

Distortion of Longitudinal Phase Space in FFAG Rings

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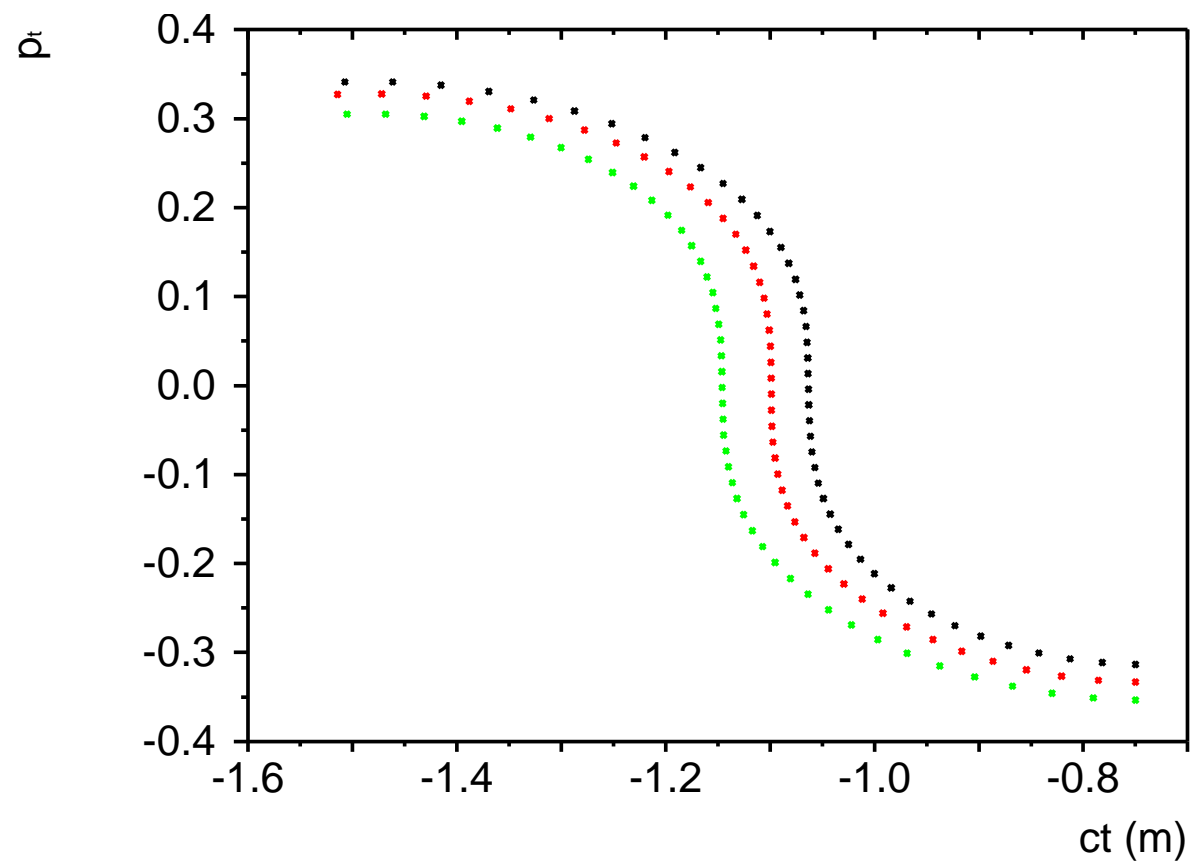
My WWW home directory:

`http://keil.home.cern.ch/keil/
MuMu/Doc/FFAG_Apr04/distort.pdf`

Different distortions in FDO and FODO lattices

- FDO lattice accelerates muons from 10 to 20 GeV with reference energy and transition at 15 GeV in 9 turns
- FODO lattice accelerates muons from 6 to 20 GeV with reference energy at 16 GeV and second zero of flight time at about 10 GeV
- Graphs show longitudinal phase space trajectories of 3 particles, launched with slightly different momentum errors on their respective closed orbit
- Difference of final t positions much larger in the FODO lattice
- Tables give initial and final particle coordinates from edited MAD output
 - Column labelled q gives positions x and t in metres
 - t is multiplied by the speed of light c
 - Column labelled p gives momenta p_x and p_t relative to reference momentum
 - Always $y = 0$ and $p_y = 0$
- Does distortion depend on accelerating range?

Distortion in FDO lattice



Initial coordinates in FDO lattice

Number		q	p
1	x	-0.01920461	-0.01863998
	t	-0.75000000	-0.31333333
2	x	-0.01924719	-0.01983984
	t	-0.75000000	-0.33333333
3	x	-0.01914568	-0.02104053
	t	-0.75000000	-0.35333333

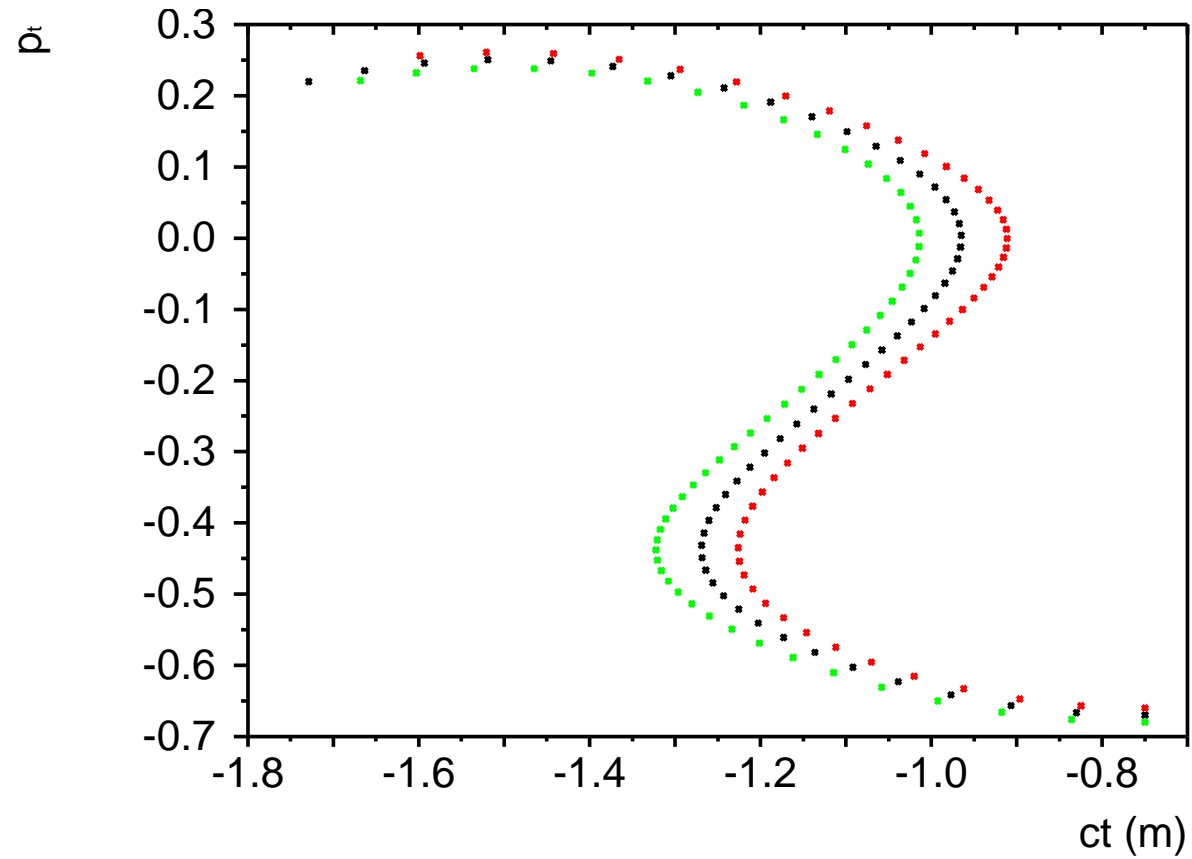
- Particles launched at $ct = -\lambda_{RF}/2 = -0.75$ m with $p_t = -1/3 \pm 0.02$

Final coordinates in FDO lattice

Number		q	p
1	x	0.06492144	0.04542468
	t	-1.50718996	0.34118215
2	x	0.06262897	0.04174988
	t	-1.51420728	0.32728471
3	x	0.06541232	0.03978966
	t	-1.50504627	0.30493856

- Particles accelerated to $0.305 \leq p_t \leq 0.341$ at $-1.514 \leq ct \leq 1.505$ m
- Spreads $\delta p_t = 0.03624$ and $\delta ct = 0.00916$ m

Distortion in FODO lattice



Initial coordinates in FODO lattice

Number		q	p
1	x	-0.04589504	-0.00873563
	t	-0.75000000	-0.67000000
2	x	-0.04663202	-0.00886573
	t	-0.75000000	-0.66000000
3	x	-0.04511468	-0.00859759
	t	-0.75000000	-0.68000000

- Particles launched at $ct = -\lambda_{RF}/2 = -0.75$ m with $p_t = -0.67 \pm 0.01$

Final coordinates in FODO lattice

Number		q	p
1	x	0.06410955	0.01135700
	t	-1.72892735	0.22018241
2	x	0.06955448	0.01369476
	t	-1.59847399	0.25619630
3	x	0.06169472	0.01043253
	t	-1.66825004	0.22122981

- Particles accelerated to $0.305 \leq p_t \leq 0.341$ at $-1.514 \leq ct \leq 1.505$ m
- Spreads $\delta p_t = 0.03601$ and $\delta ct = 0.13045$ m
- δp_t similar to FDO case
- δct 14 times larger than FDO case