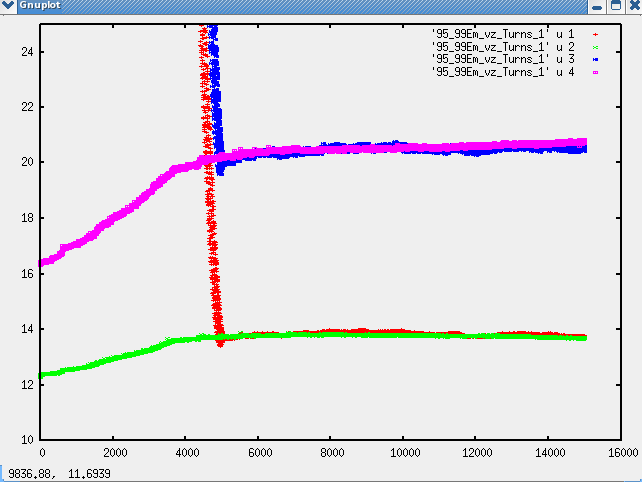
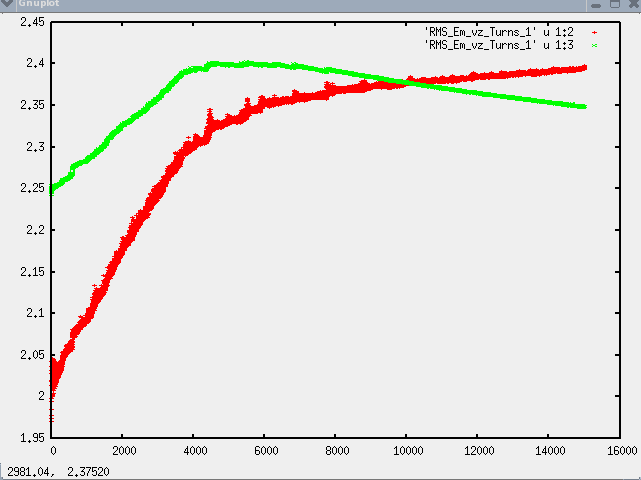
**SIMULATIONS OF THE LINAC4 - PSB INJECTION IN THE PRESENCE OF SPACE CHARGE**

**Issues and progress**

E. Benedetto, V. Forte, M. Martini

3 May 2013

20 TURNS INJECTED BEAM WITH SPACE CHARGE WITH 1% PARTICLES “ARTIFICIALLY” REMOVED (2424 out of 250000) OUTSIDE THE RF BUCKET (STANDARD PIPE+ QH=4.28 & QV=4.55)



**H & V physical 99% emittances**

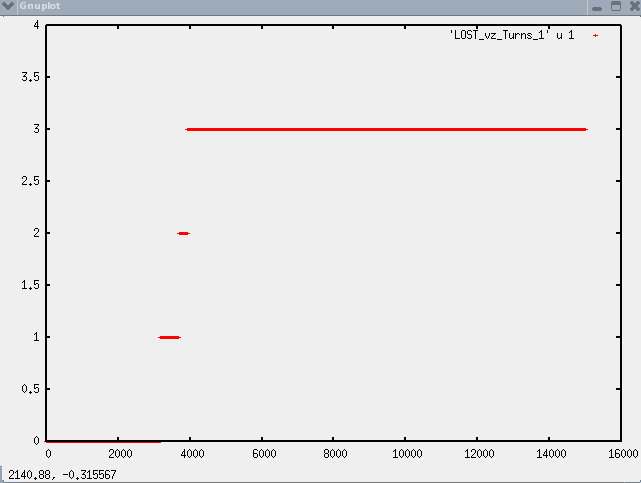
**tracking**

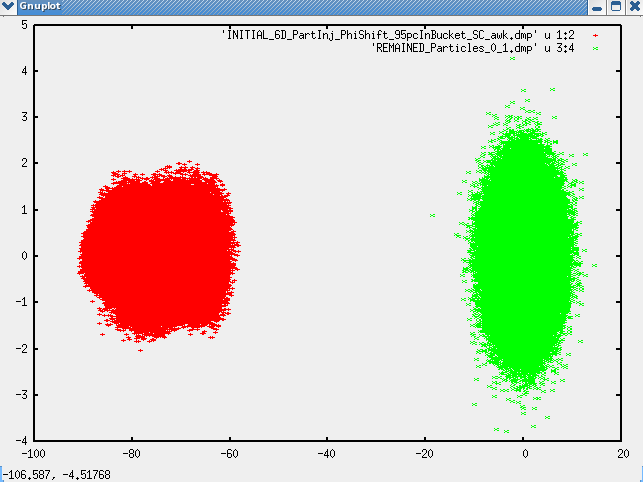
**H & V physical 95% emittances**

**tracking**

**H & V physical RMS emittances**

**tracking**



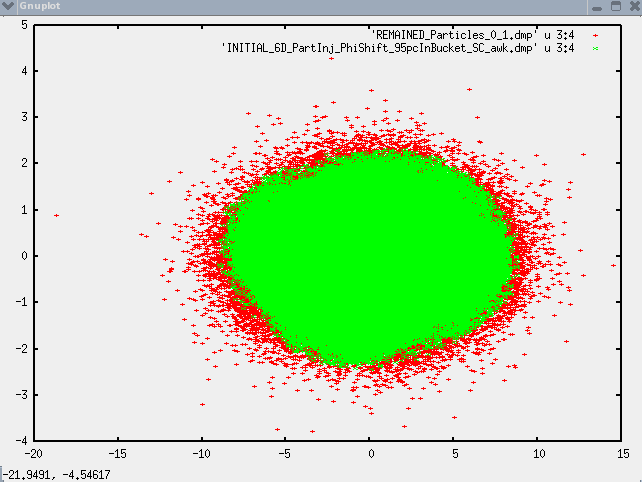


**PARTICLES LOSSES VS TURNS**

**3 macro-particles lost on Beamscope aperture out of 247576**

**H phase space after 20 injected turns with space charge**

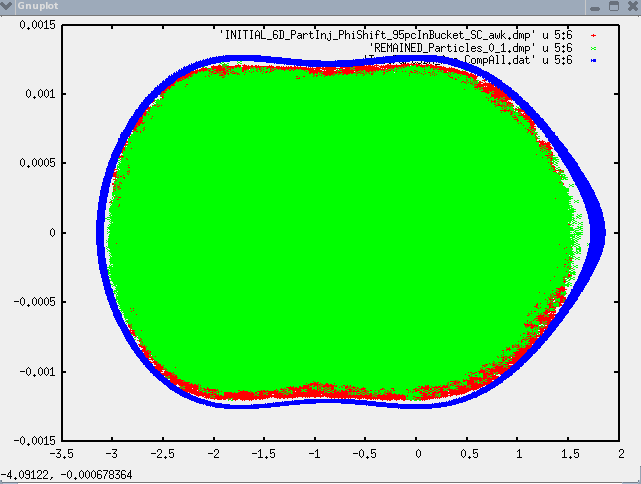
**H phase space after 15021 tracking turns with space charge**



**H phase space after 20 injected turns with space charge**

**tracking**

**V phase space after 15021 tracking turns with space charge**

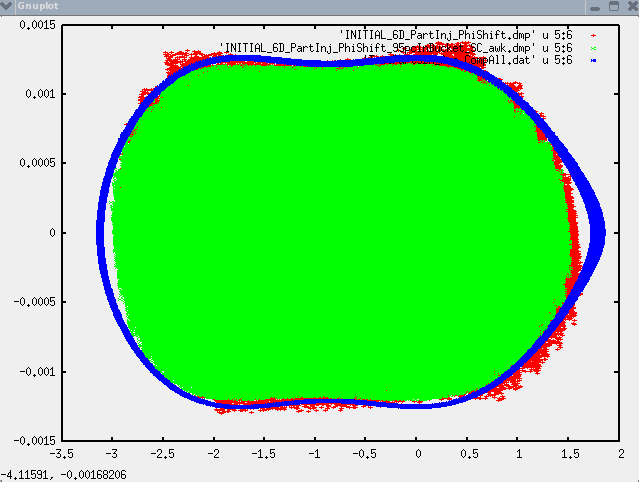


**RF bucket from 160 MeV injection to 170.6 MeV at turn 7000**

**L phase space after 20 injected turns with space charge**

**tracking**

**L phase space after 15021 tracking turns with space charge**



**RF bucket evolution from 160 MeV injection to 170.6 MeV after 7000 tracking turns**

**tracking**

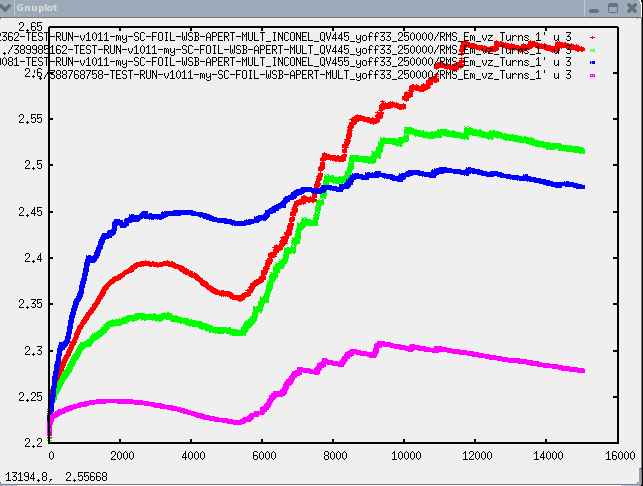
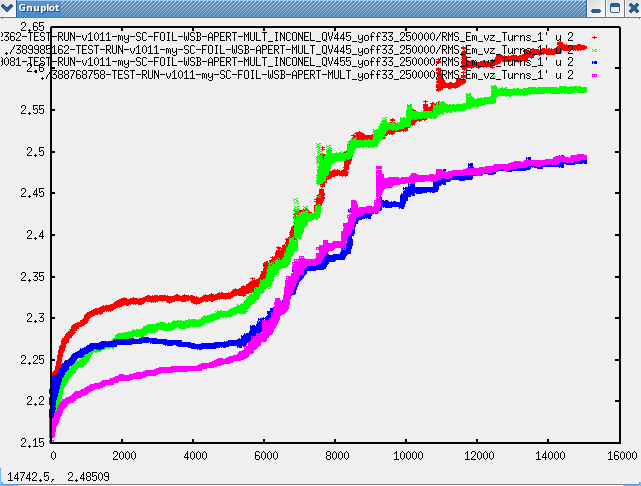
**L phase space after 20 injected turns with space charge and with particles outside the bucket removed**

**tracking**

**L phase space after 20 injected turns without space charge and without particles removed**

18 April 2013

20 TURNS INJECTED BEAM WITHOUT SPACE CHARGE WITHOUT PARTICLES REMOVED OUTSIDE THE RF BUCKET (STANDARD & INCONEL PIPES + QH=4.28 & QV=4.45/4.55)



**STD & QV=4.45**

**tracking**

**INC & QV=4.45**

**tracking**

**INC & QV=4.55**

**tracking**

**STD & QV=4.55**

**tracking**

**V physical RMS emittances**

**tracking**

**INC & QV=4.45**

**tracking**

**STD & QV=4.45**

**tracking**

**INC & QV=4.55**

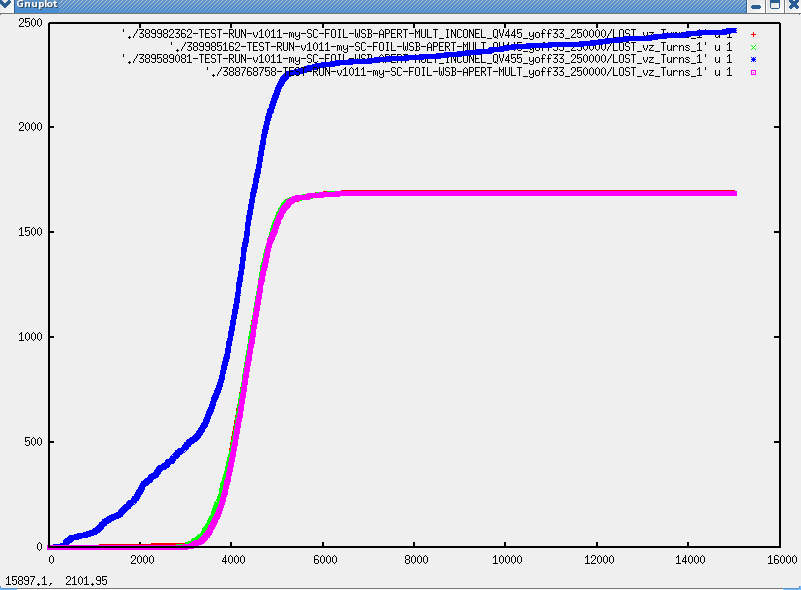
**tracking**

**STD & QV=4.55**

**tracking**

**H physical RMS emittances**

**tracking**



**INC & QV=4.45**

**tracking**

**INC & QV=4.55**

**tracking**

**STD & QV=4.45**

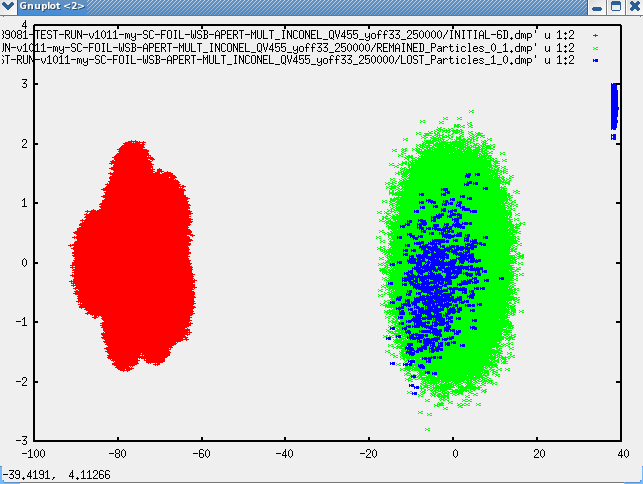
**tracking**

**STD & QV=4.55**

**tracking**

**~1700 particles lost on Beamscope aperture out of 250000**

**PARTICLES LOSSES ON APERTURE (Beamscope) VS TURNS**

INCONEL PIPE **+** QH=4.28 & **QV=4.55** 

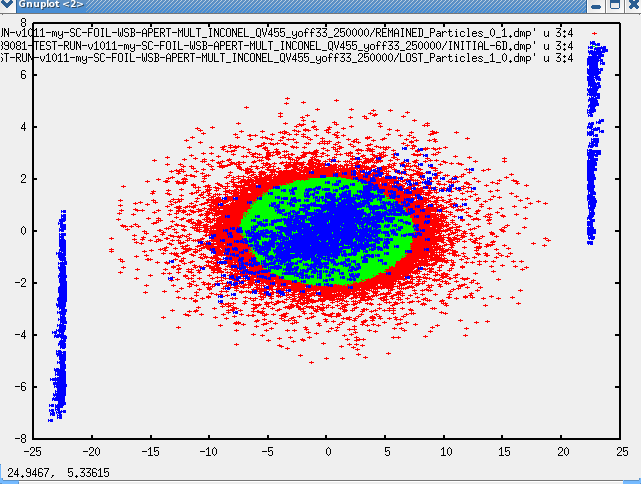
**H phase space after 20 injected turns without space charge**

**INC & QV=4.55**

**tracking**

**H phase space after 15000 tracking turns with space charge**

**Particles lost on aperture**



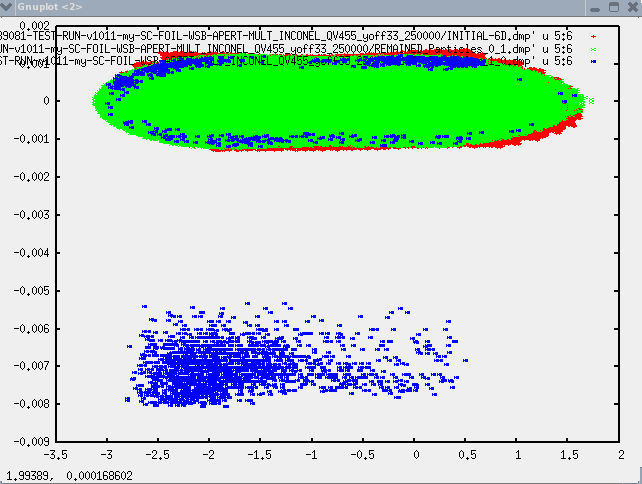
**V phase space after 20 injected turns without space charge**

**V phase space after 15000 tracking turns with space charge**

**Particles lost on aperture**

**INC & QV=4.55**

**tracking**



**L phase space after 20 injected turns without space charge**

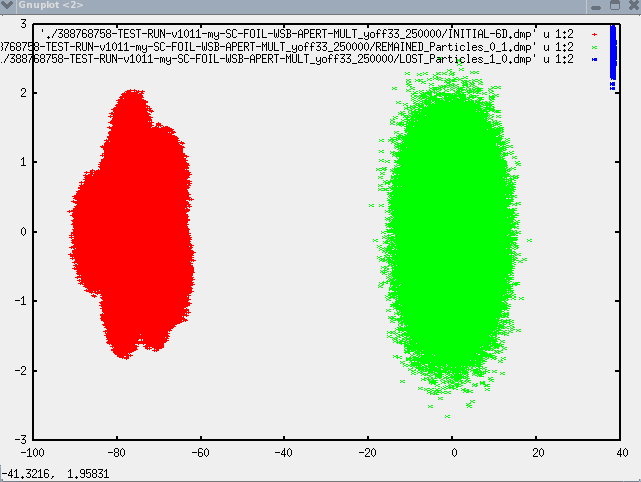
**L phase space after 15000 tracking turns with space charge**

**Particles lost on aperture**

**INC & QV=4.55**

**tracking**

STANDARD PIPE **+** QH=4.28 & **QV=4.55**



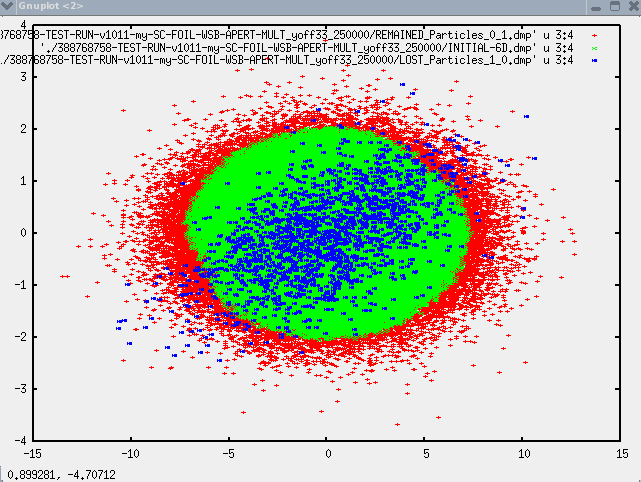
**H phase space after 20 injected turns without space charge**

**STD & QV=4.55**

**tracking**

**H phase space after 15000 tracking turns with space charge**

**Particles lost on aperture st**



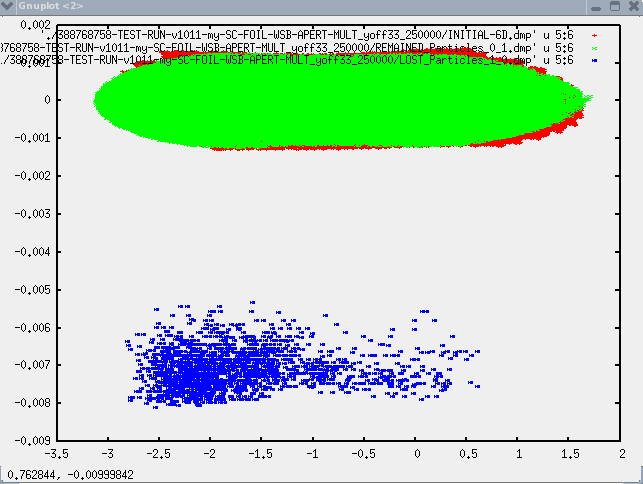
**V phase space after 20 injected turns without space charge**

**V phase space after 15000 tracking turns with space charge**

**Particles lost on aperture**

**STD & QV=4.55**

**tracking**



**L phase space after 20 injected turns without space charge**

**L phase space after 15000 tracking turns with space charge**

**Particles lost on aperture**

**STD & QV=4.55**

**tracking**