# Preparation status for sPHENIX experiment and INTT detector for Run23 at RHIC

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The sPHENIX experiment is the next generation jet detector which is under construction at RHIC as the upgrade of former PHENIX experiment.[1] The installation of a time projection chamber (TPC) detector has been completed by the middle of January, 2023 as shown in Fig. 1. The silicon strip intermediate (INTT) detector, developed by mainly Japanese group,[2] is to be implemented next inside of the TPC. The assembly of the INTT silicon ladders has been completed by Spring of 2022.

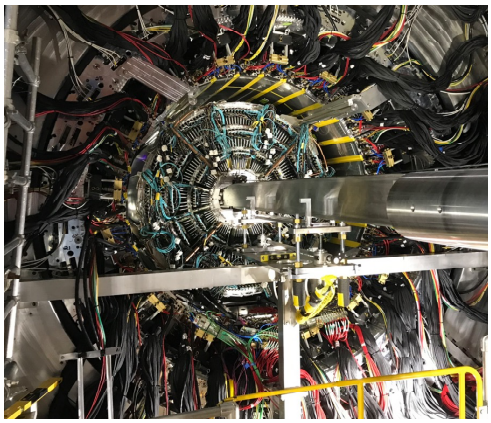

Fig. 1. Installed TPC in the sPHENIX detector.

The barrel type INTT detector consists of the inner and outer layers of INTT ladders. Shown in Fig. 2 is the pair of an INTT half barrel. 24 and 32 ladders were installed as the inner and outer barrels, respectively. The signal readout response of every single ladder was tested before and after the barrel construction using a built-in calibration system which injects an artificial pulse to an analogue to digital conversion chip implemented right next to the silicon sensors. The INTT detector is scheduled to be installed to sPHENIX in March 2023.

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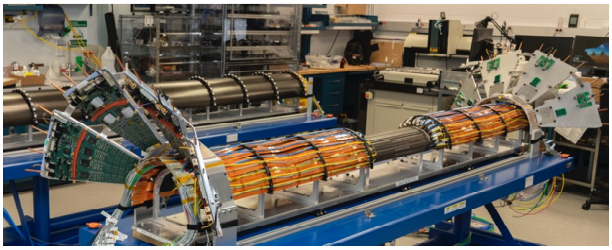

Fig. 2. INTT half barrels.

A $\mu$-coax technology (Fig. 3) was employed as the last piece of the readout cable series[3] for the INTT ladder. This technology has certain advantage in the flexibility for a high signal density cable compared to the flexible print cable (FPC) one. On the other hand, a material "fluorinated resin" used as an insulator for the $\mu$-coax harness is known to be weak against radiation compared to popular insulator materials like polyimide or liquid crystal polymer which are typically used for the FPC[4] Therefore the radiation hardness of the $\mu$-coax harness was examined at RANS facility at RIKEN. The harness was exposed to the RANS neutron beam upto $4 \times 10^{12}$ equivalent neutrons which is an order of more dose than expected during the INTT operation within 3 years of sPHENIX running. The signal transmission performance was compared before and after the irradiation. No degradation was observed due to the radiation as a result.

Fig. 3. Readout cables for the INTT ladder based on the $\mu$-coax technology.

References

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4) L. Whinnery *et al.*, SAND2017-9103C (2017), https://www.osti.gov/servlets/purl/1467983.