Space Research Institute of NS and SSAU

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PROGRESS - Horizon 2020 funded project

Main results

- New participants:
- O. Semeniv (software, modeeling), M. Makarichev (PhD student, modeling)
- EGU 2016: Space Weather Influence on Power Systems: Prediction, Risk Analysis, and Modeling
- MEETING: ISRADYNAMICS 2016: Dynamical Processes in Space Plasmas
- Dynamical- Information Approach to Prediction of Dst and Kp indexes (Internat. Conf., Odessa)
- Papers: 3 papers
- Models and software
- Software for modeling and prediction of ionizing

Mathematical models

- **Algorithms - The Guaranteed NARMAX Model (GNM) provides predictions of the Dst index. Its main advantage is that it delivers an increased prediction reliability in comparison to earlier SRI models.**

- **Algorithms, Kp - Guaranteed prediction of geomagnetic indexes**

Algorithms and software

- Algorithms and software for optimal structure and parameters identification of mathematical models of ionizing radiation have been considered.
- Forecasting mathematical models of ionizing radiation by numerical methods has been tested
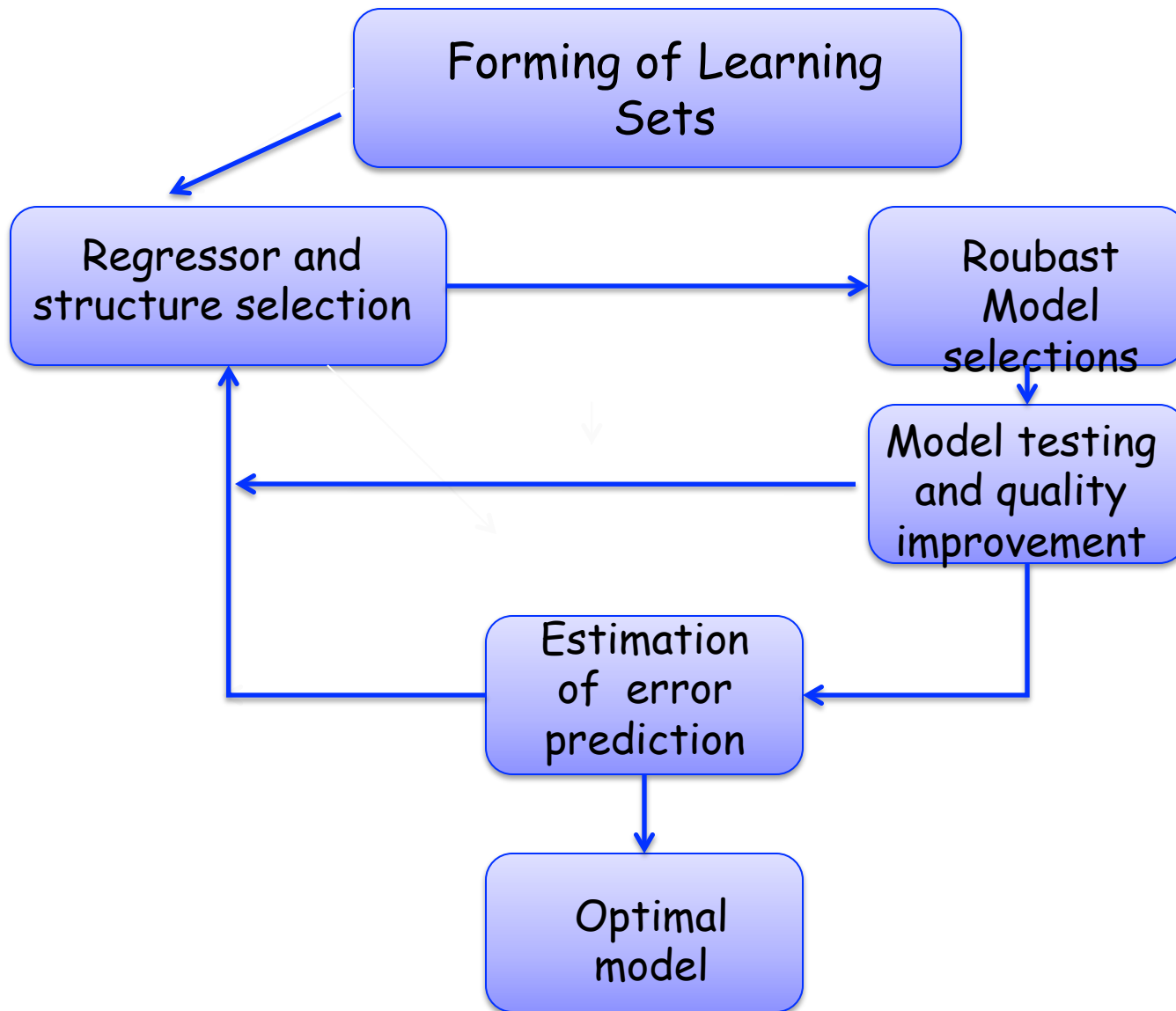
Fig. 1

Applications

- **TPS (thermal protection system)**
- **Hybrid energy storage device based on supercapacitors**
- **Space accelerometers**
- **Superconducting gravimeter**
- **Lasers**

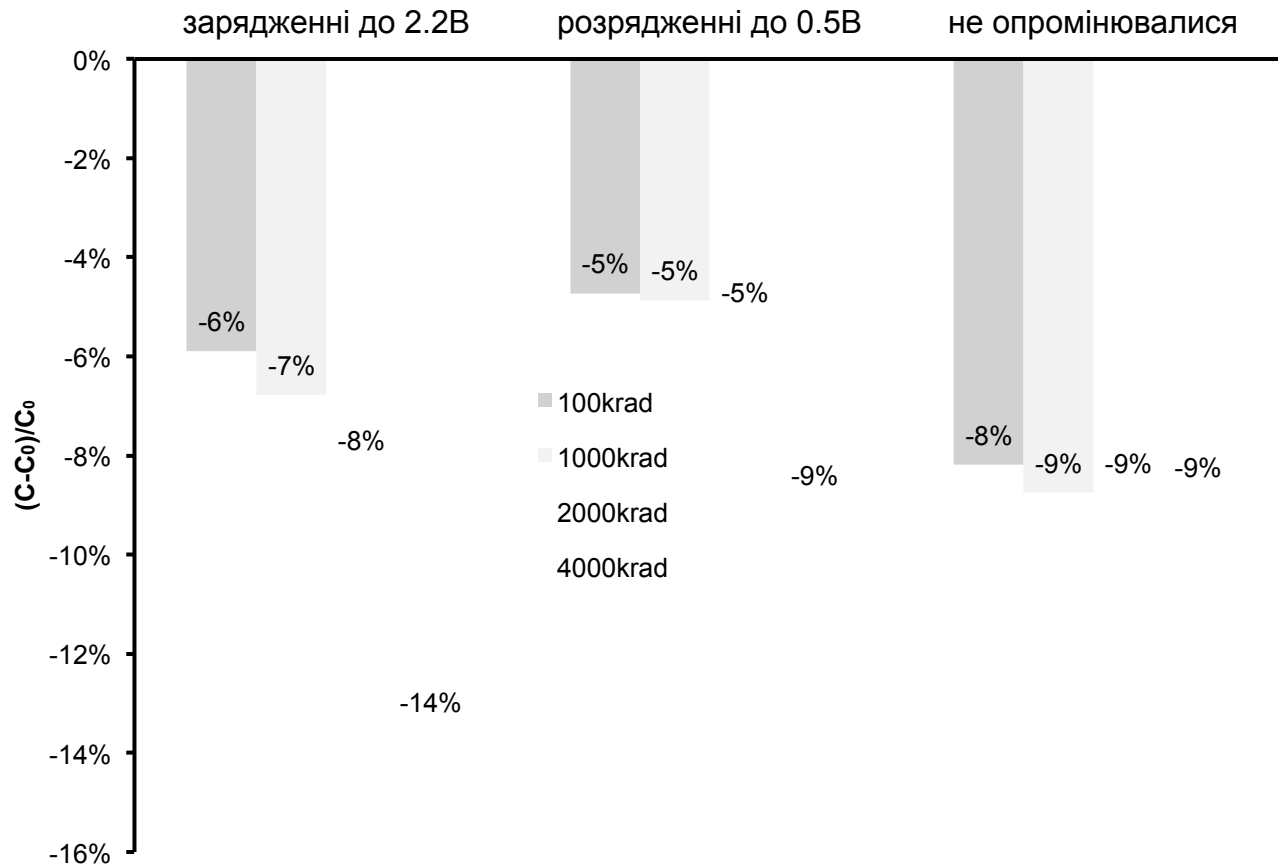# Impact γ-irradiation on capacity of hybrid energy storage device

Fig. 4

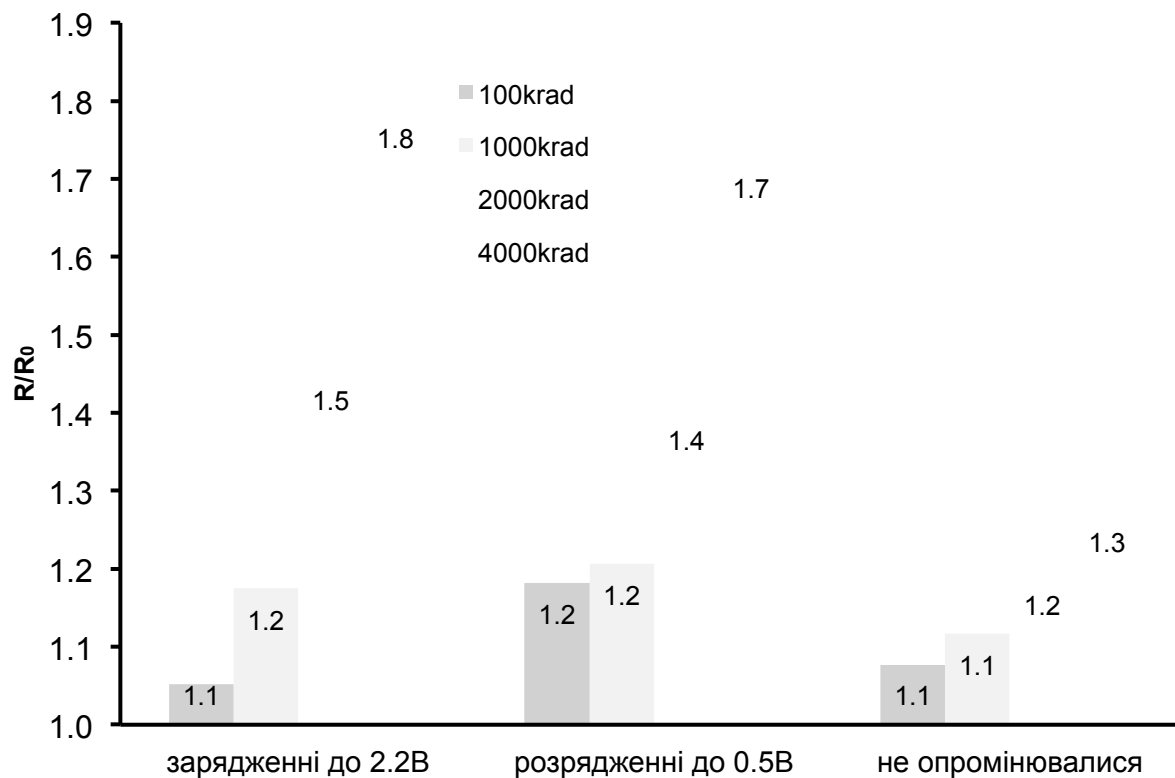# Resistance increase by γ-irradiation of hibrid energy storage device

Fig. 5

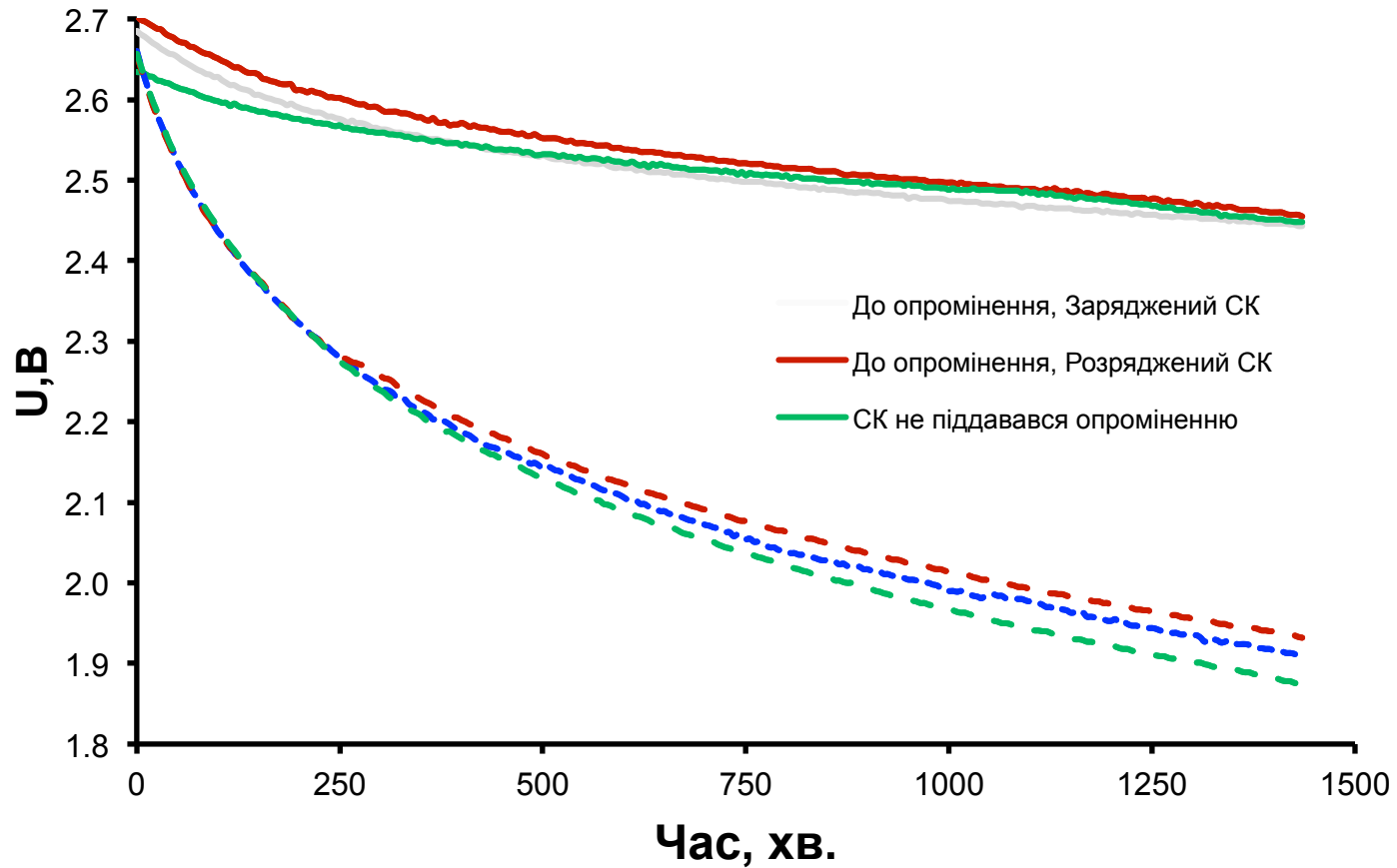# Voltage decreases of supercapacitors before and after γ-irradiation

Fig. 6

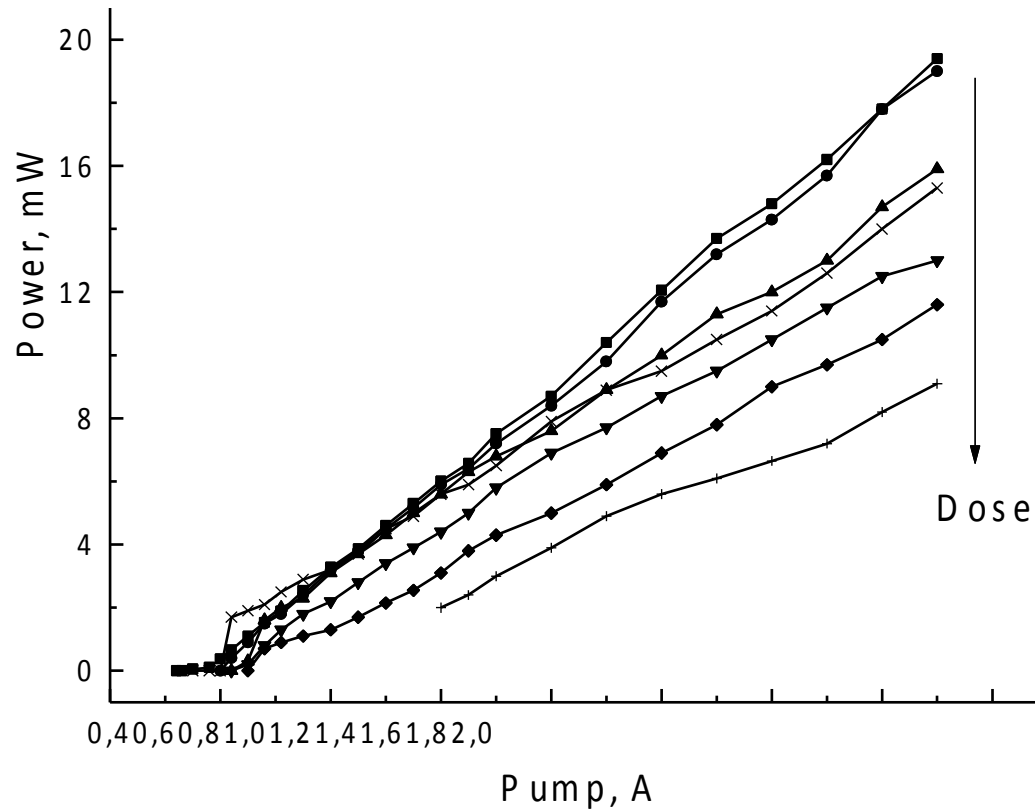# Output of the diode laser after irradiation by gamma radiation

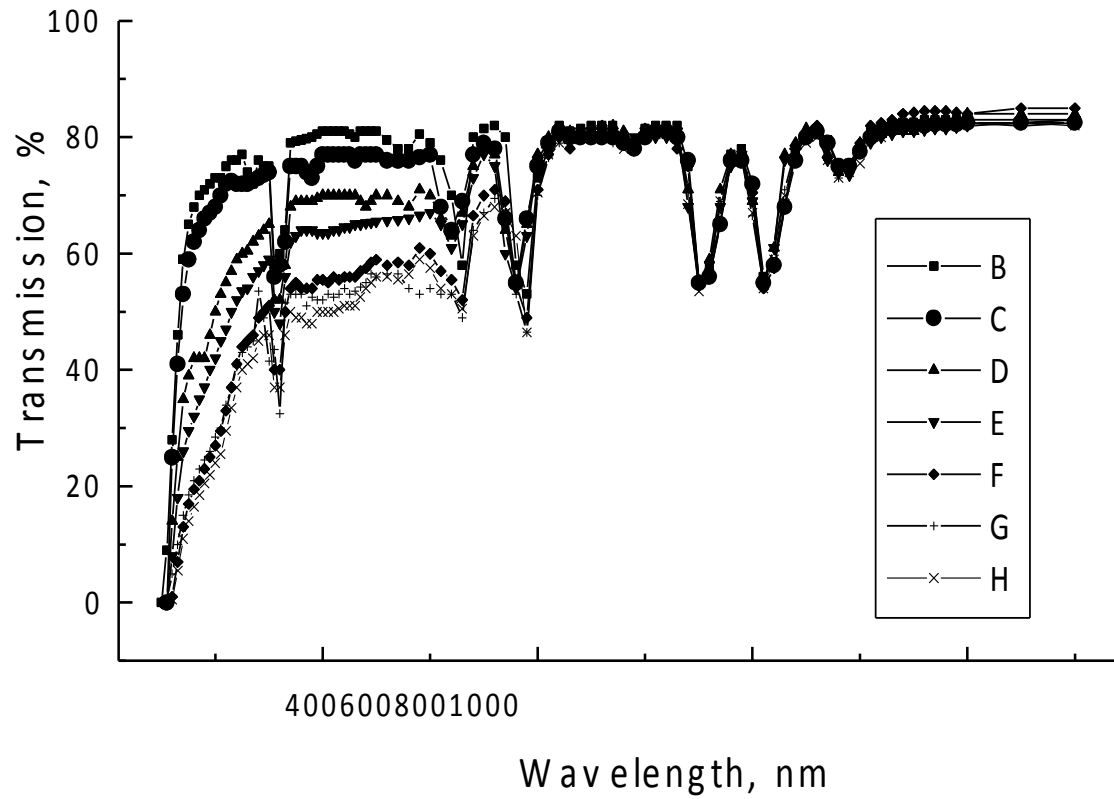
Fig. 7

Transmission of Nd YAG crystal plate

Fig. 8

Conclusions

- An application of the multicriterion optimization method to the prediction of the geomagnetic indexes. Novel algorithms to the identification of discrete input-output models have been developed.

- The following models have been proposed:
  (a) solar wind influences on devices;
  (b) forecasting of ionizing radiation;
  (c) risk assessment in safety analysis.