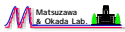


# An Ultra-Low Power Wireless Communication Circuit for Medical Telemetry Applications

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## Conclusion

- We developed a low-power near field wireless communication circuit whose static power consumption is  $6.5\mu\text{W}$  from 1.5V supply for medical close range communication.
- Measurement results: Rx 5 kbps@ASK 100%, Tx 5 kbps, and the maximum communication range of 12cm by measurements

## 1. Background



Rectum Bladder

Intravesical pressure measurement

for 3 days

is necessary for treatment of urinary disorders

Main issue of the communication circuit for medical telemetry

Small capsule = Small battery  
 ex: Only  $30\mu\text{A}$  for total analog circuit system

Our Goal

Wireless measurement System in a small capsule

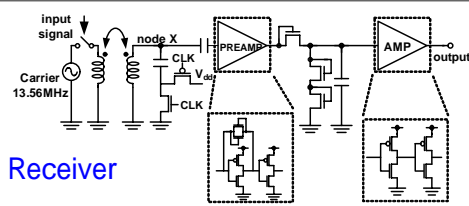


Ultra-low power is necessary (Less than  $10\mu\text{A}$ )

## 2. Circuit Architecture

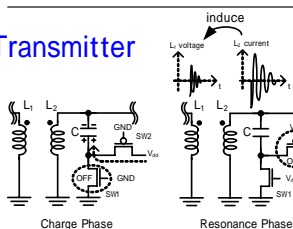
- An ultra-low power communication circuit using LC resonator and self-biasing inverter amplifier is proposed.
- Simulation results: Tx efficiency: 231pJ/bit, static power dissipation:  $6.5\mu\text{W}$ @5kbps, communication range: 15cm

### Circuit Architecture



Receiver

Transmitter

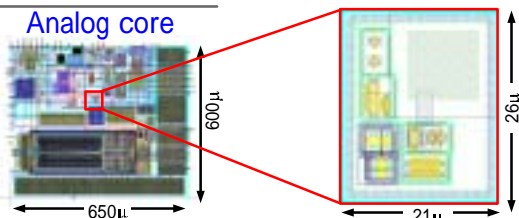


Intermittent operation by charging and discharging of a capacitor for LC resonator

### Layout

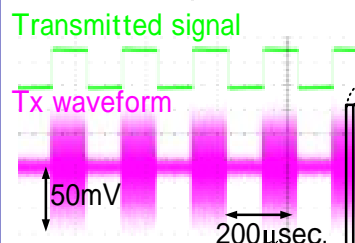
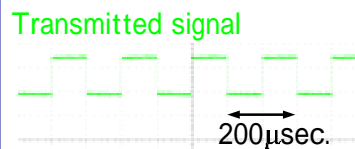
Analog core

Communication circuit



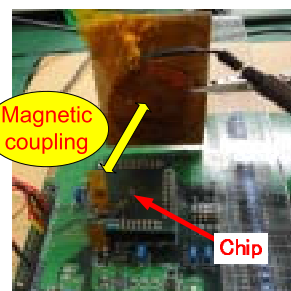
## 3. Measurement Results

### Measurement Results



- Measurement results: Tx efficiency: 302pJ/bit, static power dissipation:  $8.5\mu\text{W}$ @5kbps, communication range: 12cm.
- An ultra-low power communication circuit for medical telemetry is realized.

### Measurement Photo



Tx waveform (Unit impulse)

### Performance summary

	Simulation	Measurement
Rx data rate	5kbps	5kbps
Supply voltage	1.5V	
Modulation	ASK 100%	
Static power dissipation	$6.5\mu\text{W}$	$8.5\mu\text{W}$
Tx efficiency	231pJ/bit	302pJ/bit
Communication range	15cm	12cm
Carrier Frequency	13.56MHz	