

Czech involvement in the LISA mission

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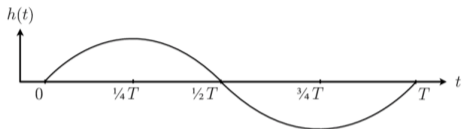
Astronomical Institute of the Czech Academy of Sciences

Academia&Industry in Space Projects III

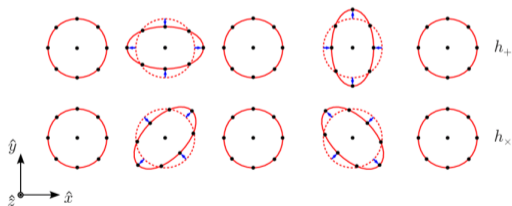
14. 5. 2026, Brno



Gravitational waves

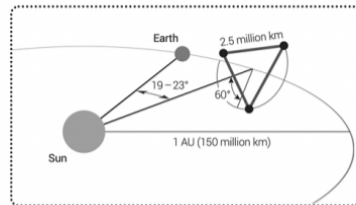
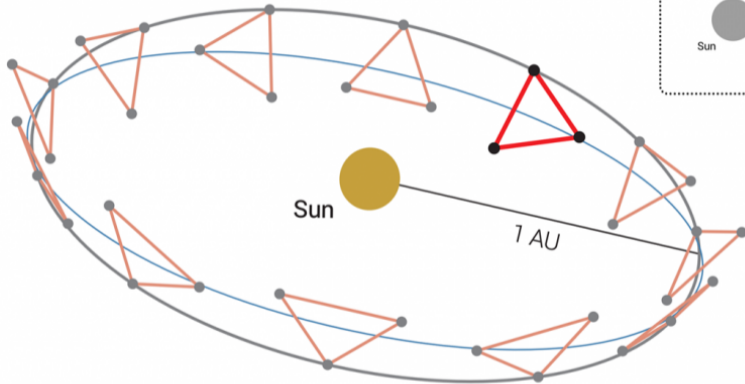


$$\Delta L = h(t) \cdot L$$

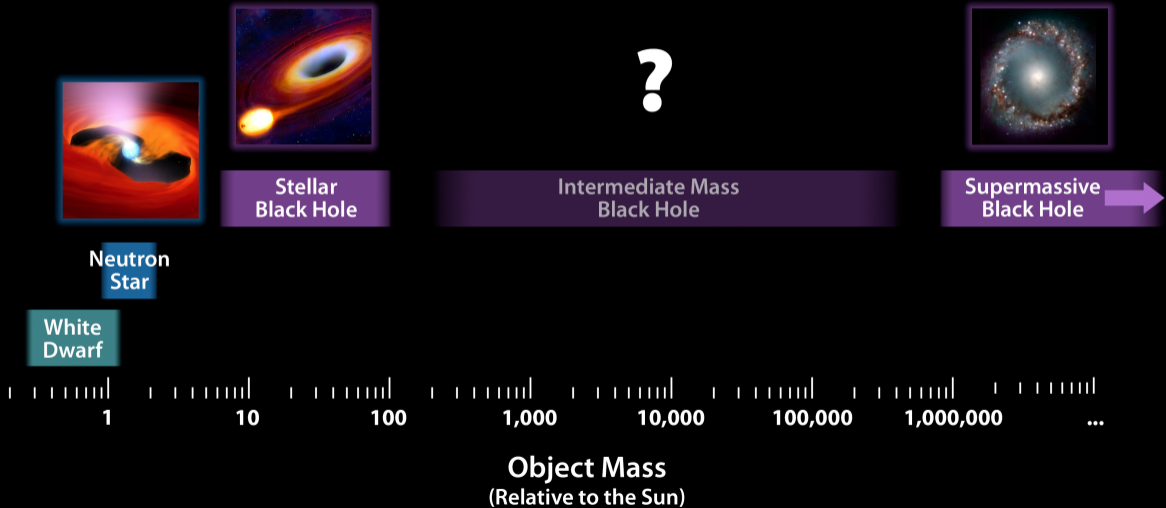


- ▶ $h \sim 10^{-21}$
- ▶ $4 \text{ km} \sim 10^{-18} \text{ m}$
- ▶ $1 \text{ AU} \sim 10^{-10} \text{ m}$

LISA mission



Observed Mass Ranges of Compact Objects



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



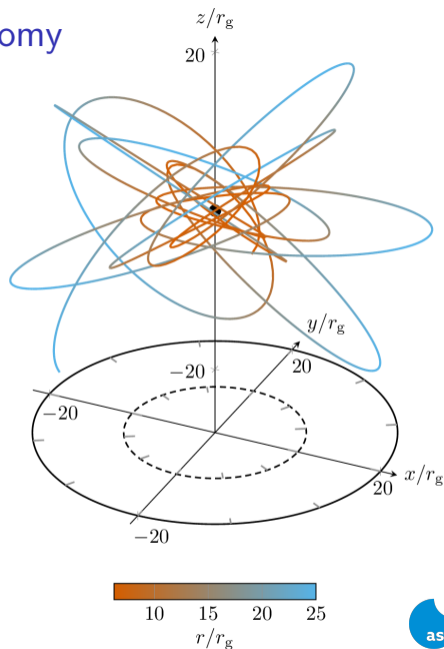
Merging stellar-mass black holes
in other galaxies



Merging white dwarfs
in our Galaxy

Aims of mHz gravitational-wave astronomy

- ▶ formation of supermassive black holes → cosmology
- ▶ tests of general relativity: black hole spacetime mapping
- ▶ primordial gravitational waves



Czech involvement in the LISA Consortium

Czech member group: CzechLISA - 10 core members, council representation

- ▶ waveform modeling: ASU, BITS Piloni
- ▶ data analysis, astrophysics: SLU
- ▶ instrumentation: ASU, FZU, ÚFA, ÚT

Outside: group at MFF

- ▶ waveform modeling

LISA
CONSORTIUM

asU Astronomický
ústav
AV ČR