



# **COCIR SELF-REGULATORY INITIATIVE FOR MEDICAL IMAGING EQUIPMENT**

## **ULTRASOUND EQUIPMENT MEASUREMENT OF ENERGY CONSUMPTION 2015**

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**COCIR**  
**SUSTAINABLE COMPETENCE IN ADVANCING HEALTHCARE**

European Coordination Committee of the Radiological, Electromedical and Healthcare IT Industry





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## **1. INTRODUCTION**

The Energy-related Products (Ecodesign) Directive, 2009/125/CE, enables the European Commission (EC) to set Ecodesign requirements through new regulations for any group of products which uses energy or is related to energy consumption. In 2007, Medical Devices were identified as a “Priority A” product group by the European Commission for future regulation.

COCIR Companies presented in 2009 a Self-regulatory Initiative for Medical Imaging Equipment, driven by the Ecodesign Steering Committee, committing to improve the environmental performances of their products.

As the Steering Committee has done for magnetic resonance and computed tomography, a working group was formed to determine a measurement methodology and ecodesign goals for Ultrasound imaging equipment.

The outcome is an agreed upon procedure for measuring typical energy consumption of ultrasound equipment. This procedure defines specific states of system operation and instructions for determining a set of scanning protocols to be analysed.

## **2. SCOPE**

This methodology can be used to measure all U/S systems. Equipment and accessories beyond a basic U/S product and not required for a basic scan, or customer-provided equipment, are outside the scope of this procedure.



### 3. DEFINITIONS

**Energy:** The capacity to do work. In this document, the unit of energy is kilowatthours (kWh).

**Power:** The rate at which energy is generated or consumed. In this document, the unit of power is kilowatt (kW).

**Procedure Type:** An examination is the collection of a scan for an individual patient. "Procedure Type" refers to an examination for a specific anatomy or type of exam. (e.g. Abdomen or Vascular).

**Off mode:** The system is shut down according to the user manual, plugged into mains, AC mains ON.

**Stand-by:** The system is configured in the lowest possible energy consuming state, according to the user manual.

**Ready-to-scan:** A state of the system when fully powered and ready to acquire image.

**Scan mode:** A state of the system during scans. This mode includes ultrasound generation and real-time image rendering.



#### 4. SYSTEM POWER MODES

The operation modes are defined as “Off”, “Stand-by”, “Ready-to-scan”, and “Scan”. As the energy usage in “scan” is virtually no different from “ready-to-scan” “ready-to-scan” is used.

The anticipated power of these modes, from high to low, is:

*Ready-to-scan > Stand-by > Off*

#### 5. USE MODES OVERVIEW

Typical daily system operation is set as follows:

Time period	Mode	Duration
12h night-time	Off	12 hours
12h day-time	6h Ready-to-scan 6h Stand-by	12 hours

The typical daily energy consumption of an U/S system is the sum of the energy consumption for each of the two time periods.

#### 6. RESOURCES FOR MEASUREMENT PROCEDURE

The following personnel are recommended:

- An engineer or technician familiar with the power distribution of the system and power electronics safety.
- An engineer or applications specialist familiar with system operation.

#### 7. UNIT UNDER TEST (UUT)

**System Voltage:** The system should be installed according to the manufacturer’s installation instructions.

**Installation:** The system shall be installed and calibrated according to its specification. Any equipment and accessories beyond the basic product offering that is not required for a basic scan shall not be included in the measurement (e.g. printers and DVD recorders should be completely off and drawing no electricity)

**Environmental Conditions:** The measurements are to be taken at a steady-state operating temperature within manufacturer’s specified ambient temperature and humidity limits.

**Measurement:** Prior to each mode’s measurement, the equipment shall remain in that mode for sufficient time to allow temperature and other pertinent transient conditions to stabilize.



## 8. MAINS POWERED U/S DEVICES

### 8.1. POWER MEASUREMENT DEVICE

The measurements shall be recorded using a device capable of measuring voltage and current, and calculating the integral of power with respect to time (energy) or a power meter able to sample average power ratings.

The power measurement device shall be installed onto the input to the system to ensure that all energy consumption of the U/S equipment is captured, including any cooling equipment provided by the U/S supplier as part of the base system.

### 8.2. MEASUREMENT OF POWER

The power measurement of different system states described in the following sections shall finally allow calculating the complete 24h power consumption according to formulas in chapter 10.

#### 8.2.1. OFF MODE POWER MEASUREMENT

- 1) Switch the system to Off mode according to the user manual.
- 2) Start the power measurement on the measurement device. Continue the measurement to include possible cyclical variation in the power.
- 3) Record the power consumption in off mode state.

#### 8.2.2. STAND-BY MODE POWER MEASUREMENT

- 1) Switch the system to stand-by mode according to the user manual.
- 2) Start the power measurement on the measurement device. Continue the measurement to include possible cyclical variation in the power.
- 3) Record the power consumption in stand-by state.

#### 8.2.3. READY-TO-SCAN POWER MEASUREMENT

- 1) Switch the system to ready-to-scan mode according to the user manual.
- 2) Start the power measurement on the measurement device.
- 3) Record the power consumption in ready-to-scan mode

## 9. BATTERY POWERED ULTRASOUND DEVICES

The power measurement device shall be installed onto the input to the charger to ensure that all energy consumption of the U/S equipment is captured, including any cooling equipment provided by the U/S supplier as part of the base system.

The U/S battery is connected to the battery charger provided with the device itself and charged until 100% level is reached.

#### 9.1.1. OFF MODE POWER MEASUREMENT

- 1) With the battery fully charged to 100% and the battery charger still connected to the mains
- 2) Switch the system to Off mode according to the user manual
- 3) Start the power measurement on the measurement device. Continue the measurement to include possible cyclical variation in the power
- 4) Record the power consumption in off mode state

#### 9.1.2. STAND-BY MODE POWER MEASUREMENT

- 1) With the battery fully charged to 100% and the battery charger still connected to the mains
- 2) Switch the system to stand-by mode according to the user manual



- 3) Start the power measurement on the measurement device. Continue the measurement to include possible cyclical variation in the power
- 4) Record the power consumption in stand-by state

### 9.1.3. READY-TO-SCAN OR SCAN POWER MEASUREMENT

- 1) With the battery fully charged to 100% and the battery charger still connected to the mains
- 2) Switch the system to ready-to-scan mode according to the user manual
- 3) Start the power measurement on the measurement device
- 4) Record the power consumption in ready-to-scan mode

Any U/S device equipped with batteries has to be considered “battery powered”. Backup batteries or button cells shall not be considered. For battery powered devices, the daily energy consumption has to be calculated using the formulas in chapter 10.

## 10. ENERGY CONSUMPTION CALCULATION

The 24h energy consumption has to be calculated out of the measured power and energy consumption of the different system states with the following formula for the 3 scenarios:

### Scenario Off

The U/S device is in Off mode for 12h during night time

$$E_{\text{tot}} = P_{\text{off}} \times 12\text{h} + P_{\text{ready-to-scan}} \times 6\text{h} + P_{\text{stand-by}} \times 6\text{h}$$

In case the U/S devices has not a stand-by mode:

$$E_{\text{tot}} = P_{\text{off}} \times 12\text{h} + P_{\text{ready-to-scan}} \times 12\text{h}$$

### Scenario Stand-by

The U/S device is in stand-by mode for 12h at night time

$$E_{\text{tot}} = P_{\text{stand-by}} \times (12+6)\text{h} + P_{\text{ready-to-scan}} \times 6\text{h}$$

### Scenario Ready-to-scan

The U/S device is in ready-to-scan mode for 24h as it is never switched to off or to Stand-by modes.

$$E_{\text{tot}} = P_{\text{ready}} \times 24\text{h}$$