## DESCRIPTION FOR THE GENERAL PUBLIC (IN ENGLISH)

Despite the progress in medical technology which in recent years have occurred, there are still many fundamental unknowns about our most complex organ functioning – the brain. Even more fascinating is that using physical and mathematical models it is possible to reflect the complex phenomena occurring in the human brain. The subject of proposed research are two mechanisms determining components of brain compliance evaluated based on pulsatile changes of cerebral blood flow velocity. Vascular component is evaluated based on the critical closing pressure (CrCP), whereas component related to cerebrospinal fluid circulation may be assessed by intracranial compliance (Ci).

The research objective of the following Project is the understanding dependence of intracranial pressure changes on calculated parameters and correlation analysis between different CrCP and Ci calculation methods. The studies will be conducted during the infusion test in patients with suspected hydrocephalus. The main goal is the attempt to understand the relationships between basic biosignals, such as arterial blood pressure, intracranial pressure and cerebral blood flow velocity, measured in intracranial hypertension conditions and model-based evaluated hemodynamic parameters. It has crucial meaning for expanding of state of knowledge concerning the intracranial pressure-volume compensatory mechanisms.

Pressure autoregulation is an important hemodynamic mechanism that protects the brain against inappropriate fluctuations in cerebral blood flow in the face of changing intracranial pressure. ICP and CBF mean values are considered as the most important parameters used for evaluation of these autoregulation processes. However, cerebral blood flow is not constant and therefore mean values of both ICP and CBF are not sufficient for efficient description of dynamic intracranial changes. The effect accompanying fluids flow (cerebral blood and cerebrospinal fluid) is temporary acquisition of these in elastic structures, in particular in autoregulatory blood vessels in cerebrospinal fluid space. Volume variations induce pressure changes in the structure. In the weakly expandable system even small changes of volume may cause a dangerous intracranial pressure increase. Therefore, assessment of brain compliance based on measured signals and understanding the mechanisms determining components of this compliance (vascular component and component related to cerebrospinal fluid circulation) may be of significant use for assessment of intracranial pressure-volume compensating phenomena.