

Comparison between MARS1507 and MARS1510 @CERN

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MARS installation @CERN

● MARS1507:

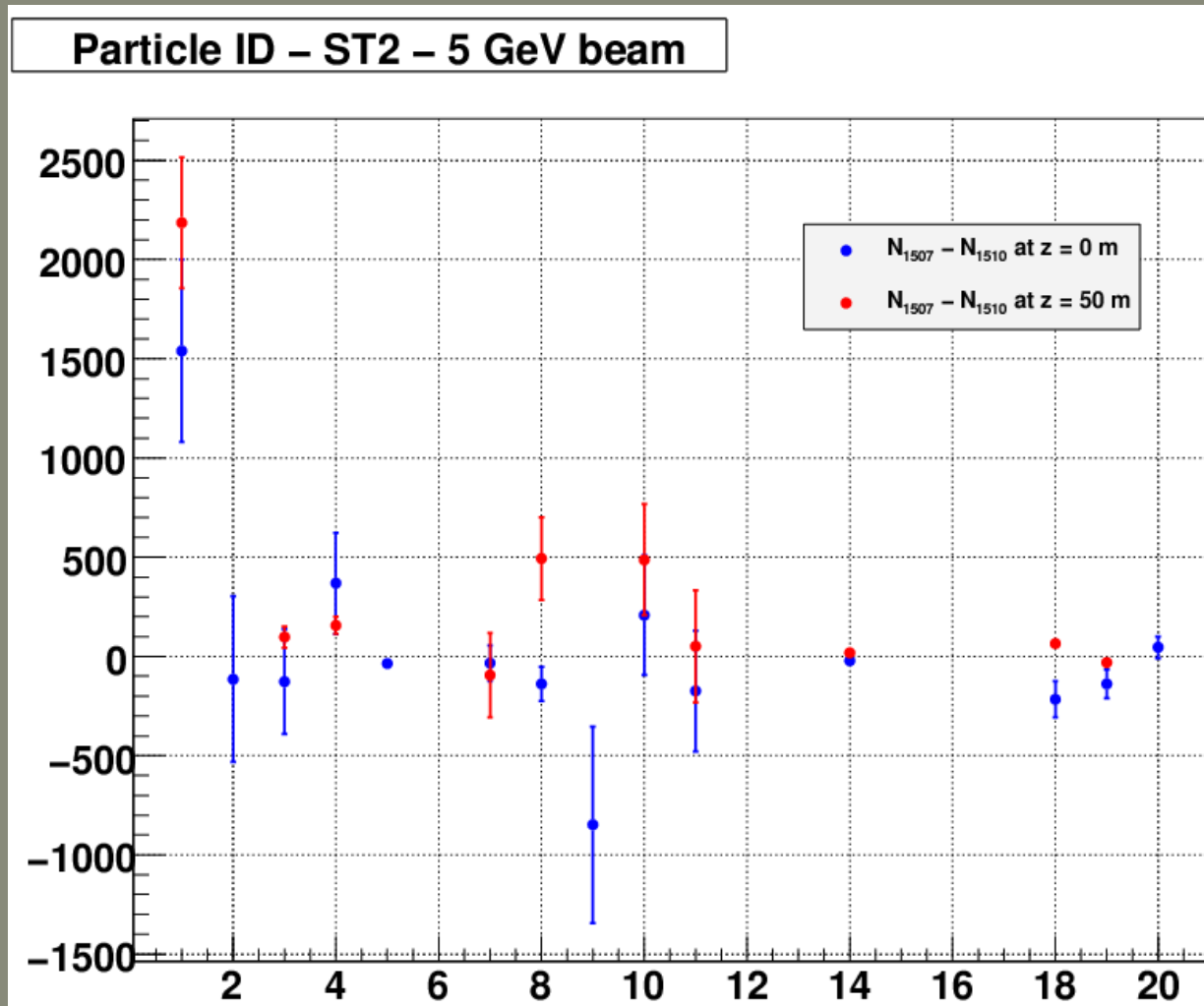
- last update in July 2009.
- benchmarked on x32 but not on x64 architecture.
- comparison with m1507@BNL was giving different yields (%).

● MARS1510:

- installed in February 2011.
- 64x architecture only.
- need small modifications in the .INP file in order to run (e.g., space after comment sign C needed).

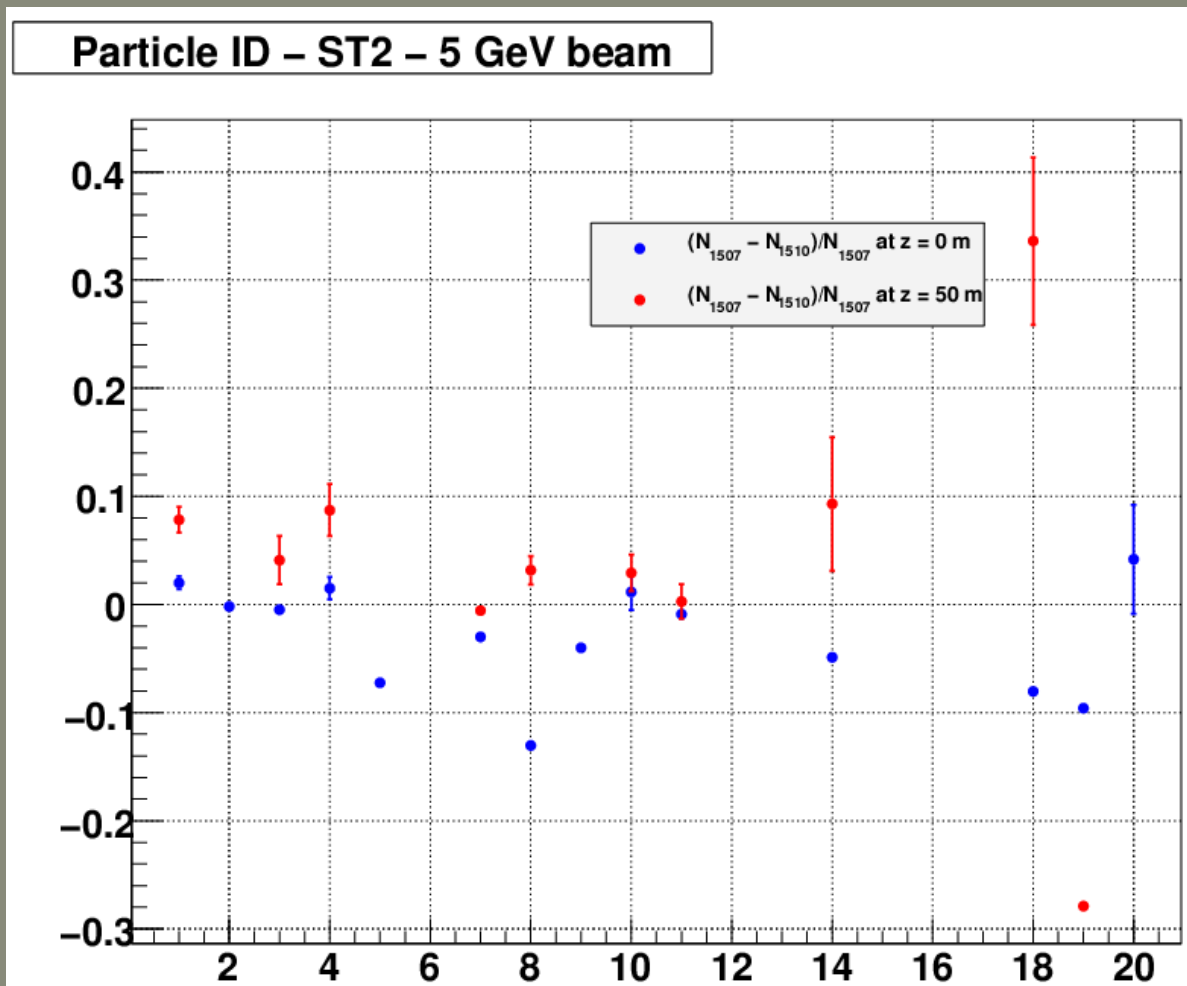
PID comparison (1/6)

- 5 GeV beam – ST2 – PID (weighted yield > 100).



PID comparison (2/6)

- 5 GeV beam – ST2 – PID (weighted yield > 100).



PID comparison (3/6)

- 5 GeV beam at $z = 0$ and $z = 50$ m. $(N_{1507} - N_{1510})/N_{1507}$.

PID#	Name	0 m	50 m
1	p	2%	8 %
2	n	0%	-
3	π^+	0%	4%
4	π^-	2%	9%
5	K+	7%	-
6	K-	-	-
7	μ^+	3%	1%
8	μ^-	13%	3%
9	γ	4%	-
10	e-	1%	3%
11	e+	1%	0%

PID#	Name	0 m	50 m
12	pbar	-	-
13	π^0	-	-
14	d	5%	9%
15	t	-	-
16	3He	-	-
17	4He	-	-
18	$\nu\mu$	8%	34%
19	$\nu\mu\text{bar}$	10%	28%
20	νe	5%	-
21	$\nu e\text{bar}$	-	-
22	$\nu\tau$	-	-

PID comparison (4/6)

- 6 GeV beam at $z = 0$ and $z = 50$ m. $(N_{1507} - N_{1510})/N_{1507}$.

PID#	Name	0 m	50 m
1	p	2%	6 %
2	n	0%	-
3	π^+	1%	7%
4	π^-	0%	3%
5	K+	19%	-
6	K-	-	-
7	μ^+	0%	3%
8	μ^-	2%	2%
9	γ	3%	-
10	e-	5%	5%
11	e+	2%	2%

PID#	Name	0 m	50 m
12	pbar	-	-
13	π^0	-	-
14	d	5%	20%
15	t	-	-
16	3He	-	-
17	4He	-	-
18	ν_μ	0%	5%
19	$\nu_{\mu\text{bar}}$	8%	28%
20	ν_e	12%	-
21	$\nu_{e\text{bar}}$	-	-
22	ν_τ	34%	-

PID comparison (5/6)

- 7 GeV beam at $z = 0$ and $z = 50$ m. $(N_{1507} - N_{1510})/N_{1510}$.

PID#	Name	0 m	50 m
1	p	3%	10 %
2	n	2%	-
3	π^+	3%	0%
4	π^-	2%	6%
5	K+	1%	-
6	K-	-	-
7	μ^+	4%	6%
8	μ^-	4%	4%
9	γ	4%	-
10	e-	2%	3%
11	e+	0%	0%

PID#	Name	0 m	50 m
12	pbar	-	-
13	π^0	-	-
14	d	11%	21%
15	t	-	-
16	3He	-	-
17	4He	-	-
18	ν_μ	0%	34%
19	$\nu_{\mu\text{bar}}$	3%	39%
20	ν_e	13%	38%
21	$\nu_{e\text{bar}}$	-	-
22	ν_τ	38%	-

PID comparison (6/6)

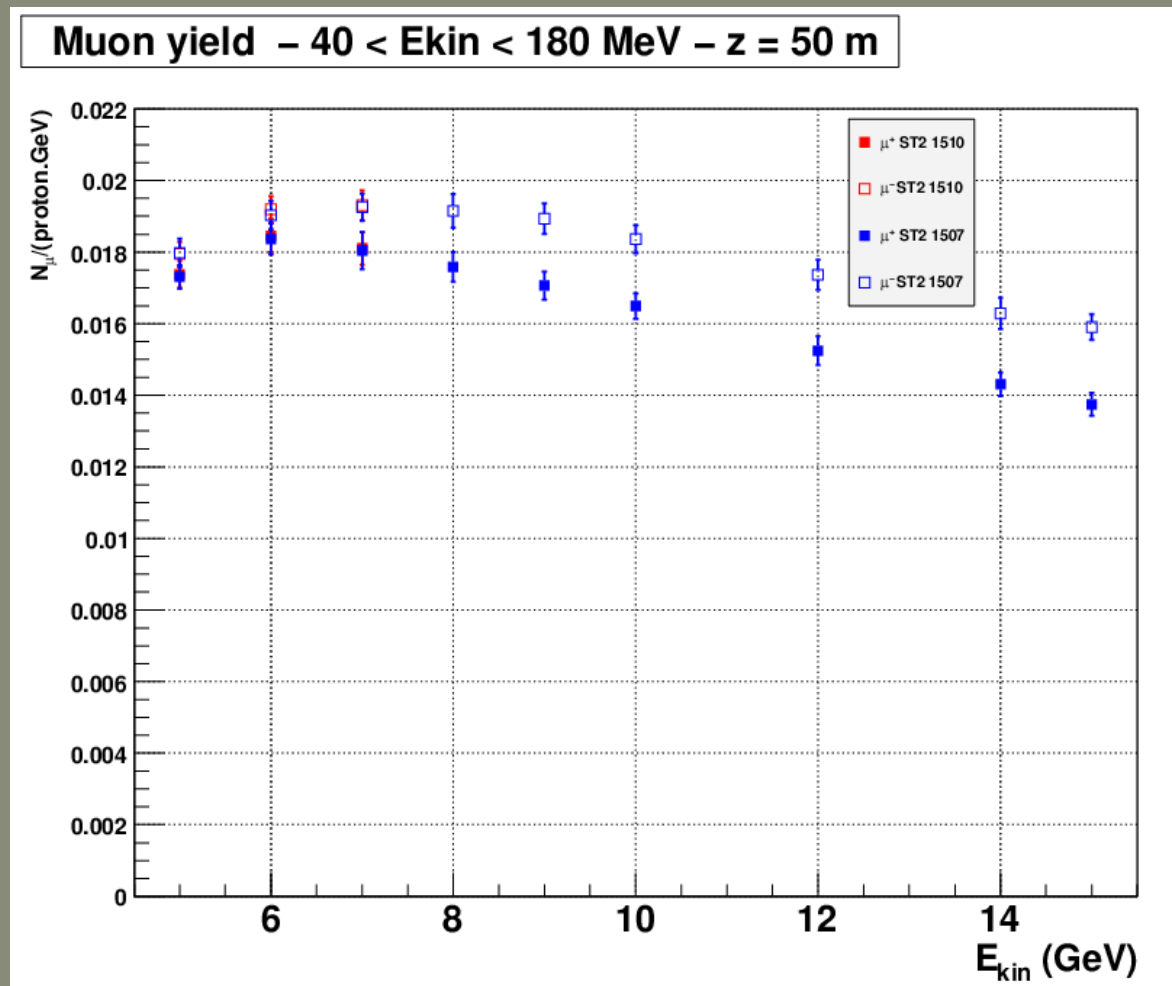
- 8 GeV beam at $z = 0$ and $z = 50$ m. $(N_{1507} - N_{1510})/N_{1510}$.

PID#	Name	0 m	50 m
1	p	2%	7%
2	n	1%	-
3	π^+	1%	1%
4	π^-	2%	1%
5	K+	14%	-
6	K-	9%	-
7	μ^+	19%	1%
8	μ^-	2%	1%
9	γ	7%	-
10	e-	4%	4%
11	e+	3%	1%

PID#	Name	0 m	50 m
12	pbar	-	-
13	π^0	-	-
14	d	4%	4%
15	t	-	-
16	^3He	-	-
17	^4He	-	-
18	ν_μ	5%	9%
19	$\nu_\mu\text{bar}$	1%	23%
20	ν_e	5%	-
21	$\nu_e\text{bar}$	16%	-
22	ν_τ	-	-

Figure of merit for muons @ 50m

- Statistical fluctuation (σ for 50 runs with different random seeds) is order of 2% (as for MARS1507).



Conclusion & todo

- MARS1510 and MARS1507 comparison:
 - 5-8 GeV beams similar yields for $\pi^\pm/\mu^\pm/K^\pm$
 - Still lower yield for beam energy < 6 GeV (but do we really use LAQGSM mode?).
 - Still difference between signs at beam energy > 7 GeV.
- 9-15 GeV beams to be checked.
- Switch to LAQGSM at lower energy TBC.
- MARS1510 thick target model ?
- Need HARP data 100% Λ_{int} to verify behavior < 6 GeV and sign difference > 7 GeV.
- Got file from N. Souchlas (BNL) difference being cross-checked.