

S. BORDONI

BRIEF REVIEW OF THE CERN TEST BEAM FACILITIES

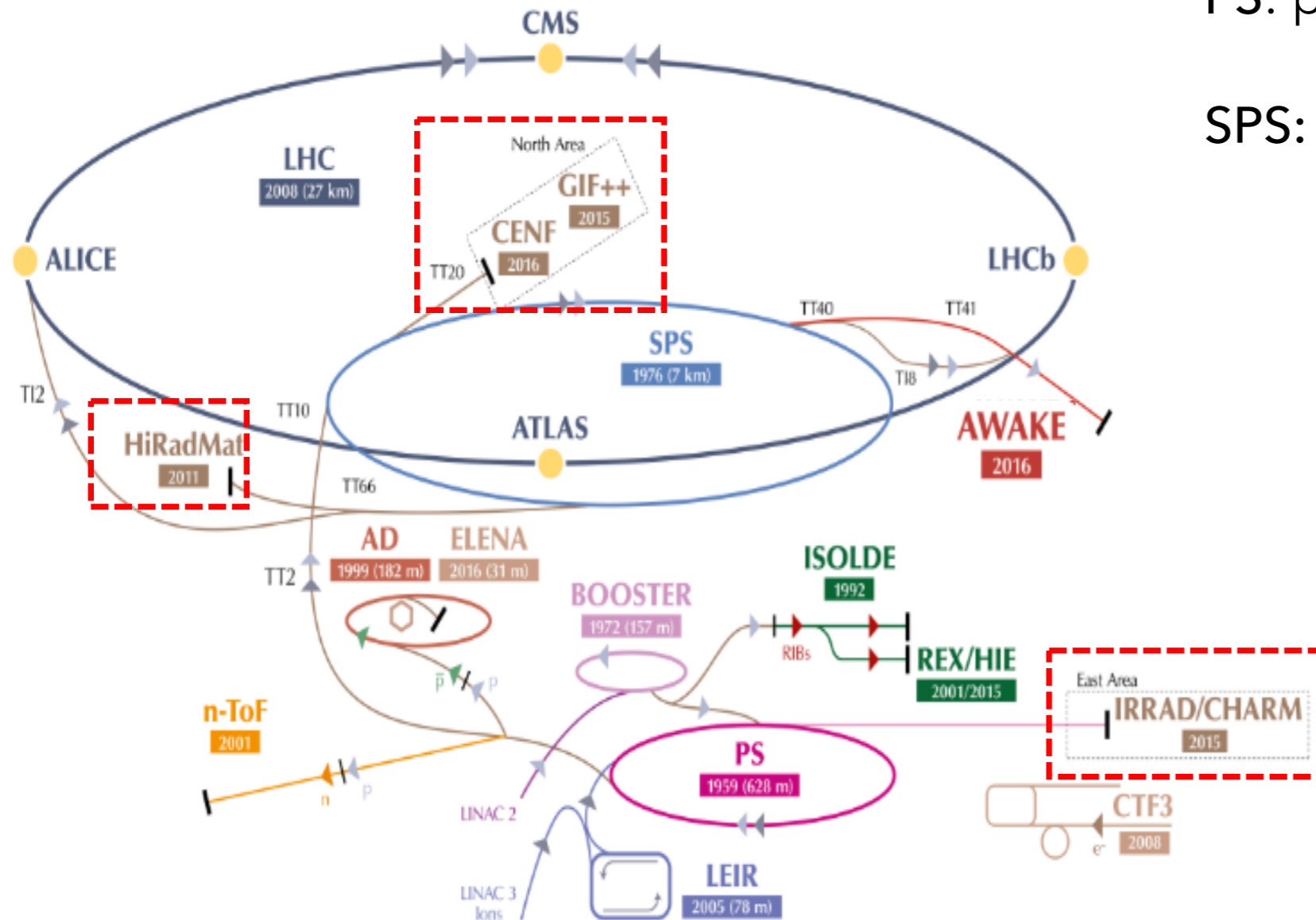
DISCLAIMER

- ▶ Not part of the EN-SBA (Secondary Beam and Areas) group nor beam expert.
- ▶ The talk will give some general informations about the test beam facilities at CERN and how to ask for beam
- ▶ Slides are deeply inspired by [L. Gagnon talk](#)

CERN ACCELERATOR COMPLEX

PS: protons/ions @ 24 GeV/c/Z

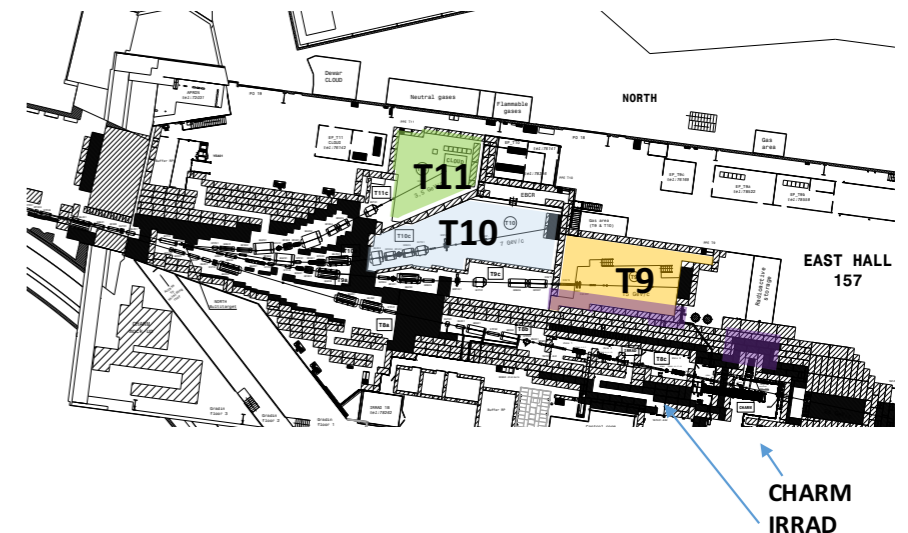
SPS: protons/ions @ 400 GeV/c/Z



TEST BEAM FACILITY AREAS

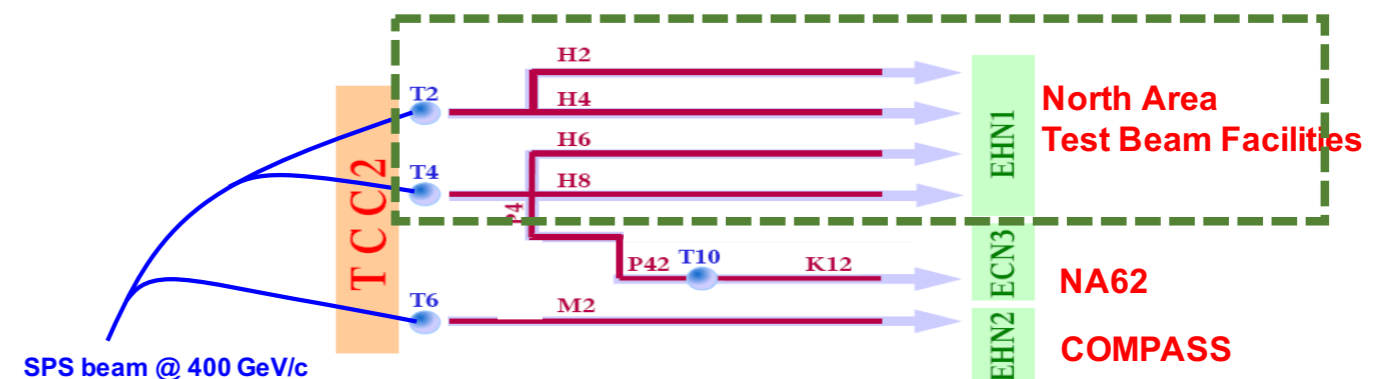
▶ EAST area (Meyrin site) : secondary beams from the PS

- ▶ PS Spill structure: 400 ms length
- ▶ 1 spill every 18s (more on request)
- ▶ 1 target, two lines : T9 and T10



▶ NORTH area (Prevessin site) : secondary/tertiary beams from the SPS

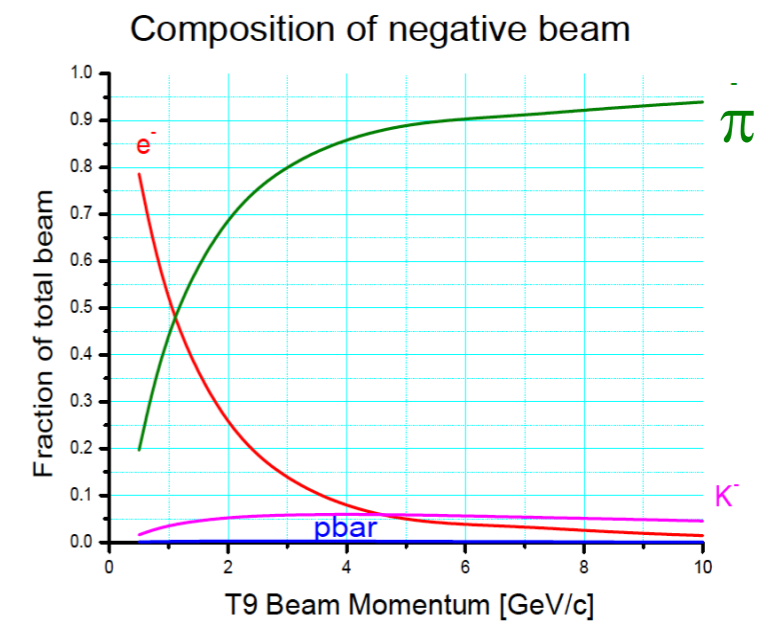
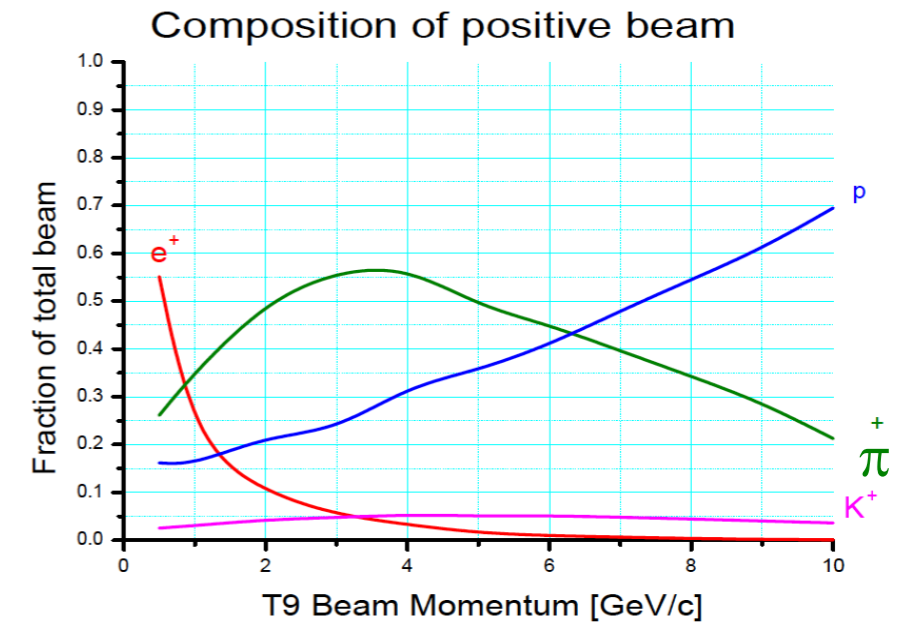
- ▶ SPS spill structure: usually 2cycles/ SPS super cycle
- ▶ spill length, frequency variable (depending on the physics program)
- ▶ two targets and 4 lines



THE EAST AREA

<http://sba.web.cern.ch/sba/BeamsAndAreas/East/East.htm>

Parameter	T9	T10
Maximum momentum (GeV/c)	10	6
Production angle (mrad)	0	61.6
Beam length to ref. focus (m)	55.8	34.9
Beam height above floor (m)	2.50	2.505
Ang.acceptance Horiz (mrad)	± 4.8	± 5.4
Vertic (mrad)	± 5.8	± 13.9
Acc. Solid angle (μ sterad)	87	224
Theor. momentum resol. (%)	0.24	0.24
Max. momentum band (%)	± 10	± 8
Magnification at ref. focus	1.0, 1.2	0.8, 0.6
Protons on North target	$\sim 2.5 \cdot 10^{11}$	
Max. flux (depending on p, Q)	10^6	10^6



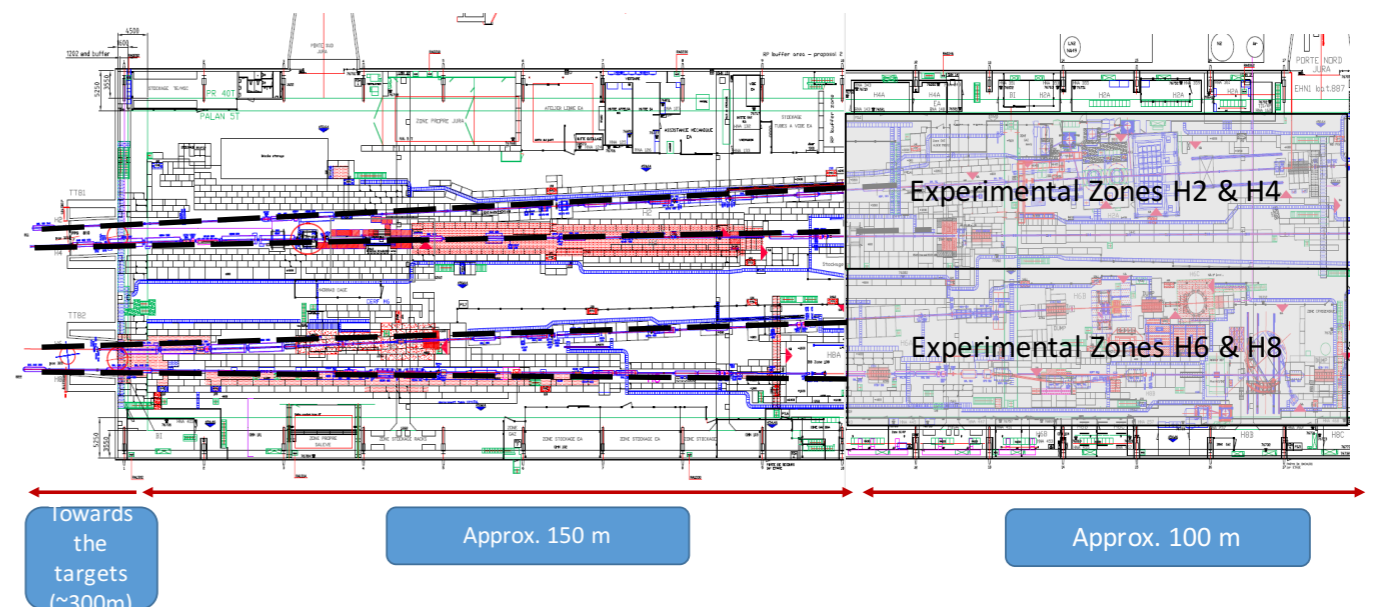
beam composition with e-enriched target. Otherwise reduced of a factor ~ 8

THE NORTH AREA

[H2 beamline](#)
[H6 beam line](#)
[H4 beamline](#)
[H8 beam line](#)

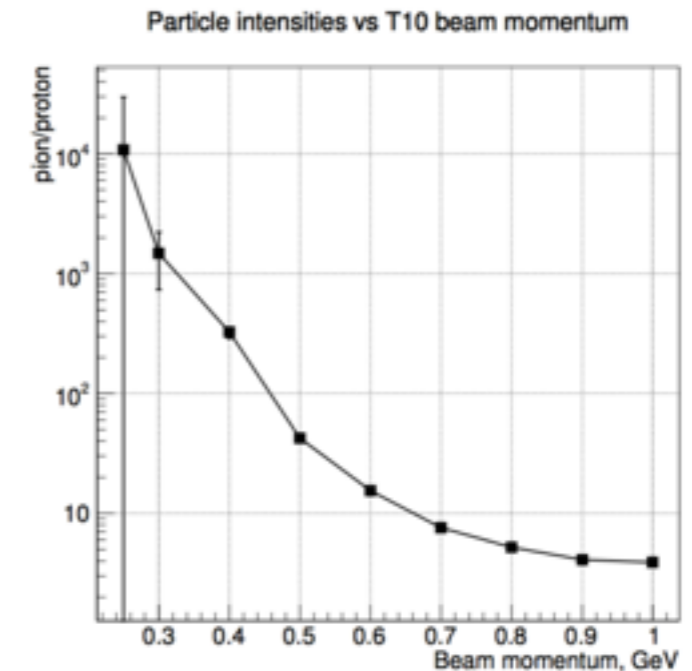
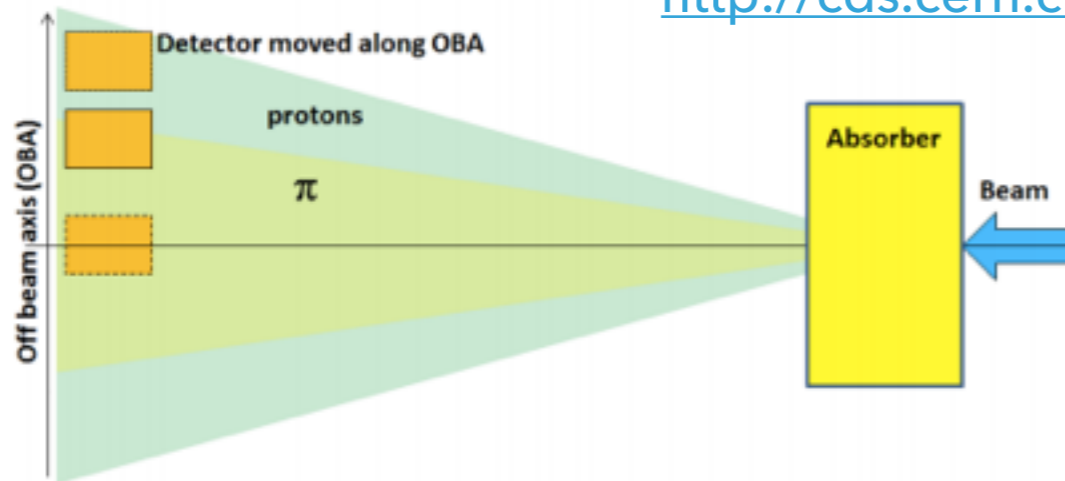
Parameters	Target T2		Target T4	
Beam Line	H2	H4	H6	H8
Maximum Momentum [GeV/c]	400 / 350	400 / 330	- / 205	400 / 350
Maximum Acceptance [uSr]	1.5	1.5	2	2.5
Maximum $\Delta p/p$ [%]	$\pm 2.0\%$	$\pm 1.4\%$	$\pm 1.5\%$	$\pm 1.5\%$
Maximum Intensity / spill * (Hadrons / Electrons)	$10^7/10^5$	$10^7/10^6$	$10^7^{**}/10^5$	$10^7^{**}/10^5$
Available Particle Types	Primary protons/ions ^{***} OR pure electrons OR mixed hadrons (pions, protons, kaons)			
Other / Special requests	sba-physicists@cern.ch & sps.coordinator@cern.ch			

Particle momenta between H2/H4 and H6/H8 lines are coupled

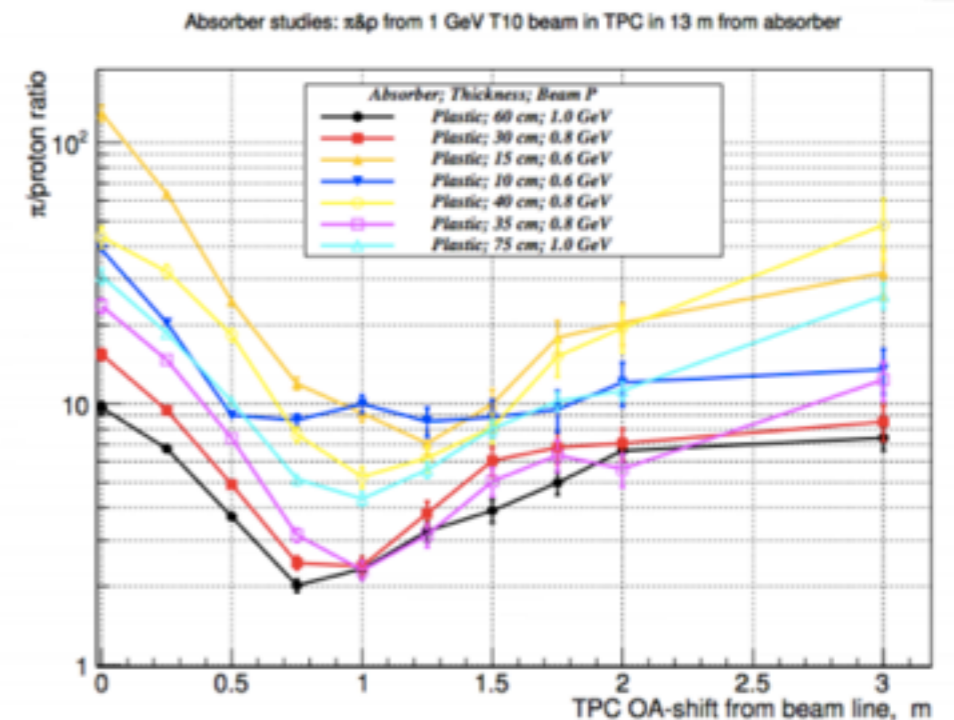


OFF-AXIS MEASUREMENTS

<http://cds.cern.ch/record/2284748>



- ▶ flux studies from High Pressure TPC R&D done with TOF
- ▶ detector off-axis and absorber in front of the target
 - ▶ lower pion to proton ratio
 - ▶ lower beam fluxes



best condition for HP-TPC purposes : 1m off-axis at 13m from a 35cm thick plastic absorber

THE NORTH AREA (EXTENSION)

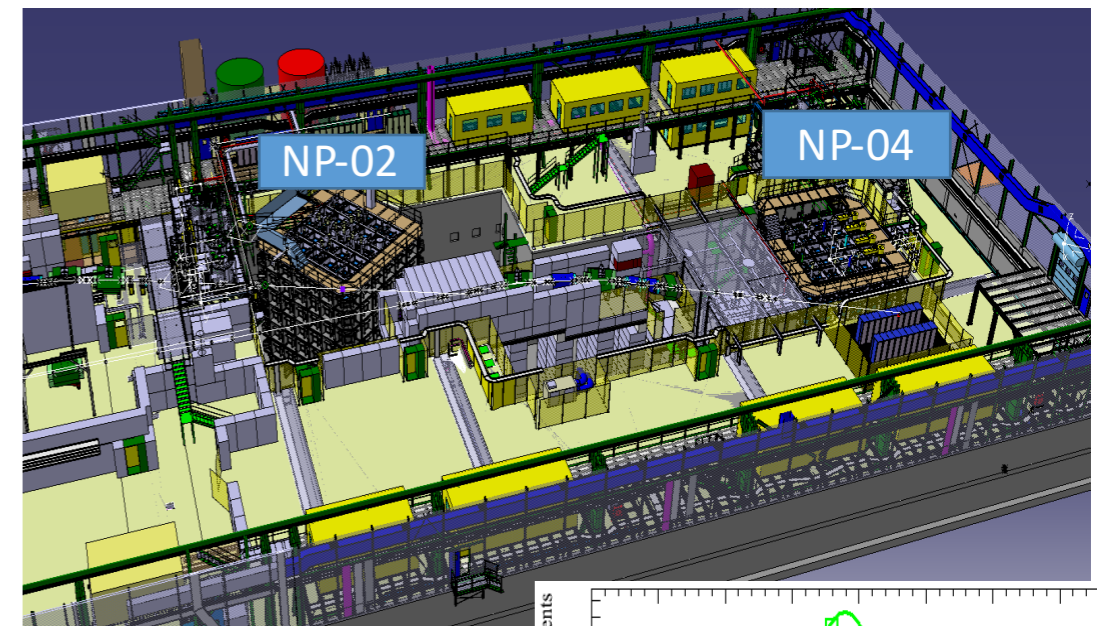
- ▶ Dedicated beam lines for protoDUNE detectors, extension of the H2 and H4
- ▶ Very low energy (VLE) beams using a secondary target ~ 0.4 GeV \rightarrow 7(H4) 12(H2) GeV

Expected rates for H2 VLE

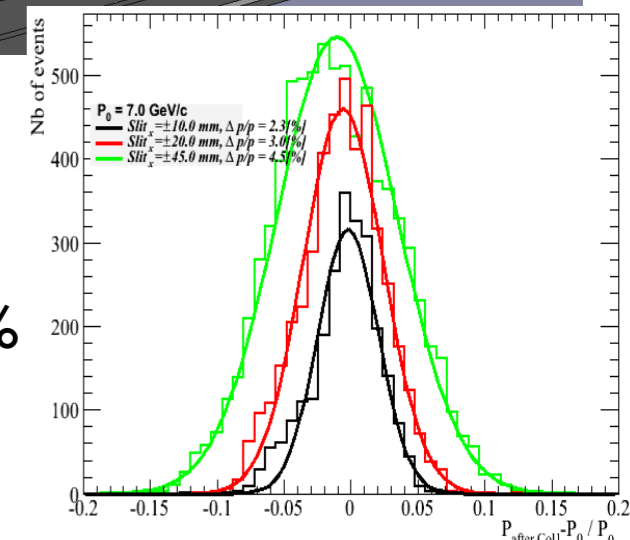
Momentum	e+	K+	mu+	p	pi+	Trigger rate [Hz]
0.4	7	0	0	0	0	7
1	21	0	0	4	3	28
2	17	0	0	7	12	36
3	14	1	1	10	30	56

Momentum	e+	K+	mu+	p	pi+	Trigger rate [Hz]
3	145	1	1	16	49	213
4	117	3	1	16	80	218
5	94	5	2	20	100	222
6	77	9	2	25	133	247
7	69	11	2	28	169	279
8	59	16	3	35	193	305
9	51	19	3	37	227	337
10	46	22	3	45	254	370
11	41	27	3	53	268	393
12	38	29	3	60	292	422

Table 2: Trigger rate for a Cu (0.4 – 3 GeV/c) target and a W (4-12 GeV/c) target.



$\Delta p/p$ down to 2.3%



BEAM INSTRUMENTATION

- ▶ Some instrumentation available depending on the beam line and zone:
 - ▶ beam profile, intensity monitor (scintillators and analog/delay multi wire chambers)
 - ▶ FISC scanners (motorised scintillators filament angular measurements)
 - ▶ Cherenkov gas counters (tagging particle species)
 - ▶ EM calorimeters

HOW TO SUBMIT A BEAM REQUEST

- ▶ Call for beam requests for 2018 opened today
 - ▶ short period (1 week at SPS, 2 weeks at PS): submit a written proposal to SPS coordinator by 18th November
 - ▶ long period : submit a proposal to SPSC (next in January)
 - ▶ parasitic runs are also possible (conditions depending on the area)

- ▶ Useful links :

<http://cern.ch/PS-SPS-User-Documents/2018%20beam%20time%20requests>

<https://sps-schedule.web.cern.ch/sps-schedule/>

SUMMARY

- ▶ Great variety of beam lines for tests : 2 experimental areas and 8 lines
- ▶ Some beam instrumentation available with signals available in counting rooms

Area	East Area		EHN1-ext (NP)		EHN1 – North Area			
Beam line	T9	T10	H2VLE	H4VLE	H2	H4	H6	H8
p_{\min} (GeV/c)	0.5	10	0.4	0.4	10	10	10	10
p_{\max} (GeV/c)	0.5	6	12	7	400	400	205	400
Particles	Mixed. h or e-enr. Tgt Some μ		Mixed. h or e-enr. Tgt		e, π , μ Quite pure beams			

- ▶ If you are interested in further details a talk with EN-SBA group can be organised for the **CENF-ND general meeting** at CERN (27-28 November)