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To Whom It May Concern

**Review of a Foreign Adviser
on the Doctoral Dissertation entitled**

**“Geomonitoring of Deformation Processes of Sports Structures Based on
High-Precision Geodetic Measurements”**

Sports structures are integral to the modern city and play a vital role in the sports and leisure industries. These structures come in various shapes and sizes and can be built in different environmental conditions. Diverse ski jumps, stadiums, arenas, racetracks, and tracks have become common elements used for sports entertainment and competitions. Sports structures are subjected to various loads; aside from their massive dead weight, they also face loads from heavy snow and wind, including extreme gusts, temperature changes, seismic activity, and potential landslides nearby. All these factors can cause deformations and displacements, highlighting the need for careful attention when designing and maintaining such structures. The best approach is to implement a continuous geodetic monitoring system, which should deliver precise and reliable results.

G.S. Seitkazina's doctoral thesis tackles the current issue in applied geodesy related to geospatial monitoring of large sports structures. The research provides a thorough approach to studying and analyzing the outcomes of geodetic monitoring of these massive structures.

The work presented here introduces the following novelties:

- The new method and models for geodetic accuracy assignment based on structural mechanics models and approaches;



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- The approach to placing the deformation targets based on the structure's stress distribution;
- The new data processing models based on spline functions to compare results from different observation epochs.

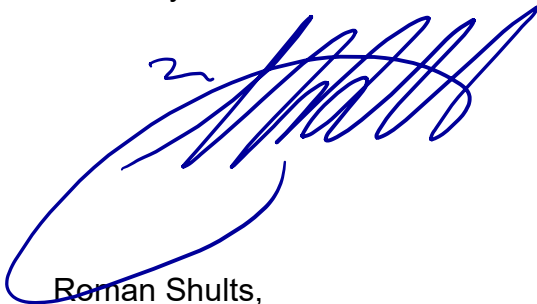
Hands-on importance is shown throughout the proposed monitoring workflows based on terrestrial laser scanning.

The scientific achievements presented in the dissertation were verified through monitoring results over multiple field campaigns conducted for the "Sunkar" International Ski Jumping Complex. The results obtained showed a strong correlation with theoretical developments.

I believe that the topic of G.S. Seitzkazin's dissertation is relevant, and that the scope of the work, the literature sources, the theoretical and practical significance of the dissertation, as well as the author's personal contribution to the results obtained, justify admitting the applicant to the public defense in the specialty 6D071100 — "Geodesy," for the PhD degree award.

Foreign Adviser:

Sincerely,



Roman Shults,

Dr. Eng. Sc., Associate Prof., CP.

Remote Sensing and Analysis Lab Coordinator, Research Scientist, IRC for Aviation and Space Exploration, King Fahd University of Petroleum and Minerals

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