## science & Technology Facilities Council Daresbury Laboratory



BASROC

GPT modelling (with space charge)

Repeat the matching while progressively increasing the bunch charge from zero up to 80 pC; Use the quadrupole settings obtained at the previous (lower) bunch charge as a starting point.

The degree of agreement between 0 and 80 pC is very good; this suggests that the combination

35 MeV beam from the exit of the second superconducting module;

· Using the Twiss parameters derived from the MAD modelling;

Initially repeated with zero bunch charge;

of 80 pC and 35 MeV is not too difficult for this technique

FR5REP107

## **Modelling the ALICE Electron Beam Properties Through** the EMMA Injection Line Tomography Section

EMMA:

- Electron Machine with Many Applications; Non-scaling electron FFAG being built at Daresbury aboratory;
- NS-FFAGs related to EMMA have an
- inprecedented potential for:
- · Medical accelerators for carbon and proton hadron therapy;
- ADSR (Accelerator Driven Sub-critical Reactor).

Matched into the existing tomography section design for EMMA <sup>╽</sup>╅╬╬╫┟╪┸╤┸╪─══──<u>╬</u>Ŋ╬╓╫╪╢╢╢╢ Tomography section - $\beta_{xy}$  for the ALICE to EMMA injection line

Standard ALICE tuning:

8.35 MeV injector beam;

MAD8 modelling (no space charge)

(MAD - no space charge).

26/03/09 15 22 29

26/03/09 15:22.2

Science & Technology Facilities Council

Initial modelling of the ALICE to EMMA injection line with MAD8;

35 MeV after second superconducting module;

1.8

16

1.4 12

1.0 0.8

0.6 0.4

> 26.2 26.6 27.0

β<sub>x,v</sub> EMMA injection line tomography section

(MAD - no space charge).



## **EMMA** injection line

 Upgraded to operate at the nominal ALICE operating energy of 35 MeV (c.f 20 MeV max. for EMMA) by:

- Uprating of the magnet power supplies;
- Addition of OTR screens in parallel with the original YAG screens

· Magnets did not need changing; EMMA tomography section can now used to measure the





## COLLABORATION



BROOKHAVEN NATIONAL LABORATORY







Note that zero metres on GPT plots corresponds to s = 15.7 m on the MAD results.



Gradient of guadrupole ALICE ST1-QUAD-01 (T/m) (in ALICE prior to the extraction dogleg) at 35 MeV and a range of bunch charges, after using GPT to re-match in the presence of space charge.

> Work supported by STFC #david.holder@stfc.ac.ul



 $\beta_{\textbf{x},\textbf{y}}$  for the tomography section of the ALICE to EMMA injection line from GPT at 35 MeV and 80 pC, with no correction for space charge.

**Fermilab** 



EMMA injection line from GPT at 35 MeV and 80 pC, following correction for space charge.

RIUMF

