Approaches for uwb transmitter : its advantages and disadvantages

Science, Physics

Approarches for UWB transmitter : its Advantages and Disadvantages

On the transmitter side, there are several approaches for IR-UWB pulse generation[4] carrier-based up-conversion , direct pulse generation , waveform synthesis based on high speed digital-to-analog converters (DAC)

- Carrier-based up-conversion defeats one of the major advantages of IR-UWB (no carrier) and results in large circuit complexity and power consumption.
- Direct pulse generation tends to have limited reconfigurability because the high-Q pulse shaping filter is typically implemented as an off-chip discrete passive filter.
- Waveform synthesis provides good time and amplitude resolution and is reconfigurable for different pulse shapes.

However, the high sampling rate required presents a challenge to both the DAC implementation and the input data stream generation The Architecture [4] Uses impulse Distributed Waveform Generator (DWG), Trigger distribution circuit, Pulse generator that can generate reconfigurable pulse waveform with sub nanoseconds time resolutions, Time interleaved impulse generator to generate the impulses and uses 10 tap impulse Distributed Waveform Generator (DWG) in 0. 18um CMOS technology, a DPC time-interleaves multiple stages in parallel.

Each stage consists (from bottom to top) of an impulse generator, a sampler, and a multiplier. The input UWB pulse , where is the timing error between the input signal and sampling system, is distributed to these sampling stages by a signal distribution circuit, and a trigger is distribute d to all stages with increasing delays by a trigger distribution circuit. Theimpulse generator in each stage is triggered in sequence togenerate an impulse at . The generated impulsesamples the distributed input UWB pulse, and the sample isthen multiplied with a tunable gain . Samples from all stagesare then summed and integrated .

The Advantages of [4] include Reconfigurable since pulse width tuning and delay tuning can be varied / controlled, Pulse Based UWB, is chosen since pulse are very short in sub-nano and hence interference does not occur, Because of interleaved architecture, only when Base band signal is recognized the pulse Generator and circuits operate and hence power consumed is minimized, Trigger distribution circuit uses current starved active delay line to achieve Low power and large tuning range and Better resolutions can be improved by increasing the no of taps in Trigger distribution circuit. Some of the Disadvantages were the Time interleaved architecture required accurate timing control, which is determined by distribution block and Systematic delay mismatch and jitter in the Trigger distribution can cause waveform distortions and detection error.

The Architecture uses Low power on off keying impulse radio UWB pulse generator, Uses RLC tank for pulse generator (PG), It uses multi pulse combination [MPC], Based on the delay lines propagation delay and output drivers with different strength , Gaussian approximation waveform is obtained in TSMC 90nm CMOS Technology. The basic idea of the proposed PG is to inject energy into an RLC tank which consists of the antennaresistance (RANT) periodically as shown in Figure 1(a). It is difficult to determine the output signal amplitude because of the system nonlinearities. Nevertheless it is important to estimate the system frequency response so that the FCC part 15 maskrequirements can be met. The schematic of the proposed IR-UWB PG is shown in Figure 4(a). LF EN = ‘ 0’ and PW EXT =‘ 1’ are assumed at this moment, the setting will be explained later. Instead of using a single switchdriven by an oscillator, several switches are cascaded and turned on and off .

The Advantages of include High flexibility and controllable centre frequency, output power, pulse width and data rate , Low power and energy efficient due to on off keying and Small size because multi pulse combination [MPC] use digital gates. Some of the disadvantages of include Operated at low UWB because the capacitive and switching losses increase with increase with frequency, Not easy to control the envelop due to process variations and Large area due to pad and bond wire inductors.

In UWB Transmiter implements Glitch Generators, Switched Oscillators , two stage buffers, Pulse Shaping and Filters in 0. 18um CMOS technology. The pulsegeneratorconsistsofaglitchgenerator, aswitched oscillator, atwo-stagebuffer, andapulseshaping filter, shownin Fig. 3. Theproposedswitchedoscillatoriscomposedofathree-stage ringoscillator,(M1–M3), apairofoscillation-enablingswitches (M4 andM5), twofeedbackresistors Rosc, andacontroltransistor M6.

The Advantages of are low power Since Oscilators and buffers are switched on and off hence power is minimized and usage of UWB is efficient. Some of the disadvantages were Area occupied is more because of more circuit stages and Pulse width is high. In Architecture Uses impulse Distributed Waveform Generator (DWG) , Trigger distribution circuit, Pulse generator that can generate reconfigurable pulse waveform with sub nanoseconds time resolutions., Time interleaved impulse , generator to generate the impulses and 10 tap impulse Distributed Waveform Generator (DWG) using 0. 18um CMOS technology. Fig. 3 represents the impulse generator.

The circuit consists of a NAND circuit, a feedback loop, followed by two stage inverter. A short impulse is generated by the NAND operation of the input trigger signal and its delayed version. The delay in the feedback loop, which consists of the propagation delay of NAND gate, the following inverter and the charging time of M1, determines the pulse width. The feedback loop has a NMOS transistor M3 as a voltage controlled transistor. This work concentrates to increase the bandwidth, i. e. to reduce the width of the impulse. The minimum width is maintained as 80ps and can be varied up to 1ns. Impulse width is varied by varying the width tuning voltage, Vwt. Vwtchanges the time constant of the charging path of M1, which in turn changes the width of impulse. The narrow basis pulses are generated at a specific sampling time by one of the impulse generators.

The Advantages were the Reconfigurable since pulse width tuning and delay tuning can be varied / controlled, Pulse Based UWB, is chosen since pulse are very short in sub-nano and hence interference does not occur, Because of interleaved architecture, only when Base band signal is recognized the pulse Generator and circuits operate and hence power consumed is minimized, Trigger distribution circuit uses current starved active delay line to achieve Low power and large tuning range and Better resolutions can be improved by increasing the no of taps in Trigger distribution circuit. The Disadvantages was on Noise measured in delay unit is max nearly 99% due to Feedback transistor NM2. Similarly noise in impulse Generator is due to Feedback transistor NM2 and By increasing the widths of both the delay unit and impulse Generator by a factor of 2 , the noise reduces to 50%, but the output gets distorted .

The Architecture is Based 7th derivative Gaussian pulse generator (PG), Consisting of 5h derivative Gaussian PG combined with RLC second order derivative to generate 7th derivative Gaussian pulse. Consists of delay Circuit, Pulse generator using XOR gate, pulse shaping and RLC second order derivative in 180nm CMOS MOSIS IBM PROCESS Technology. The Advantages were use of 7th derivative Gaussian pulse generator (PG) is best for outdoor application and has no DC component, Use of XOR gate for pulse generation instead of NAND and NOR results in shorter pulse, Reduces power consumption due to increase in speed of XOR and Consumption is lowered due to lower signal duration and smaller amplitude of pulse although Vdd is high. Some of the Disadvantages were that it did not utilize the lower band UWB range efficiently.

The proposed architecture of pulse generator circuit is shown in the Fig. 3, the inverter and NAND gates are designed using SCL. Since SCL is dual mode logic, so a designed circuit is needed to change from single-mode to dual-mode logic. The output of pulse generator circuit is ready dual-pulse (±ve& -

ve) which can be utilized for encoding the transmitted data by pulse polarity coding. The PG was designed digitally based on SCL gates to be used in analog environment . SCL inverters are used in delay line to delay the input signal where 2– inputs SCL nand were used to get difference between the original and delayed signals. The amount of delay is controlled by the total delay of the delay line, and by increases the delay elements we can increase the total delay, so the output pulse width. In our design we use 5-stages SCL-Inverters as delay line which make the output of PG as short impulse.

In paper reports a fully-integrated full 3. 1-10. 6 band UWB Gaussian pulse generator featuring tunable pulse width and extremely low power implemented in a foundry 0. 13Jlm CMOS technology. Practically, there are several different pulse generation schemes available for impulse UWB transmitters, such as rectangular, sinusoidal and Gaussian methods. However, considering the spectrum characteristics, Gaussian pulse is considered as the best fit since its side lobes has the smallest energy, making it easier to meet which strict FCC effective isotropic radiated power (EIRP) spectrum mask requirement. In this work, Gaussian pulse and its first-order derivative pulse generation scheme is used.

The first-order derivative Gaussian pulse generator consists of three cascade stages: square wave (SW) generation, Gaussian pulse formation and first-order derivative function. When an input signal, normally sinusoidal or rectangular, is fed into this circuit, a square wave (SW1) with sharp rising and falling edge will be generated, which drives the delay cell block to regenerate another delayed square wave (SW2). The delay time ~t can be controlled by adjusting the delay cell. The two square waves SWI and SW2 will meet at the separate pulse generation (SPG) block and an approximate Gaussian pulse will appear.

Finally, the differentiating operation generates the required first-order derivative Gaussian pulse at the output.

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