1 OVERVIEW

The following test method shall be used for determining product compliance with requirements in the ENERGY STAR Eligibility Criteria for Telephony.

2 APPLICABILITY

ENERGY STAR test requirements are dependent upon the features of the product under evaluation. The following guidelines shall be used to determine the applicability of each section of this document:

- The test procedures in Section 6.2 shall be performed on all products.
- The test procedures in Section 6.3 shall be performed on all products except Wireless Voice over Internet Protocol (VoIP) Telephones and Additional Handsets.
- The test procedures in Section 7 shall be performed on VoIP and Hybrid Telephones with Data Switch Ports.
- Telephones with Video Calling capability shall not be included in the Version 3.0 ENERGY STAR Program for Telephony.

Note: Stakeholders requested that Telephones capable of transmitting full-motion video be included under the scope of the Version 3.0 ENERGY STAR Program for Telephony. DOE and EPA have decided not to include video-capable Telephones in this version but may consider them for inclusion in the next revision cycle of the Telephony Program. DOE and EPA have therefore updated relevant definitions to make it clear that video-capable Telephones are excluded.

3 DEFINITIONS

Unless otherwise specified, all terms used in this document are consistent with the definitions in the ENERGY STAR Eligibility Criteria for Telephony.

Note: For initial discussion, the acronyms and definitions below have been included in the test method. Some definitions are based on those in the current eligibility criteria for telephony, while others are new and have been included to permit testing of VoIP phones. All definitions and acronyms will eventually be moved to the specification.

A) Product Types:

1) Telephone: A commercially available electronic product whose primary purpose is to transmit and receive sound over a distance using a voice or data network.

a. Sound Transmission Mechanism:

i. Analog Telephone: A Telephone or component of a Telephone system that ultimately converts sound into analog waveforms for transmission through an RJ11 connection.

ii. Voice over Internet Protocol (VoIP) Telephone: A Telephone or component of a Telephone system that ultimately converts sound into Internet Protocol data packets for transmission through an Ethernet connection.
iii. **Hybrid Telephone**: A Telephone or component of a Telephone system that has the ability to ultimately convert sound into both analog waveforms for transmission through a RJ11 connection and Internet Protocol data packets for transmission through an Ethernet connection.

iv. **Cellular Telephone**: A Telephone that converts sound into multiple-access (e.g., Code-Division Multiple Access (CDMA)) packets for transmission to a cellular.

b. **Configuration**:

i. **Cordless Telephone**: A Telephone with a base station and a handset. The charging base of a Cordless Telephone or its External Power Supply is designed to plug into a wall outlet, and although the Cordless Telephone base has a permanent physical connection to the network, there is no physical connection between the portable handset and the network.

ii. **Corded Telephone**: A Telephone with a permanent physical connection between the handset and the network.

iii. **Conference Telephone**: A Telephone without a handset that utilizes a speakerphone for all communications and is primarily used for conference calls.

iv. **Additional Handset**: A Telephone consisting of a handset, charger, and battery, designed for use with a multi-handset Telephone system.

v. **Wireless Telephone**: A Telephone consisting of a handset, charger, and battery that connects to a network via an IEEE 802.11 (WiFi) connection.

**Note**: DOE and EPA have refined the Product Type definitions so that Telephones may be categorized by two non-mutually exclusive characteristics: sound transmission mechanism and configuration, and propose that the following products be under consideration for inclusion in the Version 3.0 specification. DOE and EPA welcome further stakeholder comment on the applicability of the test method to these proposed covered product types.
Note: Based on stakeholder comment, EPA and DOE have included a new definition for Wireless Telephones, as they are under consideration for inclusion in the Version 3.0 ENERGY STAR Program for Telephony. EPA and DOE are interested in stakeholder feedback regarding the proposed definition.

B) Operational Modes:

1) Partial On (Sleep) Mode: A mode that may persist for an indefinite time when a Telephone is connected to a power source and a telephone line or other physical or wireless network connection and is capable of receiving a call. The Telephone is not receiving or transmitting sound, and the handset is “on the hook” and the speakerphone is not engaged.

2) On Mode: Comprises the Call Origination and Active Modes.

   a. Call Origination Mode: The mode in which the Telephone is connected to a power source and is "off the hook". Though not necessarily transmitting and receiving data, a dial tone is present.

   b. Active Mode: The mode in which the Telephone is connected to a power source and a telephone line or other physical or wireless network connection and is receiving and/or transmitting sound and/or playing/recording a message and the handset is “off the hook” or the speakerphone is engaged.

3) Off Mode: The mode in which the Telephone is connected to a power source but is not performing any Partial On or On Mode functions.

Note: In an effort to harmonize with the upcoming IEC 62542—Standardization of environmental aspects - Glossary of terms, EPA and DOE propose to retain Partial On (Sleep) Mode as specified in the Draft 1 Test Method but have made the above revisions to the Mode definitions to minimize confusion with industry terms. DOE and EPA welcome stakeholder feedback regarding the proposed Mode term updates.

Idle Mode has traditionally been used by industry to describe an “on-hook” state. To further avoid confusion, EPA and DOE have decided to rename Idle (Off-hook) Mode used in the Draft 1 Test Method to Call Origination Mode in the Draft 2 Test Method.

Additionally, stakeholders commented that using the term Operation Mode as one of the group of terms named Operational Modes was confusing. Therefore, EPA and DOE are proposing to change the term Operation Mode to Active Mode, as this is the term used by industry. Stakeholder comment is welcome on all changes to Operational Mode term changes.

DOE is also interested in stakeholder feedback regarding the number of products, specifically Conference Telephones that are capable of entering Off Mode. As stated above, Off Mode occurs when the unit is plugged in but is performing no functions and is unable to receive a call. DOE is also interested in feedback regarding whether or not Off Mode is utilized for the Telephones during normal usage.

C) Functionalities:

1) Video Calling: The capability of a Telephone to convert both full-motion video and sound into Internet Protocol data packets for transmission through an Ethernet connection.

2) Charging: The capability of a Telephone to charge a cordless handset battery.

Note: EPA and DOE have removed Charging Mode from the Operational Modes and made Charging functionality, because they believe charging may occur during any of the Operational Modes and should not an exclusive Mode by itself.

3) Digital Answering Technology: The capability to receive a call, play an outgoing message, and record an incoming message.
4) **Data Switch Port**: The capability to provide data connectivity to a computer Ethernet network interface controller (NIC).

5) **High Resolution Display**: A function by which a device provides a pixel-based visual display with resolution greater than or equal to 480x234 pixels, including an LCD panel. This definition does not include Status Displays.

6) **Status Display**: A function by which a product provides a visual display of less than 480x234 pixel resolution, including a back-lit alphanumeric clock or channel indicator. This definition does not include single indicator lamps.

**Note**: EPA proposes the above definitions for categorizing Telephone display types and welcomes comments on their applicability to all Telephone products.

7) **Multi-Handset Technology**: The capability of supporting multiple additional handsets.

8) **Spread Spectrum Technology (SST)**: A communication technique whereby the carrier frequency of a signal is automatically and rapidly changed to provide enhanced transmission range, extendable portable numbers, and additional security. This definition includes direct sequence (e.g., digital spread spectrum or DSS) and frequency hopping.

D) **Telecommunications and Test Equipment**:

1) **Router**: A network device that determines the optimal path along which network traffic should be forwarded as its primary function. Routers forward packets from one network to another based on network layer information. Devices fitting this definition may provide both Router functionality and wireless network capability.

2) **Switch**: A network device that filters, forwards, and floods frames based on the destination address of each frame as its primary function. The Switch operates at the data link layer of the Open Systems Interconnection (OSI) model.

3) **Power Sourcing Equipment (PSE)**: An electronic device, such as a Switch or a Midspan that sources (supplies) the power on the Ethernet cable for PoE devices. PoE Switches supply power and terminate the data link. PoE Midspans inject power and are placed between a non-PoE switch and the device being powered but provide no additional network functionality.

4) **Ringdown Simulator**: A piece of testing equipment which simulates a two-way telephone line.

E) **Additional Terms**:

1) **External Power Supply (EPS)**: A component contained in a separate physical enclosure external to the Telephone product casing and designed to convert line voltage ac input from the mains to lower ac or dc voltage(s) for the purpose of powering the Telephone. An External Power Supply shall connect to the Telephone product via a removable or hard-wired male/female electrical connection, cable, cord or other wiring.

2) **Internet Protocol (IP)**: The communications protocol used for the transmission of data packets across multiple networks (e.g., the Internet) as defined by the Internet Engineering Task Force (IETF).

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3) **Voice over Internet Protocol (VoIP):** The transmission of voice and other sound and/or full-motion video over a network using the Internet Protocol where sound is converted into IP data packets by the device for transmission over a network that uses IP. This network may be local or the Internet. Devices using VoIP do not plug into a traditional telephone jack but connect to a network through an access point, Ethernet or WiFi.

4) **Energy Efficient Ethernet (EEE):** A technology which enables reduced power consumption of Ethernet interfaces during times of low data throughput. Specified by *IEEE 802.3az.*

5) **Power over Ethernet (PoE):** A technology which enables transfer of electrical power, along with data, to network end point devices through an Ethernet cable. Currently specified by *IEEE 802.3-2012.*

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**Note:** Stakeholders commented that IEEE 802.3 was under revision when ENERGY STAR Version 3.0 Telephony Draft 1 Test Method was published. The revision to IEEE 802.3, IEEE 802.3-2012, was ratified on September 5, 2012. DOE has updated the definition for PoE to reference this newest version of IEEE 802.3. DOE and EPA welcome stakeholder feedback regarding this change.

Stakeholders also commented that Power over HDBaseT (PoH) should be included in the scope of the Draft 2 Test Method. DOE is currently unaware of PoH being used by any Telephones covered under the scope defined in the Draft 2 Test Method. As such, DOE has not included PoH in the Draft 2 Test Method. However, DOE and EPA are requesting information from stakeholders regarding PoH Telephones.

6) **Unit Under Test (UUT):** The specific sample of a representative model undergoing measurement which includes the base product (the Telephone) and any Additional Handsets and accessories packaged with it, or an Additional Handset with any accessories packaged with it, depending on the product type being tested for qualification.

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**Note:** Stakeholders asked whether Additional Handsets counted as accessories under the definition of UUT in the Telephony Test Method Draft 1 (Rev. June 2012). The word “accessories” in the Draft 1 Test Method definition of UUT was not intended to include Additional Handsets sold and packaged with the base station. Accessories were intended to mean the other items shipped with the base station, excluding the Additional Handsets and their charging bases. DOE and EPA have proposed the above update to the definition of UUT to clarify. Stakeholder feedback is welcome regarding the proposed update.

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**F) Product Family:** A group of product models that are (1) made by the same manufacturer, (2) subject to the same ENERGY STAR qualification criteria, and (3) of a common basic design. Product models within a family differ from each other according to one or more characteristics or features that either (1) have no impact on product performance with regard to ENERGY STAR qualification criteria, or (2) are specified herein as acceptable variations within a Product Family. For Telephones, acceptable variations within a Product Family include:

1) Color,
2) Housing,
3) Number of Additional Handsets.

**G) Acronyms:**

1) **ac:** Alternating Current
2) **C:** Celsius
3) **CAT 5/6:** Category 5 or 6 cable, the standard cables used for Ethernet connections
4) **dc:** Direct Current
5) **EPS:** External Power Supply
6) **Hz:** Hertz
4 TEST SETUP

4.1 Test Setup for All Products

A) Test Setup and Instrumentation: Test setup and instrumentation for all portions of this method shall be in accordance with the requirements of IEC 62301, Ed. 2.0, “Household Electrical Appliances – Measurement of Standby Power,” Section 4, “General Conditions for Measurements”, unless otherwise noted in this document. In the event of conflicting requirements, the ENERGY STAR Test Method shall take precedence.

B) Input Power:

1) Products intended to be powered from a PoE source shall be connected to a PSE voltage source of 53 ± 2 volts during testing. The PSE voltage source must be compliant with IEEE 802.3-2012.

   a. Lower voltages required for detection and classification of Powered Devices (PDs) may be used prior to testing.

   Note: Stakeholders commented that restricting the input voltage for PoE units to 48 ± 2 volts prohibits the use of Type 2 PSEs for testing. DOE and EPA have updated the input voltage requirements to 53 ± 2 to allow for the use of Type 2 PSEs during testing, while still providing stringent power requirements and allowing for flexibility in the developing market of PoE measuring equipment. Type 1 PSEs will still be able to operate under these voltage requirements.

   Stakeholders also commented that some PSEs must use voltages lower than the specified range during detection and classification of PDs for compliance with IEEE 802.3. DOE has updated the input power requirements to allow for lower voltages during detection and classification prior to testing. Stakeholders are encouraged to comment on these updates. DOE is also interested in stakeholder feedback regarding whether any PoE products would not operate within the provided voltage range.

2) Products intended to be powered from ac mains shall be connected to a voltage source appropriate for the intended market, as specified in Table 1.
Table 1: Input Power Requirements for Ac-Powered Products

<table>
<thead>
<tr>
<th>Market</th>
<th>Voltage</th>
<th>Voltage Tolerance</th>
<th>Maximum Total Harmonic Distortion</th>
<th>Frequency</th>
<th>Frequency Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America, Taiwan</td>
<td>115 V ac</td>
<td>+/- 1.0 %</td>
<td>2.0 %</td>
<td>60 Hz</td>
<td>+/- 1.0 %</td>
</tr>
<tr>
<td>Europe, Australia, New Zealand</td>
<td>230 V ac</td>
<td>+/- 1.0 %</td>
<td>2.0 %</td>
<td>50 Hz</td>
<td>+/- 1.0 %</td>
</tr>
<tr>
<td>Japan</td>
<td>100 V ac</td>
<td>+/- 1.0 %</td>
<td>2.0 %</td>
<td>50 Hz or 60 Hz</td>
<td>+/- 1.0 %</td>
</tr>
</tbody>
</table>

C) **Ambient Temperature**: Ambient temperature shall remain at 23°C ± 5°C, for the duration of the test.

D) **Relative Humidity**: Relative humidity shall remain between 10% and 80%, for the duration of the test.

E) **Ac Power Meter**: When measuring ac power, power meters shall possess the following attributes:

1) **Crest Factor**:
   a. An available current crest factor of 3 or more at its rated range value; and
   b. Lower bound on the current range of 10 mA or less.

2) **Minimum Frequency Response**: 3.0 kHz

3) **Minimum Resolution**:
   a. 0.01 W for measurement values less than 10 W;
   b. 0.1 W for measurement values from 10 W to 100 W; and
   c. 1.0 W for measurement values greater than 100 W.

4) **Measurement Accuracy**:
   a. Power measurements with a value greater than or equal to 0.5 W shall be made with an uncertainty of less than or equal to 2% at the 95% confidence level.
   b. Power measurements with a value of less than 0.5 W shall be made with an uncertainty of less than or equal to 0.01 W at the 95% confidence level.

F) **PoE Power Meter**: When measuring PoE, power meters shall possess the following attributes:

1) **Cable Compatibility**: Capable of measuring Power over Ethernet connections directly from the Category 5 or 6 (CAT5/6) cable, regardless of the PoE method used (i.e., Mode A or Mode B).
   a. Only PoE methods covered under IEEE 802.3 shall be used during testing.

2) Enables Ethernet link and packet traffic flow to UUT from a link partner at all network speeds at which the UUT is capable.

3) Acts as a PSE or allows another PSE to source power to the UUT.

Note: DOE has updated the PoE power meter requirements to allow for the use of meters that both source the power to and measure the power consumption of the UUT, as DOE did not want to preclude the use of this type of equipment during testing. Stakeholders are encouraged to comment on the new PoE power meter requirements.

DOE has also prohibited the use of PoE methods that are not covered under IEEE 802.3 such as all four Ethernet cable pairs to provide power. Stakeholders are encouraged to comment on the proposed change.
4) **Minimum Resolution:**
   a. 0.01 W for measurement values less than 10 W;
   b. 0.1 W for measurement values from 10 W to 100 W; and
   c. 1.0 W for measurement values greater than 100 W.

5) **Measurement Accuracy:**
   a. Power measurements shall have an accuracy of less than or equal to ± (2% + 0.1 W).

6) **Cable Length:** A one meter CAT 5/6 cable shall be used between the power meter and the Unit Under Test (UUT) for all testing.

5 **TEST CONDUCT**

5.1 **Test Conduct for All Products**

A) **As-shipped Condition:** The UUT shall be in new condition and shall be tested in its “as-shipped” condition including, but not limited to, display brightness settings.

B) **Battery-powered Products:** If the UUT contains rechargeable batteries, or can be integrated with another device that contains rechargeable batteries, all batteries shall be fully charged prior to the start of testing and shall remain in place for the duration of testing.

C) **Additional Handsets and Accessories:** All UUTs shall be tested in two configurations:
   1) With only the base and no Additional Handsets or accessories connected or set up, and
   2) With all Additional Handsets and accessories, shipped with the unit, connected and set up in their default configuration
      a. Additional Handsets and the base shall be placed on non-conducting surfaces, at least 1.2 meters above the floor. Additional handsets shall be placed 3 ± 0.1 meters from the base with no obstacles between them.
      b. Additional Handsets set up during testing shall remain in Partial On Mode for the duration of testing.
      c. When testing a UUT with Additional Handsets set up, only the power consumption of the base unit should be measured.
      d. The model name and number of all Additional Handsets and accessories used during testing shall be reported.

**Note:** Stakeholders recommended that the test method specify the number of Additional Handsets that should be in Active Mode when set up. DOE believes that using one handset at a time most accurately reflects normal usage and has clarified the test method to state that all Additional Handsets shall remain in Partial On Mode during all testing. DOE also clarified that only the power consumption of the base unit should be measured when testing with Additional Handsets. Stakeholders are encouraged to comment on DOE’s assumption and the clarifications proposed above.

Additionally, DOE is proposing to require that Additional Handsets be placed 3 ± 0.1 meters from the base unit, as some units can alter their power consumption and transmission power based on the cordless handset location relative to the base unit. The proposed update ensures that phones are tested in the same manner across all labs.

D) **VoIP Server:** Any standard configuration and/or equipment for creating a VoIP network is permitted. The UUT shall have a dial tone and be capable of receiving and making a phone call within the local VoIP network. A valid VoIP route to outside the local VoIP server is not required.
   1) The VoIP Server and all other network equipment shall be able to support the highest network speed at which the UUT is capable of operating.
E) **Hybrid Telephones**: Hybrid Telephones shall be tested as VoIP Telephones.

1) If a Hybrid Telephone ships with an EPS or connects directly to the mains, it shall be tested as an ac powered unit.

2) Otherwise, it shall be tested as a PoE unit.

### 6 TEST PROCEDURES FOR ALL PRODUCTS

#### 6.1 UUT Preparation

A) Set up the UUT in accordance with its instructions for use, except where these conflict with the requirements of this test method. If no instructions for use are available, then factory or "default" settings shall be used.

B) **PoE Powered Units**:

1) Connect the UUT to the PoE power meter and connect the PoE power meter to a port on a suitable Switch. There shall be no Midspans between the power meter and UUT. A suitable Switch is defined as a Switch that:

   a. Supports the maximum network speed of the UUT's network connection.

   b. Supports all modes of PoE that the Telephone can support, unless PoE power is supplied by the PoE power meter.

2) Units that can utilize an alternate power source, as well as PoE, shall be tested using the PoE connection.

3) Set up the Switch according to manufacturer instructions and connect it to the VoIP Server.

4) Connect a second VoIP Telephone that is compatible with the network to the Switch (for Active Mode testing).

5) Configure the VoIP Server and both Telephones to prepare for making and receiving calls locally to the VoIP Server and the VoIP system the server implements.

   a. Record the manufacturer and model number of the VoIP Server.

   b. Set the network speed to the UUT's highest supported speed.

   c. In the event that a VoIP Server setting does not have a default and is not specified in this test method, the setting shall be set according to the tester's discretion and recorded.

C) **Ac Powered Units**:

1) Set up the UUT in its standard configuration, utilizing any included EPSs, if applicable. Connect an approved power meter to an ac line set to the appropriate voltage and frequency as specified in Table 1.

2) Plug the UUT into the measurement outlet on the power meter. No power strips or uninterruptible power supply units shall be connected between the UUT and the meter.

3) Connect the UUT to a suitable external telephone jack for Analog Telephones or a suitable VoIP Server for Hybrid and Wireless VoIP Telephones.

   a. Additional Handsets shall be connected to a multi-handset Telephone system and be capable of making calls.

   b. In the case that a working telephone line is not available, a Ringdown Simulator may be used as a replacement. Another Telephone must be connected to the Ringdown Simulator.

   c. For Wireless VoIP Telephones, set up a WiFi network according to manufacturer instructions and connect the UUT to the WiFi network. The WiFi network shall be connected to a VoIP Server.
The UUT shall be capable of making a call across either the public switched telephone network, a Ringdown Simulator, or a VoIP network, for Wireless IP Telephones and Hybrid Telephones.

### 6.2 Partial On Mode Measurement

#### A) For UUTs with cordless handsets:

1. Place the handset with a fully charged battery in the charge cradle at least 2 hours prior to the beginning of testing.
   - For Wireless VoIP Telephones, the handset shall be placed on the battery charger during testing.
2. Ensure the UUT is in the Partial On Mode.
3. If the UUT can be placed in Call Origination Mode while the handset is in the cradle:
   - Place the UUT in Call Origination Mode for less than 1 minute.
   - Confirm the presence of a dial tone.
   - Return the UUT to Partial On Mode.
4. If the UUT cannot be placed in Call Origination Mode while the handset is in the cradle:
   - Remove the handset from the cradle.
   - Confirm the presence of a dial tone.
   - Return the handset to the cradle, within one minute of removing it, and the UUT to the Partial On Mode.
   - Wait 10 minutes.
5. Measure and record the ac input voltage and frequency.
6. Set the meter to begin accumulating true power values at a rate greater than or equal to 1 reading per second. Accumulate power values for 2 hours and record the average (arithmetic mean) value.

#### B) For UUTs without cordless handsets:

1. Ensure that the UUT is in the Partial On Mode.
2. Verify that there is a dial tone, then return the Telephone to the "on the hook" configuration.
3. Measure and record the ac input voltage and frequency.
4. Wait 10 minutes, then set the meter to begin accumulating true power values at a rate greater than or equal to 1 reading per second. Accumulate power values for 10 minutes and record the average (arithmetic mean) value.

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**Note:** In the Draft 1 Test Method, DOE requested stakeholder feedback regarding the 5 minute measurement for the Partial On Mode. Stakeholders commented that many Cordless Telephones go through charging cycles that last significantly longer than 5 minutes, making the 5 minute measurement unrepresentative of the actual power consumption of these types of Telephones. Stakeholders further commented that some charging cycles occur regardless of the status of the handset, while others reset based on when the handset was placed into the charging cradle. As such, DOE has proposed a separate test method for units with cordless handsets that ensures batteries are fully charged, and which includes a longer measurement period (2 hours) to account for charging cycles. Stakeholders are encouraged to comment on the proposed Partial On Mode test method for units with cordless handsets.

### 6.3 Active Mode Measurement

#### A) For all UUTs except Wireless Voice over Internet Protocol (VoIP) Telephones and Additional Handsets:
1) Ensure the UUT is in the Partial On Mode.

2) Disable any features that would cause the UUT to disconnect or time out during the Active Mode test. If such a feature cannot be disabled, shorten the stabilization time to permit a 10 minute measurement period.

3) Verify that there is a dial tone.

4) Sound Volume and Muting: For Active Mode testing, the UUT shall be set up such that:
   a. The UUT sound volume shall be silenced, or on the lowest possible setting, and
   b. The UUT microphone shall be muted, or on the lowest possible setting, if possible.

5) Make a voice-only call using the UUT.
   a. Calls made using the public switched telephone network shall be made to another Telephone set up at the testing facility.
   b. Calls made using VoIP or a Ringdown Simulator shall be made to the other Telephone connected to the VoIP Server or Ringdown Simulator, respectively.

6) Answer the call on the receiving Telephone.

7) Wait 10 minutes after the call is connected, then set the meter to begin accumulating true power values at a rate greater than or equal to 1 reading per second. Accumulate power values for 10 minutes and record the average (arithmetic mean) value.

**Note:** DOE and EPA are interested in receiving data regarding the normal usage profile for all types of phones to determine the contribution of Active Mode to total energy consumption.

### 7 ADDITIONAL TEST PROCEDURES FOR VOIP AND HYBRID TELEPHONES WITH A DATA SWITCH PORT

#### 7.1 Measuring Data Switch Port Connectivity

A) For VoIP and Hybrid Telephones with Data Switch Ports:

1) Set up the UUT according to Section 6.1.

2) Ensure the UUT is in the Partial On Mode.

3) Connect a personal computer to the Data Switch Port of the UUT. Ensure that the computer is on and that this is the computer's only network connection. Ensure that the computer recognizes this connection.

4) Wait 5 minutes, then set the meter to begin accumulating true power values at a rate greater than or equal to 1 reading per second. Accumulate power values for 2 hours and record the average (arithmetic mean) value.

**Note:** DOE is interested in stakeholder feedback regarding how often computers are connected to switch ports and use this as the only network connection. Investigative testing showed that connecting through the switch port added a significant amount of energy.

### 8 REFERENCES


B) IEEE 802.3-2012. IEEE Standard for Ethernet–Specific requirements–Part 2, Section 33: Data Terminal Equipment (DTE) Power via Media Dependent Interface (MDI)
IEEE 802.11-2012. IEEE Standard for Information technology--Telecommunications and information exchange between systems Local and metropolitan area networks--Specific requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications