Brief information about the project

Title	AP22682992 «A prototype of a high-mountain burst detector for studying the fine structure of the energy spectra of extensive air showers»
Relevance	The primary method for determining the nature of the break in the "knee" region is the study of the composition of cosmic rays and its variation within the relevant energy range. Numerous attempts to solve this problem using the extensive air shower (EAS) technique have not been successful [4–7]. Moreover, even the seemingly simple task of determining the proton fraction in this region remains unresolved. The results of different experiments vary significantly, with the proton fraction ranging from 10% to 40%. At present, cosmic ray research has shifted toward the region of ultra-high energies—or more precisely, toward large values of the number of electrons in EAS (Ne), since this parameter is directly measured in experiments, whereas the energy is derived from nuclear interaction models.
Goal	Modeling of the prototype of "Burst detector", selection of CR interactions model. Development of statistical method for matching EAS events. Obtaining, processing and analysis of events of the CR energy spectrum in its knee region from the prototype of the BD. Development of a prototype design of the BD
Tasks	1) Simulation of extensive air showers at observation level 3340 a.s.l. using the CORSIKA package. 2) Description of the interaction of secondary particles from a shower with ionization detectors of the "Burst detector" based on the GEANT4 simulation package. 3) Set, processing and analysis of the experimental data obtained from the prototype "Burst detector" for 8 channels. 4) Comparison with the experimental data obtained from the prototype "Burst detector" with the simulation results. 5) Creation of a model sections of "Burst detector" GEANT4 modeling package for 24 channels. 6) Expansion of the prototype "Push Installation" from 8 channels to 24 channels and obtaining preliminary experimental data.
Expected and Achieved Results	*Expected Results* 1) publication of articles in foreign peer-reviewed scientific journals – will be published: - - at least 2 (two) articles in journals from the first three quartiles by impact factor in the Web of Science database or having a CiteScore percentile in the Scopus database of at least 50. 2) publication of monographs, books and (or) chapters in books of foreign and (or) Kazakhstani publishers – not planned; 3) obtaining patents in foreign patent offices (European, American, Japanese), in Kazakhstan or Eurasian patent offices – not planned; 4) development of scientific and technical, design documentation – not planned; 5) dissemination of the results of the work among potential users, the community of scientists and the general public is planned through the participation of project executors in International and domestic scientific and technical conferences, publications in peer-reviewed journals, including those included in citation search engines and by popularizing the results of the study in social networks;

	Achieved Results 1) writing
Names and Surnames of Research Group Members with Their Identifiers (Scopus Author ID, Researcher ID, ORCID, if available) and Links to Corresponding Profiles	Nurzhan Yerezhep, H-index=**2,** ORCID: 0000-0002-7457-2189, Scopus Author ID: 57216954323, WOS ID: *AAR-7570-2021* Nurzhan Saduyev, h-index: **7**, Scopus author ID: 10640464800, OrCID ID: 0000-0002-5144- 0677, WOS ID - B-3711-2015
Publications list with links to them	Not in this project
Patent information	Not in this project