

EUTEMPE-RX: High-level education for medical physicists in diagnostic and interventional radiology

What are we all about?

EUropean:

- FP7 project supported by the EC
- European consortium
- Targeting European participants

Training and Education:

- Modular course programme
- High-level teaching of professionals

Medical Physics Experts:

- Topics related to medical physics
- Learning outcomes at the expert level (EQF level 8)

Radiology ('RX'):

- Currently targeting medical physicists working with radiological systems

Practicalities

Course organization:

- No registration cost
- First module started December 2014, last module ends May 2016
- 9 out of 12 modules completed

Perfect participant group:

- ~25 mostly European participants, strong representation from new member states
- Gender balanced with diverse backgrounds
- Working in hospitals, industry or regulatory authorities

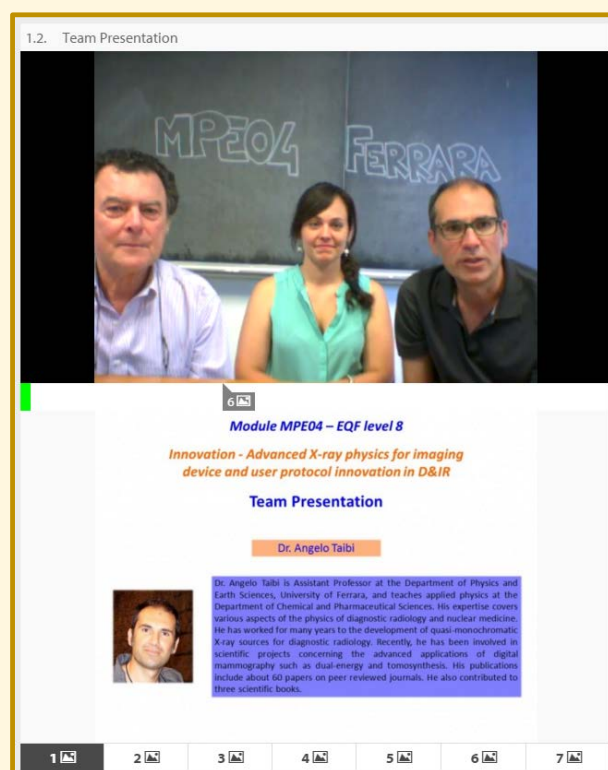
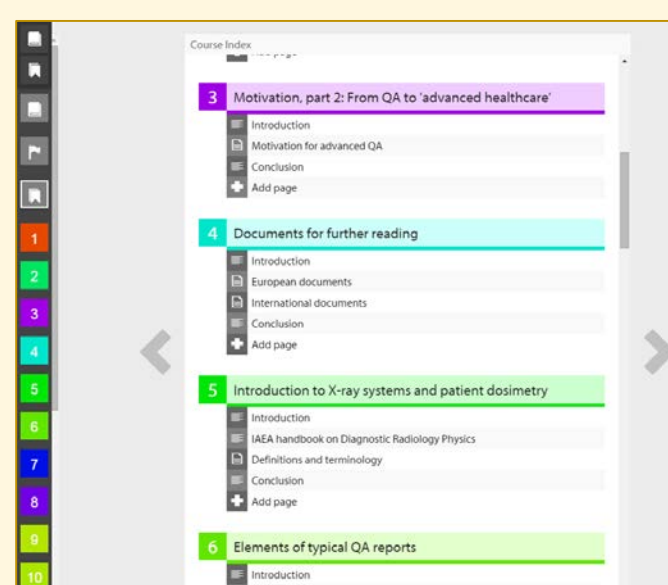
Online phase: ~40h/module

Goals:

- Preparing for the face-to-face phase
- Creating a homogeneous participant group

E-learning platform: SEKOIA

- Book structure: (sub)chapters and pages
- Online questioning + follow-up of answers
- Online forum

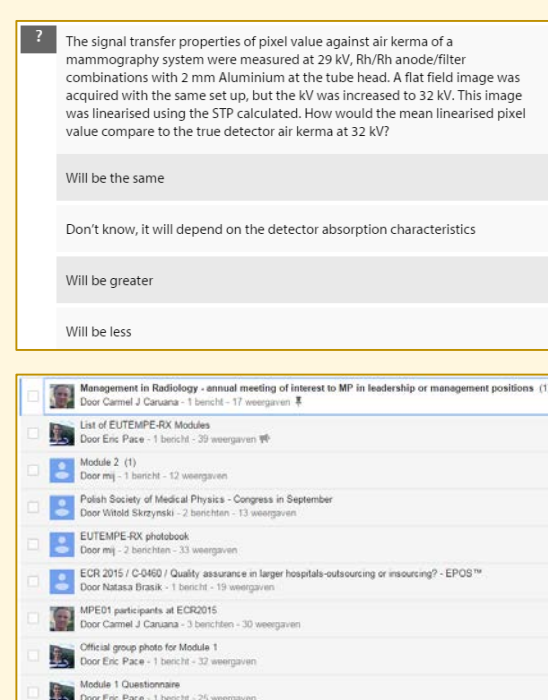


Online material:

- Standard text pages
- Uploaded powerpoints, word/excel/pdf-files, images
- Audiofiles: powerpoints with audio animations
- Videos: knowledge clips, web lectures, screencasts

Not everything is done on the e-learning platform:

- Web meetings: discuss course content, assessment, etc.
- File sharing: not trivial through e-learning platform
- Users' group: keep the group together!



What is our X-factor?

- Course modules are stand-alone and can be followed independently
- Flipped learning: preparatory online phase before face-to-face phase → allows for high level face-to-face phase
- Modern teaching techniques in each module
- The programme targets EQF level 8: PhD level!

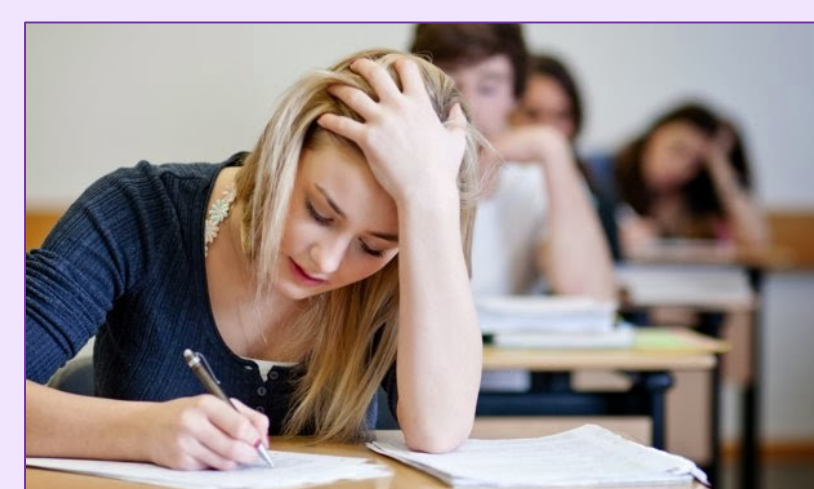
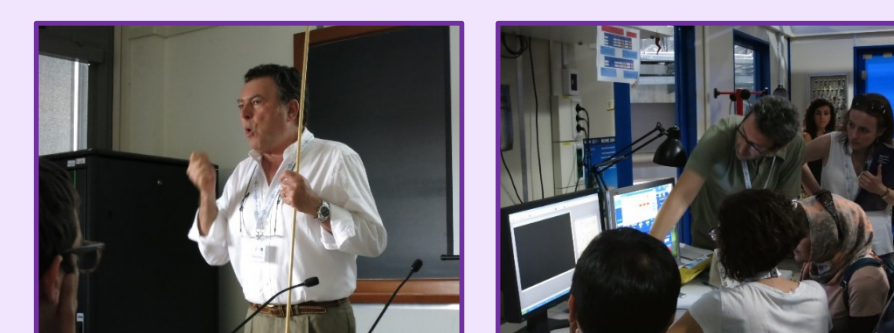
Face-to-face phase: ~40h/module

Goals:

- Transferring knowledge, skills and competences that cannot be transferred online.

Teaching methods:

- Conventional lectures
- (Computer) exercises
- (Panel) discussions
- Demonstrations
- Workshops
- Excursions
- Student presentations

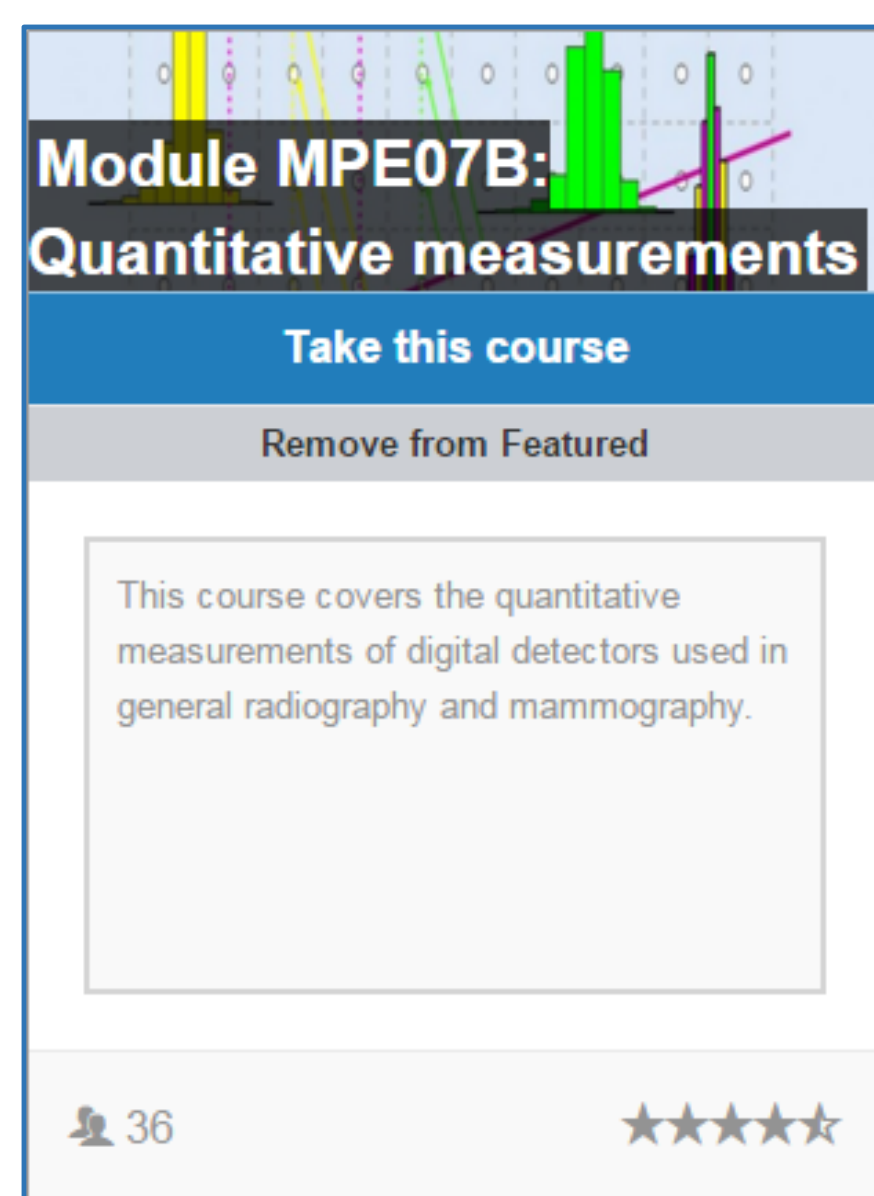


Examination:

- Oral/written
- Open/closed book
- Multiple choice, open questions, etc.
- Practical exercise
- At-home assignment

What does a lesson look like?

ONLINE PHASE



Module MPE07B: Quantitative measurements

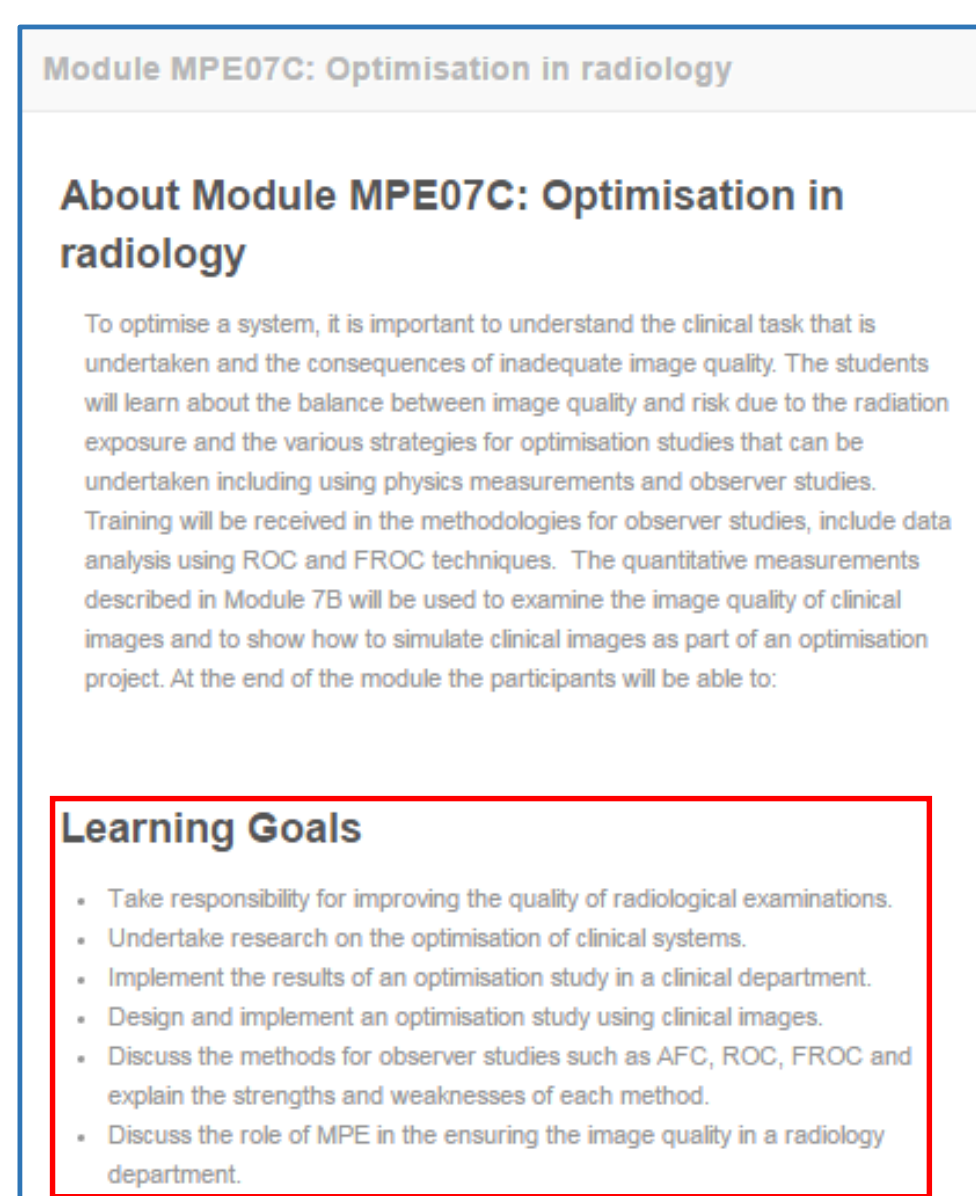
Take this course

Remove from Featured

This course covers the quantitative measurements of digital detectors used in general radiography and mammography.

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★★★★★



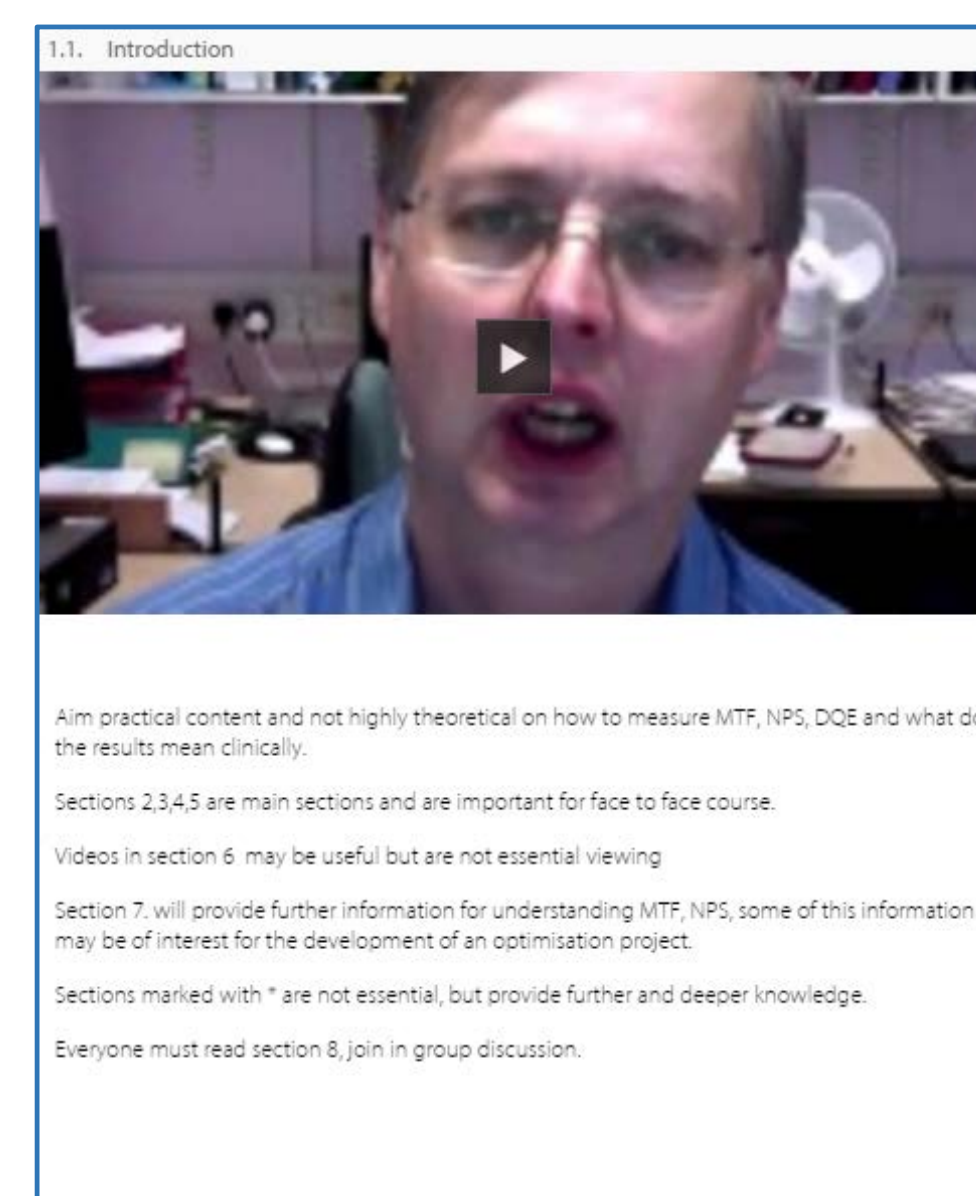
Module MPE07C: Optimisation in radiology

About Module MPE07C: Optimisation in radiology

To optimise a system, it is important to understand the clinical task that is undertaken and the consequences of inadequate image quality. The students will learn about the balance between image quality and risk due to the radiation exposure and the various strategies for optimisation studies that can be undertaken including using physics measurements and observer studies. Training will be received in the methodologies for observer studies, include data analysis using ROC and FROC techniques. The quantitative measurements described in Module 7B will be used to examine the image quality of clinical images and to show how to simulate clinical images as part of an optimisation project. At the end of the module the participants will be able to:

Learning Goals

- Take responsibility for improving the quality of radiological examinations.
- Undertake research on the optimisation of clinical systems.
- Implement the results of an optimisation study in a clinical department.
- Design and implement an optimisation study using clinical images.
- Discuss the methods for observer studies such as AFC, ROC, FROC and explain the strengths and weaknesses of each method.
- Discuss the role of MPE in the ensuring the image quality in a radiology department.



1.1. Introduction

Aim practical content and not highly theoretical on how to measure MTF, NPS, DQE and what do the results mean clinically.

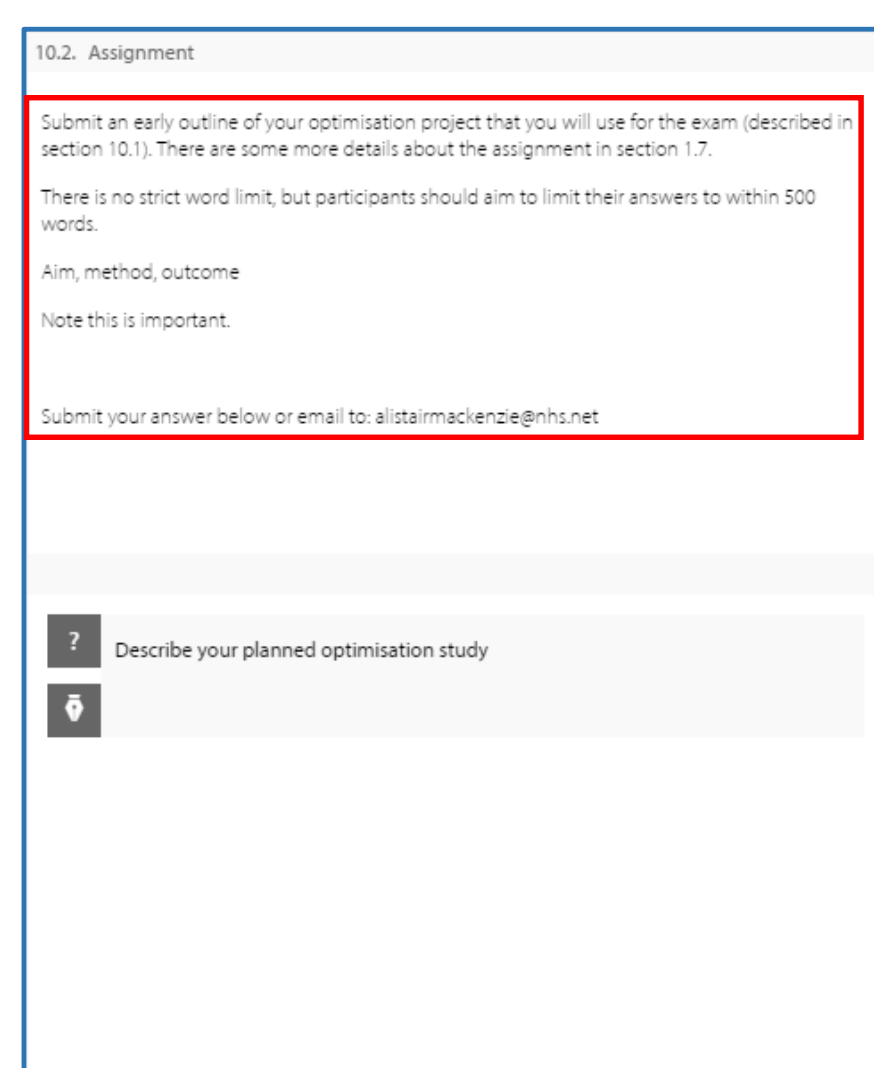
Sections 2,3,4,5 are main sections and are important for face to face course.

Videos in section 6 may be useful but are not essential viewing

Section 7 will provide further information for understanding MTF, NPS, some of this information may be of interest for the development of an optimisation project.

Sections marked with * are not essential, but provide further and deeper knowledge.

Everyone must read section 8, join in group discussion.



10.2. Assignment

Submit an early outline of your optimisation project that you will use for the exam (described in section 10.1). There are some more details about the assignment in section 1.7.

There is no strict word limit, but participants should aim to limit their answers to within 500 words.

Aim, method, outcome

Note this is important.

Submit your answer below or email to: alistarmackenzie@nhs.net

Describe your planned optimisation study



9.3. Clinically-based measures of image quality*

Clinically-based measures of image quality

Alistair Mackenzie
Royal Surrey County Hospital

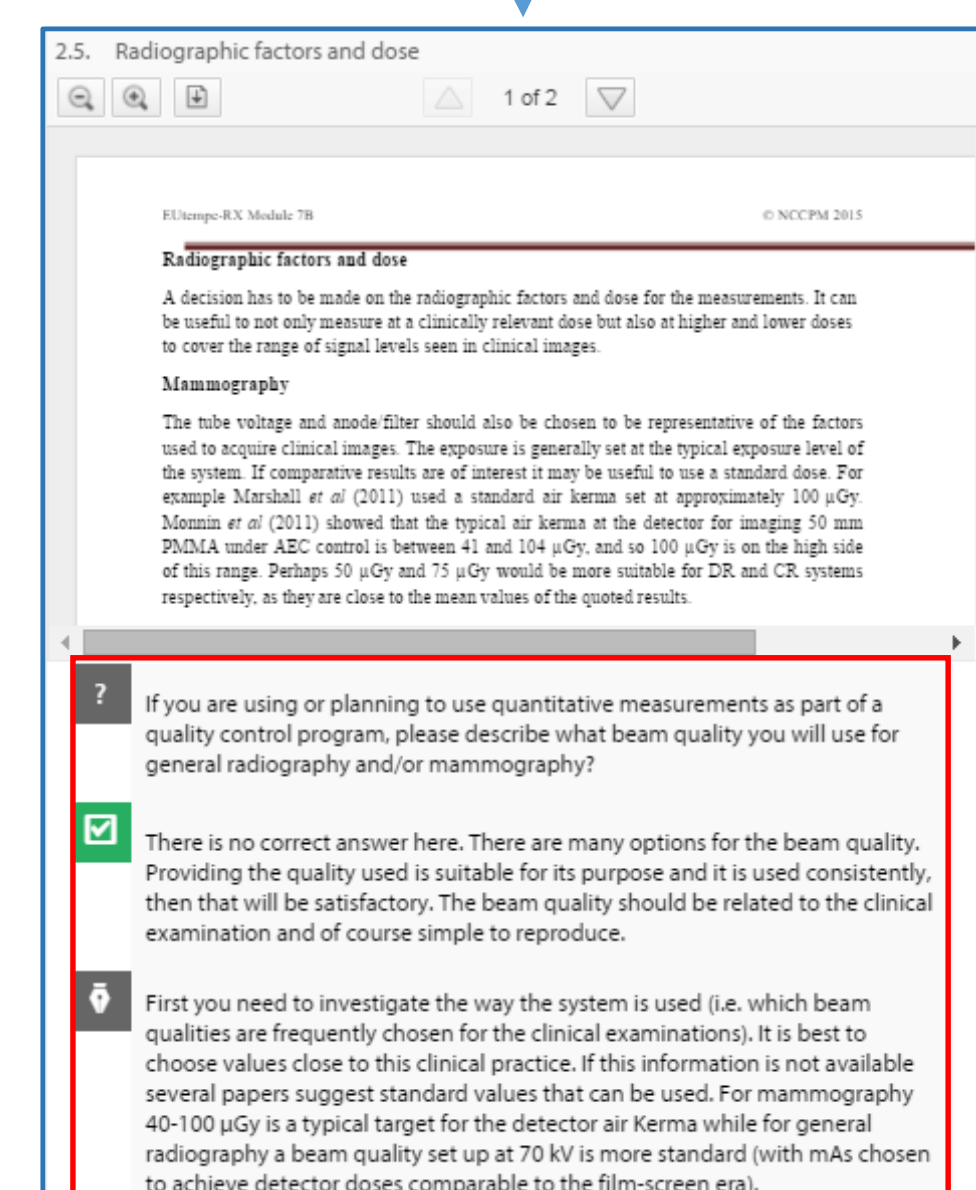
CANCER RESEARCH LINK EUTE MPE-RX

BIR Optimisation in digital radiography

<https://membersarea.bir.org.uk/multimedia/DisplayEvent.asp?Type=Full&Code=5247>

A Mackenzie, 9 October 2015.

Clinically-based measures of image quality



2.5. Radiographic factors and dose

1 of 2

Radiographic factors and dose

A decision has to be made on the radiographic factors and dose for the measurements. It can be useful to not only measure at a clinically relevant dose but also at higher and lower doses to cover the range of signal levels seen in clinical images.

Mammography

The tube voltage and mode filter should also be chosen to be representative of the factors used to acquire clinical images. The exposure is generally set at the typical exposure level of the system. If comparative results are of interest it may be useful to use a standard dose. For example Marshall et al (2011) used a standard air kerma set at approximately 100 µGy. Moosman et al (2011) showed that the typical air kerma at the detector for imaging 50 mm PMMA under AEC control is between 41 and 104 µGy, and so 100 µGy is on the high side of this range. Perhaps 50 µGy and 75 µGy would be more suitable for DR and CR systems respectively, as they are close to the mean values of the quoted results.

if you are using or planning to use quantitative measurements as part of a quality control program, please describe what beam quality you will use for general radiography and/or mammography?

There is no correct answer here. There are many options for the beam quality. Providing the quality used is suitable for its purpose and it is used consistently, then that will be satisfactory. The beam quality should be related to the clinical examination and of course simple to reproduce.

First you need to investigate the way the system is used (i.e. which beam qualities are frequently chosen for the clinical examinations). It is best to choose values close to this clinical practice. If this information is not available several papers suggest standard values that can be used. For mammography 40-100 µGy is a typical target for the detector air kerma while for general radiography a beam quality set up at 70 kV is more standard (with mAs chosen to achieve detector doses comparable to the film-screen era).

FACE-TO-FACE PHASE

Discussing the results of the measurement session in smaller groups + preparing a presentation about these results.

Conventional lecture followed by questions from the participants.

Social activity: relax!



Wednesday 11/11

- Morning: GASTHUISBERG (auditorium Louvre is also available)**
 - 9u00u-11u30: Practical in X-ray rooms in 3 groups: test your new QA protocol and improve it:
 - Group 1: Meet at the entrance of the hospital → go to St-Rafael Hospital in the city center
 - Group 2: Meet at the entrance of the hospital
 - Group 3: Meet at the staflokaal radiologie
 - 11u30-12u30: Improve your QA protocol
- Afternoon: AUDITORIUM LOUVRE**
 - 14u00-15u45: Discuss the new protocols with all the groups
 - 15u45-16u15: Coffee break
 - 16u15-17u00: Results of a recent comparative study of dosimeters (F. Bemelmans)
 - 17u00-17u30: Competition: find the best 'hint and trick' for QA (moderator: H. Bosmans)
- Social activity: meet at the railway station to go to Brussels (optional)?**

Guided measurement session: implementing a document they created in an earlier group assignment.

Each group presented the conclusions of their document + measurement session. This is followed by a group discussion.

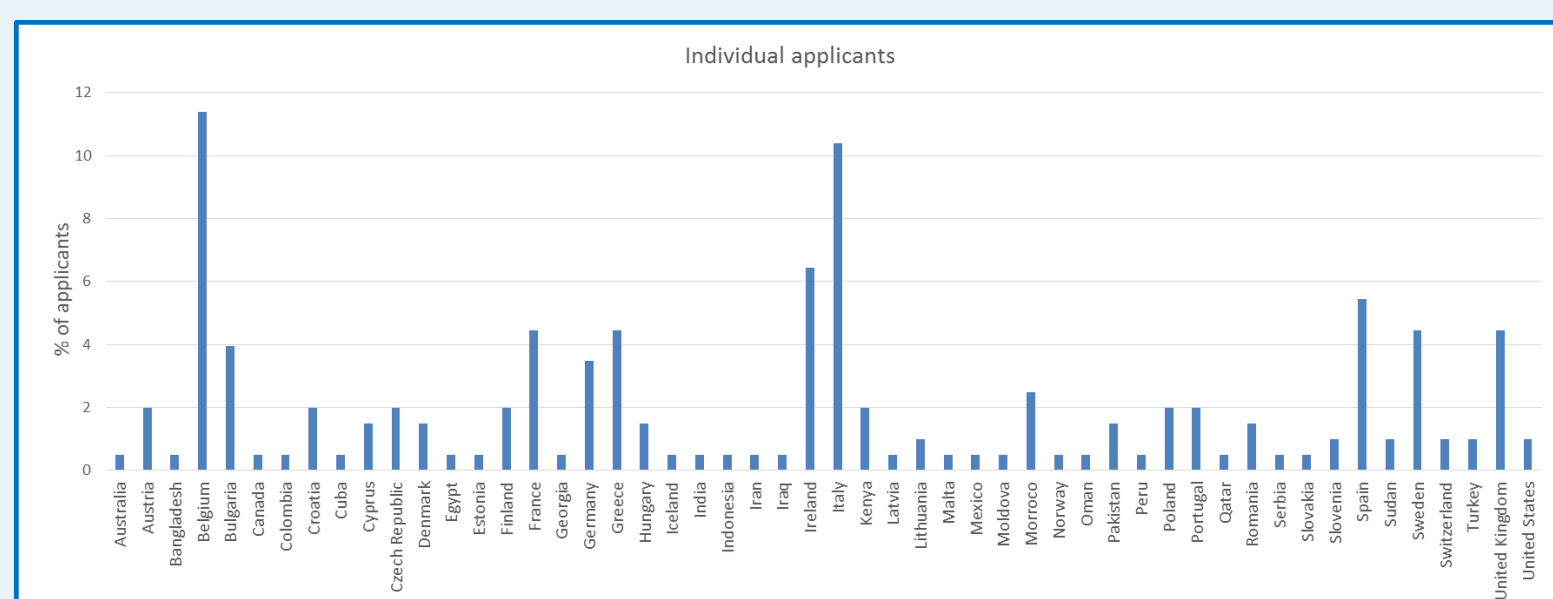
Participants present hints & tricks they find useful in their daily practice. This was an assignment given during the online phase. The best hints get a prize!

What about the future?

Future of the course

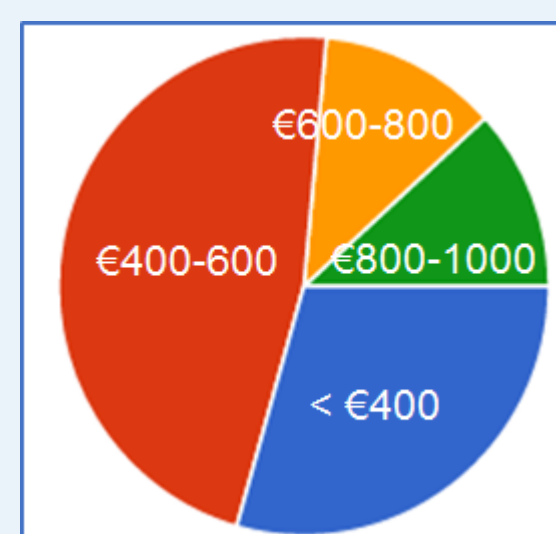
The EC-support ends at the end of the first run of the EUTEMPE-RX modules (2016).

Is the demand high enough to continue without external funding? YES



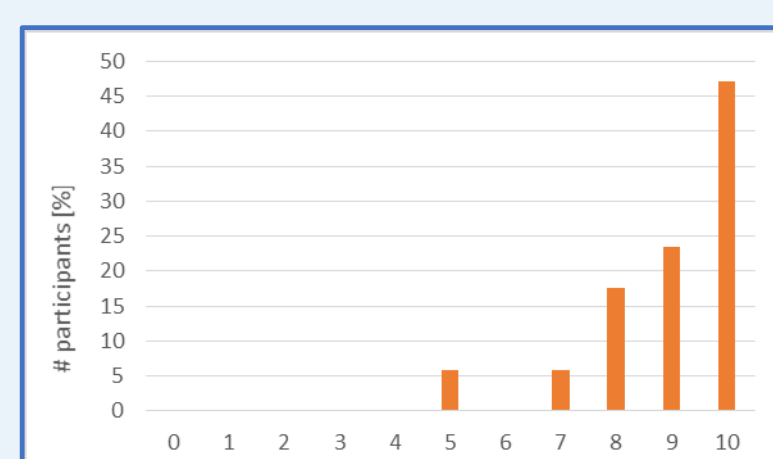
Are the participants willing to pay for the course modules? YES

Survey question: How much would you be prepared to pay in the future for a similar course (including both the e-learning and face-to-face parts)?



Are the courses of sufficient quality to organize them again? YES

Survey question: How likely is it you would recommend the EUTEMPE-RX course to a colleague?



Face-to-face phase

Positives:

- Practical organization: coffee breaks, facilities, social events, etc.
- Course content: complete, varied, up-to-date and well presented.
- Enthusiastic participants: good reviews in the participant surveys.

Negatives:

- EQF level 8 was not always reached, both for the content and for the examination.
- Often, too much theory was covered, the face-to-face phase should focus more on practical issues
- Often, too much of the content of the online phase was repeated during the face-to-face phase.
- The participants did not start at the same level.

Online phase

Positives:

- Possible to combine with a full-time job.
- Can be completed at the participants' own pace.
- Well structured and complete course content.
- Professional and clean appearance.

Negatives:

- The e-learning platform lacked some features that were vital for our project.
- The time investment varied greatly between different students.
- Not all students took the online phase seriously.

Improvements

- The online phase should be designed to force the students to take it seriously: locking certain sections until they completed a question, creating an online assessment session before the face-to-face phase, etc.
- A new e-learning platform should be chosen with the following features:
 - Better online forum
 - Tracking of student progress
 - Ability to lock sections until a task is completed
 - Ability to work with multiple teachers on one course module
 - Effective file-sharing
 - Greater stability (e.g. across browsers)
- The face-to-face phase should be designed to match the online phase perfectly. The focus should be on practical sessions and not repeating theory.

More information

You can always contact me or visit the website!

www.eutempe-rx.eu

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KU LEUVEN