

Review for Doc 5983D “Test Method for In-line sheet Resistance Inspection Using the Junction Photo-Voltage Method”

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The Process for Doc 5983D

2020.11:At the autumn meeting of China PV Standards Committee in 2021, experts suggested that theTF communicate with patent owners on patent issues.



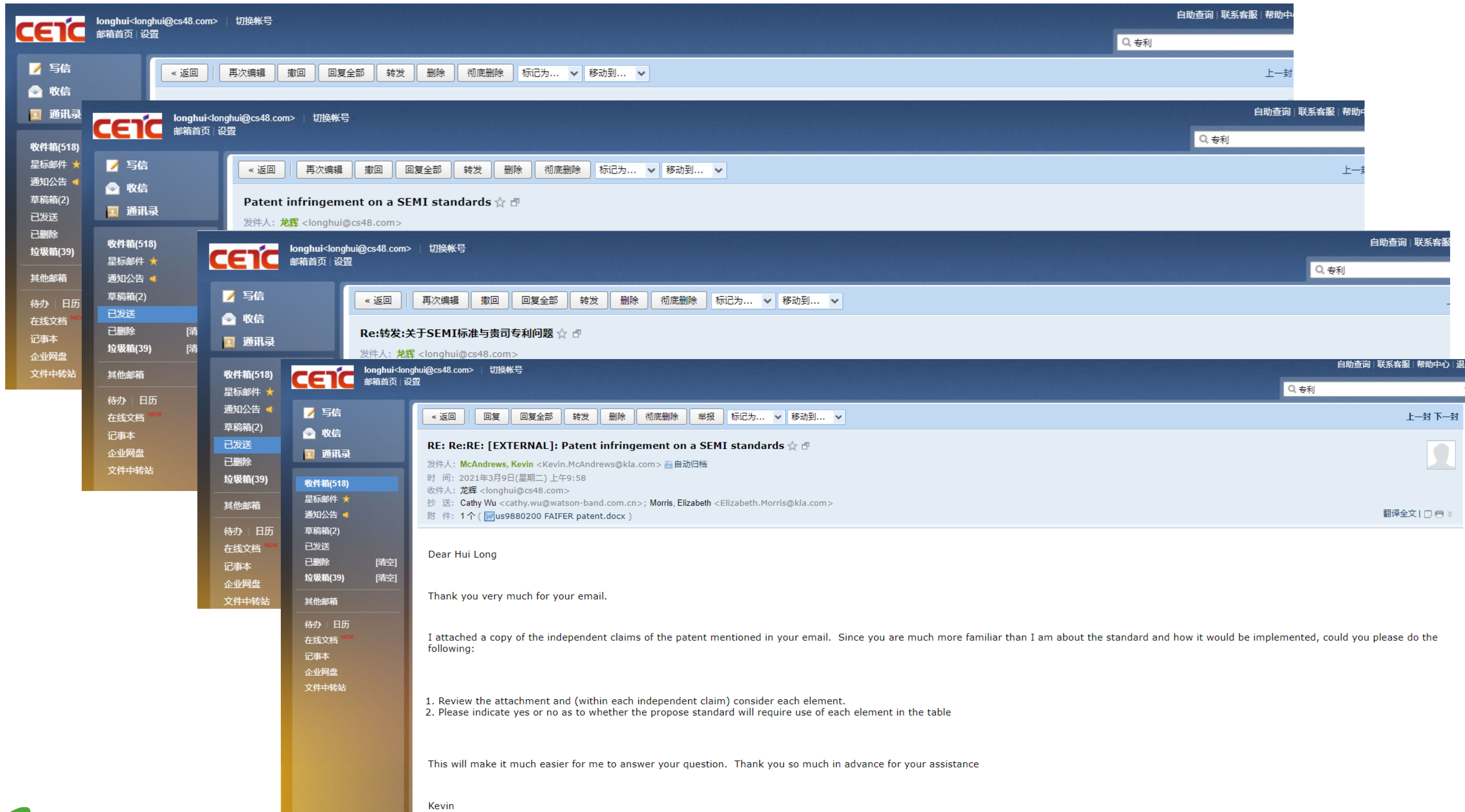
2021.1:we contacted the patent owner, KLA, USA.



2021.3:Sent relevant materials such as the draft standard to KLA by email, and communicated with relevant technical and legal consultants of KLA on the issue of patent conflicts .

2021.4:The situation of the communication with KLA company was reported to the working group, and the opinions of experts in the group were solicited.

Request for SEMI PV GCS approval for Doc.5983D



Comparative Analysis of Draft Standards and Patent Claims

CLAIM ELEMENTS

Will the standard use this element (yes/no)?

1. An apparatus for <u>contactless</u> measurement of one or more characteristics of a p-n junction comprising:	
an illumination unit for illuminating a surface of a p-n junction with light at one or more selected intensities and one or more selected frequencies;	Y
a measurement unit including at least a first measurement element including a first transparent electrode positioned proximate to the p-n junction and configured to transmit light from the illumination unit to the surface of the p-n junction, wherein the first transparent electrode has a first area for measuring a <u>junction photovoltage</u> of the p-n junction corresponding with the first area within the illuminated area, wherein the first area of the first electrode is smaller than the area illuminated by the illumination unit in order to limit an effect of lateral spreading of the <u>junction photovoltage</u> on the measurement of the <u>junction photovoltage</u> ; and a controller <u>communicatively coupled</u> to at least the measurement unit and the illumination unit, the controller configured to: 测量单元，其至少包括第一测量元件，该第一测量元件包括第一透明电极，该第一透明电极位于靠近所述 <u>pn 结</u> 的位置并且配置为将光从所述照明单元传输到所述 <u>pn 结</u> 的表面，其中所述第一透明电极具有用于测量光的第一区域 <u>pn 结</u> 的结光电压与被照射区域内的第一区域相对应，其中第一电极的第一区域小于被照明单元照射的区域，以便限制结光电压的横向扩展对测量的影响 结光电压；以及通信地耦合到至少测量单元和照明单元的控制单元，该控制单元被配置为：	Y
control at least one of light intensity or frequency of the light from the illumination unit; 控制来自照明单元的光的光强度或频率中的至少之一；	N
receive one or more measurements of the <u>junction photovoltage</u> from the measurement unit at the one or more selected light intensities and one or more selected frequencies; 在一个或多个选定的光强度和一个或多个选定的频率下，从测量单元接收一个或多个结光电压的测量值；	Y
and determine at least one of a <u>photocurrent density</u> of the p-n junction, a forward voltage of the p-n junction, a	N

saturation current density of the p-n junction, an ideality factor of the p-n junction or one or more I-V curves of the p-n junction with the one or more measurements of the <u>junction photovoltage</u> received from the measurement unit. 并确定 <u>pn 结</u> 的光电流密度， <u>pn 结</u> 的正向电压， <u>pn 结</u> 的饱和电流密度， <u>pn 结</u> 的理想因子或具有 <u>pn 结</u> 的 <u>pn 结</u> 的一条或多条 IV 曲线中的至少一项。从测量单元接收到的结光电压的一项或多项测量。	
15. A method for <u>contactless</u> measurement of one or more characteristics of a p-n junction comprising:	
illuminating an illumination area of a surface of a p-n junction with light of a first intensity, wherein the modulation of light of the first intensity is sufficient to establish a steady-state condition in a <u>junction photovoltage</u> of the p-n junction; 用第一强度的光照射 p-n 结的表面的照明区域，其中，对第一强度的光的调制足以在 p-n 结的结光电压中建立稳态条件；	Y
measuring a first <u>junction photovoltage</u> from a portion of the p-n junction within the illumination area illuminated by the light of the first intensity with a transparent electrode positioned within the illumination area and proximate to the surface of the p-n junction, wherein the first area of the first electrode is smaller than the illuminated area in order to limit an effect of lateral spreading of the <u>junction photovoltage</u> on the measurement of the <u>junction photovoltage</u> ; 使用位于照明区域内并靠近 <u>pn 结</u> 表面的透明电极，测量来自第一强度的光照射的照明区域内 <u>pn 结</u> 的一部分的第一结光电压，其中，第一电极的第一区域电极小于照射区域，以限制结光电压的横向扩展对结光电压的测量的影响。	N
illuminating the area of the surface of the p-n junction with light of an additional intensity different from the light of the first intensity, wherein the light of the additional intensity is sufficient to establish a steady-state condition in a <u>junction photovoltage</u> of the p-n junction; measuring an additional <u>photovoltage</u> from the portion of the p-n junction within the illumination area illuminated by the light of the additional intensity with the transparent electrode; and determining at least one of a <u>photocurrent density</u> of the p-n junction, a forward voltage of the p-n junction, a saturation current density of the p-n junction,	N

Comparative Analysis of Draft Standards and Patent Claims

an ideality factor of the p-n junction or one or more I-V curves of the p-n junction with at least one of the junction photovoltage or the additional junction photovoltage	
用不同于第一强度的光的附加强度的光照射 p-n 结的表面的面积，其中该附加强度的光足以在 p-n 结的结光电压中建立稳态条件；用透明电极从 p-n 结的在由附加强度的光照射的照明区域内的部分测量附加光电压；确定 pn 结的光电流密度，pn 结的正向电压，pn 结的饱和电流密度，pn 结的理想因子或 pn 结的一条或多条 IV 曲线中的至少一项，其中结光电压或附加结光电压中的至少一个。	
26. A method for contactless measurement of one or more characteristics of a p-n junction comprising:	
illuminating an illumination area of a surface of a p-n junction with light of a first intensity, wherein the light of the first intensity is sufficient to establish a steady-state condition in a junction photovoltage of the p-n junction; 用第一强度的光照射 p-n 结的表面的照明区域，其中，第一强度的光足以在 p-n 结的结光电压中建立稳态条件；	Y
measuring a first junction photovoltage from a portion of the p-n junction within the illumination area illuminated by the light of the first intensity with a first transparent electrode having a first area and positioned within the illumination area and proximate to the surface of the p-n junction; 利用具有第一区域并且位于照明区域内并且靠近 p-n 结的表面的第一透明电极，从由第一强度的光照射的照明区域内的 p-n 结的一部分测量第一结光电压；	
illuminating the illumination area of the surface of the p-n junction with light of an additional intensity, wherein the light of the additional intensity is sufficient to establish a steady-state condition in a junction photovoltage of the p-n junction; 用附加强度的光照射 p-n 结表面的照明区域，其中，附加强度的光足以在 p-n 结的结光电压中建立稳态条件；	N
measuring an additional photovoltage from the portion of the p-n junction within the illumination area illuminated by the light of the additional intensity with the first transparent electrode; 用第一透明电极测量来自 p-n 结的在被附加强度的光照射的照明区域内的部分的附加光电压；	N
monitoring a one dimensional character of at least one of the first junction photovoltage or the additional junction	N

voltage by measuring a junction photovoltage from a portion of the p-n junction within the illumination area with a second transparent electrode positioned within the illumination area and proximate to the surface of the p-n junction, the second transparent electrode having a second area external to the first area of the first transparent electrode; 通过使用位于照明区域内并靠近表面的第二透明电极测量来自 pn 结在照明区域内一部分的结光电压来监控第一结光电压或附加结电压中至少一个的一维特征 在所述 pn 结中，所述第二透明电极具有在所述第一透明电极的所述第一区域的外部的第二区域。	
illuminating the illumination area of the surface of the p-n junction with light of the first intensity at a modulation frequency sufficient to achieve non-steady-state conditions in the junction photovoltage of the p-n junction; 以足以在 p-n 结的结光电压中达到非稳态条件的调制频率，以第一强度的光照射 p-n 结的表面的照明区域；	N
measuring a high frequency junction photovoltage from the portion of the p-n junction within the illumination area with the first transparent electrode; 用第一透明电极从照明区域内的 p-n 结的部分测量高频结光电压；	N
acquiring a capacitance of the p-n junction; and determining a photocurrent density of the p-n junction with at least one of the high frequency junction voltage, the capacitance of the p-n junction and the modulation frequency. 获取 p-n 结的电容；确定具有高频结电压，p-n 结的电容和调制频率中的至少一个的 p-n 结的光电流密度。	N
36. A method for contactless measurement of one or more characteristics of a p-n junction comprising:	
illuminating an area of a surface of a p-n junction with light of a first intensity, wherein the light of the first intensity is sufficient to establish a steady-state condition in a junction photovoltage of the p-n junction; 用第一强度的光照射 p-n 结的表面的面积，其中第一强度的光足以在 p-n 结的结光电压中建立稳态条件；	Y
measuring a first junction photovoltage from a portion of the p-n junction within the illumination area by determining a difference between a first surface potential measured during a dark illumination condition and an	N

additional surface potential measured during illumination of the light of the first intensity in a steady-state condition with a first vibrating transparent electrode; 通过确定在黑暗照明条件下测得的第一表面电势与在稳定状态下对第一强度的光进行照明期间测得的附加表面电势之间的差，来测量照明区域内 pn 结的一部分的第一结光电压。第一振动透明电极处于状态状态；	
illuminating the area of the surface of the p-n junction with light of an additional intensity, wherein the light of the additional intensity is sufficient to establish a steady-state condition in a junction photovoltage of the p-n junction; 用附加强度的光照射 p-n 结的表面区域，其中附加强度的光足以在 p-n 结的结光电压中建立稳态条件；	N
measuring an additional photovoltage from the portion of the p-n junction within the illumination area by determining a difference between the first surface potential measured during the dark illumination condition and an additional surface potential measured during illumination of the light of the additional intensity in a steady-state condition with the first vibrating transparent electrode; 通过确定在黑暗照明条件下测得的第一表面电势与在稳定状态下对附加强度的光进行照明时测得的附加表面电势之间的差，来测量照明区域内 pn 结部分的附加光电压。第一振动透明电极的状态；	N
and determining a photocurrent density of the p-n junction at the first intensity. 确定在第一强度下的 p-n 结的光电流密度。	N

The Vote in Task Force

The Number of TF members	Voting	Voting Percentage	Accepts	Accepting Percentage
55	55	100%	1	2%

I move that the Committee accept the SEMI PV Equipment Task Force recommendation to approve the distribution of SEMI Document 5983D for Letter Ballot.

THANK YOU