



# IEEE Standard for Rechargeable Batteries for Cellular Telephones

IEEE Power Engineering Society

Sponsored by the  
Stationary Batteries Committee

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# **IEEE Standard for Rechargeable Batteries for Cellular Telephones**

Sponsor

**Stationary Batteries Committee**  
of the  
**IEEE Power & Energy Society**

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**IEEE-SA Standards Board**

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**Abstract:** Criteria for design analysis for qualification, quality, and reliability of rechargeable lithium ion and lithium ion polymer batteries for cellular telephone applications are established. Also included are: battery pack electrical and mechanical construction, packaging technologies, pack and cell level charge and discharge controls, and overall system considerations.

**Keywords:** cellular telephones, IEEE 1725, lithium ion batteries

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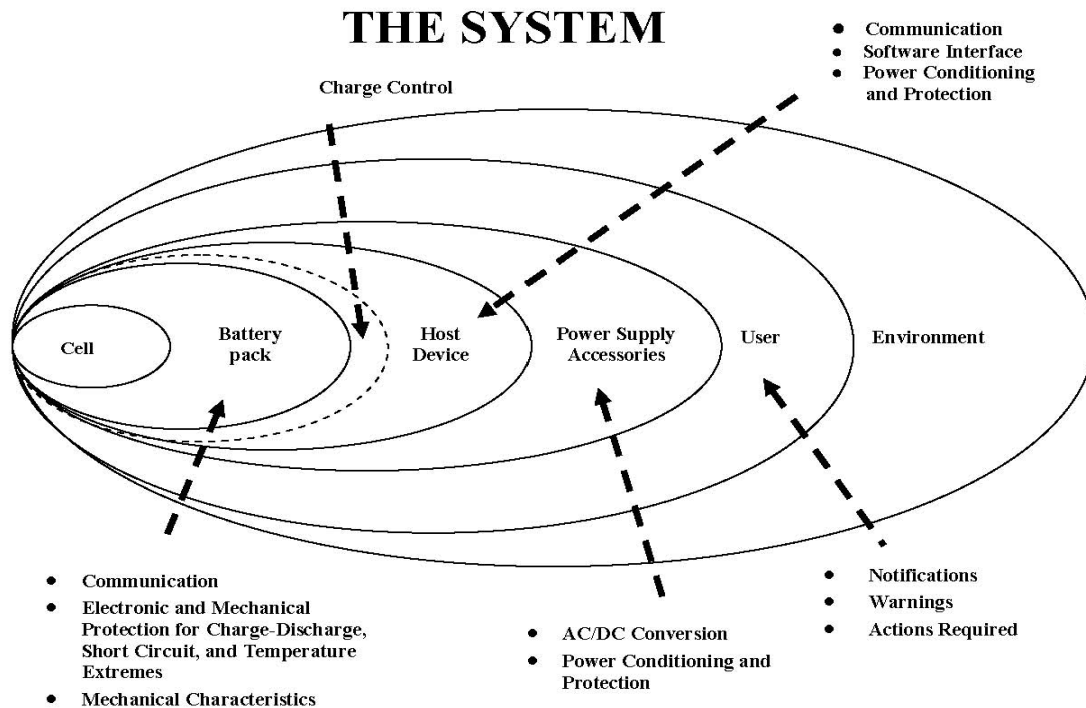
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## Introduction

This introduction is not part of IEEE Std 1725-2011, IEEE Standard for Rechargeable Batteries for Cellular Telephones.

The Working Group was formed to provide a platform based on the experience of industry leaders in cell, battery pack, and systems management leading to design approaches for mobile phones. The focus of the standard is on design approaches for reliable operation of mobile phones and similar rechargeable battery operated systems. This standard may be relevant to other devices, but these were not expressly considered in the development of this standard.

Figure A presents the need for an approach involving all subsystems of the system, including the user and environment, to arrive at a satisfactory user experience. It is necessary to examine all design margins in combination to understand the true effect of a multiple fault response on the mobile phone. This standard addresses such questions as follows: What are the critical operational parameters, and how do these parameters change with time and environment? What are the effects of extremes in temperature, pressure, and impact? A total system view is required to protect the design margins in the various components. The goal of reliability and positive user experience requires that design margins be maintained as user patterns, profiles, and duty cycles change.



**Figure A—Conceptual diagram of a mobile phone and its user  
(examples of functions for each subsystem component are shown)**

This standard applies to all types of rechargeable lithium-ion (Li-Ion) and lithium-ion polymer (Li-Ion polymer) batteries and battery packs for use in mobile phones. This standard is limited to battery packs consisting of a single Li-Ion cell or battery packs with multiple Li-Ion cells connected in parallel. Battery packs with cells connected in series are outside the scope of this standard. Because of the nature of the interactions between the battery and the host device, a system approach must be used in developing an

appropriate operating envelope for the system. The provisions of this standard are intended to provide considerations for design analyses to minimize the occurrence of failures leading to hazards.

This standard is a *system level standard* as depicted in Figure A. Overall compliance is dependent on conformity to each and every subclause of the standard. Compliance with the standard cannot be achieved by any particular mobile phone or subsystem alone without considering the conformity of all subsystems within the system as well as the user. It is incumbent on the manufacturers/suppliers of the host device, battery pack, and cell to review, thoroughly, their designs alone and in conjunction with other subsystems to identify faults that could propagate hazards. Once it has been ascertained that the cell, battery pack, and host device all conform to all their particular subclause requirements, the overall system compliance is not complete until the manufacturer/supplier completes a thorough design analysis, for example, design failure mode and effects analysis (DFMEA), to ensure their particular design prevents hazards from occurring during intended use and reasonable and foreseeable misuse.

At the end of this standard, there are five informative annexes. Annex A summarizes tests that may be used in conjunction with design verification for reliable performance of cells, battery packs, and host devices. Annex B briefly describes the failure mode and effects analysis (FMEA) process through a series of examples. Annex C provides guidance and background information related to two-fault tolerant system analysis. Annex D provides an option to implement validation of the requirement contained within this standard to include both product testing and process/system auditing to qualify or certify components and products for use in mobile phones. Annex E reports thermal environmental considerations encountered in automobiles. Annex F is a bibliography of references useful for understanding and implementing this standard.

The Working Group suggests that this standard be updated in two years, in view of the rapidity that new technology is introduced to the market.

#### **CAUTION**

Compliance with the provisions of this standard does not imply compliance to the regulatory requirements that are applicable to cell, battery packs, and systems. Care must be used to observe and refer to the applicable regulatory requirements, as part of the intended design analyses, for this standard does not assure protection or safety. This standard sets forth recommendations for design analyses and certain testing procedures. The level of assurance for protection and safety resulting from applying this standard depends on the implementation by the manufacturer/supplier and the actions of the end user. Compliance with the standard does not guarantee safety in all circumstance.

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# IEEE Standard for Rechargeable Batteries for Cellular Telephones

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## 1. Overview

### 1.1 Scope

This standard establishes criteria for design analysis for qualification, quality, and reliability of rechargeable lithium-ion (Li-Ion) and lithium-ion polymer (Li-Ion polymer) batteries for cellular telephone applications. Also included in the standard are: battery pack electrical and mechanical construction, packaging technologies, and pack and cell level charge and discharge controls and overall system considerations.

### 1.2 Purpose

The purpose of this standard is to ensure reliable user experience and operation of cell phone batteries. The battery and cellular telephone industries need standardized criteria for design and qualification of rechargeable battery systems and for verifying the quality and reliability of those batteries.

### 1.3 Introduction

This standard guides manufacturers/suppliers in planning and implementing the controls for the design and manufacture of Li-Ion and Li-Ion polymer rechargeable battery packs used for mobile phones.