



Sustainable Competence
in Advancing Healthcare



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

CT MEASUREMENT METHODOLOGY



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FOR MEDICAL IMAGING EQUIPMENT

COMPUTER TOMOGRAPHY
MEASUREMENT OF ENERGY CONSUMPTION

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SUSTAINABLE COMPETENCE IN ADVANCING **HEALTHCARE**

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





CT MEASUREMENT METHODOLOGY

- The development of a methodology to measure the environmental aspect chosen for reduction is the first and most important step of any SRI.
- The methodology has to provide reliable, solid, comparable and repeatable data
- Moreover it has to be able to take into account all possible improvements which can contribute to the target achievement.
- The CT Expert Group first meet in March 2012 and the methodology was finalized in March 2013.
- This methodology can be used to measure all CT systems.
- It is suited to be used internally by Companies but also to provide information to purchasers (e.g. in Public Procurement)

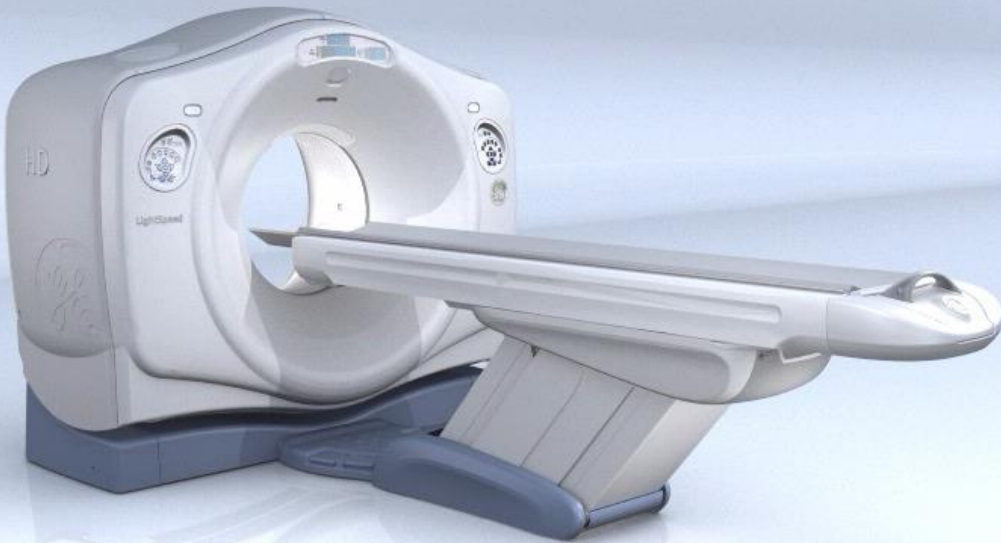


DEFINITION OF MODES

- **Off:** The system is shut down, AC mains off, according to the user manual. The system consumes no energy.
- **Low-power:** The system functions into the minimum energy consumption state that the user can select according to the user manual.
- **Idle mode:** A state of the system when fully powered but no scan has been prescribed. This mode does NOT include x-ray tube rotor or gantry rotation.
- **Scan mode:** A state of the system between individual scans and during scans (e.g. during patient handling, examination planning, contrast agent injection and active scanning with x-ray generation). This mode includes tube rotor rotation, gantry rotation and generation of image, and any possible idle between scans.



CT Scanner

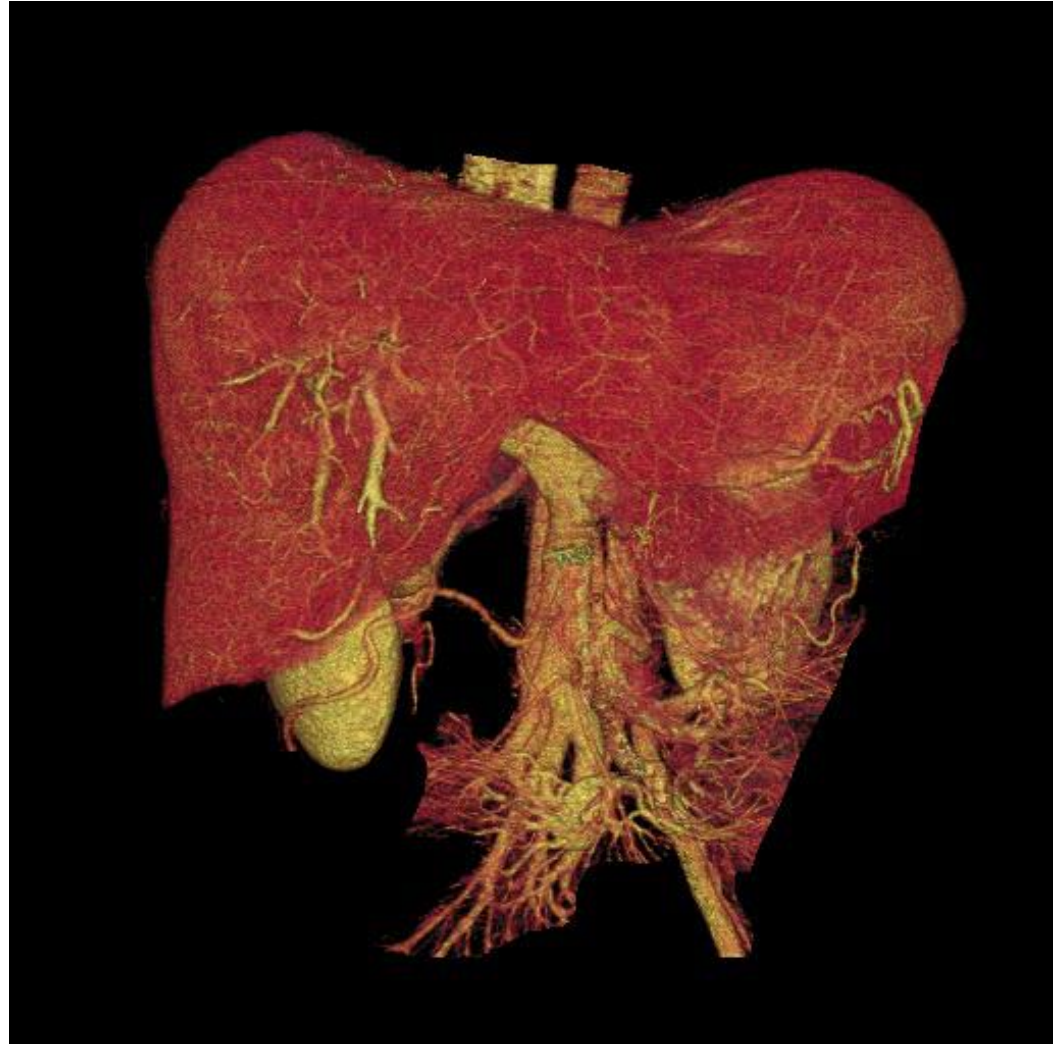


- **Rotating gantry**
- **X-Ray Tube**
- **Detector elements**



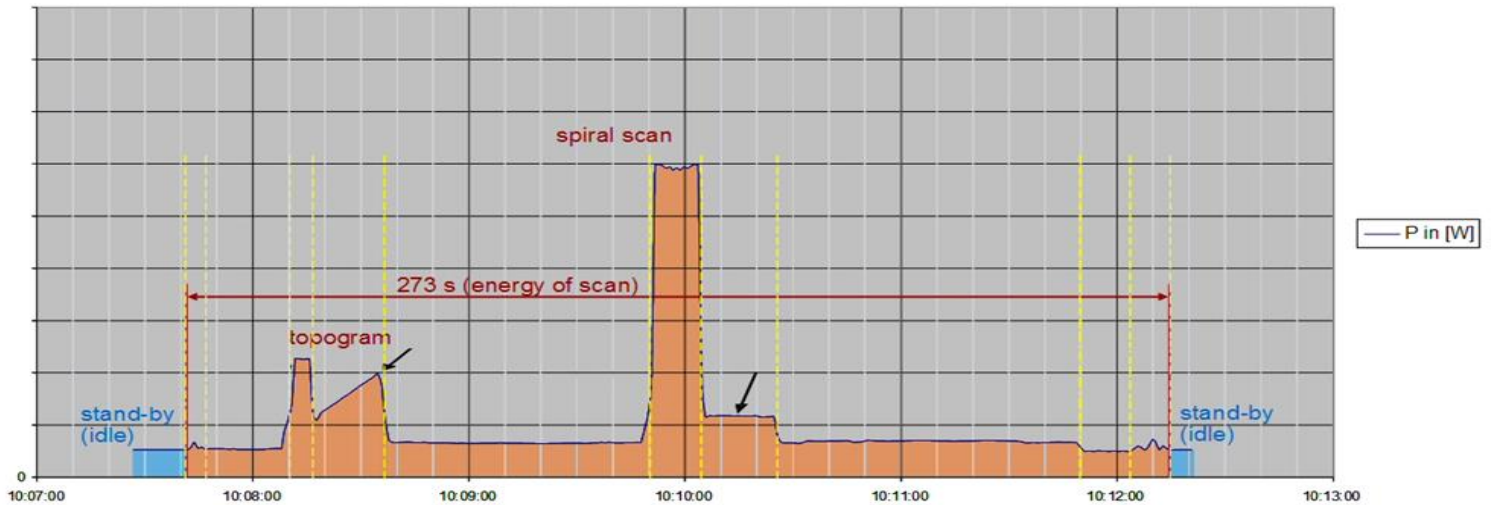
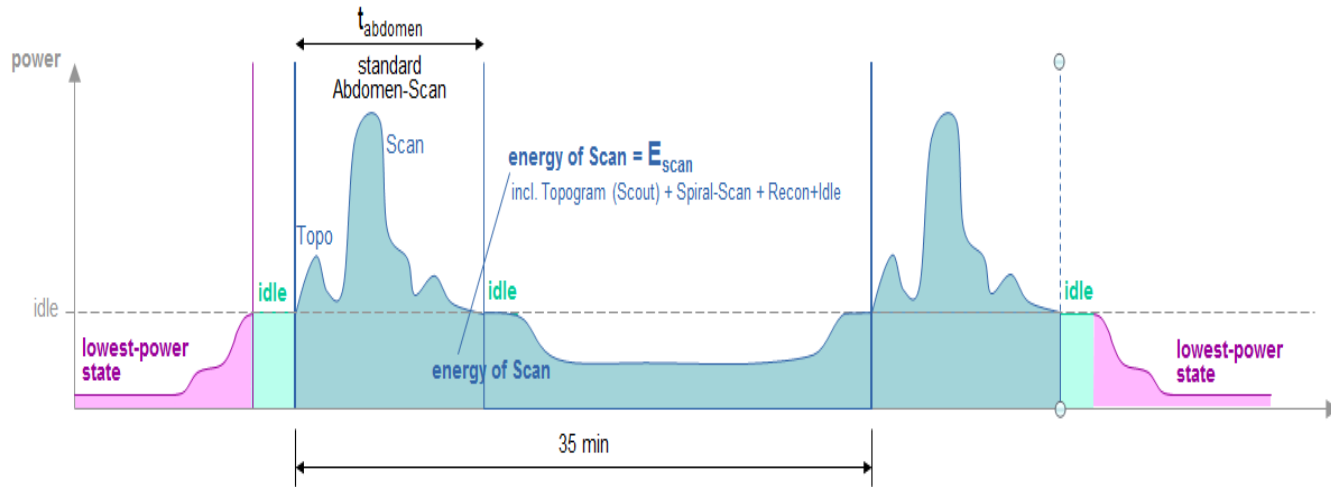
Clinical CT Image

**Energy
reduction must
not compromise
Clinical Value !**



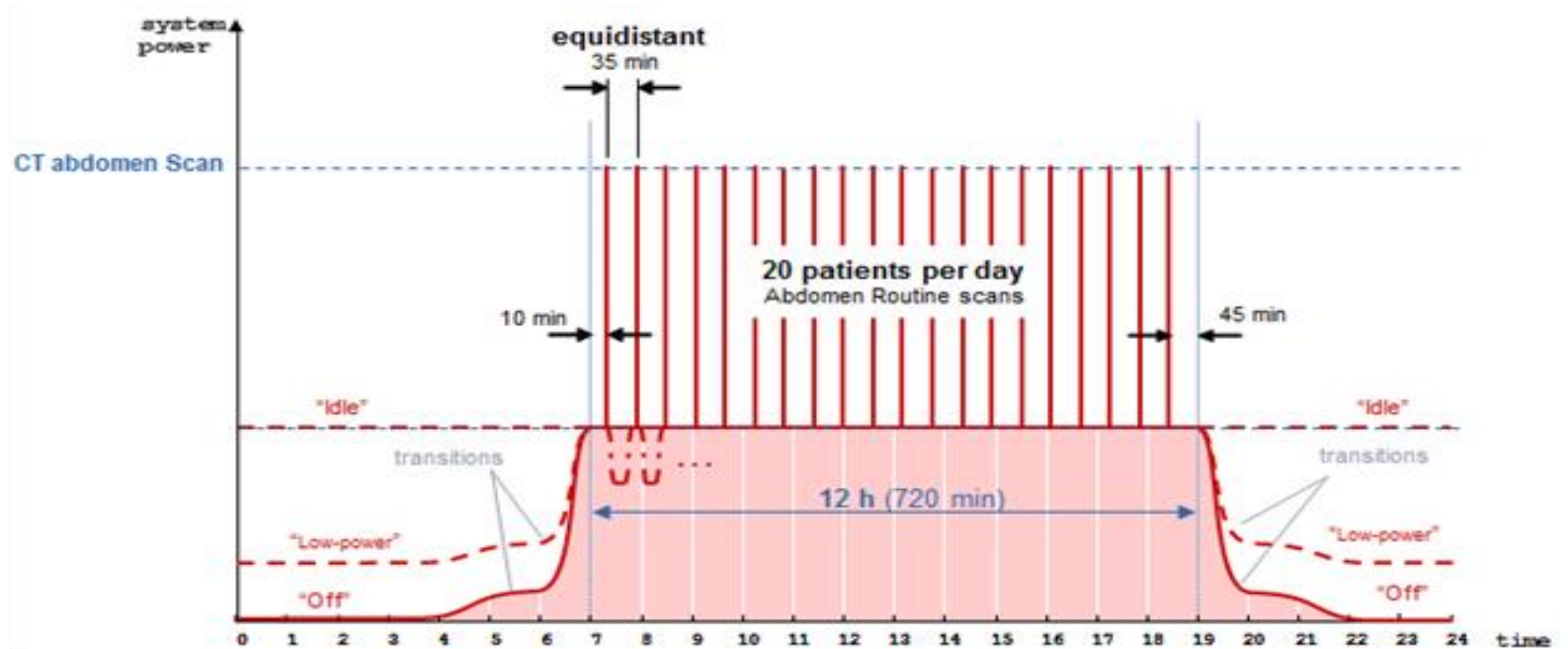


SCAN MODE





CT POWER USAGE OVER A TYPICAL DAY



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20		Total
Type of examination		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A		
Duration (min)	10	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	10	720



SCAN PARAMETERS

- Within each procedure type, the specific scan parameters representing each exam type have been chosen to harmonize across manufacturers
- This step is extremely important as it ensures comparability of measured results

Scan type	Head	Chest	Spine	Abdomen
Kv	120	120	120-140	120
mA	200-300	100-250	300	187-400
Rotation speed	0,5-1	0,5	1	0,5-0,8
CTDI Maximum	60	8	25	15
Scan Length (mm)	200	200	200	200
Reconstruction jobs	1	1	1	1
Tube current modulation	ON	ON	ON	ON



ENERGY CONSUMPTION SCENARIOS

- The daily energy consumption of a CT is determined by the way the CT low power and off modes are used.
- The definition of a single scenario is not able to reflect reality and the different technological solutions that can be implemented to reduce the energy consumption.
- The SRI SC decided to use the methodology to calculate 3 scenarios:
 - **Scenario Off:** The CT scanner is in Off mode for 12h during night time
 - **Scenario Idle:** The CT scanner is in Idle mode for 12h during night time
 - **Scenario Low :** The CT scanner is in LowPower mode during 12h night time.



ENERGY CONSUMPTION SCENARIOS

Scenario Off: The CT scanner is in Off mode for 12h during night time

$$E_{\text{tot}} = E_{\text{off}} + P_{\text{idle}} \times 20\text{mins} + 20 \times E_A$$

Scenario Idle: The CT scanner is in Idle mode for 12h during night time

$$E_{\text{tot}} = E_{\text{idle (12h)}} + P_{\text{idle}} \times 20\text{mins} + 20 \times E_A$$

Scenario Low : The CT scanner is in LowPower mode during 12h night time

$$E_{\text{tot}} = E_{\text{lowpower}} + P_{\text{idle}} \times 20\text{mins} + 20 \times E_A$$

Where:

E_{off} : $E_{\text{idle-off}} + E_{\text{off-idle}}$

E_{idle} : Energy in Idle mode over 12h night time

E_{lowpower} : $E_{\text{idle-lowpower}} + P_{\text{idle}} * (12\text{h} - T_{\text{idle-low}} - T_{\text{low-idle}}) + E_{\text{lowpower-idle}}$

P_{idle} : Power in Idle mode