The 2022 Workshop on Fixed Field Alternating
Gradient Accelerators - FFA school
Cosener's House, OX, UK, 25-26/09/2022

A quick tour of zgoubi code and methods

1/ Zgoubi numerical methods, basics:
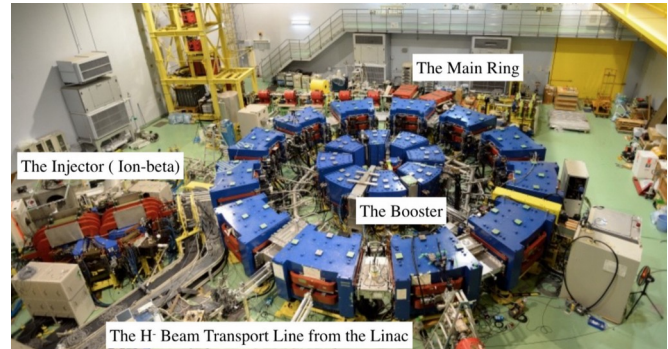### *let's turn pages in the Users' Guide*

2/ Example, tut exercise #1: Radial FFAG multiple-dipole

Use the INDEX (p. ~367) to stroll around in the Users' Guide

An FFAG radial dipole triplet
looks like this in real life (KEK, early 2000s):

Twelve of these triplets are assembled
in this 150 MeV proton ring:

Lookup FFAG keyword in the INDEX - 2 **bold** numbers in general:

Let's go to p. 115 (PART A):

p. 115 - A principle sketch. Coding allows up to 5 dipoles within AT sector
Computation of local field and derivatives at particle location are
either analytical (all formulas coded in the source code) ... Eq. 1.3.25

p. 102 - … or may instead use a small flying grid centered at particle location Fig. 23

p. 101 - Individual dipole field and derivaitves are then superimposed using Eqs. 6.3.23, 6.3.24

Coding in zgoubi.dat: back to the INDEX, or a glossary pp. 217, 218 as well will take you PART B, p. 264 ...

We'll go into the details during the radial FFAG tutorial (follows David's spiral FFAG tutorial)
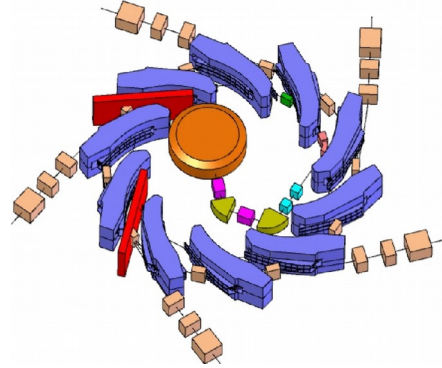
3/ Example, tut exercise #2: Spiral FFAG dipole → David

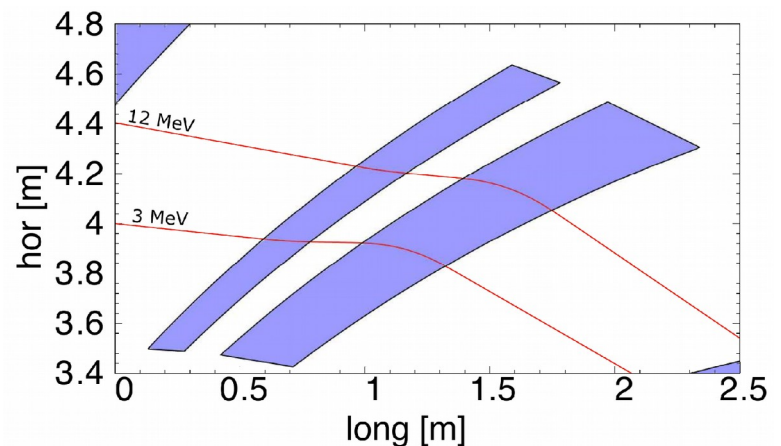*Use the INDEX (p. ~367) to stroll around in the Users' Guide*

A spiral FFAG dipole
looks like this in real life (RACCAM):

Twelve such spiral dipoles are assembled in this
principle 180 MeV hadrontherapy ring (RACCAM):

Actually, a spiral dipole doublet is going to be dealt with, with David:

Lookup FFAG-SPI keyword in the INDEX -   2 **bold** numbers in general:

Let's go to p. 114 (PART A):

p. 118 -   A principle sketch. Coding allows up to 5 dipoles within AT sector
Computation of local field and derivatives at particle location are
either analytical (all formulas coded in the source code) ...   Eq. 6.3.27

p 102 -   … or may instead use a small flying grid centered at particle location   Fig. 23

p. 101 -   Individual dipole field and derivaitves are then superimposed using   Eqs. 6.3.23, 6.3.24

Coding in zgoubi.dat: PART B, p. 265

4/ Example, tut exercise #3: Vertical FFAG dipole → Marion

Developed in zgoubi the past 2~3 years by Marion and co-workers @ ULB

quite a piece of art form my point of view

*You won't be able to use the INDEX in the Users' Guide: still needs be documented.
Placeholders are in place though, see p. 215 (PART A), p. 218 (PART B),*