Supplementary Information

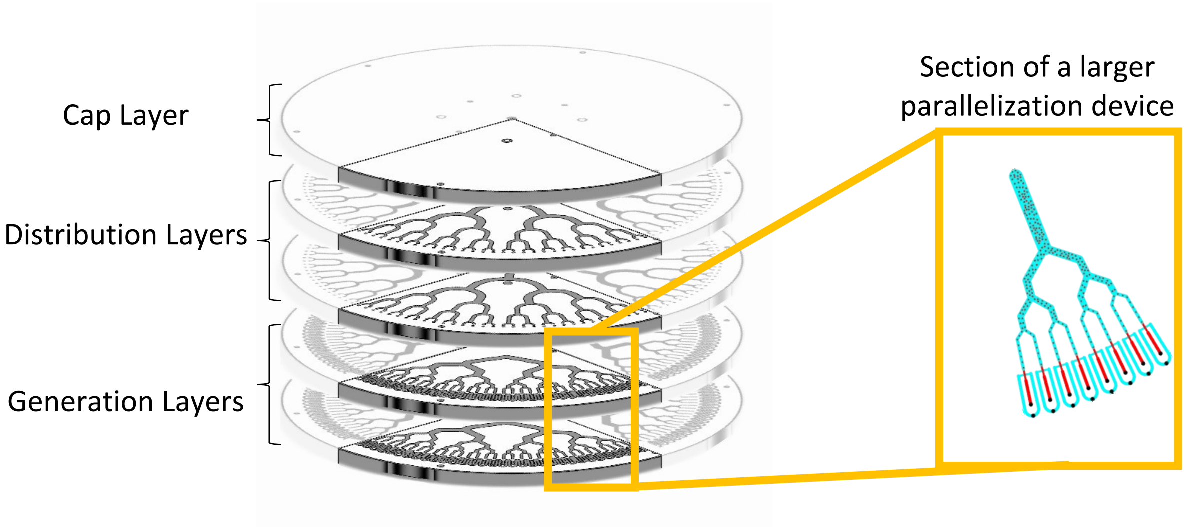

Fig 1. Section of a high-throughput emulsion generator. By monitoring groups of droplet generation in a parallelization device, we can observe variations in the permittivity of the emulsions and identify any problem at the droplet generation stage. This information can then be used to trigger corrective actions to avoid wasteful material. Examples of corrective actions include closing valves, adjusting flow rates and replacing the parallelization device in a manufacturing plant.

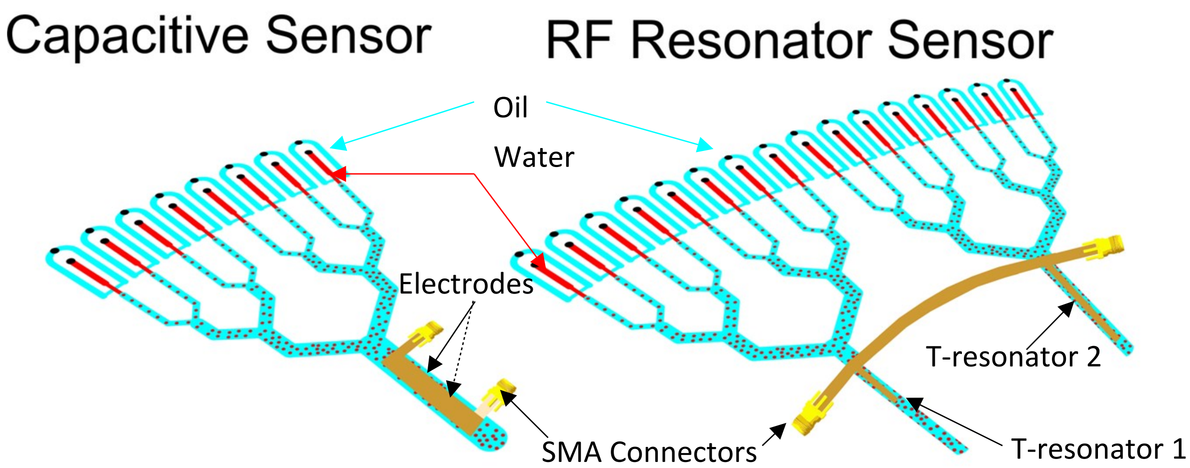

Fig. 2. In this figure, we show our strategy of integrating either the capacitive or the radio frequency resonator sensors in high-throughput parallelization devices. An independent resonator can monitor each section of the device, and when a section fails and starts generating polydisperse output, the effective permittivity of the new emulsion will change. By comparing the readings from various sensors, we can pinpoint the section of the device that has the problem. In the case of the capacitive sensor, each sensor has to be read out individually, whereas the RF resonator sensors can be designed at different operational frequencies and their readings can be obtained together by using a single probe