Gravitational-wave research in **China**: overview

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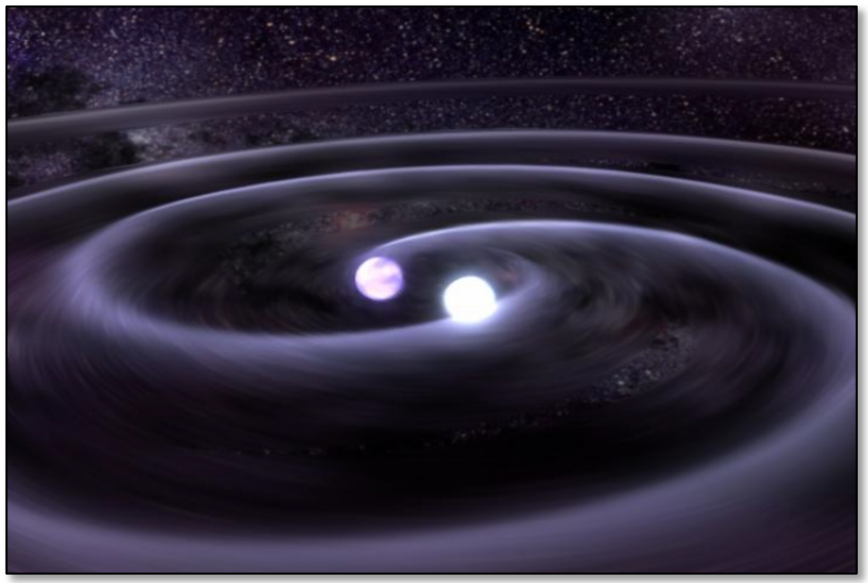


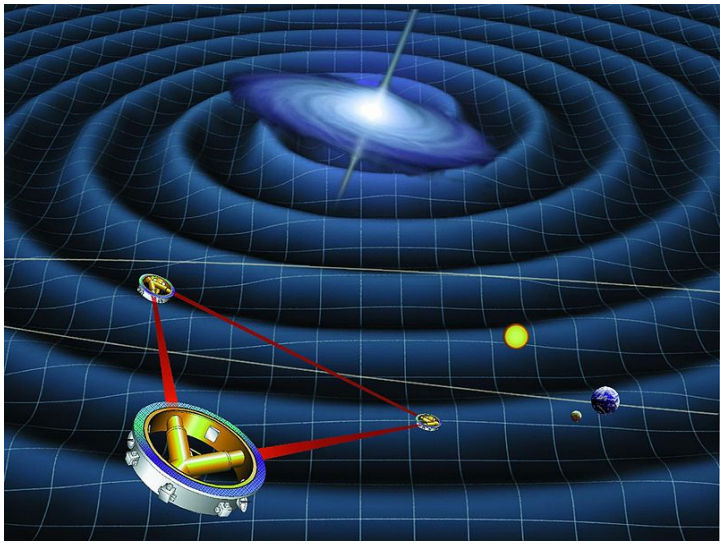
Main themes

- Detection of gravitational waves (GW)
- Study of gravitation (including theory)
- Electromagnetic follow-up after GW detection

GRAVITATIONAL-WAVE DETECTION

Space gravitational-wave observatory

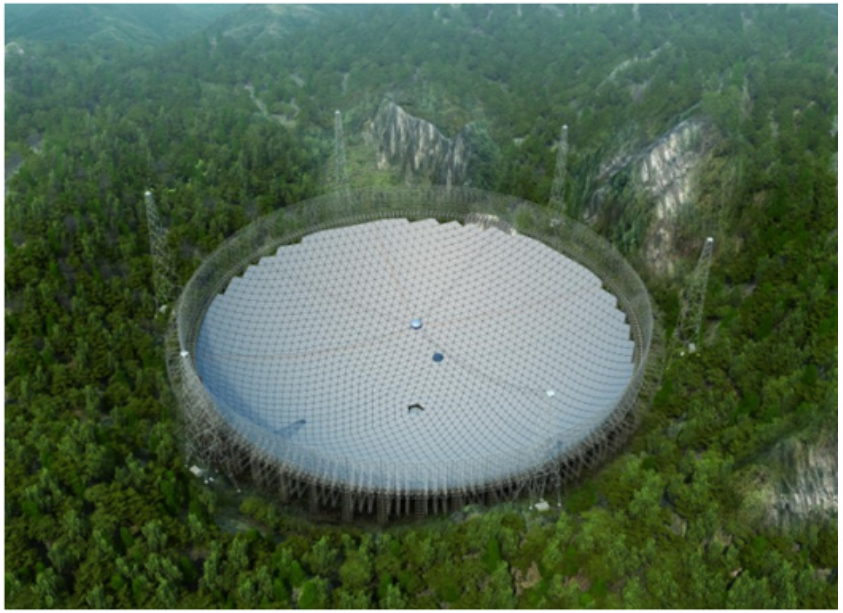
- Interferometer in space: ASTROD-GW proposed
  - Low-frequency GW (~1–0.01 Hz)



- Nanjing U, Chin. Acad. Sc., Chin. Space Agency,…
- Plus: collaboration with Europe on the similar New Gravitational wave Observatory (NGO)

Use of Pulsar Timing Arrays

- Gravitational waves make pulsars shimmer: measurement of the arrival time of radio waves from an array of pulsars
- Chinese 500-meter Spherical Telescope (FAST) under construction



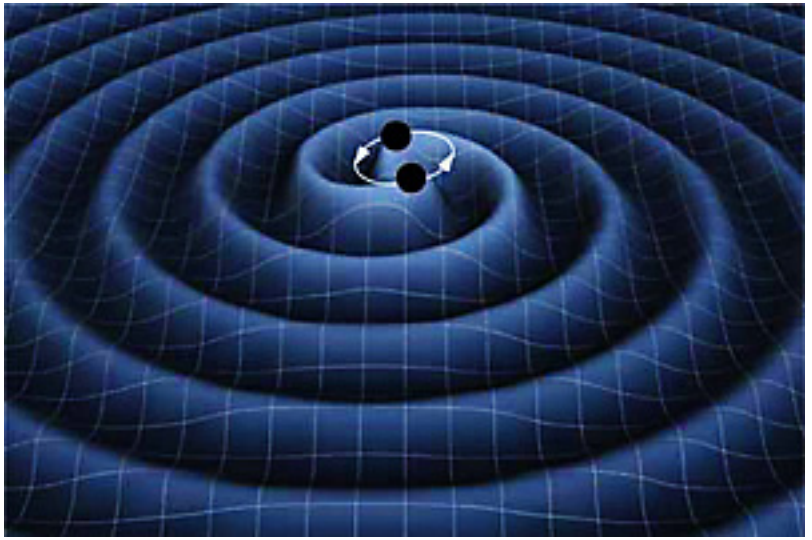
(computer image)

Collaboration with LIGO (MIT-Caltech)

Laser Interferometer Gravitational-Wave Observatory

Collaboration with LIGO

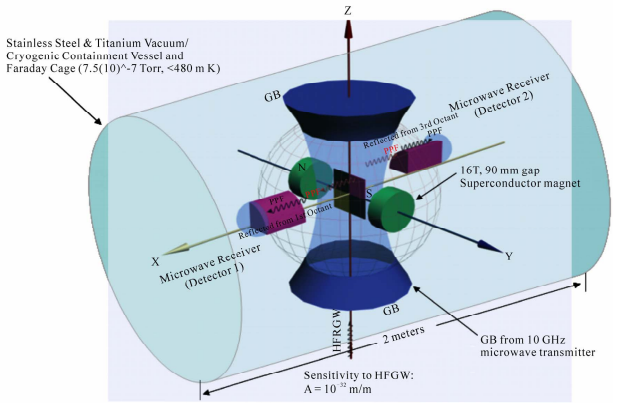
- Automatic detection of interferometer glitches
- Detection of Compact Binary Coalescence with GPU acceleration



- Easy access to the LIGO software suite through a virtual machine
- At Tsinghua U (Beijing)

High-frequency gravitational waves (~0.1–10 GHz)

- Proposed by Prof. LI Fangyu (Chongqing): coupling of gravitational waves with electromagnetic waves in a strong magnetic field



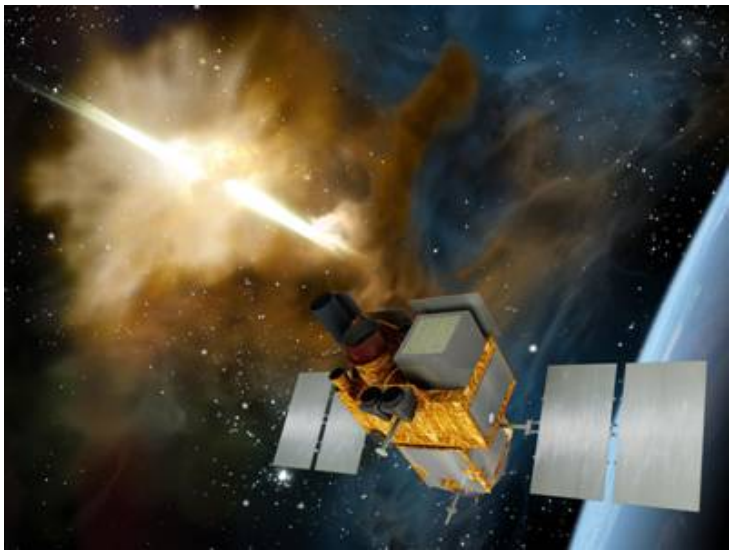
- Detector in development (Chongqing)

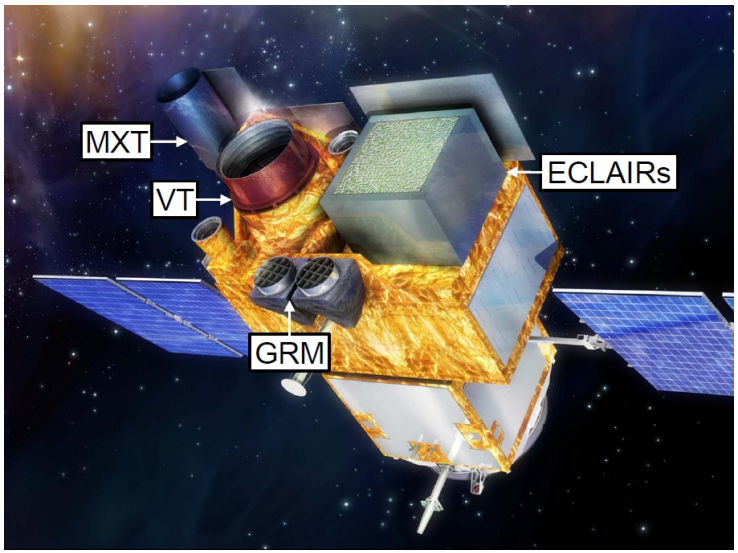
- Congqing U, Shanghai Inst. of Optics and Mech., Chengdu Microwave Laboratory,…

ELECTROMAGNETIC FOLLOW-UP (AFTER GRAVITATIONAL-WAVE DETECTION)

SVOM: X rays (4 keV–5 MeV)

- Gamma ray burst detection
- 1 satellite, 3 ground-based instruments

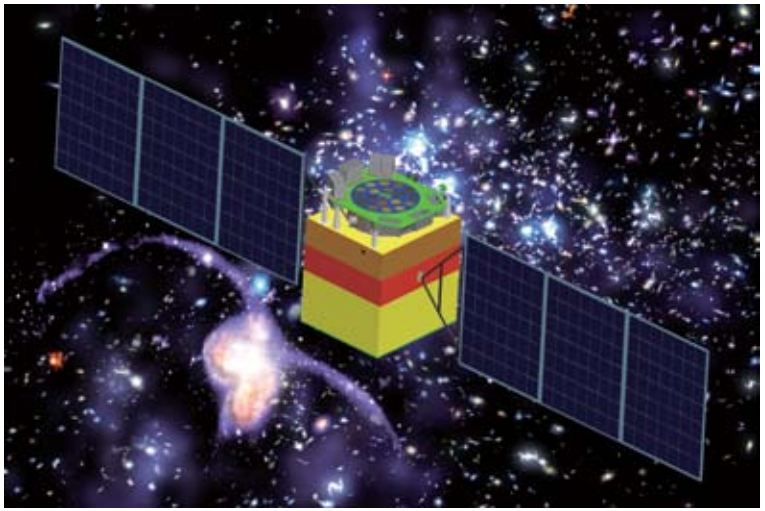




- French-Chinese collaboration (Nat. Astronomical Observatories [Beijing], Tsinghua U [Beijing],…)

Hard X-ray Modulation Telescope (20–200 keV)

- Can be used for X-ray follow-up
- Launch in 2014–2016
- China's first astronomy satellite

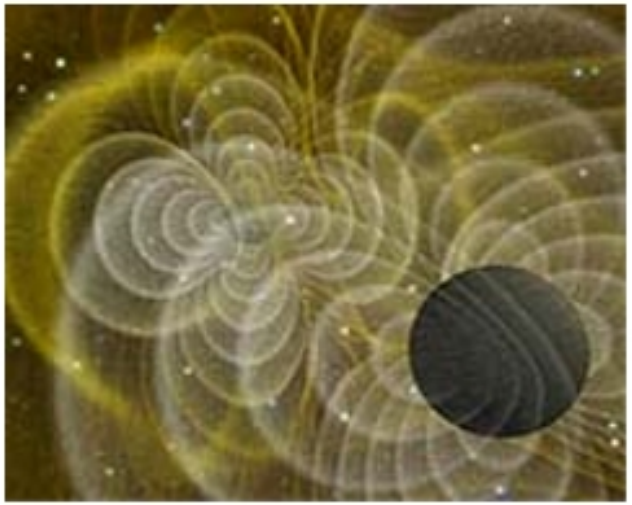


- Chin. Acad. of Sciences, Tsinghua U (Beijing),…

STUDY OF GRAVITY

Measurement of the speed of gravity

- Measurement of small changes in the Earth surface



- Prof. TANG Keyun et al., World Data Center for Geophysics (Beijing)

Theory

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Gravitational waves from the axial perturbations of hyperon stars*

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The eigen-frequencies of the axial w-mode oscillations of hyperon stars are examined. It is shown that as the appearance of hyperons softens the equation of state of the super-density matter, the frequency of gravitational waves from the axial w-mode of hyperon star becomes smaller than that of a traditional neutron star at the same stellar mass. Moreover, the eigenfrequencies of hyperon stars also have scaling universality. It is shown that the EURO third-generation gravitational-wave detector has the potential to detect the gravitational-wave signal emitted from the axial w-mode oscillations of a hyperon star.

THERE IS MORE…

THANK YOU!

谢谢！