NACIONĀLAIS ATTĪSTĪBAS PLĀNS 2020
EIROPAS SAVIENĪBA
Eiropas Reģionālās attīstības fonds
IEGULDĪJUMS TAVĀ NĀKOTNĒ

Overview of scientific results of the project
Reference period **Nr. 2.**
01.08.2019 - 31.10.2019

Project: Nr. 1.1.1.1/18/A/133 Prototype development of transportable in multimodal traffic mobile space testing facility "Metamorphosis"

Project implementers: Riga Technical University (Leading Partner), “CRYOGENIC AND VACUUM SYSTEMS” Ltd.

Overall Project Objective: To develop a prototype of the mobile testing facility "Metamorphosis" (MSTF), transported in an intermodal traffic environment on the base of industrial research and to rise MSTF Technology Readiness Level from TRL2 to TRL4 (under European Space Agency (ESA) scale) for further evolution of the project.

Project activities and accomplishments during the reporting period:

Activity 1. Design calculations and design documentation for the design elements of the prototype:
Work 1.1. Calculation of the vacuum system
Outcomes:
Vacuum calculation:
In progress variational calculation.
Prototype vacuum chamber volume and sizes is determined.
In progress the calculation of the ultimate and working pressures for various tests and various modes of operation of the prototype, as well as possible ranges of their change due to determined sizes.
In progress the determination of the prototype vacuum chamber inside gas composition and the gas load during various tests.
The technical requirements for vacuum measuring instruments are determined.
The analysis of the methods of quality control of the vacuum chamber of the prototype has begun and methods for controlling the quality and integrity of the prototype have been identified.
In the process of development, technical requirements for vacuum valves, gates, compensators and vacuum-pumping equipment, as well as for electrical, cryogenic and optical feedthroughs.
An analysis on the vacuum equipment market for the equipment that meets the previously defined technical requirements and the project budget is in progress.
Thermophysical calculation:
The development of a thermal model and preliminary thermal balance calculations for various types of tests are in progress
An evaluation development analysis of infrared sources and cryogenic shrouds has begun.
Started determination of the technical requirements for cryogenic shrouds.
Hydraulic calculation of the prototype cryogenic system started.
Work 1.2. Vacuum vessel strengthen and stability calculation
Outcomes:
The mechanical structure and system of connections of the elements of the prototype, weights and efforts is determined, interactions between the components of the prototype are under determination.
In progress the development of a scheme for the static loading of prototype elements.
The modeling of the basic elements is in progress.
The EN standards and industry methodologies for strength analysis are determined.
A static strengthen and stability calculation has been started, which is carried out in accordance with the determined before requirements of the EN standards and methods of the engineering industry.

The design parameters determination of the prototype structural elements, based on preliminary results of vacuum, strength and thermophysical calculations started.
Started the search in the technical literature for descriptions of typical vibrational and other dynamic loads on objects moving in intermodal transport.

Activity 2. Prototype software development:
Work 2.1. Development of the prototype working algorithm
Outcomes:
Finalized the analysis of all types of tests that are planned to be performed using the MSTF test facility. Based on the analysis of test types, the development of test program templates in accordance with the requirements of the ESA ECSS standard for those types of tests that will be performed using the MSTF has begun.

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