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A Simple Non-coherent Solution to the UWB-IR Communication

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Fig. The transmission system concept

- System consists of bi-phase shift keying (BPSK) ultra-wideband impulse radio (UWB-IR) transmitter, antenna and BPSK UWB-IR receiver.
- Gaussian monocycle pulse (GMP) is used.
- Applicable to both the far- (GMP-derv) and near-field transmission.

- TX=> simple logic and delay elements.
- RX=> Amplifier (AMP), MOS voltage divider (analog to digital interface A/D interface), logic elements (detector).
TX Architecture

Fig. Schematic diagram of the TX

Fig. GMP generation principle

- Generating pulses e.g. D1/U1 are generated at the up-/down slopes of the inputs i.e. DN1/UP1.
- Pulses (D1/U1) are sequenced by the control logic => BPSK GMP generated.
- Push-pull structure with the bias => antenna interface.
RX Architecture

- One input is used as a reference to the other input.
- Amp=> Shunt-peaked amplifier.
- A/D interface adds bias to the amplified pulses, so that digital blocks can detect.
Measurement results

Fig. TX micrograph

Fig. RX micrograph

Fig. Response of the TX @ 2 Gb/s

Fig. GMP-derv at the receiving side

Fig. Response of the RX @ 500 Mb/s

Fig. GMP-derv recovery by the RX

Fig. Measured BER of the RX
Overall features and applications

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<tr>
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<th>[1]</th>
<th>This work</th>
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<tbody>
<tr>
<td>Technology</td>
<td>90 nm</td>
<td>65 nm (TX) 180 nm (RX)</td>
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<tr>
<td>Supply voltage</td>
<td>0.9-1 V</td>
<td>1.2 V (TX) 1.8 V (RX)</td>
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<tr>
<td>Modulation scheme</td>
<td>S-OOK</td>
<td>BPSK</td>
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<tr>
<td>Core die area</td>
<td>1 mm²</td>
<td>0.0017 mm² (TX) 3.4mm² (RX)</td>
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<td>Energy consumption</td>
<td>200 pJ/bit</td>
<td>1.5 pJ/bit (TX) 126 pJ/bit (RX)</td>
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<tr>
<td>Maximum data rate</td>
<td>1 Mb/s</td>
<td>2 Gb/s (TX) 500 Mb/s (RX)</td>
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<tr>
<td>BER</td>
<td>$&lt;10^{-3}$ @ -66 dBm</td>
<td>$&lt;10^{-4}$ @ -55 dBm</td>
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Fig. 3 dimensional multi-bit data links

Global wireless interconnect (GWI) => enables future reconfigurable wireless multi-bit data link


Application area =>
- 3 dimensional multi-bit data links
- TX => CMOS solution to breast cancer detection.

Fig. CMOS solution to breast cancer detection.