Taiwan PV Committee
Meeting Summary and Minutes

25 October, 2013, at 14:00-15:30
ITRI, HsinChu

Table 1 Meeting Attendees (15 ppls.)

Co-Chairs: J.S. Chen (Tera Solar) / Ray Sung(UL Taiwan)/Bor-Nien Chuang (ITRI)
SEMI Staff: Cher Wu/ Ula Huang

Company	*First*	*Last*	*Company*	*First*	*Last*
CMS-ITRI	B. N.	Chuang	UL	Ray	Song
PV Guider	Jay	Lin	TUV	Eric	Lin
Grans System	Kuang-Han	Ke	Tera Solar	J. S.	Chen
PV Guider	Shiny	Chen	CMS-ITRI	HungSen	Wu
CMS-ITRI	Anderson	Hsu	CMS-ITRI	Saumine	Chen
Big Sun	Henry	Hu	King Design	David	Lee
Topcell Solar	Li-Wei	Cheng	King Design	James	Shih
Tainergy	Yu-Chou	Lee			

Table 2 Leadership Changes

PV Measurement Method TF leader change to Dr. Saumine Chen/ITRI, CMS

Table 3 Ballot Results (or move to Section 4, Ballot Review)

None

Table 4 Authorized Ballots (or move to Section 7, New Business)

None

Table 5 Authorized Activities (or move to Section 7, New Business)

None

Table 6 New Action Items (or move to Section 8, Action Item Review)

1. SEMI staff to check if different TF but the members are the same group members, check the regulation from SEMI HQ.
2. BIPV TF Leader to further communicate with China PV Power Station Equipment Integrated Performance Task Force, Stone Wu for new proposal.

Table 7 Previous Meeting Actions Items (or move to Section 8, Action item Review)

None

1 Welcome, Reminders, and Introductions

Committee Co-Chair J. S. Chen (Tera Solar) called the meeting to order at 14:00. After welcoming all attendees, the SEMI meeting reminders on antitrust issues, intellectual property issues and holding meetings with international attendance were reviewed. Attendees introduced themselves.

2 Review of Previous Meeting Minutes

The committee reviewed the minutes of the previous meeting.

Attachment : SEMI Taiwan PV Committee Meeting Minutes_20130725

3 Liaison Reports

- Europe: Europe Photovoltaic Equipment Committee

- Last meetings
  - ✓ October 8-10, 2013
  - ✓ SEMICON Europa
  - ✓ Dresden, Germany

- Next meeting
  - ✓ June 2014
  - ✓ Intersolar Europe
  - ✓ Munich, Germany
  - ✓ Check www.semi.org/standards for latest update
- Upcoming Ballots

#	When	SC/TF/WG	Details
5566			Line Item Revision to SEMI PV002-00-0709E Guide for PV Equipment Communication Interfaces (PVECI), modify requirement [PV02-RQ-00007-00] to allow implementation of new namelist requests instead of required documentation. Postponed until E30 IP issue resolved
5153	Cycle 8	PV EIS TF	New Subordinate Standard "Data Definition specifications for a Horizontal Communication between equipment for crystalline photovoltaic fabrication system" (Parent Document is 4804, "Specification For A Horizontal Communication Between Equipment For Photovoltaic Fabrication System") Cycle 8-2013
5418		PV Traceability TF	Revision of SEMI PV29-0212, Specification for Front Surface Marking of PV Silicon Wafers with Two-Dimensional Matrix Symbols
5419		PV Traceability TF	Revision of SEMI PV32-0312, Specification for Marking of PV Silicon Brick Face and PV Wafer Edge

· SEMI Europe Staff, Yann Guillou at yguillou@semi.org

Attachment: EU PV Automation Liaison Report Updated 20131021 v1

- Europe Photovoltaic Materials Committee:
  - Last meetings
    Oct 7, 2013
    SEMICON Europa
    Dresden, Germany

  - Next meeting
    June 2014
    Intersolar Europe
    Munich, Germany

  - Ballot Results Summary from October meeting
    - ✓ Doc 5565, Line Item Revision to PV42, Test Method for In-Line Measurementof Waviness on PV Silicon Wafers by a Light Sectioning Technique Using Multiple Line Segments – PASSED
    - ✓ Doc 5433, New Standard, Test Method for In-line Characterization of PV Silicon Wafers regarding Grain Size – PASSED

- ✓ Doc 5432, New Standard, Test Method for In-line Characterization of PV Silicon Wafers by Using Photoluminescence – PASSED

- Authorized Ballots

#	When	SC/TF/WG	Details
5433	Early 2014	Silicon Materials	Revision to Test Method for In-line Characterization of PV Silicon Wafers regarding Grain Size
5432	Early 2014	Silicon Materials	Revision to Test Method for In-line Characterization of PV Silicon Wafers by Using Photoluminescence

- PV Silicon Materials TF
  - ✓ Published:
  - ✓ PV17-1012 Specification for Virgin Silicon Feedstock Materials for Photovoltaic Applications
  - ✓ PV39-0912 Test Method for In-Line Measurement of Cracks in PV Silicon Wafers by Dark Field Infrared Imaging
  - ✓ PV40-0912 Test Method for In-Line Measurement of Saw Marks on PV Silicon Wafers by a Light Sectioning Technique Using Multiple Line Segments
  - ✓ PV41-0912 Test Method for In-Line, Noncontact Measurement of Thickness and Thickness Variation of Silicon Wafers for PV Applications Using Capacitive Probes
  - ✓ PV42-0113 Test Method for In-Line Measurement of Waviness of PV Silicon Wafers by a Light Sectioning Technique Using Multiple Line Segments
  - ✓ SEMI PV18-0912 Guide for Specifying a Photovoltaic Connector Ribbon
  - ✓ SEMI PV19-0712 Guide for Testing Photovoltaic Connector Ribbon Characteristics
  - ✓ Future project will write Ribbon Specification
    SEMI Europe Staff, Yann Guillou at yguillou@semi.org

  Attachment: EU PV Materials Liaison Report 20131022

- North America:
  - Last meeting

  Intersolar North America Meetings
  Marriott Marquis, San Francisco, CA
  July 9-10, 2013
  - Next meeting

  North America Fall Standards Meetings
  SEMI HQ, San Jose, CA Check www.semi.org/standards for the latest update
    - New SNARF
      - ✓ PV Electrical & Optical Measurement TF
      - ✓ Doc. 5608: Line-item Revision to SEMI PV13-0813, Test Method for Contactless Excess-Charge-Carrier Recombination Lifetime Measurement in Silicon Wafers, Ingots, and Bricks Using an Eddy-Current Sensor
      - ✓ (To add literature citations for methods to determine Fe concentrations based on PV13 measurement results) Ballot Results Summary
      - ✓ Published 5 Standards, 5 Auxiliary Information
      - ✓ PV1-0211 - Test Method for Measuring Trace Elements in Si. Feedstock for Si. Solar Cells by High-Mass Resolution Glow Discharge Mass Spectrometry
      - ✓ PV10-1110 - Test Method for Instrumental Neutron Activation Analysis (INAA) of Silicon
      - ✓ PV25-1011 - Test Method for Simultaneously Measuring Oxygen, Carbon, Boron And Phosphorus in Solar Silicon Wafers and Feedstock by Secondary Ion Mass Spectrometry
      - ✓ PV43-0113 - Test Method for the Measurement of Oxygen Concentration in PV Silicon Materials for Silicon Solar Cells by Inert Gas Fusion Infrared Detection Method
      - ✓ PV49-0613 - Test Method for the Measurement of Elemental Impurity Concentrations in Silicon Feedstock for Silicon Solar Cells by Bulk Digestion, Inductively Coupled-Plasma Mass Spectrometry

- ✓ AUX017-0310, Contactless Measurement of Carrier Recombination Lifetime in Silicon Wafers and Ingots
- ✓ AUX019-0211, Interlaboratory Study Results For Determining the Precision of SEMI PV1
- ✓ AUX022-0611, Conversion of units for impurity concentrations in Silicon
- ✓ AUX026-1012, Research Report On Interlaboratory Study To Establish Precision Statements For SEMI PV13, Test Method For Contactless Excess-charge-carrier Recombination Lifetime Measurement In Silicon Wafers, Ingots, And Bricks Using An Eddy-current Sensor
- ✓ AUX027-0213, Results of Round Robin for SEMI PV10, Test Method for Instrumental Neutron Activation Analysis (INNA) of Silicon
- ✓ Doc. 5435: Auxiliary Information interlaboratory study for PV25 - Test Method for Simultaneously Measuring Oxygen, Carbon, Boron and Phosphorus in Solar Silicon Wafers and Feedstock by Secondary Ion Mass Spectrometry
- ✓ 6 Labs participating, Preliminary report to be updated at NA Fall meeting
- ✓ Doc. 5501: Auxiliary Information interlaboratory study for PV43 - Test Method for Measurement Of Oxygen Concentration In PV Silicon Materials For Silicon Solar Cells By Inert Gas Fusion Infrared Detection Method
- ✓ 10 Labs participating. Preliminary report to be updated at NA Fall meeting
- ✓ Doc. 5567: Auxiliary Document: Interlaboratory Study for PV49-0613, Test Method for the Measurement of Elemental Impurity Concentrations in Silicon Feedstock for Silicon Solar Cells By Bulk Digestion, Inductively Coupled-Plasma Mass Spectrometry
- ✓ PV9-0611 Test Method for Excess Charge Carrier Decay in PV Silicon Materials by Non-Contact Measurements of Microwave Reflectance After a Short Illumination Pulse
- ✓ PV13-0813 Test Method for Contactless Excess-Charge-Carrier Recombination Lifetime Measurement in Silicon Wafers, Ingots, and Bricks Using an Eddy-Current Sensor
- ✓ PV15-0211 Guide for Defining Conditions for Angle Resolved Light Scatter Measurements to Monitor The Surface Roughness and Texture of PV Materials
- ✓ PV28-0212 Test Methods for Measuring Resistivity or Sheet Resistance with a Single-Sided Noncontact Eddy-Current Gauge
- ✓ PV31-0212 Test Method for Spectrally Resolved Reflective and Transmissive Haze of Transparent Conducting Oxide (TCO) Films for PV Application
- ✓ Doc. 4825, New standard: Test Methods for Hg Probe Measurements of Crystalline Silicon PV Materials and Devices
- ✓ Doc. 5394, New Standard: Test Method for QSS Microwave PCD Measurements of Carrier Decay and Lifetime
- ✓ Doc. 5093, Auxiliary Information, Round Robin (Multi-Laboratory Test) for PV9-1110, Microwave Reflectance Test Method
- ✓ To established a precision statement, a round robin for SEMI PV28-0212 - Test Methods for Measuring Resistivity or Sheet Resistance with a Single-Sided Noncontact Eddy-Current Gauge has initiated.
- ✓ A call for participation is being sought. If anyone is interested, please contact Chris Moore at Semilab chrisjlmoore@msn.com or Danh Nguyen at Lehighton Electronic at Danh@lehighton.com

SEMI NA Staff, Kevin Nguyen at knguyen@semi.org

- *Attachment: NA Liaison Report PV Materials 20131017*

- Japan PV Automation Committee Liaison Report
  - Last Meeting
    October 24, 2013 at SEMI Japan Office, Tokyo, Japan Next Meeting
  - Next Meeting
    December 13, 2013 at SEMI Japan Office, Tokyo, Japan
    - ✓ Leader

    Tetsuo Fukuda/ AIST
    Takashi Ishihara/ Mitsubishi Electric
    - ✓ Charter

Identify standardization needs and priorities for specifications, guidelines and procedures related to Materials used for manufacturing PV cells/modules and systems.
Examples of such material include, but are not limited to: substrates, TCO films, optical enhancement films, conductive interconnect, insulator materials, absorber films, PVB, EVA, backsheet, sputtering targets, starting material e.g. UMG Si, Poly-si, etc.
Participate and support the PV Standards Roadmap discussion.

✓ Scope

Survey PV producers, material suppliers, other SDOs (e,g, ASTM, etc.) consortia (e.g. NREL, NIST, etc.) and DOE interests to validate and prioritize the prospective materials list.
Develop a list of key players to support the TF efforts.
Find leaders for selected TF activities.
Generate a document development plan

✓ Shared the outcome of NA and EU meetings.

✓ The SNARF of Doc. #5417 "New Standard: Test Method for Measurement of Defects in PV Silicon Wafers in PV Modules by Electroluminescence Imaging"

✓ Rationale

Defects in Si wafers in PV modules are a key parameter affecting module performance and reliability. Electroluminescence (EL) has been employed to measure in high volume module in production. However, a standardized test method for measuring defects by EL is currently not available, neither off-line nor in-line measurement. This often results in uncertain discussions about the wafer quality between suppliers and customers. The standardized test method for defects in PV Si wafers in PV modules by EL is required for improving PV module performance and reliability.
The standardization was requested to Japan PV Committee by International PV Module Quality Assurance Forum Task Group 2.

✓ Scope

This standard defines the test method for crack measurement in PV silicon wafers in PV modules by EL imaging, including EL measurement tool setup and suggestions in interpreting measurement results. This standard does not intend to cover all kinds of defect detected by EL but crack only.

✓ The SNARF of Doc. #5532, "New Standard: Test Method for Measurement of Cracks in PV Silicon Wafers in PV Modules by Laser Scanning"

✓ Rationale

Cracks in silicon PV cells are key parameters affecting module performance and reliability. Electroluminescence (EL) has been employed to measure these in high volume module production. However, it has some difficulty identifying cracks, in particular, in multi-crystalline silicon cells. This often results in uncertain discussions about the wafer quality between suppliers and customers. Laser scanning (LS) is particularly advantageous in detection of cracks both in multi-crystalline and mono-crystalline silicon cells in modules. The standardized test method for cracks in PV Si wafers in PV modules by LS is required for improving PV module performance and reliability.

- Scope
  - This standard defines the test method for crack measurement in PV silicon wafers in PV modules by LS imaging, including LS measurement tool setup and suggestions in interpreting measurement results.

- Current activity

Currently, the Task Force has been drafting the Doc. # 5532 in Japanese and will successfully complete by the end of December, 2013. After the English translation is completed, the ballot will be issued.

SEMI Japan Staff, Hiro'fumi Kanno at hkanno@semi.org
Attachment: JA_PV_PVM_to NA PV_PVM_R0.1

- **Japan PV Automation Committee**
  - Last Committee Meeting
    July. 24, 2013
    SEMI Japan, Ichigaya Office, Tokyo, Japan

  - ✓ Next Committee Meeting
    October 24, 2013
    SEMI Japan, Ichigaya Office, Tokyo, Japan

✓ Ballot Action

✓ Doc. #5223A is being balloted to Cycle 6
New Subordinate Standard: "Media Interface Specifications for a Horizontal Communication between Equipment" to be Used to Implement SEMI PV35
✓ Doc. #5631 is being balloted to Cycle 6
Line Item Revisions to SEMI PV35-1012, Specification For Horizontal Communication Between Equipment For Photovoltaic Fabrication System

✓ Will be adjudicated at;
Next Japan PV Automation Committee Meeting
Scheduled on October 24 15:00-17:30
At SEMI Japan Ichigaya Office, Tokyo, Japan

✓ Global PV-Equipment I/F Specification TF
✓ Leadership
JA:
Takashi Murakami /Tokyo Electron
Makoto Ishikawa /Nisshinbo Mechatronics
EU:
Carsten Born / VITRONIC

✓ Charter
Study and development of a suite of equipment communication interface related standards for photovoltaic (PV) production systems.
The study will lead to development of standards that are optimized to reduce costs with well-fit definitions and specifications to the requirement of real-world PV manufacturing operation.

✓ Scope
Development of a suite of standards on communication interface between equipment or between equipment and factory for photovoltaic (PV) production systems.
Please contact:Hirofumi Kanno, SEMI Japan, email: hkanno@semi.org

- *Attachment: JP_PVAuto_Liaison_R0.1*

4. SEMI Staff Report

- Welcome all PV TC members to join PV Taiwan and PVSEC Taiwan from Oct. 30-Nov1.
- Plan to have annual standards gathering dinner on Dec. 17 with award ceremony in Hsinchu
- China PV Power Station Equipment Integrated Performance Task Force, Leader Stone Wu would like to have power station proposal to discuss with Taiwan PV leaders. Information will support later soon by Stone Wu.

5 TF Report

Package TF Report by David Lee (King Design) SEMI Draft Document 5431:New Standards :Test Method for Performance Criteria of Photovoltaic (PV) Wafer, Cell, and Module Package in process. Survey Horizontal Impact , Rotational Flat Drop Test specification and Equipment, Arrange test with Real and Dummy cells, Define Experimental Project and Running schedule.

BIPV TF Report by Jay Lin (PV Guider) SEMI Draft Document 5560 : New Standard : Classification of Building Integrated Photovoltaic (BIPV) in progress.

Wafer Measurement Method TF by Jason Lin (Chunson): Leader Changed due to Mr. Jason Lin will not continue to be leader due to no new plan. Dr. Saumine Chen/ITRI, CMS would like to take the leader role.

- ✓ Motion: Change the new leader, James Shih/ King Design
- ✓ By / 2nd: Shiny Chen/PV Guilder, B. N. Chuang/ITRI,CMS, Ray Sung/UL
- ✓ Voted: 15 -0, Motion passed
- ✓ Discussion: Suggest leader and team members could discuss more information, could refer EU TF Topic.

DSSC TF Report by James Shih(King Design) Review papers about test methods for DSSC, major progress is as below**.** Doc 5597-Voltage (I-V) Performance Measurement of Dye Sensitized Solar Cell (DSSC), Doc 5599 Spectrum Response (SR) Measurement of Dye Sensitized Solar Cell (DSSC), Doc 5598-Durability Test Method of Dye Sensitized Solar Cell (DSSC)

- ✓ Prepare shipping tanker: KDi
- ✓ Prepare DSSC samples (1 cm x 1cm): EVERLIGHT and NCKU
  - ■ Samples (5 unit) have to keep stable efficiency and degradation
  - ■ rate < 10% in one month
- ✓ define test procedures for IV and SR : ITRI
- ✓ Pilot run DSSC sample (5x2) with ITRI test method
  - ■ Data : repeatability =1 ~ 1.5 %

6 Old Business

#Doc. 4833 is no progress after c-Si Cell Appearance TF disband, so, members discussed this doc. is continue or not.

Motion: continue this Doc. 4833, Kuang-Han Ke/ Grans Syatem

By / 2nd: H. S. Wu/ITRI, CMS

Voted: 3 -6-6, Motion failed.

Motion: discontinue this Doc. 4833, B. N. Chuang/ITRI, CMS

By / 2nd: H. S. Wu/ITRI, CMS

Voted: 14 -0-1, Motion passed.

Discussion: None.

7 New Business

8 Action Item Review

9 Next Meeting and Adjournment

Dec., 2013 (TBD)

Respectfully submitted by:
Cher Wu
SEMI Taiwan
Phone:+ 886 3 560 1777 +802
Email: cwu@semi.org

Minutes approved by:

J. S. (Tera Solar), Co-chair	<Date approved> Oct. 28,2013

Table 8 Index of Available Attachments [#1]

#	Title	#	Title
1	*20131025 PV TC meeting minutes*	2	*JA_PV_PVM_to NA PV_PVM_R0.1*
3	*Attachment: EU PV Automation Liaison Report Updated 20131021 v1*	4	*JP_PVAuto_Liaison_R0.1*
5	*Attachment: EU_PV_Materials_Liaison_Report 20131022*	6	*NA Liaison Report PV Materials 20131017*
7	*SEMI TC Meeting 2013 10 25 (DSSC TF)*	8	*SEMI-Report-Package_performance_TF_report 10 25*
9	*Presentation-2013-10-25_Wafer Measurement Method TF*		

#1 Due to file size and delivery issues, attachments must be downloaded separately. A .zip file containing all attachments for these minutes is available at www.semi.org. For additional information or to obtain individual attachments, please contact [SEMI Staff Name] at the contact information above.