The number of particles generated during showers was calculated using the precise geometry of the experimental setup with FLUKA simulations. The simulations indicated that, in the GEM plane, the total number of electrons and positrons, neutrons, pions, protons, kaons, and muons were 0.8, 0.2, 0.08, 0.04, 0.006, and 0.001 per primary pion, respectively. These values were compared with experimental data, with the comparison for various datasets shown in Figure 5. FLUKA simulations also revealed that more than 40% of particles in showers reaching the GEM area are slow-moving.

As part of an investigation into galaxies at redshifts greater than 7 using the X-shooter spectrograph on the Very Large Telescope, the candidate high-redshift galaxy A1689-zD1 was observed behind the lensing galaxy cluster Abell 1689 (Figure 1). The source was first identified as a potential $z > 7$ galaxy through deep imaging by the Hubble and Spitzer Space Telescopes, with photometric fitting suggesting a redshift of $z = 7.6 \pm 0.4$. Gravitationally magnified by a factor of 9.3 due to the galaxy cluster, it remains one of the brightest known $z > 7$ candidates despite its intrinsic faintness. Observations with the X-shooter spectrograph were conducted over several nights.

Future measurements will be conducted with a 3 mm drift gap and without a current-limiting protection resistor at the base of the GEMs. The effects of these modifications will be analyzed and reported at a later stage.

The UV flux (Fν) was measured using Hubble F160W photometric data. UV luminosity was calculated for a best-fit redshift of 7.5, without applying dust correction, based on standard cosmological parameters. For UV luminosity, a value of LUV = $1.8 \pm 0.2 \times 10^{10}$ L⊙ was obtained, corresponding to a star formation rate (SFR) of 2.7 ± 0.3 M⊙ yr^{-1}. Total infrared (TIR) luminosity was measured as LTIR = $6.2 \pm 0.8 \times 10^{10}$ L⊙, yielding an SFR from infrared data (SFRTIR) of 9 ± 2 M⊙ yr^{-1} using recent calibrations for 3–1100 μm IR luminosity. An SFRTIR below 7 M⊙ yr^{-1} is inconsistent with this model, and lower dust temperatures would imply excessive dust masses.

The physical mechanisms driving quasar UV-optical variability remain unclear despite extensive observations. A recent model by Dexter and Agol attributes the variability to significant local temperature fluctuations in quasar accretion discs. This model has been proposed to explain single-band variability amplitude, microlensing size constraints, and the composite spectral shape of quasars. By analyzing multi-epoch, five-band light curves of nearly 9,000 quasars in the Sloan Digital Sky Survey (SDSS) Stripe 82 region, the intrinsic scatter (σint) in two-band magnitude plots was compared between observed and simulated data. Results show that the model fails to explain the strong inter-band correlations frequently observed, suggesting that local temperature fluctuations are not the primary driver of UV-optical variability over several years. Consequently, the assumption of large localized temperature fluctuations in quasar accretion discs is not supported by the observed spectral variability.