The sPHENIX experiment at RHIC is scheduled to be started in 2023 in BNL. The INTermediate Tracker (INTT)\textsuperscript{1)} is a silicon sensor strip detector to be implemented in the central rapidity region. The massive raw data generated in INTT need to be transmitted to downstream readout electronics through a quite narrow and curving cabling path for 1.2 m. Since there is no commercial cable available, a high signal density cable is developed using a flexible printed cable technology. The cable is called "bus-extender" and has 62 pairs of 130 μm width signal lines. The bus extender mainly transmits digital signals. The development of the bus extender is in the final stage\textsuperscript{2)}.

Due to the long path length of high density flexible printed cables, the poor performance of signal transmission of high-frequency data is the major concern. A simulation predicts 30% attenuation of the signal for 200 MHz signal.

The eye diagrams before (a) and after (b) the bus-extender in the readout chain.

An eye diagram is a useful tool to visually inspect the attenuation and distortion of the signal pulse. We measured the eye diagram by overlaying the waveforms of various bit patterns. The transmission efficiency can be evaluated qualitatively by the size of the opening of the eye. Fig.1 (a) and (b) show the eye diagram of the LVDS signals before and after passing the bus extender. From the comparison, the attenuation of the signal is 33%. The result is consistent with the simulation. It is found that the eye-opening after the bus-extender is too small to receive the signals at the readout electronics. To solve the problem, we increase the drawing current of the LVDS signals from 2 mA to 8 mA to get sufficiently wider eye-opening effectively.

The electrical and mechanical properties of the bus-extender

1) I. Nakagawa et al., in this report.
2) T. Hachiya et al., in this report.
3) H. Imai et al., in this report.
4) D. Imagawa et al., in this report.

References