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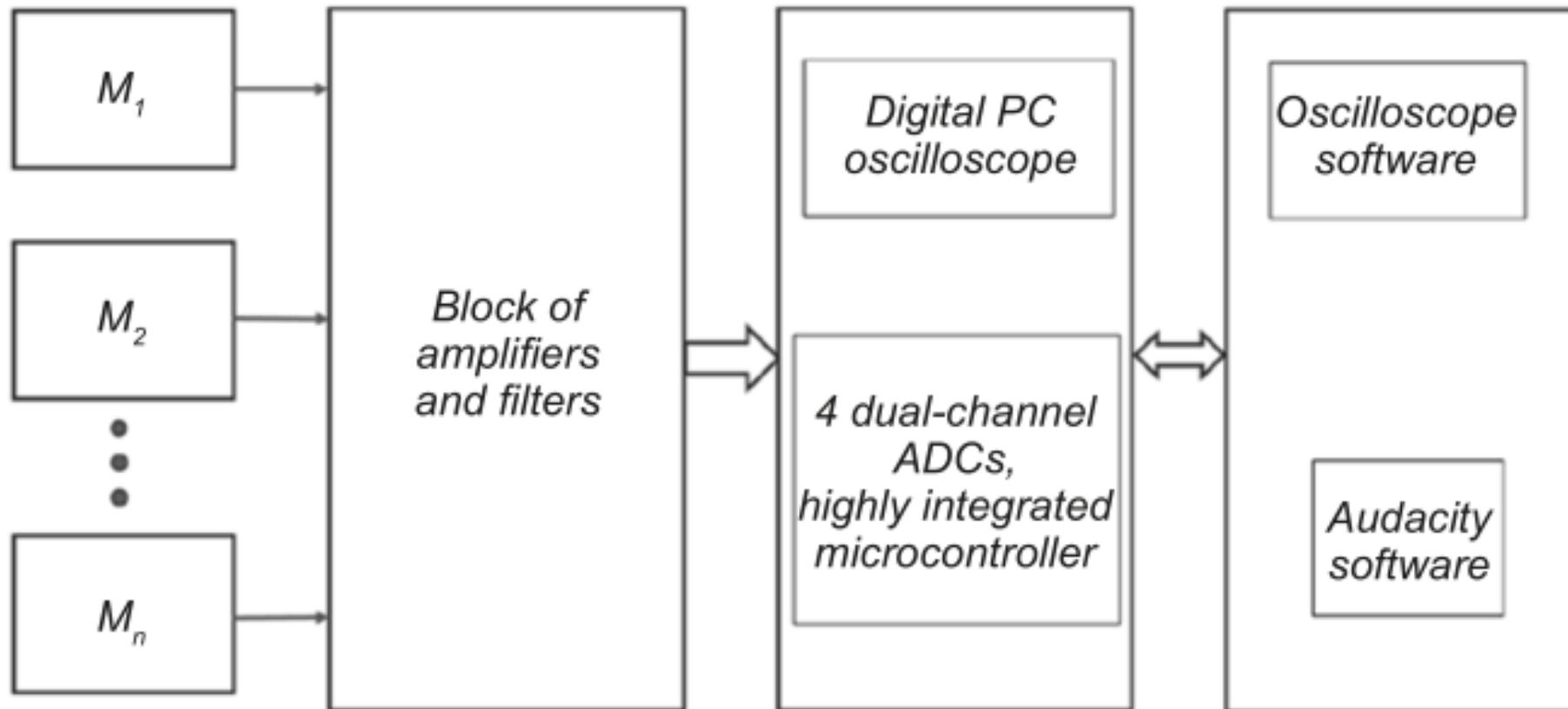
Possibilities of Acoustic Myography for Assessment of the Functional Condition of the Lower Esophageal Sphincter

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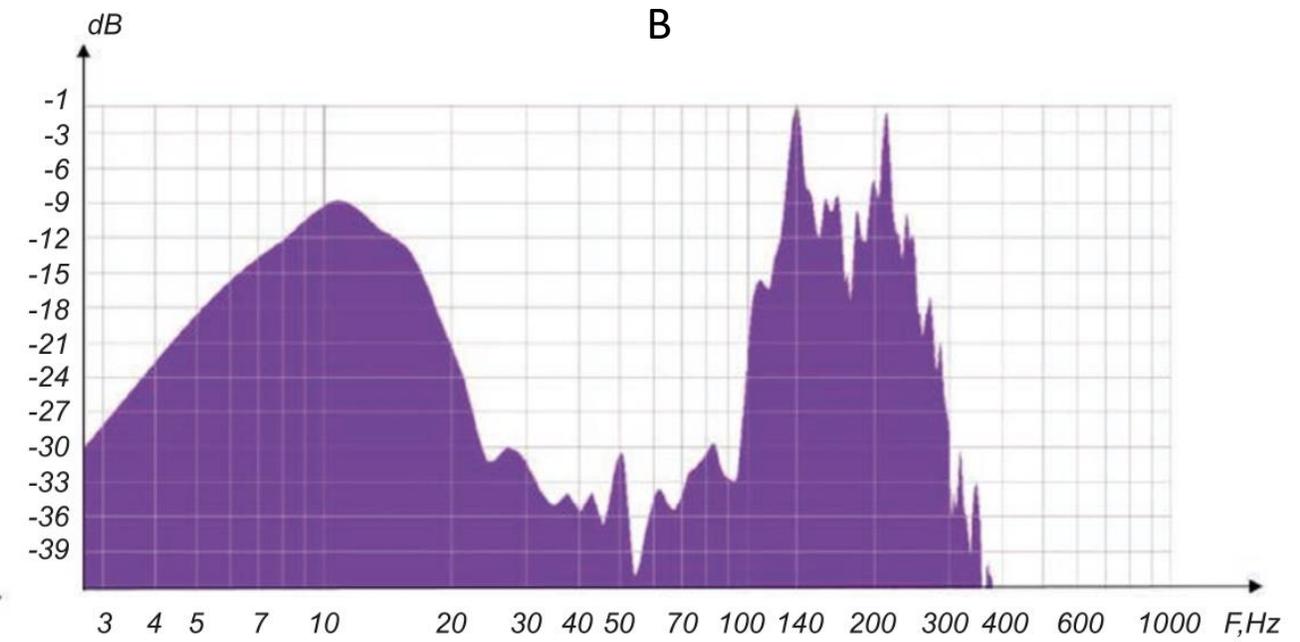
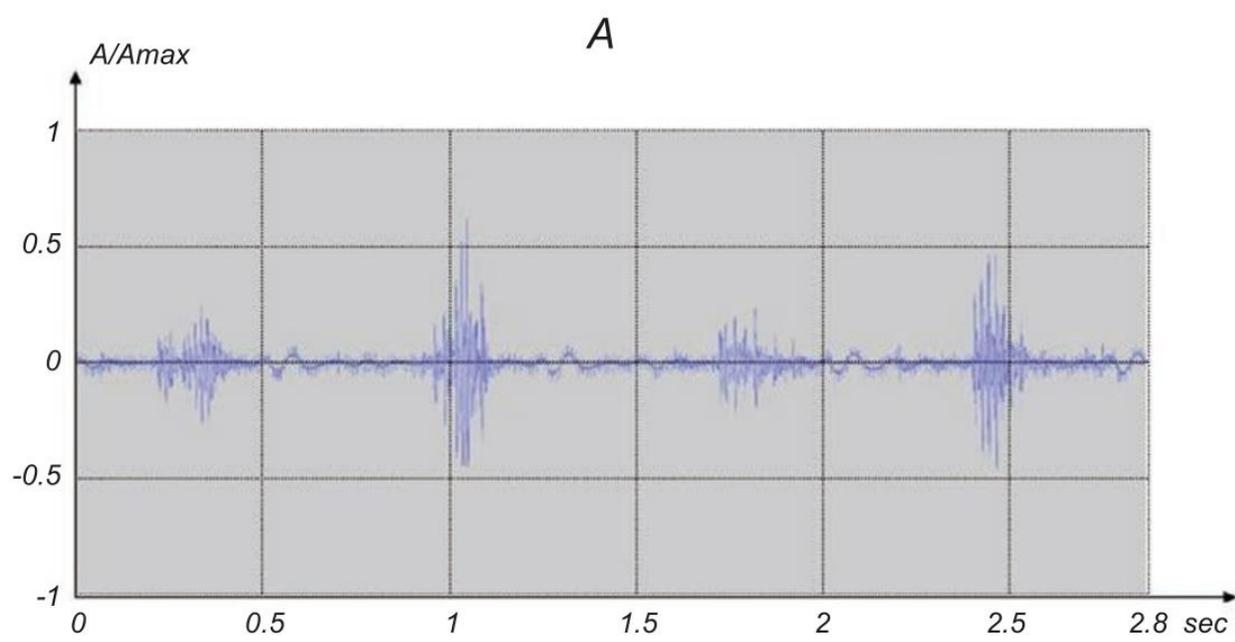
- **Background.** Acoustic myography (AMG) is a method of detecting and measuring muscle sounds, the essence of which is that during contraction the muscles create an acoustic wave, which is recorded using a special microphone. The use of AMG for the diagnosis of smooth muscle (GM) of the lower esophageal sphincter (LES) is proposed in our work.
- **Aim.** The aim of the current study was to investigate the possibility of non-invasive assessment of the functional state of GM LES, using the AMG technique.
- **Methods.** Two volunteers, 19 years old men, weighing 67 kg and 74 kg, height 181 cm and 182 cm were included. The subjects excluded signs of GERD using the GERDQ questionnaire. The hardware included a microphone, an amplifier, a filter, analog-to-digital signal converters, and a personal computer. Piezoelectric, dynamic and optical microphones and low frequency electronic amplifiers with amplification of 6, 20, 40, 50 and 60 dB in various combinations were used. The microphone was placed under the xiphoid process, at the level of Th XI, along the midline of the body, coinciding with the projection zone of the LES. Frequency analysis was performed by calculating the Fourier spectrum of an audio signal with a duration of about 2.5 seconds.

Scheme of the equipment for recording and processing of sound-range signals generated by smooth muscles



M_1 – M_n - microphones

Examples of AMG records related to contractions of the lower esophageal sphincter (A) and the frequency spectrum of these records (B)



- **Results.** Graphical recording of the received signals showed that the spectrum of local movements for muscle fibers during the opening and closing of the LES is characterized by a significant proportion of mechanical oscillations with frequencies mainly from 100 Hz to 300 Hz. The presence of only low-frequency components (from units of Hz to 15-20 Hz) is typically for the reduction of GM when the LES is in a state of closed and significant oscillations of muscle fibers were not recorded. Instead, the reduction of GM after the opening of the LES leads to the appearance of relatively high-amplitude components of the signal. Similar results were obtained using the other types of microphones mentioned above.
- **Conclusion.** Using the method of non-invasive diagnosis of the functional state of GM LES, using the AMG technique, we obtained and analyzed a graphical recording of the sound signal from the reduction of GM LES and the spectra of local displacements of GM.