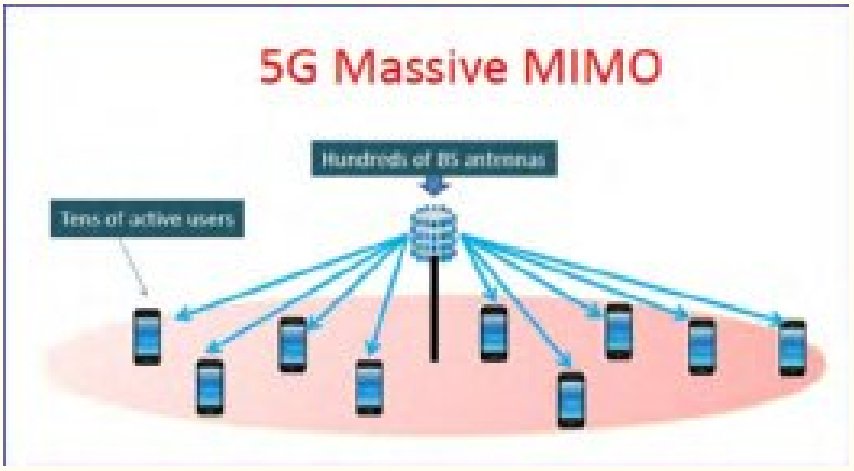
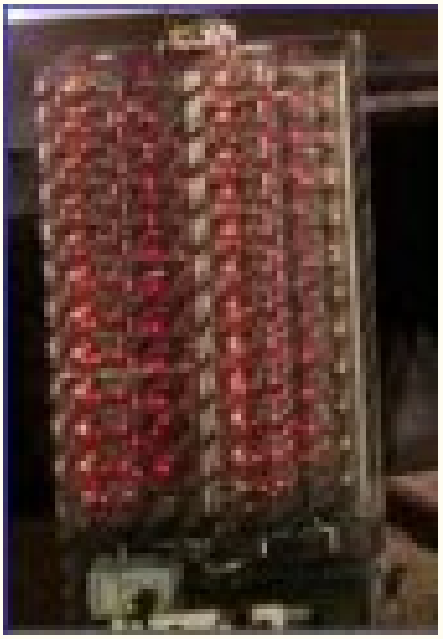
5G MASSIVE MIMO TRANSMITTER RECEIVER -REAL SYSTEM TRAINER

MODEL - MU-MIMO100

This trainer has been designed with a view to provide practical and experimental knowledge of 5G Massive MIMO Realtime Mobile Transmitter Receiver System - **64 x 64 MIMO**





What is 5G Massive MIMO (Multiple Input and Multiple Output)

- Massive multiple-Input Multiple-output (MIMO) wireless communications refers to the idea equipping cellular base stations (BSs) with a **very large number of antennas.**
- Massive MIMO is also known as **5G MIMO,** Large-Scale Antenna Systems, Very Large MIMO, Hyper MIMO, Full-Dimension MIMO, 3D MIMO and Multi User MIMO (**Mu-MIMO**).
- It uses very large number of Service antennas (e.g., hundreds or thousands) that are operated fully coherently and adaptively. This brings huge improvements in throughput and energy efficiency, in particularly when combined with simultaneous scheduling of a large number of user terminals (e.g., tens or hundreds).
- Massive MIMO was originally envisioned for time division duplex (TDD) operation, but can potentially be applied also in frequency division duplex (FDD) operation.
- Other benefits of Massive MIMO is use of inexpensive low-power components, reduced latency, simplification of the media access control (MAC) layer, and robustness to interference and intentional jamming.

FEATURES

- Radio tunable up to 6 Ghz
- Turnkey solution includes TDD + FDD
- Enables real-time, wideband, Massive MIMO research
- Capable radio heads with real-time baseband processing
- Up to 56 MHz OTA real-time baseband bandwidth
- Can support up to 1000 transceivers (or antenna elements)
- Truly scalable & upgradable
- Optional WiFi 5 GHz band antenna matrix
- Includes phase aligned RF clocks and common local oscillators synchronization system
- 100% Data Throughput
- Validate various waveform propagation schemes
- Optimize network deployment by balancing cost versus performance
- Validate interoperability scenarios
- Validate, optimize & develop analytic channel models
- Optimize TDD and RF calibration techniques

SPECIFICATIONS

General Specifications

1. RRH (Radio Remote Head) : It includes Radio FMC module - Radio640x based on Ad9361 which provide all synchronization capabilities to implement large antenna system arrays.
2. RRH TX RX : Support 8x RF transceivers while providing a wide FPGA for pre/postprocessing.
3. Cable : 7x user-defined 20 Gbps P2P cable interfaces for channel aggregation
4. Octal V6 Baseband Core : Octal Virtex-6 baseband core module which offers tremendous FPGA processing capabilities (8x Virtex-6) and up to 32x user-defined 20 Gbps P2P cable interfaces.
5. RTM interface (Rear Transition Module) : 16x 20 Gbps full-duplex P2P cable connection on the Front Panel (typically interfacing with the RRH)
   : 16x 20 Gbps full-duplex P2P cable connection on the RTM side (typically for interconnection between multiple Octal V6 Baseband Core Module)
6. RF Tuning Range : 0.07 to 6 Ghz
7. OTA Real Time BW : Up to 56 Mhz
8. TRX Channels : 64
9. RRH Nodes : 8
10. Virtex-6 FPGAs : 8
11. Record & Playback : Each RRH (8 TRXs) is equipped with a 4 GB SDRAM FPGA memory, which allows for recording of the full signal bandwidth
12. High Speed Real-Time Data Exchange (RTDEx) with embedded CPU (4C i7)
13. LTE typical class : Home eNB / Local area eNB
14. Gain Control : 50 dB.

EXPERIMENTS

1. To Study Theory and Block Diagram of Massive MIMO OFDM 4G LTE Mobile System
2. To Study different Hardware parts of Massive MIMO
3. To Study different Software used in Massive MIMO Trainer
4. To Study Vertex FPGAs
5. To Install Xlink ISE
6. To Install Matlab Software
7. To Configure Xlink and Matlab Software
8. To implement 64 x 84 MIMO configuration
9. To transmit and receive Streaming Video using Massive MIMO
10. To observe Constellation Diagrams
11. To carry out SISO Transmission and Reception
12. To carry out SISO OFDM Communication
13. To carry out MIMO OFDM Communication
14. To carry out Synchronized Nodes Example
15. To carry out Multi-Node Array Example
16. To carry out Spectrogram Example
17. To demonstrate and understand different types of faults
18. To understand Glossary and Acronyms used in OFDM MIMO Wireless Technology

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