HDL Design for Exa Hertz Clock Based $2e^{10}$-1 Exa Bits Per Second (Ebps) PRBS IP Core Generator for Ultra High Speed Wireless Communication Products

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Abstract: The Design is mainly Intended for High Speed Random Frequency Carrier Wave Generator of 1 Ebps Data Rate using $2e^{10}$-1 Tapped PRBS Pattern Sequence. The PRBS is Designed by using LFSR Linear Feed Back Shift Register & XOR Gate with Specific Tapping Points as per CCITT ITU Standards. RTL Design Architecture Implemented by using VHDL &/ Verilog HDL, Programming & Debugging Done by using Spartan III FPGA Kit. Transmission done through this carrier frequency. Propagation Carrier Done either Serially / Parallel lines I/O.

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I. INTRODUCTION

In Modern Hi-tech Communication Engineering world, High Speed based Portable Communication System Hardware & Software Products Came to the market, speed is an important factor and is in terms of Giga/Tera bits per second for all Hi-tech Real time Smart Computing Portable wireless Communication System Software products like Cloud Computing , wireless Internet Data Packets Transceivers Computing, Tablets, Pocket Mobile Multimedia Systems, Note Book Computers, Wireless Routers, NOCs, Network Cards/ Racks, WiFI, GiFi, Wimax, GPS, GSM, QCDMA Tranceivers.For that purpose , I Designed Exa Bits Per Second High Speed PRBS is Pseudo Random Binary Sequence Frequency Generators, Generate & Received Random Frequency Data in the form of Random frequency numbers of different speed w.r.t specific data tapping sequence points for both signal & carrier wave generation. PRBS Generators, Receivers, Transceivers Designed for Hi-Fi Wireless Internet Data Packets Computing and Cloud Computing etc. Transmission, Reception of Data is in the RANDOM Sense, This PRBS Generator, Receiver is Designed for Identification property of Different Tapped PRBS Sequences like 7, 10, 15, 23, 31 at a Clock carrier frequency speed of Exa Bits Per Second Ebps. The Length of PRBS sequence is 2^L-1. 2^L-1 times repeated the sequences. this is mainly suit for multiple users to transmit and received data in accurate time for very long distance communications like GPS Data Acquisition, GSM

Communication Systems, WiFi, GiFi, LTE, Wireless OFDMA , CDMA, QCDMA Computing, wireless internet computing, cloud computing etc because of Ultra High speed Communication Rate in terms (Exa Bits Per Second) Ebps . All these PRBS LFSR Sequences are designed by tapping different points according to ITU O.150, O.151, O.152 Standards. This PRBS Design Consists of Multiplexer, PRBS Registers of different tapped sequence points, Clock Frequency Generators of Ebps Speed. The Advantages of these PRBS Generators having In Built Checkers, Bit Error Rate Detection & Correction by using PRBS Checkers. these are simply Linear Polynomial Checkers & CRC.
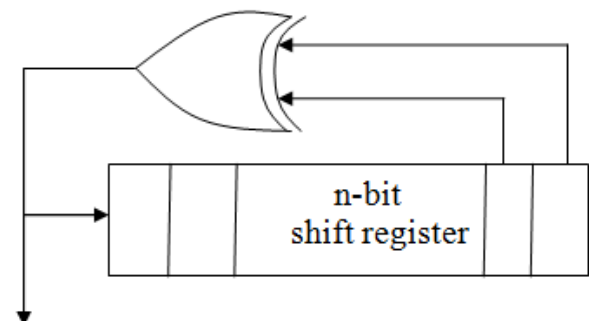
XOR GATE

Figure 1.PRBS DESIGN-Fibonacci (many-to-one)Realization of LFSR with minimum number of taps and XOR gate in its feedback.

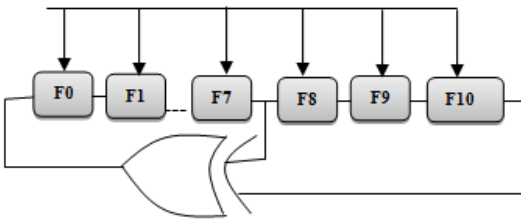## II. 2e^{10}-1 Exa Bits Per Second PRBS DESIGN ARCHITECTURE

Ebps Clock

Figure 2. 2e^{10}-1 Ebps Rate PRBS Design
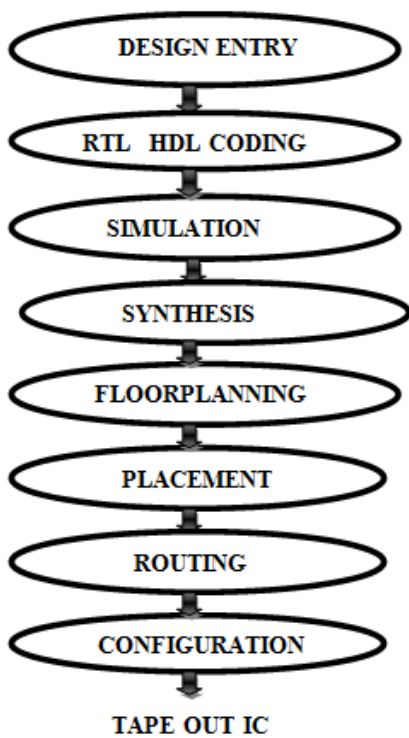
III. SOFTWARE – VLSI IC DESIGN FLOW

Figure 3. VLSI IC Design Flow Chart

IV. DESIGN FLOW REPORTS
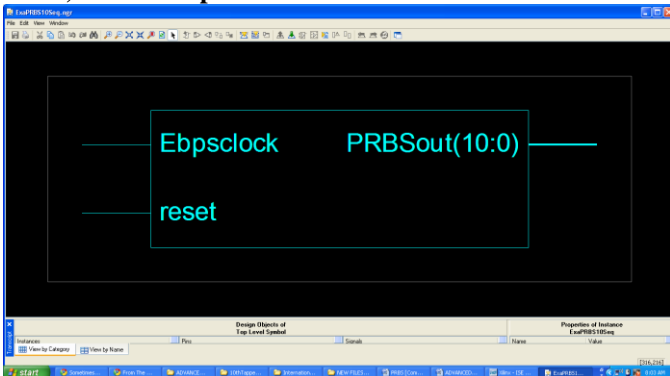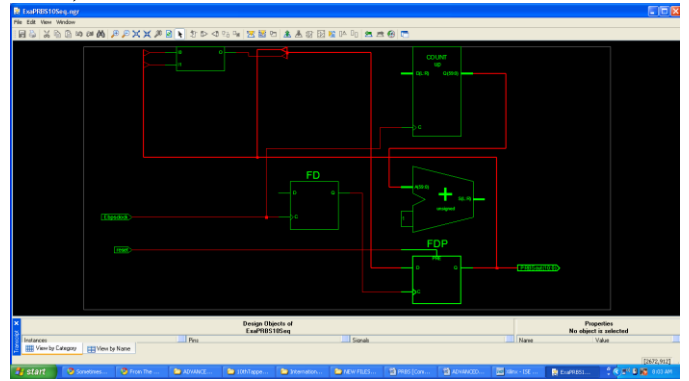
A) 2e^{10}-1 Ebps Rate PRBS DESIGN RTL BLOCK

Figure 4.RTL Design Block 2e^{10}-1 Ebps PRBS

B) RTL Schematic

C) FLOOR PLANNER DESIGN

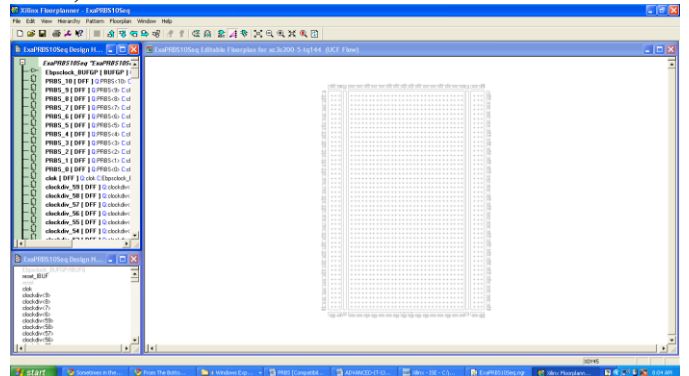**Figure 5. Floor planner Design 2e^{10}-1 Ebps PRBS**

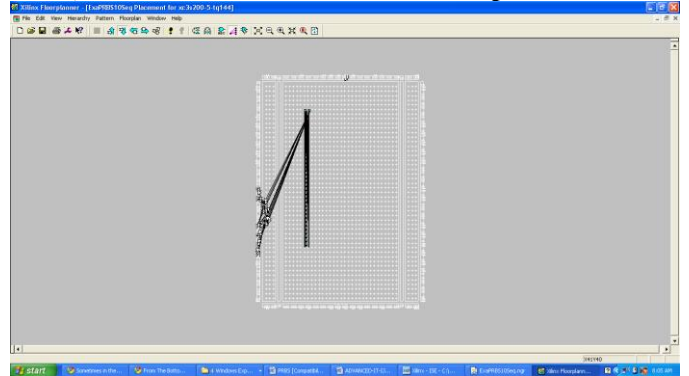### D) DESIGN PLACED REPORT –Ebps PRBS

Figure 6. Placed Design 2e^{10}-1 Ebps PRBS

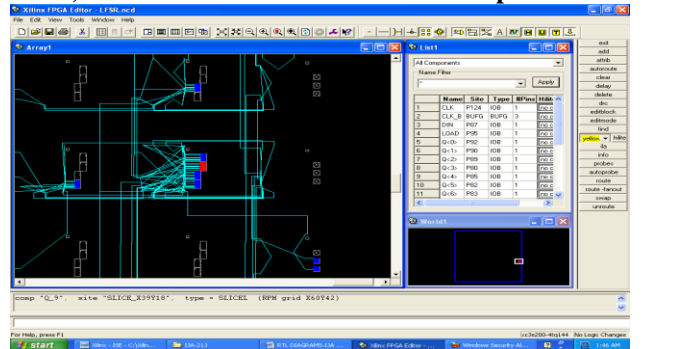### E) DESIGN ROUTED REPORT –Ebps PRBS

Figure 7. Routed Design Report 2e^{10}-1 Ebps
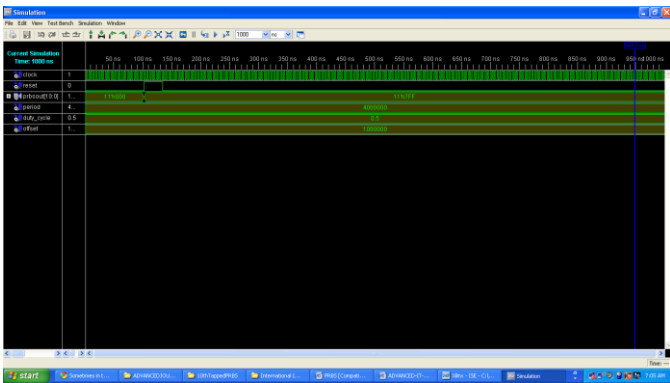
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PRBS
F) SIMULATION WAVE FORM RESULTS

Figure 8. Simulation Results-2e^{10}-1 Ebps PRBS

V. CONCLUSION

Designed High Speed Random Carrier Frequency Generator for Ultra High Speed Wireless Communication Engineering Products

VI. REFERENCES

1.http://en.wikipedia.org/wiki/Pseudorandom_binary_sequence
2.ITU – CCITT Reference Document

VII. Bibliography

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Recently he delivered Invited lecture in University of Minnesota, Minneapolis USA.on Application of Kalman filtering for Power Electronics and Power systems.. He has guided 5 Ph.D students and currently guiding 8 Ph.D students.