SES06-2006-000045

Abstract for an Invited Paper
for the SES06 Meeting of
the American Physical Society

LISA[1]

GUIDO MUELLER, University of Florida

The Laser Interferometer Space Antenna (LISA) is a joint NASA/ESA mission to detect gravitational waves (GW) in the 0.1mHz to 1 Hz range. GW in this frequency range are generated by many exciting sources. Low mass galactic binaries are among the guaranteed LISA sources. In some cases we will be able to calculate the expected GW amplitude based on optical information. Some of these binaries will even be used to verify the interferometer response. Other binaries will form a GW background which will be difficult to resolve. Extreme mass ratio inspirals like a 10 solar mass black hole falling into a super-massive black hole (SMBH) will allow LISA to measure the multipol moments of the gravitational potential of the SMBH. This is considered the test particle case of general relativity. Mergers between super-massive black holes are among the most violent processes in the universe. These mergers were relatively common in the past and helped to form the universe as we know it now. LISA will measure the merger and will also be able to predict the merger and its sky position weeks in advance. This offers the chance to point classical telescopes in all EM-bands to the merger and have simultaneous observations. LISA will measure most of these signals and probably many others often with high signal to noise ratio. LISA will consist of three spacecraft in a triangular formation with a 5 Gm (16s light travel time) baseline. Each spacecraft will house two proof masses which form the end pieces of the LISA interferometer arms. In the sensitive direction, the proof masses will freely fall inside the spacecraft and the spacecraft are steered around their proof masses shielding them from all external forces except gravity. Laser interferometer will then measure the distances between opposite proof masses with 10pm/rtHz accuracy. I will give an overview of LISA sources, event rates, technology, and status of the project.

[1]This work is supported by the NASA/OSS grant BEFS04-0019-0019