

Acoustic Coupler for the Acquisition of Coronary Artery Murmurs

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The weak murmurs originating from stenosis in the coronary arteries can only be acquired with a dedicated coupler and system design. The aim of the study was to design and evaluate such a coupler.

The suggested design is based on the use of a high quality microphone, coupled to the chest through a small air cavity. The geometry, and thereby the volume of the cavity are amongst others determining the high frequency roll off. Since the exact frequency range of interest related to murmurs is part of the objects of the study, one of the goals of the design was to achieve a high signal to noise ratio in a broad frequency range. The coupler was designed to have a high cut off frequency at 1.0 kHz, while the low frequency behavior was determined by the properties of the microphone, electronic circuits and inadvertent leakages in the acoustical coupling.

The performance of the acoustical coupler and the microphone used was evaluated through a large study, where the coupler was used for recording the murmur sound from 464 heart patients. The power spectrum of the diastolic heart sounds was analyzed to determine the characteristics of the frequency spectrum.

The preliminary results show, that it was possible to record heart sound in the diastolic period with a sound pressure level approximately 30 dB above the noise floor of the microphone and recording system in the frequency range from 200-700 Hz. The capability of the sensor to record diastolic heart sound in the relevant frequency range indicates that the sensor is suitable for recording of coronary murmurs.