

**SXT Calibration Note 13**  
**Entrance annulus of SXT**

From: Loren Acton  
Date: 7 December 1990  
Ref 1. UTOS Mfg. Drawing 5966-01 (FINAL OPTICAL CONFIGURATION - FLIGHT MIRROR)  
2. UTOS Final Technical Report dated March 27, 1989  
3. Telecon with Greg Hull-Allen on Nov. 21, 1990 (cut-off and notch dimensions).

The entrance annulus of the SXT mirror is set by the forward and aft edges of the forward hyperboloid (H1) of the x-ray mirror. According to reference 3 these edges are, for H1:

Aft (edge of notch)	2.438 mm forward of mirror joint.
Width of H1	20.087 mm.
Forward (top of mirror)	22.525 mm forward of mirror joint.

For reference, the corresponding edges for H2, the second hyperboloid, are:

Forward (edge of notch)	2.196 mm aft of mirror joint.
Width of H2	20.427 mm.
Aft (bottom of mirror)	22.623 mm aft of mirror joint.

Total average length of mirror 45.148 mm.

Entrance annulus of mirror:

	<u>Description</u>	<u>Inner radius (in)</u>	<u>Outer radius (in)</u>	<u>Difference (mm)</u>
a.	Flight design	4.526712	4.541401	0.373
b.	Corrected for radius and delta radius error (ref 2 Table 6)	4.541132	4.526682	0.367
c.	Corrected for radius and measured slope of 1.0321 deg. (ref 2 Tables 6 & 7)	<b>4.541061</b>	<b>4.526808</b>	<b>0.362</b>

Although the mirror data given in references 1 and 2 are not internally consistent it is necessary to use the slopes of Table 7 of reference 2 to match the measured (MSFC2) joint focal length of the mirror. Therefore, the (c) description of the mirror is to be adopted for future work pending better information.

Mirror Figure

12/7/90 SXT Mirror figure spread sheet  
 Ref: UTOS drawing and Final report.

				Delta radius error->		Slope	
						1.0321 UTOS slope	
Z (in)	R (in)	Z (mm)	R (mm)	Z (mm)	Rad corr	Delta rad corr	1.046327862 Slope for Table 6 errors
1.181102	4.546858	29.9999908	115.4901932		4.546676	4.5464995	1.046327862 Slope for G@ delta radius
1.161417	4.546493	29.4999918	115.4809222		4.546311	4.546140483	
1.122047	4.545763	28.4999938	115.4623802		4.545581	4.545422449	
1.082677	4.545034	27.4999958	115.4438636		4.544852	4.544705415	Focal length (joint)
1.043307	4.544304	26.4999978	115.4253216		4.544122	4.543987381	Total angle 4.260299504 deg
1.003937	4.543574	25.4999998	115.4067796		4.543392	4.543269347	Radius@-12.5 mm 114.2399899 mm
0.964567	4.542844	24.5000018	115.3882376		4.542662	4.542551313	My focal length 1546.054588 mm
0.925197	4.542113	23.5000038	115.3696702		4.541931	4.54183228	
0.886811024	4.541401246	Top of cut off mirror		22.525	4.541219246	4.541132192	Table 7 total angle 4.3 deg
0.885827	4.541383	22.5000058	115.3511282		4.541201	4.541114246	UTOS focal length 1531.843212 mm
0.846457	4.540653	21.5000078	115.3325862		4.540471	4.540396212	
0.807087	4.539922	20.5000098	115.3140188		4.53974	4.539677178	
0.767717	4.539192	19.5000118	115.2954768		4.53901	4.538959144	
0.728346	4.538461	18.4999884	115.2769094		4.538279	4.53824011	UTOS Table 6
0.688976	4.53773	17.4999904	115.258342		4.537548	4.537521076	H1 radius error -182 μinch
0.649606	4.537	16.4999924	115.2398		4.536818	4.536803042	H2 radius error 182 μinch
0.610236	4.536269	15.4999944	115.2212326		4.536087	4.536084008	H1 delta radius error 353 μinch
0.570866	4.535538	14.4999964	115.2026652		4.535356	4.535364975	H2 delta radius error 339 μinch
0.531496	4.534806	13.4999984	115.1840724	Middle of H1	4.534624	4.534624	
0.492126	4.534075	12.5000004	115.165505	12.4815	4.533893	4.533925907	Delta radius to match Utos Table 7 slopes
0.452756	4.533344	11.5000024	115.1469376		4.533162	4.533206873	H1 delta radius error 642 μinch
0.413386	4.532612	10.5000044	115.1283448		4.53243	4.532486839	H2 delta radius error 225 μinch
0.374016	4.531881	9.5000064	115.1097774		4.531699	4.531767805	
0.334646	4.531149	8.5000084	115.0911846		4.530967	4.531047771	Note: When UTOS slopes are matched the SXT joint focal length agrees with the MSFC2 value.
0.295276	4.530418	7.5000104	115.0726172		4.530236	4.530328737	
0.255906	4.529686	6.5000124	115.0540244		4.529504	4.529608703	
0.216535	4.528954	5.499989	115.0354316		4.528772	4.52888867	Width of entrance annulus
0.177165	4.528222	4.499991	115.0168388		4.52804	4.528168636	Design As built
0.137795	4.52749	3.499993	114.998246		4.527308	4.527448602	0.014689626 0.014449263 inches
0.098425	4.526757	2.499995	114.9796278		4.526575	4.526727568	0.373116506 0.367011282 mm
0.05984252	4.526025	1.499997	114.961035		4.525843	4.526007534	
0.019685	4.525293	0.499999	114.9424422		4.525111	4.5252875	
				Delta radius error->		339	
-0.019685	4.523829	-0.499999	114.9052566		4.524011	4.5238415	3.176477614 Slope for Table 6 errors
-0.059055	4.521635	-1.499997	114.849529		4.521817	4.521658992	3.176477614 Slope for G@ delta radius
-0.086456693	4.52010727	H2 edge of notch		-2.196	4.52028927	4.52013926	
-0.088425	4.51944	-2.499995	114.793776		4.519622	4.519475483	
-0.137795	4.517245	-3.499993	114.738023		4.517427	4.517291975	
-0.177165	4.51505	-4.499991	114.68227		4.515232	4.515108466	
-0.216535	4.512855	-5.499989	114.626517		4.513037	4.512924958	
-0.255906	4.51066	-6.5000124	114.570764		4.510842	4.510741449	
-0.295276	4.508465	-7.5000104	114.515011		4.508647	4.508557941	
-0.334646	4.50627	-8.5000084	114.459258		4.506452	4.506374432	
-0.374016	4.504074	-9.5000064	114.4034796		4.504256	4.504189924	
-0.413386	4.501878	-10.5000044	114.3477012		4.50206	4.502005415	
-0.452756	4.499682	-11.5000024	114.2919228	Middle of H2	4.499864	4.499820907	
-0.492126	4.497487	-12.5000004	114.2361698	-12.413	4.497669	4.497637398	
-0.531496	4.49529	-13.4999984	114.180366		4.495472	4.49545189	
-0.570866	4.493094	-14.4999964	114.1245876		4.493276	4.493267381	
-0.610236	4.490898	-15.4999944	114.0688092		4.49108	4.491082873	
-0.649606	4.488701	-16.4999924	114.0130054		4.488883	4.488897364	
-0.688976	4.486505	-17.4999904	113.957227		4.486687	4.486712856	
-0.728346	4.484308	-18.4999884	113.9014232		4.48449	4.484527347	
-0.767717	4.482111	-19.5000118	113.8456194		4.482293	4.482341839	
-0.807087	4.479914	-20.5000098	113.7898156		4.480096	4.480156331	
-0.846457	4.477717	-21.5000078	113.7340118		4.477899	4.477970822	
-0.885827	4.475519	-22.5000058	113.6781826		4.475701	4.475784314	
-0.890944882	4.475233402	Bottom of cut off mirror		-22.63	4.475415402	4.47550021	
-0.925197	4.473322	-23.5000038	113.6223788		4.473504	4.473598805	
-0.964567	4.471124	-24.5000018	113.5665496		4.471306	4.471412297	
-1.003937	4.468927	-25.4999998	113.5107458		4.469109	4.469226788	
-1.043307	4.466729	-26.4999978	113.4549166		4.466911	4.46704028	
-1.082677	4.464531	-27.4999958	113.3990874		4.464713	4.464853771	
-1.122047	4.462333	-28.4999938	113.3432582		4.462515	4.462667263	
-1.161417	4.460134	-29.4999918	113.2874036		4.460316	4.460479754	
-1.181102	4.459035	-29.9999908	113.259489		4.459217	4.4593865	

SXT FM-2 FINAL ASSEMBLY DATA PRELIMINARY SUMMARY

CONTENTS:

- WITNESS SAMPLE PULL TEST RESULTS
- FINAL ASSEMBLY MODAL TEST RESULTS
- FINAL ALIGNMENT
- EPOXY LOT CODE AND EXPIRATION DATE

FINAL TILT OF OPTICAL AXIS WITH RESPECT TO MOUNT INTERFACE PLANE:

3.4 ARC-SECONDS AT 78 DEGREES AFTER 215 DEGREE CLOCKING OF MIRROR WITH RESPECT TO THE MOUNT

AS RECEIVED HEIGHT OF MIRROR REFERENCE ABOVE MOUNT INTERFACE PLANE:

1 (TOP DEAD CENTER)

- 1) 2.9400 IN.
- 2) 2.9399 IN.
- 3) 2.9405 IN.

2                      3

$\bar{x} = 2.9402667$

*wrong!*  
*should be 2.94013333*  
*mirror is close to Sun*  
*following re-mounting.*  
 MS 11-29-90

AS DELIVERED HEIGHT:

- 1) 2.9409 IN.
- 2) 2.9405 IN.
- 3) 2.9402 IN.

$\bar{x} = 2.9405333$

$\Delta z = + 0.0002667$

From: SAG::ACTON 21-NOV-1990 16:36:10.43  
To: LEMEN,CLAFLIN  
CC: BROWN,ACTON  
Subj: SXT Mirror dimensions.

Greetings,

I have just had a call from Greg Hull-Allen. He provided new (calculated today from metrology data) dimensional information on the SXT mirror. I will send this along now because I know that it is needed but it should ultimately be summarize in an SXT Calibration Note and become part of the SXT Instrument Handbook.

1. The average radius versus Z of the mirror is given by the FINAL table on the UTOS drawing in the SXT indentured drawing list, corrected by the radius and delta radius (slope) errors of Table 6 of the UTOS final report. This will give you the figure of the as-built but un-cut-off mirror.

2. The UTOS final report is WRONG on page 20 where it states that the width of the notch between H1 and H2 is 2.5 mm. It's half-width is about 2.5 mm.

3. The final average dimensions of H1 in the Z direction are as follows, measured forward from the joint:

Joint to bottom of H1 = 2.438 mm.

Bottom of H1 to top (sun end) of H1 = 20.087 mm.

4. The final average dimensions of H2 in the -Z direction are as follows, measured aft from the joint:

Joint to top of H2 = 2.196 mm.

Top of H2 to bottom (detector end) of H2 = 20.427 mm.

5. The total average length of the mirror = 45.148 mm.

6. Peak-to-valley difference in length of mirror = 0.000105 mm with thinnest position at 123 degrees.

Loren

SXT Mirror Figure  
 Design from UTOS drawing  
 Final from errors in UTOS Final Report Table 6 (applied to uncut mirror)  
 LWA 12/10/90

