

# Wirelessly Powered and Controlled Electrical Signal Generator for Lab-on-a-Chip Devices

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## BACKGROUND

Lab-on-a-chip microfluidic devices have facilitated shrinking biological instruments onto chips that produce results faster while reducing consumables and waste and presenting the advantages of low cost, high portability, and easy operation. DC and AC power are widely used in these lab-on-a-chip devices to control the bioparticles suspended in microfluidic channels (e.g., localized heating, fluid mixing, and bio-particle handling). Interactions between electrical signals and cells and biomolecules also enable unique functions for diagnosis and cellular engineering (e.g., cell impedance measurements, electroporation, control of ion channels and membrane potential, and neural excitation and detection). In various types of such interactions, electrical signals of specific amplitudes, waveforms, and frequencies are needed to produce the desired effects. This has necessitated the use of several connecting wires between the lab-on-a-chip device and external instruments (power supplies, waveform, and function generators), thus adding to the cost and size of a system and, more importantly, increasing operational complexity and chance of error when clinicians with little electrical training use the device. For lab-on-a-chip devices to be more widely used in point-of-care settings, the devices need to offer additional functionalities and performance while keeping their operation simple. The current invention enables simple operation by providing wireless solutions for powering and signal generation and control.

## TECHNOLOGY DESCRIPTION

UC San Diego researchers have developed concepts, methods, and devices for wirelessly powering a lab-on-a-chip circuit and wirelessly generating controlled electrical waveforms. In the invention photoconductive switches, photovoltaic device, and/or RF circuits are used to produce DC and AC signals. These signals, in turn, control the behaviors of suspended particles and biological samples in the microfluidic channels of a lab-on-chip device. The invention provides various architectures to achieve wireless electrical signal generation.

## INTELLECTUAL PROPERTY INFO

This technology has a patent pending and is available for licensing and/or sponsorship.

## PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	10,024,819	07/17/2018	2011-085
United States Of America	Issued Patent	9,484,772	11/01/2016	2011-113

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## OTHER INFORMATION

### KEYWORDS

wireless power, lab-on-a-chip,  
microfluidic, RF, photovoltaic

### CATEGORIZED AS

- **Communications**
  - Wireless
- **Medical**
  - Devices

### RELATED CASES

2011-113-0, 2011-085-0