RFA measurements of the "Fast Particles" in Tore Supra

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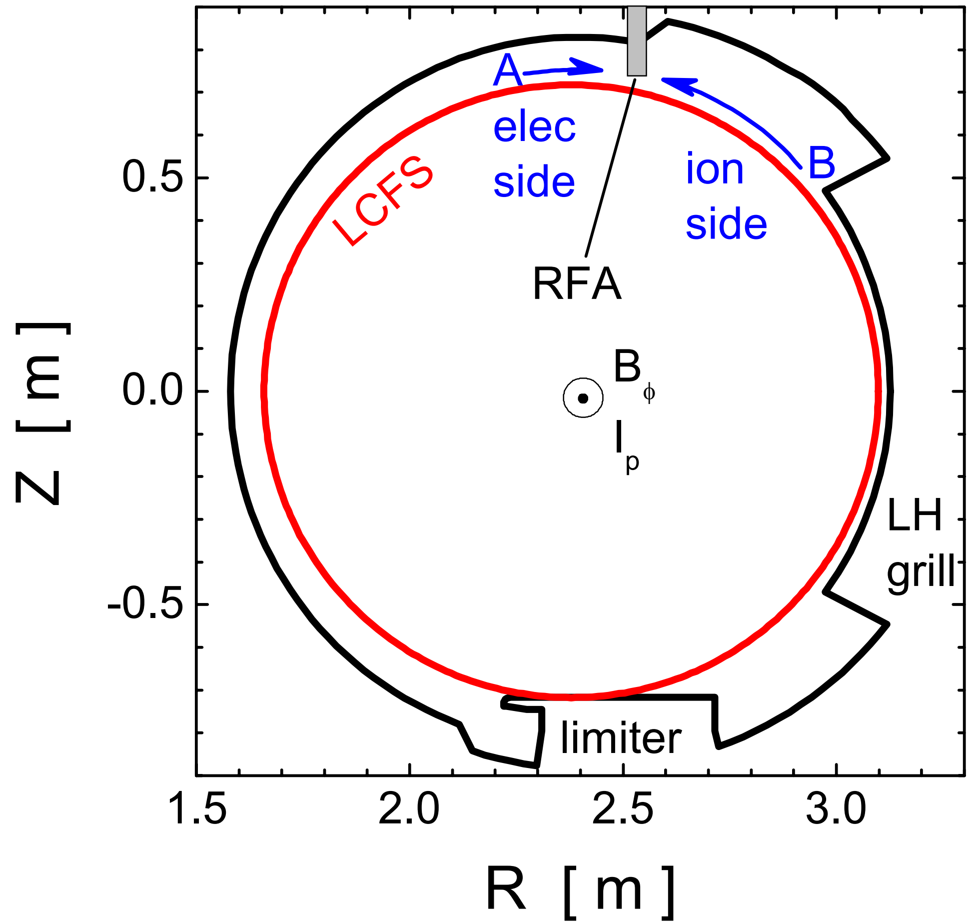
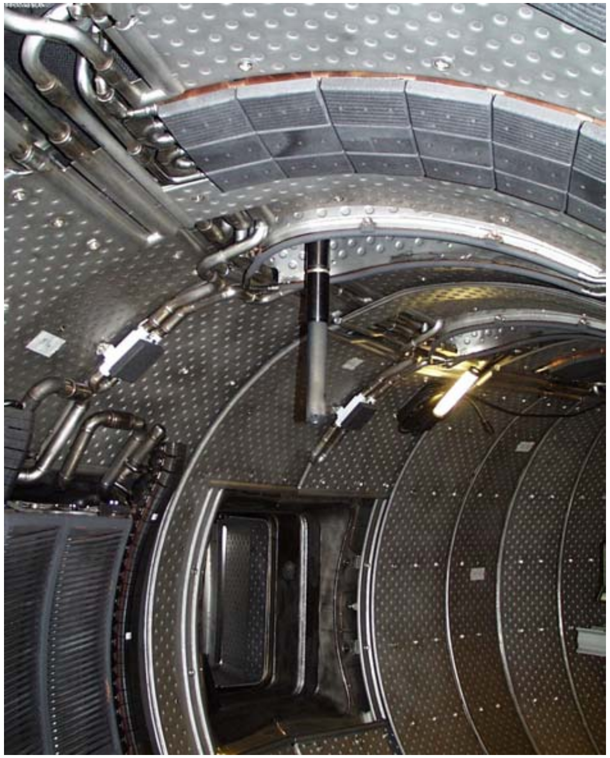
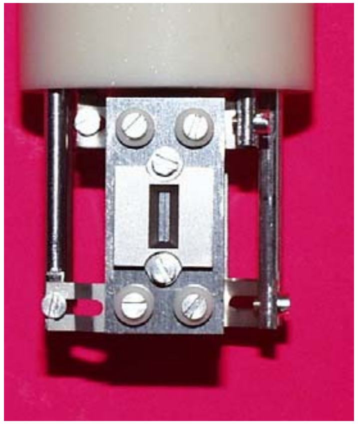
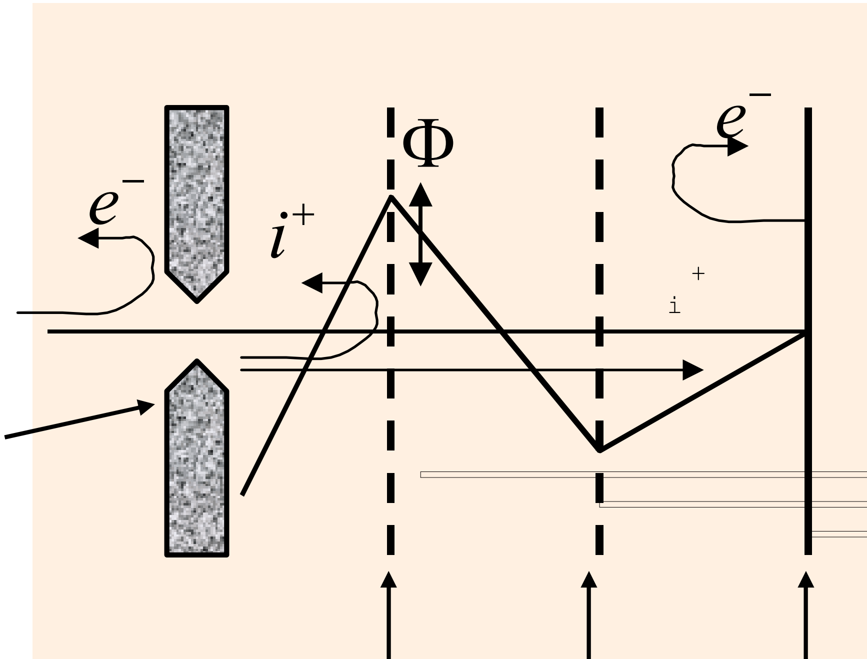
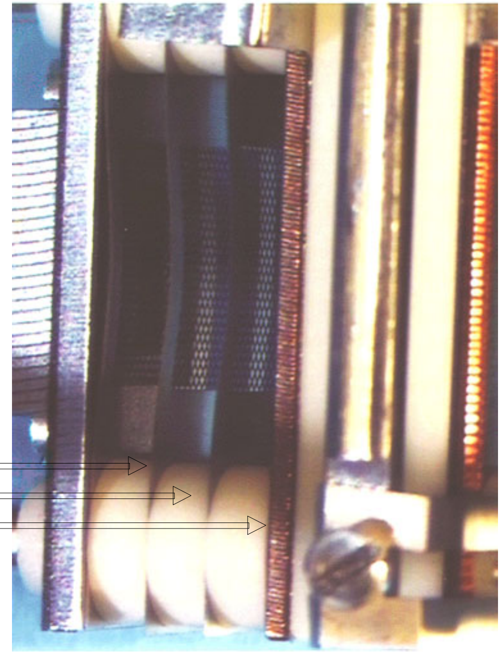
title


0.5
0.0
-0.5
Z [m]
1.5
2.0
2.5
3.0
R [m]
A
B
elec side
ion side
LCFS
RFA
B ϕ
I p
LH grill
limiter









entrance slit (-50 V) : negative voltage to repel thermal electrons

Grid 1 :
variable positive voltage to reject low energy ions;
BUT in our experiment the voltage was zero : all ions go to collector

Grid 2 (-200 V) :
negative voltage to repel secondary electrons

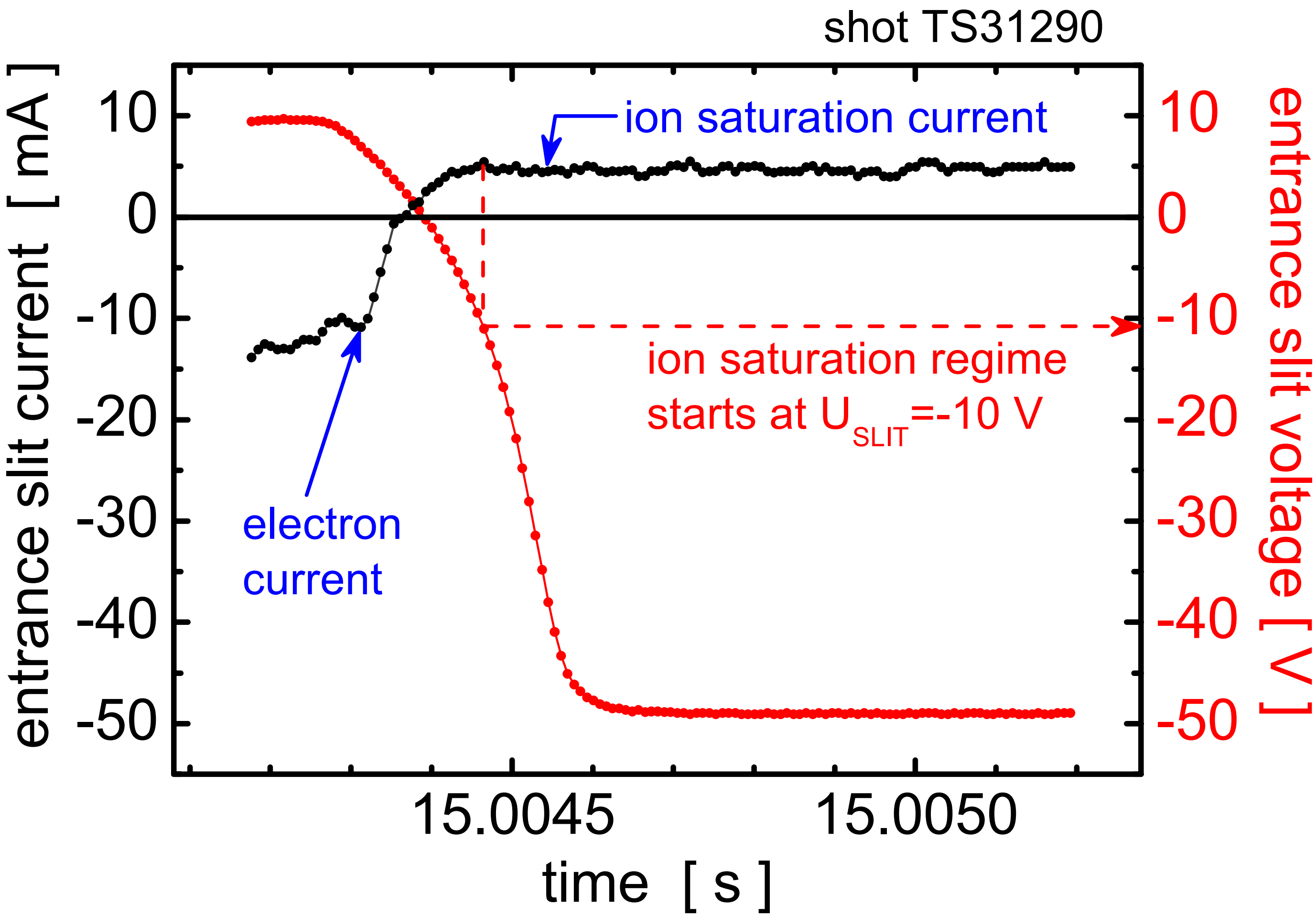
Collector (grounded):
pure ion current characteristic (analysis gives T_i)

No thermal electrons pass through the entrance slit in the ohmic regime

This is verified by sweeping the voltage of the entrance slit from +10 V down to -50 V.

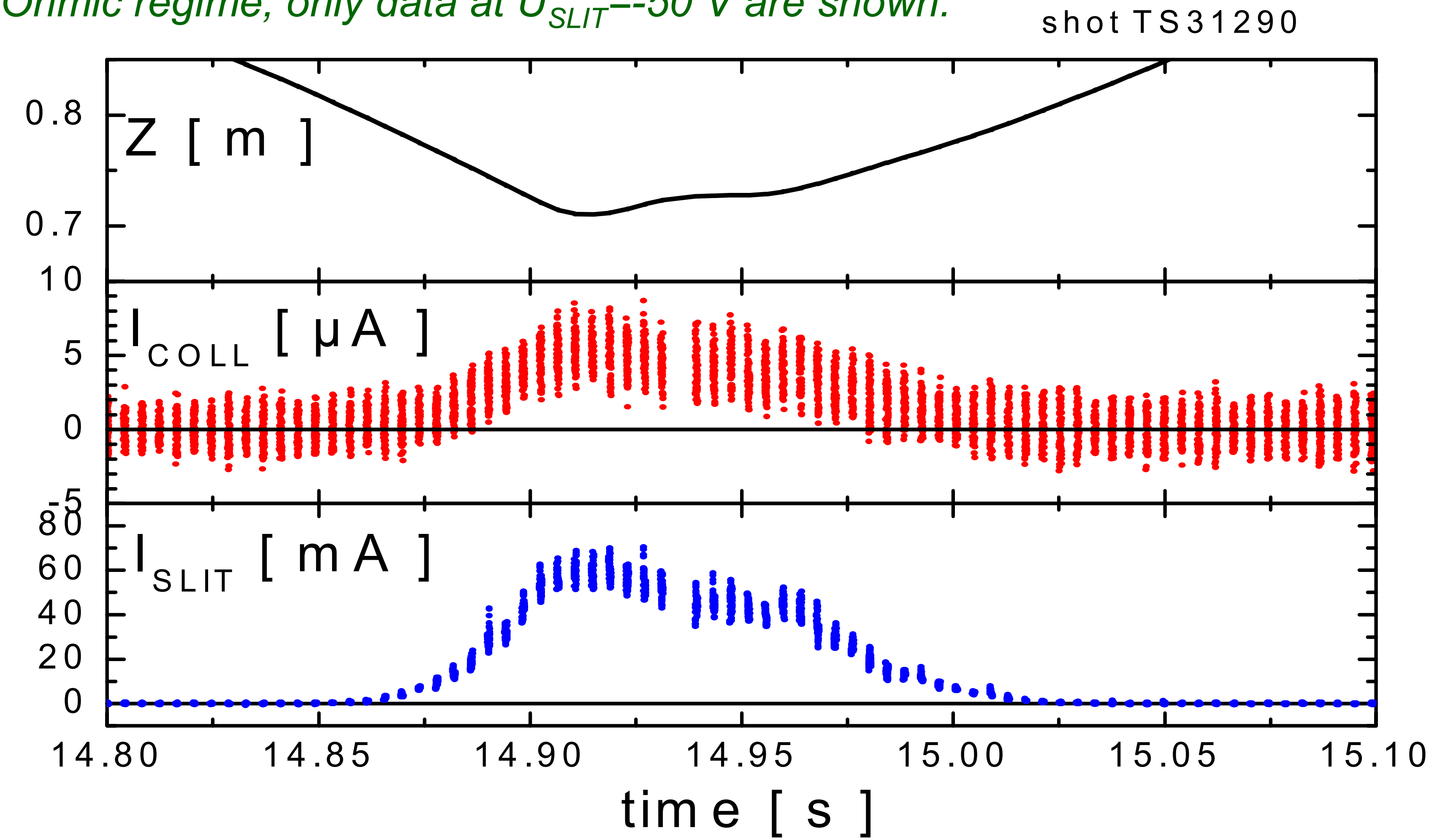
The ion current saturates already at -10 V.

The RFA collector therefore measures pure ion current.

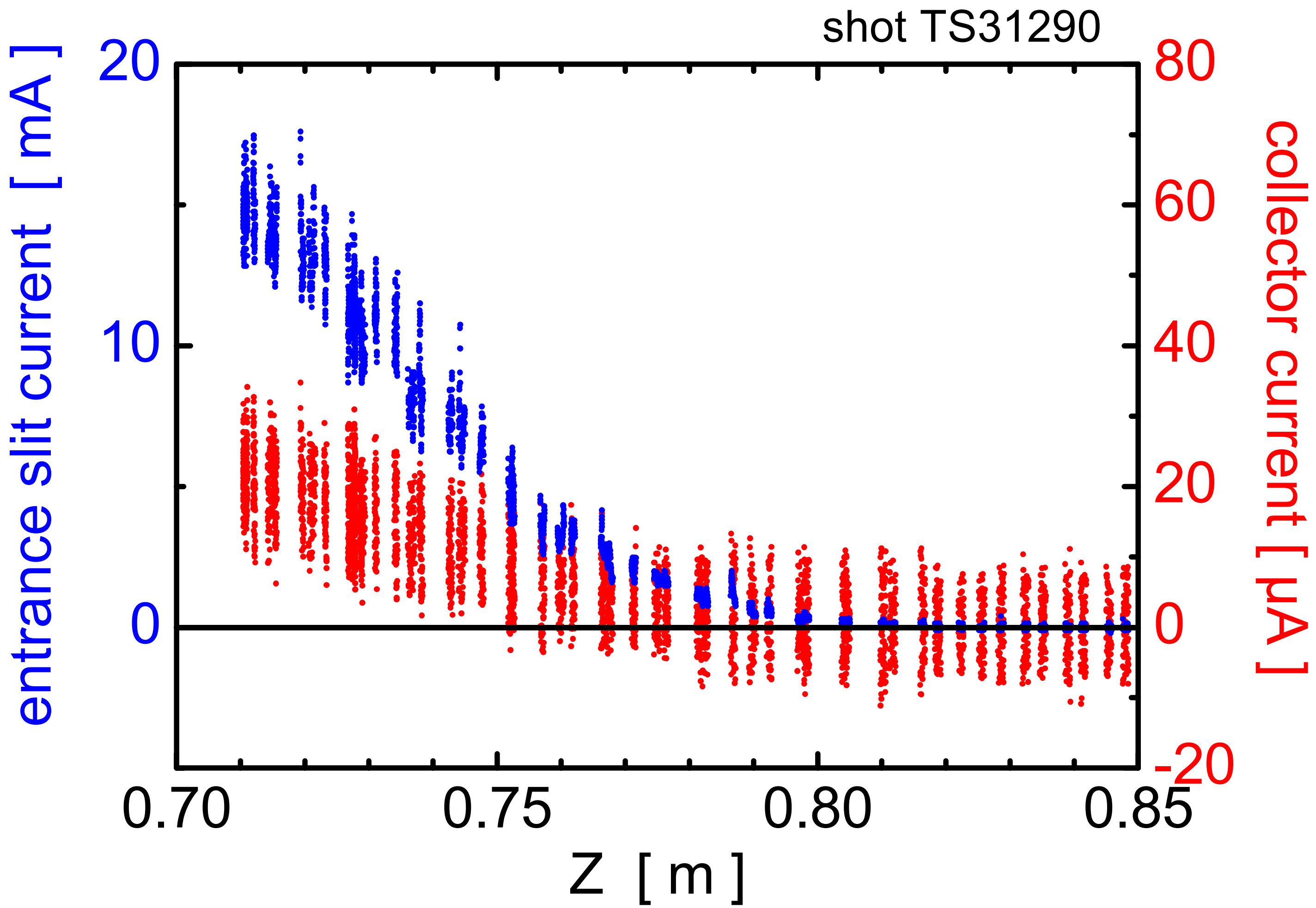


Temporal evolution of ion currents during a probe reciprocation

Ohmic regime; only data at U_{SLIT}=-50 V are shown.



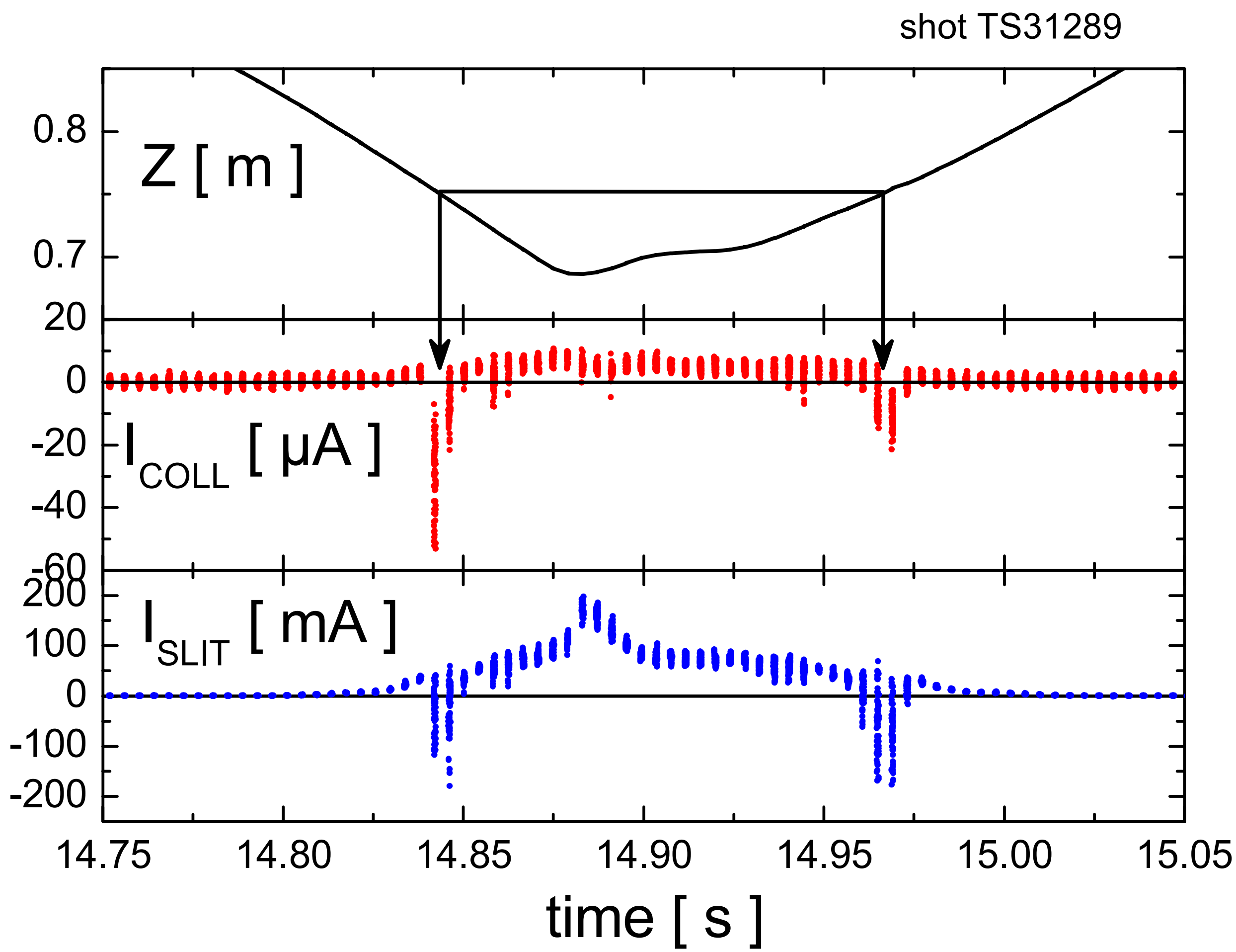
Radial profiles of ion currents in ohmic regime



When antenna C2 is active (1.5 MW) negative current is observed on both the entrance slit and the collector.

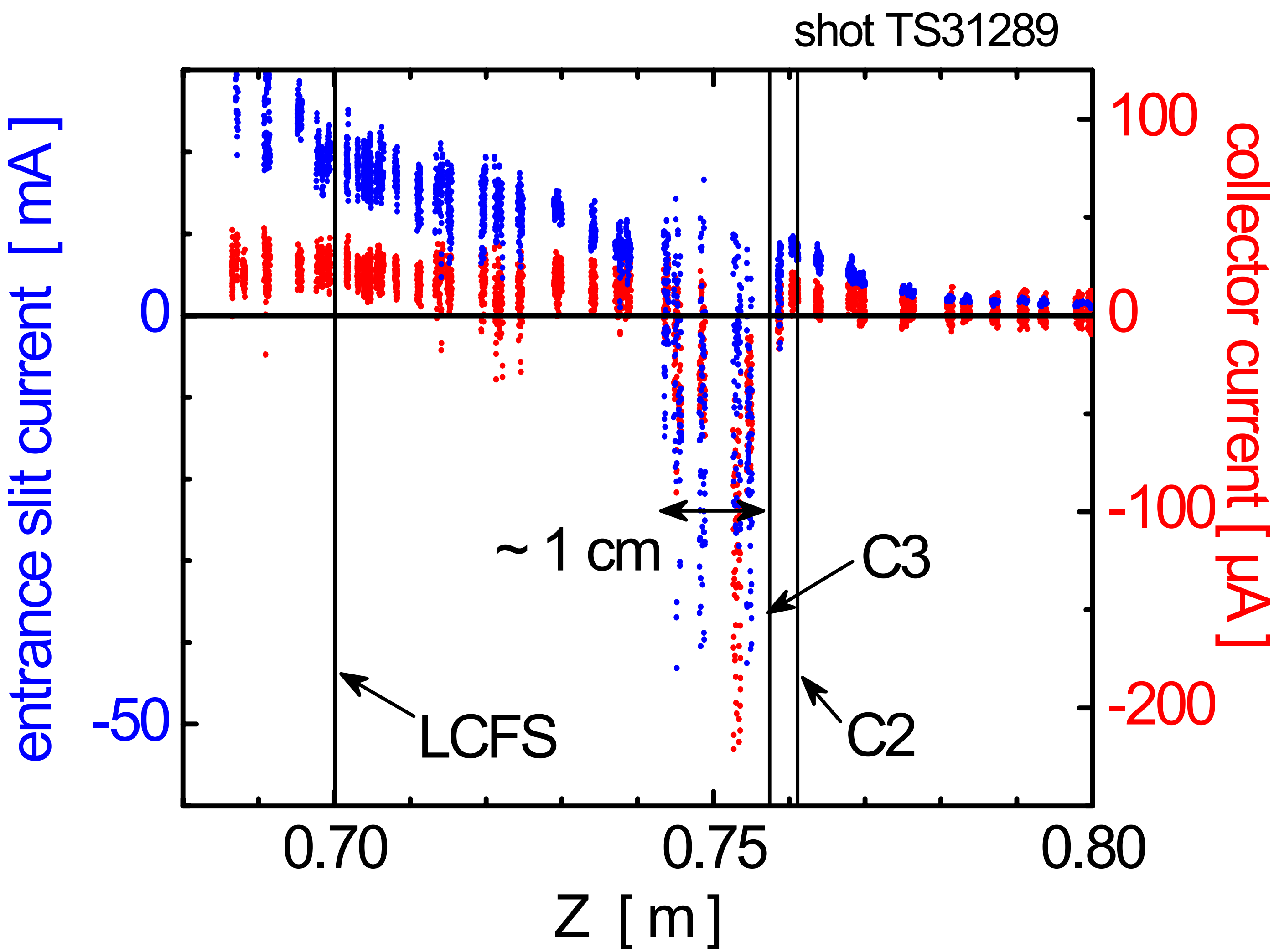
Negative current means that :
(1) the electron flux exceeds the ion flux
(2) the applied potentials are not negative enough to repel the electrons

The negative current is observed at the same position on the inward and outward parts of the probe reciprocation.



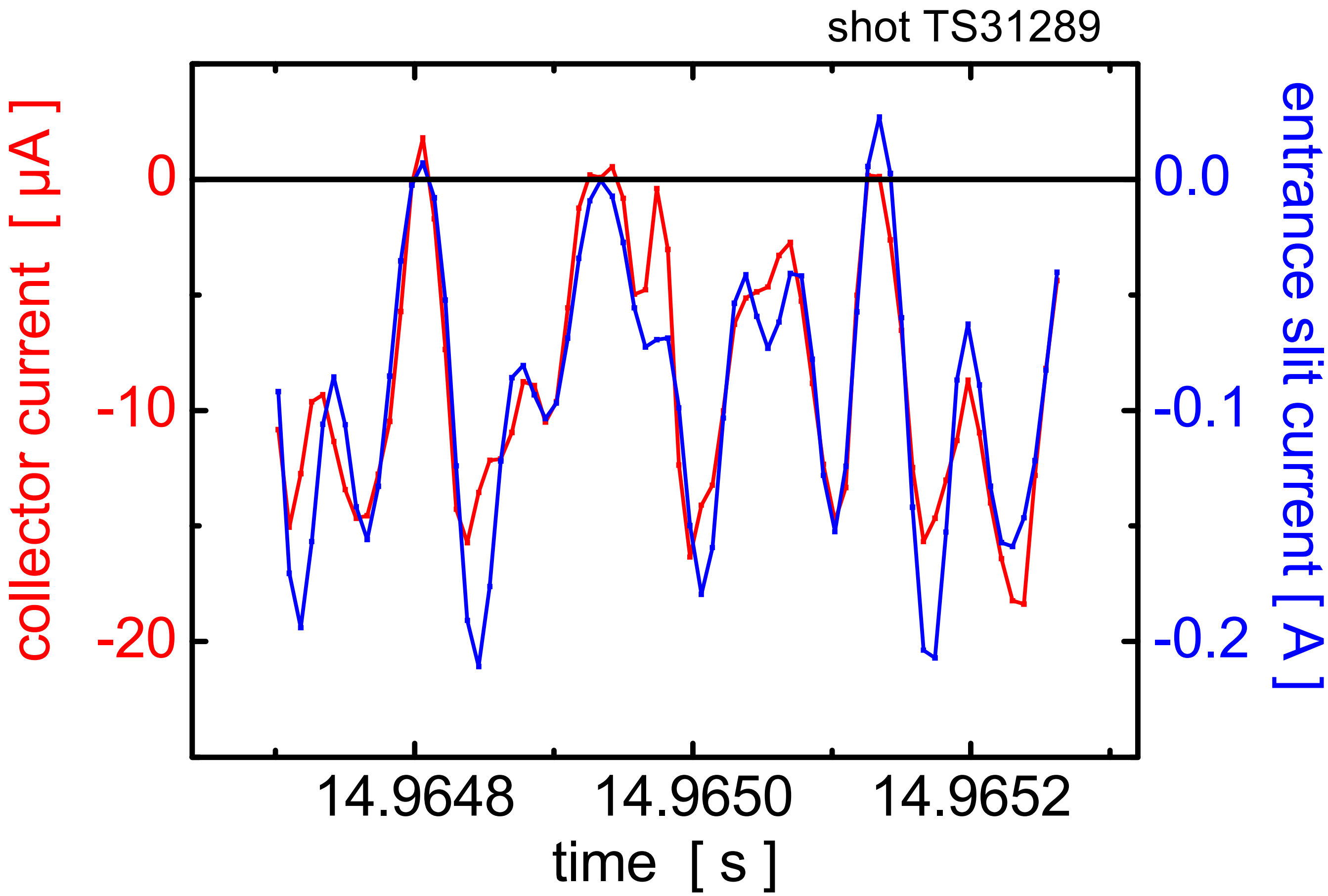
The electron flux is localized in a layer ~1 cm thick.

The outer edge of the electron layer coincides with the leading edge of the LH antennae within the uncertainty of the magnetic measurements (at most ±5 mm).



The electron current on the entrance slit and on the collector comes in rapid bursts (typical frequency in the 10-20 kHz range).

Here we have subtracted the ion saturation currents from the signals to extract the pure electron component.



The transmission factor is defined as the ratio of the electron current densities to the entrance slit and collector. Here we show the transmission factor of the largest bursts. The transmission is higher in the center of the beam.

Electrons that reach the collector have at least 150 eV of kinetic energy as they pass through the entrance slit.

The variation of transmission factor could be qualitatively indicative of the width of the electron distribution function.