

# IMAGE QUALITY OF CT SCANNERS AND PATIENT DOSE FROM CT EXAMINATIONS IN GREECE

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## Introduction

The use of computed tomography (CT) has seen enormous growth over the past decade. The clinical information obtained from CT examinations makes CT one of the most widely used diagnostic tools. On the other hand, CT delivers very high dose to the patient compared with other diagnostic radiology examinations and thus contributes significantly to the collective dose to the population of many countries. As a consequence, the optimization of CT systems' performance and of patient protection is very important.

## Purpose of this work

To evaluate image quality of various CT scanners installed in Greece, as well as to investigate patient doses from common CT examinations.

## Materials and Method

### Image Quality

A survey was performed in 44 CT scanners countrywide. 18 of them were single slice scanners and the rest 26 were multi-slice (up to 128-slice) The imaging performance of the systems was evaluated by measurements of image noise, spatial uniformity, high contrast spatial resolution, low contrast detectability and slice thickness accuracy. A cylindrical homogeneous water phantom, 20 cm in diameter, was used for the assessment of image noise, spatial uniformity and CT number of water. The rest of the image parameters were assessed using a standard Gammex-RMI 461A phantom.



## Materials and Method

### Patient doses

Preliminary results of patient dose survey are presented. Phantom measurements of CTDI<sub>w</sub> and DLP were performed on 13 scanners for the most common examinations using the exposure parameters for a typical adult patient. The dosimetry method was based on the *European Guidelines for Quality Criteria in CT*.

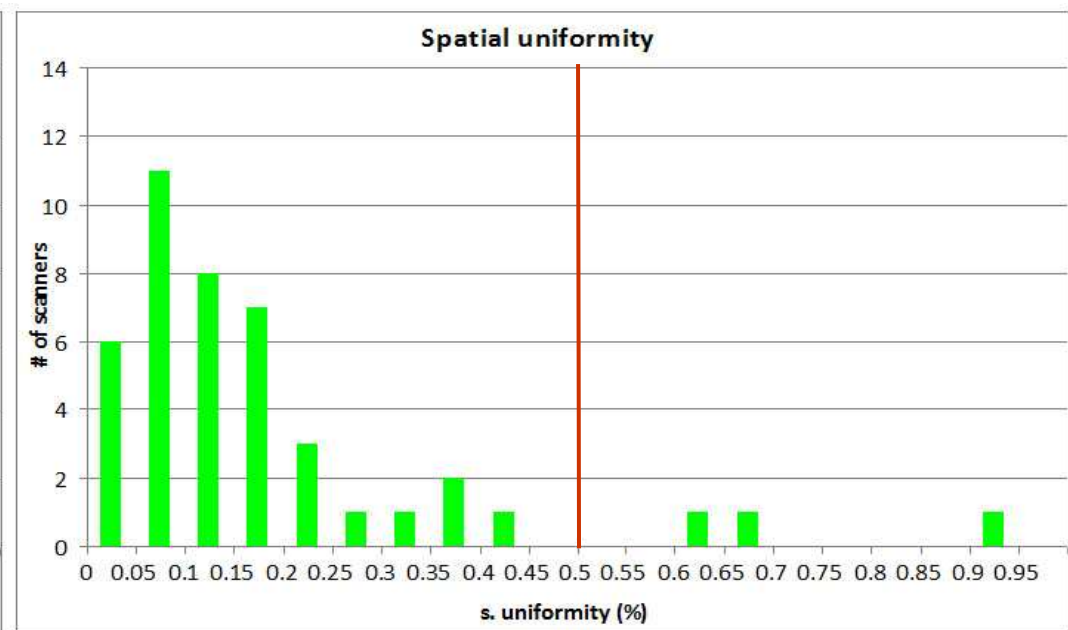
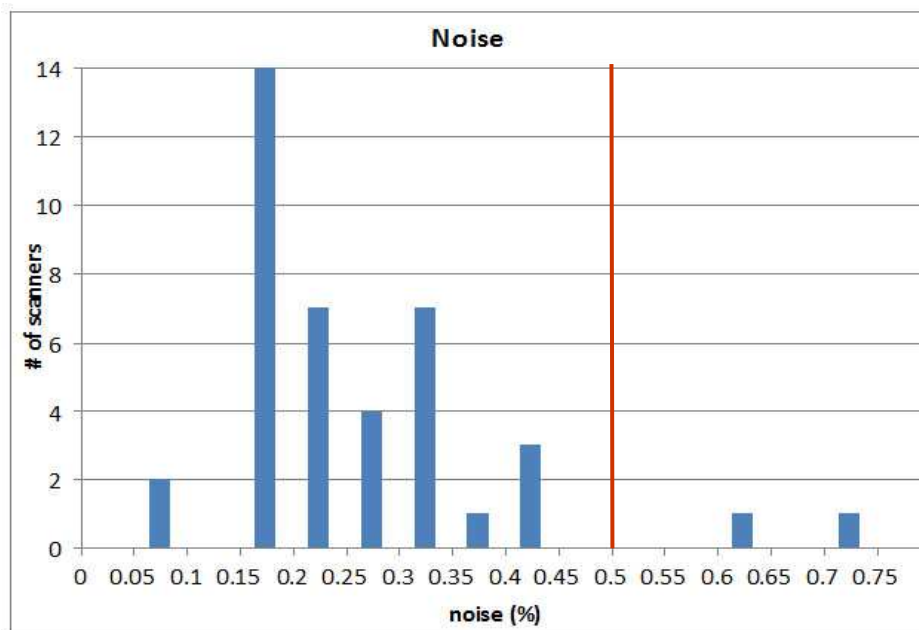
Head and body PMMA phantoms were used, 16 cm and 32 cm of diameter respectively, as well as a 10 cm pencil ionization chamber. The CTDI<sub>w</sub> and DLP for these examinations were compared with the dose reference levels provided in the aforementioned guidelines.



## Results

### Image Quality

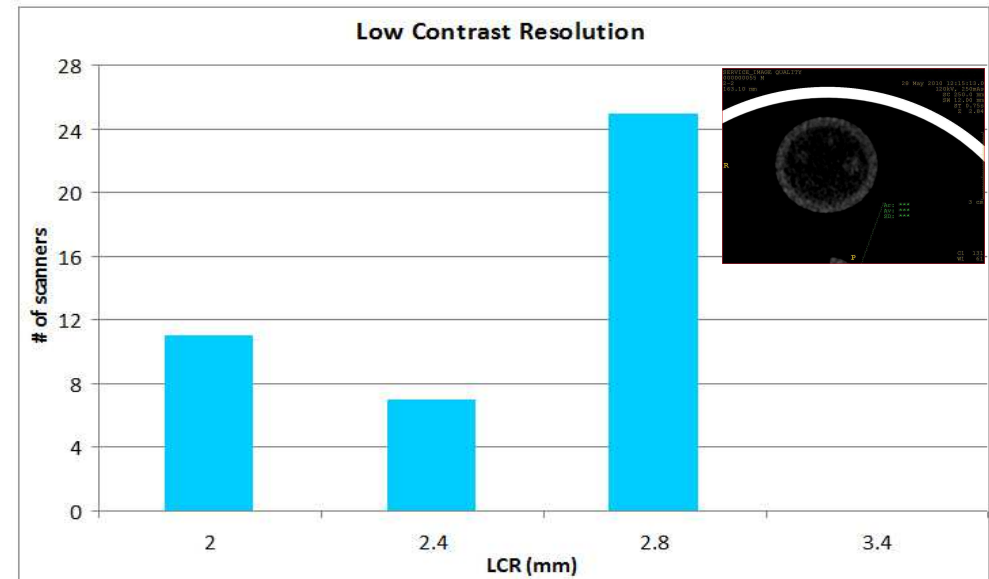
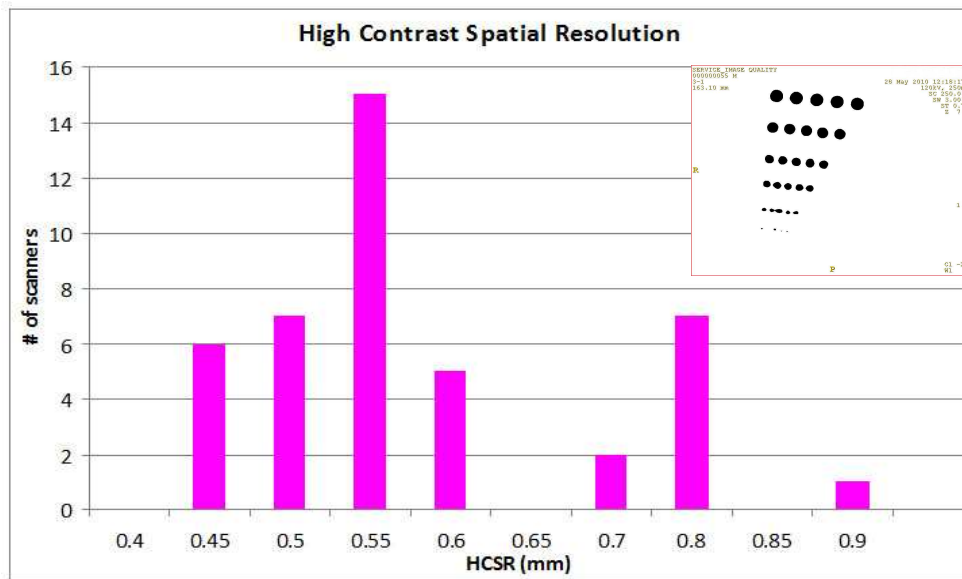
The majority of the scanners (79.5%) were found to be in compliance with national legislation and relative international guidelines for all the examined image quality parameters.



4.5% and 6.8% of the scanners exceeded the suggested limit for image noise and spatial uniformity respectively (0.5%).

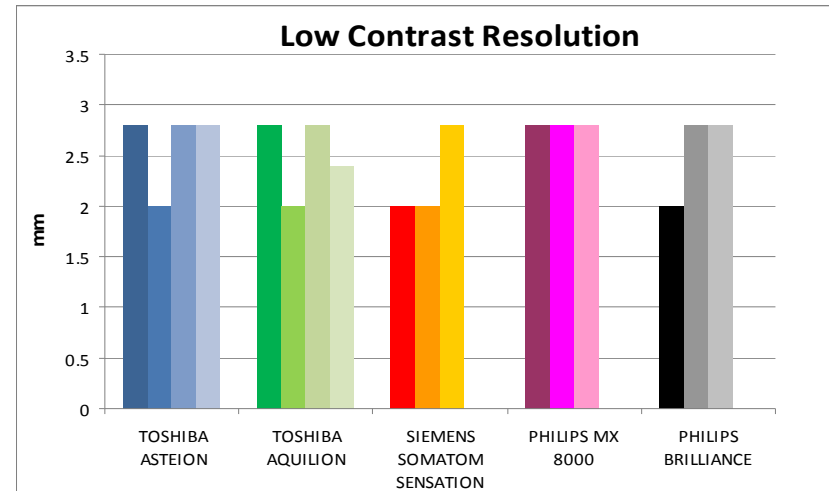
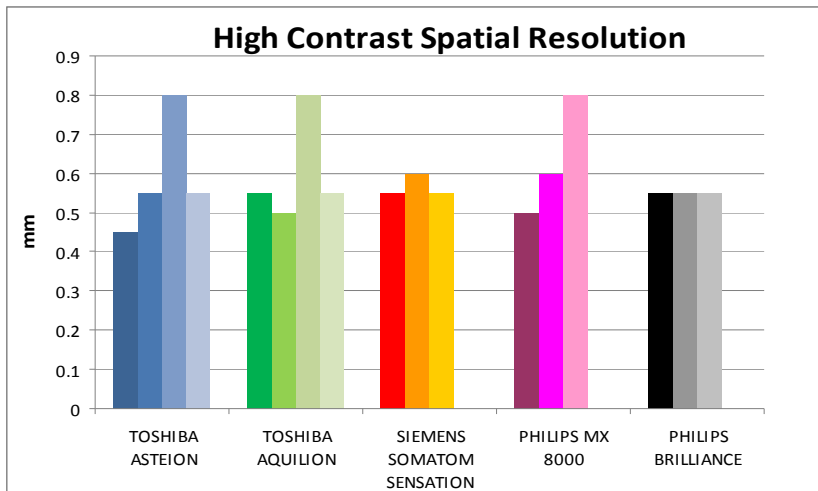
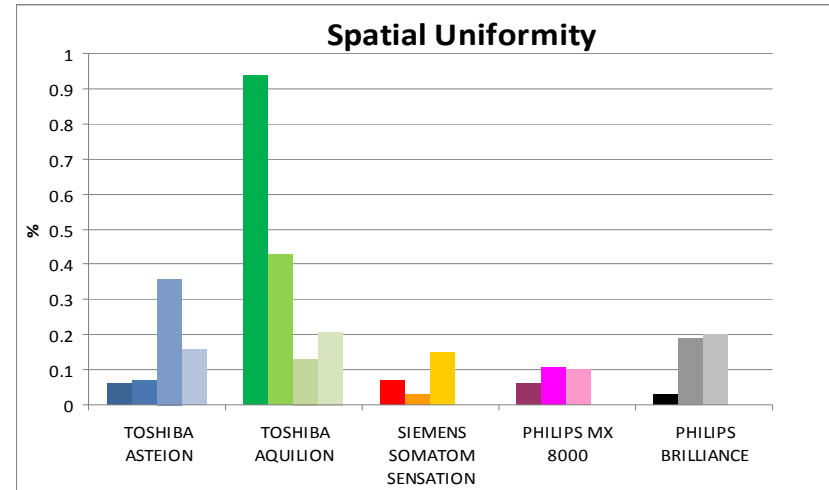
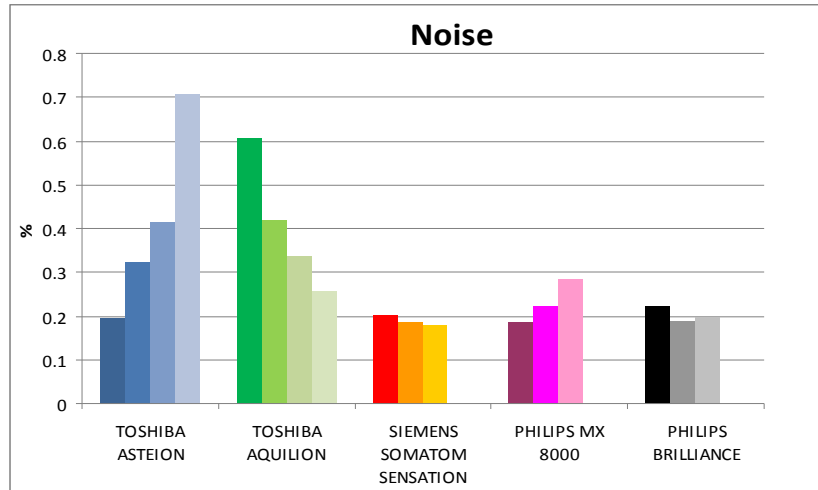
# Results

## Image Quality



All scanners were within the suggested limits for high contrast and low contrast resolution (1mm and 4 mm respectively).

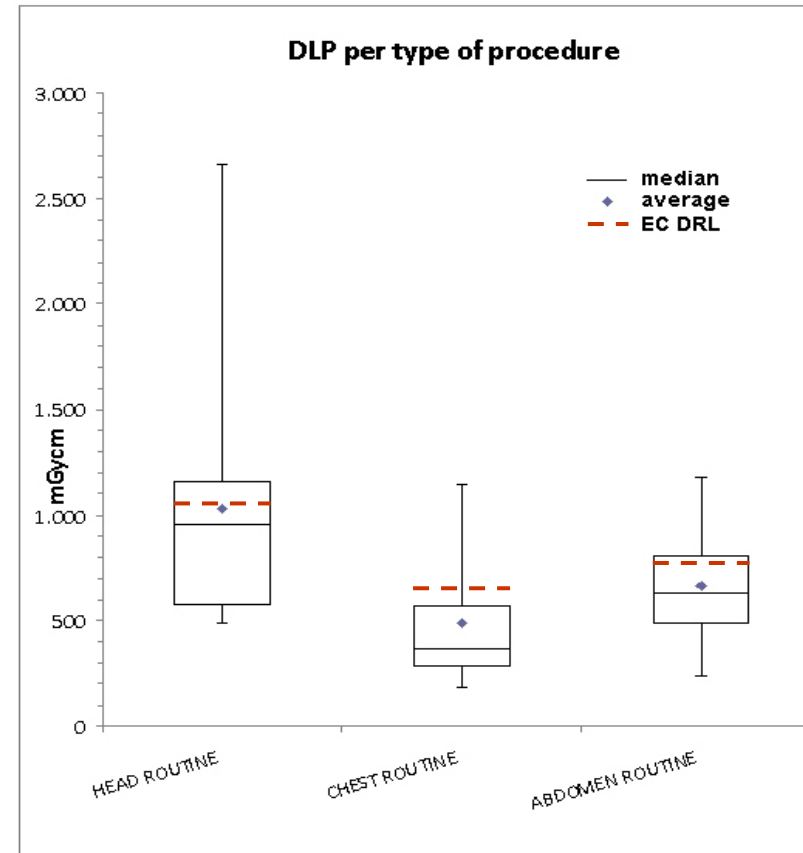
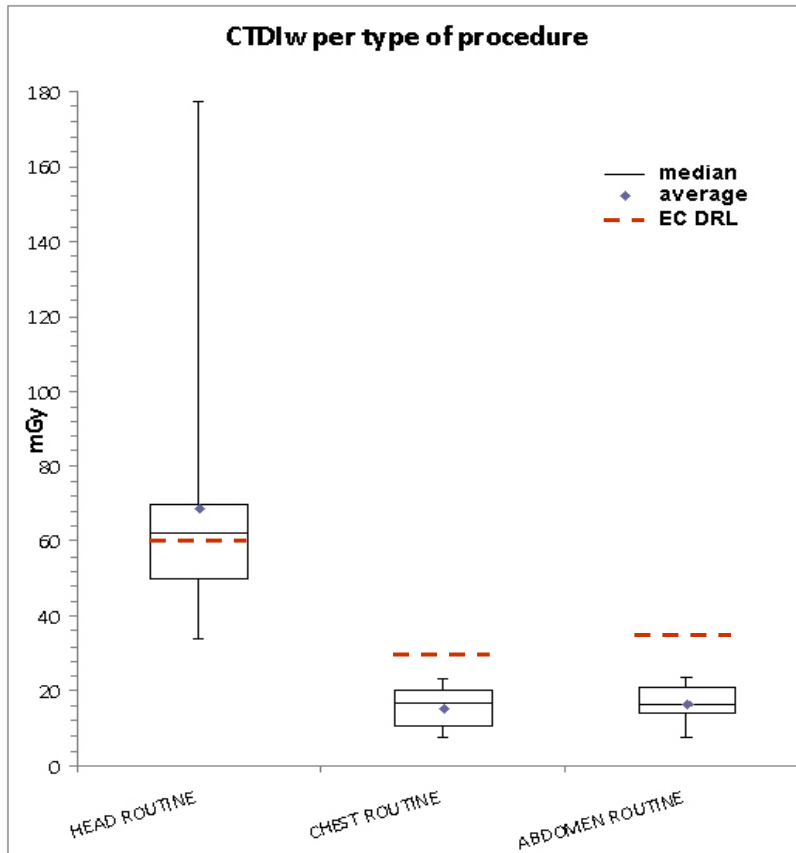
Differences on the performance among scanners of the same type and similar age were observed.



# Results

## Patient Doses

The CTDI<sub>w</sub> and DLP results for head, chest and abdomen routine scans are presented, in comparison with the respective EC DRLs.





## Conclusions

- **The overall performance of the majority of the CT scanners examined is satisfactory.**
- **Differences on the performance among scanners of the same type and similar age, point out the importance of frequent calibration, routine quality control and proper maintenance.**
- **Some of the scanners were found to deliver significantly higher patient doses than the EC reference levels.**
- **The feasibility of reducing patient doses without compromising image quality for these systems seems likely and should be further examined.**