

# SENSKIN

## BRIDGE MONITORING SYSTEMS AND CHALLENGES IN UKRAINE

Senskin 2<sup>cd</sup> Workshop, İstanbul, 24-25.May.2018

Project co-funded  
by the EU under H2020



Overpass near the subway station "Shuliavska" in Kyiv



Damage of the overpass structures after the fire





## The bridge over the harbor of the Dnipro River in Kyiv



Defects of cables

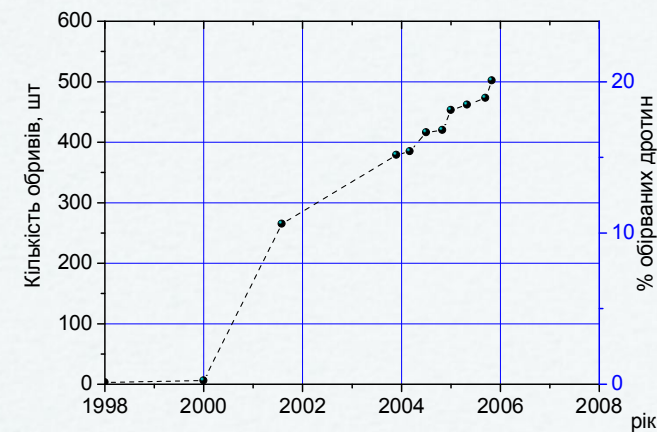
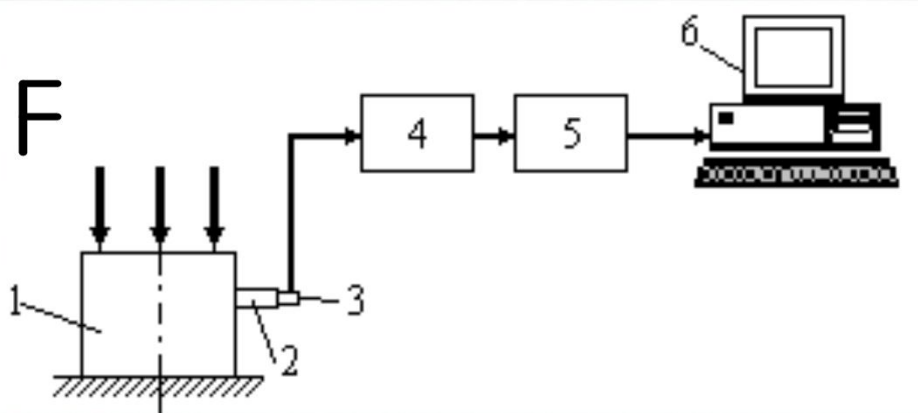


Diagram showing an increase in the number of wire breaks in the cables of cable stays

Acoustic emission (AE) is a phenomenon that consists in the radiation of elastic waves in solid bodies due to local, dynamic rearrangement of an internal structure of the material



Flowchart of AE signals recording .  
 1 - investigated element (structure);  
 2 - waveguide;  
 3- AE sensor;  
 4- amplifier;  
 5 - the connection port to the computer;  
 6 - personal computer





a

Software and technical complex "AKEM" - a,  
Transformer of acoustic emission installed on the metal surface structure of the cable attachment [point to the stiffener girder - b.



b

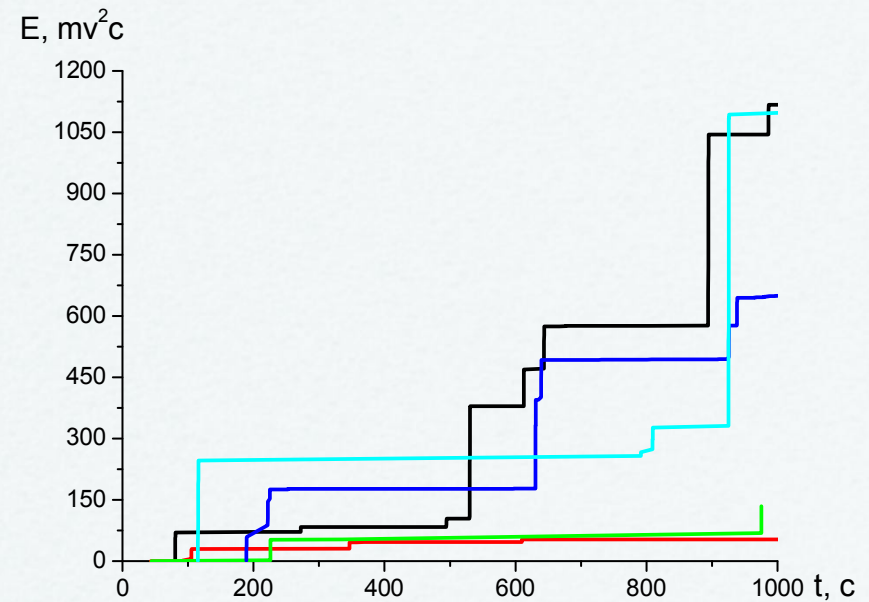
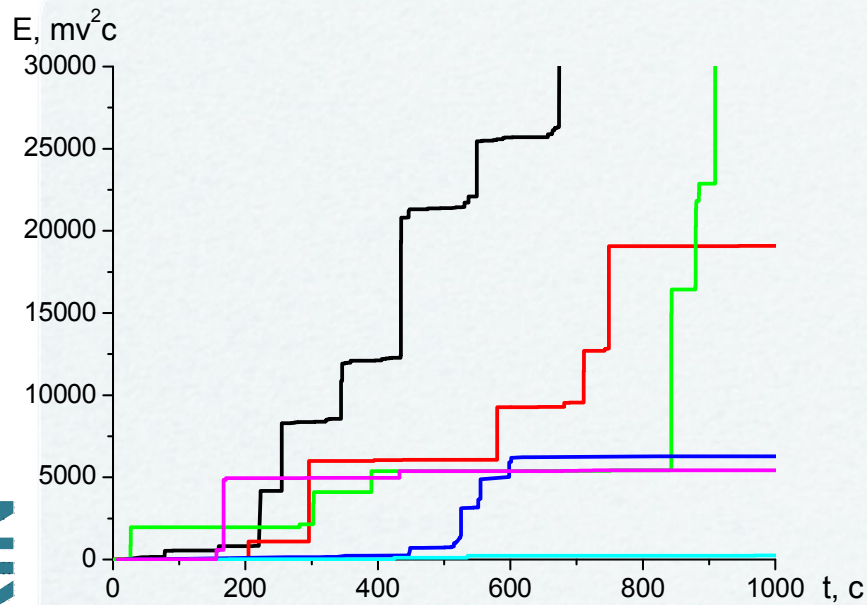


Loading of bridge spans



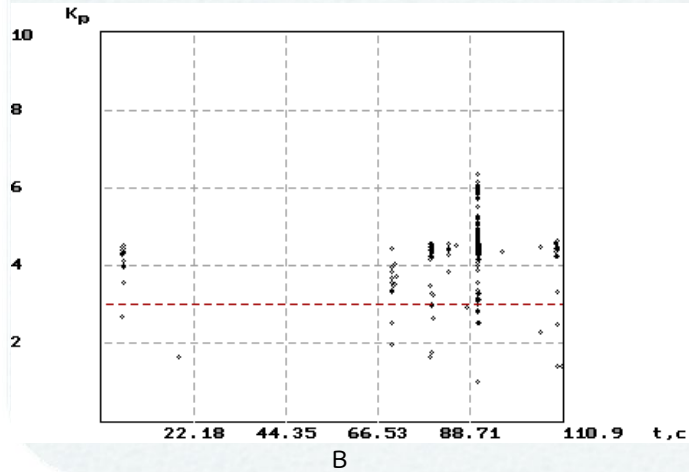
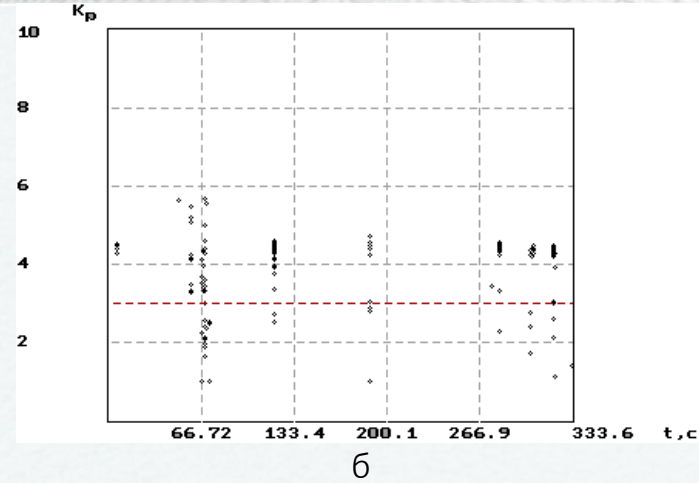
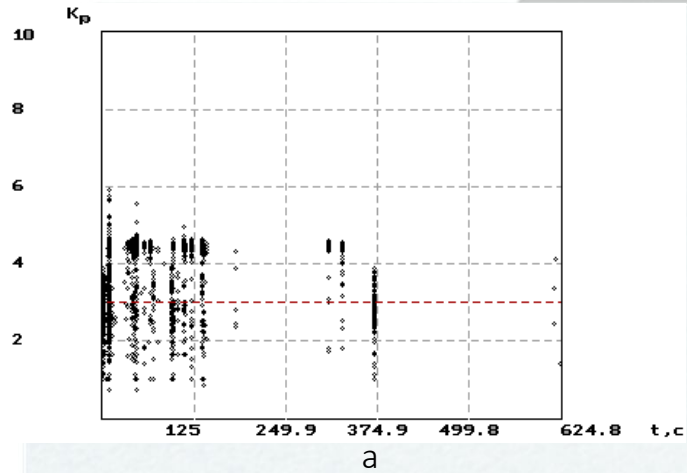
The change in the coefficient  $K_p$  of AE (acoustic emission) signals recorded during testing of the bridge span. Temporary load on the bridge span according to the loading scheme (one car).

According to the results of the conducted research using the AE method it has been established that during the static tests the temporary load on the bridge span causes the formation of microcracks (dots in the graph under the red line) and macrocracks (dots in the graphs over the red lines) in the material of the cable stays and in the attachment points with the stiffener girder. The structure's limit load is defined which exceeding may cause dangerous defects.



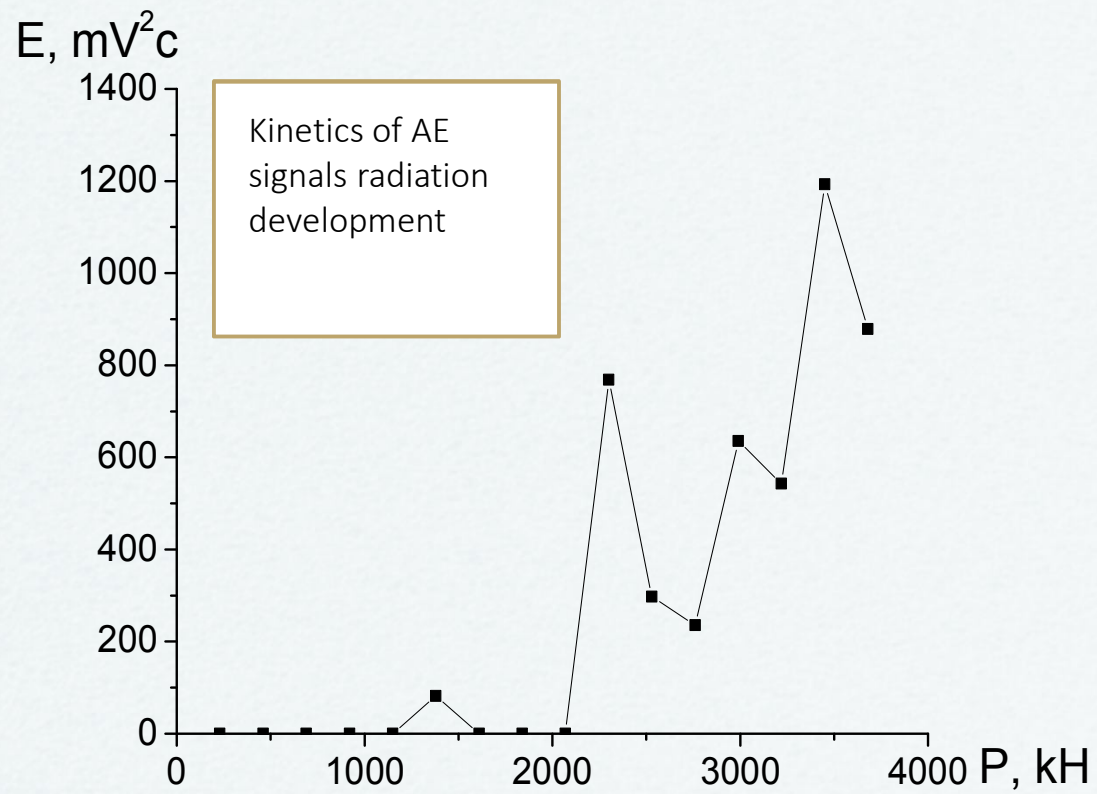
The value of acoustic emission signals energy accumulation recorded by acoustic emission transformer ( $\Pi\text{AE}1$ ) in the material of the structure of the bridge spans: a - before the reinforcement of the structure; b - after the reinforcement of the structure





The change in the coefficient  $K_p$  during testing of steel bridge span. Load on the bridge starting with the AE signals recording: a - 1-5 cars; b - 5-9 cars; c - 9-10 cars.





# Challenges in Ukraine

- - Provide stationary monitoring systems on large bridges that would signalize in the event of emergencies (e.g. critical structural deformations, rising water levels, etc.);
- - Improvement of normative documents on the order of data provision according to the monitoring results (specification of the bridge passport (certificate) which contains information on the existing defects and their rate high is necessary for further planning the repair of bridges).

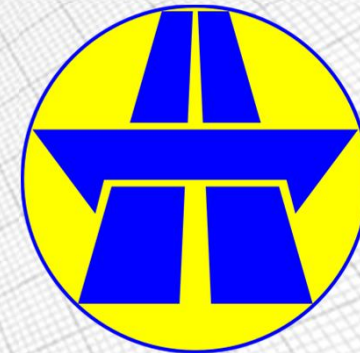
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THANK YOU! ANY QUESTIONS?

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