Even in this case, and taking into account the Schenberg detector, the energies associated to these amplitudes ($\delta L \sim 10^{-19}$ meter) would deposit energy of $\sim 6 \times 10^{-28}$ Joules on the detector's natural quadrupolar modes around 3.2 kHz, which are only 290 gravitons! This is 10^{-9} times the energy of a photon of light!

2. GRAVITATIONAL WAVE DETECTORS

Since Weber's pioneering work in the 60's there have been dozens of proposed gravitational wave detector projects. Most of them have never been implemented. Of those implemented I will talk about interferometers, bars, spheres, radio telescopes, and CMB satellites. They cover many frequency bands in the range of 10^{-18} Hz all the way up to 10^4 Hz. I am not going to talk here about very high frequency (above 10 kHz) detection.

Using laser interferometry, interferometers detect differences between the distances of test bodies caused by the passage of a gravitational wave, while bars and spheres are very low loss (high mechanical Quality Factor) resonant bodies that absorb energy from the wave and mechanically resonate. An electromechanical transducer (resonant or not) converts this mechanical signal into an electrical one.

The seven long-base ground interferometer detectors that have been constructed so far are: three LIGO interferometers (two in Hanford and one in Livingston), VIRGO, TAMA300, GEO600, and CLIO. There are also two under construction: AIGO (or LIGO in Australia) and LCGT, and at least one big project for the future: the EINSTEIN Telescope.

The three LIGO interferometers are made up of two with 4 km arms and one with 2 km arms. One with 4 km arms is at the Livingston site and the other two at the Hanford site. Livingston and Hanford are 3030 km (about 10 light-milliseconds) apart. The LIGO collaboration involves more than 600 people and around 60 universities/institutions. The first engineering runs occurred in 2001 and the interferometers started runs in the so called science mode in September 2002. Six science runs have been performed so far. The last one ended in October 2010. From the fifth science run the sensitivity has been practically equal to that designed for the initial project. All the LIGO interferometers are now being upgraded to an advanced performance now. They will be back in operation in 2014. The six science run data is still being analyzed.

When LIGO resumes operation in 2014, it is expected to have a 10-12-fold increase in sensitivity, which will result in an increase of 1000–1500 in the rate of detectable events. One day of Advanced LIGO will be worth more than three years of Initial LIGO.

VIRGO is a collaboration involving France, Italy, Netherlands, and Poland. The 3 km arm interferometer, which started commissioning runs in 2003, is located in Cascina, near Pisa, Italy. The VIRGO collaboration has plans for a large underground interferometer in Europe, named EINSTEIN Telescope; when operational EINSTEIN will surpass all other interferometers in sensitivity. VIRGO, like LIGO, is now being upgraded to an advanced version now, which will come into operation in 2014.

TAMA300 is a 300 m arm Japonese interferometer located at the National Astronomical Observatory of Japan, in Tokyo. The project started in 2005. It was the first large interferometer to begin observations, achieving the best sensitivity in the world during the period of 2000–2002.

GEO600 is a collaboration involving German and British universities and the Universitat de les Illes Balears. The interferometer has arms of 600 m and is located in Hannover, Germany. It started commissioning operations in 2002. Its present sensitivity is pretty close to the designed one.

CLIO is a 100 m arm Japonese interferometer located in the Kamioka mine (underground). It is a cryogenic prototype detector for LCGT (Large-scale Cryogenic Gravitational wave Telescope), which will have arms of 3 km. LCGT is under construction and will operate, like CLIO, underground in the Kamioka mine with mirrors cooled down to very low temperatures.

AIGO, the Australian International Gravitational-wave Observatory, has, so far, only an 80 m high optical power interferometer test facility in collaboration with LIGO. The final decision for the installation of the hardware of the 2 km arm Hanford LIGO in Australia under the name LIGO-Australia will come in October 2011. IndIGO, a laser interferometer project from India, is also claiming this facility.

NAUTILUS and AURIGA are the names of the two ultra-cryogenic (cooled to about 100 mK) bar detectors (or antennas) in operation, both in Italy. NAUTILUS is located in Frascati (near Rome), and AURIGA in Legnaro (near Padova). They will remain operational during the upgrading of VIRGO (2011–2013). Ten years ago there were five cryogenic bars receiving data. The three others, which were cooled to about 4 K, were as follows: NIOBE, in Perth (Australia), ALLEGRO, in Baton Rouge (USA), and the Italian EXPLORER, in CERN