

Status of U/V-Strips GEM Assembly

SBS Weekly Meeting, Dec 21, 2020

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Weekly meeting for the commissioning of the GEMs every Wednesday at 10:00 am

Wiki: https://hallaweb.jlab.org/wiki/index.php/GMn_GEM_Commissioning_Meeting

SBS U-V Strips GEM Layers

Motivation:

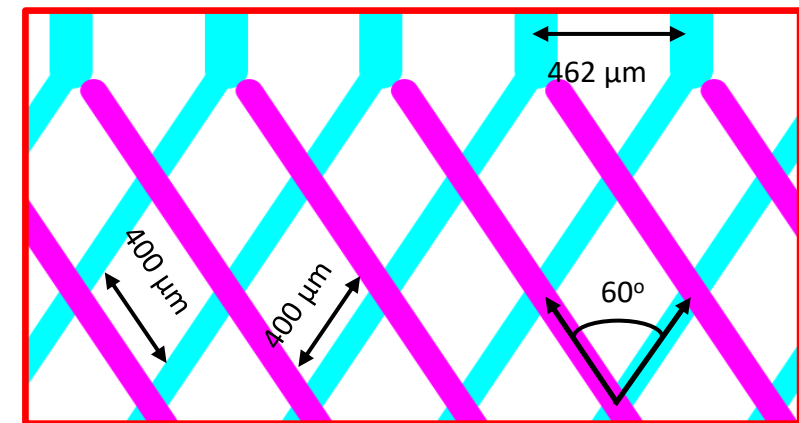
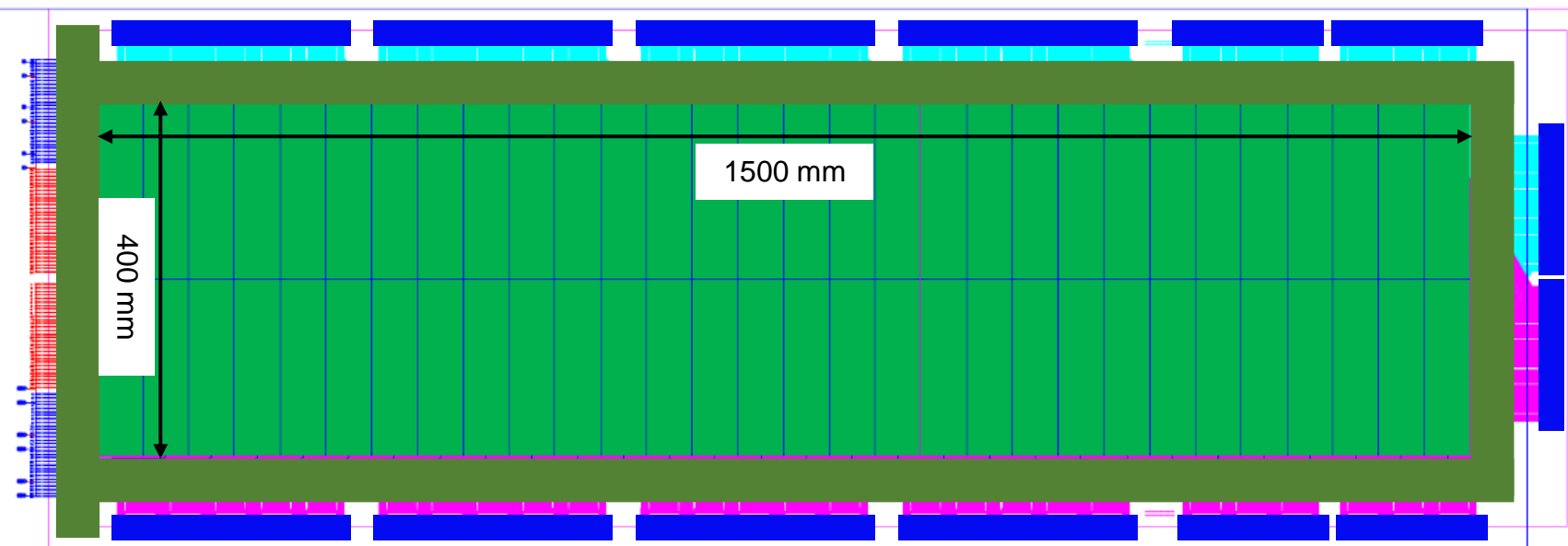
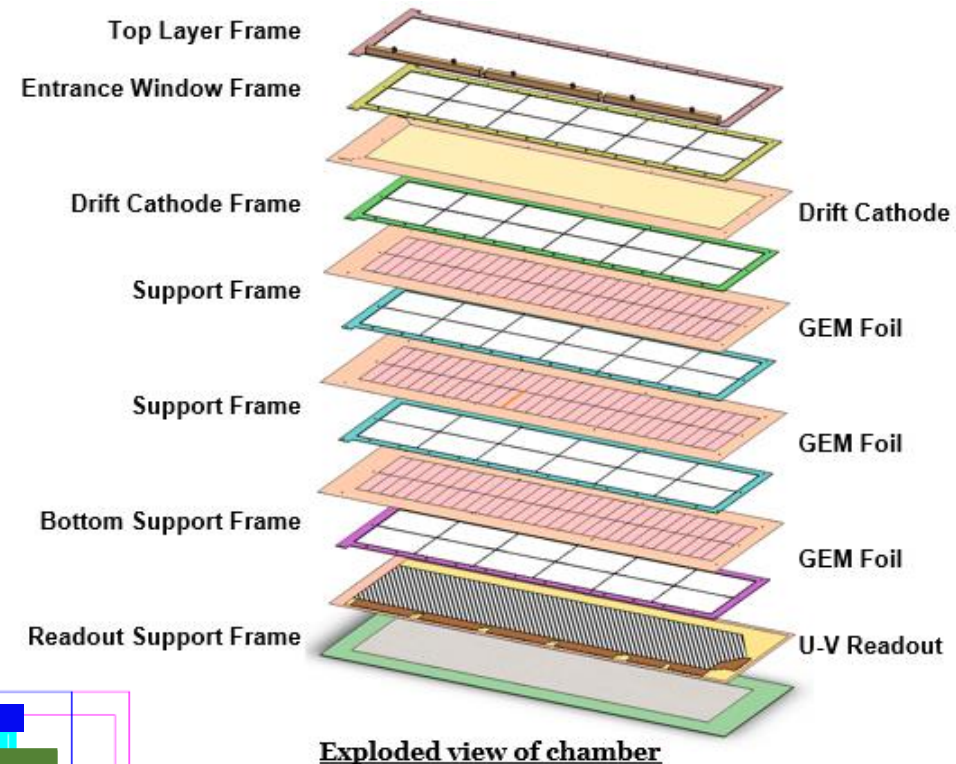
- ⇒ The U-V GEM: to complement the INFN GEM Layers which use COMPASS 2D straight strip.
- ⇒ The addition of U-V geometry enhances and complements the X-Y strips and will help with tracking in the high rate environment.

Key Features: active area: $150 \times 40 \text{ cm}^2$, U-V strips readout (60°) stereo angle

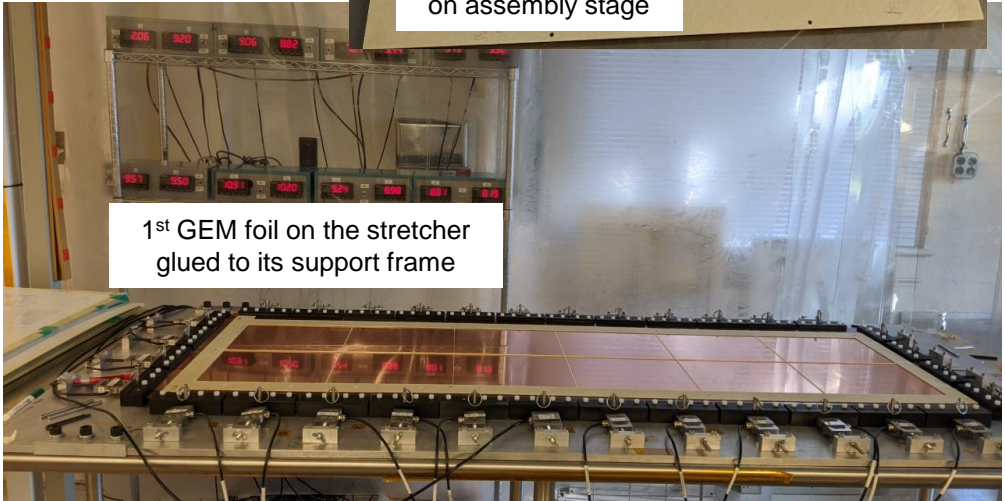
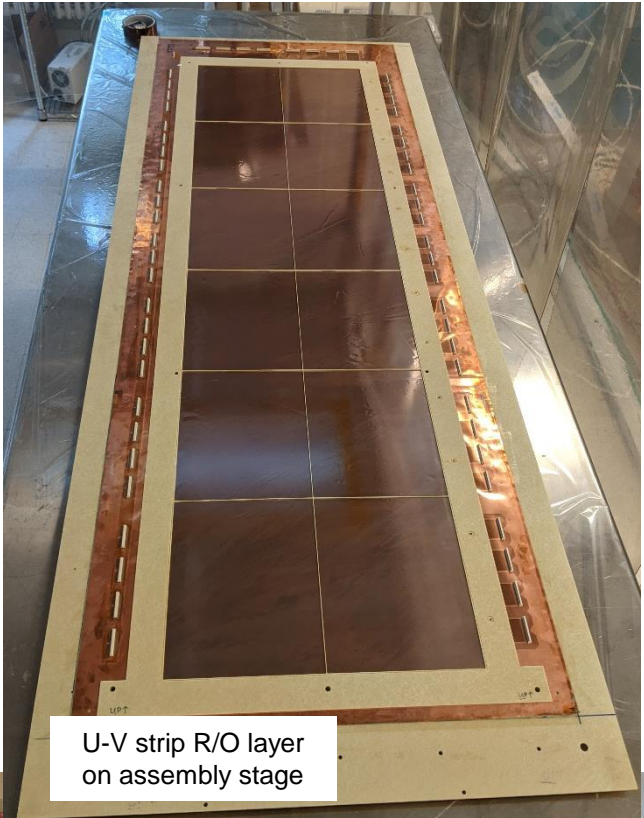
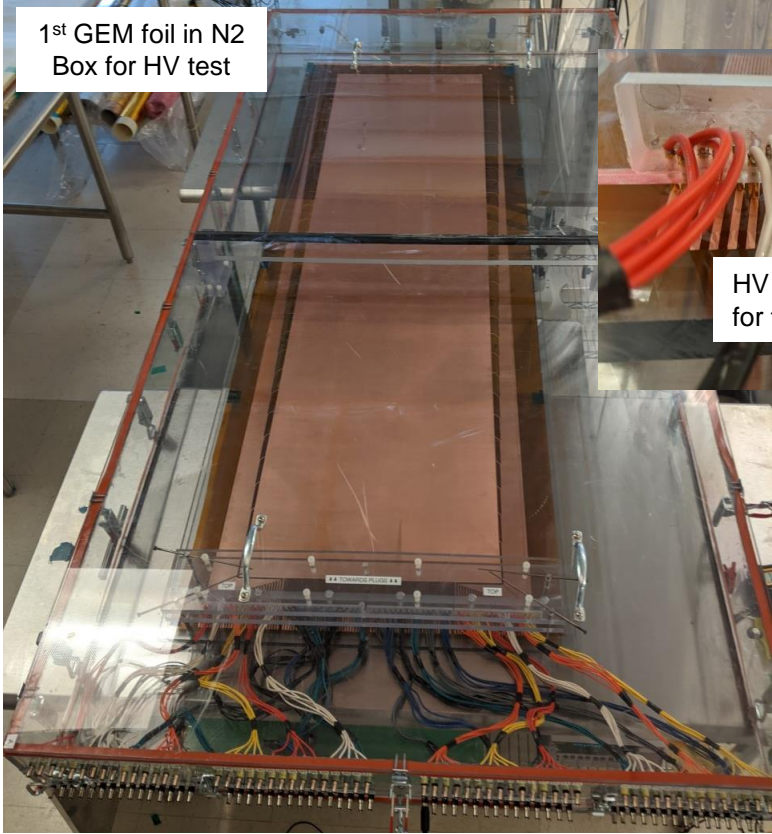
- ⇒ New GEM foil production allows for the FT U-V GEM layer to be **one single large module**
- ⇒ **No dead area** from support frames or electronics (Other than for spacers and HV sector)
- ⇒ The INFN-built MPD readouts for these GEMs will be the same as for all SBS GEMs

Our Experience: UVa has a successful track record with large area GEMs and U-V readout

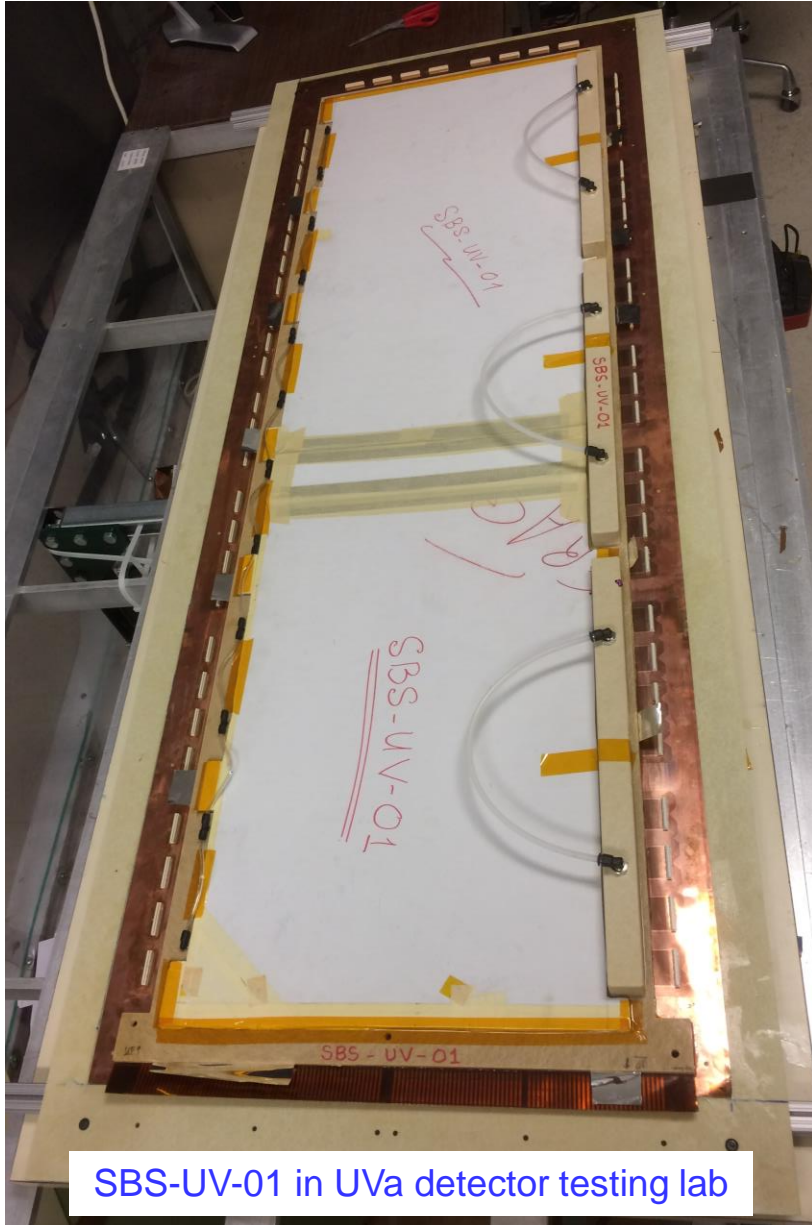
- ⇒ Large GEM with PRad Experiment (June 2016 in Hall B), similar size
- ⇒ U-V strip readouts with large U-V GEM for the EIC Forward GEM Trackers Detector R&D



Assembly of the first U-V Strips GEM Layers



Status of U/V-strip GEM chambers: assembly SBS-UV-01 and SBS-UV-02



SBS-UV-01 in UVA detector testing lab

SBS-UV-01: Assembly in clean room part completed, chamber out of clean room ⇒ Next steps:

- HV test of all 180 individual sectors in N₂
- Mount the HV divider board and perform full HV test of the chamber
- Move the chamber to EEL124 Clean room at JLab for tests on cosmic stand

SBS-UV-02: Assembly in clean room almost completed, 3 GEMs glued to the R/O board ⇒ Next steps:

- cathode and entrance window foil remained to be glued to the chamber
 - Complete the assembly with the gas distribution parts mounted
 - Take the chamber out and apply the same steps as for SBS-UV-01 to complete assembly
 - Two chambers likely to be brought together at JLab to EEL124 Clean room for cosmic test.
- ✓ Target time for cosmic tests at JLab early February 2021
- ✓ Would be ready for installation in BB frame early March 2021



SBS-UV-02 in clean room

Assembly stand: R/O with 3 GEM foils glued

Status of U/V-strip GEM chambers: Plans for SBS-UV-03 and SBS-UV-04

- Preparation of the readout support frames for the last two layers completed
 - Gluing the 2 R/O boards tentatively in January 2021
- 2 more GEM foils for already glued and framed but each had one HV sector with unexpected high current after framing ⇒ issue under investigation
 - if we can not recover the sectors, the GEM foils will be used for the last chamber (SBS-UV-04) ⇒ will amount to a total of 3.33% dead area
- Batch of GEM frames from RESARM were shipped ⇒ Delivery expected next week or the week after
- Batch of GEM foils from CERN expected to be shipped mid-January ⇒ based on experience with CERN, we should target mid-February
- Tentative schedule to start assembly of SBS-UV-03: mid-February 2021, **but will depend on availability of the team working at UVa**
- Expect the last two chambers to be completed by end March 2021 **(again upon availability of the team working at UVa)**
- Test in cosmic stand in EEL124 clean room at JLab and for installation in GEN-RP frames by April 2021

- **UVa team working on the assembly of the chambers**
 - Senior scientist supervising the activity: **Huong Nguyen**
 - Grad students: **John Boyd, Sean Jeffas, Salina Ali**

Status of U/V-strip GEM chambers: APV25-MPD electronics for U/V-strips GEMs

Procurement & production of the various parts readout of the U/V-strips GEM chambers

- **240 APV25 cards:** 100 from M. Kohl + production for a batch for 110 new APV25 cards by EES
- **16 MPD boards:** all in hand (will borrow Evaristo's modules for INFN GEMs that are replaced by U/V-strips GEMs)
- **54 APV25 back planes (3 and 4-slots):** Design by Evaristo group, procurement by Thia & Bogdan @ JLab, production by EES Italy
- **35 Digital patch panel:** procurement by Thia & Bogdan @ JLab, production US company
- **HDMI cables:** We should have more than enough between UVa and INFN GEMs supply
- **16 Low voltage regulator boards:**
 - ✓ 32 LV regulators chips: procurement from CERN store by Nilanga; just receive the chips this week
 - ✓ procurement by Thia & Bogdan @ JLab, production US company

Institutions contributing to the four U/V-strips GEM chamber effort

- **INFN (E. Cisbani):** both GEM detectors + Readout electronics parts
- **NCCU (B. Vlahovic):** GEM detector parts
- **U. Conn (A. Pucket):** GEM detector parts
- **U. Glasgow (D. Hamilton):** GEM detector parts
- **Saint Mary Univ. (A. Sarty):** GEM detector parts
- **Hampton Univ. (M. Kohl):** Readout electronics
- **UVa (N. Liyanage):** GEM detector, readout electronics, clean room equipment & assembly
- **JLab (T. Keppel, B. Wojtsekhowski):** GEM detector, readout electronics