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Implementation Of Satellite Data Receiving Systems Testing Unit Using BER Method Along With Built In BER Generator Using ALTERA-VHDL

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National Remote Sensing Center (NRSC) gets information from diverse remote satellites like IRS-P6, IRS-P5, Cartosat-2, Cartosat-2a, and so forth., and forms it relying upon the client request. The satellite information got in X band is in a specific information position. The collector equipment setup must be prepared in such a way that it is ready to take the data at any time. In the proposed project VHDL code has been produced for BER reader with differential encoding and decoding..the errors tht are occurred in the satellite data will be displayed by using HP display devices. The hardware kit is devoleped by using ALTERA EPLDs. This needs cystal oscillators, thumb wheel switches,7 section show and so on., must be programmed according to the necessity. The equipment needed for this has been executed on the wire-wrap board.

Keywords: Very High Speed Integrated Circuit Hardware Description Language (VHDL), Bit error rate reader(BER), Electrically Programmable Logic Device (EPLD)

I. INTRODUCTION

Indian Remote sensing satellites sends data serially and continuously in X-band frequency.the frequency at which the satellite data is coming must be known and both the frequencies must match,but in case of bitsynchronisation the frequency may change.a frequency reader is placed at the receiver side to know the frequency. The satellite data is Frame synchronized and BER reader is used to detect the errors in coming satellite data.differential encoding and decoding techniques are used.

In satellite communication QPSK modulation method is utilized and as a part of this I and Q channels are consolidated. So there is a possibility of phase ambiguity to overcome this issue satellite information is differentially encoded at transmitter side and differentially decoded at collector side.

In BER Reader the property of PRBS generator is checked and mismatch counter is utilized to calculate number of errors. In the event that the property of generator is not coordinating then mismatch counter begins increasing.

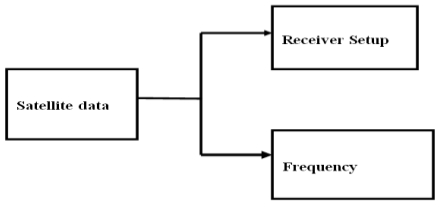

Fig.1. Project over view

II. RELATED WORK

Remote sensing satellites are in the circle of 600 to 800km range from the earth surface and send information ceaselessly covering entire globe in some predefined times ,that send particulars of any landmass, may be climate data, ocean particulars, and so forth., Satellite is noticeable to the earth station for a brief time of around 12 to 15min.Therefore ground station is designed to be arranged and created for the above effectiveness on a continous basis uninterruptedly on day in and day out premise .Before launch of a satellite into its orbit ,it is essential to check all the health parameters of Ground Station. The systems and process are required to be designed to demonstrate the reliability of all on day-to-day basis .So a framework is made at the ground station with the goal that it can check system performance.The ground system chiefly comprises of two sections.

Generator:

PRBS generator is utilized to create a PN succession. The tapping bits are xored and input is given to create PN sequence.PN succession is differentially encoded to keep away from phase ambiguity.Errors are injected at the encoded data by using a reset switch.

The clock is resynchronized to maintain a strategic distance from glitches by altering clock and going through. D flip flop.By utilizing resynchronized clock yield and clock of generator are taken as info for Reader

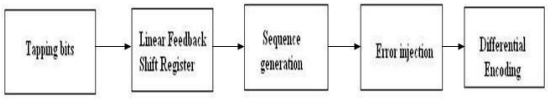

Fig.2 square outline of generator

Reader:

In BER Reader the clock and output of generator are taken as inputs .First encoded sequence is decoded. At that point property of PN sequenceis checked. Windows are created.Mismatch counter is utilized to compare the decode sequency. These errorsare shown utilizing seven segment display. Ifno errors occursthen zero is shown.

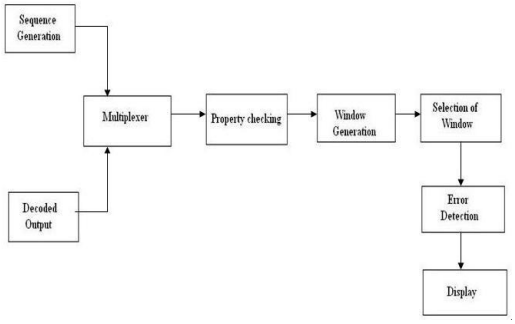

Fig3. Block diagram of reader

III. PRBS GENERATOR

Psuedo Random Binary Sequence generator utilizes Linear feedback shift register logic .A random binary sequence number sequence is generated by using the pn-sequence It is '**random**' in a sense that the value of an element of the sequence is independent of the values of any of the other elements. It is "pseudo" on the grounds that it is deterministic and after N components it begins to rehash itself, not at all like genuine arbitrary sequences.Fig4 shows pn grouping era utilizing LFSR(Linear feedback shift register).If we consider a 11 bit sequence 9 and 11 are the tapping bits .Those tapping bits are xored and is send as an input to the first bit lastly arrangement is created which is as demonstrated in below fig

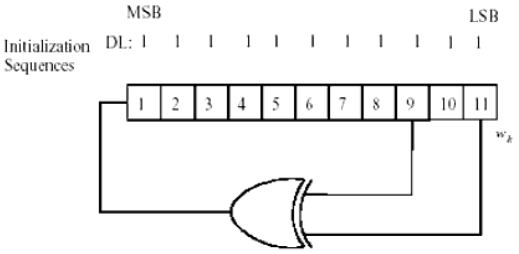

Fig. 4. PRBS generator

	Feed back taps
9	5+9
11	9+11
15	14+15
20	17+20
23	18+23
29	27+29
31	28+31

IV. DATA TRANSMISSION

The physical transfer of data (a digital bit stream or a digitized analog signal) over a point-to-point or point-to multipoint communication channel. Examples of such channels are copper wires, opticalfibres, wireless communicati on channels, storage media and computer buses. The data are represented as an electromagnetic signal, such as an electrical voltage, radio wave, micro wave, or infrared signal.

As digital, and pass band transmission of digital data as a form of digital-to-analog conversion While analog transmission is the transfer of a continuously varying analog signal over an analog channel, digital communications is the transfer of discrete messages over a digital or an analog channel.

The messages are either represented by a sequence of pulses by means of line code (baseband transmission) , or by a

limited set of continuously varying waveforms pass band transmission),using a digital modulation method. The pass band modulation and corresponding demodulation (also known as detection) is carried out by modem equipment. According to the most common definition of digital signal, both baseband and passband signals representing bit-streams are considered as digital transmission, while an alternative definition only considers the baseband signal.

Data transmitted may be digital messages originating from a data source, for example a computer or a keyboard. It may also be an analog signal such as a phone call or a video signal, digitized into a bit-stream for example using pulse-code modulation (PCM) or more advanced source coding (analog-to-digital conversion and data compression) schemes. This source coding and decoding is carried out by codec equipment.

V. DIFFERENTIAL ENCODING AND DECODING

For ordinary coding systems a reference signal must be sent to the collector to disentangle the information. by utilizing differential coding procedures any reference sign is not necessary. It relies on upon present and past quality. In satellite communication QPSK regulation method is utilized. In this strategy I and Q channels are combined. At receiver side it is hard to separate I and Q channels. So by utilizing differential encoding and decoding we can avoid this problem.fig5 shows differential encoding and decoding

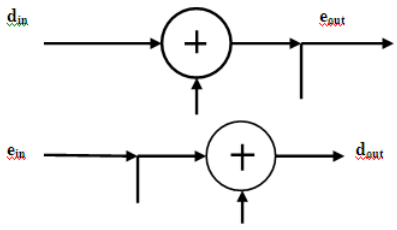

fig. 5. Differential encoding and decoding

VI. Error injection:

The errors are added into the sequence manually bu using a reset switch.when reset switch is pressed the sequence at which the reset switch was pressed will be inverted that is the high signals will be converted into low signals and low signals will be converted in to high signals.for latching operation a debouncer is used.the debouncer used in this project is dm7400n.

VII. BER READER

Bit error rate (BER) of a communication system is defined as the ratio of number of error bits and total number of bits transmitted during a specific period. It is the likelihood that a single error bit will occur within received bits, independent of rate of transmission. There are many ways of reducing BER.

The errors coming from the transmitter are to be detected at receiver side. For the measurement of these errors first property of LFSR is to be checked and mismatch counter is activated whenever property is not satisfied mismatch counter will get incremented.

Various windows are produced as 10^4,10^5,10^6.This window size demonstrates aggregate number of bits and mismatch counter shows number of errors utilizing these both Bit error rate can be figured. Theseerrors are shown utilizing seven segment display. The equipment is checked utilizing Logic analyzer. Thumb wheel switch is utilized to choose window.

In the event that no errors exist then the yield of ber reader will be zero and if errors happens those will be shown and window are checked continuosly.

VII. RESULTS

fig. 6. PRBS Generator

Fig 6 shows the hardware part of prbs sequence. It consists of an EPLD in which the program has to be dumped. After dumping the program we can get the desired sequence by using a logic analyzer.

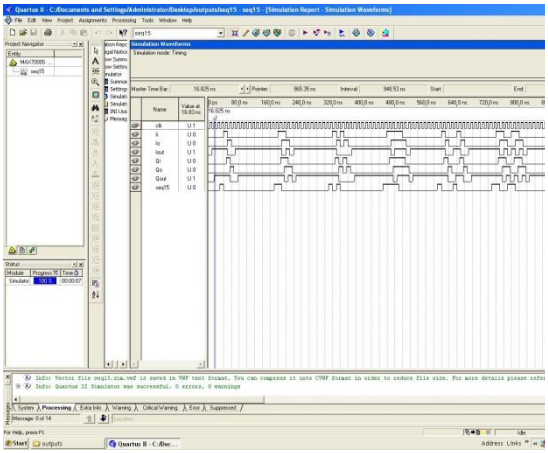

fig. 7. Encoded sequence

Fig7 shows the generation of prbs sequence along with the encoded output.

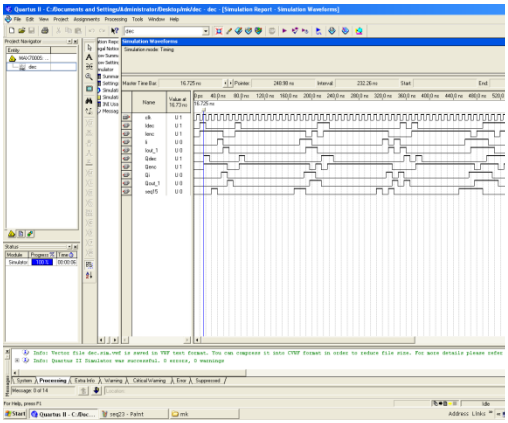

fig. 8. Decoded sequence

Fig8 shows the decoded out for the sequence which is shown in fig7

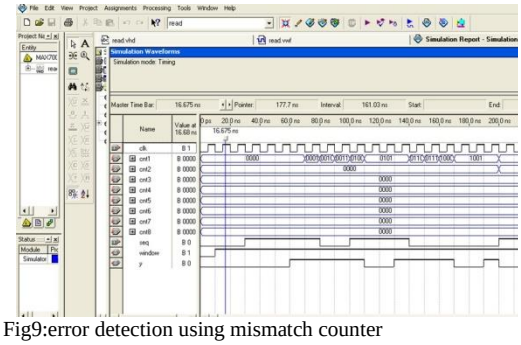

Fig9:error detection using mismatch counter

A mismatch counter is used for counting the errors that are present at the receiver side.when ever an error occur the mismatch counter increments by one and the number of errors are displayed by using a seven segment display.

CONCLUSION

A 2^{15}-1 PN sequence is generated at the transmitter side. The generated PN-Sequence output is transmitted to the Reader. At the reader the property checking was done. A mismatch counter is kept at the receiver side so that whenever an error occurred the mismatch counter gets incremented

A 10^6 size window is generated and whenever the mismatch counter gets incremented they are counted in the 10^6 window and the numbers are displayed by using the seven segment display.

Hence by using the BER Reader the overall system performance can be tested.

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