Aspect Ratio / Elongation Studies

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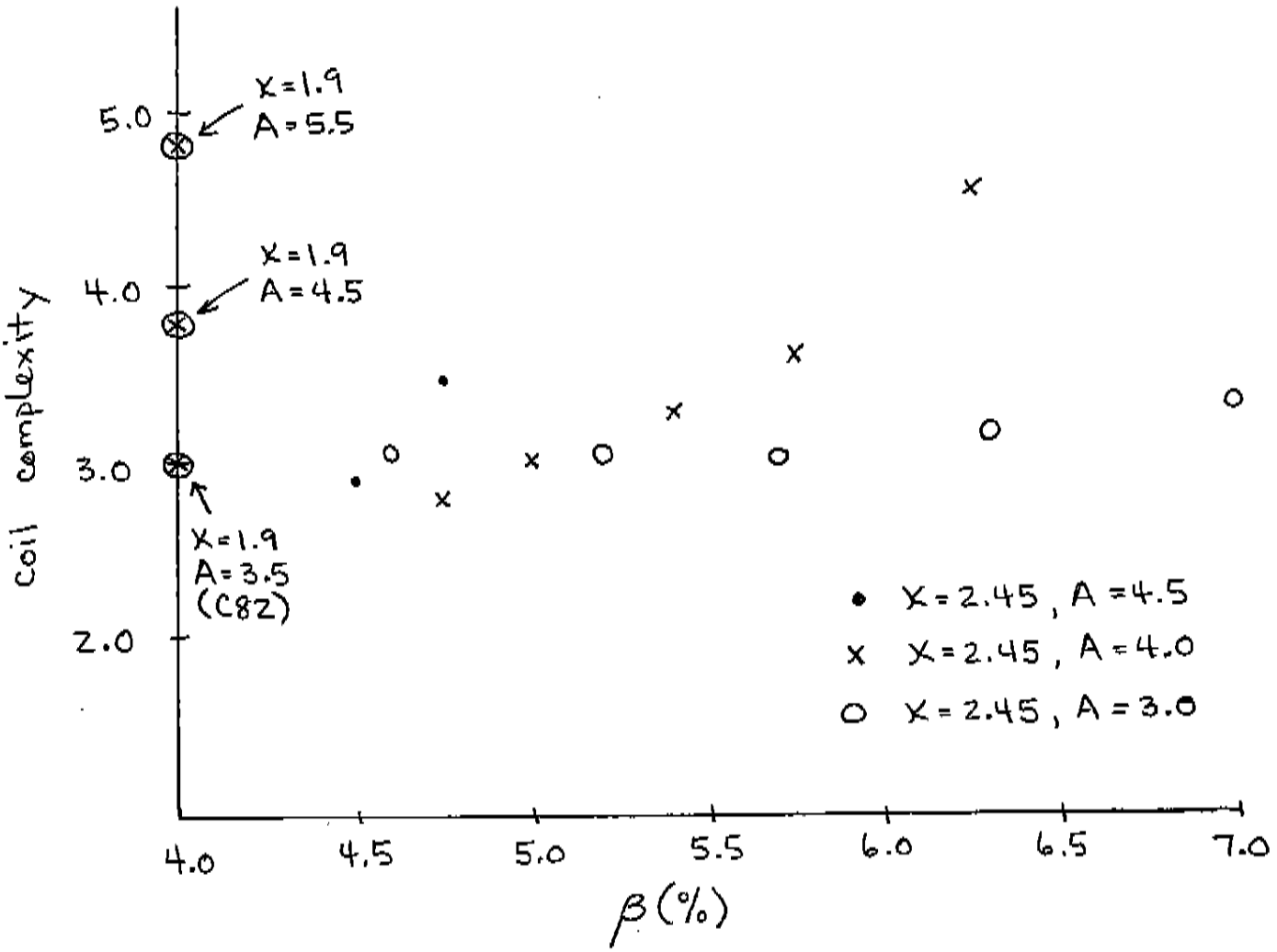
6/8/00

- have continued studies at $X = 2.45$, with bootstrap current consistency enforced, at $A = 4.5$ and $A = 3.0$

  → higher aspect ratio configurations are not favorable due to a strongly increasing coil complexity, due to bootstrap current destabilizing the kink mode



Various Aspect Ratios, $\chi = 2.45$, Bootstrap Consistency Enforced

A	I(KA)	$\beta(\%)$	λ_K	balloon stability	$\lvert B_{mn}^{max} \rvert$	coil complexity	$\iota(a)$	$\iota(0)$
3.0	256	4.5	$-.63\times10^{-4}$	stable	2.21%	3.07	.488	.251
3.0	277	5.0	$-.5\times10^{-4}$	stable	1.88%	3.05	.479	.243
3.0	298	5.7	$-.56\times10^{-4}$	stable	2.07%	3.04	.479	.269
3.0	329	6.3	$-.81\times10^{-4}$	stable	2.37%	3.16	.485	.287
3.0	359	7.0	$+.64\times10^{-4}$	stable	2.52%	3.30	.488	.305
4.0	232	4.75	$-.28\times10^{-4}$	1 surface	0.48%	2.84	.483	.301
4.0	244	5.00	$-.35\times10^{-4}$	1 surface	0.60%	3.02	.484	.308
4.0	255	5.4	$-.5\times10^{-4}$	1 surface	0.76%	3.27	.479	.309
4.0	266	5.75	$-.63\times10^{-4}$	1 surface	0.90%	3.62	.478	.316
4.0	290	6.25	-1.9×10^{-4}	1 surface	1.17%	4.57	.479	.327
4.5	208	4.5	-1.5×10^{-4}	stable	0.52%	3.10	.489	.279
4.5	218	4.75	$-.58\times10^{-4}$	1 surface	1.07%	3.45	.488	.273

→ higher elongation has relieved the the increasing coil complexity to some extent, allowing higher β values

→ coil complexity should be mostly driven by kink stabilization, and kink stability is driven by

- β
- current
- magnetic well strength
- profiles ($p(s) * j(s)$)

- pursuing coil complexity further for $X = 2.45$, $A = 4.0$ case
  - $\beta = 5.0\%$, I varied
  - fixed I, β varied
  - target coil complexity in optimization

- examining higher elongation, $\kappa = 3.0$

$A = 3.5$

$I = 275$ kA
$\beta = 5.25\%$
$\lambda_K = -.64 \times 10^{-4}$
ballooning stable
$|B_{mn}^{max}| \lesssim 1.97\%$
coil complexity = 3.18
$i(a) = .485$
$i(0) = .272$

$I = 298$ kA
$\beta = 5.75\%$
$\lambda_K = -1.1 \times 10^{-4}$
ballooning stable
$|B_{mn}^{max}| \lesssim 2.53\%$
coil complexity = 3.25
$i(a) = .485$
$i(0) = .285$

$A = 4.0$

$I = 252$ kA
$\beta = 5.0\%$
$\lambda_K = -1.1 \times 10^{-4}$
ballooning stable
$|B_{mn}^{max}| \lesssim 1.02\%$
coil complexity = 3.04
$i(a) = .478$
$i(0) = .269$

$\longrightarrow$ will examine other aspect ratios as well