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

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System concept

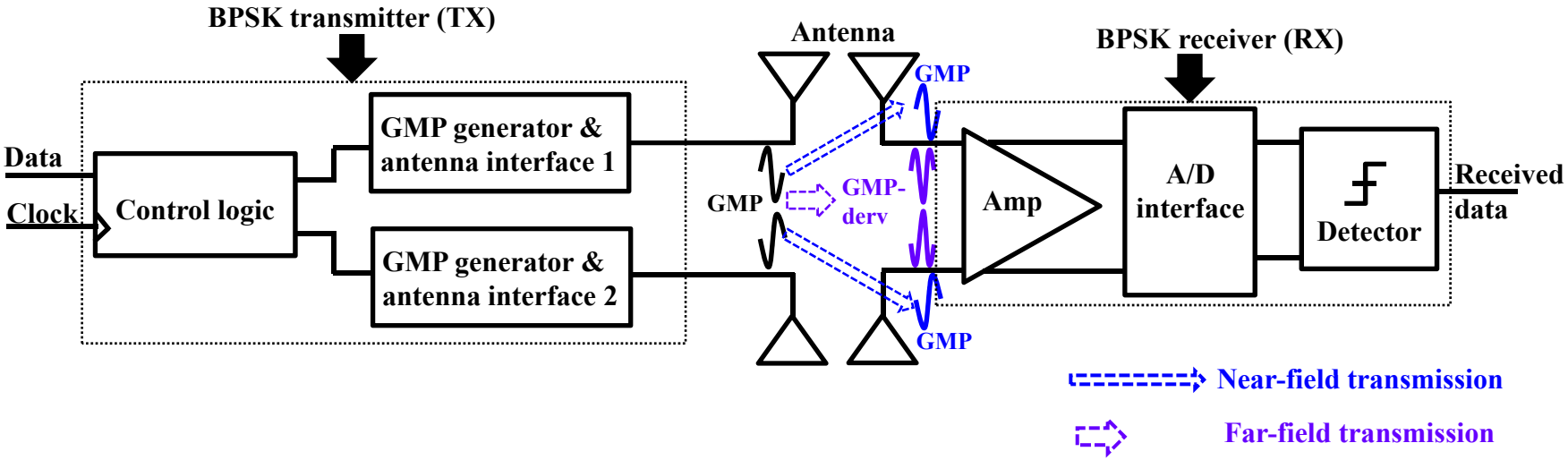


Fig. The transmission system concept

- ❖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

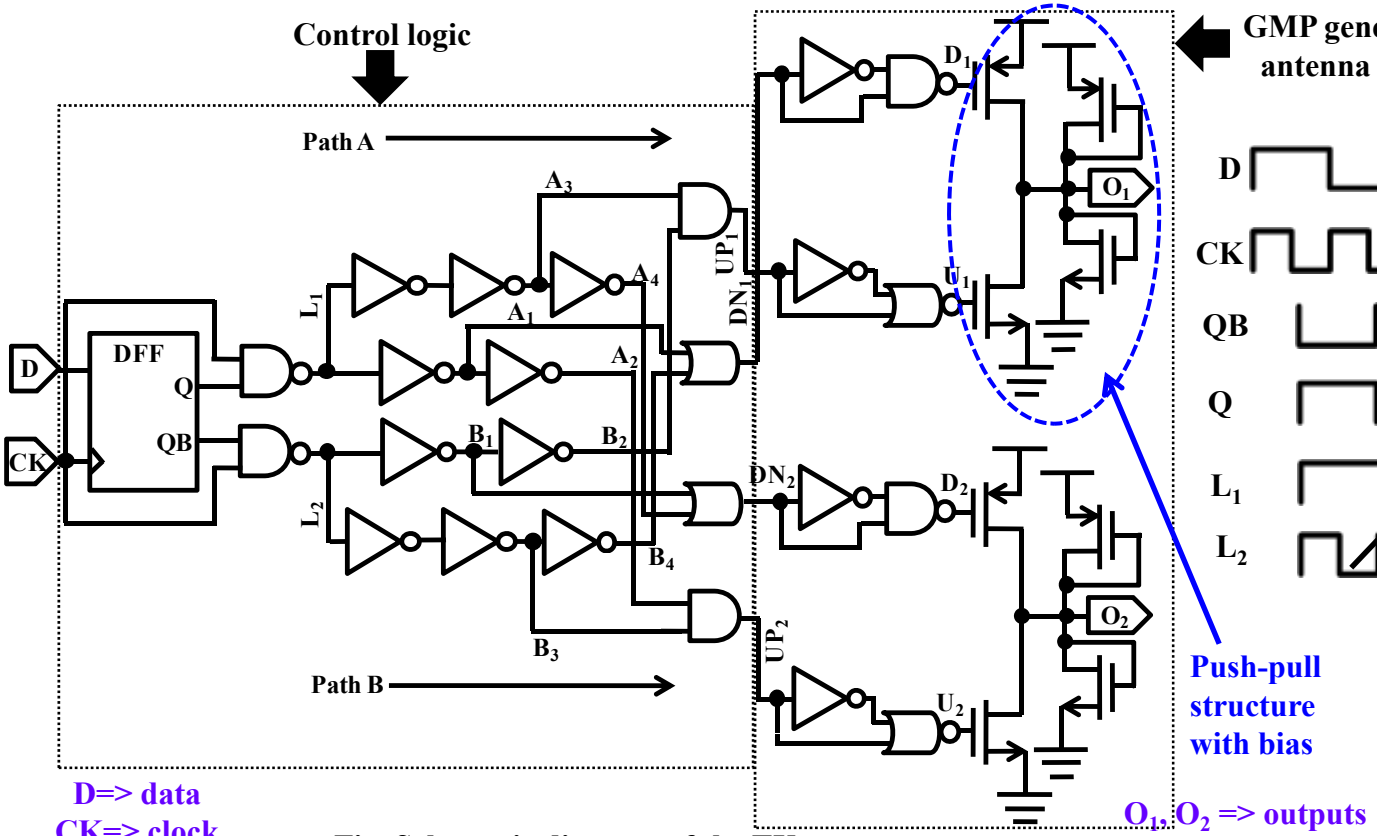


Fig. Schematic diagram of the TX

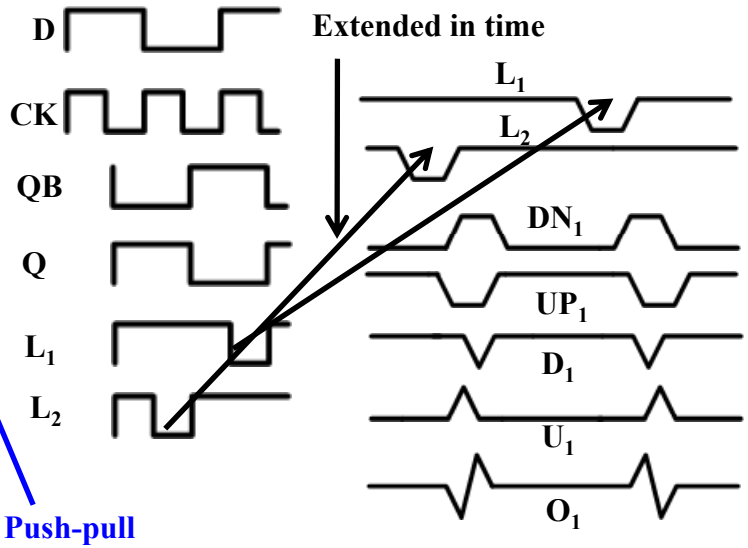
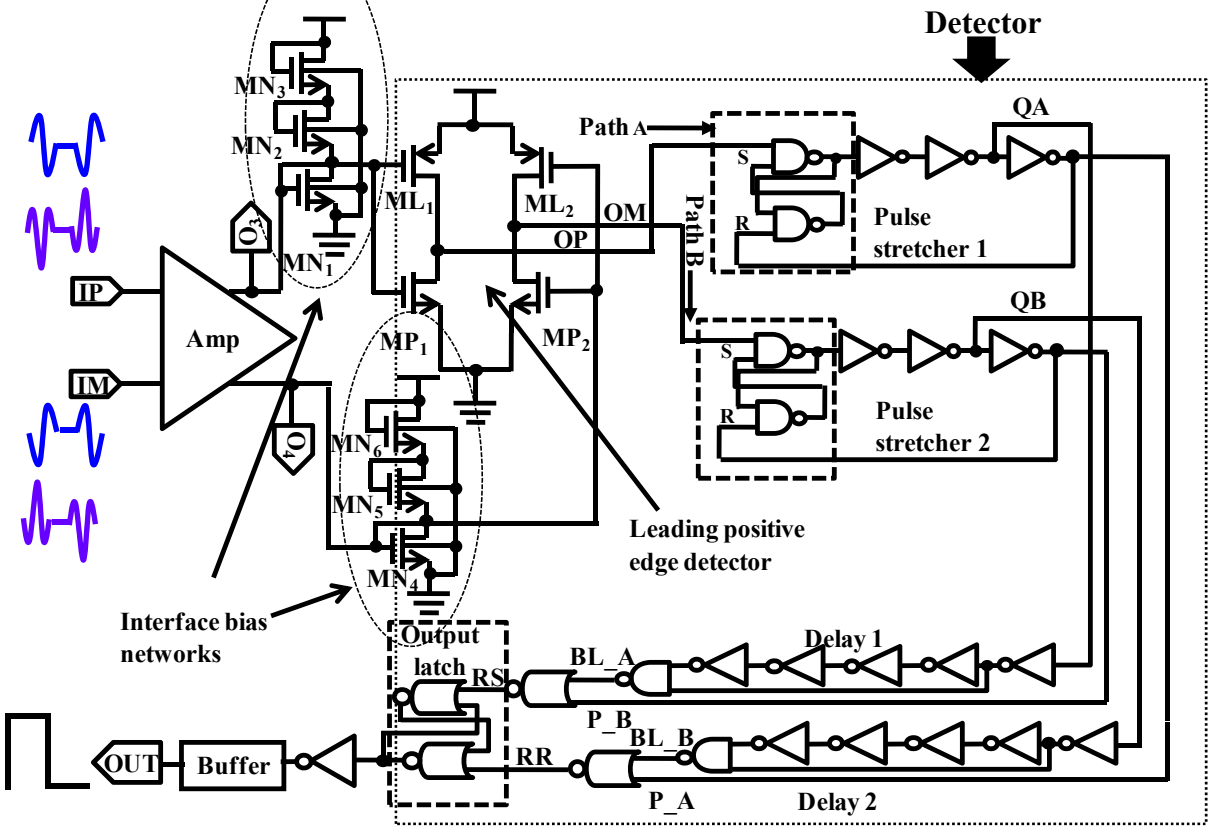


Fig. GMP generation principle

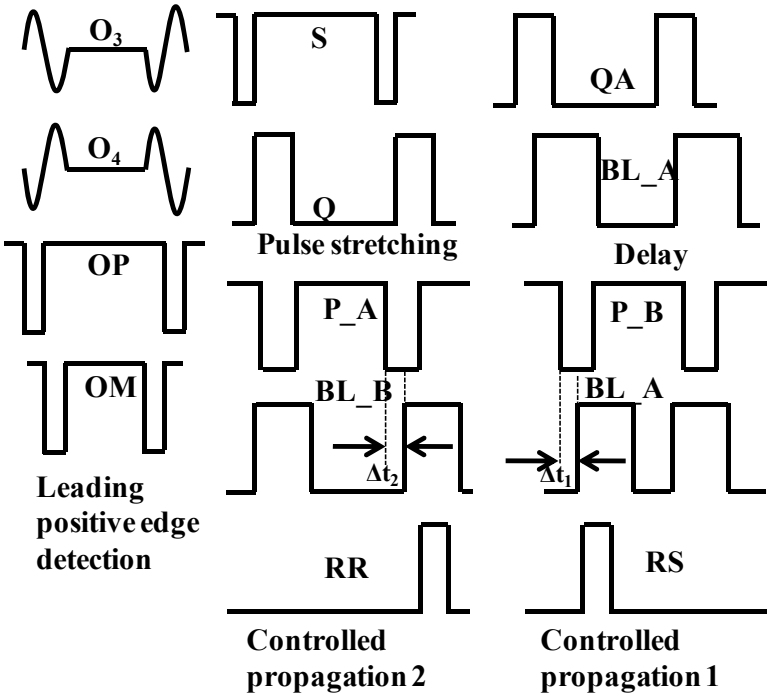
- Generating pulses e.g. D1/U1 are generated at the up-/down slopes of the inputs i.e. DN_1/UP_1.
- Pulses (D_1/U_1) are sequenced by the control logic => BPSK GMP generated.
- Push-pull structure with the bias => antenna interface.

RX Architecture



IP, IM=> inputs

Fig. Schematic diagram of the RX



- 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.

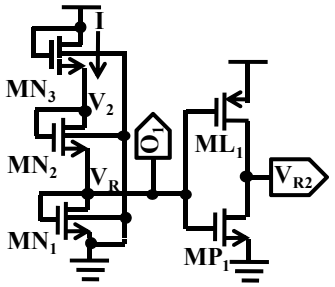
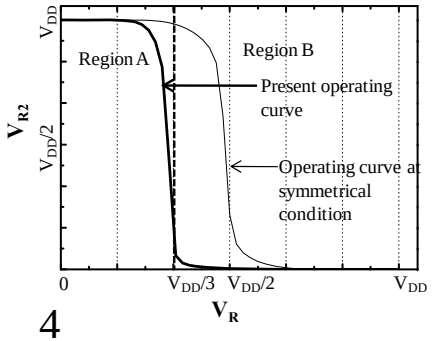


Fig. The A/D interface

Fig. Detection mechanism



Measurement results

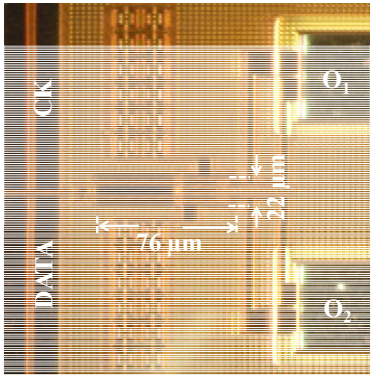


Fig. TX micrograph

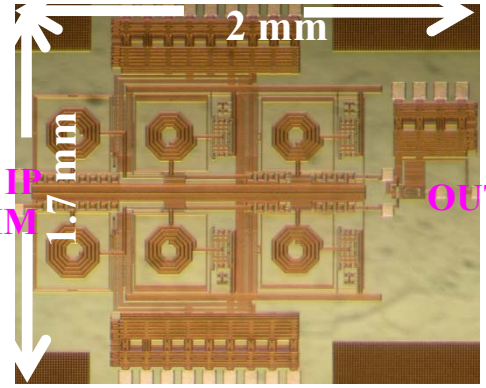


Fig. RX micrograph

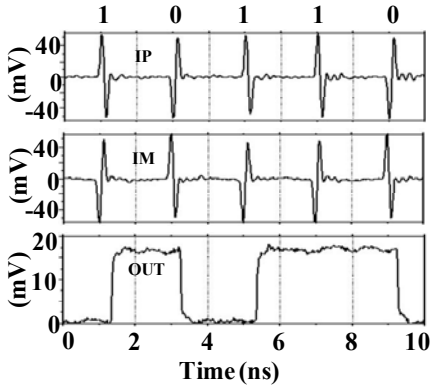


Fig. Response of the RX @ 500 Mb/s

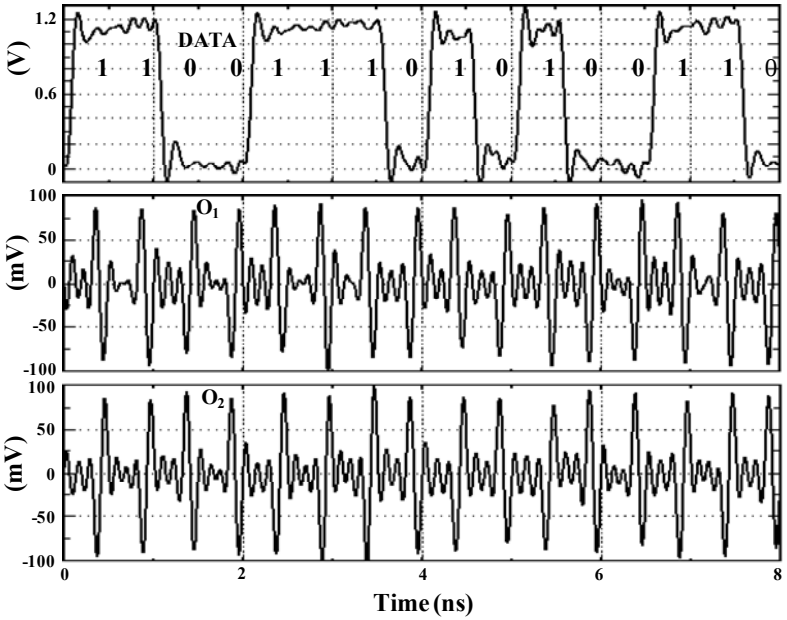


Fig. Response of the TX @ 2 Gb/s

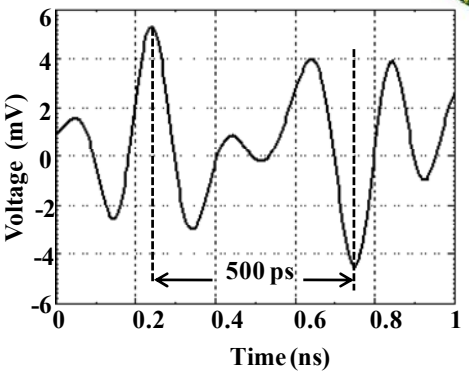


Fig. GMP-derv at the receiving side

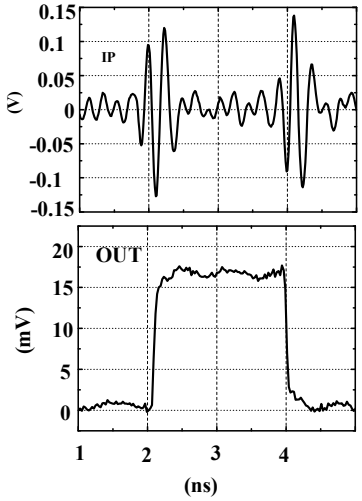


Fig. GMP-derv recovery by the RX

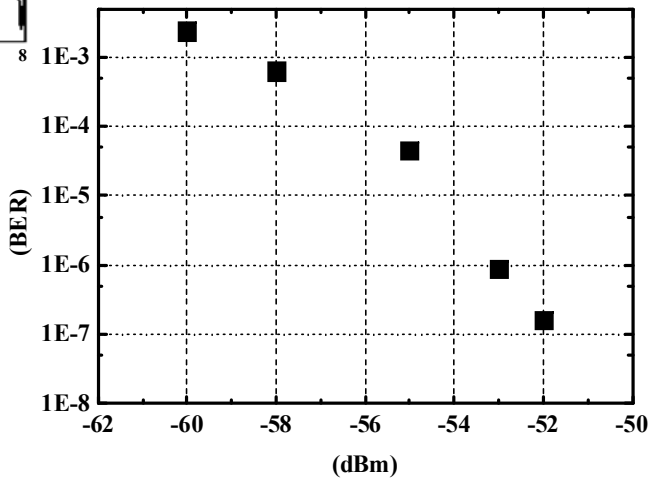


Fig. Measured BER of the RX

Overall features and applications

	[1]	This work
Technology	90 nm	65 nm (TX) 180 nm (RX)
Supply voltage	0.9-1 V	1.2 V (TX) 1.8 V (RX)
Modulation scheme	S-OOK	BPSK
Core die area	1 mm^2	0.0017 mm^2 (TX) 3.4mm^2 (RX)
Energy consumption	200 pJ/bit	1.5 pJ/bit (TX) 126 pJ/bit (RX)
Maximum data rate	1 Mb/s	2 Gb/s (TX) 500 Mb/s (RX)
BER	< 10^{-3} @ -66 dBm	<10^{-4} @ -55 dBm

[1]M. Crepaldi, et al Proc. ISSCC 2010,pp.226–228.

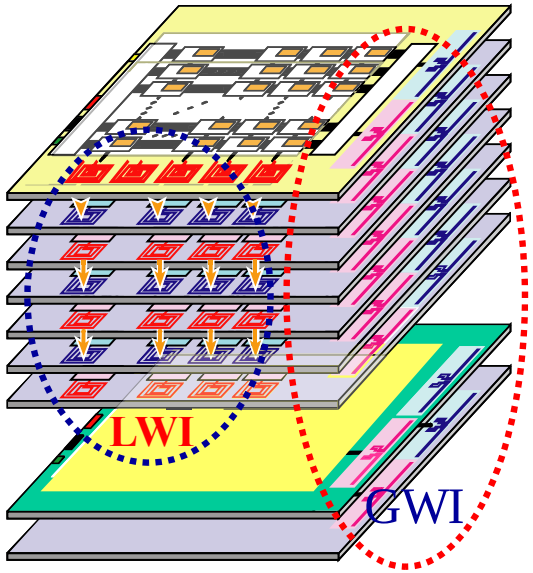


Fig. 3 dimensional multi-bit data links

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

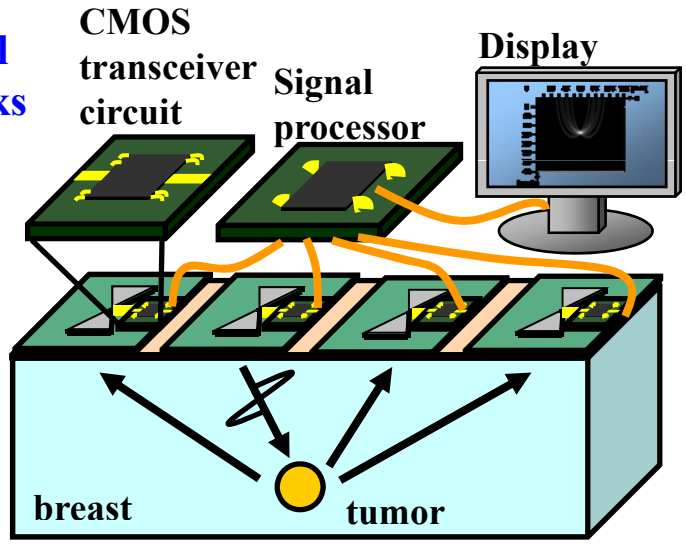


Fig. CMOS solution to breast cancer detection.

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