Proceedings of the
EUROPEAN SPACE
POWER CONFERENCE

Florence, Italy, 2–6 September 1991

Volume 2: Photovoltaic Generators

Jointly organised by:
European Space Agency (ESA)
Politecnico di Milano
Italian Space Agency (ASI)
European Power Electronics (EPE)
Contents

Volume 2

Photovoltaic Generators

Session 1A: Solar Cell Technology

Chairpersons:
C. Vérié (CNRS-LPSE, France)
D. Flood (NASA Lewis Research Center, USA)

Assessment of Third Generation Solar Cells
G. La Roche & al, MBB GmbH, Germany, & K.P. Bogus, ESTEC 487

Thin GaAs/Ge Solar Cell Development
B. Bollani & al, CISE SpA, Italy 495

InP Solar Cells for Scientific Satellite Applications
K. Takahashi, ISAS, Japan, & al 501

GaAs Space Solar Cells - A European Pilot Production Facility
T.A. Cross & al, EEV Ltd, UK 507

Diffused Junction - Surface Texture Engineered GaAs Heteroface Solar Cell
C. Hardingham & T. Cross, EEV Ltd, UK 513

Thin-Film Photovoltaics: Status and Applications to Space Power
A.F. Hepp, NASA Lewis Research Center, & G.A. Landis, Sverdrup Tec. Inc., USA 517

Investigation of Silicon Solar Cell and Module Reverse Characteristics
M. Uesugi & T. Noguchi, NASDA, Japan, & al 523
Session 2A: Solar Cell Assembly Technology

Chairpersons:
J. Koch (TST, Germany)
T. Cross (EEV, UK)

Thin Film, Concentrator and Multijunction Space Solar Cells - Status and Potential
D.J. Flood, NASA Lewis Research Center, USA

Pilot-Line Production of Aluminium Interconnected Solar Modules
U. Hoffmann, TST GmbH, Germany, & J-C. Larue, ESTEC

Interconnecting and Contacting to InP Based Solar Cells
C. Hardingham & al, EEV Ltd, UK, & al

CMG - Coverglass for GaAs Cells
P. White, Pilkington Space Technology, UK

Teflon Bonding of Silicon Solar Cells
P. White, Pilkington Space Technology, UK

Pre-Qualification of Very Thin Silicon Solar Cells on Module Level for GEO Applications
G. Neuhausser & J. Koch, TST GmbH, Germany

Holographic Dispersive Concentrators for Photovoltaic Power Generators
G. Reich & W.J. Denner, Dornier GmbH, Germany, & al

GaAs Solar Panel Technology Assessment
R. Crabb, ESTEC, & al

Electrostatic Bonding of Silicon Solar Cells
P.A. White, Pilkington Space Technology, UK
Session 3A: Solar Cell/Array Tests, Measurements & Modelling
Chairpersons:
M. Martella (ESTEC, The Netherlands)
A. Dunnet (INTELSAT, USA)

The Calibration of Solar Cells in Terrestrial Sunlight
M.A.H. Davies & C. Goodbody, RAE, UK

Arc Discharges at Negatively Biased Solar Arrays
H. Thiemann, Thiemann and Noack, Germany, & R.W. Schunk, Utah State Univ., USA

Testing Method of Insulating Materials for Spatial Applications
A. Cherifi, Lab. d'Electronique de Montpellier, France, & al

Watts Per Kilo (WPK): Solar Array Dimensioning Tool Version 2 Enhancements
Ph. Bobo, Artegy, France

Production and Improvement of 50 µm and 100 µm Thin Silicon Solar Cells for Space Use
S. Matsuda, NASA, Japan, & al

Dynamical Analysis by IR Thermography of Breakdown Phenomena in BSFR Type Reverse
Biased Solar Cells Mounted on a GSR3 Coupon in Simulated Space Conditions
J-P. David, Université d'Aix-Marseille III, France, & al

Investigations of Transients on the Solar Array Bus Caused by Electrostatic Discharges
L. Lévy, CERT, Toulouse, France, & al

Investigation of the Effects of Proton Irradiation on the Insulation Properties of Kapton
V. Hude, CERT, Toulouse, France, & A.P. Robben, ESTEC
### Session 4A: Solar Array Technology 1

**Chairpersons:**
- C. Signorini (FIAR, Italy)
- R. Kurland (TRW, USA)

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Near Optimum Design of Solar Array for Stretched Rohini Satellite Series-C (SROSS-C)</td>
<td>635</td>
</tr>
<tr>
<td>K. Vijayakumar &amp; al, ISRO Satellite Centre, India</td>
<td></td>
</tr>
<tr>
<td>Enhanced EOS Photovoltaic Power System Capability with InP Solar Cells</td>
<td>641</td>
</tr>
<tr>
<td>S.G. Bailey, I. Weinberg &amp; D.J. Flood, NASA Lewis Research Center, USA</td>
<td></td>
</tr>
<tr>
<td>LOCSTAR Solar Array</td>
<td>647</td>
</tr>
<tr>
<td>G. Martin, Aérospatiale Cannes, France, &amp; al</td>
<td></td>
</tr>
<tr>
<td>SPOT 4 Solar Array</td>
<td>653</td>
</tr>
<tr>
<td>P. Benarroche, Aérospatiale Cannes, France, &amp; al</td>
<td></td>
</tr>
<tr>
<td>The SAX Solar Array Design and Verification</td>
<td>659</td>
</tr>
<tr>
<td>J.T. Konink, Fokker Space &amp; System, NL</td>
<td></td>
</tr>
<tr>
<td>The Columbus Solar Array</td>
<td>665</td>
</tr>
<tr>
<td>R. Zwanenburg &amp; B. Busz, Fokker Space &amp; System, NL</td>
<td></td>
</tr>
<tr>
<td>SPOT 1 Solar Array: Now 5 Years in Orbit</td>
<td>671</td>
</tr>
<tr>
<td>E. Rapp, CNES, &amp; P. Samson, Aérospatiale (Cannes) France</td>
<td></td>
</tr>
<tr>
<td>Demonstration of the Advanced Photovoltaic Solar Array</td>
<td>675</td>
</tr>
<tr>
<td>R. Kurland, TRW Space &amp; Technology, &amp; P.M. Stella, JPL, USA</td>
<td></td>
</tr>
</tbody>
</table>
Session 6A: Solar Array Environmental Effects and Flight Data

Chairpersons:
M. Romero (DERTS, France)
P. Samson (Aerospatiale, France)

Environmental Interactions of the Space Station Freedom Electric Power System
H.K. Nahra, NASA Lewis Research Center, & C.Y. Lu, Rockwell Int., USA

Flight and Irradiation Studies of ITO/InP Solar Cells
N.M. Pearsall, N. Robson & I. Forbes, Newcastle Photovoltaics Applications Centre, UK

Solar Array for the First Indian Remote Sensing Satellite (IRS-1A) - Design and Performance
B.L. Agrawal & al, ISRO Satellite Centre, India

Assessment of Atomic Oxygen Erosion of Silver Interconnects on Intelsat VI, F3
A. Dunnet, Intelsat, & T. Kir kendall, Comsat, USA

Solar Radiation for Mars Power Systems
J. Appelbaum & G.A. Landis, NASA Lewis Research Center, USA

The AMADEUS Experiment: In-Flight Test Results Evaluation
MM Bastard-Delambre, Aérospatiale Cannes, & MM Condé-Mercier, CNES, France

Effect of an In-Flight Pollution by Thrusters on a Solar Array
L. Pelenc, Aérospatiale Cannes, France, & al

HST Solar Generator—Electrical Performance during the First Year in Orbit
L. Gerlach, ESA-ESTEC
### Session 8A(i): Solar Array Technology 2

**Chairperson:**
- M. Kagan (KVANT, USSR)
- D. Richard (ESTEC, The Netherlands)

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>SFU Solar Array Development Test</td>
<td>735</td>
</tr>
<tr>
<td>Y. Shibayama, NEC Corporation, Japan, &amp;al</td>
<td></td>
</tr>
<tr>
<td>The Solar Array of ASTRO-D Spacecraft</td>
<td>741</td>
</tr>
<tr>
<td>Y. Okada, NEC Aerospace Systems, Japan, &amp;al</td>
<td></td>
</tr>
<tr>
<td>Structural Scaling Approximations for Solar Arrays</td>
<td>747</td>
</tr>
<tr>
<td>G.A. Landis, Sverdrup Technology Inc., USA</td>
<td></td>
</tr>
</tbody>
</table>

### Session 8A(ii): Solar Cell/Array News Flash

**Chairpersons:**
- K. Rasch (TST, Germany)
- M. Tajima (ISAS, Japan)

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>V. Poulek, Czechoslovak Academy of Sciences, Czechoslovakia</td>
<td></td>
</tr>
<tr>
<td>GaAs Solar Cells for Low Temperature Low Intensity Operations</td>
<td>759</td>
</tr>
<tr>
<td>R. Campesato &amp; C. Flores, CISE SpA, Italy</td>
<td></td>
</tr>
<tr>
<td>Dark Forward Current Measurements of Solar Arrays</td>
<td>765</td>
</tr>
<tr>
<td>H. Preitnacher, MBB GmbH, Germany, A.P. Robben &amp; L. Gerlach, ESTEC</td>
<td></td>
</tr>
<tr>
<td>Solar Array Management Guide</td>
<td>771</td>
</tr>
<tr>
<td>J.C. Vermalle, Aérospatiale Cannes, &amp; M. Roussel, CNES, Toulouse, France</td>
<td></td>
</tr>
<tr>
<td>Experimental Investigations of Solar Cell at Low Temperature</td>
<td>775</td>
</tr>
<tr>
<td>D. Schwander, CNES, Toulouse, France</td>
<td></td>
</tr>
<tr>
<td>Development and Application of a Computer Tool for GaAs Solar Array Electrical Design and In-Orbit Performance Prediction</td>
<td>781</td>
</tr>
<tr>
<td>F. Svelto, ASI, Italy, &amp;al</td>
<td></td>
</tr>
<tr>
<td>Investigations and Tests with State-of-theArt GaAs-Solar Cells</td>
<td>787</td>
</tr>
<tr>
<td>G. Neuhäußer, J.W. Koch, TST GmbH, Germany</td>
<td></td>
</tr>
</tbody>
</table>