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# A Multi-Beam High-Speed Receiver System Based on ZYNQ7000

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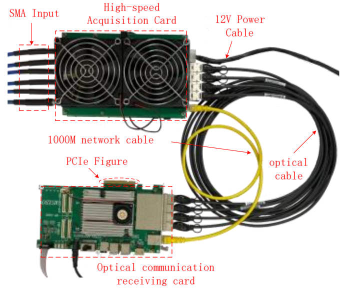



*On board test by AMD ZYNQ7000*

## INTRODUCTION

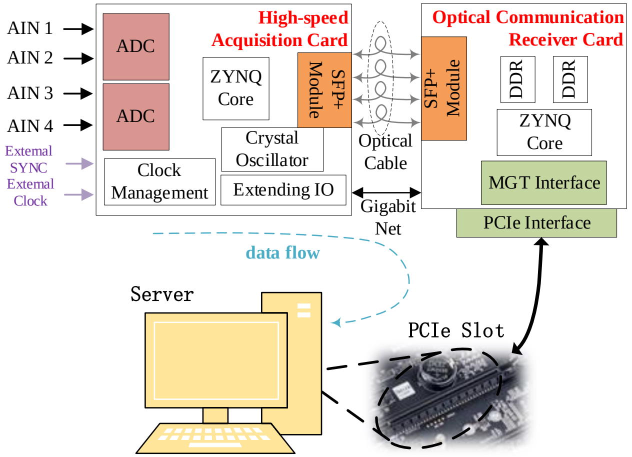
Radio telescopes use wireless radio reception, measurement, and analysis of celestial radio signals to explore the radio window of celestial bodies after the optical window.


### Typical application case

A typical radio telescope system consists of **an antenna system, a receiver analog front-end system, a data processing and recording system**. Most of the current receiver systems have the capability of accumulate integration, FFT transformation, and correlation calculation, but cannot retain the raw data of the radio signals, Lost a lot of temporal information.

**Key technical issues addressed:**

1. Signal acquisition, High-performance ADC (Analog-to-Digital Converter) device.
2. Data receiving and processing, AMD-Xilinx 7 series Zynq System on a Chip (SoC) devices.
3. Data transmitting, SERDES (Serializer/Deserializer) Interface with GTX for 10G linerate.
4. Data storing, Dedicated server with disk array and RNIC support.




### System Architecture

Optical Communication Receiver Card:
1. Communicating with the acquisition card;
2. Receiving and Handling data from SFP+ with protocol such as Ethernet, Aurora and so on;
3. Acting as an assistant to speed up the data processing workflow;
4. Collaborating with the server for data uplink and downlink;

High-speed Acquisition Card:
1. Sampling and Quantization of Analog Signals;
2. Receiving and Handling data from ADC;
3. Transporting data to next work platform;

## CREATIVE DESING

## RESULT

The completed work has verified the architecture of using a high-performance ADC (Analog-to-Digital Converter) to acquire multiple beams from a radio reception antenna.

The system is composed of **independent components, with a flexible and highly scalable architecture**. It is based on FPGA's logic programmability and serdes technology support, which enables it to meet higher performance requirements.

SFP+ interface is driven directly by GTX, can be programmed by users to support various communication protocols. This **high degree of programmability** ensures maximum compatibility with both existing and future communication devices, thereby reducing the cost of device deployment and iterative updates.

Raw data storage requires a significant amount of storage bandwidth. **The limitations** of current storage devices necessitate the need to build disk arrays that can support high-bandwidth data storage.