A. **State title and scope of TC**

Are there any new or emerging trends in technology that will impact the scope and work activities of the TC? Please describe briefly.

Do you need to update your scope to reflect new and emerging technologies? If yes, will these changes impact another TC’s scope or work activities?

If yes, describe how these will impact another TC(s) and list the TC(s) it would impact.

**Title:** Electronic displays

**Scope:** Standardization, in the field of electronic displays and specific relevant components, of terms and definitions, letter symbols, essential ratings and characteristics, measuring methods, specifications for quality assurance and related test methods, and reliability.

Note: Where actual or potential overlap in scope with other TCs/SCs such as IEC/TC 47, SC 62B, TC 76, TC 77, TC 100, TC 111, TC 119 and TC 124 exists, coordination through liaison or JWG with the concerned TCs/SCs should be maintained or actively pursued.

B. **Management Structure of the TC**

Describe the management structure of the TC (use of an organizational chart is acceptable) (should be integrated by CO automatically) and, if relevant (for example an unusual structure is used), provide the rationale as to why this structure is used.

Note: Check if the information on the IEC website is complete.

When was the last time the TC reviewed its management structure? Describe any changes made. When does the TC intend to review its current management structure? In the future, will the TC change the current structure, for example due to new and emerging technologies, product withdrawal, change in regulations etc. Please describe.

Make sure the overview includes:

- any joint working groups with other committees,
- any special groups like advisory groups, editing groups, etc.

**Officers:**

- Chair: Mr Xiaolin Yan (CN)
- Secretary: Mr Yoshi Shibahara (JP)
- Assistant Secretary: Mr Kei Hyodo (JP), Mr Shin-ichi Uehara (JP)
- Technical Officer: Ms Suzanne Yap Geok Sim

**Working Groups (WG), Project Team, Maintenance Team, ad-hoc group, and advisory groups:**

- WG 6: 3D Display Devices (3DDD)
- WG 8: Flexible display devices (FDD)
- WG 9: Touch and interactive displays (TID)
WG 10: Laser display devices (LDD)
WG 12: Eyewear display (EWD), set up in 2017-07
WG 13: Optical measurements of electronic displays (OPT), set up in 2015-11
PT 62341: Organic light emitting diode displays (OLED), transformed from WG 5 in 2018-10
PT 62595: Display lighting unit (DLU)
PT 63211: Durability test methods for electronic displays (DTM), set up in 2018-10
MT 61747: Liquid crystal display devices (LCD), transformed from WG 2 in 2018-10
AG 11: Advisory Group on Strategy (AGS)
AG 15: Advisory Group for Project allocation (AGP), set up in 2018-01
AHG 16: Electronic displays for special applications (SPA), set up in 2018-10

Remarks:
AG 11: The Advisory Group on Strategy (AGS) has been set up since 2013 to advise TC 110 on strategic business plans, specifically identifying and making recommendations on the TC 110 grand roadmap, WG structure and establishment of projects in accordance with market needs.
TC 110 reviews the management structure every year based on the recommendations of AG 11.
AG 15: The Advisory Group on Project allocation (AGP) has been set up since 2018-01, to advise TC 110 Secretary for allocation of new proposals.

C. BUSINESS ENVIRONMENT

Provide the rationale for the market relevance of the future standards being produced in the TC.

If readily available, provide an indication of global or regional sales of products or services related to the TC/SC work and state the source of the data.

Specify if standards will be significantly effective for assessing regulatory compliance.

Worldwide revenue from electronic displays is a hundred and several tens of billions dollars and is steadily increasing at a rate of several percent per annum, with TV and mobile displays leading this growth. Demand for in-vehicle displays is also increasing, and commercial, medical and other fields represent further important markets for electronic displays.

Among display technologies, LCD retains the largest share. Shipment volumes of LCD TV, LCD monitor and notebook PC maintain stable growth, whereas shipment of Tablet PCs and smart phones is rapidly increasing. The market for OLED is also expanding rapidly, particularly in handheld mobile applications and also in TV applications. OLED is currently the second largest technology, having overtaken PDP in 2012. PDP shipment is decreasing and is fading from the display market. Laser display devices have attracted attention due to their efficiency and sharp light spectrum.

Regarding display performance and specifications, the following points are noteworthy.

1) The screen sizes of TVs, PC monitors and mobile displays continue to increase.

2) The number of pixels in display screens also continues to grow. “4K” and even “8K” displays are increasing, particularly in the large-size TV market. (4K and 8K refer to displays with a horizontal pixel number of 4,000 and 8,000 respectively, but the detailed definition will be discussed further in TC 110.) The number of pixels is also increasing in smart-phones, reaching 2560 × 1440 (QHD) and even 4K (UHD) in high-end products.

3) "High dynamic range (HDR)" TV has been introduced to the market in association with the provision of HDR contents.

4) Several technologies for expanding the colour gamuts of displays have been proposed.

5) Curved displays are a conspicuous new product. Curved TVs aim to provide a uniform viewing
distance from edge-to-edge.

3D displays have seen gains in certain markets, and are now seeking further expansion into other applications and technologies.

Having established a market for “E-reader”, EPDs are evolving to incorporate improvements in image quality and features such as built-in illumination.

Touch panel technology has achieved rapid market penetration, first in smartphones and tablets, and then notebook PCs. Worldwide revenue for touch panels has exceeded several tens of billions dollars and is growing at over ten percent annually.

Laser display devices (LDD) are penetrating into the market with the rapidly improving performance of the RGB laser diodes and the speckle reduction technology. LDD is the best solution to achieve the widest colour gamut of BT.2020.

Flexible displays have been attracting much attention. Non-flat displays employing a flexible substrate have been introduced to the market and growth is expected. Flexible displays that can be bent or folded, for example foldable smart phone or PC, are also highly anticipated.

In terms of new trends, growth in transparent displays is predicted, with wearable or head-up displays anticipated as upcoming key products.

AR/VR technologies using eyewear displays are receiving a lot of attention of B2B and B2C markets. It is likely that these devices will eventually become more prominent in the market.

Digital signage or public displays are also important application of electronic displays.

Electronic display devices have become essential components of Human-Machine Interfaces (HMI) and consequently the production volumes of these devices have increased steadily to meet the increasing demand. Further growth is expected due to the expansion of application of displays, being pushed by smart house, smart office, connected industries, remote office, drone, security camera, and others.

In the meantime, government regulations, to deal with their impact on the environment have been formulated in many countries. The electronic display industry strives to comply with the various government regulations, in those covering the reuse and recycle of these displays and their components, the reduction of related waste material and energy consumption, and health impact on the end users from e.g. flicker and short wavelength light. TC110 will continue to review these needs as industry practices and government regulations develop.

### D. Market Demand

Provide a list of likely customers of the standards (suppliers, specifiers, testing bodies, regulators, installers, other TC/SC’s etc.). Do not specify company names, only categories of customers.

The market for electronic displays encompasses a variety of products, such as notebook and tablet PCs, monitors, TV sets, cellular phones, electronic signage, head-up displays, head-mount displays or eyewear displays, other wearable displays, and all the rest. Standards are required for all aspects of electronic display devices such as terms and definitions, measurement methods and customer detail specifications, which include both functional specifications and assessment specifications (product qualification and test specifications). To enable customers to fairly compare different technologies, it is now necessary to begin harmonizing the many standards for different electronic displays.

The likely customers of the Standards are as follows;

- **Suppliers**: Manufacturers of materials, components, panels, modules, and products related to electronic displays, such as LCD, OLED, 3DDD, EPD, FDD, TID, LDD
- **Testing**: Manufacturers of test equipment, testing body, certification bodies
- **Customers**: Distributors, public offices, and end customers
- **Academia**
E. Trends in Technology and in the Market

If any, indicate the current or expected trends in the technology or in the market covered by the products of your TC/SC.

Great progress has been made with front-plane and back-plane display technologies, and still further substantial improvements are expected in terms of finer pixel structures, reduced power consumption and image quality enhancements in areas including contrast, colour, uniformity, moving image quality, viewing direction dependence and reliability.

Other components, including films and glasses, continue to see improvements in terms of reliability, strength and optical properties. Various kinds of film are used in display devices to boost optical performance, such as viewing direction dependence and optical efficiency.

Quantum dot is a hot topic, with photoluminescent quantum dots being introduced in some products as a down converter in order to improve efficiency and expand the colour gamut of the display.

Flexible front-plane, flexible back-plane, flexible touch panel and other flexible components are being realised. Their respective reliabilities are also being tested across various potential applications.

Capacitive-based designs are the major touch panel technology. Sensitivity, accuracy and precision, reporting rate, applicability to larger panels, optical properties, reliability and power consumption are all seeing improvements.

Developments in electronic display device technologies are too numerous to comprehensively list here. The future will see the emergence of many new ideas, technologies and applications.

The optical performance of AR VR headset and eyewear products has been improved rapidly.

Micro LED attracts attention as a new display technology.

F. Systems Approach Aspects (Reference - AC/33/2013)

Does your TC/SC have a need for a systems approach?

If so:

• Will the Systems work be in a single TC or in multiple TCs?
• Will a Systems Evaluation Group (SEG), Systems Committee (SyC), or Systems Resource Group be required?
• Is your TC/SC work of relevance to ISO?
• Is or are there fora or consortia working in parallel to IEC? Is there a chance to integrate this work in your TC/SC?

This should not only be restricted to the customer/supplier relationships with other TC/SCs indicating types of co-operation (e.g. liaisons, joint working groups) but be of a more generic nature.

If there is no need for a systems approach as outlined in AC/33/2013, is it intended a TC would not be requested to report on general systems approach considerations such as customer/supplier relationships, liaisons, joint WGs, etc. as referenced in the system approach matrix illustrated in slide 14 of the presentation attached to AC/37/2006?

The TCs and organizations that are relevant to TC 110 are as follows:

<table>
<thead>
<tr>
<th>IEC Internal liaisons</th>
<th>IEC/TC 47</th>
<th>IEC/TC 76</th>
<th>IEC/TC 77</th>
<th>Semiconductor devices</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IEC 62/SC 62B</td>
<td>IEC/TC 76</td>
<td>IEC/TC 77</td>
<td>Diagnostic imaging equipment</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Optical radiation safety and laser equipment</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Electromagnetic compatibility</td>
</tr>
</tbody>
</table>
The Systems work in multiple TCs. However, the performances and the specifications of display devices can be discussed independently. Hence, Systems Evaluation Group (SEG), Systems Committee (SyC), or Systems Resource Group are not necessarily required.

G. CONFORMITY ASSESSMENT

With reference to clause 33 of Part 2 of the ISO/IEC directives, are all your publications in line with the requirements related to conformity assessment aspects?

Will the TC/SC publications be used for IEC Conformity Assessment Systems (IECEE, IECEx, IECQ, IECRE)?

Will any of your standards include test specifications, reproducible test requirements, and test methods?

Are there likely to be special conformity assessment requirements generated by any standards projects? If yes, list which projects.

The standards developed in TC 110 are in line with the requirements related to conformity assessment aspects, and may include test specifications, reproducible test requirements, and test methods. TC 110 publications can be used in conformity assessment systems, but they do not include requirements related to conformity assessment other than requirements which are necessary to provide repeatable and reproducible conformity assessment results.

H. HORIZONTAL ISSUES

Indicate here how the TC/SC deals with horizontal issues such as energy efficiency, environmental aspects, safety, security...

Provide information on the interaction with SMB Advisory Committees, if applicable.
## I. 3-5 Year Projected Strategic Objectives, Actions, Target Dates

<table>
<thead>
<tr>
<th>Strategic Objectives 3-5 years</th>
<th>Actions to Support the Strategic Objectives</th>
<th>Target Date(s) to Complete the Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Restructuring of WGs for more efficient and integrated standardization</td>
<td>Effective operation of new groups (WG 13, PT 63211)</td>
<td>2019-10 Review</td>
</tr>
<tr>
<td></td>
<td>Effective operation of AG 15 (Advisory Group for Project allocation)</td>
<td></td>
</tr>
<tr>
<td>Developing new application area</td>
<td>Launch and orientation of AHG 16 (Electronic displays for special applications)</td>
<td>2019-10 Review</td>
</tr>
<tr>
<td>Addressing the following new subjects;</td>
<td>Measuring methods of haptic devices</td>
<td>2019-10 review</td>
</tr>
<tr>
<td>PWI 110-8</td>
<td>Electrical signal interface of LED BLU</td>
<td></td>
</tr>
<tr>
<td>PWI 110-11</td>
<td>Test method of lifetime of laser display devices</td>
<td></td>
</tr>
<tr>
<td>PWI 110-14</td>
<td>Blank detail specification of retina direct projection laser display devices</td>
<td></td>
</tr>
<tr>
<td>PWI 110-16</td>
<td>Measurement method of holographic display - optical</td>
<td></td>
</tr>
<tr>
<td>PWI 110-17</td>
<td>Environmental and mechanical stress test methods</td>
<td></td>
</tr>
<tr>
<td>PWI 110-18</td>
<td>Volumetric display (including head-up display, projection mapping, drone display, stacked transparent screen, etc.)</td>
<td></td>
</tr>
<tr>
<td>PWI 110-22</td>
<td>Essential ratings and characteristics of flexible displays</td>
<td></td>
</tr>
<tr>
<td>PWI 110-23</td>
<td>Measuring method of finger print recognition performance</td>
<td></td>
</tr>
<tr>
<td>PWI 110-24</td>
<td>Measuring method of pen touch performance</td>
<td></td>
</tr>
<tr>
<td>PWI 110-25</td>
<td>Measuring methods of image quality of raster-scanning laser display devices</td>
<td></td>
</tr>
<tr>
<td>PWI 110-26</td>
<td>Specific measurement methods for AR type - Image quality (future IEC 63145-22-20)</td>
<td></td>
</tr>
<tr>
<td>PWI 110-28</td>
<td>3D HUD</td>
<td></td>
</tr>
<tr>
<td>PWI 110-29</td>
<td>Measurement of autostereoscopic display – image quality</td>
<td></td>
</tr>
<tr>
<td>PWI 110-30</td>
<td>Aerial display</td>
<td></td>
</tr>
<tr>
<td>PWI 110-31</td>
<td>Bending stiffness test methods</td>
<td></td>
</tr>
<tr>
<td>PWI 110-32</td>
<td>Foldable test methods</td>
<td></td>
</tr>
<tr>
<td>PWI 110-33</td>
<td>Measuring methods of transparent optical sensors for fingerprint recognition devices</td>
<td></td>
</tr>
<tr>
<td>PWI 110-34</td>
<td>Measurement of optical performance for laser raster scanning display</td>
<td></td>
</tr>
<tr>
<td>PWI 110-35</td>
<td>Future of IEC 63145-30: Durability test methods of eyewear display</td>
<td></td>
</tr>
<tr>
<td>PWI 110-36</td>
<td>Future of IEC 63145-201: Optical components of eyewear display</td>
<td></td>
</tr>
<tr>
<td>PWI 110-37</td>
<td>Future of IEC 63145-40: Measurement methods of specific functions with sensors</td>
<td></td>
</tr>
<tr>
<td>PWI 110-39</td>
<td>for eyewear display</td>
<td></td>
</tr>
<tr>
<td>PWI 110-40</td>
<td>Future of IEC 63145-23: Contact lens type</td>
<td></td>
</tr>
<tr>
<td>PWI 110-41</td>
<td>Future of IEC 63145-50: User interaction</td>
<td></td>
</tr>
<tr>
<td>PWI 110-42</td>
<td>Measurement of display sparkle contrast</td>
<td></td>
</tr>
<tr>
<td>PWI 110-43</td>
<td>Measurements of tiled displays</td>
<td></td>
</tr>
<tr>
<td>PWI 110-44</td>
<td>Guideline for light measuring devices</td>
<td></td>
</tr>
<tr>
<td>PWI 110-43</td>
<td>Measuring methods for optical quantities of</td>
<td></td>
</tr>
<tr>
<td>PWI 110-44</td>
<td>lighting units with arbitrary shapes</td>
<td></td>
</tr>
</tbody>
</table>

Note: The progress on the actions should be reported in the RSMB.