Supplementary materials 1

A miniaturized wireless electrical impedance myography platform for the long-term adaptive muscle fatigue monitoring

YU Shanshan[1, 2#], GAN Yichao[1#], SONG Feifan[1], WANG qiongzhang[1], TANG Hao†[1], LI Zhao†[1, 2]

[1]State Key Laboratory of Optoelectronic Materials and Devices, Institute of Semiconductors, Chinese Academy of Sciences, Beijing, 100083;

[2] College of Materials Science and Opto-Electronic Technology, University of Chinese Academy of Sciences, Beijing, 100049.

Table S1 Comparison of Device Dimensions for Representative EIM Platforms

Platform	Length (cm)	Width (cm)	Height (cm)	Remarks
Our device	7.5	5.0	2.5	Includes electrode module and wireless transmission
Rutkove S B[1]	18.0	13.0	10.5	Electrode module not integrated
Chuong Ngo[2]	7.0	5.0	5.0	Electrode module not integrated
Kusche R[3]	8.7	5.4	-	Casing and electrodes not integrated

Table S2 Arm geometry simulation data

Tissue	Skin	Fat	Muscle	Skeleton	Calcareous substance
Thickness/mm	1	2	20	4	8

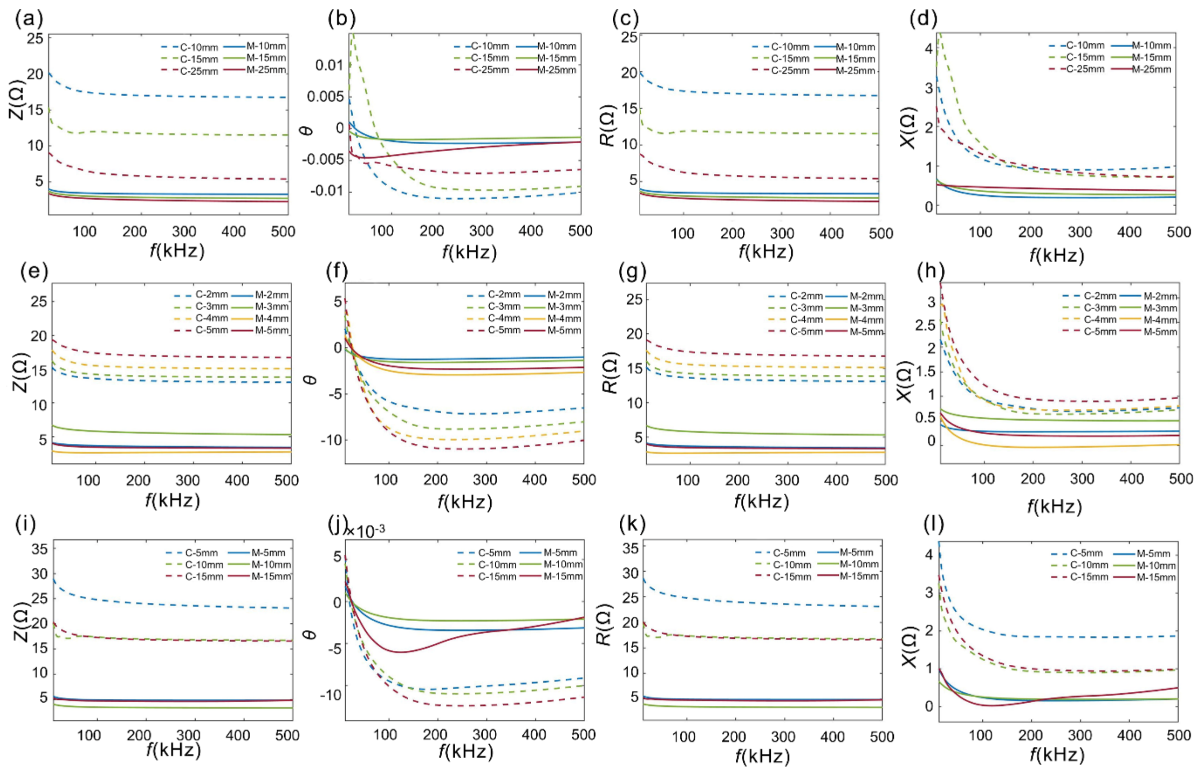

Fig. S1. Variation of EIM simulation results caused by electrode tissue interface under different electrode width: (a)*Z*; (b)*θ*; (c)*R*; (d)*X*; width: (e)*Z*; (f)*θ*; (g)*R*; (h)*X*; length: (i)*Z*; (j)*θ*; (k)*R*; (l)*X*.

Figure S1 shows the increment of the simulated values after considering the electrode-skin contact. M represents the model with MAE and C represents the model with conventional electrodes. It can be seen that the absolute value of the model increment using MAE is always smaller than the model using conventional electrodes.

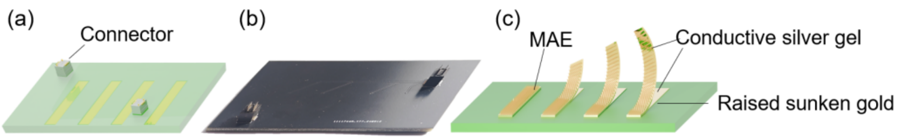

Fig. S2. Electrode module diagrams: (a) Plug and Play module 3D drawing; (b) physical drawing; (c) MAE integration drawing

References

[1] Rutkove S B, Electrical impedance myography: Background, current state, and future directions, Muscle Nerve, 2009, 40(6), 936

[2] Ngo C, Munoz C, Lueken M, et al., A Wearable, Multi-Frequency Device to Measure Muscle Activity Combining Simultaneous Electromyography and Electrical Impedance Myography, Sensors (Basel), 2022, 22(5),

[3] Kusche R, Oltmann A and Rostalski P, A Wearable Dual-Channel Bioimpedance Spectrometer for Real-Time Muscle Contraction Detection, IEEE Sensors Journal, 2024, 24(7), 11316