C10 versus I55 Coil Comparisons

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Current Sheet Comparison

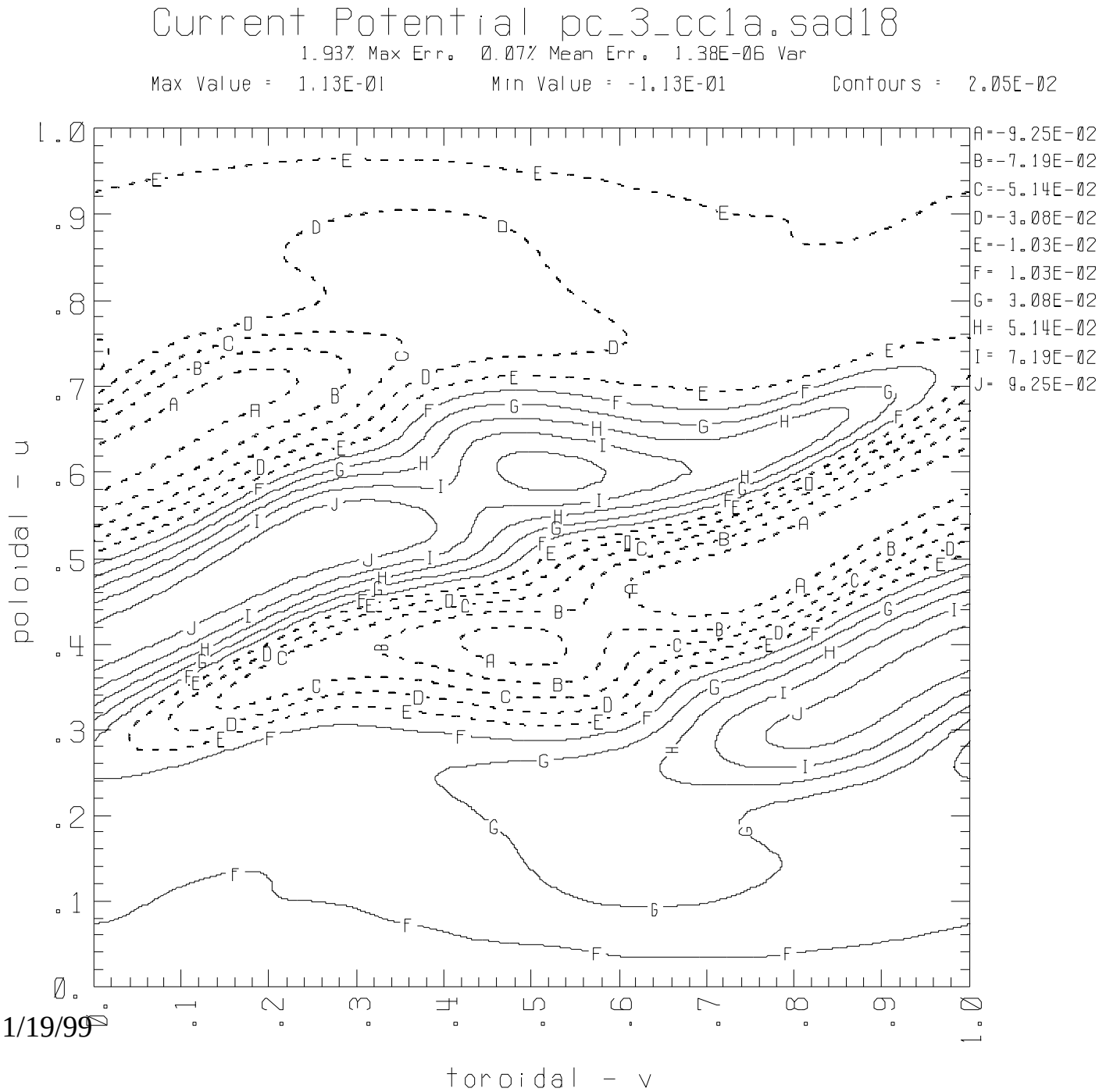
Comparison of Current Sheet Solution for Saddles on a 18 cm surface offset

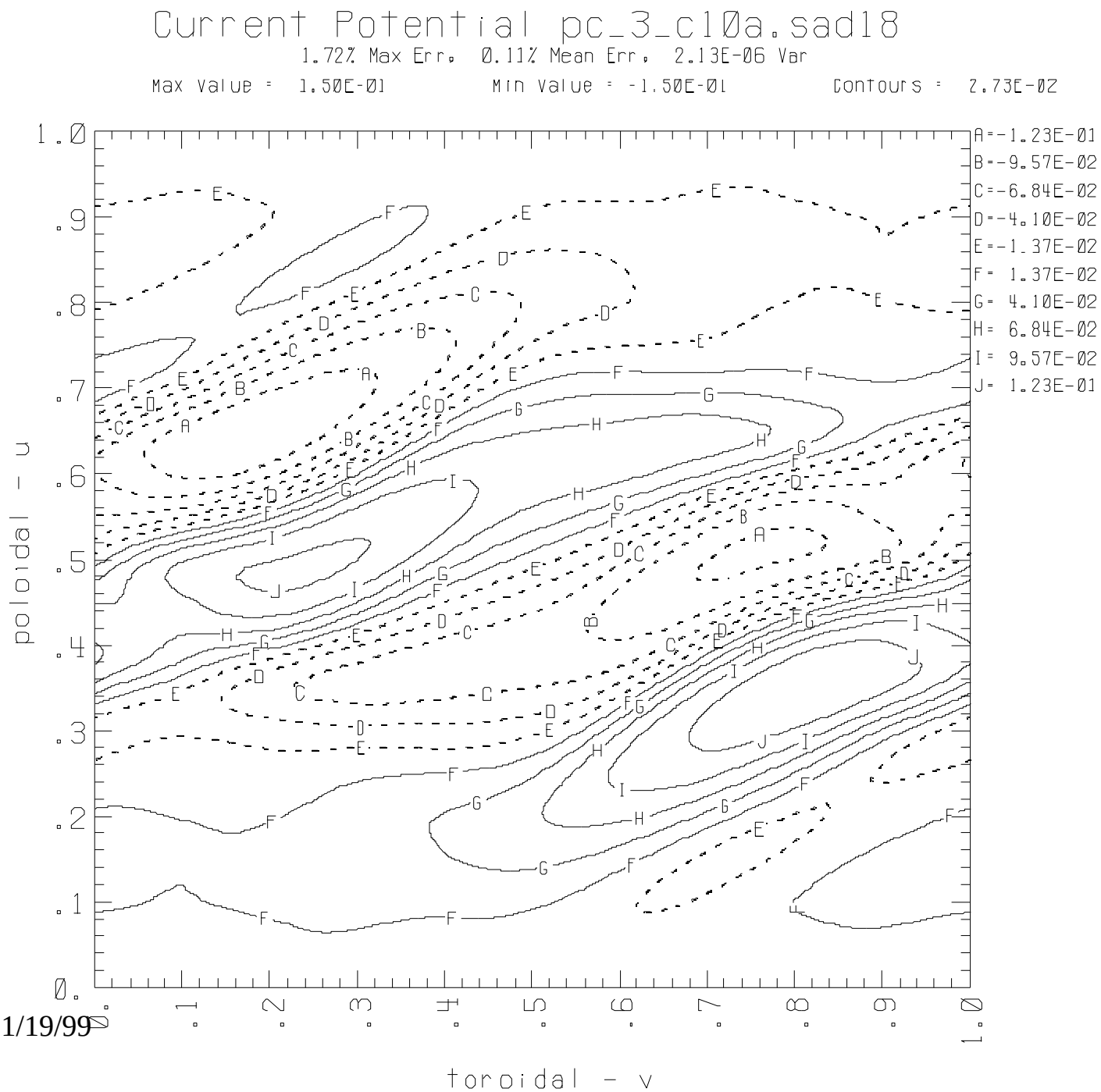
(Finite Beta with No Background Vertical Field)

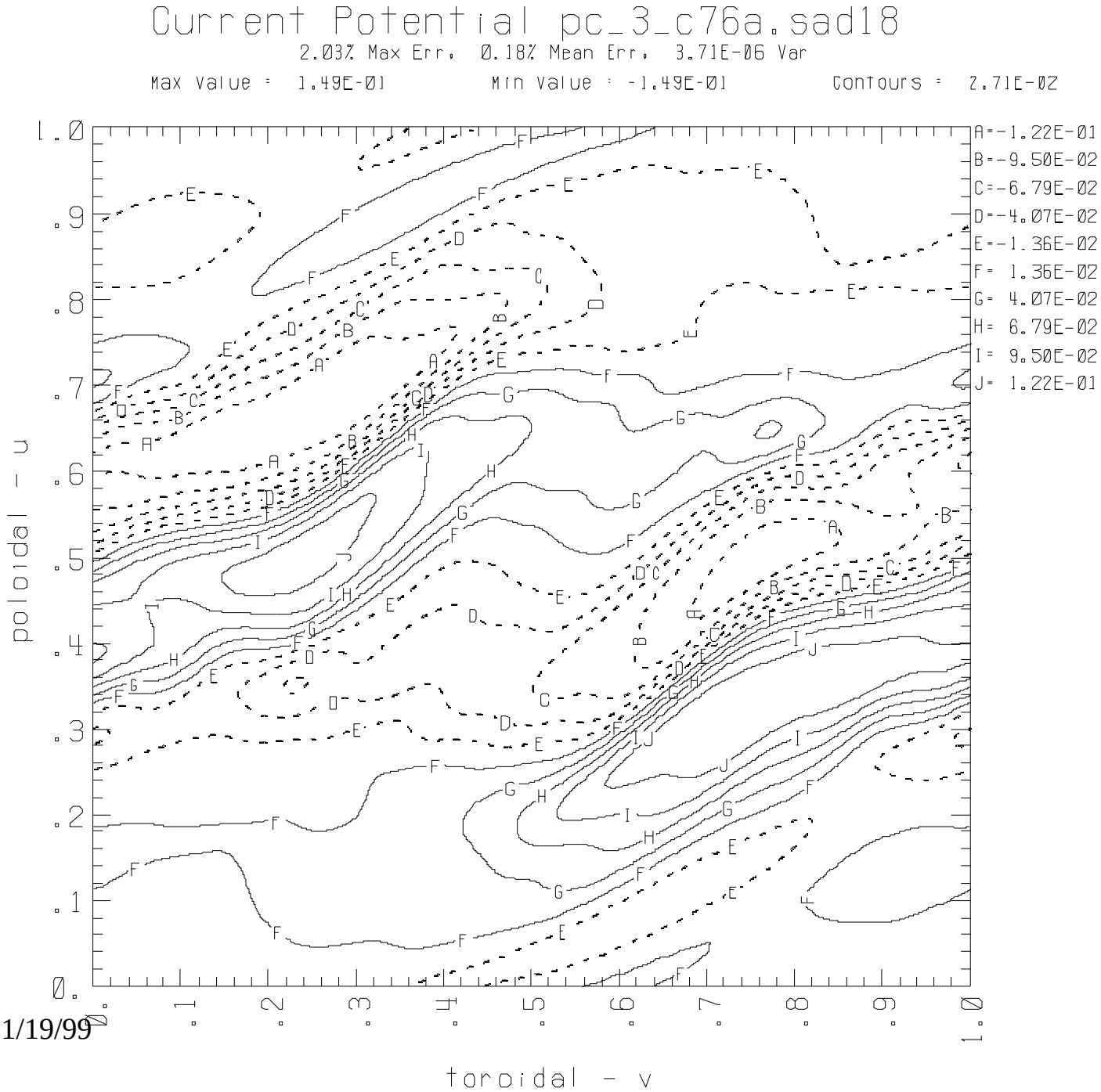
Plasma ID Description	cc1a c10a without edge shear	c10a Fits in PBX (A=3.42)	c76c kink stablizied c10a	i55b New Machine (A=2.75)	i63b kink stablizied i55
Current Sheet					
Max Err, %	1.93	1.72	2.03	4.69	5.19
Mean Err, %	0.07	0.11	0.18	0.60	0.61
J max/Ipol	0.70	0.85	1.13	1.49	1.45
Ipol	2.73	2.75	2.76	2.82	2.92
J max, MA/m	1.90	2.35	3.12	4.20	4.24
Complexity	2.85	2.91	3.10	3.36	3.22

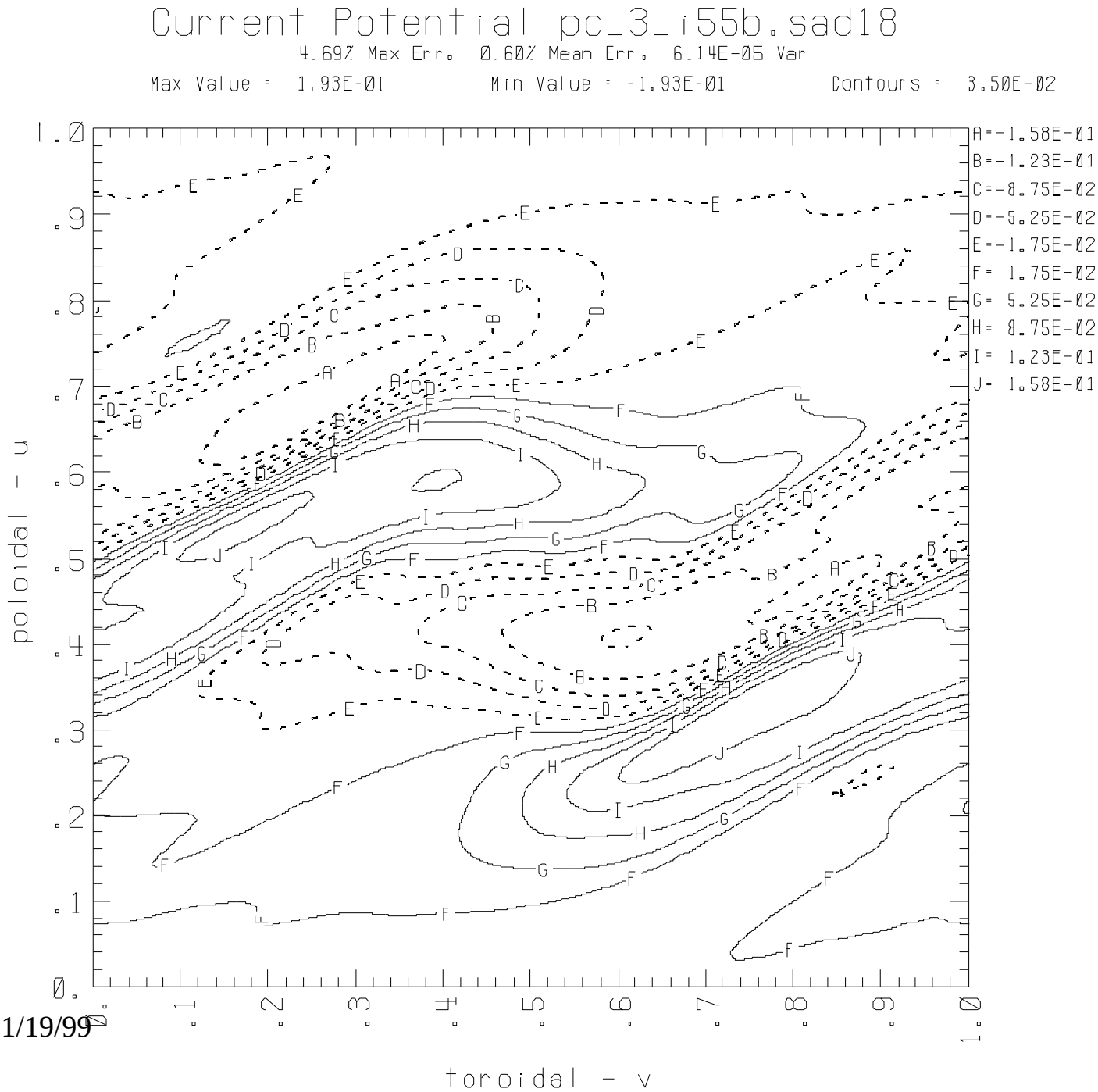
Comparison of
(Some)
Plasma Parameters

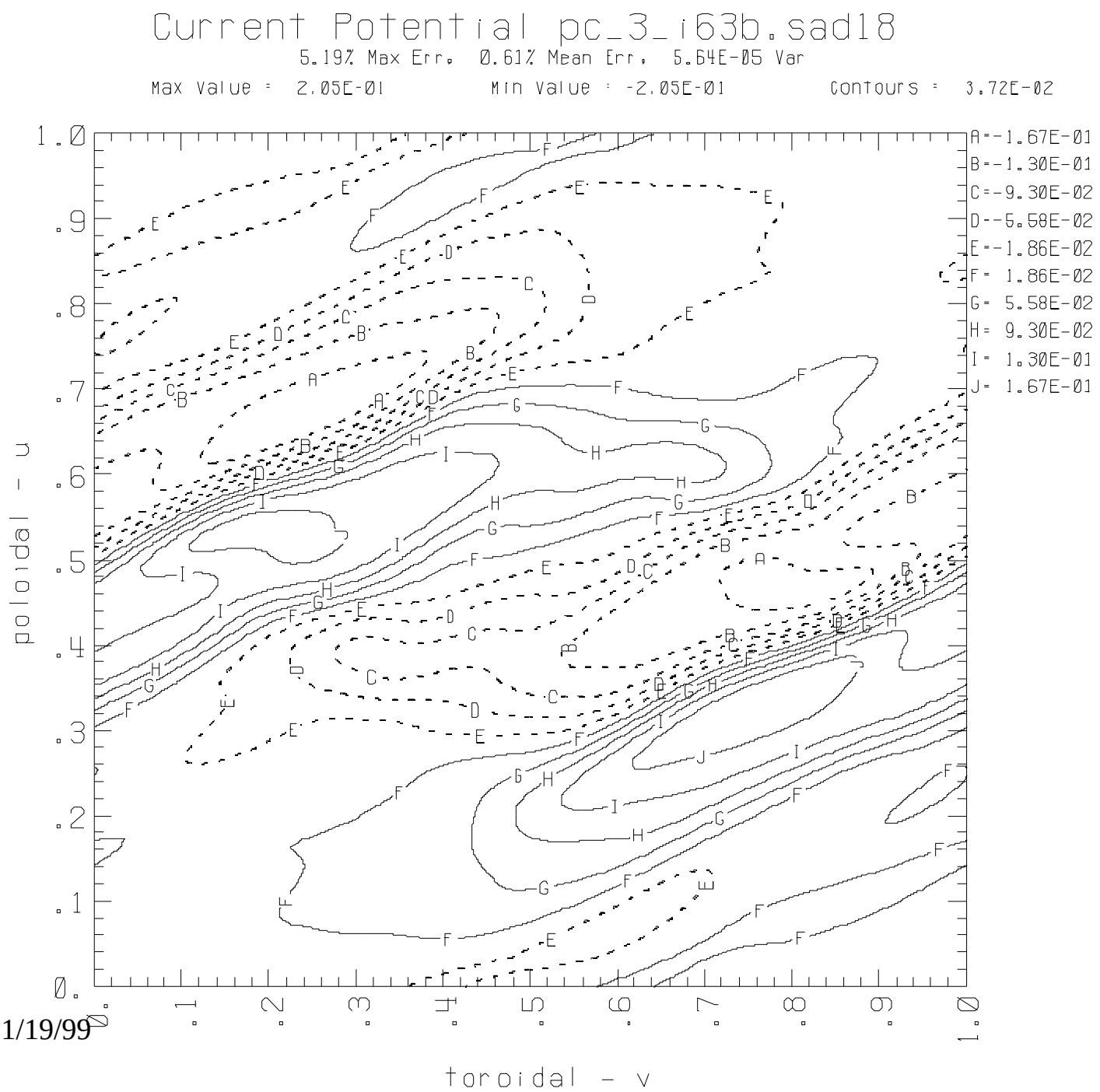
Plasma ID Description	cc1a c10a without edge shear	c10a Fits in PBX (A=3.42)	c76c kink stablizied c10a	i55b New Machine (A=2.75)	i63b kink stablizied i55
Ipol	2.73	2.75	2.76	2.82	2.92
R(0,0), Plasma Boundary	1.432	1.423	1.423	1.380	1.380
Plasma R,min	1.050	1.041	1.065	0.889	0.911
Plasma R,max	1.848	1.861	1.849	1.948	1.900
Plasma R, mean	1.449	1.451	1.457	1.419	1.406
R*Btor	1.638	1.649	1.656	1.691	1.753
Btor (at R(0,0))	1.144	1.159	1.164	1.225	1.270
Btor (at R, mean)	1.130	1.137	1.137	1.192	1.247


Current Potential pc_3_cc1a.sad18
1.93% Max Err. 0.07% Mean Err. 1.38E-06 Var
Max Value = 1.13E-01
Min Value = -1.13E-01
Contours = 2.05E-02
A=-9.25E-02
B=-7.19E-02
C=-5.14E-02
D=-3.08E-02
E=-1.03E-02
F= 1.03E-02
G= 3.08E-02
H= 5.14E-02
I= 7.19E-02
J= 9.25E-02
poloidal - u
toroidal - v


Current Potential pc_3_c10a.sad18
1.72% Max Err, 0.11% Mean Err, 2.13E-06 Var
Max Value = 1.50E-01
Min Value = -1.50E-01
Contours = 2.73E-02
A=-1.23E-01
B=-9.57E-02
C=-6.84E-02
D=-4.10E-02
E=-1.37E-02
F= 1.37E-02
G= 4.10E-02
H= 6.84E-02
I= 9.57E-02
J= 1.23E-01
poloidal - u
toroidal - v


Current Potential pc_3_c76a.sad18
2.03% Max Err, 0.18% Mean Err, 3.71E-06 Var
Max Value = 1.49E-01
Min Value = -1.49E-01
Contours = 2.71E-02
A=-1.22E-01
B=-9.50E-02
C=-6.79E-02
D=-4.07E-02
E=-1.36E-02
F= 1.36E-02
G= 4.07E-02
H= 6.79E-02
I= 9.50E-02
J= 1.22E-01
poloidal - u
toroidal - v


Current Potential pc_3_i55b.sad18
4.69% Max Err. 0.60% Mean Err. 6.14E-05 Var
Max Value = 1.93E-01
Min Value = -1.93E-01
Contours = 3.50E-02
A=-1.58E-01
B=-1.23E-01
C=-8.75E-02
D=-5.25E-02
E=-1.75E-02
F= 1.75E-02
G= 5.25E-02
H= 8.75E-02
I= 1.23E-01
J= 1.58E-01
poloidal - u
toroidal - v

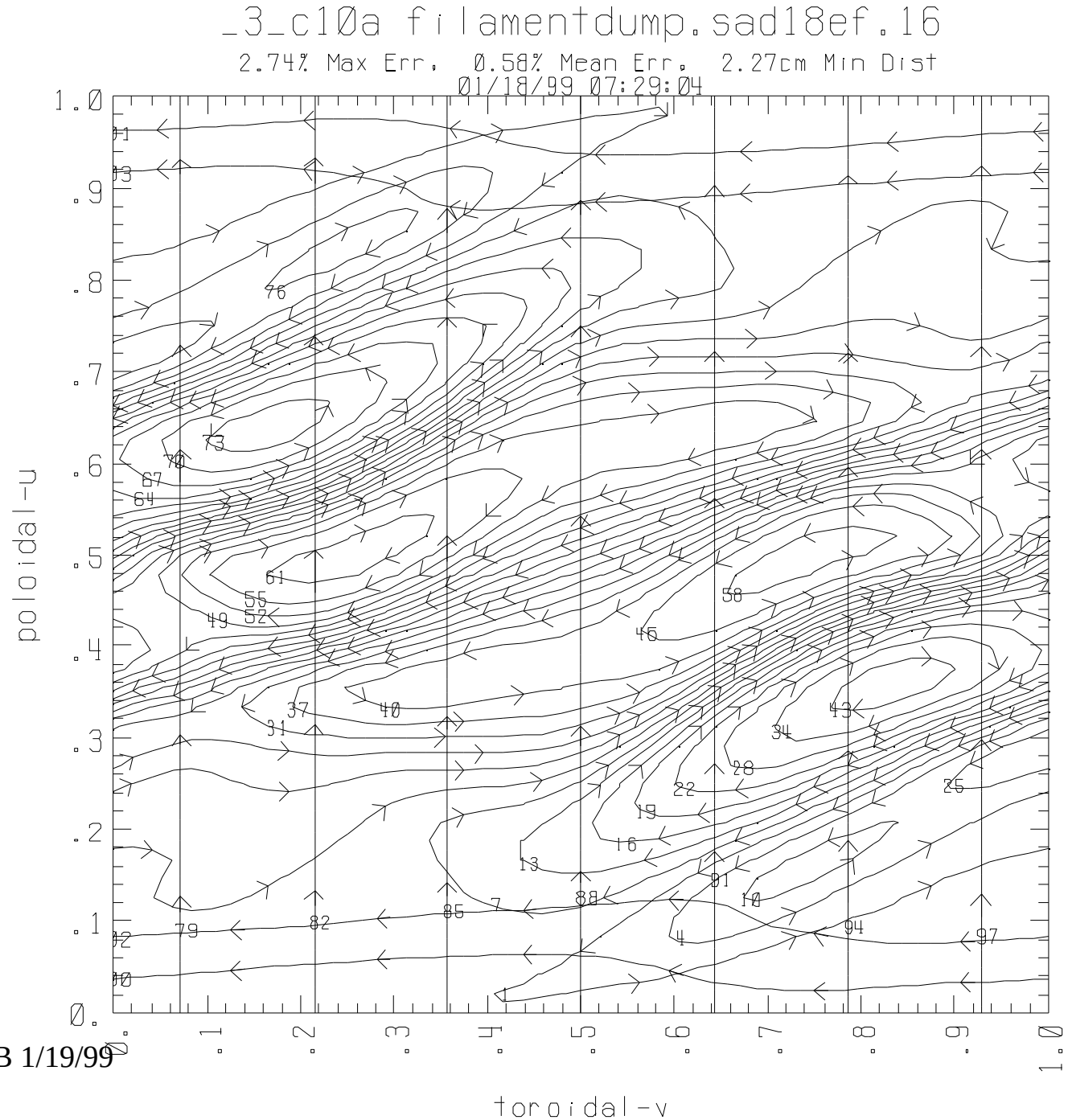

Current Potential pc_3_i63b.sad18
5.19% Max Err, 0.61% Mean Err, 5.64E-05 Var
Max Value = 2.05E-01
Min Value = -2.05E-01
Contours = 3.72E-02
A=-1.67E-01
B=-1.30E-01
C=-9.30E-02
D=-5.58E-02
E=-1.86E-02
F= 1.86E-02
G= 5.58E-02
H= 9.30E-02
I= 1.30E-01
J= 1.67E-01
poloidal - u
toroidal - v

C10 vs i55 Saddle Coils

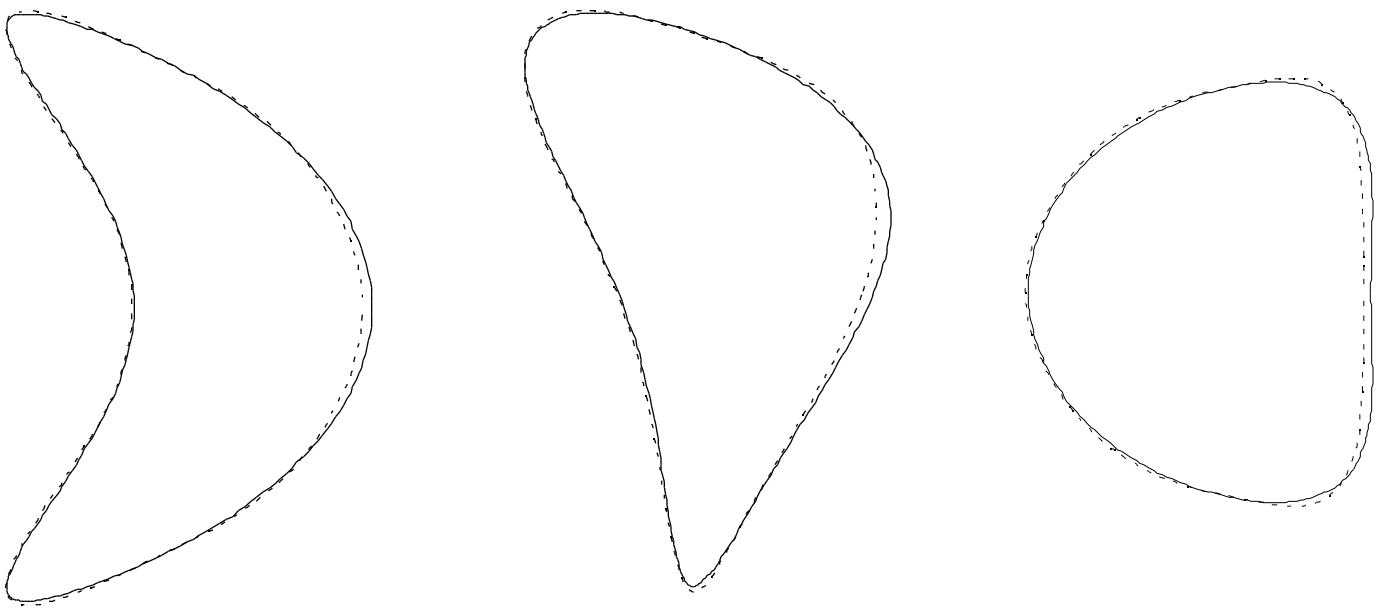
Comparison of Saddles Coil on a 18 cm surface offset

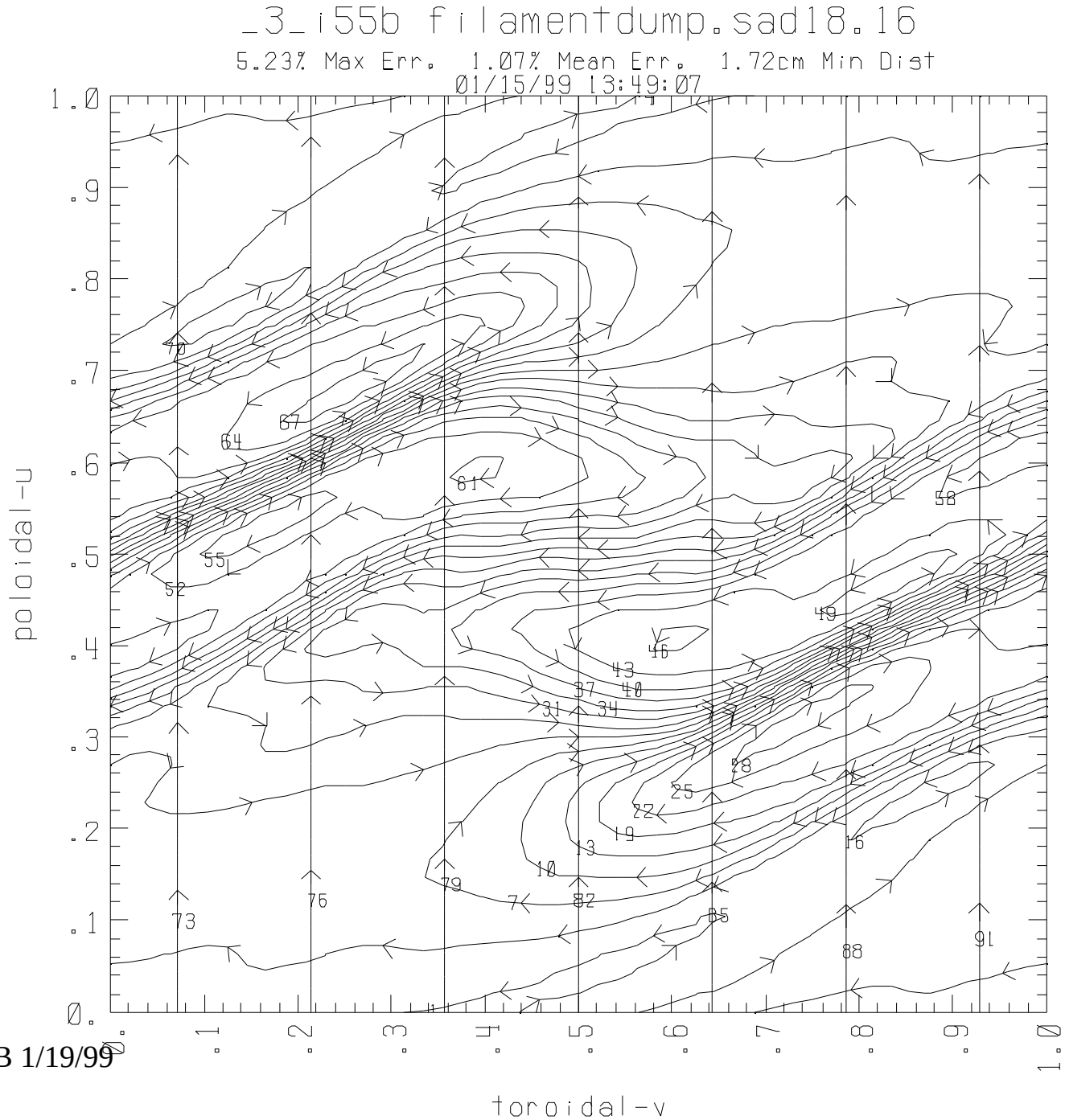
(Finite Beta with Background Vertical Field)

Plasma ID Description	c10a Fits in PBX (A=3.42)	i55b New Machine (A=2.75)	i55 w/o EF
Current Sheet			
Max Err, %	1.69	4.72	4.69
Mean Err, %	0.11	0.60	0.60
J max/Ipol	0.88	1.47	1.49
Ipol	2.75	2.82	2.82
J max, MA/m	2.43	4.14	4.20
Complexity	2.96	3.41	3.36
Discrete Coils, 16 Contours			
Coils per Half Period	12	12	12
Max Err, %	2.45	5.1	5.23
Mean Err, %	0.58	1.16	1.07
Min Dist, cm	2.40	1.63	1.72
Coil Current, KA	51.66	62.57	67.75
Coil Build, cm	7.00	7.00	7.00
Current Density, KA/cm2	3.08	5.48	5.63
VMEC <M>	2.30	3.16	2.76

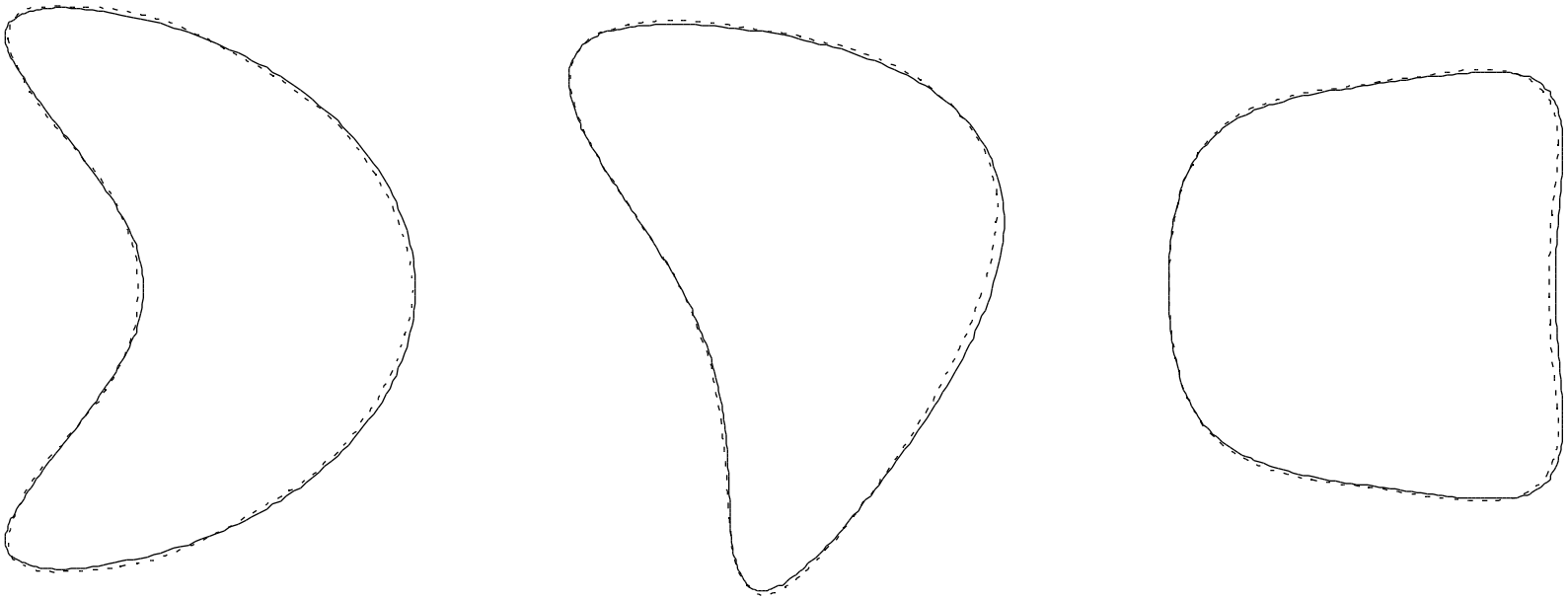

_3_c10a filamentdump.sad18ef.16
2.74% Max Err, 0.58% Mean Err, 2.27cm Min Dist
01/18/99 07:29:04
poloidal-u
toroidal-v

Reconstruction of c10a




_3_i55b filamentdump.sad18.16
5.23% Max Err. 1.07% Mean Err. 1.72cm Min Dist
01/15/99 13:49:07
poloidal-u
toroidal-v
0.
.1
.2
.3
.4
.5
.6
.7
.8
.9
1.0

Reconstruction of i55



Option 3B: New Machine , externally wound Saddle Coils on 18.5 to 20.5 cm Coil Surface Offset

#Contours	#Coils per Half Period	Max Err %	Mean Err %	Min Dist cm	Coil Current KA	<M>
current she	-	1.72	0.12	jmax=2.969 MA/m		complexity=3.05
8	6	4.13	1.03	3.63	97.53	2.385
16	12	2.57	0.54	1.97	48.77	2.295
24	18	2.05	0.39	1.20	32.52	2.331
32	24	2.00	0.31	0.94	24.39	2.326
40	29	1.97	0.25	0.72	19.51	2.291

Option 3B: New Machine , externally wound Saddle Coils on 18.5 to 30.5 cm Coil Surface Offset

#Contours	#Coils per Half Period	Max Err %	Mean Err %	Min Dist cm	Coil Current KA	<M>
current she	-	1.77	0.13	jmax=2.969 MA/m		complexity=3.23
8	7	3.64	0.77	3.61	97.64	2.388

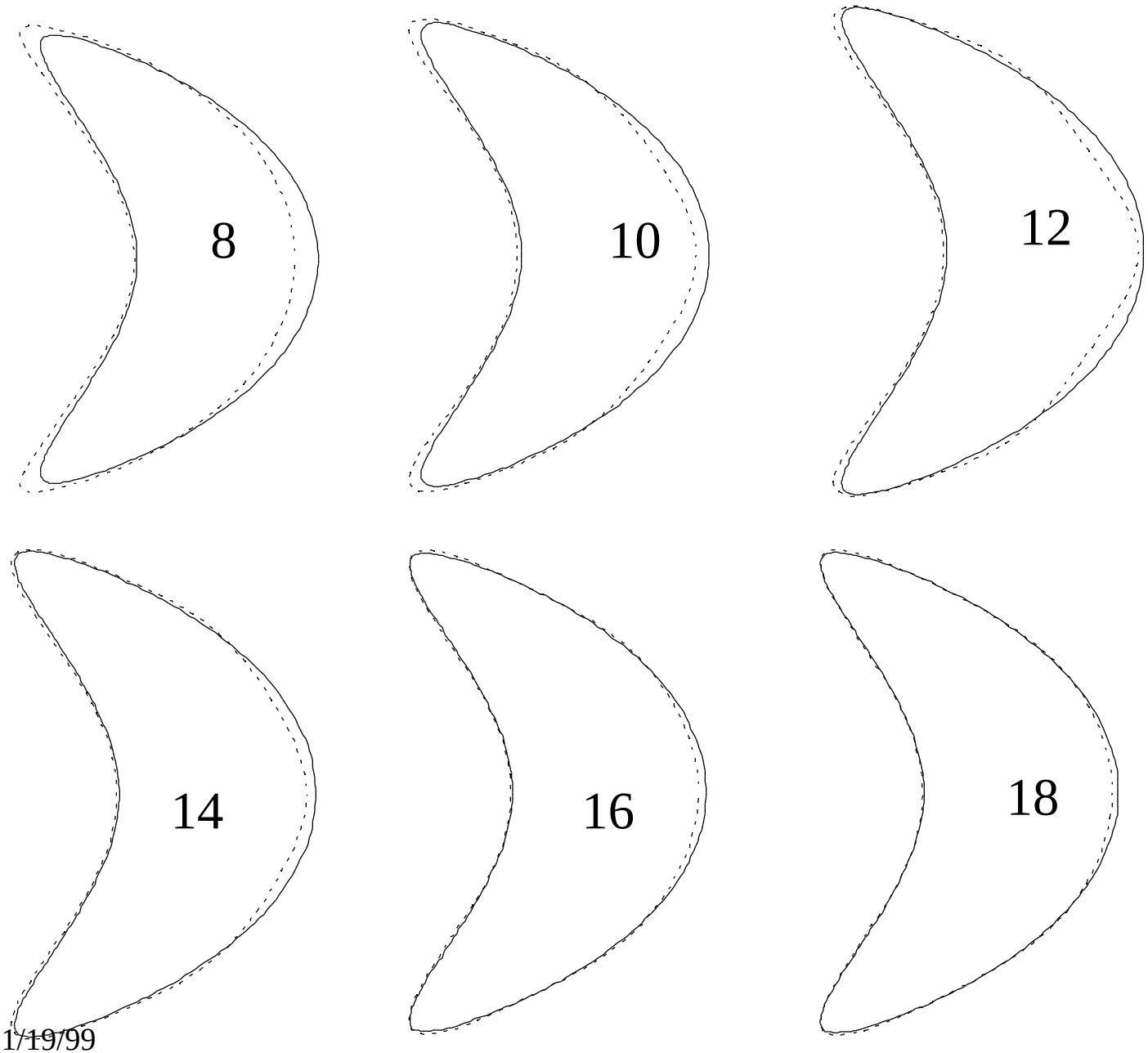
Option 3B: New Machine, externally wound Saddle Coils on 18.5 to 40.5 cm Coil Surface Offset

#Contours	#Coils per Half Period	Max Err %	Mean Err %	Min Dist cm	Coil Current KA	<M>
current she	-	1.78	0.14	jmax=2.969 MA/m		complexity=3.70
8	14	3.02	0.64	3.78	97.72	2.347
current sheet - svd 0		0.13	0.01	jmax=86.0 MA/m		complexity=16.7
current sheet - svd 100		2.70	0.57	jmax=2.749 MA/m		complexity=3.65

Number of Coils Scan for c10a

Option 3B: New Machine , externally wound Saddle Coils on 18 cm Coil Surface Off

#Contours	#Coils per Half Period	Max Err %	Mean Err %	Min Dist cm	Coil Current KA	<M>
current she	-	1.70	0.11	jmax=2.963 MA/m		complexity=
8	7	4.38	1.10	4.24	91.22	2.548
10	9	4.02	0.90	3.35	72.97	2.860
12	10	3.69	0.77	2.74	60.81	3.192
14	12	3.09	0.70	2.29	52.12	2.483
16	13	2.74	0.58	2.27	45.61	2.301
18	15	2.50	0.50	1.87	40.54	2.317
20	17	2.25	0.49	1.57	36.49	2.349


8
10
12
14
16
18