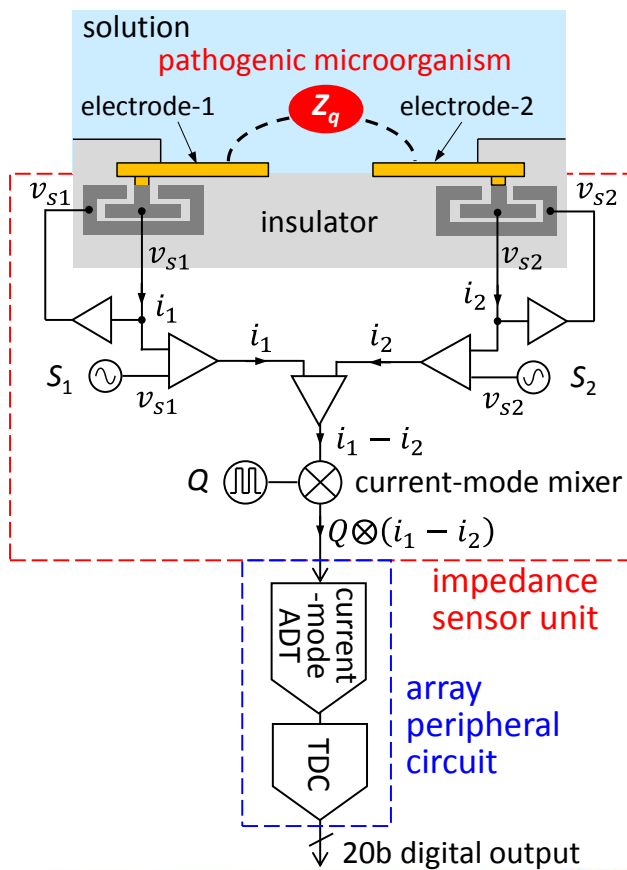


On-chip impedance sensor array

measurement of small impedance in pL solution

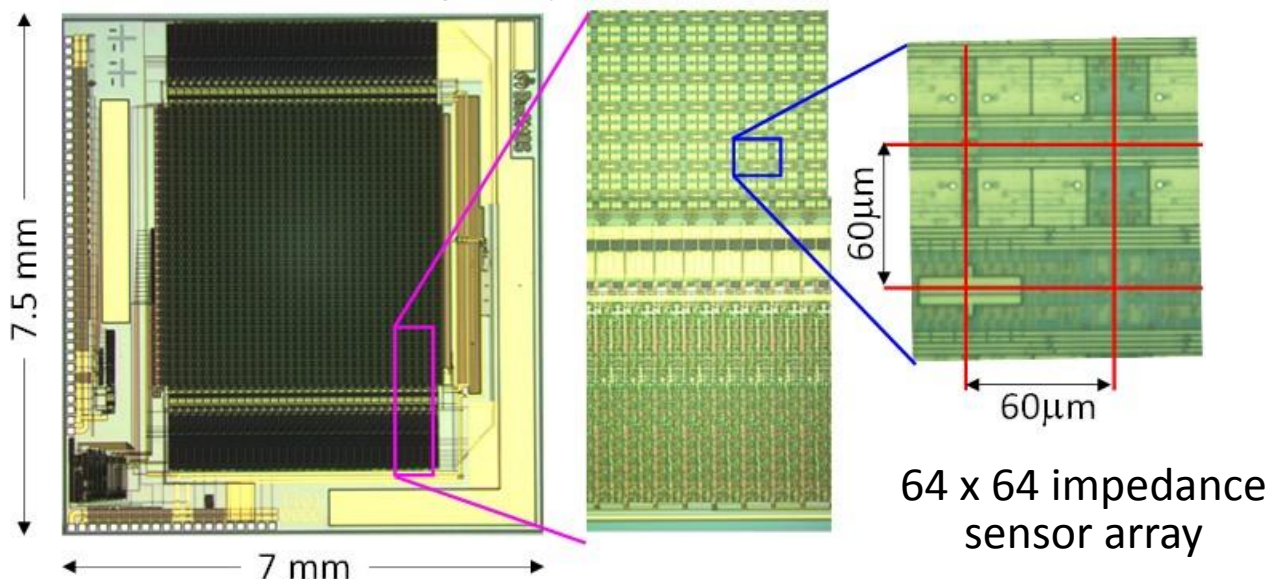
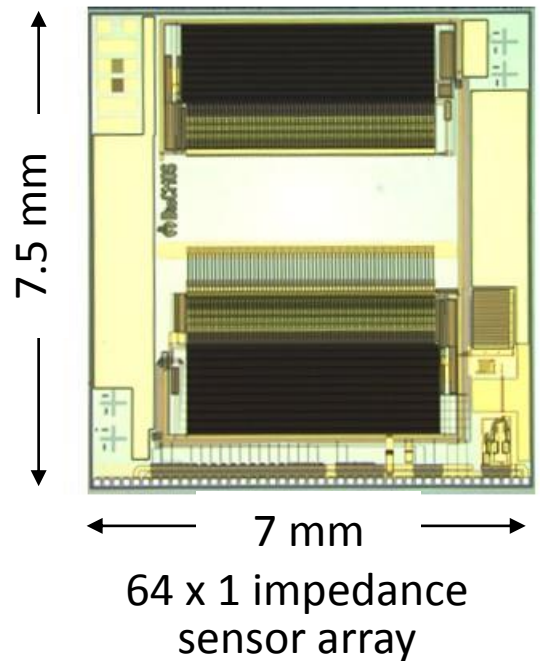
- detection of single pathogenic microorganism (virus, bacterium, parasite) in micrometer resolution

dielectric dispersion specific to pathogenic microorganism

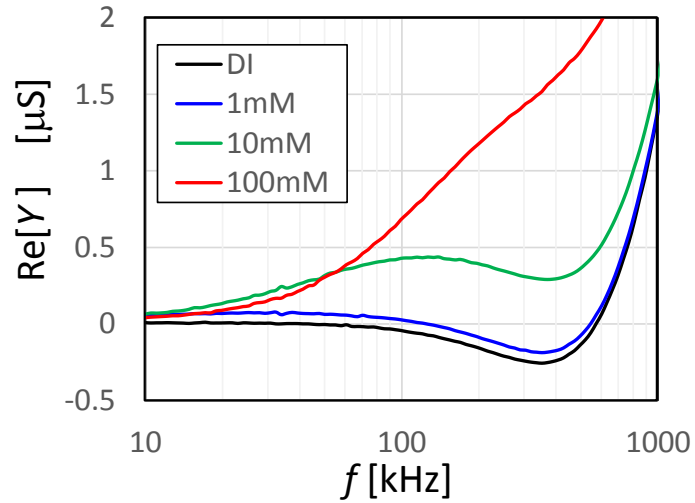
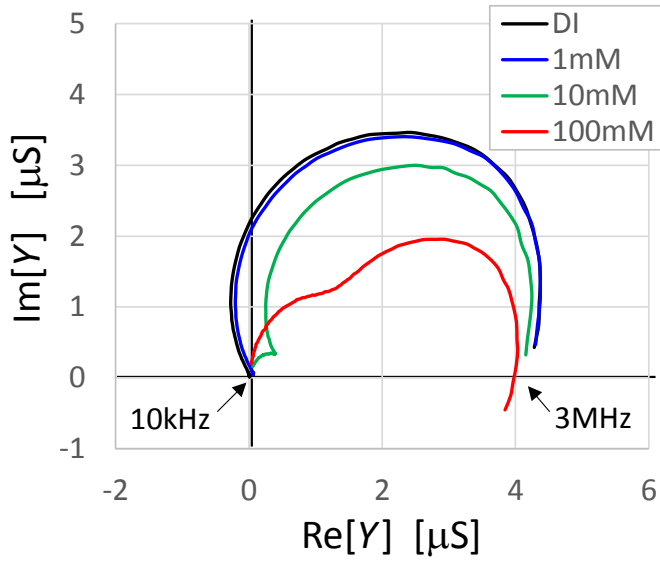


$$f = 1 \text{ Hz} - 3 \text{ MHz}$$

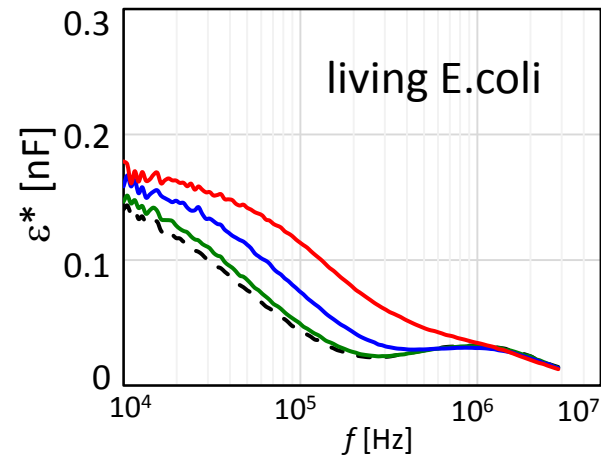
$$Z = 1 \text{ M}\Omega - 10 \text{ G}\Omega$$



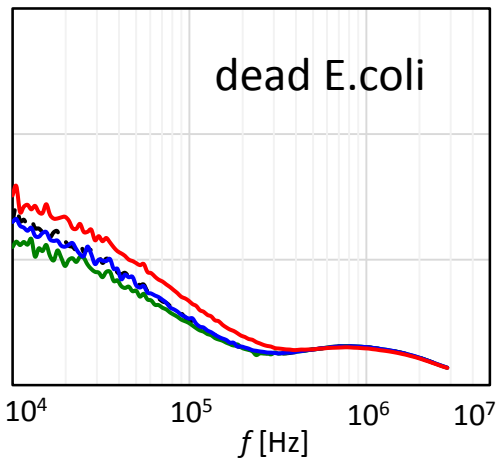
verification using ion solution



detection of E.coli



- Impedance measurement of E.coli β -dispersion, which is proportional to the density.
- Impedance change can be observed by living E.coli, not by dead E.coli.



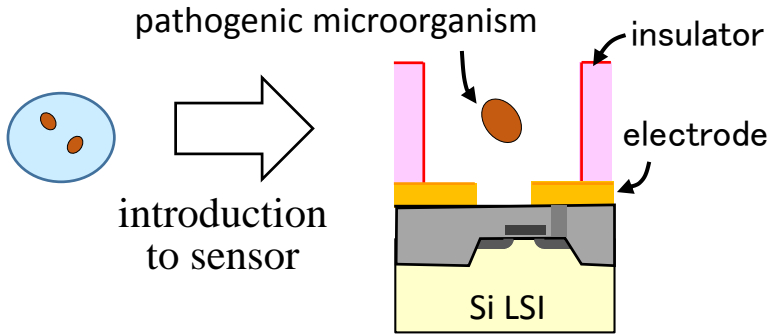
plot	solution	average number of E.coli between electrodes
— (red)	7.6×10^6 CFU/mL	14
— (blue)	7.6×10^5 CFU/mL	1.4
— (green)	7.6×10^4 CFU/mL	0.14
- - - -	0 CFU/mL	0

equivalent parallel-plate permittivity $\epsilon^* = |Y|/f$

Y : admittance, f : frequency

Detection process of E.coli

Detection of living E.coli



schematic cross-sectional view

impedance measurement

reagent	none
detection range	1-10 ⁷ CFU/mL
detection time	10 minutes

Detection of specific E.coli

