News from Japan

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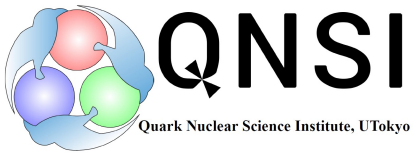
QUARK-NUCLEAR SCIENCE INSTITUTE, THE UIVERSITY OF TOKYO

NISHINA CENTER, RIKEN



TOF Japan: Structure & Responsibilities

- **TOF Japan Organization**
  - **Sensor development & QA:** Hiroshima, RIKEN, others
  - **Readout board (based on UCSC):** Tohoku
  - **FPC:** Nara+RIKEN
  - **Integration:** Hiroshima + RIKEN / Tokyo
  - **Simulation & Reconstruction:** Shinshu
  - **DAQ support:** Tokyo, RCNP-Osaka

Budget Situation (Japanese FY2025)

- **Budget overview**
  - RIKEN supplementary budget: ~400M JPY (~2.6M USD)
  - Approximately ~300M JPY (~2M USD) allocated to TOF
- **Purpose**
  - Infrastructure building
  - Real-size strip sensor production
  - Readout and DAQ preparation for R&D in lab. and beamtests
  - Toward integration-level capability
- **This was a strategic infrastructure-building year.**

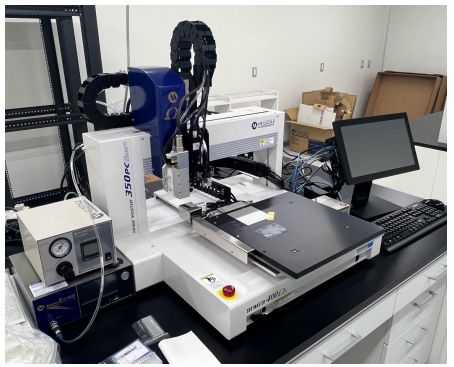
Clean room and assembly environment

- **New Cleanroom Facilities**
  - Hiroshima: ~100 m² (operational from April)
  - RIKEN: ~50 m² (starting June)
- **Capable of:**
  - Sensor QA
  - Wire bonding
  - PCB (stavelet) and FPC mounting (stave)
  - Assembly and prototype integration

Major Infrastructure Investment

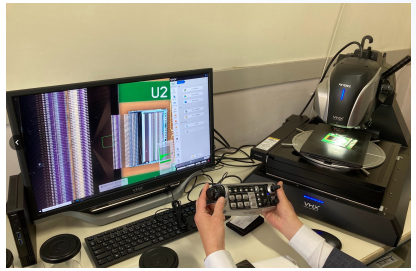
- **Electronics & Measurement**
  - Oscilloscopes: WaveRunner 8208 ×5, WavePro 804HD ×2 (Teledyne Lecroy)
    → Some units to be distributed for sensor QA
  - Source meter units, electrometers, picoammeters
    → To support distributed QA

- **Assembly Equipment** (RIKEN & Hiroshima)
  - (Automatic and Manual) Wire bonders
  - Dispenser x2
  - Bond tester x2
  - Die bonder x2



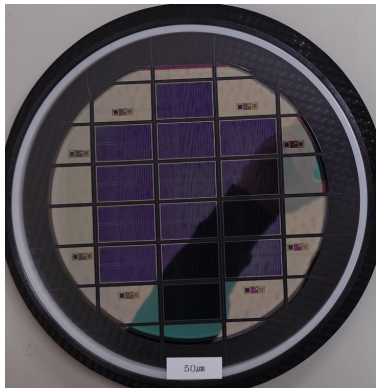
Major Infrastructure Investment

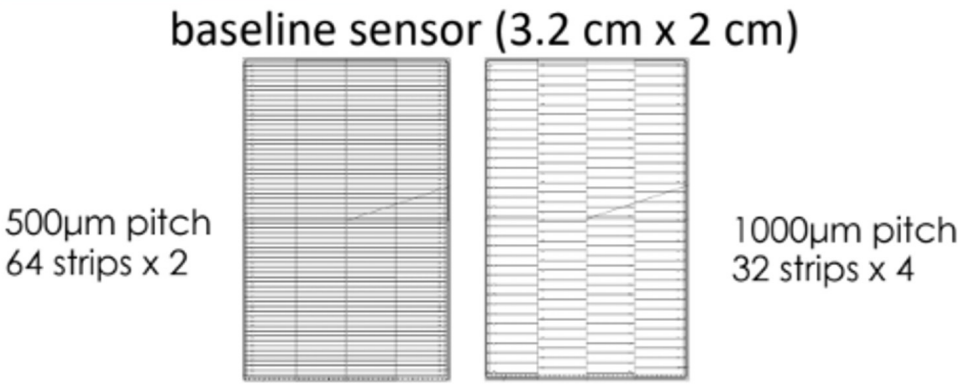
- **Advanced Characterization**
  - Laser & TCT scan systems (RIKEN & Hiroshima)
  - RFSoC digitizer modules (RIKEN, currently 40 ch)
  - CAEN digitizer VME modules (RIKEN)
  - Multi-channel CAEN HV systems (RIKEN & Hiroshima)
  - Digital microscopes(RIKEN & Hiroshima)
  - Substrate processing machine
  - Network analyzer (FPC development)



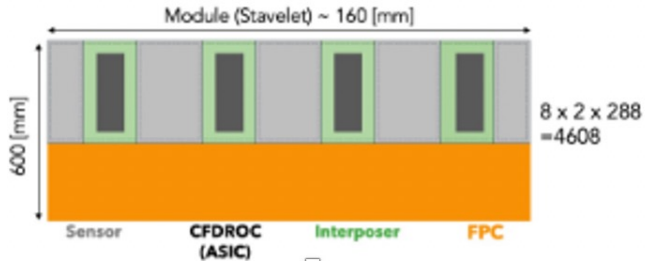
Strip Sensor Production

- **Baseline sensor 2×3.2 cm²**
  - Thickness: 20µm / 30µm / 50µm
  - 500 µm pitch (2 rows)
  - 1000 µm pitch
    (4 rows, reduced capacitance)
  - Total: 72 sensors



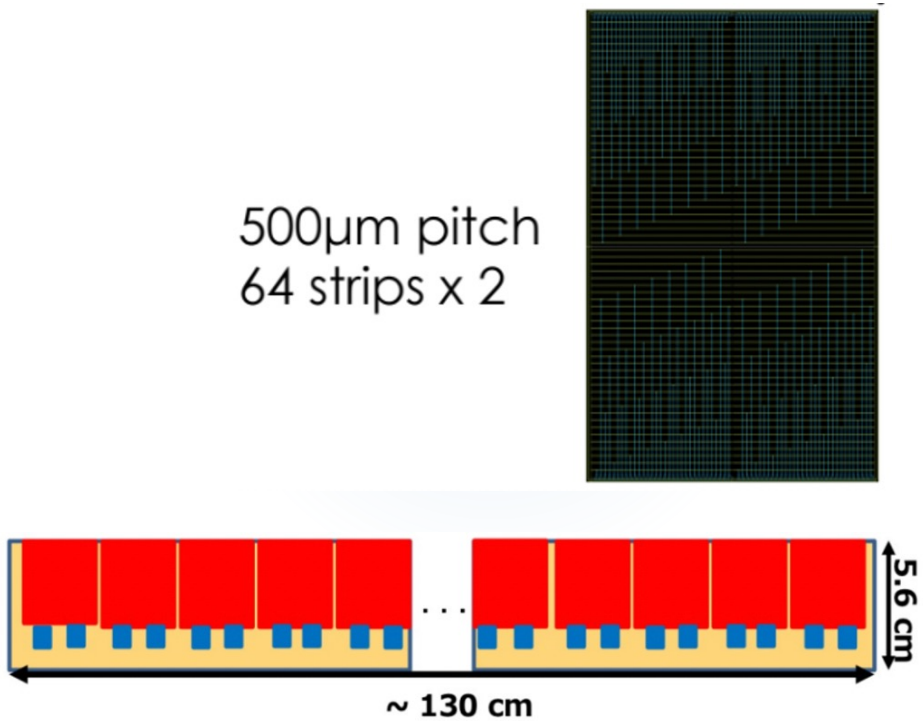


- **New Baseline Batch (~end of March)**
  - 30µm / 50µm
  - 2 rows, 500µm pitch
  - 112 × 2 sensors
  - Shared with RIBF

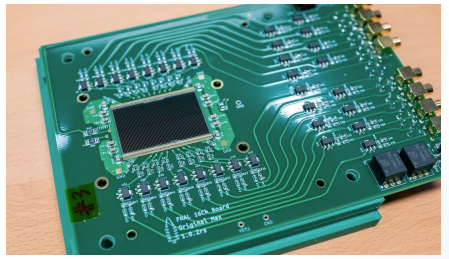


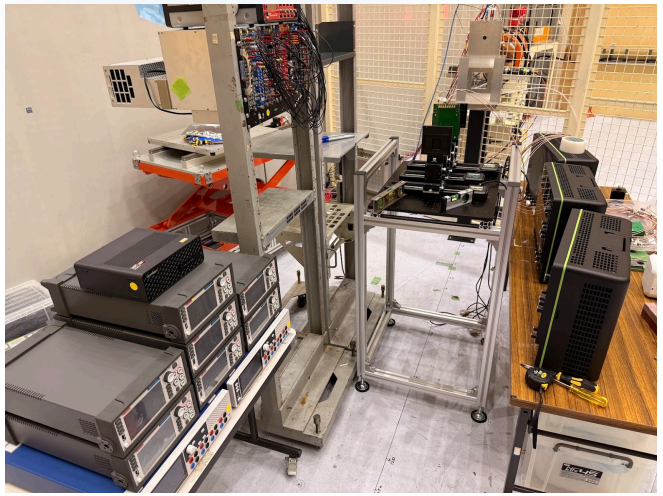
Strip Sensor Production

- **Double-metal sensors (~ end of March)**
  - 2×3.2 cm^2, 20/30/50µm
  - 2-row, 500µm pitch (single-side readout) 22×3
  - 2-row, 500µm pitch (double-side readout) 22×3
  - 4-row, 1000µm pitch (single-side readout) 22×3
  - 4-row, 1000µm pitch (double-side readout) 22×3
  - Shared with RIBF



Test Beam Activities

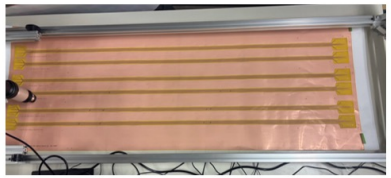
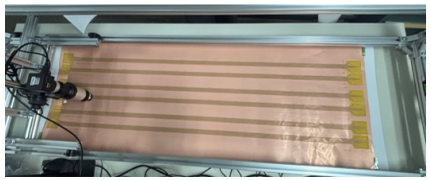
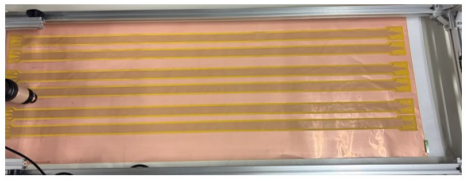
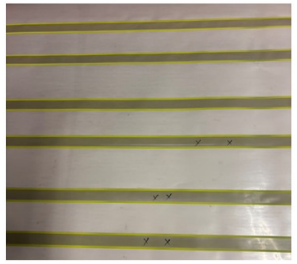
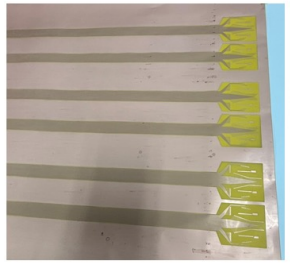
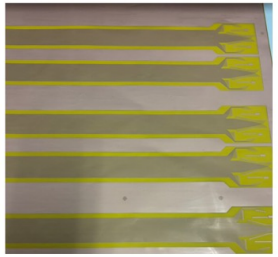




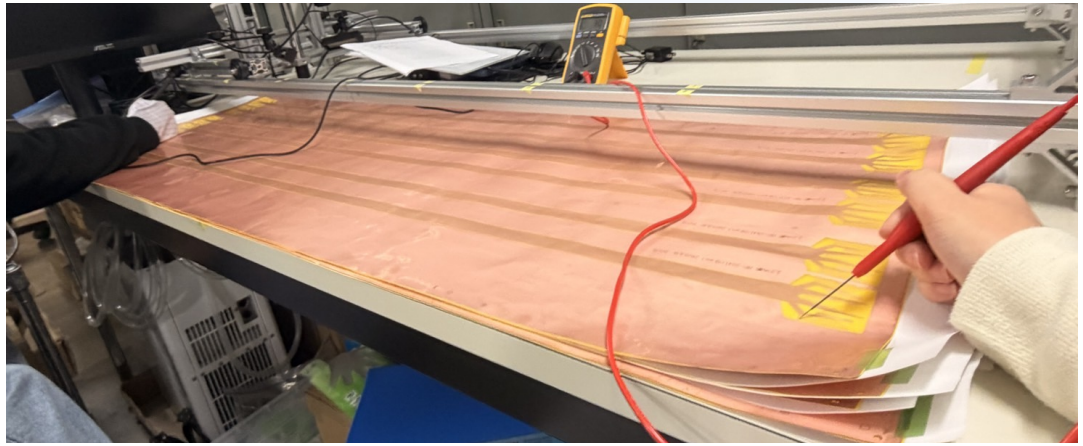
- **DESY**
  - 3 strip sensors, 2 pixel sensors, CAEN digitizer
- **KEK**
  - 4 strip sensors + 2 pixel sensors, Scope / RFSoC
- **RARiS**
  - 5 sensors with scope
  - 3 sensors with QTC + nestDAQ
    - Japanese SRO DAQ will be tested with AC-LGAD
    - nestDAQ formats SRO data compatible with EIC reconstruction framework (EICrecon). Online reconstruction under discussion

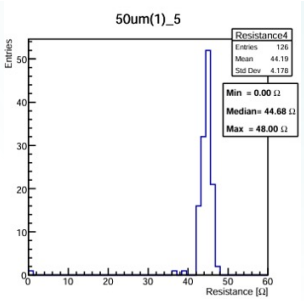
FPC Activities

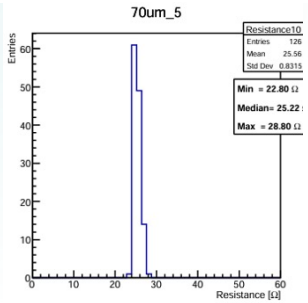
- Supporting production of long FPC in Korea
  - First tests ongoing at Nara
- Contract with company in preparation for simulation and design of FPC

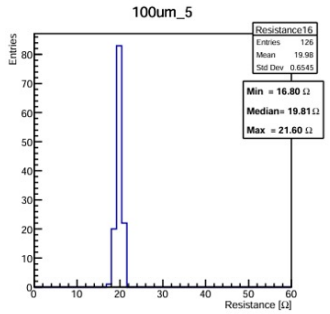







50um 70um 100um









Next JFY's plan

- **Next year's funding not confirmed yet. Hopefully will come soon.**
- **Expand capabilities**
  - Accelerate sensor QA throughput
  - FPC production and signal integrity
  - Explore ASIC development path
- **More Beamtests at KEK and RARiS**
  - We will support AC-LGAD-wide beamtest activities in Japan. Please contact us!
- **Move toward integration scale**
  - **From sensor R&D → stavelet production**
    - Taiwan collaboration (gantry machine), Synergies with Belle-II
  - **Start considering QA/QC system for components and stavelets**
  - **Investment in BNL (Itaru, Rachid)**