

 GLAST LAT TECHNICAL DOCUMENT	Document # LAT-DS-00741-1	Date Effective 05/17/02
	Prepared by(s) Bob Hartman	Supersedes None
	Subsystem/Office Anticoincidence Detector Subsystem	
Document Title Documentation for ACD Qualification Photomultiplier Tubes		

Gamma-ray Large Area Space Telescope (GLAST)

Large Area Telescope (LAT)

Documentation for ACD Qualification Photomultiplier Tubes

R4443

NASA Goddard Space Flight Center

Serial No. : ZL0609

Ver.4

Model / Level		Model						Level					
		☒ Qualificatio		☐ Engineering		☐ Flight		☐ Vib. tes		☐ Level-1		☒ Level-2	
Visual Inspection Spec		1) Window Material			2) Glass Defects Check			3) Loose Particle Check			4) Internal Structure		
		The face plate shall be free of clearly visible bubbles, inclusions, surface scratches and edge chippings in accordance with internal spec.			Any observed Bubble: 1mm Max There shall exist no irregularities, surface defects, or any variations of condition at the glass envelope in accordance with internal spec			0.5 mm Max for Metallic Particle; 1 mm Max for Non-Metallic Particle; 1.5 mm Max for Accumulations of Particles			No observable structural defect in accordance with internal spec		
Date		2002.02.20	2002.02.13	2002.03.05	2002.02.20	2002.02.13	2002.03.05	2002.02.20	2002.02.13	2002.03.05	2002.02.20	2002.02.13	2002.03.05
Item No.	1, 4, 7	No. 1	No. 4	No. 7	No. 1	No. 4	No. 7	No. 1	No. 4	No. 7	No. 1	No. 4	No. 7
		☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail

DC Measurements Spec		Sk (uA/lm)	Skb	Sp (A/lm)	Gain (x e6)	Dark (nA)			Q.E. (%)	Ebb (V)	Idb (nA)	Note #1 : Max Variation SK = ± 10 % Gain = ± 25 % Idb = + 100% If Idb is less than 1 nA, it should be 10 times max..	
				at 1250 V		750 V	1000 V	1250 V	at 490nm	at 5 x e5 Gain			
		-	-	-	Min. 2	-	-	-	Min. 14.0	Max. 1000	Max. 10		
Item No.	Date												
2	2002.02.20	65.3	9.26	437	6.69	1.40	4.20	18.00	15.7	872	2.30		
3	2002.02.13	○ 12-hour Burn-in Test ● Random Vibration											
5	2002.02.13	67.6	9.32	414	6.12	1.30	4.00	15.00	-	881	2.30		
Between #2 & #5 [%] Note#1		3.5	0.6	-5.3	-8.5	-7.1	-4.8	-16.7	-	1.0	0.0		
6	2002.03.01	Drift Test											
		● 12-hour burn-in		After 0hr(%)		After 12hr(%) : Note #2		After 24hr(%)		After 48hr(%)		After 100hr(%) : Note #2	
		○ 100-hour Burn-in		100		99.4		-		-		-	
		Burn-in Spec		-		90 % to 110%		-		-		75% to 125%	
8	2002.03.05	64.0	9.07	396	6.19	1.30	3.30	12.00	16.0	879	2.00		
Between #5 & #8 [%] Note#1		-5.3	-2.7	-4.3	1.0	0.0	-17.5	-20.0	-	-0.2	-13.0	Note#2 : Burn-in Spec (Gain)	

Item No. 1 : Visual Inspection 1
2 : DC Measurements 1

3 : Vibration or Burn-in
4 : Visual Inspection 2

5 : DC Measurements 2
6 : Burn-in

7 : Visual Inspection 3
8 : DC Measurements 3

Judgement

Result

☒ Pass☐ Fail

Failure analysis :

Date : 2002.04.20

Judges :T. INADA

Note#2 : Burn-in Spec (Gain)

12 hours Burn-in
 no SPEC
100 hours Burn-in
 ±10% at 12 hours
 ±25% at 100 hours

Print Date : 5/17/2002

R4443

NASA Goddard Space Flight Center

Serial No. : ZL0610

Ver.4

Model / Level		Model						Level					
		☒ Qualificatio		☐ Engineering		☐ Flight		☐ Vib. tes		☐ Level-1		☒ Level-2	
Visual Inspection Spec		1) Window Material			2) Glass Defects Check			3) Loose Particle Check			4) Internal Structure		
		The face plate shall be free of clearly visible bubbles, inclusions, surface scratches and edge chippings in accordance with internal spec.			Any observed Bubble: 1mm Max There shall exist no irregularities, surface defects, or any variations of condition at the glass envelope in accordance with internal spec			0.5 mm Max for Metallic Particle; 1 mm Max for Non-Metallic Particle; 1.5 mm Max for Accumulations of Particles			No observable structural defect in accordance with internal spec		
Date		2002.02.20	2002.02.13	2002.03.05	2002.02.20	2002.02.13	2002.03.05	2002.02.20	2002.02.13	2002.03.05	2002.02.20	2002.02.13	2002.03.05
Item No.	1, 4, 7	No. 1	No. 4	No. 7	No. 1	No. 4	No. 7	No. 1	No. 4	No. 7	No. 1	No. 4	No. 7
		☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail

DC Measurements Spec		Sk (uA/lm)	Skb	Sp (A/lm)	Gain (x e6)	Dark (nA)			Q.E. (%) at 490nm	Ebb (V)	Idb (nA)	Note #1 : Max Variation SK = ± 10 % Gain = ± 25 % Idb = + 100% If Idb is less than 1 nA, it should be 10 times max..
				at 1250 V		750 V	1000 V	1250 V		at 5 x e5 Gain		
		-	-	-	Min. 2	-	-	-	Min. 14.0	Max. 1000	Max. 10	
Item No.	Date											
2	2002.02.20	65.4	9.26	711	10.87	0.04	0.13	0.72	15.1	815	0.05	
3	2002.02.13	○ 12-hour Burn-in Test ● Random Vibration										
5	2002.02.13	66.5	9.34	695	10.45	0.04	0.14	0.67	-	818	0.06	
Between #2 & #5 [%] Note#1		1.7	0.9	-2.3	-3.9	0.0	7.7	-6.9	-	0.4	20.0	
6	2002.03.01	Drift Test										
		● 12-hour burn-in		After 0hr(%)		After 12hr(%) : Note #2		After 24hr(%)		After 48hr(%)		After 100hr(%) : Note #2
		○ 100-hour Burn-in		100		102.7		-		-		-
		Burn-in Spec		-		90 % to 110%		-		-		75% to 125%
8	2002.03.05	63.1	9.00	656	10.40	0.04	0.12	0.53	15.4	818	0.05	
Between #5 & #8 [%] Note#1		-5.1	-3.6	-5.6	-0.5	0.0	-14.3	-20.9	-	0.0	-16.7	Note#2 : Burn-in Spec (Gain)

Item No. 1 : Visual Inspection 1
2 : DC Measurements 1

3 : Vibration or Burn-in
4 : Visual Inspection 2

5 : DC Measurements 2
6 : Burn-in

7 : Visual Inspection 3
8 : DC Measurements 3

Judgement

Result

☒ Pass☐ Fail

Failure analysis :

Date : 2002.04.20

Judges :T. INADA

Print Date : 5/17/2002

R4443

NASA Goddard Space Flight Center

Serial No. : ZL0879

Ver.4

Model / Level		Model						Level					
		☒ Qualificatio		☐ Engineering		☐ Flight		☐ Vib. tes		☐ Level-1		☒ Level-2	
Visual Inspection Spec		1) Window Material			2) Glass Defects Check			3) Loose Particle Check			4) Internal Structure		
		The face plate shall be free of clearly visible bubbles, inclusions, surface scratches and edge chippings in accordance with internal spec.			Any observed Bubble: 1mm Max There shall exist no irregularities, surface defects, or any variations of condition at the glass envelope in accordance with internal spec			0.5 mm Max for Metallic Particle; 1 mm Max for Non-Metallic Particle; 1.5 mm Max for Accumulations of Particles			No observable structural defect in accordance with internal spec		
Date		2002.02.26	2002.03.05	2002.03.07	2002.02.26	2002.03.05	2002.03.07	2002.02.26	2002.03.05	2002.03.07	2002.02.26	2002.03.05	2002.03.07
Item No.	1, 4, 7	No. 1	No. 4	No. 7	No. 1	No. 4	No. 7	No. 1	No. 4	No. 7	No. 1	No. 4	No. 7
		☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail

DC Measurements Spec		Sk (uA/lm)	Skb	Sp (A/lm)	Gain (x e6)	Dark (nA)			Q.E. (%) at 490nm	Ebb (V)	Idb (nA)	Note #1 : Max Variation SK = ± 10 % Gain = ± 25 % Idb = + 100% If Idb is less than 1 nA, it should be 10 times max..	
				at 1250 V		750 V	1000 V	1250 V		at 5 x e5 Gain			
		-	-	-	Min. 2	-	-	-	Min. 14.0	Max. 1000	Max. 10		
Item No.	Date												
2	2002.02.26	74.9	9.60	616	8.22	0.03	0.39	2.60	16.7	848	0.08		
3	2002.03.05	○ 12-hour Burn-in Test ● Random Vibration											
5	2002.03.05	73.0	9.48	641	8.78	0.02	0.08	0.49	-	842	0.03		
Between #2 & #5 [%] Note#1		-2.5	-1.3	4.1	6.8	-33.3	-79.5	-81.2	-	-0.7	-62.5		
6	2002.03.05	Drift Test											
		● 12-hour burn-in		After 0hr(%)		After 12hr(%) : Note #2		After 24hr(%)		After 48hr(%)		After 100hr(%) : Note #2	
		○ 100-hour Burn-in		100		99.7		-		-		-	
		Burn-in Spec		-		90 % to 110%		-		-		75% to 125%	
8	2002.03.07	74.4	9.55	644	8.66	0.02	0.06	0.32	16.9	842	0.03		
Between #5 & #8 [%] Note#1		1.9	0.7	0.5	-1.4	0.0	-25.0	-34.7	-	0.0	0.0	Note#2 : Burn-in Spec (Gain)	

Item No. 1 : Visual Inspection 1
2 : DC Measurements 1

3 : Vibration or Burn-in
4 : Visual Inspection 2

5 : DC Measurements 2
6 : Burn-in

7 : Visual Inspection 3
8 : DC Measurements 3

Judgement

Result

☒ Pass☐ Fail

Failure analysis :

Date : 2002.04.20

Judges :T. INADA

Print Date : 5/17/2002

R4443

NASA Goddard Space Flight Center

Serial No. : ZL0880

Ver.4

Model / Level		Model ☒ Qualificatio ☐ Engineering ☐ Flight Level ☐ Vib. tes ☐ Level-1 ☒ Level-2 ☐ Level-3											
Visual Inspection Spec		1) Window Material			2) Glass Defects Check			3) Loose Particle Check			4) Internal Structure		
		The face plate shall be free of clearly visible bubbles, inclusions, surface scratches and edge chippings in accordance with internal spec.			Any observed Bubble: 1mm Max There shall exist no irregularities, surface defects, or any variations of condition at the glass envelope in accordance with internal spec			0.5 mm Max for Metallic Particle; 1 mm Max for Non-Metallic Particle; 1.5 mm Max for Accumulations of Particles			No observable structural defect in accordance with internal spec		
Date		2002.02.26	2002.03.05	2002.03.07	2002.02.26	2002.03.05	2002.03.07	2002.02.26	2002.03.05	2002.03.07	2002.02.26	2002.03.05	2002.03.07
Item No.	1, 4, 7	No. 1	No. 4	No. 7	No. 1	No. 4	No. 7	No. 1	No. 4	No. 7	No. 1	No. 4	No. 7
		☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail

DC Measurements Spec	Sk (uA/lm)	Skb	Sp (A/lm)	Gain (x e6)	Dark (nA)			Q.E. (%)	Ebb (V)	Idb (nA)	Note #1 : Max Variation SK = ± 10 % Gain = ± 25 % Idb = + 100% If Idb is less than 1 nA, it should be 10 times max..		
					at 1250 V	750 V	1000 V	1250 V	at 490nm	at 5 x e5 Gain			
	-	-	-	Min. 2	-	-	-	Min. 14.0	Max. 1000	Max. 10			
Item No.	Date												
2	2002.02.26	74.1	9.38	698	9.42	0.83	1.50	2.60	16.0	836	1.00		
3	2002.03.05	○ 12-hour Burn-in Test			● Random Vibration								
5	2002.03.05	73.1	9.32	737	10.08	0.89	1.60	3.00	-	831	1.10		
Between #2 & #5 [%] Note#1		-1.3	-0.6	5.6	7.0	7.2	6.7	15.4	-	-0.6	10.0		
6	2002.03.05	Drift Test		After 0hr(%)		After 12hr(%) : Note #2		After 24hr(%)		After 48hr(%)		After 100hr(%) : Note #2	
		● 12-hour burn-in		100		100.9		-		-		-	
		○ 100-hour Burn-in		-		90 % to 110%		-		-		75% to 125%	
8	2002.03.07	73.8	9.44	748	10.14	0.72	1.40	2.80	16.4	828	0.88		
Between #5 & #8 [%] Note#1		1.0	1.3	1.5	0.5	-19.1	-12.5	-6.7	-	-0.4	-20.0		

 Item No. 1 : Visual Inspection 1
 2 : DC Measurements 1

 3 : Vibration or Burn-in
 4 : Visual Inspection 2

 5 : DC Measurements 2
 6 : Burn-in

 7 : Visual Inspection 3
 8 : DC Measurements 3

Judgement

Result

☒ Pass☐ Fail

Failure analysis :

Date : 2002.04.20

Judges :T. INADA

 12 hours Burn-in
 no SPEC
 100 hours Burn-in
 ±10% at 12 hours
 ±25% at 100 hours

Print Date : 5/17/2002

R4443

NASA Goddard Space Flight Center

Serial No. : ZL0882

Ver.4

Model / Level		Model ☒ Qualificatio ☐ Engineering ☐ Flight						Level ☐ Vib. tes ☐ Level-1 ☒ Level-2 ☐ Level-3					
Visual Inspection Spec		1) Window Material			2) Glass Defects Check			3) Loose Particle Check			4) Internal Structure		
		The face plate shall be free of clearly visible bubbles, inclusions, surface scratches and edge chippings in accordance with internal spec.			Any observed Bubble: 1mm Max There shall exist no irregularities, surface defects, or any variations of condition at the glass envelope in accordance with internal spec			0.5 mm Max for Metallic Particle; 1 mm Max for Non-Metallic Particle; 1.5 mm Max for Accumulations of Particles			No observable structural defect in accordance with internal spec		
Date		2002.02.22	2002.03.05	2002.03.08	2002.02.22	2002.03.05	2002.03.08	2002.02.22	2002.03.05	2002.03.08	2002.02.22	2002.03.05	2002.03.08
Item No.	1, 4, 7	No. 1	No. 4	No. 7	No. 1	No. 4	No. 7	No. 1	No. 4	No. 7	No. 1	No. 4	No. 7
		☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail

DC Measurements Spec		Sk (uA/lm)	Skb	Sp (A/lm)	Gain (x e6)	Dark (nA)			Q.E. (%)	Ebb (V)	Idb (nA)	Note #1 : Max Variation SK = ± 10 % Gain = ± 25 % Idb = + 100% If Idb is less than 1 nA, it should be 10 times max..
				at 1250 V		750 V	1000 V	1250 V	at 490nm	at 5 x e5 Gain		
		-	-	-	Min. 2	-	-	-	Min. 14.0	Max. 1000	Max. 10	
Item No.	Date											
2	2002.02.22	71.0	9.40	524	7.38	0.06	0.12	0.38	-	862	0.08	
3	2002.03.04	○ 12-hour Burn-in Test			● Random Vibration							
5	2002.03.05	70.9	9.39	580	8.18	0.07	0.13	0.45	-	850	0.08	
Between #2 & #5 [%] Note#1		-0.1	-0.1	10.7	10.8	16.7	8.3	18.4	-	-1.4	0.0	
6	2002.03.05	Drift Test		After 0hr(%)		After 12hr(%) : Note #2		After 24hr(%)		After 48hr(%)		After 100hr(%) : Note #2
		● 12-hour burn-in		100		100.5		-		-		-
		○ 100-hour Burn-in		-		90 % to 110%		-		-		75% to 125%
8	2002.03.08	70.0	9.24	554	7.91	0.06	0.14	0.45	16.0	850	0.08	
Between #5 & #8 [%] Note#1		-1.3	-1.6	-4.5	-3.3	-14.3	7.7	0.0	-	0.0	0.0	

Item No. 1 : Visual Inspection 1
2 : DC Measurements 1

3 : Vibration or Burn-in
4 : Visual Inspection 2

5 : DC Measurements 2
6 : Burn-in

7 : Visual Inspection 3
8 : DC Measurements 3

Judgement

Result

☒ Pass☐ Fail

Failure analysis :

Date : 2002.03.08

Judges :T. INADA

Note#2 : Burn-in Spec (Gain)

12 hours Burn-in
no SPEC
100 hours Burn-in
±10% at 12 hours
±25% at 100 hours

Print Date : 5/17/2002

R4443

NASA Goddard Space Flight Center

Serial No. : ZL0883

Ver.4

Model / Level		Model ☒ Qualificatio ☐ Engineering ☐ Flight						Level ☐ Vib. tes ☐ Level-1 ☒ Level-2 ☐ Level-3					
Visual Inspection Spec		1) Window Material			2) Glass Defects Check			3) Loose Particle Check			4) Internal Structure		
		The face plate shall be free of clearly visible bubbles, inclusions, surface scratches and edge chippings in accordance with internal spec.			Any observed Bubble: 1mm Max There shall exist no irregularities, surface defects, or any variations of condition at the glass envelope in accordance with internal spec			0.5 mm Max for Metallic Particle; 1 mm Max for Non-Metallic Particle; 1.5 mm Max for Accumulations of Particles			No observable structural defect in accordance with internal spec		
Date		2002.02.26	2002.03.05	2002.03.07	2002.02.26	2002.03.05	2002.03.07	2002.02.26	2002.03.05	2002.03.07	2002.02.26	2002.03.05	2002.03.07
Item No.	1, 4, 7	No. 1	No. 4	No. 7	No. 1	No. 4	No. 7	No. 1	No. 4	No. 7	No. 1	No. 4	No. 7
		☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail

DC Measurements Spec	Sk (uA/lm)	Skb	Sp (A/lm)	Gain (x e6)	Dark (nA)			Q.E. (%)	Ebb (V)	Idb (nA)	Note #1 : Max Variation SK = ± 10 % Gain = ± 25 % Idb = + 100% If Idb is less than 1 nA, it should be 10 times max..		
					at 1250 V	750 V	1000 V	1250 V	at 490nm	at 5 x e5 Gain			
	-	-	-	Min. 2	-	-	-	-	Min. 14.0	Max. 1000		Max. 10	
Item No.	Date												
2	2002.02.26	70.7	9.30	595	8.42	1.40	2.70	6.60	16.4	849	1.80		
3	2002.03.05	○ 12-hour Burn-in Test			● Random Vibration								
5	2002.03.05	69.5	9.18	644	9.27	1.50	2.90	8.20	-	840	1.80		
Between #2 & #5 [%] Note#1		-1.7	-1.3	8.2	10.1	7.1	7.4	24.2	-	-1.1	0.0		
6	2002.03.05	Drift Test		After 0hr(%)		After 12hr(%) : Note #2		After 24hr(%)		After 48hr(%)		After 100hr(%) : Note #2	
		● 12-hour burn-in		100		101.3		-		-		-	
		○ 100-hour Burn-in		-		90 % to 110%		-		-		75% to 125%	
8	2002.03.07	69.5	9.17	633	9.11	1.40	2.70	6.90	16.8	840	1.70		
Between #5 & #8 [%] Note#1		0.0	-0.1	-1.7	-1.7	-6.7	-6.9	-15.9	-	0.0	-5.6		

 Item No. 1 : Visual Inspection 1
 2 : DC Measurements 1

 3 : Vibration or Burn-in
 4 : Visual Inspection 2

 5 : DC Measurements 2
 6 : Burn-in

 7 : Visual Inspection 3
 8 : DC Measurements 3

Judgement

Result

☒ Pass☐ Fail

Failure analysis :

Date : 2002.04.20

Judges :T. INADA

12 hours Burn-in
 no SPEC
100 hours Burn-in
 ±10% at 12 hours
 ±25% at 100 hours

Print Date : 5/17/2002

R4443

NASA Goddard Space Flight Center

Serial No. : ZL0885

Ver.4

Model / Level		Model						Level					
		☒ Qualificatio		☐ Engineering		☐ Flight		☐ Vib. tes		☐ Level-1		☒ Level-2	
Visual Inspection Spec		1) Window Material			2) Glass Defects Check			3) Loose Particle Check			4) Internal Structure		
		The face plate shall be free of clearly visible bubbles, inclusions, surface scratches and edge chippings in accordance with internal spec.			Any observed Bubble: 1mm Max There shall exist no irregularities, surface defects, or any variations of condition at the glass envelope in accordance with internal spec			0.5 mm Max for Metallic Particle; 1 mm Max for Non-Metallic Particle; 1.5 mm Max for Accumulations of Particles			No observable structural defect in accordance with internal spec		
Date		2002.02.27	2002.04.16	2002.04.19	2002.02.27	2002.04.16	2002.04.19	2002.02.27	2002.04.16	2002.04.19	2002.02.27	2002.04.16	2002.04.19
Item No.	1, 4, 7	No. 1	No. 4	No. 7	No. 1	No. 4	No. 7	No. 1	No. 4	No. 7	No. 1	No. 4	No. 7
		☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail

DC Measurements Spec		Sk (uA/lm)	Skb	Sp (A/lm)	Gain (x e6)	Dark (nA)			Q.E. (%) at 490nm	Ebb (V)	Idb (nA)	Note #1 : Max Variation SK = ± 10 % Gain = ± 25 % Idb = + 100% If Idb is less than 1 nA, it should be 10 times max..	
				at 1250 V		750 V	1000 V	1250 V		at 5 x e5 Gain			
		-	-	-	Min. 2	-	-	-	Min. 14.0	Max. 1000	Max. 10		
Item No.	Date												
2	2002.02.27	67.2	9.45	361	5.37	0.00	0.01	0.06	15.6	899	0.01		
3	2002.04.16	○ 12-hour Burn-in Test ● Random Vibration											
5	2002.04.16	66.0	9.27	417	6.32	0.01	0.02	0.08	-	881	0.01		
Between #2 & #5 [%] Note#1		-1.8	-1.9	15.5	17.6	150.0	100.0	33.3	-	-2.0	0.0		
6	2002.04.17	Drift Test											
		● 12-hour burn-in		After 0hr(%)		After 12hr(%) : Note #2		After 24hr(%)		After 48hr(%)			After 100hr(%) : Note #2
		○ 100-hour Burn-in		100		98.9		-		-		-	
		Burn-in Spec		-		90 % to 110%		-		-		75% to 125%	
8	2002.04.19	66.2	9.30	425	6.42	0.00	0.02	0.06	16.1	879	0.01		
Between #5 & #8 [%] Note#1		0.3	0.3	1.9	1.6	-60.0	0.0	-25.0	-	-0.2	0.0	Note#2 : Burn-in Spec (Gain)	

Item No. 1 : Visual Inspection 1
2 : DC Measurements 1

3 : Vibration or Burn-in
4 : Visual Inspection 2

5 : DC Measurements 2
6 : Burn-in

7 : Visual Inspection 3
8 : DC Measurements 3

Judgement

Result

☒ Pass☐ Fail

Failure analysis :

Date : 2002.04.20

Judges :T. INADA

Print Date : 5/17/2002

R4443

NASA Goddard Space Flight Center

Serial No. : ZL0896

Ver.4

Model / Level		Model ☒ Qualificatio ☐ Engineering ☐ Flight						Level ☐ Vib. tes ☐ Level-1 ☒ Level-2 ☐ Level-3					
Visual Inspection Spec		1) Window Material			2) Glass Defects Check			3) Loose Particle Check			4) Internal Structure		
		The face plate shall be free of clearly visible bubbles, inclusions, surface scratches and edge chippings in accordance with internal spec.			Any observed Bubble: 1mm Max There shall exist no irregularities, surface defects, or any variations of condition at the glass envelope in accordance with internal spec			0.5 mm Max for Metallic Particle; 1 mm Max for Non-Metallic Particle; 1.5 mm Max for Accumulations of Particles			No observable structural defect in accordance with internal spec		
Date		2002.03.04	2002.04.16	2002.04.19	2002.03.04	2002.04.16	2002.04.19	2002.03.04	2002.04.16	2002.04.19	2002.03.04	2002.04.16	2002.04.19
Item No.	1, 4, 7	No. 1	No. 4	No. 7	No. 1	No. 4	No. 7	No. 1	No. 4	No. 7	No. 1	No. 4	No. 7
		☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail

DC Measurements Spec	Sk (uA/lm)	Skb	Sp (A/lm)	Gain (x e6)	Dark (nA)			Q.E. (%)	Ebb (V)	Idb (nA)	Note #1 : Max Variation SK = ± 10 % Gain = ± 25 % Idb = + 100% If Idb is less than 1 nA, it should be 10 times max..	
					at 1250 V	750 V	1000 V	1250 V	at 490nm	at 5 x e5 Gain		
	-	-	-	Min. 2	-	-	-	-	Min. 14.0	Max. 1000		Max. 10
Item No.	Date											
2	2002.03.04	68.5	9.49	653	9.53	0.04	0.34	2.00	17.0	829	0.08	
3	2002.04.16	○ 12-hour Burn-in Test			● Random Vibration							
5	2002.04.16	68.0	9.42	749	11.01	0.03	0.27	1.60	-	814	0.06	
Between #2 & #5 [%] Note#1		-0.7	-0.7	14.7	15.5	-25.0	-20.6	-20.0	-	-1.8	-25.0	
6	2002.04.17	Drift Test		After 0hr(%)		After 12hr(%) : Note #2		After 24hr(%)		After 48hr(%)		After 100hr(%) : Note #2
		● 12-hour burn-in		100		95.0		-		-		-
		○ 100-hour Burn-in		-		90 % to 110%		-		-		75% to 125%
8	2002.04.19	67.9	9.42	684	10.07	0.01	0.05	0.31	17.6	823	0.02	
Between #5 & #8 [%] Note#1		-0.1	0.0	-8.7	-8.5	-66.7	-81.5	-80.6	-	1.1	-66.7	

Item No. 1 : Visual Inspection 1
2 : DC Measurements 1

3 : Vibration or Burn-in
4 : Visual Inspection 2

5 : DC Measurements 2
6 : Burn-in

7 : Visual Inspection 3
8 : DC Measurements 3

Judgement

Result

☒ Pass☐ Fail

Failure analysis :

Date : 2002.04.20

Judges :T. INADA

12 hours Burn-in
no SPEC
100 hours Burn-in
±10% at 12 hours
±25% at 100 hours

Print Date : 5/17/2002

R4443

NASA Goddard Space Flight Center

Serial No. : ZL1085

Ver.4

Model / Level		Model ☒ Qualificatio ☐ Engineering ☐ Flight						Level ☐ Vib. tes ☐ Level-1 ☒ Level-2 ☐ Level-3					
Visual Inspection Spec		1) Window Material			2) Glass Defects Check			3) Loose Particle Check			4) Internal Structure		
		The face plate shall be free of clearly visible bubbles, inclusions, surface scratches and edge chippings in accordance with internal spec.			Any observed Bubble: 1mm Max There shall exist no irregularities, surface defects, or any variations of condition at the glass envelope in accordance with internal spec			0.5 mm Max for Metallic Particle; 1 mm Max for Non-Metallic Particle; 1.5 mm Max for Accumulations of Particles			No observable structural defect in accordance with internal spec		
Date		2002.03.12	2002.04.16	2002.04.19	2002.03.12	2002.04.16	2002.04.19	2002.03.12	2002.04.16	2002.04.19	2002.03.12	2002.04.16	2002.04.19
Item No.	1, 4, 7	No. 1	No. 4	No. 7	No. 1	No. 4	No. 7	No. 1	No. 4	No. 7	No. 1	No. 4	No. 7
		☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail

DC Measurements Spec	Sk (uA/lm)	Skb	Sp (A/lm)	Gain (x e6)	Dark (nA)			Q.E. (%)	Ebb (V)	Idb (nA)	Note #1 : Max Variation SK = ± 10 % Gain = ± 25 % Idb = + 100% If Idb is less than 1 nA, it should be 10 times max..	
					at 1250 V	750 V	1000 V	1250 V	at 490nm	at 5 x e5 Gain		
	-	-	-	Min. 2	-	-	-	Min. 14.0	Max. 1000	Max. 10		
Item No.	Date											
2	2002.03.12	60.4	9.12	637	10.55	0.01	0.05	0.59	15.1	818	0.02	
3	2002.04.16	○ 12-hour Burn-in Test			● Random Vibration							
5	2002.04.16	62.4	9.11	745	11.94	0.02	0.06	0.66	-	809	0.03	
Between #2 & #5 [%] Note#1		3.3	-0.1	17.0	13.2	100.0	20.0	11.9	-	-1.1	50.0	
6	2002.04.17	Drift Test		After 0hr(%)		After 12hr(%) : Note #2		After 24hr(%)		After 48hr(%)		After 100hr(%) : Note #2
		● 12-hour burn-in		100		94.0		-		-		-
		○ 100-hour Burn-in		-		90 % to 110%		-		-		75% to 125%
8	2002.04.19	61.8	9.18	707	11.44	0.02	0.05	0.35	15.2	809	0.02	
Between #5 & #8 [%] Note#1		-1.0	0.8	-5.1	-4.2	0.0	-16.7	-47.0	-	0.0	-33.3	

Item No. 1 : Visual Inspection 1
2 : DC Measurements 1

3 : Vibration or Burn-in
4 : Visual Inspection 2

5 : DC Measurements 2
6 : Burn-in

7 : Visual Inspection 3
8 : DC Measurements 3

Judgement

Result

☒ Pass☐ Fail

Failure analysis :

Date : 2002.04.20

Judges :T. INADA

12 hours Burn-in
no SPEC
100 hours Burn-in
±10% at 12 hours
±25% at 100 hours

Print Date : 5/17/2002

R4443

NASA Goddard Space Flight Center

Serial No. : ZL1088

Ver.4

Model / Level		Model ☒ Qualificatio ☐ Engineering ☐ Flight						Level ☐ Vib. tes ☐ Level-1 ☒ Level-2 ☐ Level-3					
Visual Inspection Spec		1) Window Material			2) Glass Defects Check			3) Loose Particle Check			4) Internal Structure		
		The face plate shall be free of clearly visible bubbles, inclusions, surface scratches and edge chippings in accordance with internal spec.			Any observed Bubble: 1mm Max There shall exist no irregularities, surface defects, or any variations of condition at the glass envelope in accordance with internal spec			0.5 mm Max for Metallic Particle; 1 mm Max for Non-Metallic Particle; 1.5 mm Max for Accumulations of Particles			No observable structural defect in accordance with internal spec		
Date		2002.03.22	2002.04.17	2002.04.19	2002.03.22	2002.04.17	2002.04.19	2002.03.22	2002.04.17	2002.04.19	2002.03.22	2002.04.17	2002.04.19
Item No.	1, 4, 7	No. 1	No. 4	No. 7	No. 1	No. 4	No. 7	No. 1	No. 4	No. 7	No. 1	No. 4	No. 7
		☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail	☒ Pass ☐ Fail

DC Measurements Spec	Sk (uA/lm)	Skb	Sp (A/lm)	Gain (x e6)	Dark (nA)			Q.E. (%)	Ebb (V)	Idb (nA)	Note #1 : Max Variation SK = ± 10 % Gain = ± 25 % Idb = + 100% If Idb is less than 1 nA, it should be 10 times max..	
					at 1250 V	750 V	1000 V	1250 V	at 490nm	at 5 x e5 Gain		
	-	-	-	Min. 2	-	-	-	-	Min. 14.0	Max. 1000		Max. 10
Item No.	Date											
2	2002.03.22	65.0	8.96	200	3.08	0.17	0.80	9.20	15.0	969	0.63	
3	2002.04.16	○ 12-hour Burn-in Test			● Random Vibration							
5	2002.04.17	64.7	8.93	206	3.18	0.16	0.74	7.50	-	965	0.57	
Between #2 & #5 [%] Note#1		-0.5	-0.3	3.0	3.5	-5.9	-7.5	-18.5	-	-0.4	-9.5	
6	2002.04.17	Drift Test		After 0hr(%)		After 12hr(%) : Note #2		After 24hr(%)		After 48hr(%)		After 100hr(%) : Note #2
		● 12-hour burn-in		100		94.0		-		-		-
		○ 100-hour Burn-in		-		90 % to 110%		-		-		75% to 125%
8	2002.04.19	63.7	8.91	191	3.00	0.13	0.29	3.30	15.0	973	0.25	
Between #5 & #8 [%] Note#1		-1.5	-0.2	-7.3	-5.8	-18.8	-60.8	-56.0	-	0.8	-56.1	

 Item No. 1 : Visual Inspection 1
 2 : DC Measurements 1

 3 : Vibration or Burn-in
 4 : Visual Inspection 2

 5 : DC Measurements 2
 6 : Burn-in

 7 : Visual Inspection 3
 8 : DC Measurements 3

Judgement

Result

☒ Pass☐ Fail

Failure analysis :

Date : 2002.04.20

Judges : T. INADA

 12 hours Burn-in
 no SPEC
 100 hours Burn-in
 ±10% at 12 hours
 ±25% at 100 hours

Print Date : 5/17/2002