

CEA Standard

Determination of Television Set
Power Consumption

CEA-2037-A

April 2014



CEA
Consumer Electronics Association®

www.CE.org

NOTICE

Consumer Electronics Association (CEA[®]) Standards, Bulletins and other technical publications are designed to serve the public interest through eliminating misunderstandings between manufacturers and purchasers, facilitating interchangeability and improvement of products, and assisting the purchaser in selecting and obtaining with minimum delay the proper product for his particular need. Existence of such Standards, Bulletins and other technical publications shall not in any respect preclude any member or nonmember of CEA from manufacturing or selling products not conforming to such Standards, Bulletins or other technical publications, nor shall the existence of such Standards, Bulletins and other technical publications preclude their voluntary use by those other than CEA members, whether the standard is to be used either domestically or internationally.

Standards, Bulletins and other technical publications are adopted by CEA in accordance with the American National Standards Institute (ANSI) patent policy. By such action, CEA does not assume any liability to any patent owner, nor does it assume any obligation whatever to parties adopting the Standard, Bulletin or other technical publication.

This document does not purport to address all safety problems associated with its use or all applicable regulatory requirements. It is the responsibility of the user of this document to establish appropriate safety and health practices and to determine the applicability of regulatory limitations before its use.

This document is copyrighted by the Consumer Electronics Association (CEA[®]) and may not be reproduced, in whole or part, without written permission. Federal copyright law prohibits unauthorized reproduction of this document by any means. Organizations may obtain permission to reproduce a limited number of copies by entering into a license agreement. Requests to reproduce text, data, charts, figures or other material should be made to CEA.

(Formulated under the cognizance of the **CEA R4 Video Systems Committee**.)

Published by
©CONSUMER ELECTRONICS ASSOCIATION 2014
Technology & Standards Department
www.CE.org

All rights reserved

FOREWORD

This standard was developed under the auspices of the Consumer Electronics Association (CEA) R4 Video Systems Committee.

CEA-2037-A

[This page intentionally left blank.]

CONTENTS

| | |
|---|-----------|
| 1 Scope | 1 |
| 2 References | 1 |
| 2.1 Normative References | 1 |
| 2.1.1 Normative Reference List..... | 1 |
| 2.1.2 Normative Reference Acquisition..... | 1 |
| 2.2 Informative References..... | 1 |
| 2.2.1 Informative Reference List..... | 1 |
| 2.2.2 Informative Reference Acquisition..... | 2 |
| 3 Definitions | 2 |
| 3.1 Symbols and Abbreviations | 4 |
| 3.2 Compliance Notation | 5 |
| 4 Modes of Operation | 5 |
| 4.1 Power modes..... | 5 |
| 4.1.1 General | 5 |
| 4.1.2 Disconnected:..... | 5 |
| 4.1.3 Off mode:..... | 5 |
| 4.1.4 Standby-passive mode:..... | 5 |
| 4.1.5 Standby-active, low mode:..... | 5 |
| 4.1.6 Standby-active, high mode:..... | 5 |
| 4.1.7 On mode:..... | 6 |
| 4.2 Configurations and picture settings | 6 |
| 4.2.1 Conceptual framework | 6 |
| 4.2.2 Selection of home configuration | 6 |
| 4.2.3 Selection of retail configuration | 7 |
| 5 Measurement Conditions | 7 |
| 5.1 General Measurement Conditions | 7 |
| 5.2 Power supply..... | 7 |
| 5.2.1 Main battery connection..... | 7 |
| 5.2.2 External power supplies..... | 7 |
| 5.2.3 Mains power..... | 7 |
| 5.2.4 Power from other than the mains | 7 |
| 5.2.5 On mode | 7 |
| 5.2.6 Partial On and Off modes | 8 |
| 5.3 Environmental conditions | 8 |
| 5.4 Ambient light conditions | 8 |
| 5.5 Measuring equipment | 8 |
| 5.5.1 Power measuring instrument..... | 8 |
| 5.5.2 Power measurement accuracy | 9 |
| 5.5.3 Luminance measuring device | 9 |
| 5.5.4 Illuminance measuring instrument | 9 |
| 5.6 Signal generation | 9 |
| 5.6.1 Audio-visual signal generating device | 9 |
| 5.6.2 Video signals | 10 |
| 5.6.2.1 Dynamic broadcast-content video signal | 10 |

| | |
|--|-----------|
| 5.6.2.2 Three bar video signal..... | 10 |
| 5.6.2.3 Color bar video signals | 10 |
| 5.6.3 Accuracy of video signal levels | 10 |
| 5.6.4 Audio test signal(s) | 10 |
| 5.6.5 Light source for specific illuminance levels | 10 |
| 5.6.6 Light source for disabling the ABC feature | 11 |
| 5.6.7 Networking equipment | 11 |
| 5.7 Interfaces | 11 |
| 5.7.1 HDMI®..... | 11 |
| 5.7.2 Component analogue video | 11 |
| 5.7.3 S-Video | 11 |
| 5.7.4 Composite analogue video | 12 |
| 5.7.5 Analog terrestrial interface | 12 |
| 5.7.6 Digital terrestrial interface | 12 |
| 5.7.7 Other interfaces | 12 |
| 6 Procedures | 13 |
| 6.1 Order of activities..... | 13 |
| 6.2 Preparation | 14 |
| 6.2.1 Measurement plan | 14 |
| 6.2.2 Power supply voltage and frequency | 14 |
| 6.2.3 Input terminals | 14 |
| 6.2.4 Video format..... | 14 |
| 6.2.5 Automatic brightness control capabilities | 15 |
| 6.2.6 Network connection capabilities | 15 |
| 6.3 Initial activities | 16 |
| 6.3.1 Order of initial activities | 16 |
| 6.3.2 Cool down | 16 |
| 6.3.3 Main batteries | 16 |
| 6.4 Plug-in module | 16 |
| 6.4.1 Installation..... | 17 |
| 6.4.2 Application of input signals | 17 |
| 6.4.3 Luminance measuring device setup | 17 |
| 6.4.4 Light source setup..... | 17 |
| 6.4.5 Power..... | 18 |
| 6.4.6 TV settings | 18 |
| 6.4.6.1 Default settings..... | 18 |
| 6.4.6.2 Input source selection..... | 19 |
| 6.4.6.3 Satellite feature | 19 |
| 6.4.6.4 Additional functions | 19 |
| 6.4.6.5 Special functions | 19 |
| 6.4.6.6 Video aspect ratio..... | 19 |
| 6.4.6.7 Sound level adjustments..... | 19 |
| 6.4.6.8 Networking | 19 |
| 6.5 Determination of power consumption, On mode | 20 |
| 6.5.1 Order of activities | 20 |
| 6.5.2 Stabilization | 20 |
| 6.5.3 Television sets without Automatic Brightness Control enabled by default | 21 |
| 6.5.4 Television sets with Automatic Brightness Control enabled by default..... | 21 |
| 6.6 Determination of relative peak luminance ratio and power factor | 21 |
| 6.6.1 General | 21 |

| | |
|--|----|
| 6.6.1.1 Automatic Brightness Control | 22 |
| 6.6.1.2 Stabilization | 22 |
| 6.6.1.3 Normal measurement | 22 |
| 6.6.1.4 Quick measurement | 22 |
| 6.6.2 Activities for peak luminance ratio and power factor determination | 23 |
| 6.6.2.1 Order of activities | 23 |
| 6.6.2.2 Peak luminance, default picture setting | 23 |
| 6.6.2.3 Determination of power factor | 24 |
| 6.6.2.4 Determination of brightest selectable preset picture setting | 24 |
| 6.6.2.5 Peak luminance, brightest selectable preset picture setting | 24 |
| 6.6.2.6 Peak luminance, retail picture setting | 24 |
| 6.6.2.7 Peak luminance, overall brightest preset picture setting | 24 |
| 6.6.2.8 Peak luminance ratio | 24 |
| 6.6.2.9 Return to default conditions | 24 |
| 6.7 Determination of power consumption, Partial On mode | 25 |
| 6.7.1 General | 25 |
| 6.7.2 Order of activities | 25 |
| 6.7.3 AV inputs | 25 |
| 6.7.4 Standby-passive | 25 |
| 6.7.5 Standby-active, low | 25 |
| 6.7.5.1 Networking | 26 |
| 6.7.5.2 Availability | 26 |
| 6.7.5.3 Measurement | 26 |
| 6.8 Determination of power consumption, Off mode | 27 |
| 6.8.1 Connections and networking | 27 |
| 6.8.2 Availability | 27 |
| 6.8.3 Measurement | 27 |
| Informative Annex A | 28 |
| A.1 Weighting the measured result to determine P_{on_mode} | 28 |
| Informative Annex B | 29 |
| B.1 Electricity supplies | 29 |
| Informative Annex C | 30 |
| C.1 Items to be reported | 30 |
| Informative Annex D | 31 |
| D.1 Standby-active, high | 31 |
| D.2 Definitions | 31 |
| D.3 Ideal | 31 |
| D.4 Practical | 32 |
| D.5 Verification | 33 |

CEA-2037-A

| | |
|--|-----------|
| D.6 Connection Diagram | 33 |
| D.7 Template for DAM power measurement..... | 34 |
| D.8 Example template for DAM power measurement..... | 35 |

Determination of Television Set Power Consumption

1 Scope

This standard defines a method for measuring television set power consumption and related items. It is intended for television sets powered from an external source. Television sets with a non-removable main battery are excluded.

2 References

2.1 Normative References

The following standards contain provisions that, through reference in this text, constitute normative provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed here.

2.1.1 Normative Reference List

- IEC 62087:2011, Methods of measurement for the power consumption of audio, video and related equipment
- IEC 62301:2011, Household electrical appliances - Measurement of standby power

2.1.2 Normative Reference Acquisition

- IEC Standards:
 - Global Engineering Documents, World Headquarters, 15 Inverness Way East, Englewood, CO USA 80112-5776; Phone 800-854-7179; Fax 303-397-2740; Internet <http://global.ihs.com>; Email global@ihs.com
 - IEC Central Office, 3, rue de Varembe, PO Box 131, CH-1211 Geneva 20, Switzerland; Phone +41 22 919 02 11; Fax +41 22 919 03 00; Internet <http://www.iec.ch>; Email pubinfor@iec.ch

2.2 Informative References

The following standards contain provisions that, through reference in this text, constitute informative provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed here.

2.2.1 Informative Reference List

- CEA-770.3-E, High Definition TV Analog Component Video Interface
- CEA Home Illumination Technical Report, TR-1, July 2012
- CLASP Further Analysis of Background Lighting Levels during Television Viewing, March 2012
- ENERGY STAR® Program Requirements for Televisions, Eligibility Criteria
- HDMI Specification