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Development of an amplifying element for GEM by laser drilling

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The performance of a prototype amplifying element for gas-discharge detectors made of polyurethane by a combination of stereolithography, laser drilling and magnetron sputtering has been demonstrated.
An array of 20×20 conical-shaped holes with a solution angle of 78° was formed on an area of 40 mm^2. The average diameter of the holes was 300±30 μm on the non-metallised side and 200±20 μm on the metallised side, respectively. The metallisation of the prototype did not result in dusting of the inner surface of the holes.
The prototype amplifying element is characterised by the gas gain coefficient $G \approx 1.3 \cdot 10^4$ at electric field strength $E \approx 24$ kV/cm, which is comparable to standard detectors. The dependence of *G(E)* is described by a standard exponential function.
The applied set of technologies allowed to effectively eliminate the disadvantages of already existing analogues: an ordered array of holes without delamination of metallisation along the edges was obtained.
The obtained results confirm the feasibility of using additive technologies and laser drilling to create amplifying elements and can be useful for modernisation of such complexes as *NICA, LHC* and others.

[1] M. Arif, Zeitschrift Für Physikalische Chemie 237, 809 (2023).

Primary author: SHMANAY, Yahor (Institute Nuclear Problem BSU)

Co-authors: ZUR, Ilya (Research Institute for Nuclear Problems of Belarusian State University); Dr FEDOTOVA, Julia (INP BSU); MOVCHAN, Sergey (JINR)

Presenter: SHMANAY, Yahor (Institute Nuclear Problem BSU)

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