Workshop I

Welcome
to SPRAT Workshop
on

Systems/Standards/Arrays

Wednesday, September 21, 2005

Chairs: Mike Piszczor (NASA GRC) &
Brad Reed (Aerospace Corp.)

Advanced Solar Cell Testing & Characterization

Workshop Format

- 1:00 - 3:00 to cover various topics as appropriate
- At last SPRAT, conducted Workshop topic on solar cell and array qualification standards. Brad Reed will present update on status of that effort.
- Second workshop topic:
  The Future of PV Research within NASA.
- Any time remaining, specific topics from participants
- Reminder for IAPG Members!
  RECWG today 3:00-5:00 in Federal Room, 2nd Floor OAI.

Evaluation of Solar Array Technology Readiness Levels

Product	Manufacturer	Orbit	Minimum Average Production Cell Efficiency	Projected Array-Level TRL, by Year, for Materials in Established Projects/Programs							
				2005	2006	2007	2008	2009	2010	2011	First Flight
1J GaAs	Spectrolab	Both	18	9	9	9	9	9	9	9	1991
DJ	Spectrolab	GEO	22	8	8	8	8	8	8	8	08/1997 PanAmSat K5 (15)[4]
DJ	Spectrolab	LEO	22	9	9	9	9	9	9	9	2001 P81
DJ	EMCORE	GEO	23	8	8	8	8	8	8	8	08/2002 Echostar 8 (15)
DJ	EMCORE	LEO	23	9	9	9	9	9	9	9	12/2002 Micro-Lab-Sat 1 (1)
TJ	Spectrolab	GEO	25	8	8	8	8	8	8	8	11/2001 DirecTV4S (15)
TJ	Spectrolab	LEO	25	8	9	9	9	9	9	9	01/2003 IceSat (3)
TJ	EMCORE	GEO	26	8	8	8	8	8	8	8	03/2004 MB Sat 1 (12)
TJ	EMCORE	LEO	26	9	9	9	9	9	9	9	09/2001 Starshine 3 (2)
ITJ	Spectrolab	GEO	27	8	8	8	8	8	8	8	06/2002 Galaxy 3C (15)
ITJ	Spectrolab	LEO	27	8	8	8	9	9	9	9	01/2003 Sorce (5)
ATJ	EMCORE	GEO	27	8	8	8	8	8	8	8	09/2003 Insat 3E (15)
ATJ	EMCORE	LEO	27	8	8	8	9	9	9	9	10/8/2005 Cryosat (3)[5]
ATJM	EMCORE	GEO	27	6	8	8	8	8	8	8	2006 SBIRS (12) Atlas-5/401
ATJM	EMCORE	LEO	27	8	9	9	9	9	9	9	04/13/2005 XSS-11(1)
UTJ	Spectrolab	GEO	28	8	8	8	8	8	8	8	09/2005 MEASAT-3 (15)
UTJ	Spectrolab	LEO	28	8	9	9	9	9	9	9	08/23/2005 INDEX (1)
BTJM[1]	EMCORE	LEO	28	7	7	8	8	8	8	8	7/26/05 MISSE-5 (1)
BTJM[1]	EMCORE	GEO	28	5	6	8	8	8	8	8	----------
XTJ[1]	Spectrolab	LEO	30	4	5	6	8	8	8	8	----------
XTJ[1]	Spectrolab	GEO	30	4	5	6	8	8	8	8	----------
DUS&T MJ[2]	Spectrolab	------	33	3	4	5	6	6	8	8	----------
DUS&T 4J, 5J[2]	EMCORE	------	33	3	4	5	6	6	8	8	----------
a-Si[2]	Various	LEO	7[6]	6	7	7	7	7	7	7	2006 JWSD-1 (1)
a-Si[2]	Various	MEO	8[6]	4	5	5	6	6	7	7	2010 DSX (1)
a-Si[2]	Various	------	9[6]	3	4	4	5	5	6	6	----------
CIGS[2]	Various	MEO	8	4	5	5	6	6	7	7	2010 DSX (1)
CIGS[2]	Various	------	15	1	2	2	3	3	3	4	----------

TRL	Experience Level
9	Solar array has flown successfully[3] on it's intended mission.
8	Solar array flight qualified on the ground, or is flying successfully [3] as primary power.
7	Solar array prototype is flying successfully[3].
6	Solar array passes life-cycle & qualification test at the panel/coupon level for mission conditions.
5	Solar cell/CIC is space-qualified.
4	Solar cell/CIC is characterized at prototype level.
3	Solar cell prototype has been fabricated.
2	Solar cell design and modeling completed. Subcell components demonstrated.
1	Solar cell conceptual design formulated.

[1] TRL projections verified by Melanie Klein, Spectrolab, on 4/29/05 and Navid Fatemi, Emcore, on 8/25/05.

[2] TRL projections verified by Donna Senft on 7/7/05.

[3] "Success" is defined as "solar array performing as predicted for the intended mission design life."

[4] Mission life shown in parentheses

[5] Areas shaded in grey indicate future launches

[6] Amorphous Silicon stabilized efficiency at 28 °C (post light soak at 60°C)

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Updated 8/25/05