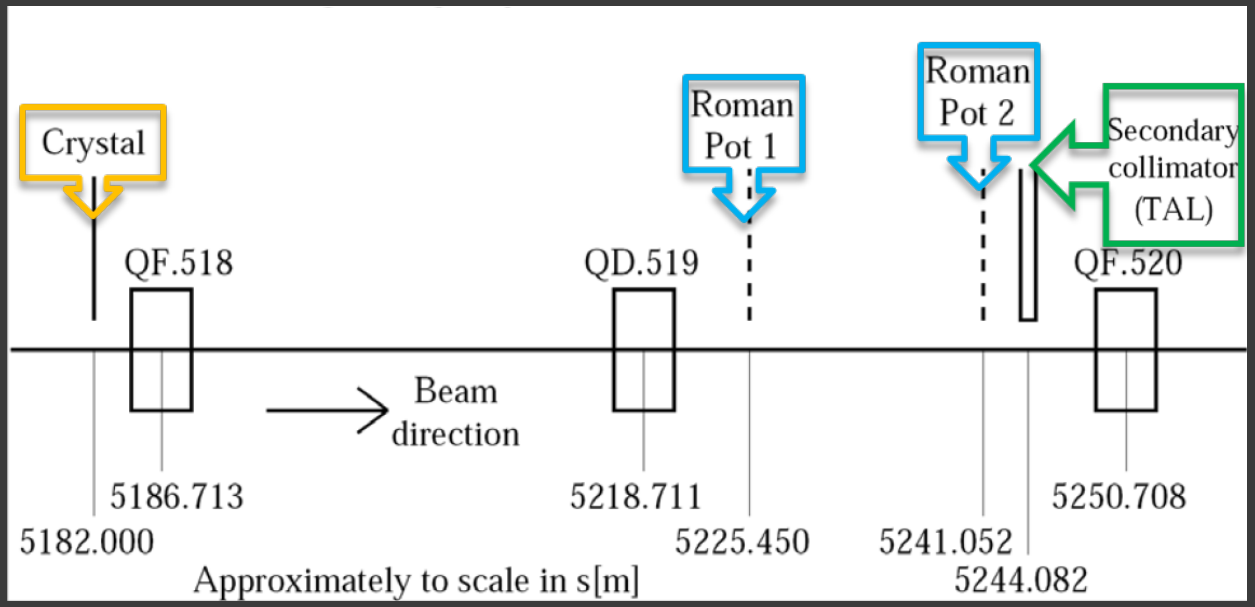
G. Robert-Demolaize, A. Drees, BNL

STATUS OF SIMULATIONS FOR THE UA9 EXPERIMENT

SIMULATED LAYOUT

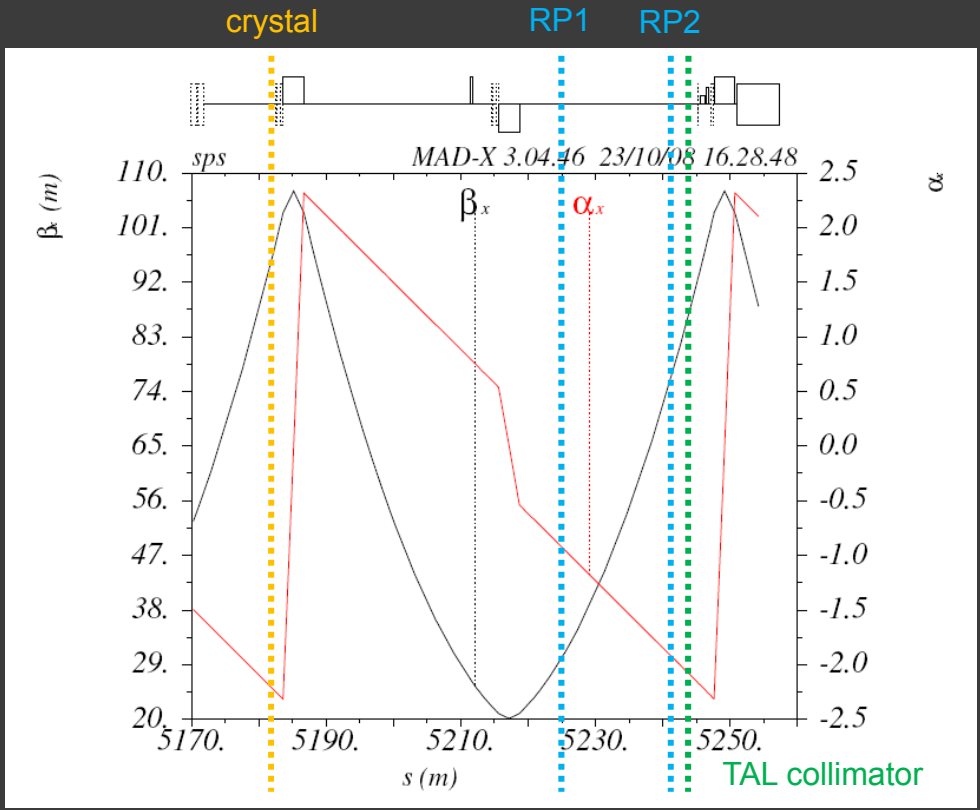
- The CRYSTAL experiment is scheduled for early 2009 along LSS5 in the CERN SPS. The bent Si crystal is placed upstream of QF.518; two locations are foreseen downstream of QD.519 for the installation of RP's.

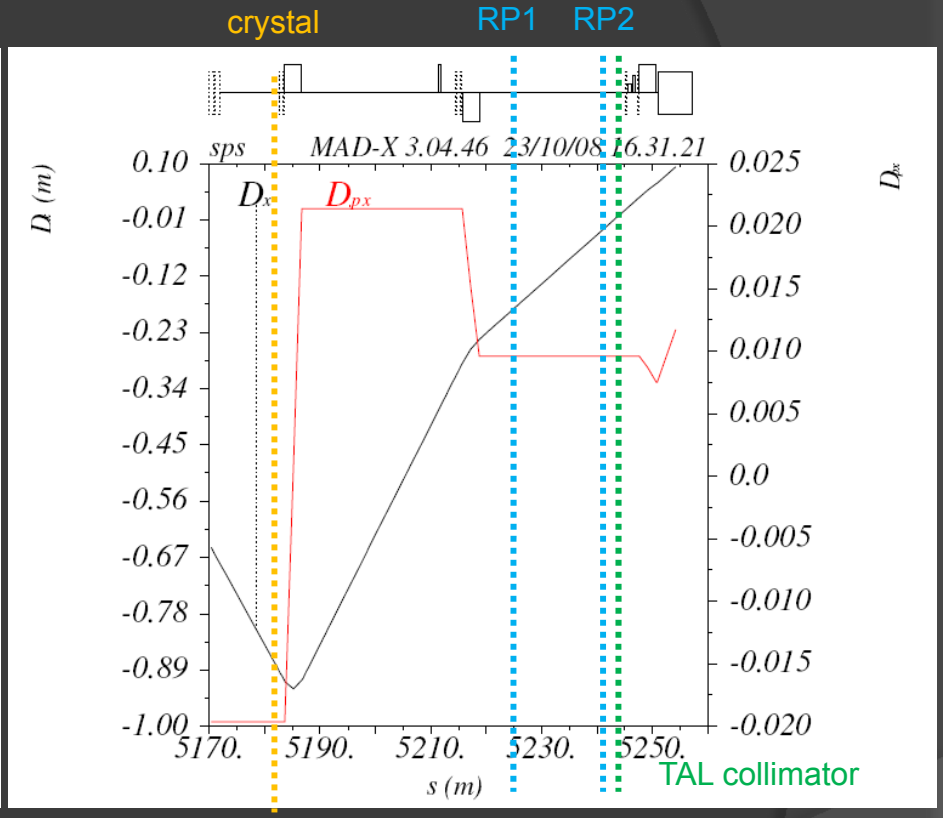


W. Scandale & A. Taratin, CERN/AT 2008-21

- A 60 cm long secondary tungsten absorber (TAL) is located upstream of QF.520. The crystal configuration will aim at deflecting particles in the horizontal plane so as to dump them on the TAL; practically, the crystal will only intercept particles with $X > 0$ and give them a transverse angular kick $\Delta X' > 0$.

OPTICS ALONG LSS5





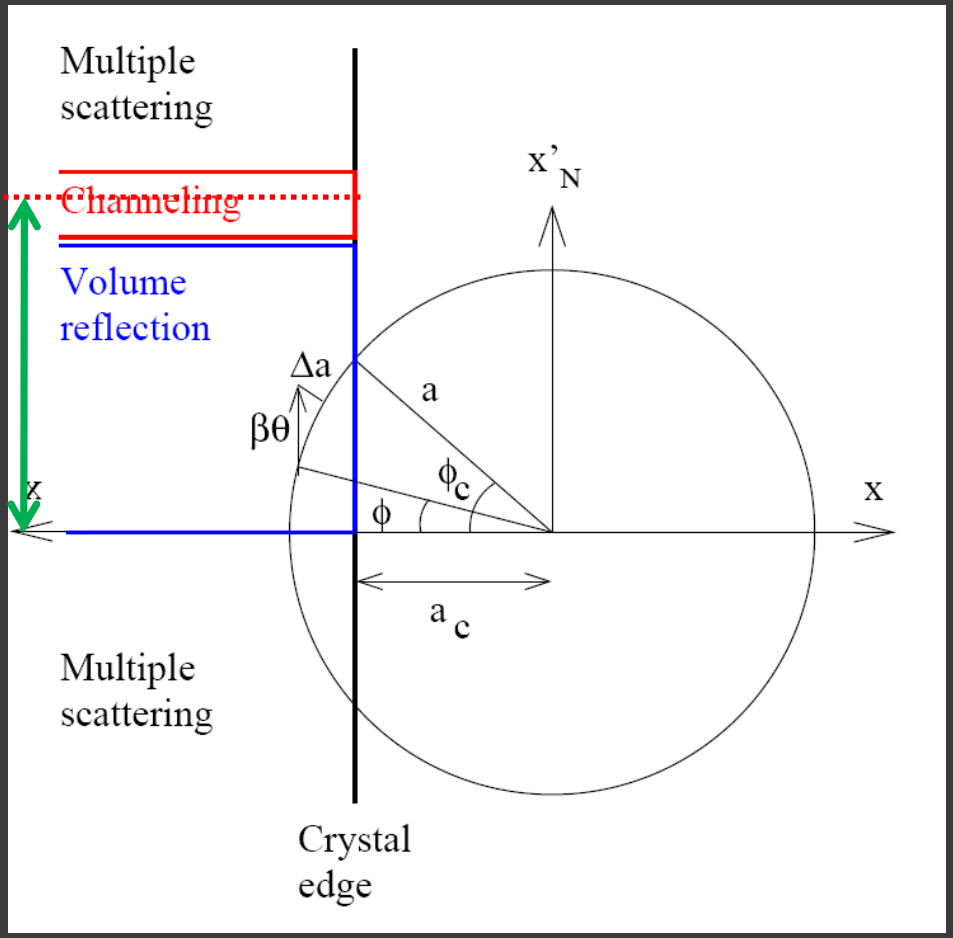
- The crystal will be installed close to a maximum of β_x (GOOD) and an extrema of η_x (BAD). Values of α_x and η'_x are also non negligible…
- For collimation efficiency studies, the crystal will sit at 6 σ_x from the center of the beam; RP1&2 and TAL at $\approx$ 6.83 σ_x.

BEAM PARAMETERS

	High energy	Unbunched	Bunched
Momentum P [GeV/c]	270	120	120
Tune Qx	26.13	26.13	26.13
Tune Qy	26.18	26.18	26.18
Tune Qs	0.0021	0	0.004
Normalized emittance (at 1 σ) [mm mrad]	1.5	1.5	1.5
Transverse radius (RMS) [mm]	0.67	1	1
Momentum spread (RMS) Δp/p	2 to 3×10^{-4}	2 to 3×10^{-4}	4×10^{-4}
Longitudinal emittance [eV-s]	0.4	≤0.4	0.4
RF Voltage [MV]	1.5	0	1.5

- Scenario considered in this presentation: 120 GeV bunched beam with N_{part} ~ 1e11.
- At the location of the crystal: 1 σ_x = 1.058 mm , 1 σ_p = | η_x * Δp/p | = 0.351 mm !!!
- From W. Scandale & A. Taratin, CERN/AT 2008-21: halo flux will range between 1e2 and 1e4 particles per turn, synchronous to the bunch structure => limit for single particles experiment: can it be reduced ?? Does the instrumentation then still work ??

CRYSTAL MODEL



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- In the results presented in the next slides, the following values were used (from W. Scandale & A. Taratin, CERN/AT 2008-21):
  - Ω = 150 μrad,
  - θ_{VR} = 22 μrad,
  - θ_{RMS} = 10 μrad,
  - α_{cc} = 20.4 μrad,
  - λ_{CC} = 56%, λ_{VR} = 95 % (taken from RD22).
- The crystal is set up so that channeling is the favored mechanism for the impacting distribution. VR and MCS can also occur.

ROMAN POTS LAYOUT

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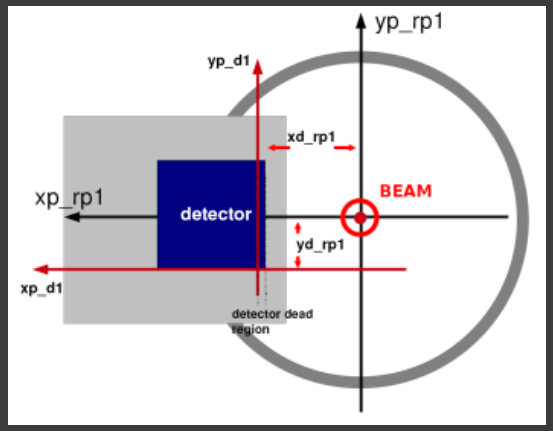
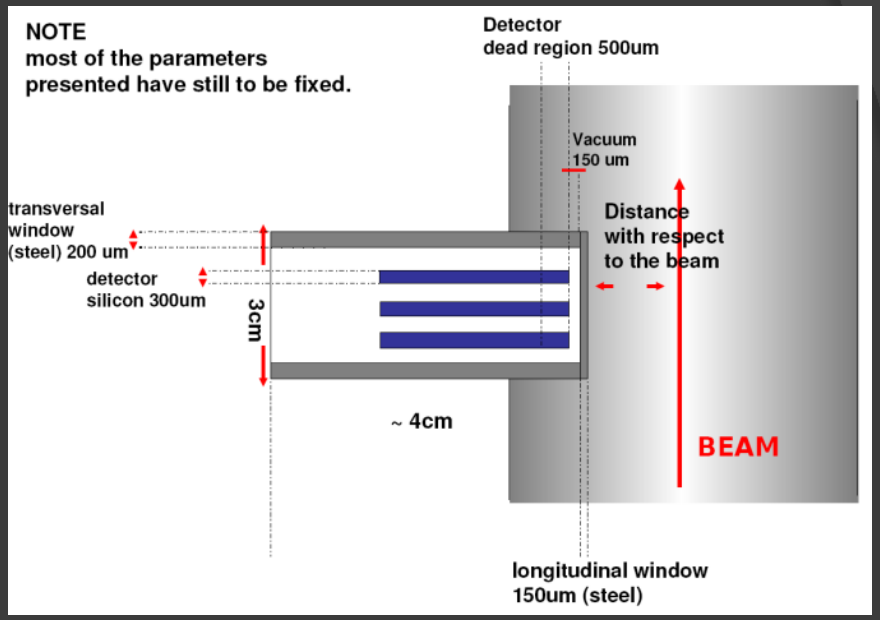
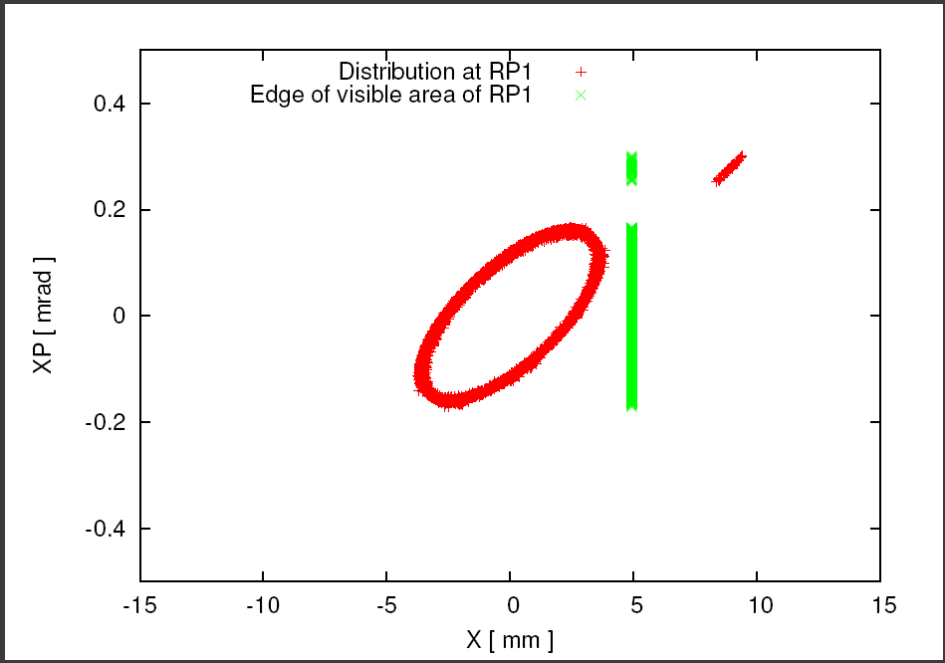
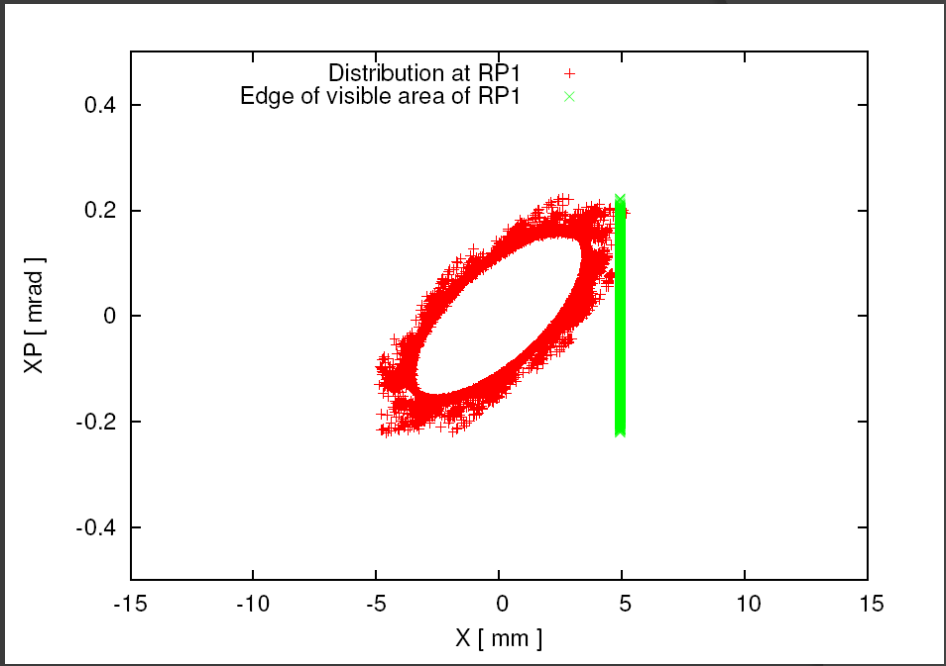




- Total detector dead zone for each RP is equivalent to:
  - @ RP1: 0.8 mm = 1.329 σ_x => particles invisible until they reach 8.155 σ_x !!
  - @ RP2: 0.8 mm = 0.802 σ_x => particles invisible until they reach 7.628 σ_x !!
- Dead zone is included in the fast algorithms; dE/dx and RMS kicks from passage through RP material is not, but is foreseen in later versions for full treatment.

PRELIMINARY RESULTS





- Statistics for 100 particles tracked for 100 turns; 6D distribution with a 0.05 σ_x impact parameter on the crystal. All elements are included (crystal, RP1, RP2, TAL). Lattice is described and tracked using the EVOL tracking code (transfer matrices between specified lattice elements).

- Left: crystal aligned for channeling as described in W. Scandale & A. Taratin, CERN/AT 2008-21. Right: crystal is optimized for volume reflection kicks towards the RP's and the TAL. The latter would be the favored mechanism to study the multi-turn physics of a crystal.