



New optical microbarometer

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Usually, transducers implemented in infrasound sensor (microbarometer) are mainly composed of two associated elements. The first one converts the external pressure variation into a physical linear displacement. The second one converts this motion into an electrical signal. According to this configuration, MB3, MB2000 and MB2005 microbarometers are using an aneroid capsule for the first one, and an electromagnetic transducer (Magnet-coil or LVDT) for the second one.

CEA DAM (designer of MB series) and PROLANN / SEISMO WAVE (manufacturer and seller of MB3) have associated their expertise to design an optical microbarometer:

However, we think that changing the electromagnetic transducer by an interferometer is an interesting solution in order to increase the dynamic and the resolution of the sensor. Currently, we are exploring this way in order to propose a future optical microbarometer which will enlarge the panel of infrasound sensors.

Firstly, we will present the new transducer principles, taking into account the aneroid capsule and the interferometer using integrated optics technology. More specifically, we will explain the operation of this optical technology, and discuss on its advantages and defaults.

Secondly, we will present the first part of this project in which the interferometer is positioned outside the aneroid capsule. In this configuration, interferometer mechanical adjustments are easier, but measurement is directly disturbed by environmental effects like the thermal variations. Six prototypes were manufactured with two sets of different aneroid capsules, in order to compare their performances, and also an optical digitizer specifically designed to record the four channels interferometer.

Then, we will present the first sensitivity and self-noise measurement results compared to those of a MB2005 microbarometer.

Finally, we will propose a new design of the optical microbarometer as a second part of our study. It will implement a new location of interferometer into the aneroid capsule under vacuum in order to protect the optical measurement from environmental effects. Manufacturing such a prototype is a huge challenge from the miniaturization point of view and the interferometer mechanical stability.