ALFA/ATLAS RP AND MACHINE PROTECTION PANEL

REVIEW: 2/11/2011

How to use the Roman Pots in 2012 and beyond?

- What are the plans of ALFA/ATLAS ?
- What conditions for operation. High beta? Parasitic running with standard physics?

ACHIEVED IN 2011

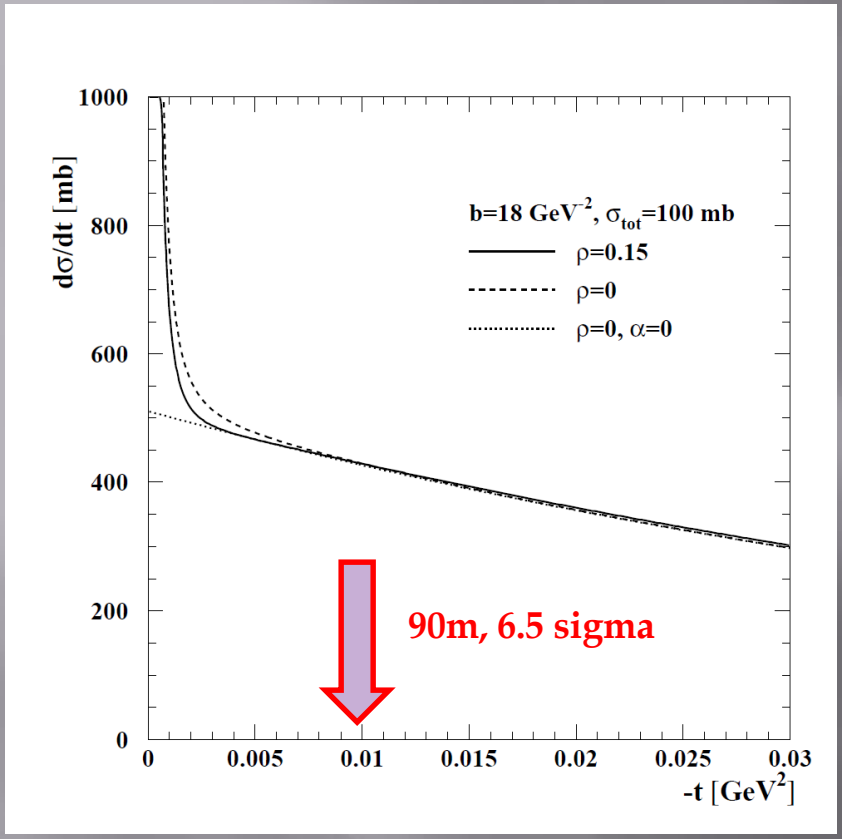
- Pots installed during 2010-11 shutdown
- Complete validation of the Interlock logic. Worked very well. Documented (EDMS note).
- May 2011: 1.7E11p/beam
  - First scraping exercise + data taking (20') at 10 sigma.
  - Very successful
- Various loss maps with protons: β^*=90m but also at β^*=1.5 (pots at 7mm – 2.4E11p/beam). No problem
- Various commissioning runs at 25mm (latency scan, OD….)
- Sept/October: Physics run 1 and 2. After various trials, very efficient data taking. Background?
- Loss map in HI (pots at 7mm)

➡ Quite a lot of movements of the pots! Worked quite well

Two incidents:

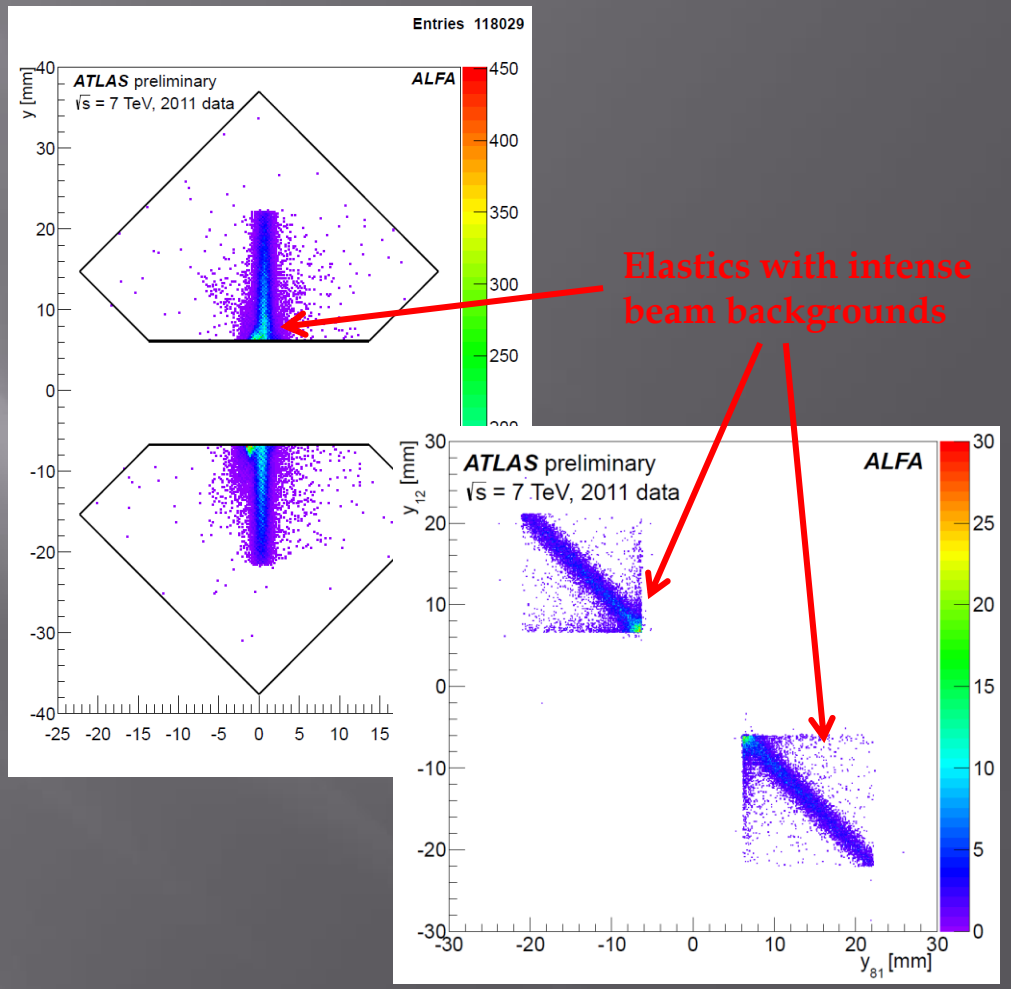
- Lost PXI control. Reboot was needed but beam in the machine….Beam dumped by operator.
- Reset procedure during HI loss map. Weakness of the procedure; not a safety issue (LVDTs are protecting us!).

2 key parameters: t_{min} and beam backgrounds



Plot for 2 x 7 TeV

At 3.5TeV primary energy for same distance/angle slightly smaller *t* accessible



How much alignment & physics analysis suffer from asymmetric, irreducible background ?

PLAN FOR 2012

- Commissioning of the modified Motor Control and Interlocks
- Commissioning of the new OD trigger schema (no longer needed to take separate runs!!)
- Commissioning of the Charge R/O
- Commissioning of the new Trigger Menu schema
  - Loss maps, standard optics – 1 bunch (pots @ 7mm)
  - Take commissioning data at 25mm

PHYSICS:

90m

- Finalize 2011 data analysis
- For beta* 90m statistics is large enough, we have finally to confirm the data quality. Level of background much higher than during May/June runs
- If problematic (because of background) we may ask for a new run in 2012

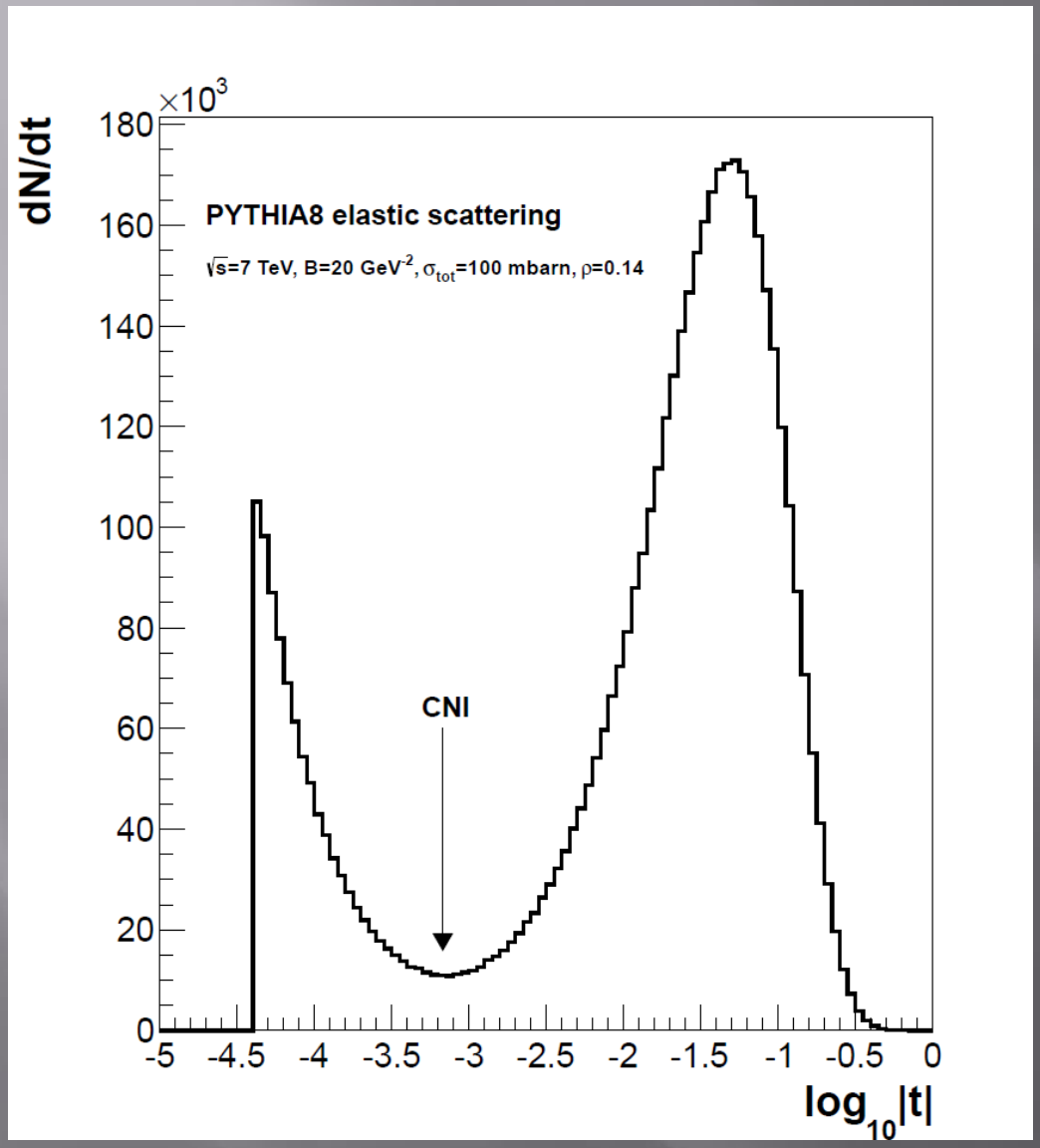
PLAN FOR 2012

PHYSICS @ **HIGH beta**

From M.Aleksa to LPC meeting (28.11.2011)

- Goal is to reach (or to come very close to) the CN interference region in 2012 – seems to be very challenging
- Measurements in CN interference region depend on 4 parameters: beta*, beta at RPs, emittance, and backgrounds
- Goal for optics (exact values to be defined together with machine experts):
  - Highest beta* compatible
  - Increase horizontal phase advance to get better resolution for Theta_X
- A possible scenario:
  - Develop highest possible beta* optics in spring, use MD time to develop the optics!
    - Range under discussion is beta* of 500m – 1000m,
  - Scraping and data taking with high beta* optics in 2 periods (early summer, autumn)

CNI: Update of the t-dependence for 3.5 TeV



Cross over from strong to Coulomb part basically at the same t-values as in the TDR

~ 0.0006 GeV^2

This is related to the underestimated total cross section of 100 mb in TDR. About 100 mb was measured by TOTEM for 3.5 TeV .

Going to 4 TeV will obviously slightly Increase!

t_min versus beta* to reach the CN interfence region.

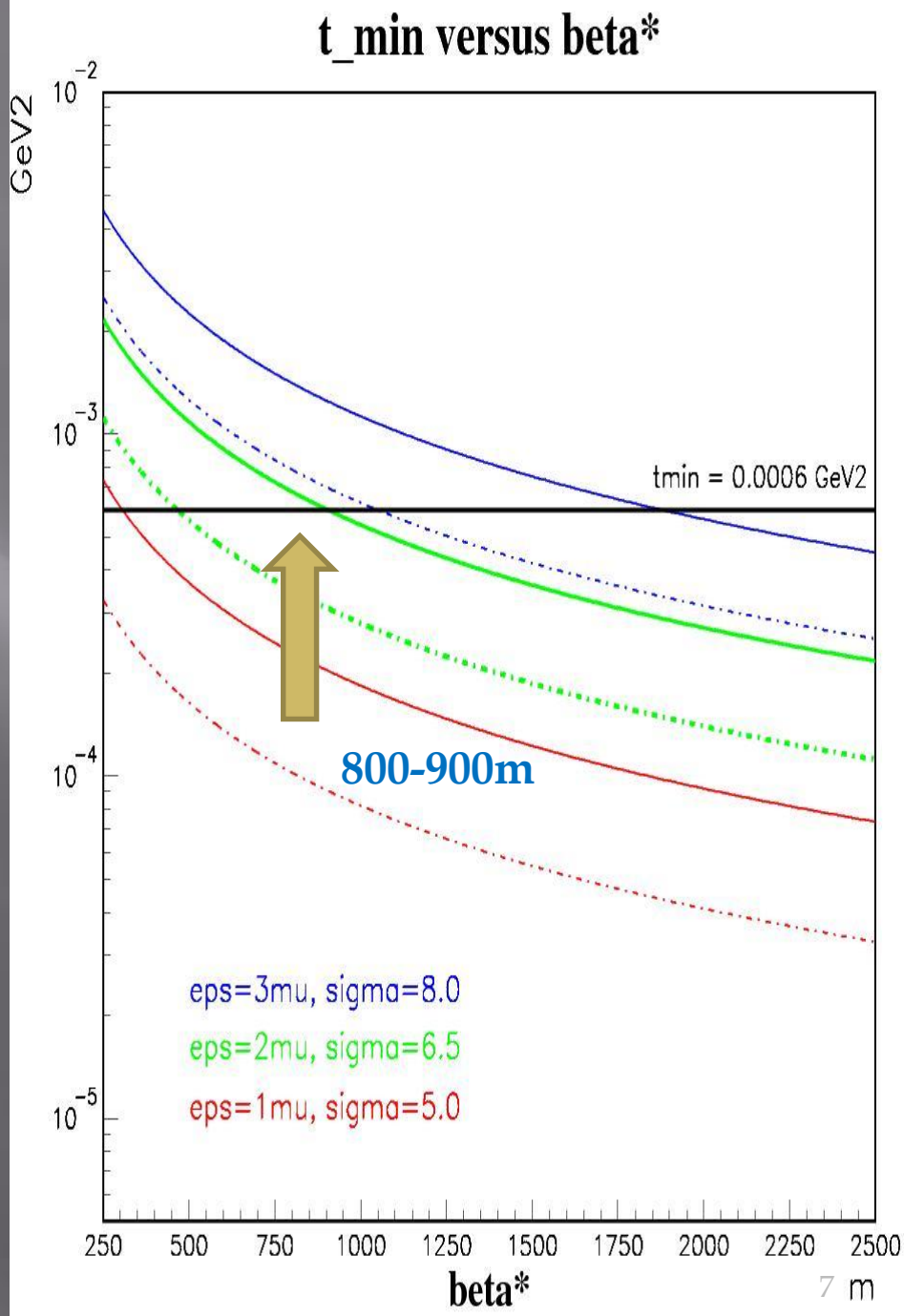
- Coulomb and Nuclear contributions are equal at 0.0006 GeV^2.
- Basically the same as for 7 TeV since in the TDR sigma_tot of 100 mb was assumed, as it is now the value for 3.5 TeV. (TOTEM measured

- In the plot curves for 3 scenarios are plotted: (acceptance 50%)

A) 6.5 sigma, 2mu (as for the 2011 90m run)
B) super-optimistic: 5 sigma, 1mu
C) 8 sigma, 3mu (if background is limiting)

For the combined fit one needs to go beyond the CNI point. Combining this with some realism we have a chance to get sigma_tot from the combined fit in the CNI region with beta* 800-900m.

- The lower beta* the less the probability that we can manage the goal of ALFA already in 2012…..



ALFA/ATLAS community plan for running 2012

Essential input for ALFA/ATLAS:

- The potential (final) measurement of luminosity and sigma_tot already in reach in 2012 ! (excellent beam conditions, pots at 6.5 (or closer) instead of 10 sigmas (TDR)).
- Realistic conditions: emittance close/below 2μ, pots near 6 sigmas, beta* near 800m makes the Physics program possible

But also:

- ATLAS/CMS asked for maximum luminosity (20fb-1) for Higgs search, a large part before summer!
- Very few days will be given to the high beta* program, especially until summer

From optics: (Input from Helmut B.)

- 200 easy!
- 400-500m, very tricky (Limitations of the Qpoles Q4 to Q10 w/o new extra cables and possibly limitations on the aperture).
- We have to expect longer studies to setup safe optics (for 90m 3 fills + AC dipole fill)

Draft schedule: (to be adapted to machine and ATLAS plans)

- Likely no other 90m run (background!), in particular if at the prize of higher beta* optics studies
- Spring: ALFA commissioning, optics development
- Summer: data taking period#1
- Autumn: data taking period#2

ALFA/ATLAS community plan beyond 2012

- 2013-2014: Most probably remove detectors. No major maintenance/upgrade of the detectors
- Plan is to resume with the Physics program at energies higher than 4 Tev, up to 7 Tev.
- To enter CNI, higher energies means higher beta* values
- Higher beta* means higher currents, meaning HW modifications during LS1 (extra power cables). Discussed in previous LMC meetings
- Most probable that we reach CNI at nominal energy (7 Tev) w/o Q4 inversion and special injection schema.