

DESCRIPTION FOR THE GENERAL PUBLIC:

Innovative method for measurement of high-amplitude, fast-pulsing flows - modeling, optimization and experimental verification

The scientific aim of the proposal is to become acquainted with and to optimize the metrological properties of a new research method as well as a new type of measuring instrument designed for investigation of fast-changing and pulse flows of gases. The idea of the constant-bandwidth hot-wire anemometer has been patented, preliminary testing of such instrument confirming metrological possibilities of proposed method, have been performed. Currently, it seems to be reasonable to conduct systematic model and experimental investigations of this new solution and to determine and optimize its metrological parameters, as well as to determine the area of possible applications of constant-bandwidth hot-wire anemometer. To conduct the research it is necessary to build a stand for fast-changing and pulse test flows generation, development and optimization of the structure of the measurement system and testing for different classes of sensors. These studies will result in a development of database of knowledge on new measurement method as well as of new research instrument with unique metrological properties, which will present a contribution of Polish science into the development of metrology of rapidly changing flows. As a result of testing conducted within this project, a study containing comprehensive description of the measurement method and the system, the results of model and experimental testing, metrological properties and parameters of the system together with exemplary realizations of the system supplied with full metrological characteristics as well as determination of the scope and evaluation of application possibilities of such system, will be prepared. The constant-bandwidth anemometer, owing to its metrological properties and parameters, presents a new quality in the field of hot-wire anemometric metrology. Research of presented method will allow for dynamic measurement errors in various metrological applications to be minimized. A potential area of applicability of this instrument comprises the measurements of rapidly changing flows characterized by the wide range of velocity changes. Among these, one can mention investigation of turbulence generated by turbines or propellers, investigation of exhaust nozzles jet-streams, investigation of shock waves and the shape of pneumatic streams. Measurements of the shape of pneumatic pulses have their practical application in investigation of automatic pneumatic systems, pneumatic tools, pneumatic measurement heads and pneumatic weapons. Mechatronics, MEMS and NEMS systems, the field based on new technologies, provides currently a completely new area of applicability for measurement methods and systems developed by the author. In the future, elaboration of measurement technology and apparatus may comprise a part of the offer of Polish science for scientific and industrial institutions home and abroad. Owing to vehement development of new technologies in the field of complex sensors designing, these solutions find more and more practical applications in measurement systems being elaborated and become as well more and more frequently cited.