INTRODUCTION

The PANOSETI experiment is an all-sky, all-the-time visible search for nanosecond to millisecond time-scale transients. The experiment will deploy observatory domes at several sites, each dome containing ~45 telescopes and covering ~4,440 square degrees. Here we describe the focal-plane electronics for the visible wavelength telescopes, each of which contains a Mother Board and four Quadrant Boards. On each quadrant board, 1024 silicon photomultiplier (SiPM) photon detectors are arranged to measure pulse heights to search for nanosecond time-scale pulses. The instrument implements both a Continuous Imaging Mode (CI-Mode) and a Pulse Height Mode (PH-Mode). Precise timing is implemented in the gateware with the White Rabbit protocol.

PANOSETI GATEWARE

In the FPGA gateware, we have currently implemented two observation modes: Continuous Imaging (CIM) mode and Pulse Height (PH) mode. Pulse height mode is optimized for detecting optical pulse widths <30 ns. Continuous imaging mode employs counters on every pixel that count over-threshold events to produce images at a programmable frame rate. White rabbit is also implemented in the gateware for precise timing.

Networking

In PANSETI project, ~90 telescopes will be deployed between two domes for covering ~4,441 square degrees. A large quantity of scientific packets will be generated over the nightly observations, sent via a data network to storage and computing units. We also need a computer cluster for controlling and monitoring the domes and all the telescopes, and processing and storing the scientific data.

CONCLUSIONS

The PANOSETI focal plane electronics for each of the visible wavelength telescopes contains 1024 SiPM detectors, sensitive to 300–850 nm wavelengths, feeding 1024 channels of analog and digital electronics in Maroc3 ASICs. We implemented continuous imaging mode and pulse height mode for capturing transients with pulse widths from nanoseconds to milliseconds, and with ns-accurate time stamping via the White Rabbit protocol. The PANOSETI data network is designed to accommodate the challenging rates of data transmission, real time data processing, and data storage.

REFERENCES