Supplementary information for

Hongyong Zhang, Lingrui Zhao, Nan Huang, Xiaobo Zhang, Tian Xu, Sumin Bian, Mohamad Sawan, 2025. Magnetic nanoparticles for single-neuron manipulation to design a customized neural circuit. *Bio-Des Manuf*, 8(4):511-523. https://doi.org/10.1631/bdm.2400372

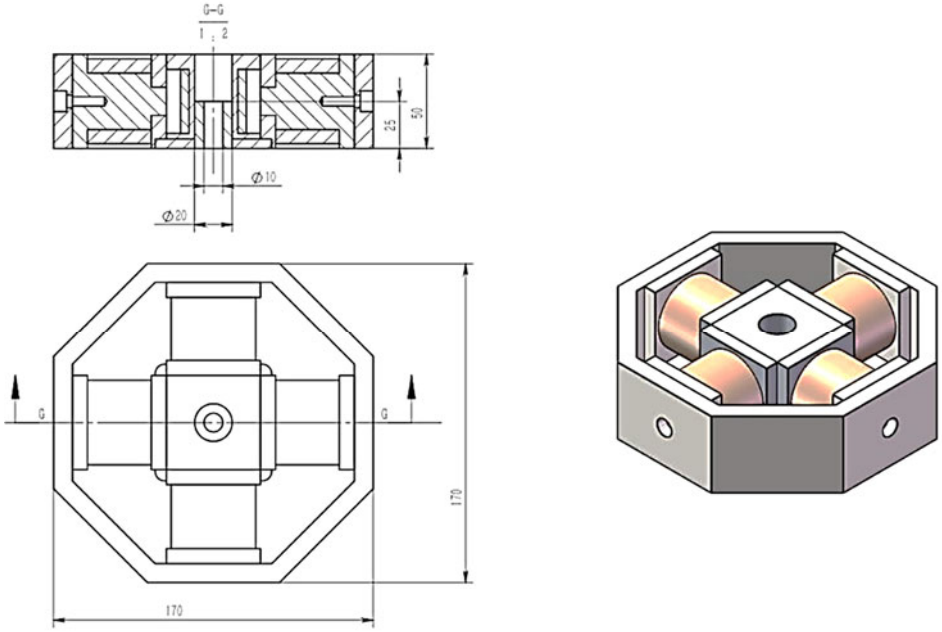

Fig. S1 Engineering drawing of the magnetic field generator

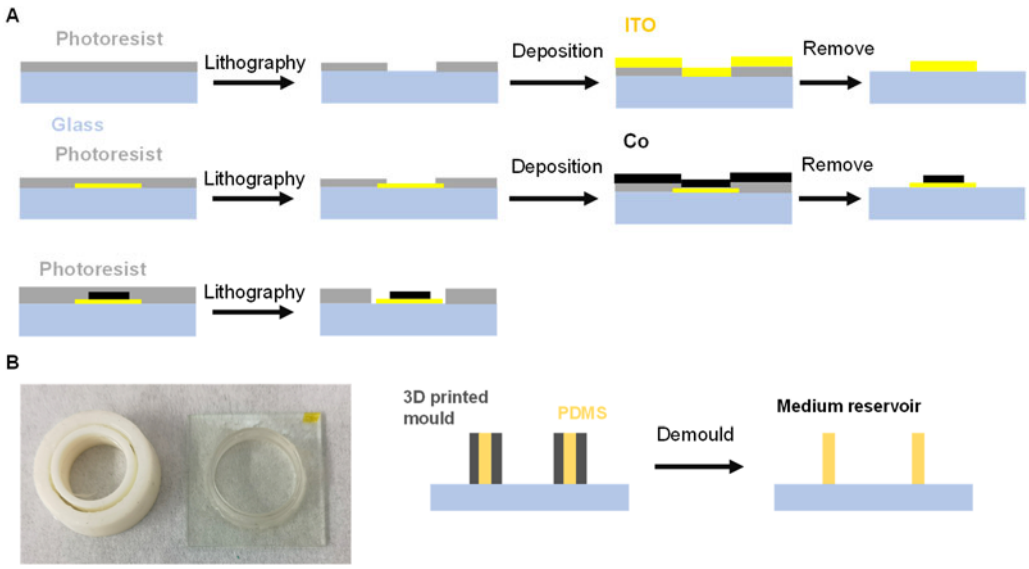

Fig. S2 Fabrication process of MMA chip. (A) The MMA chip was fabricated by standard lithography and lift-off technique. (B) The medium reservoir was fabricated by reverse mold of PDMS

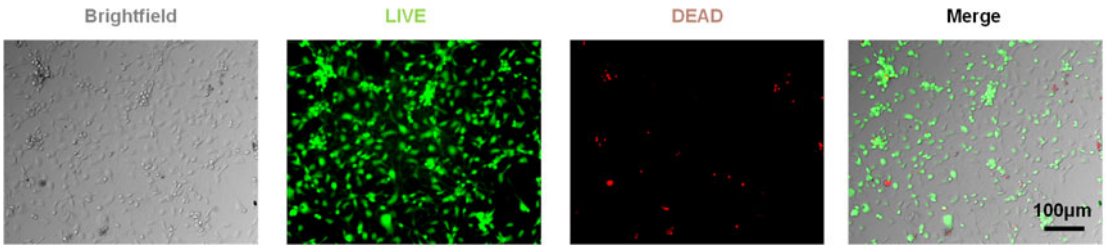

Fig. S3 Neural viability test of neurons without MNPs by using Calcein-AM/PI staining kit

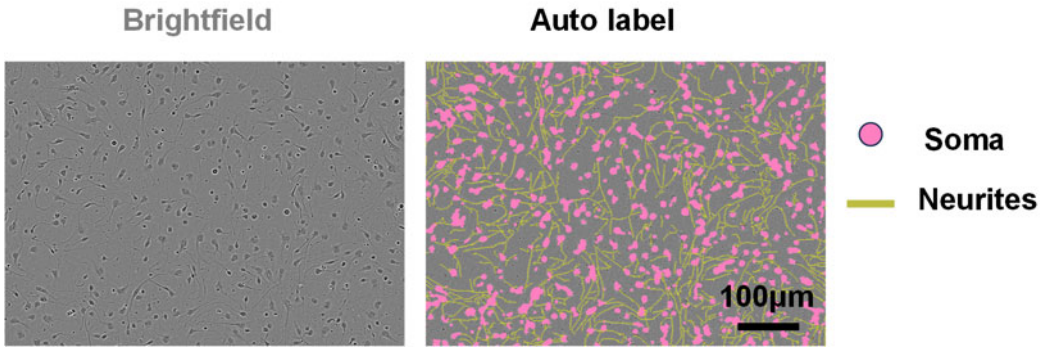

Fig. S4 Neuromorphology test of neurons without MNPs by using Incucyte Live-Cell Analysis System

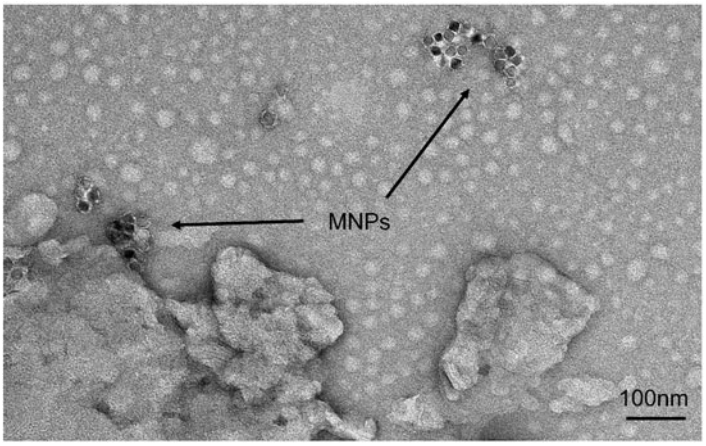

Fig. S5 The TEM figure of MNPs, which were inside neurons for two weeks. There was some organic matter stuck to it, but the shape is still clear and stable, indicating the long-term stability of MNPs inside neurons

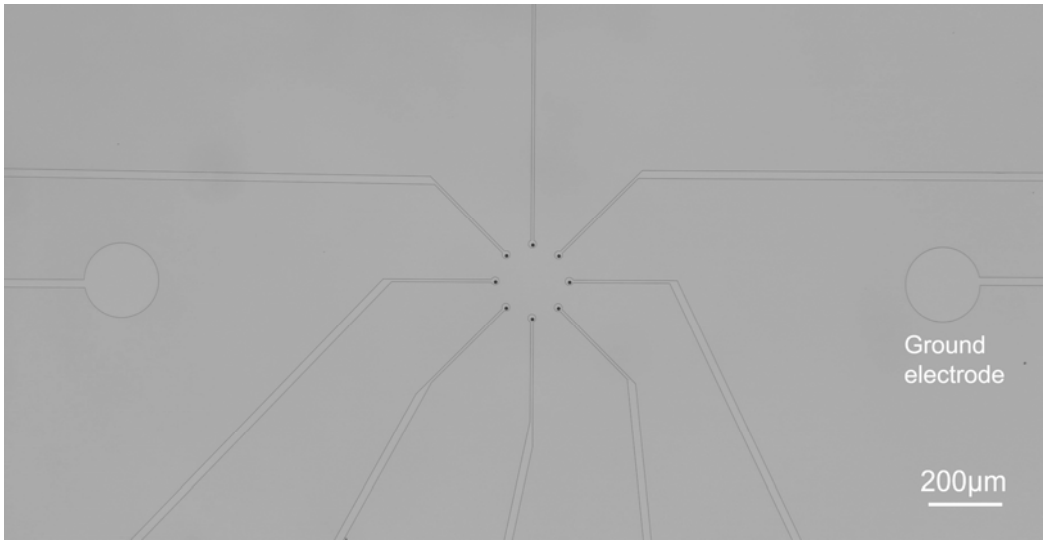

Fig. S6 Position of two reference electrodes relative to the micromagnet circular array

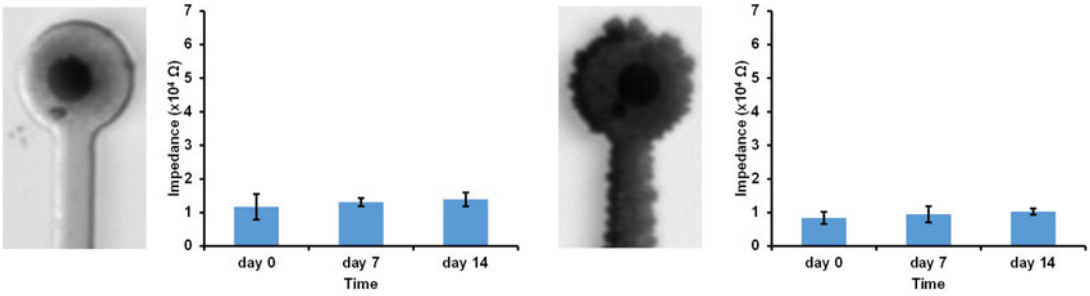

Fig. S7 Electrodes coated with PEDOT:PSS for 2 min (left) and 8 min (right) were immersed in culture medium for two weeks and the impedance still maintained in a low level. Data are expressed as mean±standard deviation (*n*=3)

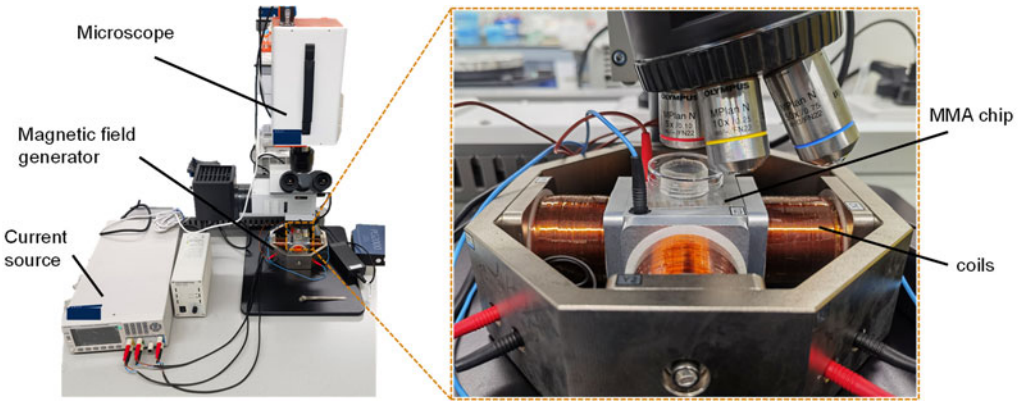

Fig. S8 A physical view of the whole MMA device during the experiments

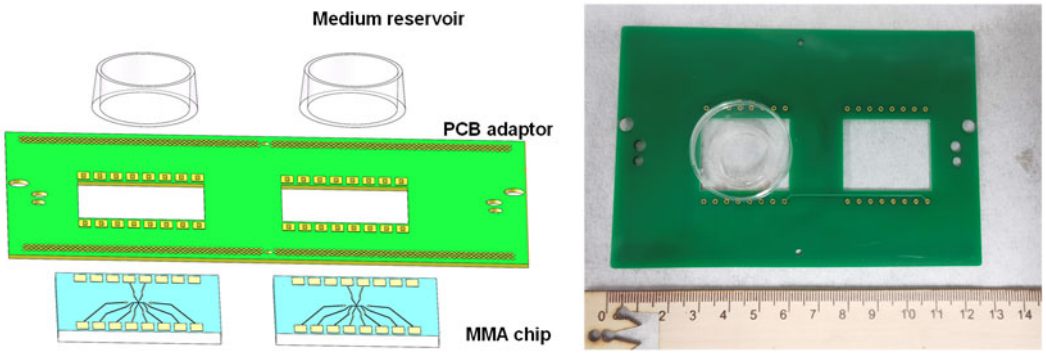

Fig. S9 The matched PCB was designed to connect the proposed MMA chip with the commercially available data acquisition system