**IEEE P802.15**

**Wireless Personal Area Networks**

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| Project | IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs) | |
| Title | **TG4k\_PAR \_as\_Approved\_by\_NESCOM** | |
| Date Submitted | [The date the document is contributed, in the format “21 May, 1999”] | |
| Source | [] [] [Chicago, IL, USA] | Voice: [ +1.847.960.3715 ] Fax: [ ] E-mail: [ ] |
| Re: | [TG4k PAR as approved by NESCOM and pasted onto 802.15 document template | |
| Abstract | [TG4k PAR as approved by NESCOM and pasted onto 802.15 document template.] | |
| Purpose | [Document is to be used as guidance to the TG4k membership | |
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**P802.15.4k**

**Submitter Email:** bheile@ieee.org **Type of Project:** Amendment to IEEE Standard 802.15.4-2006 **PAR Request Date:** 02-Oct-2010 **PAR Approval Date:** 08-Dec-2010 **PAR Expiration Date:** 31-Dec-2014 **Status:** PAR for an Amendment to an existing IEEE Standard **Root Project:** 802.15.4-2006

**1.1 Project Number:** P802.15.4k

**1.2 Type of Document:** Standard

**1.3 Life Cycle:** Full Use

**2.1 Title:** IEEE Standard for Local and Metropolitan Area Networks - Part 15.4: Wireless Medium Access Control (MAC) and Physical Layer (PHY) Specifications for Low Rate Wireless Personal Area Networks (WPANs) Amendment - Physical Layer (PHY) Specifications for Low Energy, Critical Infrastructure Monitoring Networks (LECIM)

**3.1 Working Group:** Wireless Personal Area Network (WPAN) Working Group (C/LM/WG802.15)

**Contact Information for Working Group Chair Name:** Robert F Heile **Email Address:** bheile@ieee.org **Phone:** 781-929-4832

**Contact Information for Working Group Vice-Chair**

None

**3.2 Sponsoring Society and Committee:** IEEE Computer Society/LAN/MAN Standards Committee (C/LM)

**Contact Information for Sponsor Chair Name:** Paul Nikolich **Email Address:** p.nikolich@ieee.org **Phone:** 857.205.0050

**Contact Information for Standards Representative**

None

**4.1 Type of Ballot:** Individual

**4.2 Expected Date of submission of draft to the IEEE-SA for Initial Sponsor Ballot:** 03/2012

**4.3 Projected Completion Date for Submittal to RevCom:** 10/2012

**5.1 Approximate number of people expected to be actively involved in the development of this project:** 100

**5.2 Scope:** This standard is an amendment to IEEE 802.15.4. It addresses principally those applications such as critical infrastructure monitoring. It defines an alternate PHY and only those MAC modifications needed to support its implementation. The amendment supports: ' \*Operation in any of the regionally available licensed, license exempt, and special purpose frequency bands ' \*Simultaneous operation for at least 8 co-located orthogonal networks ' \*Application data rate of less than 40 kbits per second ' \*Propagation path loss of at least 120 dB ' \*>1000 endpoints per mains powered infrastructure ' \*Asymmetric application data flow ' \*Extreme difference in capabilities and performance between endpoint devices and coordinating devices (collectors) ' -coordinator may support all standardized modulations (MCS) and data rates ' -coordinator may be required to support antenna diversity or antenna beam steering ' -end point must be able to conserve energy ' \*Reliable operation in dramatically changing environments (no control over environment) This amendment also provides mechanisms that enable coexistence with other systems in the same band(s) including IEEE 802.11,

802.15 and 802.16 systems. (See explanatory notes in Section 8.1)

**5.3 Is the completion of this standard dependent upon the completion of another standard:** No

**5.4 Purpose:** The purpose of this amendment is to facilitate point to multi-thousands of points communications for critical infrastructure monitoring devices. The amendment addresses the application's user needs of minimal network infrastructure, and enables the collection of scheduled and event data from a large number of non-mains powered end points that are widely dispersed, or are in challenging propagation environments. To facilitate low energy operation necessary for multi-year battery life, the amendment minimizes network maintenance traffic and device wake durations. In addition, the amendment addresses the changing propagation and interference environments.

**5.5 Need for the Project:** To address the monitoring and management needs of Critical Infrastructure applications such as water, transportation, security, bridges; to enable preventative maintenance, safety, reliability and cost reduction through operational efficiency. The response to request for application presentations by the Low Energy Critical Infrastructure Monitoring (LECIM) Interest Group indicate a large and growing market for wireless critical infrastructure applications that fit the objectives of IEEE 802.15, but are not satisfied by existing IEEE 802 standards. (See explanatory notes in Section 8.1). The LECIM Interest Group tutorial held in San Diego, CA, and previous interest group meetings in Beijing and Orlando have had average attendance of more than 50 participants. There has been substantial interest from regions of the world outside of North America, where the regulatory limits on transmitted power are much lower, in addition to broad interest to better address non-mains powered networks, and hard to reach devices. There have been 6 application presentations, from 10 author companies, with 15 applications described. They are summarized in document 15-10-0533-00-leci-lecim-tutorial-application-presentations.pptx. (See explanatory notes in Section 8.1).

**5.6 Stakeholders for the Standard:** Semiconductor manufacturers, network equipment manufacturers, wireless device manufacturers, network operators, utility companies, sensor equipment manufacturers, condition based monitoring equipment manufacturers, public safety, energy industries, and location based services and users.

**Intellectual Property**

**6.1.a. Is the Sponsor aware of any copyright permissions needed for this project?:** No

**6.1.b. Is the Sponsor aware of possible registration activity related to this project?:** No

**7.1 Are there other standards or projects with a similar scope?:** No

**7.2 Joint Development Is it the intent to develop this document jointly with another organization?:** No

**7.3 International Activities**

**a. Adoption**

**Is there potential for this standard (in part or in whole) to be adopted by another national, regional or international organization?:** No

**b. Harmonization**

**Are you aware of another organization that may be interested in portions of this document in their standardization development efforts?:** No

**8.1 Additional Explanatory Notes (Item Number and Explanation):** 5.2 Scope While the current IEEE 802.15.4 standard has many of the desired properties for this application space, some of the baseline assumptions of the IEEE 802.15.4 standard are not consistent with the requirements of this application space such as asymmetric link budgets (due to elevated noise floor), or the use of data rates and encodings on a per device basis. Furthermore, since these types of applications are often setup by professional installers, it would be advantageous to allow the installer to optimize the configuration of parameters to suit each device. This amendment addresses dramatically changing environments such as increased interference due to urban build out, placement of interfering transmitter tower near devices, new chain-link fence, etc.

5.5 Need for Project Document numbers for IEEE posted Utility presentations regarding their Wireless Smart Metering Utility Network experiences are: a.15-10-0053 - LECIM applications b.15-10-0186 - Container tracking c.15-10-0291 - Wireless environment in agriculture d.15-10-0297 - Remote monitoring e.15-10-0299 - Soil Monitoring f.15-10-0307 - Applications in China In addition to the applications covered in the presentations, the interest group identified several other potential applications, including: \*Structural monitoring (bridges, levees, etc.) \*Wastewater monitoring \*Machine/Server room monitoring \*First Responder monitoring LECIM applications are characterized by properties including large path loss, minimal infrastructure requirements, and multi-year battery life. The communications link budget, coexistence characteristics, and data model for this class of applications have not been met with existing IEEE 802 standards. NOTE: At the time of its completion, this amendment will be applied to 802.15.4 current revision. Please ignore any contrary reference in the MyProject assigned "Type of Project" field.