A 16.6-pJ/b 150-Mb/s Body-Channel Communication Transceiver with Decision Feedback Equalization Improving >200x Area Efficiency

Ji-Hoon Lee, Kwangmin Kim, Minsoo Choi, Jae-Yoon Sim, Hong-June Park, and Byungsub Kim

Pohang University of Science and Technology
Body-Channel Communication

- Narrowband (NB)
- Ultra-wideband (UWB)
- Body-channel communication (BCC)

Air
Human body

Path Loss (dB) vs. Distance (m)

UWB on a Body
40dB

Body Channel


J. Bae et al., “A 0.24-nJ/b wireless body-area-network transceiver with scalable double-FSK modulation,” IEEE JSSC
DFE-based BCC Transceiver

- Capacitive-coupling
- Voltage-mode TX
- Bias Voltage
- RX impedance
- DFE RX

Capacitive-coupling
Voltage-mode TX
Bias Voltage
RX impedance
DFE RX
Measurement Setup

- Pattern generator
  - CLK
  - DATA
- Clock generator
  - SYNC
  - CH1
  - CH2
- Error detector
  - CLK
  - DATA

Connections:
- GPIB
- GPIB/LAN GATEWAY
- TX Clock
- RX Clock
- Recovered Data
- TX Data
- RX GND
- TX GND
- TX Board
- RX Board
- FPGA
- Latop

Pattern generator:
- Clock generator
- Error detector

GPIB/LAN GATEWAY connects with TX Board, RX Board, and Latop.

Latop connects with FPGA and TX Board.

TX Clock and RX Clock are synchronized with respective boards.

Recovered Data is obtained from RX Board.
Results

Clock Phase [UI] vs. Differential Voltage [mV]

- 150 Mb/s @ 20 cm (17% at 35 mV)
- 16.6 pJ/b

- 100 Mb/s @ 1.3 m (22% at 45 mV)
- 23.5 pJ/b

*d_1 = 20 cm*
*d_2 = 1.3 m*