Parametrization of the Straw Tracker spatial resolution based on the September 2024 test beam data

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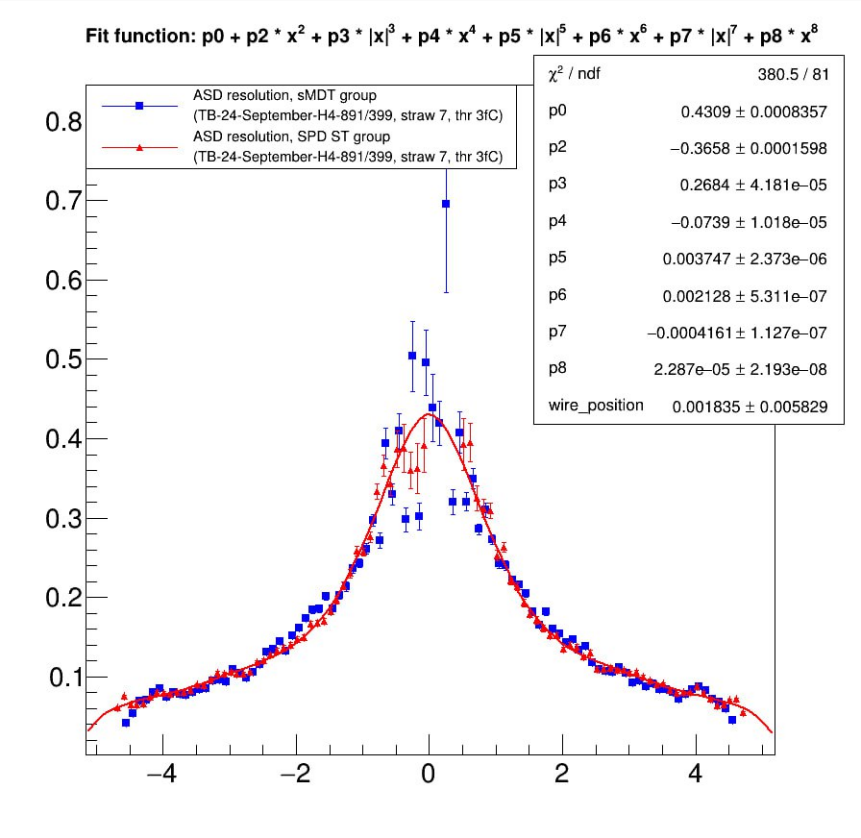
E. Mosolova, D.Sosnov, for JINR—PNPI Straw team
Supervisors: Katerina Kuznetsova, Temur Enik, Viktor Kim

February 19, 2025

PNPI | SPD Physics & MC Meeting

2024| Sosnov D. received the fit function on testbeam in September 2024

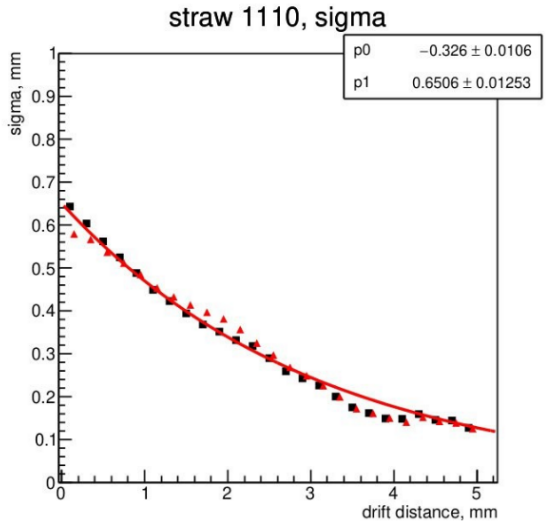


Slide by Dmitry Sosnov VIII SPD Collaboration Meeting 6 Nov. 2024

Data from testbeam September 2024 (ASD readout)

2023-2024| Chukanov A. & Akhunzyanov R. attempted to implement a spatial resolution that is a function of R

σ_R as a function of R



$$\sigma_R(R) = 0.6506 \exp(-0.326\,R)$$

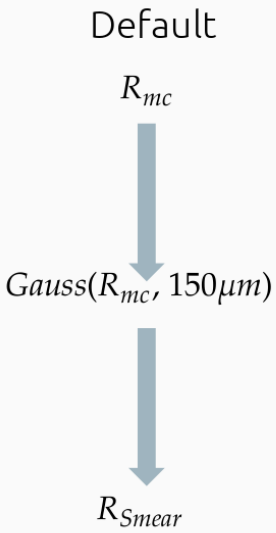
(here all values in mm)

Plot and parameterization
by Artem Chukanov.

Slide by Ruslan Akhunzyanov SPD Physics & MC meeting 19 June 2024

Data from testbeam August 2023 (VMM3 readout) Commit: 3b5538

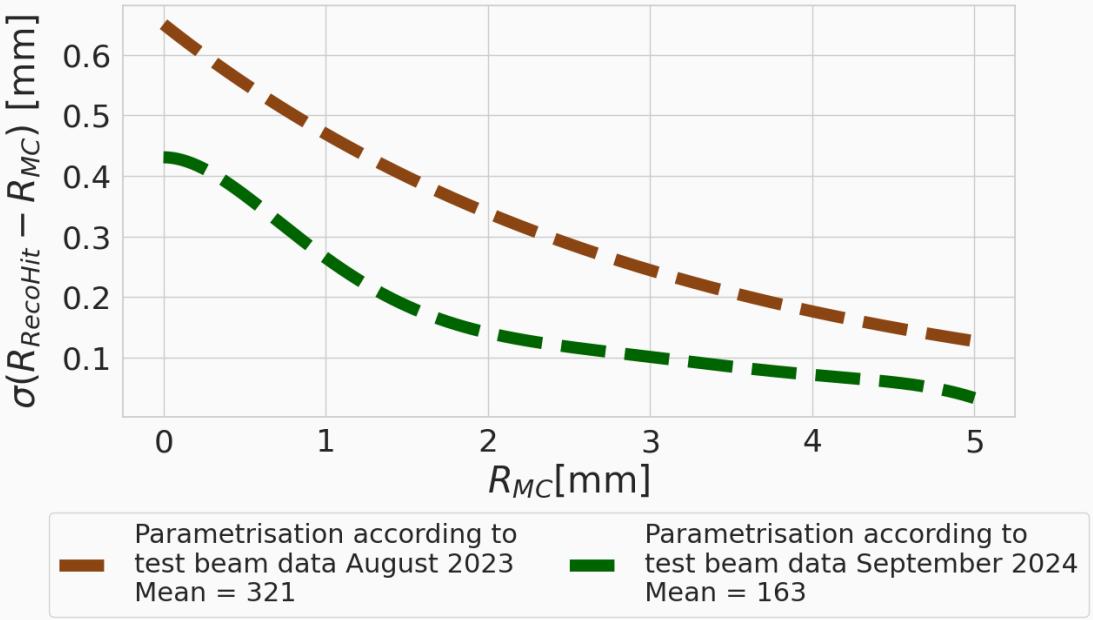
By default SPDROOT accounts for the final straw resolution by smearing the MC hit coordinates



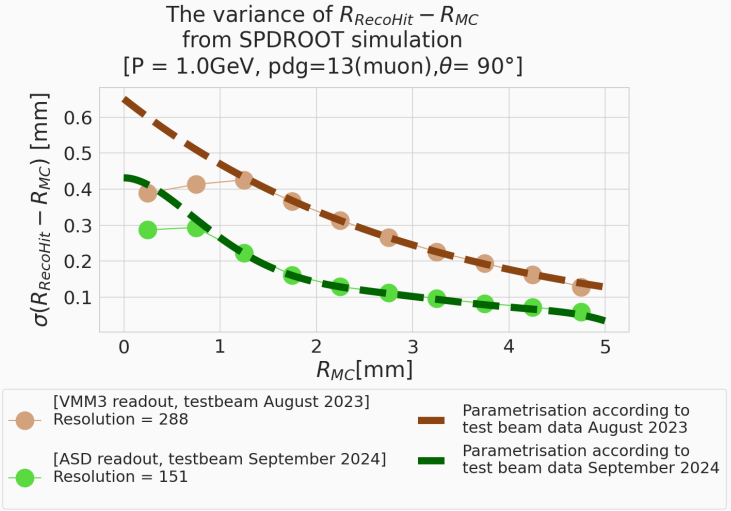
- Monte Carlo Point was smearing in an almost infinite while loop with a fixed variance of 150 μm

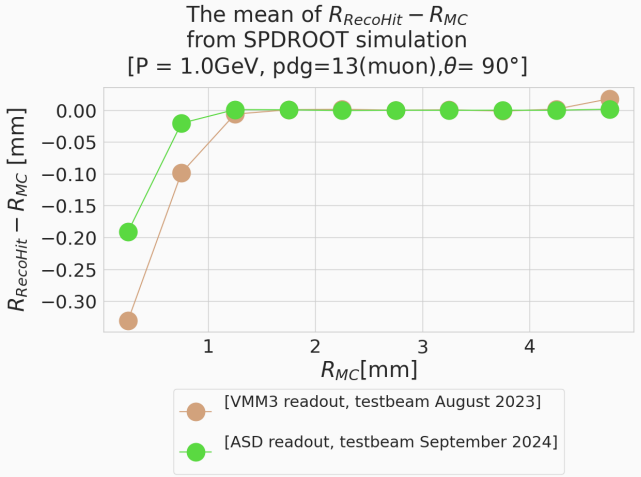
The new data shows an improvement of almost two times

The parameterization according to various test beam data

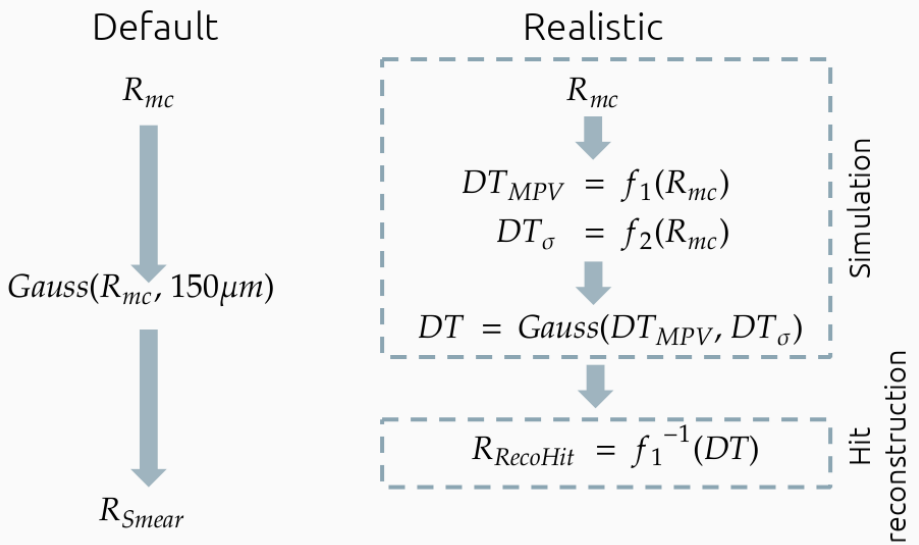


Dependency behavior up to 1mm on consideration





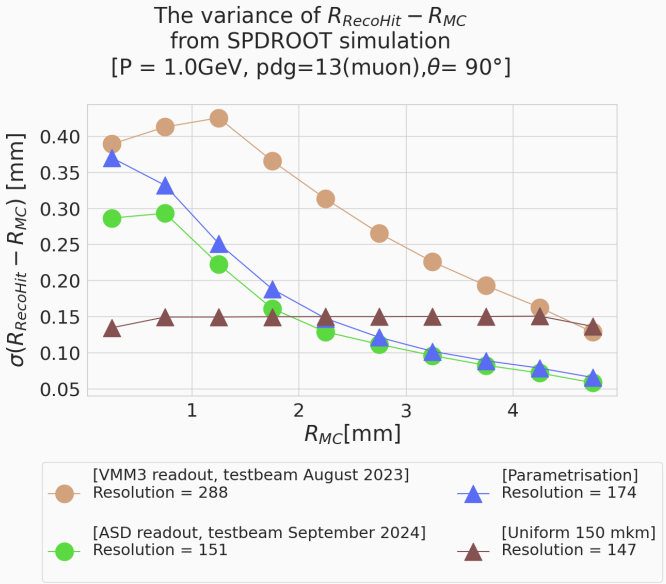
The realistic signal parameterization and hit reconstruction

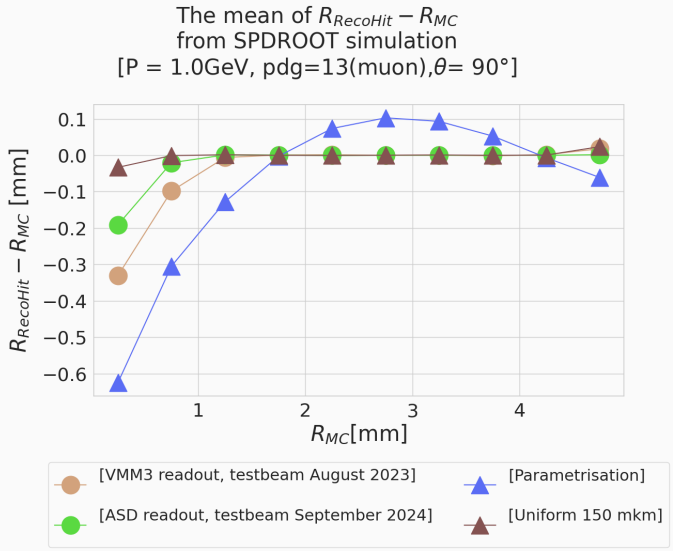


- The distribution of the drift time (DT) is provided by Sonya B. & Vitalii B.
- The DT is calculated for each Monte Carlo point
- Afterward, DT is smeared by $\sigma(DT) = f(R_{MC})$
- Roots of the inverse function (parabola) provide $R_{RecoHit}$

See my slides from VIII SPD Collaboration Meeting 8 Nov. 2024

The spatial resolution with our parameterization matches the data from the testbeam Sep. 2024





Conclusion

- Average resolution of testbeam data 2023 is 288 μm
  Average resolution of testbeam data 2024 is 150 μm
- Comparing results of of teasbeam data 2024 parametrisation to results Garfield++ and LTSpice simulations we get comparable spatial resolution for 90°

Thank you for your attention!