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Pixel array for 3-D integration with an intracortical electrode array

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ABSTRACT

Here we present a Read-Out Integrated Circuit (ROIC) with metalized topside contacts that is bonded to an array of high aspect ratio insulated microwires to form a platform for in vivo, intracortical recording (fig 1) of unprecedented scale.

The ROIC (fig 2) has 256x256 pixels (fig 3) consisting of an AC-coupled sense-amplifier, followed by an anti-aliasing band filter. In designing a CMOS array for such an application, several features are desirable: (1) it has a metalized top-side contacts on each readout array element (pixel) for bonding to an array of microwire probes, (2) it has lower than 10 μ V_{RMS} noise to record action potentials with high fidelity, (3) it is insensitive to slow changes in electrochemical potential between the recording electrodes and reference electrode, (4) the pixel size should be no bigger than the desired inter-wire spacing for the array, (5) it supports full-frame readout beyond 32,000 fps.

Details and measurements results of this device will be shown.

A glimpse of the next generation device, tackling the data bottleneck, may be given.

Primary authors: GAO, Peng (Caeleste); DIERICKX, Bart (Caeleste); BABAIEFISHANI, Amir (Caeleste); LUYSSAERT, Bert (Caeleste); KHAN, Aamir (Paradromics); SAHASRABUDDHE, Kunal (Paradromics); MINA, Hanna (Paradromics); EDGINGTON, Robert (Paradromics); NISHIMURA, Kurtis (Paradromics & Univ Hawai); ANGLE, Matt (Paradromics)

Presenter: DIERICKX, Bart (Caeleste)

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