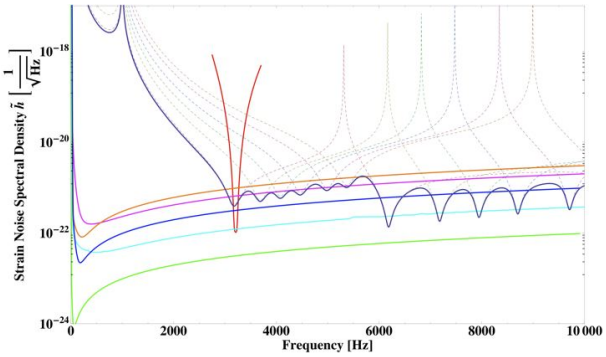

Fig. 3. The sensitivity curve for the Schenberg broadband detector using a nanogap klystron cavity nonresonant transducer. The dashed curves represent each of the 6 spheres we chose for the array (masses: 1150 kg (Schenberg), 744 kg, 547 kg, 414 kg, 301 kg, 239 kg), the lowest frequency being Schenberg. The V-shaped red curve is Schenberg with its usual configuration operating at dilution fridge temperatures (10 mK). Interferometer curves are also plotted: advanced LIGO (green), LIGO (blue), VIRGO (light blue), TAMA300 (pink) and GEO600 (orange). All of these are project curves, not actual data.

is to reduce the gap between the sensor silicon membrane and the cavity at the top of the post from about 10 micron to one nanometer! It is a challenge we hope to solve by using the recent achievements in nanotechnology together with those to come in the near future (Figure 3).

The Mario SCHENBERG Gravitational Wave Detector (Brazil) started commissioning operation on the 8th of September, 2006. It involves a collaboration between many Brazilian institutions such as INPE, USP, ITA, UNIFESP, IFSP, UNICAMP, UFABC, IAE, and UNIPAMPA, and also some foreign universities as the Leiden University, UWA, and LSU and it has been supported by FAPESP (the São Paulo State Foundation for Research), CAPES, CNPq, and MCT.

We performed a few runs during the period of 2006 and 2008, testing the system (Figure 4 and 5). Since 2008, we have been upgrading the detector. We have designed a new suspension and vibration isolation system for the cabling and microstrip antennas, we have designed a complete new set of transducers, which is under construction now, and we have installed a dilution refrigerator's 1K pot (Figure 6). We hope to start a run with the new set of resonant transducers soon.

Spherical detectors, when fully operational at their designed sensitivities, will be very reliable in-

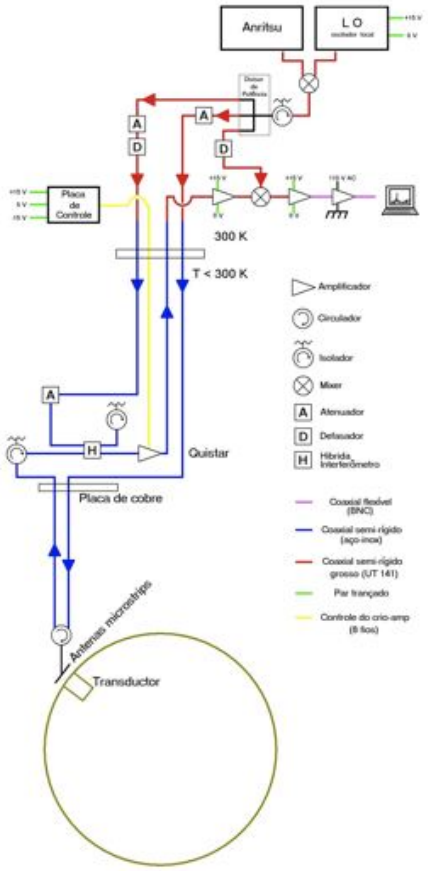

Fig. 4. The schematic diagram of the transducer's electronic circuit (for one transducer).

struments. The reason is because they are six-sensor detectors while the interferometers, like the bars, are only single sensor detectors. A gravitational wave burst signal arrives at the interferometers and to the bars at different times, therefore it is very difficult to confirm a burst signal if it comes close to the noise level. In these cases, a confirmation from the electromagnetic band is necessary, which provides valuable information about the wave direction and arrival time. On the other hand, being a six-sensor instrument, a spherical antenna always has robust information about a detected signal, which already helps to separate a real signal from ordinary noise with a high probability.

An array of six spheres, when placed close enough together (only a few meters apart) and sampled with the same A/D converter system, is an even more reliable system. They will form a coherent system able to provide the correct phase in various frequency bands, because the wave is a coherent source of energy in the various frequency bands