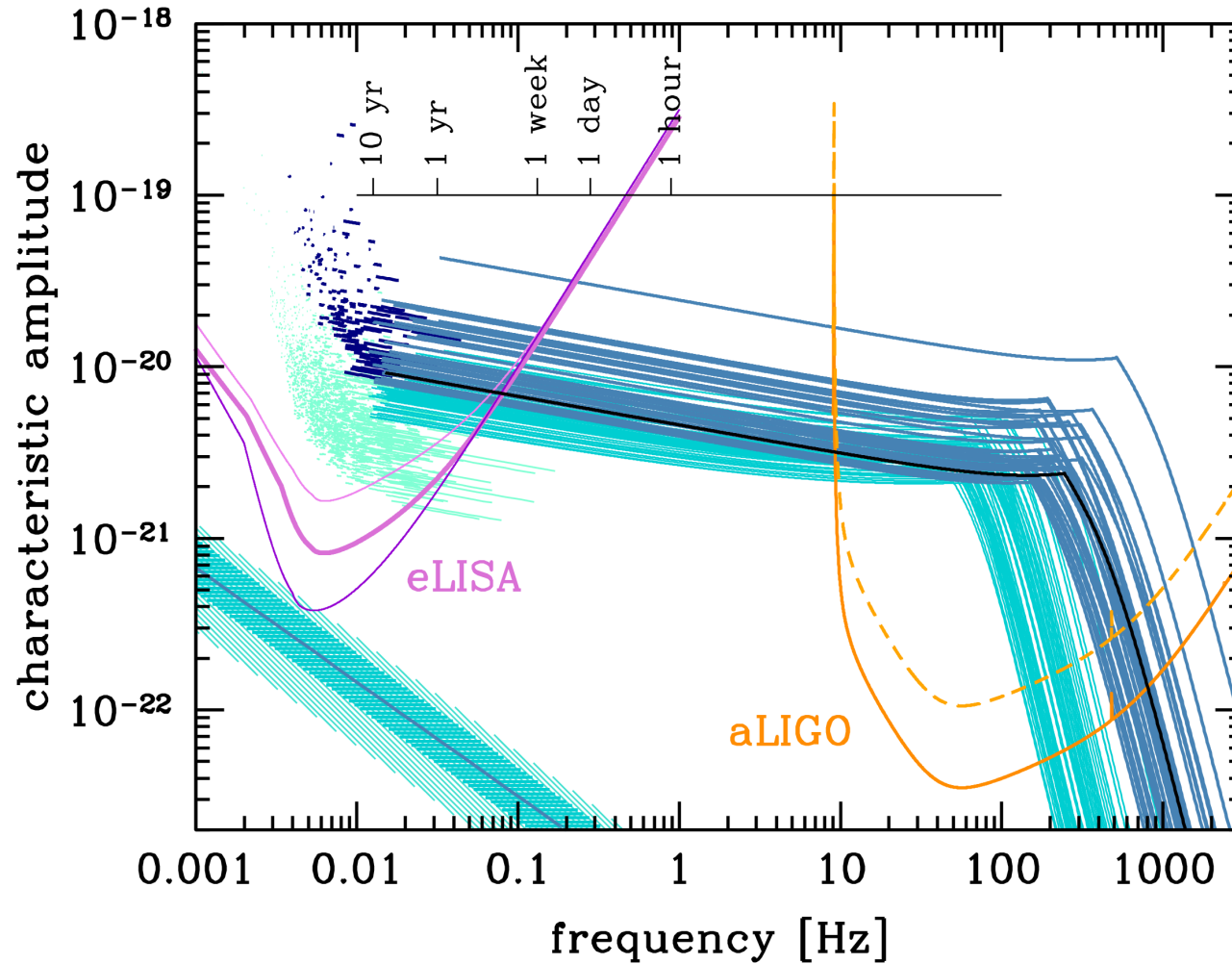




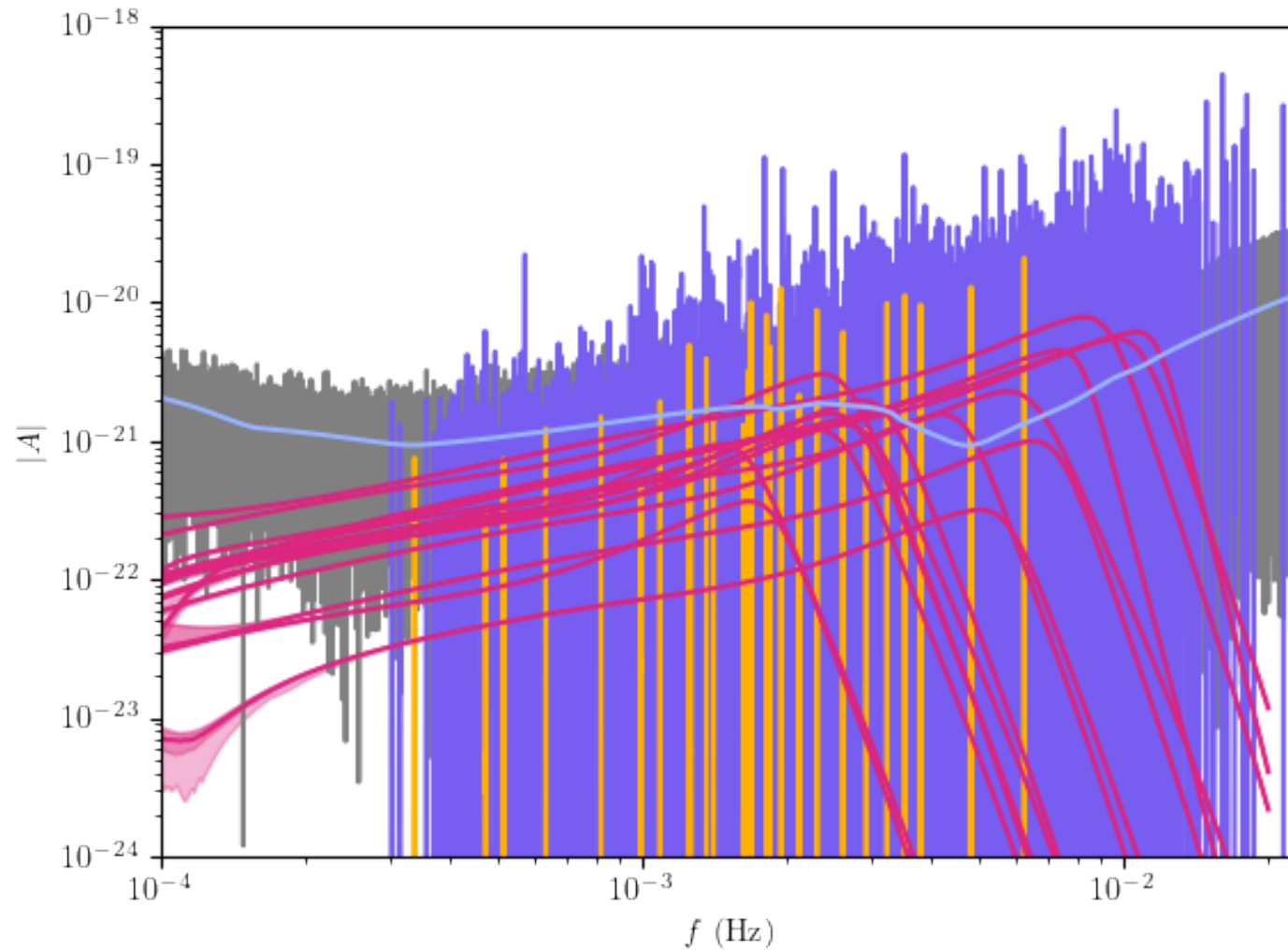




# Multiband Binaries



# Global Fit





# NASA LISA Project Office

## LISA Preparatory Science (LPS)

NASA ROSES February 2024

## LISA Science Team

Dear Colleague Letter February 2024



## Constituent Council

some US members:

David Shoemaker

Kelly Holley-Bockelmann

Neil Cornish

Shane Larson

Michele Valisneri

Joey Shapiro Key

Robert Rosati

Deirdre Shoemaker



# Links between LIGO and LISA science

Neil Cornish, Montana State University

GWSIG session

Tuesday, January 9

Ernest N. Morial Convention Center room 219

2:00pm – 3:30pm CT

# THE SPECTRUM OF GRAVITATIONAL WAVES

**Observatories & experiments**

Ground-based experiment



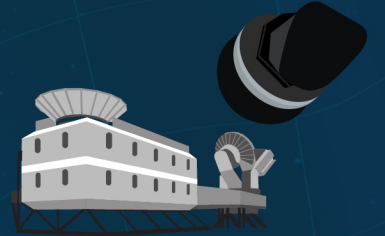
Space-based observatory



Pulsar timing array



Cosmic microwave background polarisation



**Timescales**

milliseconds

seconds

hours

years

billions of years

**Frequency (Hz)**

100

1

$10^{-2}$

$10^{-4}$

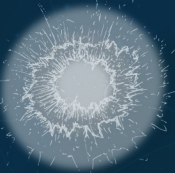
$10^{-6}$

$10^{-8}$

$10^{-16}$

Cosmic fluctuations in the early Universe

**Cosmic sources**



Supernova



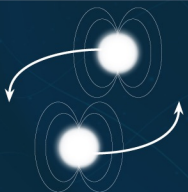
Pulsar



Compact object falling onto a supermassive black hole



Merging supermassive black holes



Merging neutron stars in other galaxies



Merging stellar-mass black holes in other galaxies



Merging white dwarfs in our Galaxy