Effects of curved rf windows on the Study 2a performance

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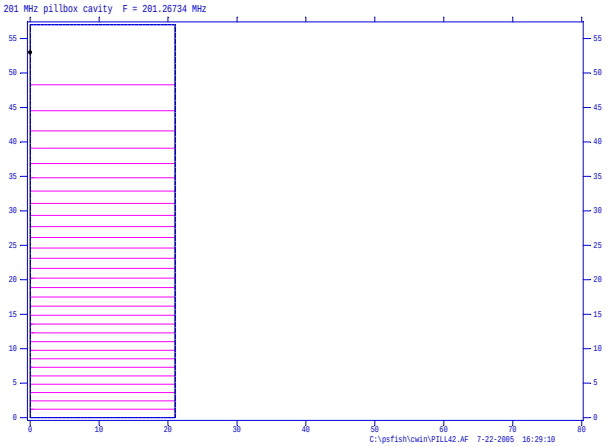
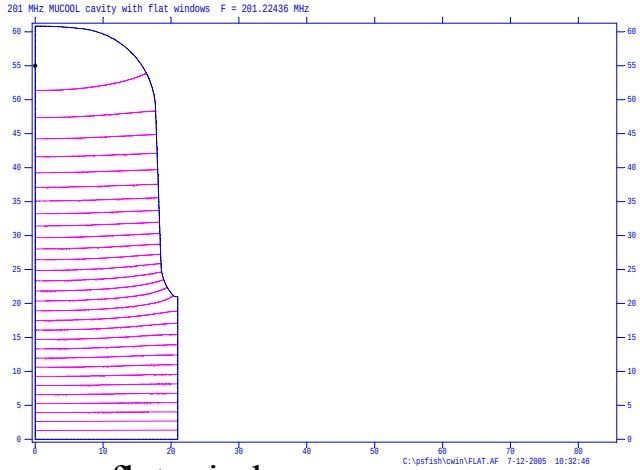
Introduction

- latest MUTAC review raised the question
  will radial electric fields from curved rf windows affect our cooling performance?
- procedure
  - got Superfish model of a cavity from Derun Li
  - made series of Superfish cavity models for this study
  - saved Superfish maps in standard format
  - modified ICOOL to directly read Superfish maps
  - reran Study 2a front-end using Superfish fields

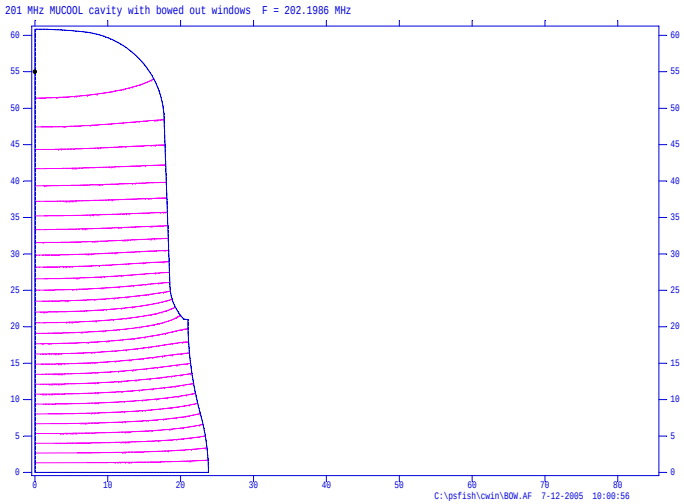
Superfish models



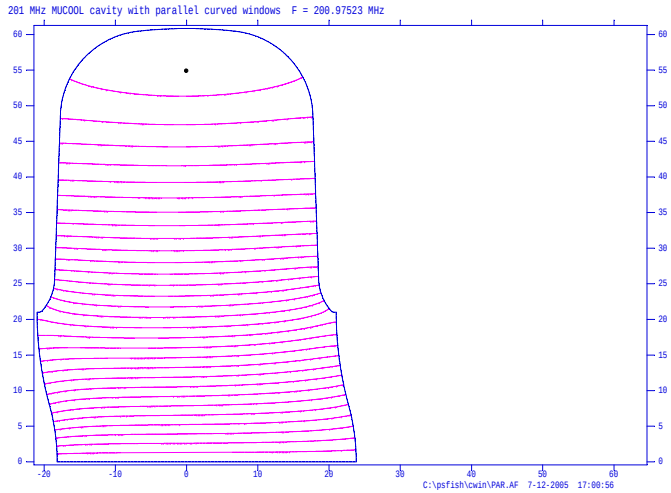
42 cm long pillbox



flat window



bowed out curved windows (D. Li)



parallel curved windows

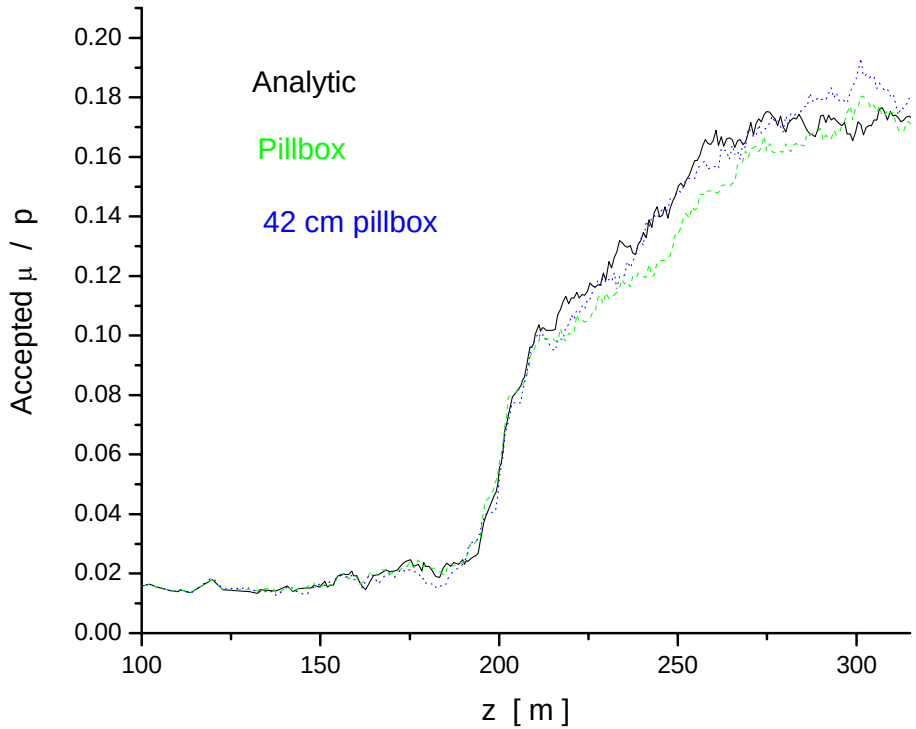
Electric field variations

model	δE_Z [%]	peak E_R
FLAT	+2 / -3	0.14
BOW	+12 / -30	0.21
PARA	+43 / -38	0.17

- for flat and bowed models deviation in E_Z is positive at center of cavity and negative at windows
- for parallel model deviation was positive for left window and negative for right window
- E_R grows with radius initially
- Table shows E_R value at z=20 cm and r=20 cm
- magnitude of E_R is relative to average E_Z field on-axis

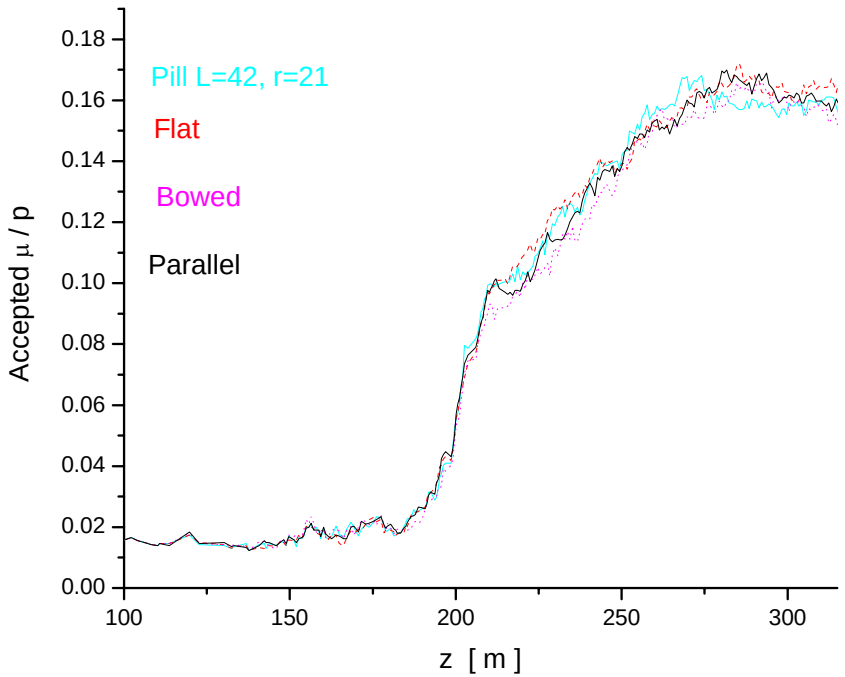
ICOOL: Study 2a performance

- Study 2a cavities have L = 50 cm and R = 25 cm
- "real" cavities are ~42 cm long
- scale gradient for 42 cm pillbox



ICOOL: Study 2a performance

- "real" cavities have 21 cm window size



Conclusions

- new feature in ICOOL v2.90 allows using Superfish field maps for rf cavity modeling
- decreasing Study 2a channel radius from 25 to 21 cm reduced performance by 6%
- the effects of the curved rf windows on Study 2a performance were statistically insignificant