

CASS - Telescope Design Program, SPP Version of 19-APR-99
 Executed on: Mon 22:47:29 07-Feb-2000
 Parameters based on third order aberration calculations.

LBT F/15 GREGORIAN FOCUS (infrared, case D, new BFD)

telescope input parameters

2.	number of mirrors in optical train
3.	gregorian configuration
8.408	primary mirror diameter (m)
1.14177	primary focal ratio
-14.7204	system focal ratio
3.05	vertex -- focus distance (m)
INDEF	secondary focal length (m)
4.	field diameter (arcmin)
0.898	primary obstruction (m)
40.	maximum infrared wavelength (microns)
3.7	tolerable diffraction radius
7.000000E-4	infrared centration allowance (m)
1.00029	refractive index of air

other telescope parameters

9.600002	primary focal length (m)
solving based on fs and eve	
-12.89261	magnification of secondary
-123.7691	system focal length (m)
0.002445788	throughput (ubar1*y1)
-0.03396647	telescope numerical aperture
-0.03396315	half angle of telescope light cone (in air, rad)
10.66369	separation of m1 and m2 (m)
13.71369	pathlength from secondary to focus (m)
0.7775945	l = separation / back focal distance
0.3177083	beta = vertex distance / focal length of m1
0.3627498	eta = normalized vertex back focus
0.01140689	specified central obstruction (fractional area)
0.3164188	diameter of primary hole (m)
0.001416247	obscuration by cassegrain hole (fractional area)
0.9871208	focal length of secondary (m)
96.24219	entrance pupil position relative to primary (m)
-9.025225	entrance pupil magnification, paraxial
0.9442862	vertex diameter of secondary (m)
0.0126131	obscuration by secondary (fractional area)
0.9318784	vertex diameter of beam at secondary (m)
0.1749726	?exit pupil throughput (ubar*y) for secondary
-1.	primary asphere fixed
-0.7328021	secondary asphere for cass
1.	primary eccentricity
0.8560386	secondary eccentricity
normalized structural aberration coefficients	
0.	sigmai
-1.	sigmaii
-9.80282	sigmaiii
138.2766	sigmaiv
-22.57252	sigmav

primary mirror parameters

0.4602503	sagitta of primary mirror (m)
-5652.75	primary aspheric amplitude (microns)
0.4311129	half angle of primary light cone (rad)
0.4180033	primary numerical aperture

```

1.196163      ??primary focal ratio apparently
secondary mirror parameters
0.9404014    edge diameter of secondary mirror (m)
1.04968      secondary focal ratio
0.05620711   sagitta of secondary mirror (m)
0.9145526    *infrared vertex diameter of secondary mirror (m)
8.254044     *entrance pupil diameter, paraxial (m)
              (using chief rays through secondary vertex)
-0.01240776  field correction to m2 diameter (m)
-0.0014      centration correction to m2 diameter (m)
1.624639E-4  infrared diffraction angle (radians)
-0.003515957 diffraction correction to m2 diameter (m)
0.9109714    infrared edge diameter of secondary mirror (m)
1.083591     infrared secondary focal ratio
0.0527317    sagitta of secondary mirror (m)
8.251091     effective primary aperture (m)
15.00001     effective system focal ratio
8.362538     effective primary envelope (m)
100.7615     ??entrance pupil position relative to primary (m)
-9.495984    ??entrance pupil magnification
8.65057      ??entrance pupil diameter, from edge (m)
-530.295     secondary aspheric amplitude (microns)
0.1182378    infrared unused hole in secondary (m)
-12.89261    ??magnification by focal length
-12.89261    ??magnification by image distance
-12.69355    ??magnification by angle U
-13.53796    ??magnification by tangent U
-12.30635    ??magnification by numerical aperture
0.0126131    fractional area of telescope obscuration
52.76998     net telescope collecting area (m**2)
wavefront aberration coefficients
0.           w040 (microns) spherical aberration
-0.7054392   w131 (microns) coma
0.2368898    w222 (microns) astigmatism
-1.67076     w220p (microns) field curvature
-0.01868577  w311 (microns) distortion
focal plane parameters
0.6000496    platescale (mm/arcsec)
5.817764E-4  field radius angle (ubar1), (rad)
0.1440119    linear diameter of focal plane (m)
0.047        rms angular image radius tolerance (arcsec)
28.20233     rms physical image radius tolerance (microns)
1.520967     fractional curved field radius
6.083869     maximum curved field diameter (arcmin)
-0.8950837   ?petzval radius of curvature (m)
-1.042961    focal plane radius of curvature (m)
0.8939903    fractional flat field radius
3.575961     maximum flat field diameter (arcmin)
1.17422      height of largest flat field (mm)
-0.550124    full field distortion (microns)
field focus curve for aligned system
radius        focal plane height    image size          wave aberration
(mm)          (arcmin)              (mm)                (+/-mm)            (micron)  (arcsec)            (micron rms)
0.00          0.00                  0.                   1.17                0.         0.                   0.
3.60          0.10                  0.006214            1.17                0.848     0.00141             0.00416
7.20          0.20                  0.02486             1.17                1.7       0.00283             0.00833
10.80         0.30                  0.05593             1.17                2.55     0.00424             0.0125

```

14.40	0.40	0.09943	1.17	3.4	0.00566	0.0168
18.00	0.50	0.1554	1.16	4.25	0.00708	0.0211
21.60	0.60	0.2237	1.15	5.11	0.00851	0.0255
25.20	0.70	0.3045	1.15	5.97	0.00994	0.03
28.80	0.80	0.3977	1.14	6.83	0.0114	0.0346
32.40	0.90	0.5033	1.13	7.7	0.0128	0.0393
36.00	1.00	0.6214	1.12	8.57	0.0143	0.0441
39.60	1.10	0.7519	1.11	9.45	0.0157	0.0491
43.20	1.20	0.8948	1.09	10.3	0.0172	0.0542
46.80	1.30	1.05	1.08	11.2	0.0187	0.0596
50.40	1.40	1.218	1.06	12.1	0.0202	0.065
54.00	1.50	1.398	1.04	13.	0.0217	0.0707
57.60	1.60	1.591	1.02	13.9	0.0232	0.0766
61.21	1.70	1.796	0.998	14.8	0.0247	0.0826
64.81	1.80	2.013	0.973	15.8	0.0263	0.0889
68.41	1.90	2.243	0.946	16.7	0.0279	0.0954
72.01	2.00	2.486	0.916	17.7	0.0294	0.102
secondary alignment tolerances based on rms image radius						
0.09588546	wavefront focus -- axial motion (micron/micron)					
7.064276	m2 focus tolerance (on-axis) -- axial motion (micron)					
5.507792	m2 focus tolerance (field) -- axial motion (micron)					
1.833691E-7	scale change without refocus (fraction/micron)					
2.532618E-7	scale change with refocus (fraction/micron)					
0.004568509	wavefront spherical ab'n -- axial motion					
(micron/micron)						
0.08966701	induced image radius (micron/micron)					
1.494327E-4	induced image radius (arcsec/micron)					
314.5229	tolerable secondary motion (micron)					
27.48479	wavefront spherical ab'n -- focal motion (micron/meter)					
-0.05227985	tolerable focal plane motion (m)					
0.01103283	wavefront spherical ab'n -- primary asphere					
(micron/ppm)						
0.2165435	induced image radius (micron/ppm)					
3.608759E-4	induced image radius (arcsec/ppm)					
1.302387E-4	tolerable primary asphere error					
0.001529529	wavefront spherical ab'n -- secondary asphere					
(micron/ppm)						
0.03002037	induced image radius (micron/ppm)					
5.002981E-5	induced image radius (arcsec/ppm)					
9.394400E-4	tolerable secondary asphere error					
1.063686	distance from m2 to zero-coma pivot (m)					
0.	distance from prime focus to zero-coma pivot (m)					
-0.1022064	image motion from zero-coma rotation (arcsec/arcsec)					
-0.2216011	image motion from m2 vertex rotation (arcsec/arcsec)					
13.89261	image motion from lateral displacement (micron/micron)					
0.02315244	image motion from lateral displacement (arcsec/micron)					
0.02098232	wavefront coma -- lateral motion (micron/micron)					
0.5043794	induced image radius (micron/micron)					
8.405629E-4	induced image radius (arcsec/micron)					
55.91491	tolerable motion (micron)					
0.1082036	wavefront coma -- vertex rotation (micron/arcsec)					
2.601031	induced image radius (micron/arcsec)					
0.004334693	induced image radius (arcsec/arcsec)					
10.84275	tolerable rotation (arcsec)					
-0.4882808	wavefront coma -- vertex chop angle (micron/arcsec)					
-11.73745	induced image radius (micron/arcsec)					
-0.01956079	induced image radius (arcsec/arcsec)					

-2.402766	tolerable vertex chop throw (arcsec)
74.90606	tolerable zero coma chop throw (arcsec), astig only
0.9765616	wavefront coma -- primary rotation (micron/arcsec)
23.47489	induced image radius (micron/arcsec)
0.03912158	induced image radius (arcsec/arcsec)
1.201383	tolerable rotation (arcsec)

Writing OSLO format input file: y15D.len

Deleting existing output file.