

# Technological services suporting the LED luminaries issues





# **CTI and LED\***

- **1. Basic Structure of LED Luminaire**
- 2. Brazilian standards for LED Luminaires
- **3. Tests for LED Luminaires**
- 4. Qualification and Reability at CTI

#### \*CALL MCTIC/CNPQ/BRICS-STI Nº 18/2016



### **Basic Structure of LED Luminaire**



HB-LEDs (High Brightnes LEDs) typical currents of 20mA HP-LEDs (High Power LEDs) typical currents of 300mA – 1.5A



LED White Light - PC-LEDs (Phosphor Converter LEDs) Blue LEDs coated with a layer of yellow phosphor



### Brazilian standards for LED Luminaires

Code	Title
ABNT NBR IEC 62722-2-1:2016 IEC 62722-2-1: 2014	Desempenho de luminárias Parte 2-1: Requisitos particulares para luminárias LED Luminaire performance Part 2-1: Particular requerements for LED luminaires
ABNT NBR 16205-1:2013	Lâmpadas LED sem dispositivo de controle incorporado de base única Parte 1: Requisitos de segurança Non-ballasted single capped LED lamps Part 1: Safety requeriments
ABNT NBR 16205-2:2013	Lâmpadas LED sem dispositivo de controle incorporado de base única Parte 2: Requisitos de desempenho Non-ballasted single capped LED lamps Part 2: Performance requeriments
ABNT NBR IEC 62560:2013 IEC 62560:2011	Lâmpadas LED com dispositivo de controle incorporado para serviços de iluminação geral para tensão > 50 V — Especificações de segurança Self-ballasted LED-lamps for general lighting services > 50V – Safety specifications
ABNT NBR IEC 62031:2013 IEC 62031:2008	Módulos de LED para iluminação em geral — Especificações de segurança LED modules for general lighting – Safety specifications
ABNT IEC/PAS 62612:2013 IEC/PAS 62612:2009, Ed 1.0	Lâmpadas LED com dispositivo de controle incorporado para serviços de iluminação geral — Requisitos de desempenho Self-ballasted LED-lamps for general lighting services – Performance requeriments
ABNT IEC/TS 62504:2013 IEC/TS 62504:2011 Ed 1.0	Termos e definições para LEDs e os módulos de LED de iluminação geral Terms and definitions for LEDs and LED modules in general lighting
ABNT NBR 16026:2012 IEC 62384	Dispositivo de controle eletrônico c.c. ou c.a. para módulos de LED — Requisitos de desempenho DC or AC supplied electronic control gear for LED modules – Performance requeriments
ABNT NBR IEC 61347-2-13:2012	Dispositivo de controle da lâmpada Parte 2-13: Requisitos particulares para dispositivos de controle eletrônicos alimentados em c.c ou c.a para os módulos de LED Lamp control gear Part 2-13: Particular requirements for d.c. or a.c. supplied eletronic control gear for LED modules
ABNT NBR 15889:2010	Sinalização semafórica – Foco semafórico com base em diodos emissores de luz (LED) Traffic ligh signaling – Focus semaphore based on light emitting diodes (LED)





### Tests

- Photometric (ABNT NBR 16205-2; ABNT NBR 62612) (IESNA LM-61; CIE 25; CIE 121)
- Mechanical (ABNT NBR IEC 60.598-1)
- Electrical (NBR 16026 e NBR IEC 61347-2-13
- Thermal (ABNT NBR IEC 60.598-1)



### **Photometric Tests**

Standards: ABNT NBR 16205-2; ABNT IEC/PAS 62612-12

- Luminous flux
- Correlated colour temperature CCT
- Colour rendering index CRI
- Luminous intensity
- Luminous intensity vs. angle
- Influence of temperature on the performance of led luminaires
- Photometric characteristics: Color reproduction index, color temperature, chromatic coordinate (x, y), luminous flux
- Yield, utilization factor, Söllner diagram, UGR, zonal flow for internal luminaires
- Yield, zone flow for external luminaires
- Creating Photometric IES Files
- Photometric measurement: luminous distribution curve



### **Mechanical Tests**

Standards: ABNT NBR IEC60.598-1

- Resistance to dust, solid objects and moisture
- Test of marking
- External and internal wiring
- Creepage distance and clearances
- Vibration
- Torsion resistance
- Moisture and corrosion
- Resistance to heat



### **Electric Tests**

Standards: NBR 16026 e NBR IEC 61347-2-13

- Insulation Resistance
- Electric Strength
- Leakage current
- Short-circuit
- Electric Shock Protection



### **LED Driver Testing**

Standards: NBR 16026\* e NBR IEC 61347-2-13\*\*

- Tests of electrical characteristics of operation (NBR 16026)
- Operational test for abnormal conditions (NBR 16026)
  - short-circuit and open circuit
- Endurance test (NBR 16026)
  - Thermal shock, Switching, Maximum nominal temperature
- Moisture resistance, insulation resistance, electric strength (NBR 61347-2-13)
- *Heating test* (NBR 61347-2-13)
- Impedance at audio-frequencies(NBR 16026)

\* NBR 16026 = IEC 62384 – d.c. or a.c. supplied electronic control gear for LED modules – Performance. \*\* NBR IEC 61347-2-13 –IEC 61347-2-13 – Lamp control gear – Particular requirements for d.c. or a.c. supplied electronic control gear for LED modules – Safety.



### **Thermal Tests**

Standards: ABNT NBR IEC 61347-2-13

- Endurance test
- Thermal test (normal operation)
- Thermal test (abnormal operation)
- Variation of the electrical parameters of LED luminaires as a function of temperature
- Variation of the photometric parameters of LED luminaires as a function of temperature



### Center of Information Technology Renato Archer - CTI

 Qualification and Certification of Processes and Electronic Product

Study and development of new methods for qualification and certification of manufacturing processes, products and electronic components.

 Characterization, Electrical Testing and Testing of Electronic Component

Study and development of new characterization methods, evaluation of conformity, electrical testing and testing of electronic components (ICs)

 Reliability testing and Failure Analysis of Electronic Products

Study and development of new methods of reliability testing and failure analysis of electronic products and components.

### Development of Technologies for Sustainability

Study and development of technologies in ecodesign, life cycle assessment, cleaner production and recycling of electronic products and waste



### **Electrical Testing Laboratory**



**Prober Station** 



Electronic voting machine



Digital signal analyzer





Tester ICs

#### Electrical Test and Characterization (devices, integrated circuit and boards)

- Characterization of electrical parameters for devices (DC and AC)
- Test and characterization of devices functionality (static and dynamic)
- Test and characterization of displays (LCD)
- Test and validation of integrated circuit prototypes (digital and analog)

### **Reliability Laboratory**





Thermal Cycling Chamber



Climatic chamber



Shaker

IÊNCIA, TECNOLOG



Thermal Cycling chamber Environmental Stress and Reliability Tests

- Burn-in of ICs and electronic components
- Thermal cycling and thermal cycling liquid to liquid
- Climatic tests
- Pressure cooker
- Salt spray
- Ionic contamination
- Vibration test (shaker)

### **Optical Microscopy Laboratory**





Metallographic microscope



Stereoscopic optical microscope

**Optical** microscope



### **Microscopy Laboratory**



Scanning Electron Microscope



#### X-Ray Spectroscopy



Atomic Force Microscope



### **Technological Services Available**

Chemical and Physical Characterization (materials and microelectronic structures)

- Topographic and dimensional analysis of microelectronic structures
- Microanalysis of materials (elemental chemical analysis)
- X-ray spectroscopy
- Photographic documentation



## CTI's main areas of activity

### Microelectronic

- Hardware Systems Design
- Microsystems and Packaging
- Qualification and Analysis of Electronic Products
- Interaction Surfaces and Displays

### Software

- Technology for Software Development
- Process Improvement and Software Quality
- Information Systems Security

Applications

- Robotics and Computer Vision
- Tridimensional Technologies
- Decision Support Technologies
- Assistive Technology













# Urban and Landscape Directorial Plan



MINISTÉRIO DA CIÊNCIA, TECNOLOGIA, INOVAÇÕES E COMUNICAÇÕES



## How to participate

- Available space
  - Participation in public tender
  - Payment of occupancy fees and condominium expenses
- Investment in infrastructure
  - Presentation of proposal demonstrating affinity with the work of the CTI
  - Approval of the Council of CTI-Tec
  - Payment of occupancy fees and condominium expenses



## **Final Words**

The CTI is interested to promote a meeting of BRICS in Brazil with representatives of the Federal Government and possibly State, to evaluate perspectives of investments, partnership and cooperation in R & D and industrial, and evaluation of trends in the area of lighting technologies.





### Thank you 謝謝

thebano.santos@cti.gov.br www.cti.gov.br

