Remarks of the H0 detection upgrade in 2026

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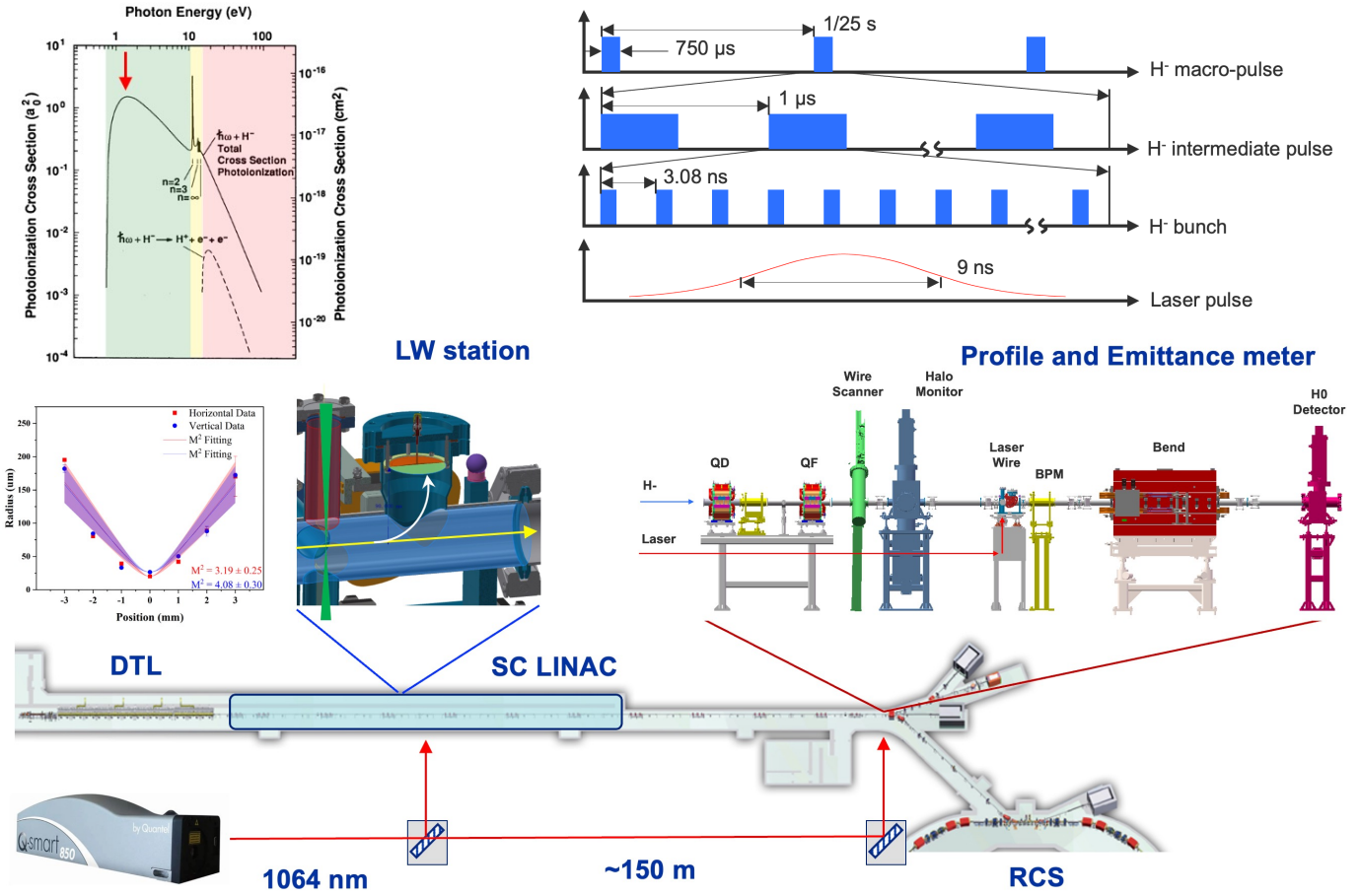
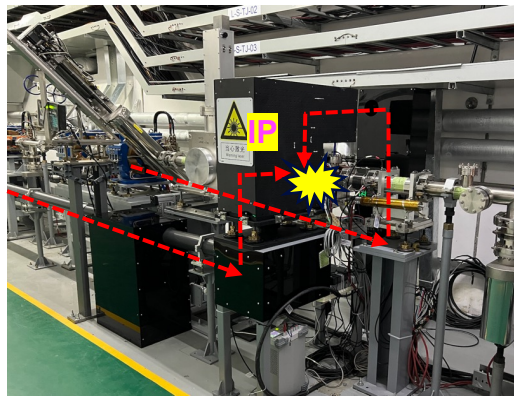
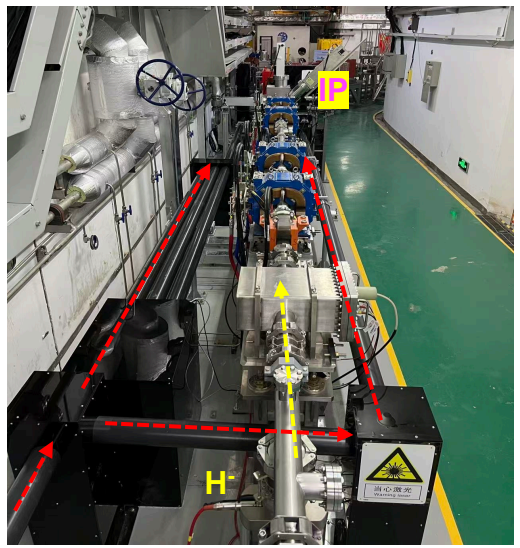
Laser-Wire profile monitor prototype

- LW profile monitor: a swiss-knife style diagnostic tool for superconducting LINAC
- A LW profile monitor/emittance meter prototype was established at the LRBT (2024-present)

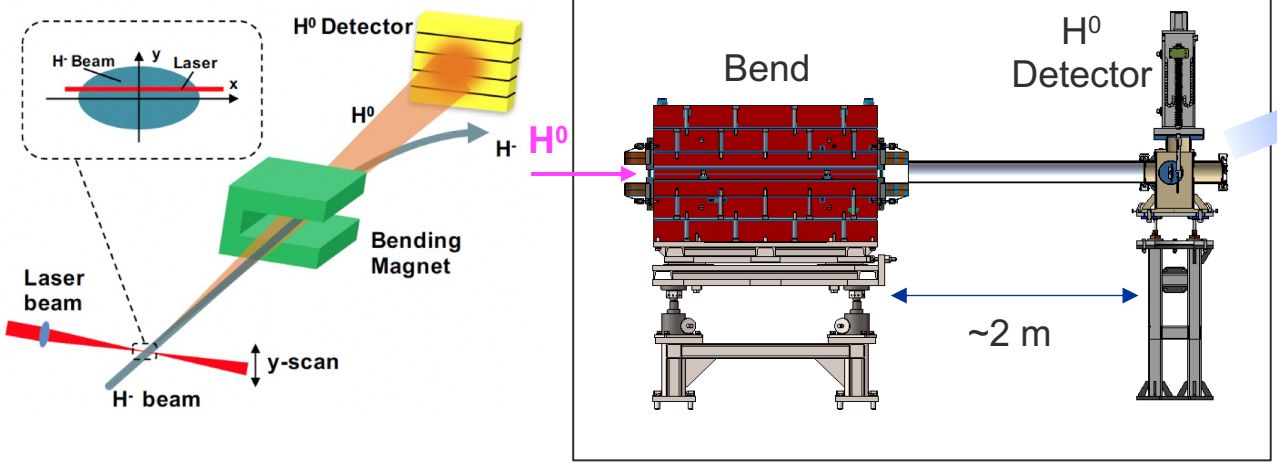


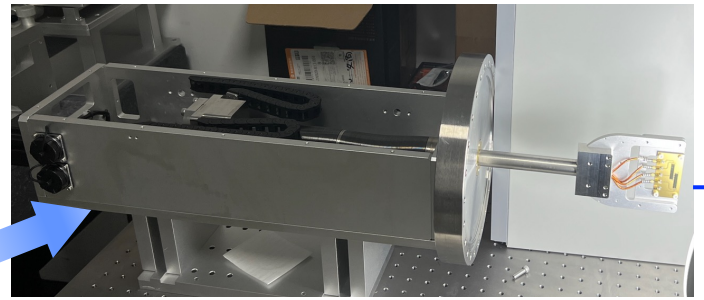


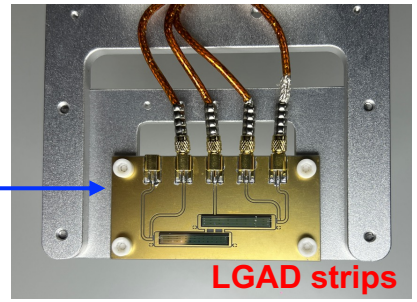


Upgrade to an emittance meter

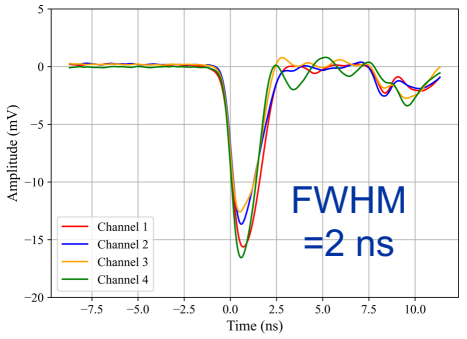
- A in-vacuum H^0 detection was established at ~5m downstream of the LW interaction point in 2025
- Use the LGAD strips (19x0.3x0.05 mm^3, gain=1-10) developed for ATLAS/CEPC as the H^0 sensor
- A rise time of <1 ns demonstrated in lab., and the photodetached H^0 signal was observed this month
- LGAD signal disappeared after the 1st beam test (in-vacu. coaxial cable issue? strip breakdown?)



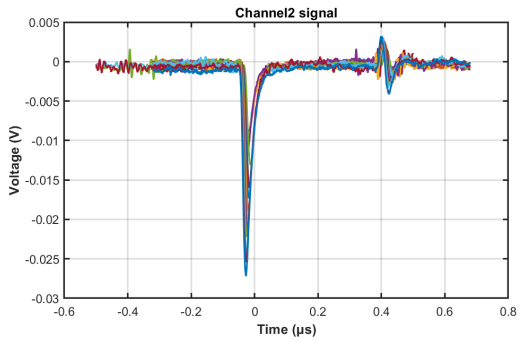




Test w/ Am241 α source
E_d~5.4 MeV



LGAD output signal w/ laser ON
(photodetached H^0)

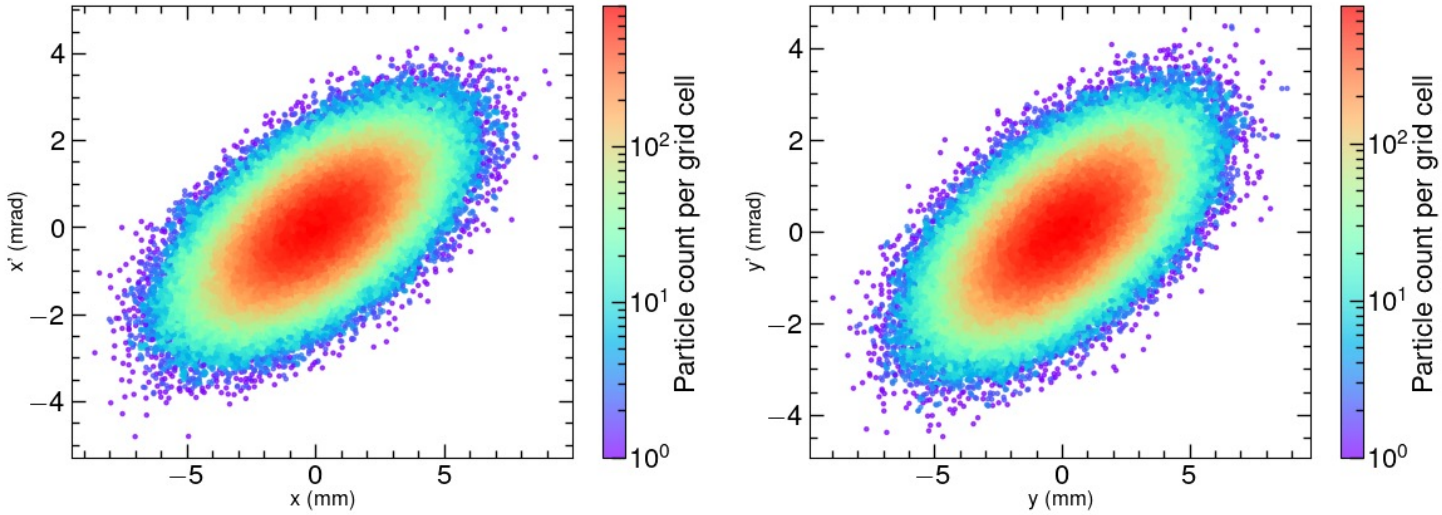


➢ **It's risky to rely on the newly developed LGAD strips, and a plan B will be of great importance!**

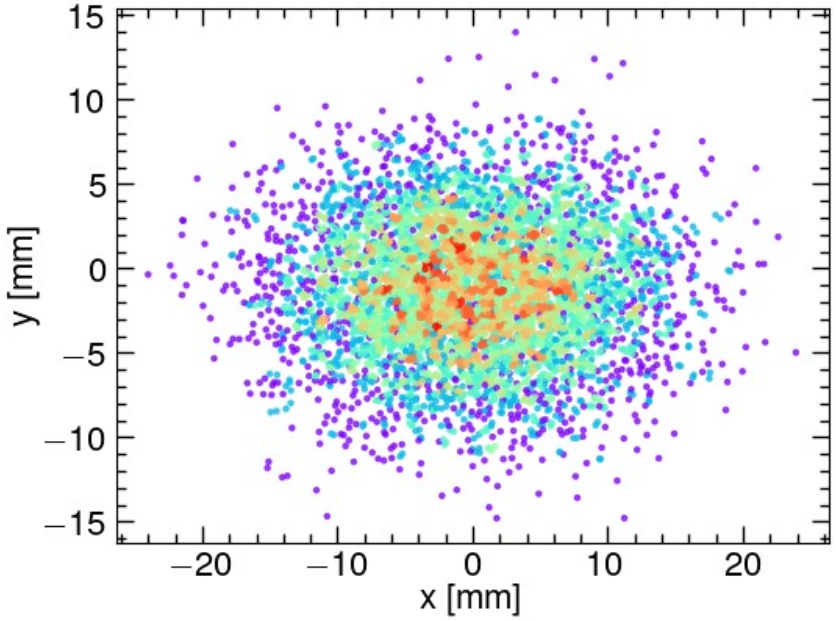
H0发射度测量模拟

- 初始束流分布σx = σy = 2mm, σx’ = σy’ = 1mrad，相关系数0.6。
- 扫描激光狭缝位置，H0子束团漂移~5米后进行横向分布*ρ(x,y)*测量

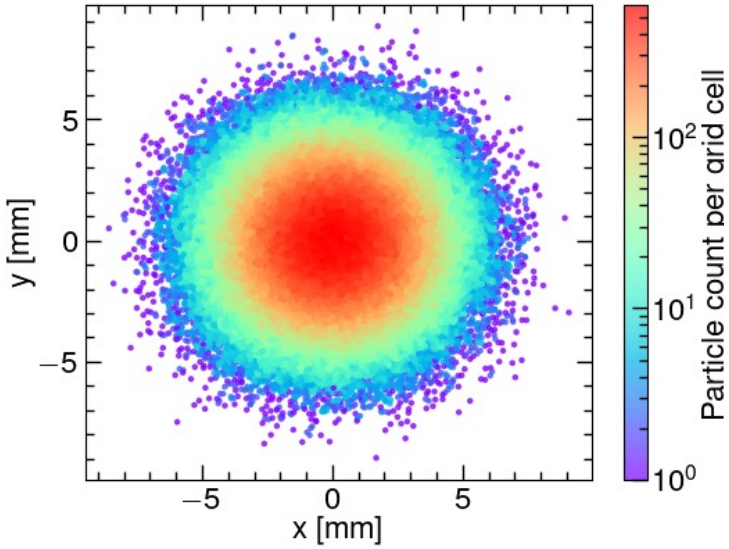
初始相空间分布



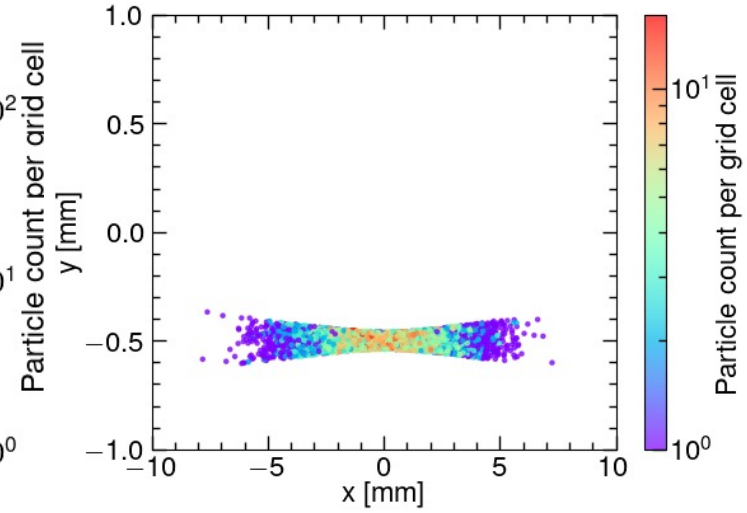
子束团drift后横向2D分布



初始横向2D分布

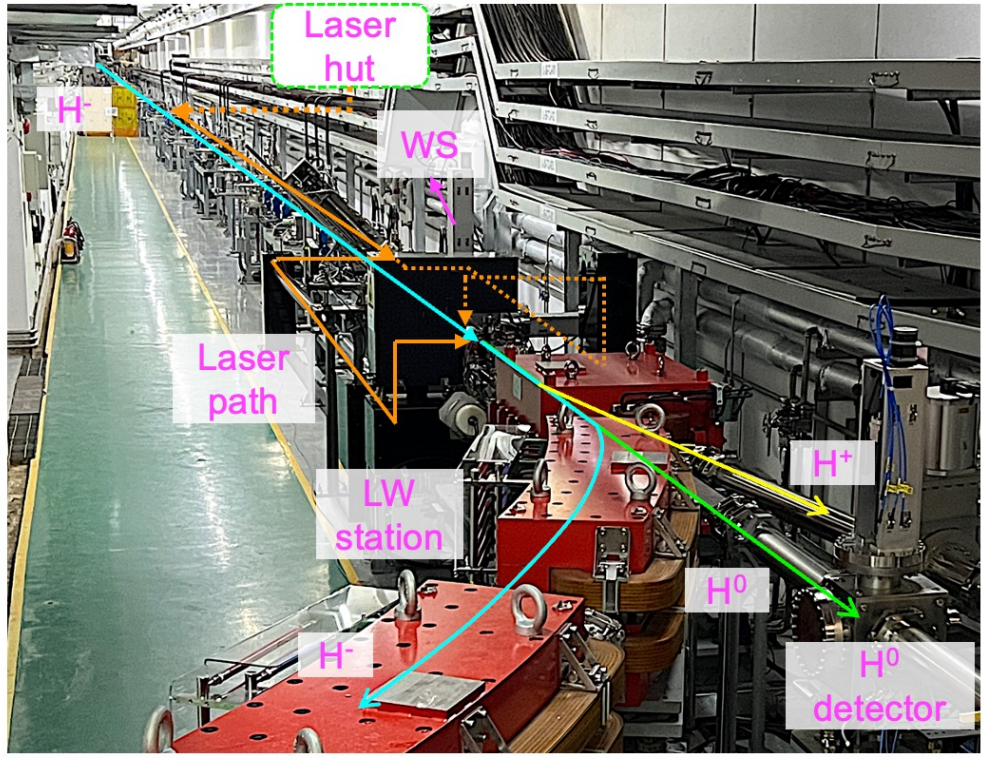


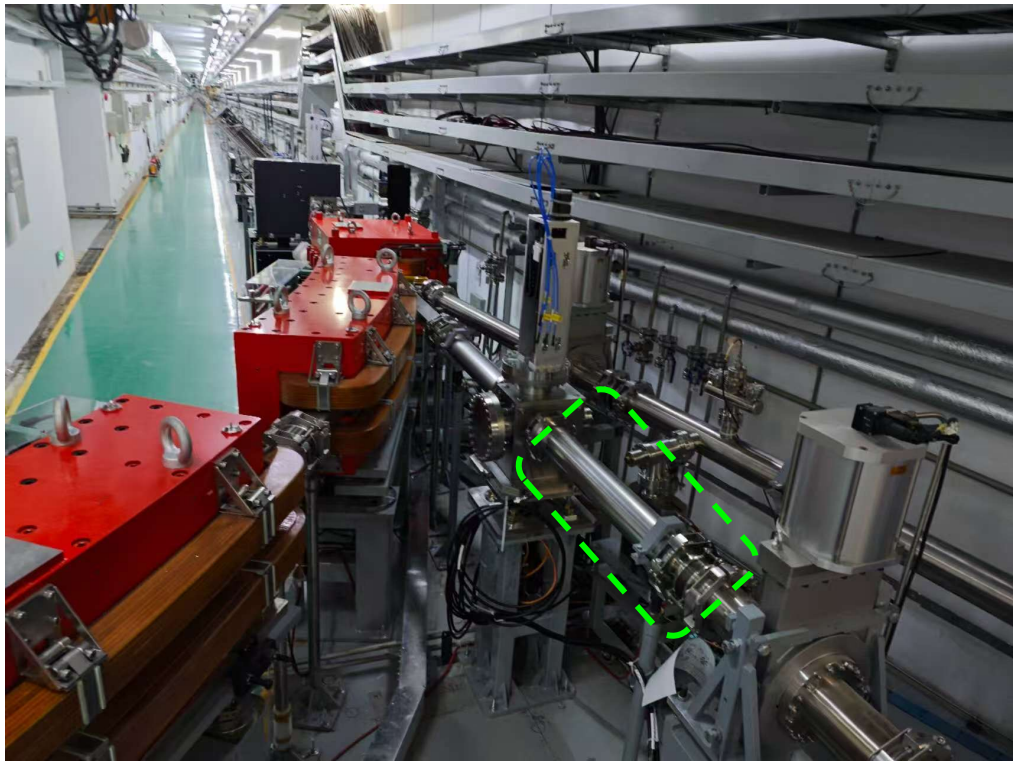
剥离H0/e-横向2D分布



H0截面探测器设计

- 基于激光丝的剖面测量已完成验证，同时利用LGAD的H0探测器加高压出现问题，引入新的探测发射度方法。直接二维分布测量可以大大节省探测时间，并可通过tomographic或GPSR的方法重建四维相空间。
- 目标：可以完整探测到激光丝剥离后的H0的二维剖面信息。并与丝靶的方法相互验证。
- 解决方案：原H0探测器的后面，新增1台高灵敏度光学剖面探测器（荧光屏+sCMOS相机）





H0截面探测器设计

- 束流高度120mm。
- 荧光屏：142×100 mm^2（有效面积），d = 1mm，与束线夹角呈45°放置，通过矩形边框固定。（135×93）
- 荧光屏扫描范围：工作位置中心与管道中心对齐，home位置整个荧光屏完全移除管道。
- 观察窗：直径150mm（有效尺寸），观察窗与荧光屏距离280mm。
- 腔在走廊一侧开φ150mm观察窗，加LED灯光。
- 相机与荧光屏相距320mm。镜头：LBTEK-PTL15219-C，相机：pc
- 腔体内部发黑。

LB-PTL15219-C 0.122X F6.5 1.1" ¥24,290.00 3周 1 加入购物车

双远心镜头，放大倍率0.122X，最大适合相机尺寸1.1"(18.5mm)，C-Mount

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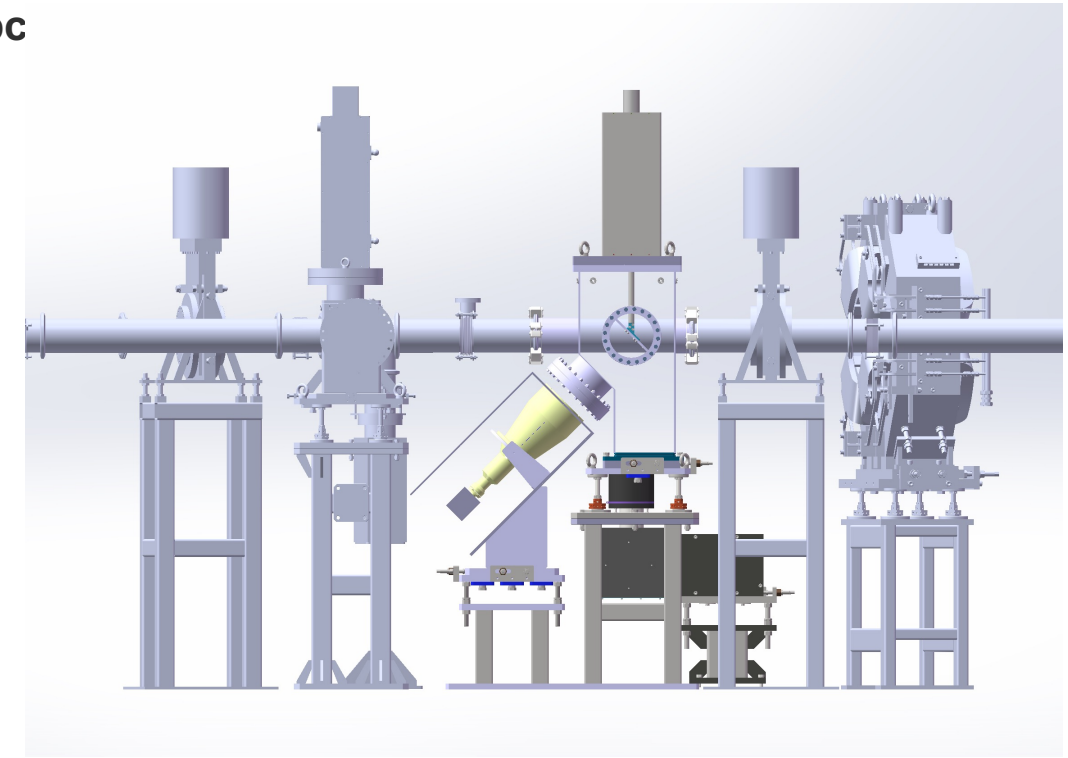
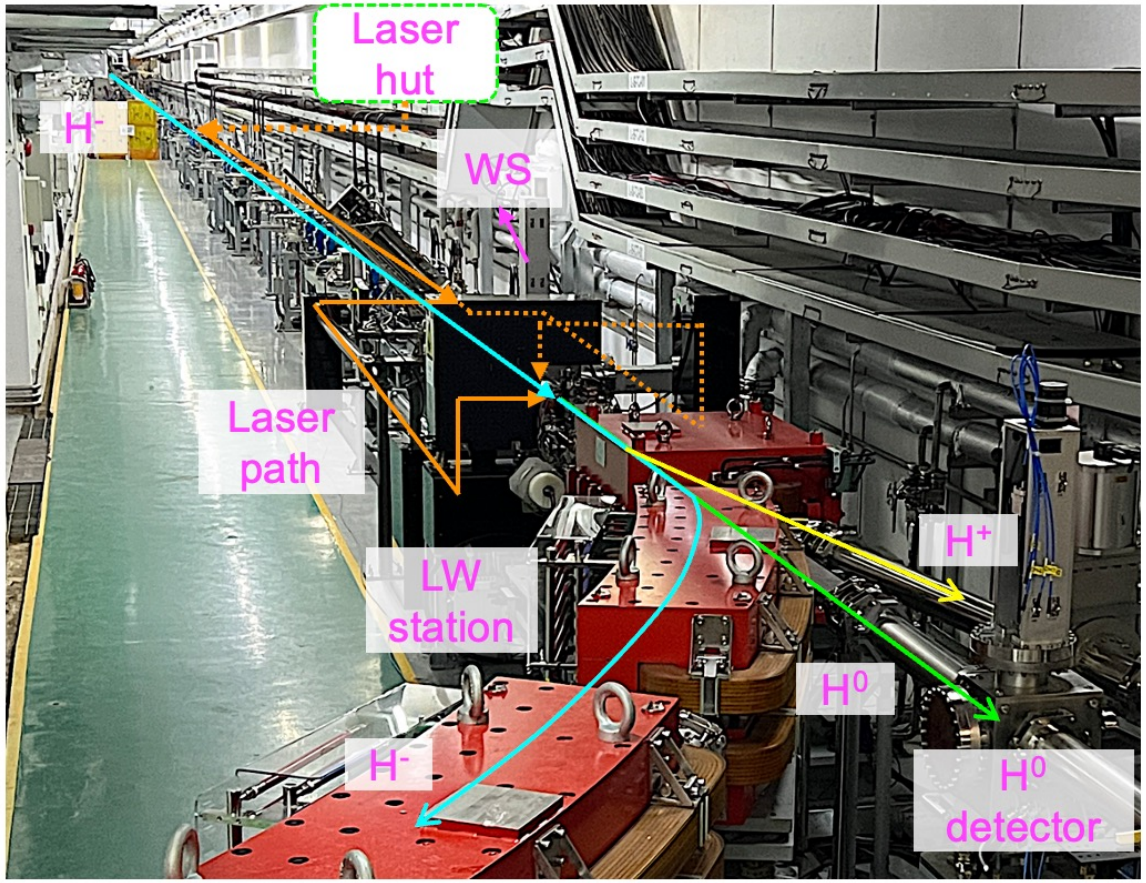
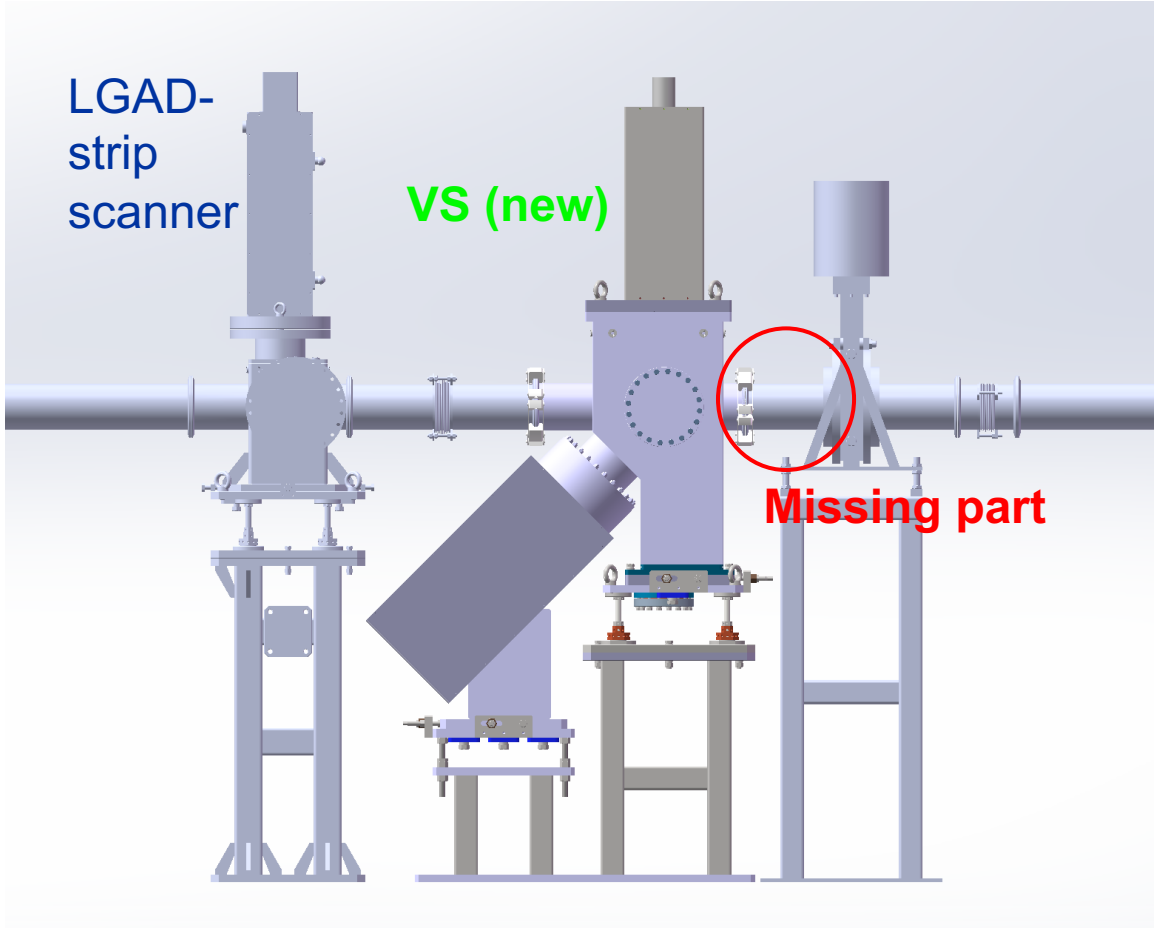
物方视场	Ø151.6 mm	像方视场	Ø18.5 mm
放大倍率	0.122X	工作距离	320 mm±3%
光圈	F6.5	远心度	< 0.04°
景深	48.2 mm	分辨率	35.17 μm
像方MTF	> 0.3@160 lp/mm	畸变	< 0.040%
适用传感器最大尺寸	1.1"	测量范围	1.1" 116.4×85.2 mm 1.0" 107.4×72.1 mm 2/3" 69.3×58.0 mm 1/1.8" 59.0×43.4 mm
尺寸	Ø180 mm×440 mm	光学接口	C-Mount



Layout of the H0 detection area

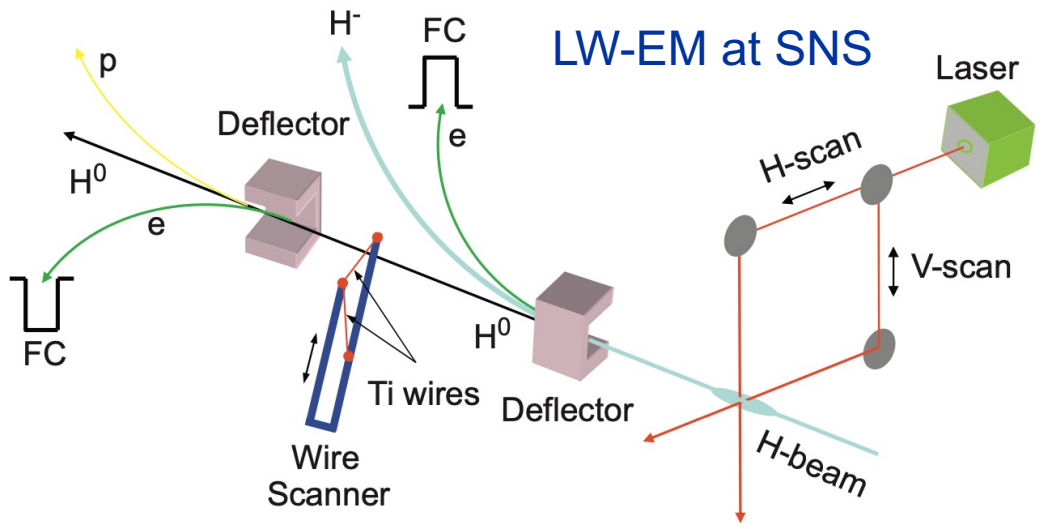
- **Currently, we have a LW profile monitor, and a H0 detector (LGAD strips)**
- **A new visualization screen monitor will be inserted behind the LGAD-monitor (scanner)**

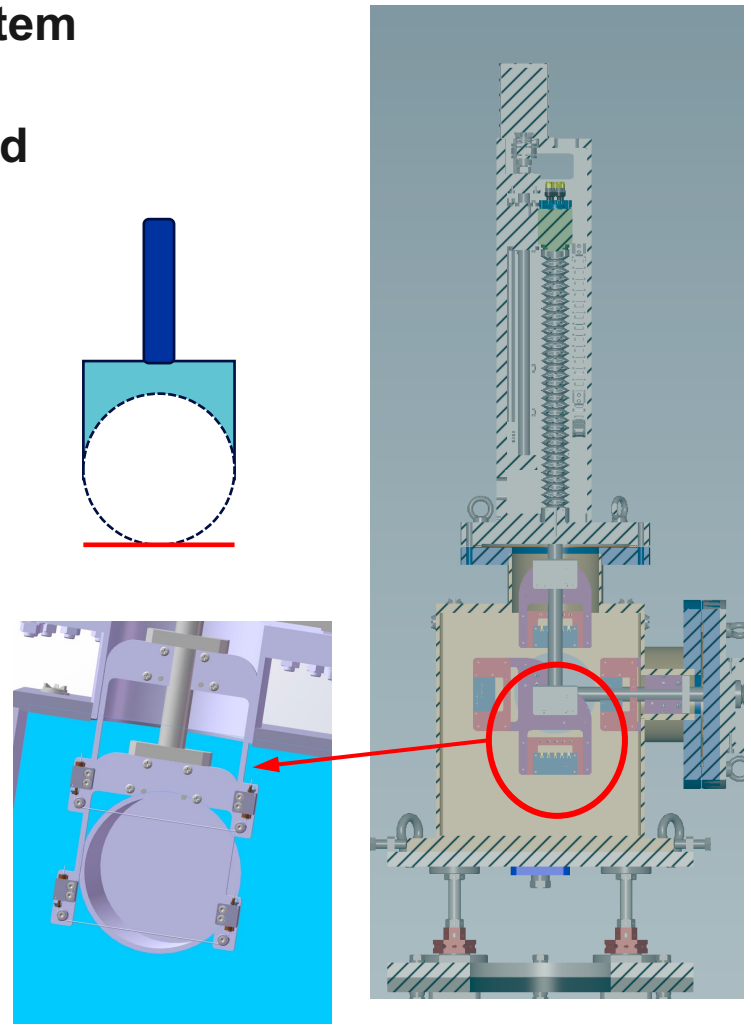




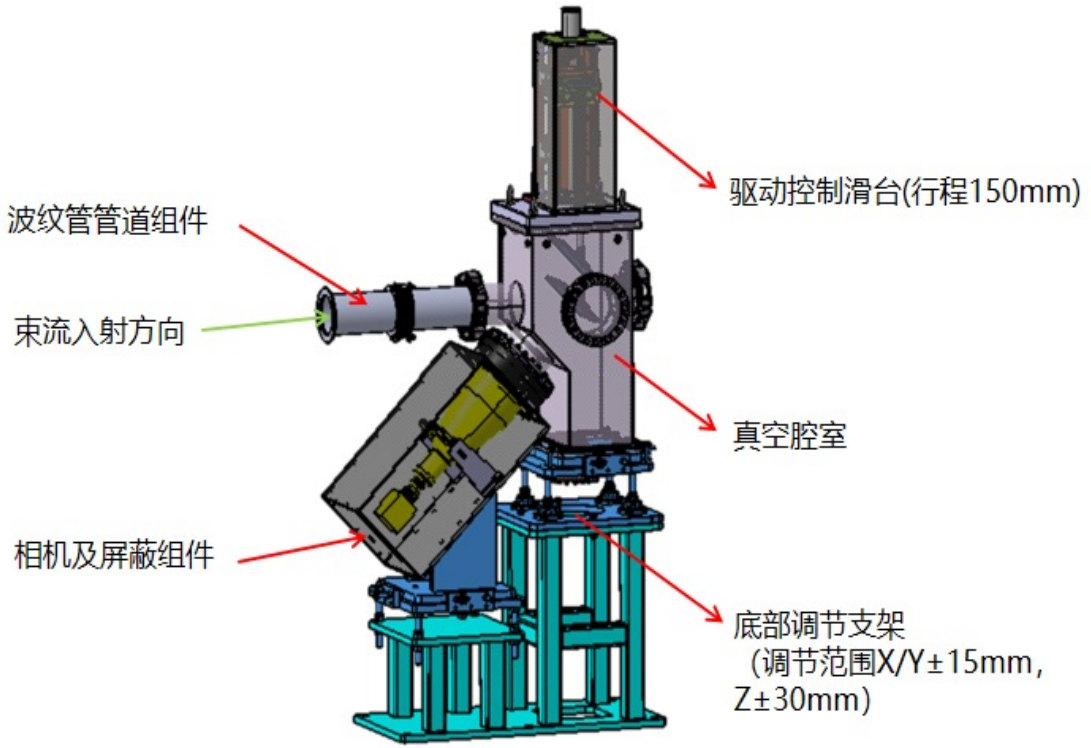
Updated of LGAD detector

- **The current LGAD strip array do NOT work properly, and the system robustness is questionable (conducted at feedthru?)**
- **SNS use stripping wire array (φ50 μm*10, pitch width=75 μm), and the collect the neutralized e-**
- **CSNS: laser 100 mJ => 5V@BLD w/ LGAD frame inserted**
  => 0.1-1% H0 at 0.5 mm wire
  -> 5-50 mV while the BLD background level is ~mV
- **delivery time: 15/07/2025**





时间进度和需求



- **探头及屏蔽体：7月22日到货**
- **光学元件、运动控制、上层GUI等：已有**
- **真空转接波纹管：@真空系统**
- **各型线缆：到货中**
- **安装时间：~8月15日（计划）**

谢谢！