

Muon acceptance study update

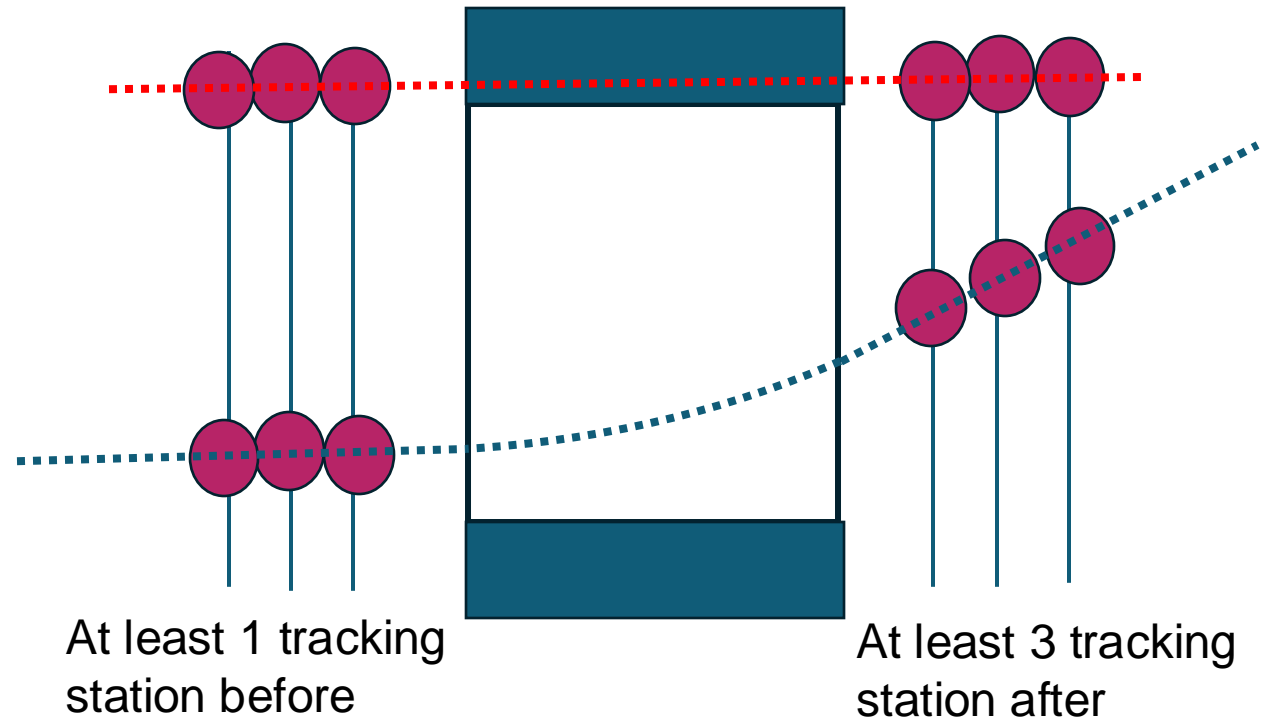
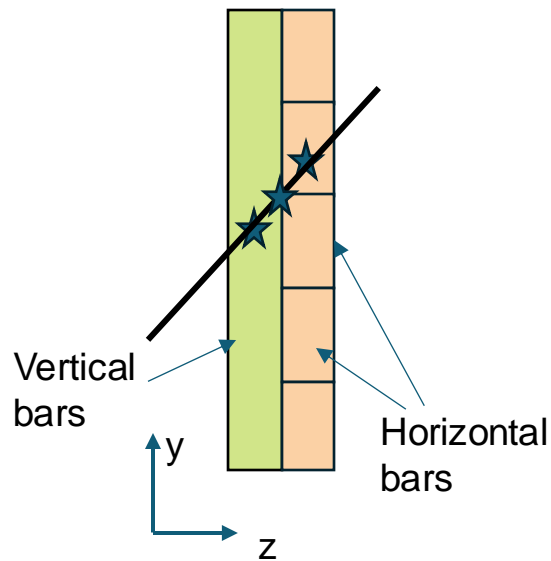
Matteo Vicenzi, Kin Yip

August 6th, 2024

FLArE Technical Meeting

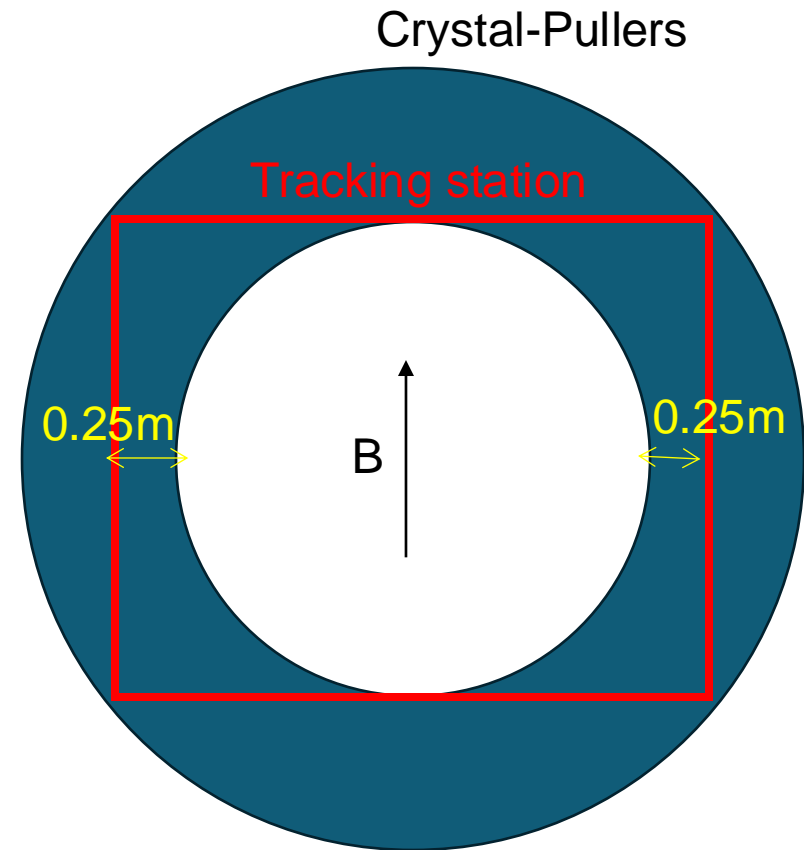
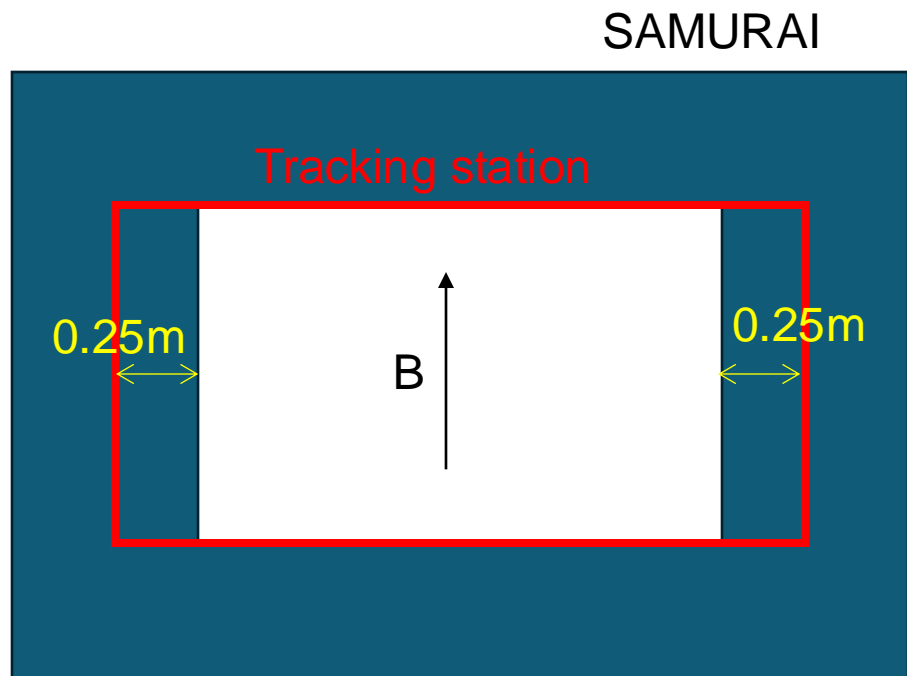
Acceptance bias

- Kin has worked in investigating the effect of the bias between magnet options introduced by our definition of the acceptance.
- Previously, the acceptance only depended on the number of tracking stations crossed by the muons...



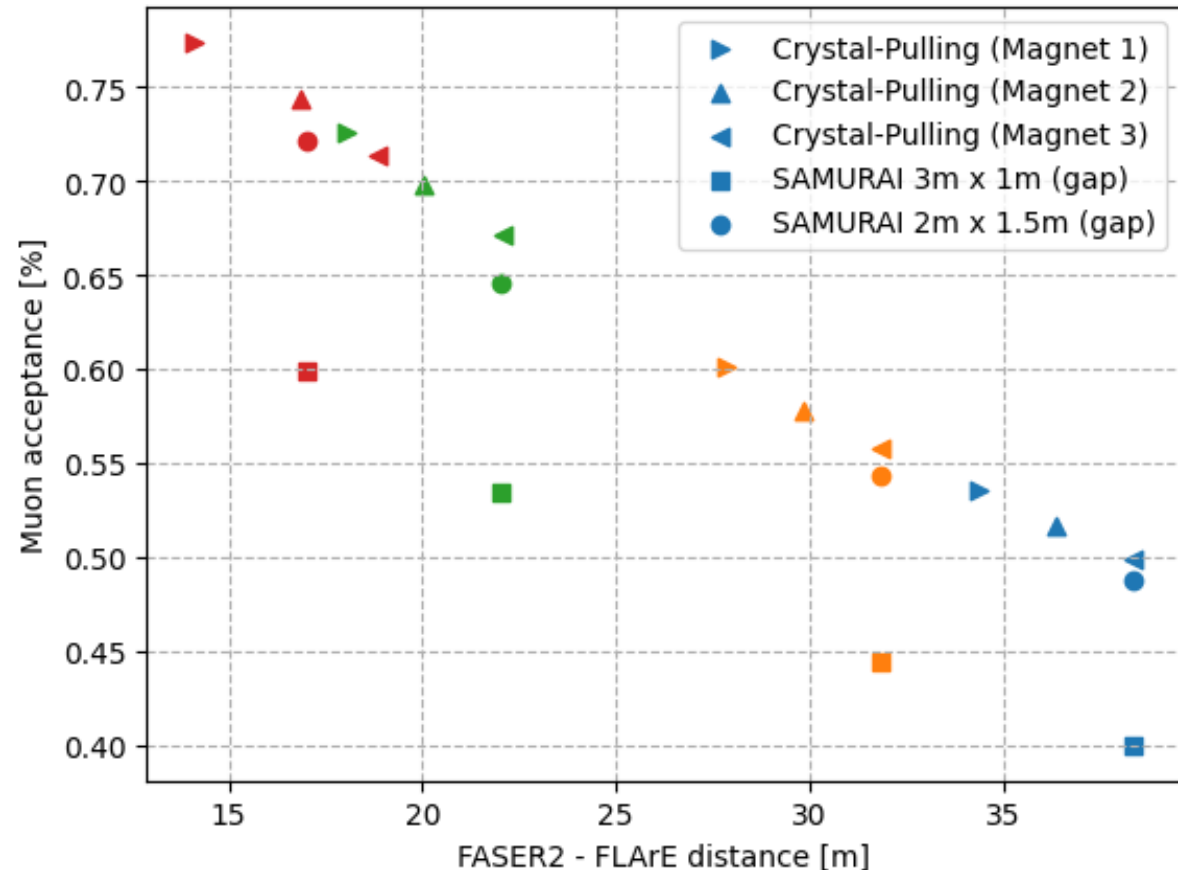
Acceptance bias

- Less important for the SAMURAI magnet (wide x-size + rectangular opening), but possibly more significant for the Crystal-Pullers.



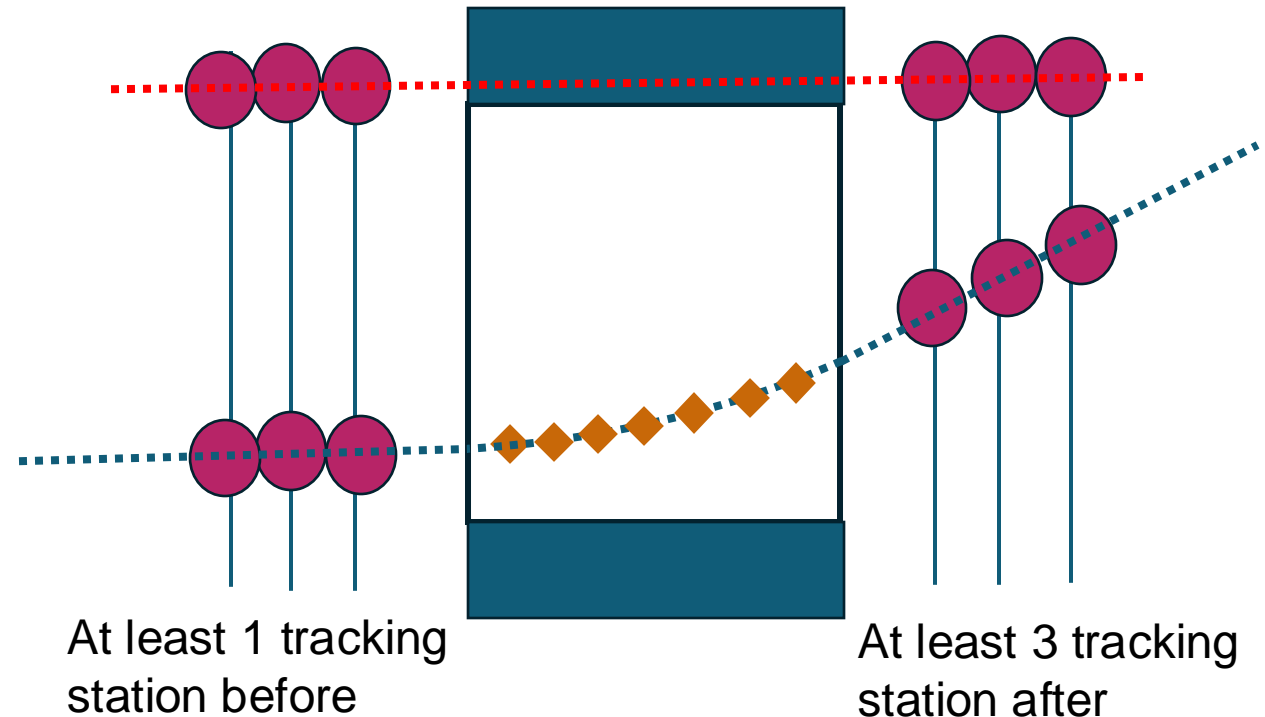
Acceptance bias

- Less important for the SAMURAI magnet (wide x-size + rectangular opening), but possibly more significant for the Crystal-Pullers.
- Could bias the comparison...



New acceptance requirements

- Now saving also “hits” in the magnet volume (true info).
- Comparison between three requirements:
 1. **Tracking stations:** $pre > 0$ && $post > 2$ (old condition)
 2. **Magnet hits:** $n_{hits} > 0$
 3. **Tracking stations && Magnet hits**



SAMURAI magnet (3 m x 1 m)

HALL OPTION	ACCEPTANCE: TRK STATIONS ONLY	ACCEPTANCE: MAGNET HITS ONLY	ACCEPTANCE: TRK STATIONS & MAG HITS
Reference	0.39870142	0.42867573	0.39722813
FORMOSA last	0.444842827	0.484400057	0.44417789
FASERnu2 first	0.534804887	0.594936049	0.534752735
“squeezed”	-	-	-

As expected, only minor differences for the SAMURAI geometry

SAMURAI magnet (2 m x 1.5 m)

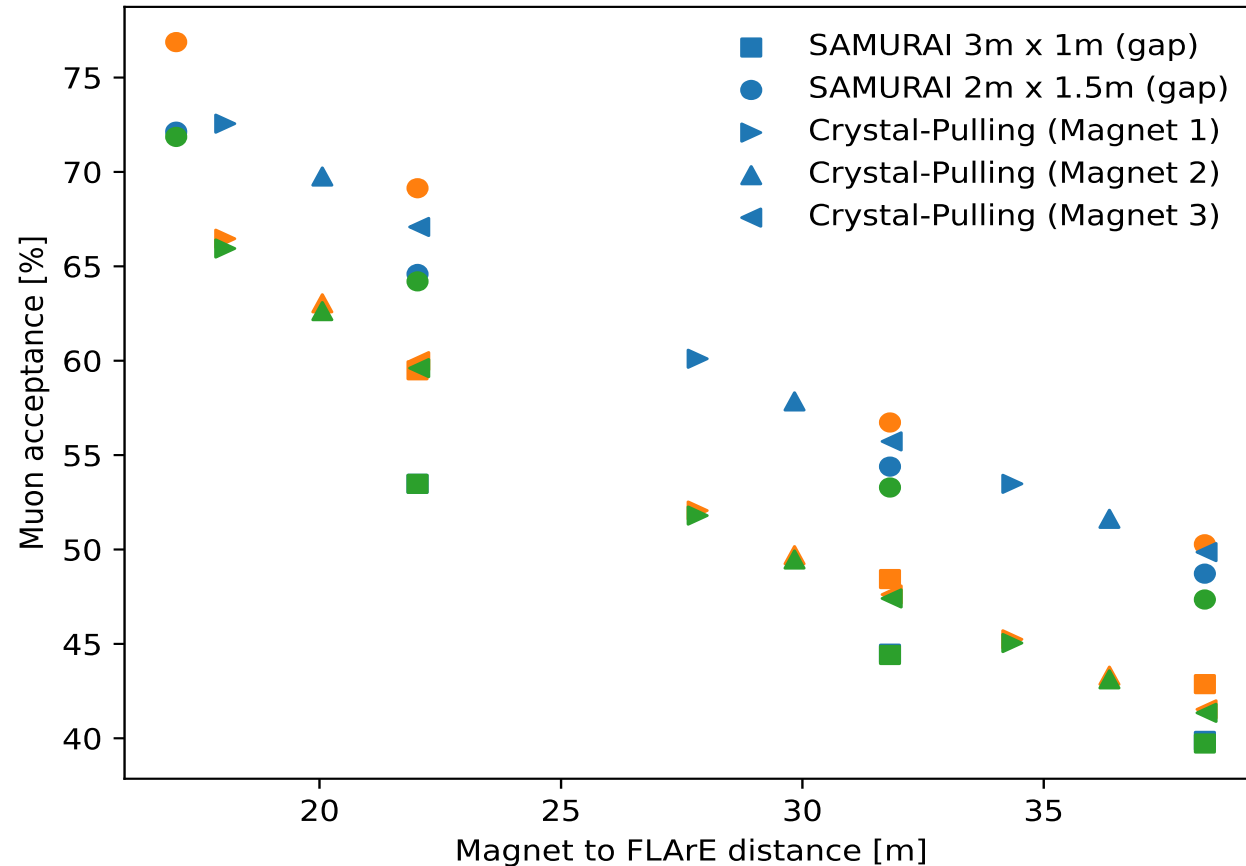
HALL OPTION	ACCEPTANCE: TRK STATIONS ONLY	ACCEPTANCE: MAGNET HITS ONLY	ACCEPTANCE: TRK STATIONS & MAG HITS
Reference	0.487255375	0.502783609	0.473500306
FORMOSA last	0.54394451	0.56730857	0.532875266
FASERnu2 first	0.645927587	0.69140406	0.642003155
“squeezed”	0.721287109	0.768784469	0.71857521

As expected, only minor differences for the SAMURAI geometry

Crystal-Pullers (1.6 m diameter)

HALL OPTION	ACCEPTANCE: TRK STATIONS ONLY	ACCEPTANCE: MAGNET HITS ONLY	ACCEPTANCE: TRK STATIONS & MAG HITS
Reference	0.534830963	0.452470045	0.450540424
	0.516251842	0.433186873	0.431231176
	0.498637531	0.415298765	0.413473448
FORMOSA last	0.601076937	0.520580451	0.518011969
	0.578482118	0.496994746	0.494660947
	0.557230212	0.476173092	0.474113091
FASERnu2 first	0.725563567	0.664611012	0.659447972
	0.697623176	0.630373277	0.6262272
	0.67081709	0.599786177	0.596044277
“squeezed”	-	-	-

Comparison



- **BLUE**: Tracking stations only (OLD)
- **ORANGE**: Magnet hits only
- **GREEN**: Tracking stations && magnet hits

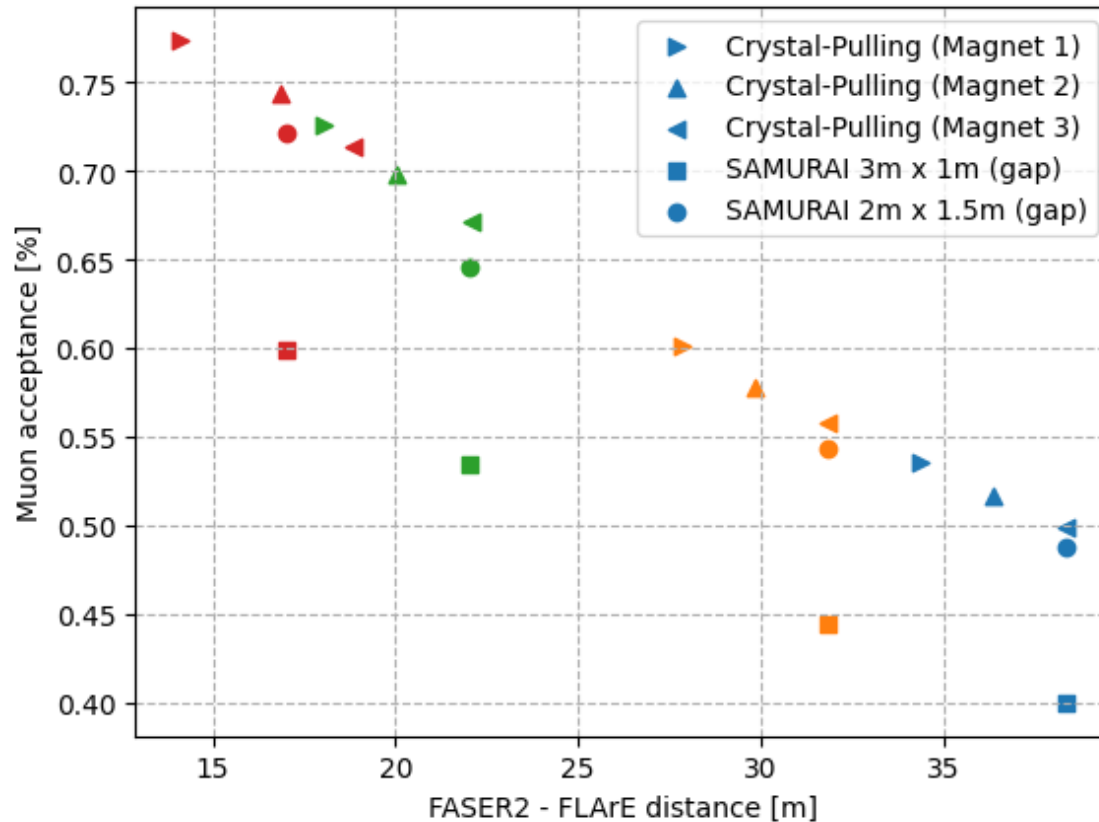
Decreasing distances according to the different options (Reference, FORMOSA last, FASERnu2 first)

Comparison

COLORS = different hall options

Comparing old vs new acceptance definitions

OLD: Tracking stations only



NEW: Tracking stations & Magnets hits

