Geometry and optics

Within ATLAS, the ALFA project consists in Roman Pot (RP) type detectors installed in the forward region for measuring elastic scattering at small angles in order to determine the absolute luminosity.
The idea is to go at very small distances from the beam, during runs with special optics designed to have high β^* at least in one of the two transverse planes. The experiment is foreseen to operate with few bunches of very small emittance.

Pics

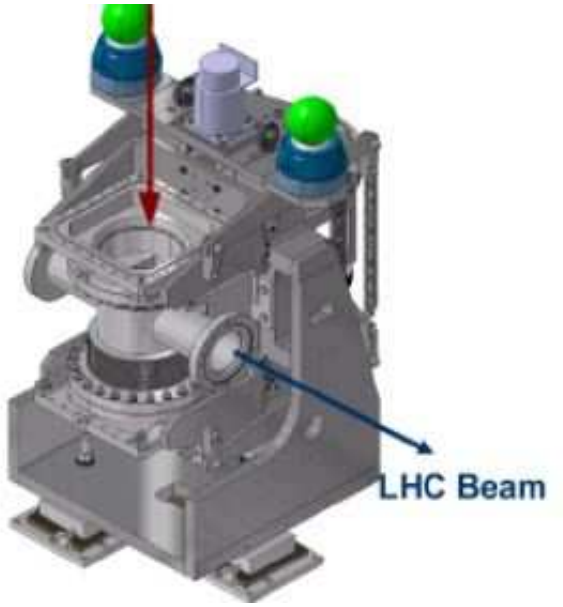

Figure 1: RP as seen from outside.

Beam parameters

- β_x^*=2630 m, β_y^*=2625 m, $\varepsilon_x^n = \varepsilon_y^n$=1 μm

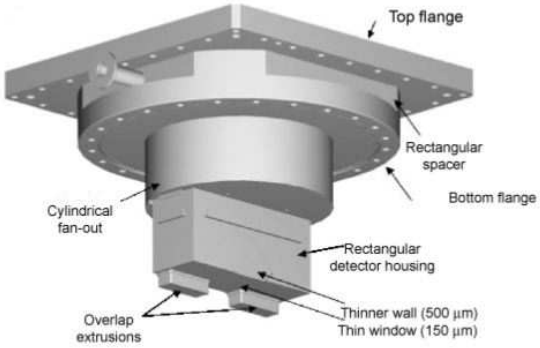

Figure 2: RP as seen from inside.

Optics at Roman pot locations

Two RP detectors are installed on each side of ATLAS, between Q6 and Q7. All 4 Roman pots operate in the vertical plane.

	RP1	**RP2**
s from IP [m]	237.4	241.5
$\beta_x[m]$	81.2	86.4
$\beta_y[m]$	135.1	123.1

Table 1: Location and optics of the 2 RP detectors on one side of ATLAS. The same applies for the other side.

RP settings and dimensions relevant for wall impedance.

During the LHC runs at high luminosity with normal optics the ATLAS RP will remain in the parking position, with detectors at about 4 cm apart from the beam. For this case, having stainless steel or copper coated surfaces is expected to have a negligible effect. Geometric effects related to coupling between the 'cavity-like' structure and the beam have been studied with laboratory measurements and numerical simulations. (see EPAC08 paper). Following those studies ferrite tiles for absorbing RF power have been installed in the available space inside the pots.
During the special runs for which the ATLAS RP have been designed, the

pots will be closed to gaps as small as 10 σ_y (i.e. 1.1 mm). Due to the small distance from the beam, one could think about coating with copper the portion of stainless steel that is closer to the beam. Considering the geometry of a single pot and the 2 pots per beam, such portion amounts to 4 cm * 2 *2 = 16 cm per beam.

Copper gives a higher real part of the wall impedance at frequencies below xxx MHz.

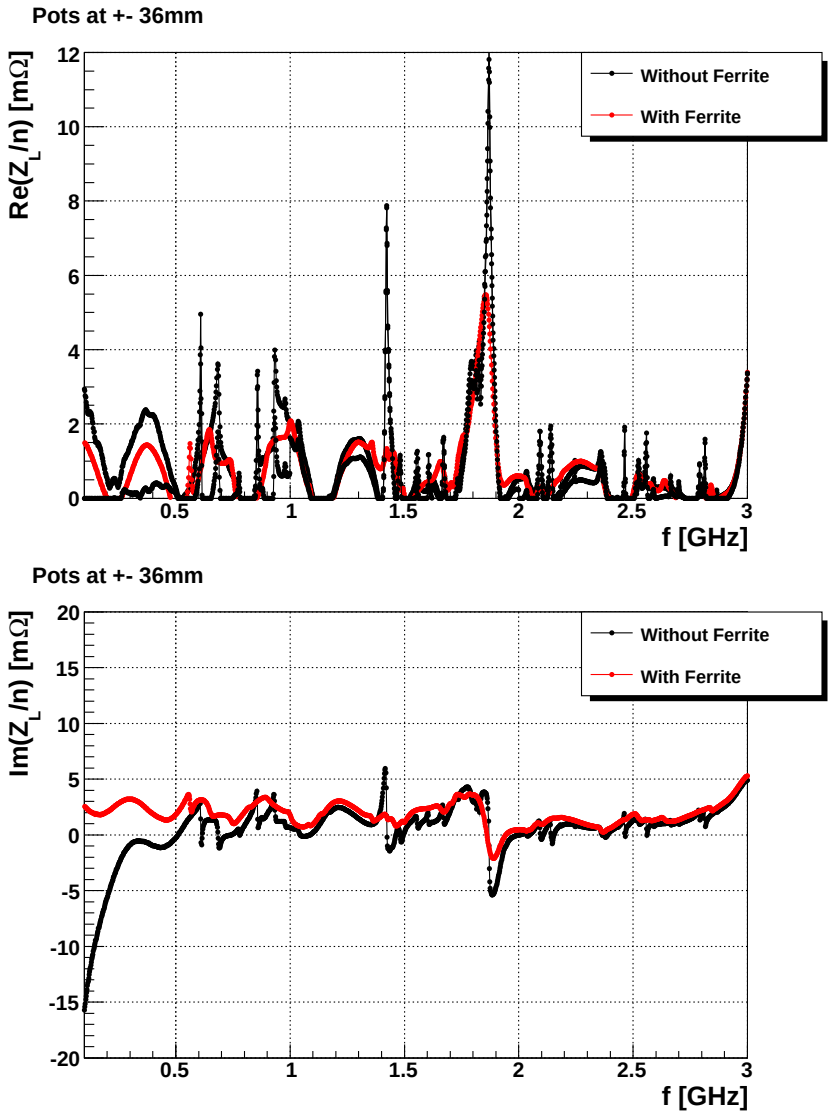

Figure 3: Longitudinal impedance Z_L/n as measured in the laboratory before and after inserting the ferrite tiles