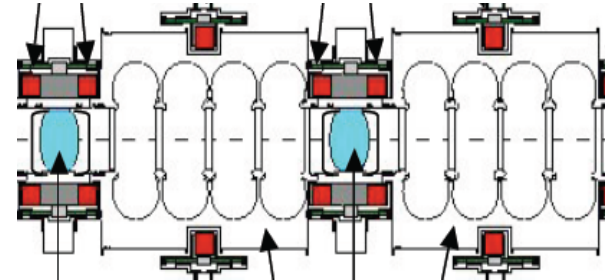
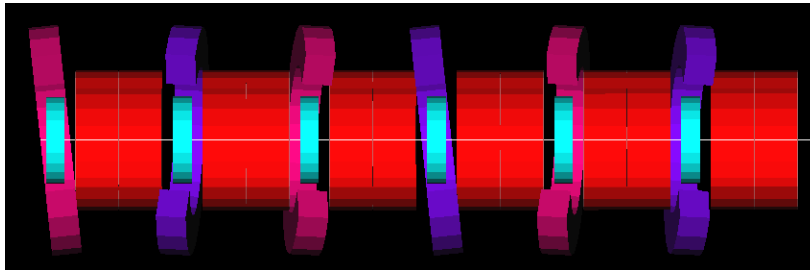


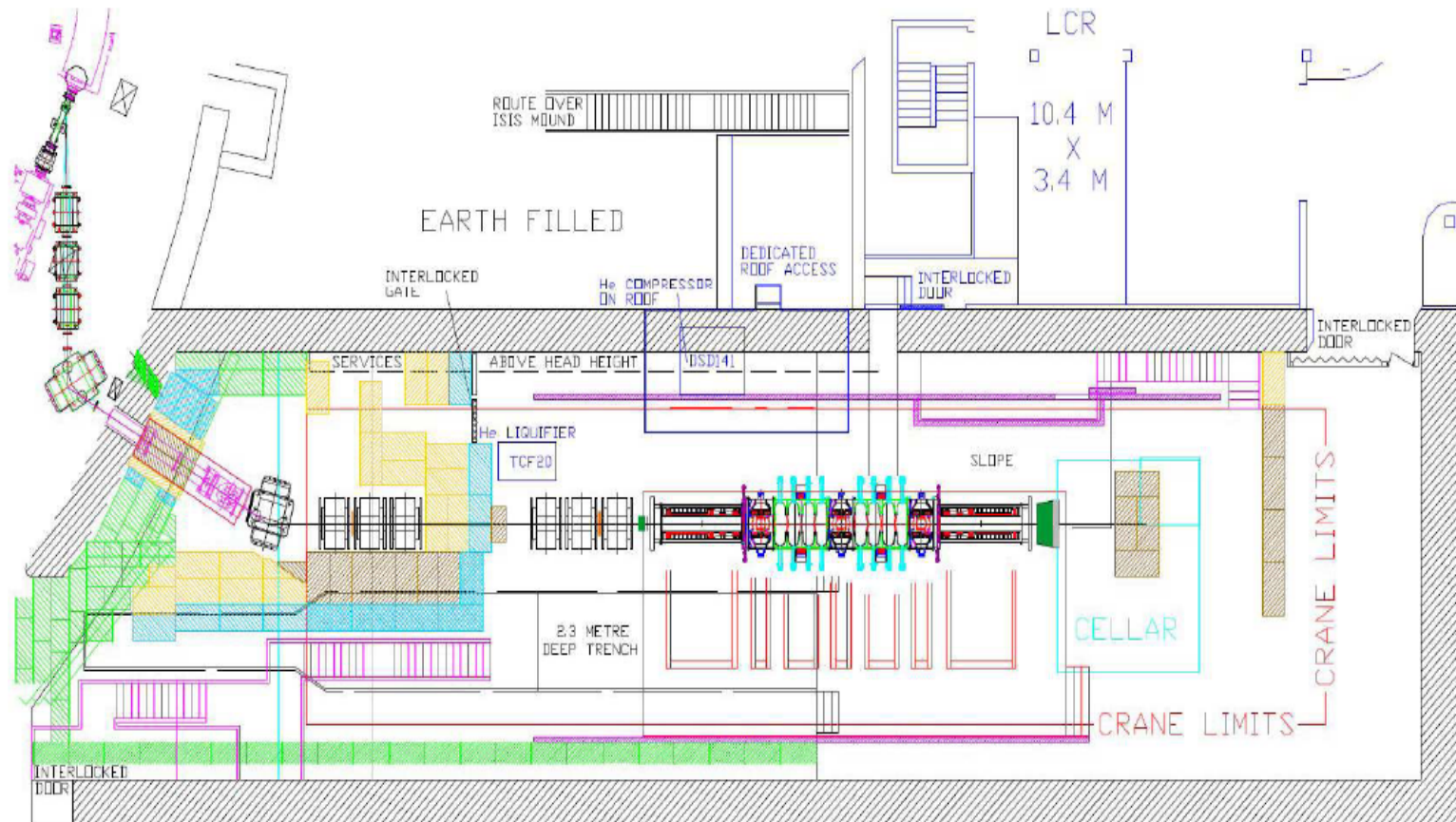
# FOFO Snake Test @ MICE?

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**(FNAL)**

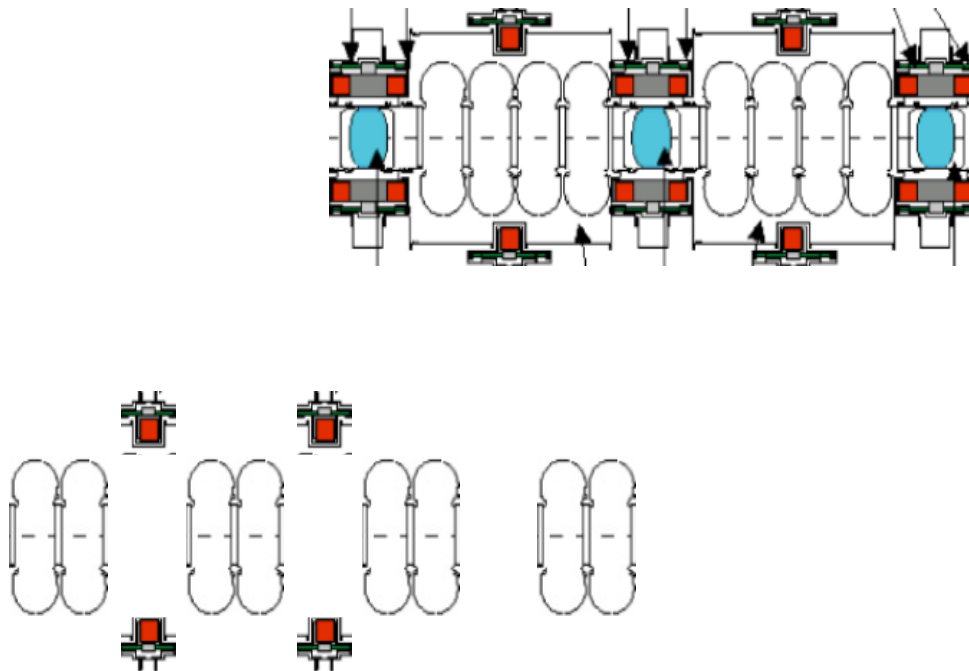


## Channel parameters:

	Snake	MICE	
201 MHz RF cavities	2x36cm	4x43cm	
# RF cavities / period	6	2	
Max RF gradient	16MV/m	16MV/m	
Solenoids L/ Rin/ Rout, cm	24/60/92	21/26.3/34.7	25/72.5/84.1
Current density, A/mm <sup>2</sup>	58	114	96
Integrated current, MA	4.4	2	2.8
# Solenoids / period	6	4	2
LH2 absorbers / period	6x15cm	2x35cm	
Period length, m	6.12	5.5	



There is no much room left, but 1 full snake period (~7m) can be accommodated



## To make 1 snake period:

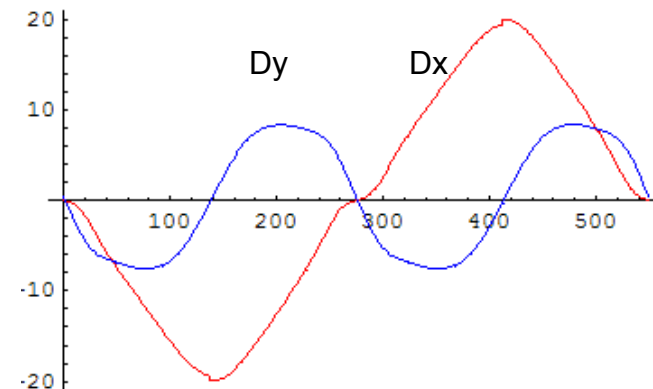
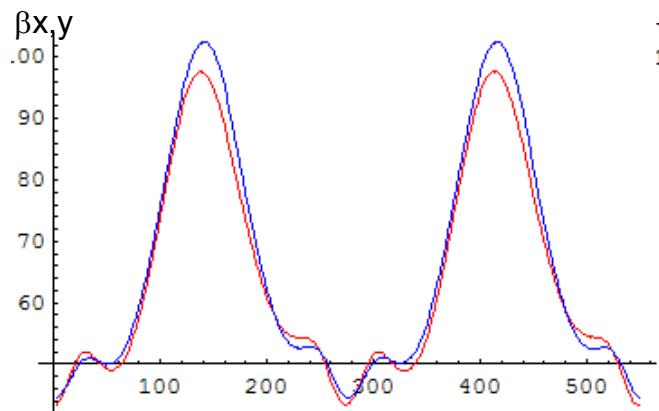
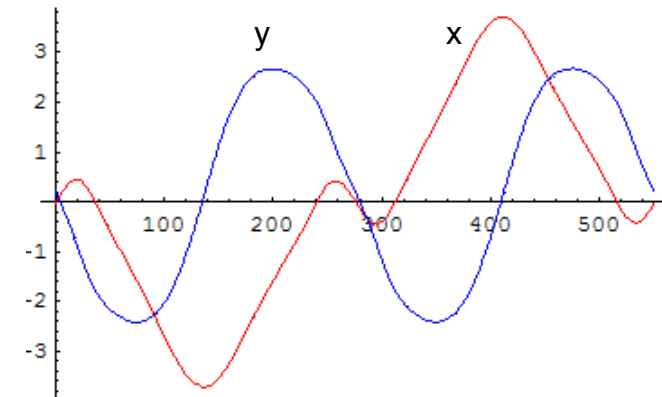
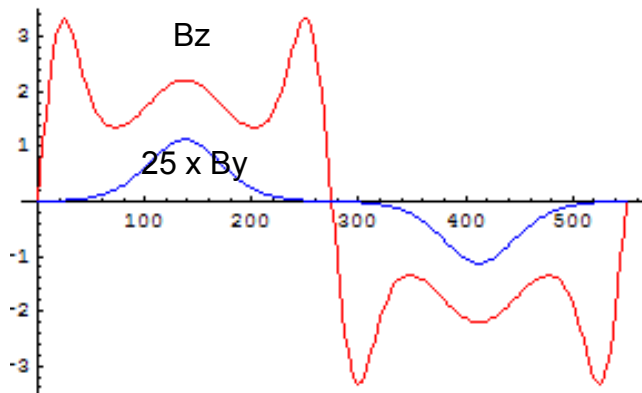
- 4 more RF cavities
- 4 more coupling coils (or 6 new coils with larger cross-section)
- 6 new LH2 absorbers

**Can 6D cooling be obtained with the present MICE configuration?**

With nominal currents and RF gradient  $Q_{\perp} \approx 1.377 + 0.0097i$ ,  $Q_{\parallel} \approx 0.186 - 0.0028i \Rightarrow$

1st harmonic transverse field is required to excite integer resonance

- can be generated by tilting (or displacing) coupling coils in the same direction. With a 20mrad tilt:

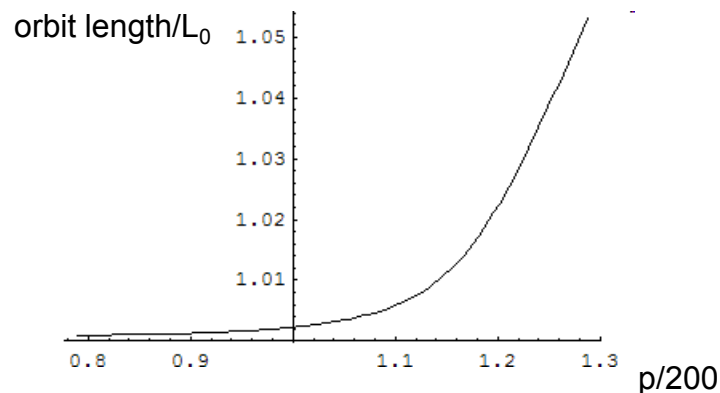
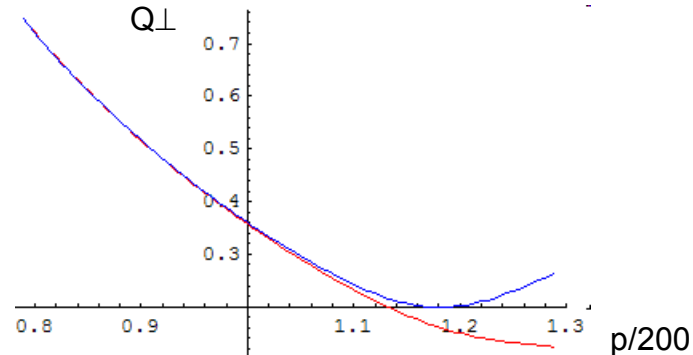


Dispersion  $\approx 0$  at absorbers, maximum in the center of RF linacs

With 20 mrad coupling coils tilt and 100 mrad Be wedges @ center of RF linacs

mode	I	II	III
tune	1.416+0.0101i	1.420+0.0054i	0.177+0.0019i
$\varepsilon_{eq}$ (mm)	1.7	3.2	3.1

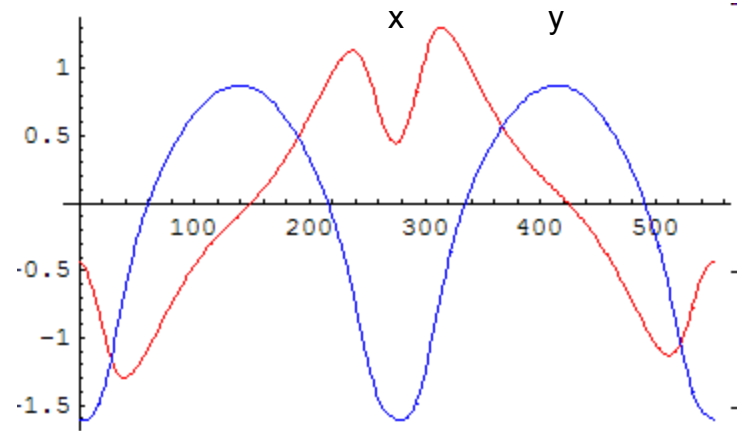
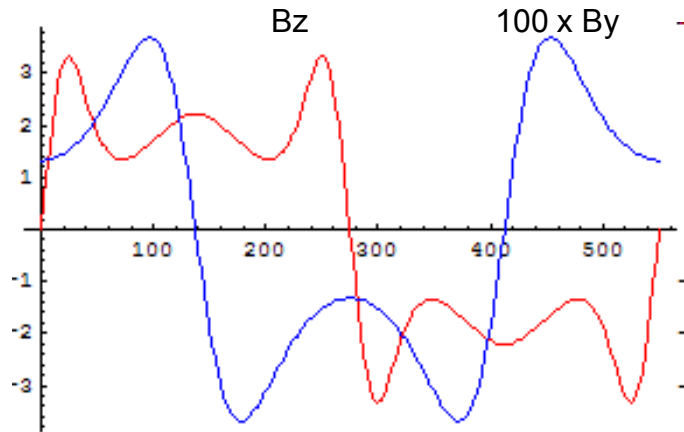
- again, there is a problem with unequal damping of transverse modes



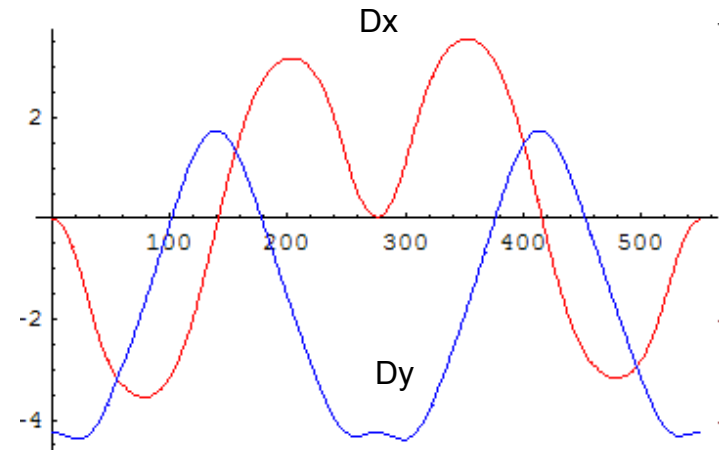
Transverse dynamic aperture obtained by tracking particles 25 periods w/o stochastics and with initial conditions  $J_1=J_2$ ,  $J_3=0$ ,  $\psi_1=\psi_2=0$ :

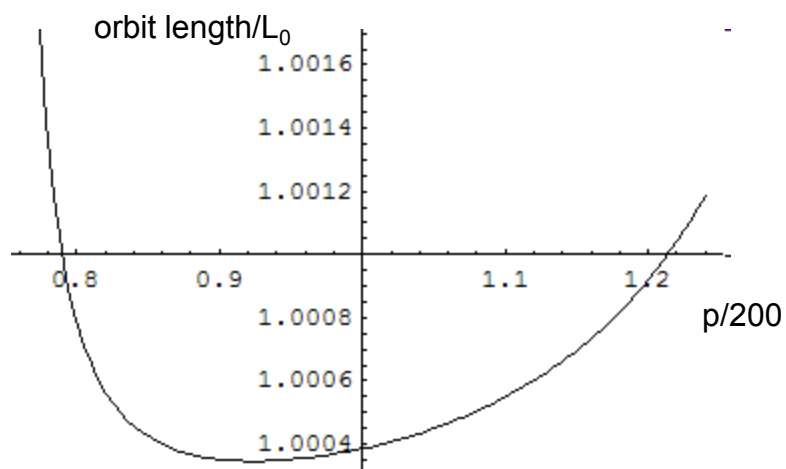
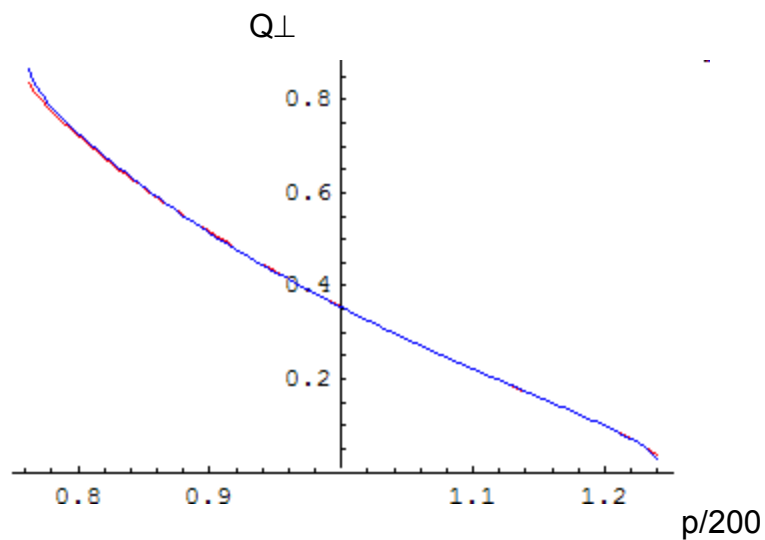
Lattice	$(J_1+J_2)_{max}$ (cm)
hel. FOFO snake	4.2
straight MICE	5.8
tilted MICE	2

vertical offset +3cm



Dispersion (its vertical component) reaches maximum at the absorber, but its value is too small. Again, Be wedges might have helped, but....





good momentum range  $(-0.9, 1.2)p_0$   
is not large enough



- It seems possible to test the Helical FOFO Snake at RAL utilizing MICE RF cavities and - probably - the coupling coils
- Converting MICE into a 6D cooling channel by introducing the coupling coils tilts or offsets does not seem a lucky idea due to a significant reduction in the transverse and/or momentum acceptance
- This does not exclude the possibility to find a better solution with additional magnets