



The Abdus Salam
International Centre for Theoretical Physics



2166-Handout

**College on Medical Physics. Digital Imaging Science and Technology to
Enhance Healthcare in the Developing Countries**

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Radiation Protection Audit

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Radiation Protection Audit

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King's College Hospital

London, UK

Why Audit?

- Best practice
- Legal compliance
- Quality system (ISO 9000) requirement



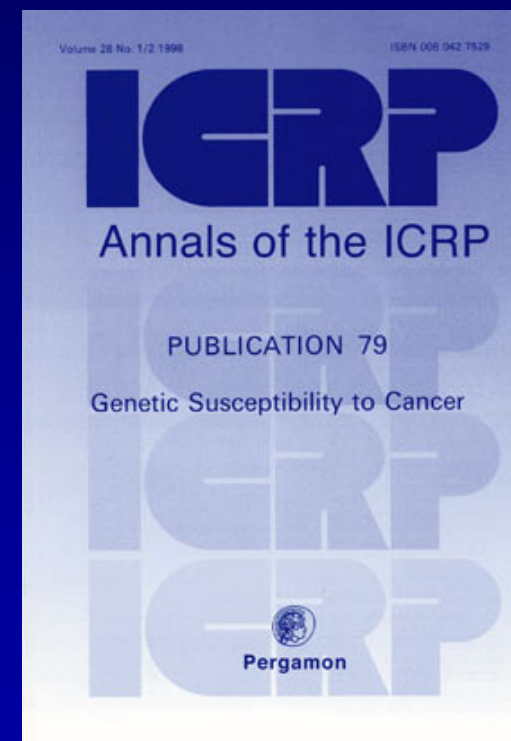
Advisory Bodies



Protecting people
Preventing harm
Preparing for threats



- Recommendations form basis of RP internationally
- Main commission and four standing committees
 - Effects, Doses, Protection in Medicine, Application of Recommendations
- Ad Hoc Task Groups and Working Parties
- ***Annals of the ICRP***



International Commission on Non-Ionising Radiation Protection

- All non-ionising
- Established 1977 by ICRP
- Four standing committees
 - Epidemiology, Biology, Physics and Engineering, Optical Radiation
- Produce exposure guidelines, practical guides etc
- Publish in Health Physics & net





International Commission on
Radiation Units & Measurements

- Measurements and Units
- Up to 20 report committees
- Publish own reports

Nuclear Data for
Neutron and Proton
Radiotherapy and for
Radiation Protection



INTERNATIONAL COMMISSION
ON RADIATION UNITS
& MEASUREMENTS

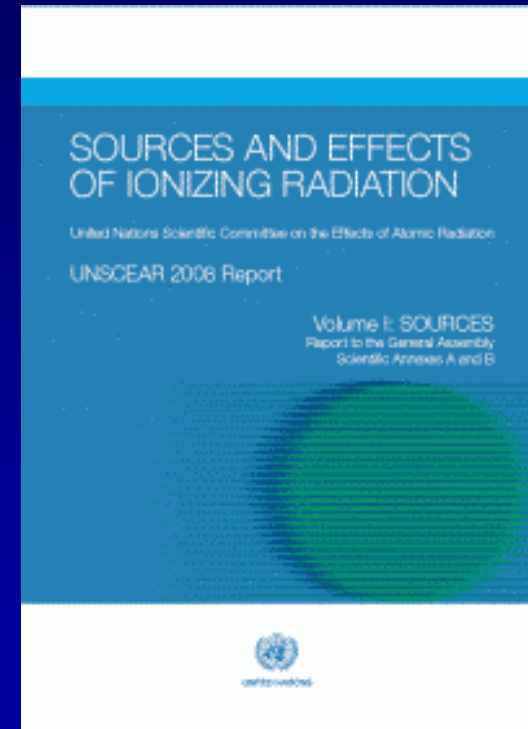


- Linked to United Nations
- One concern is Protection of the Human Environment
- Undertakes studies of environmental impact
 - Chernobyl
 - Depleted Uranium



United Nations Scientific Committee on the Effects of Atomic Radiations

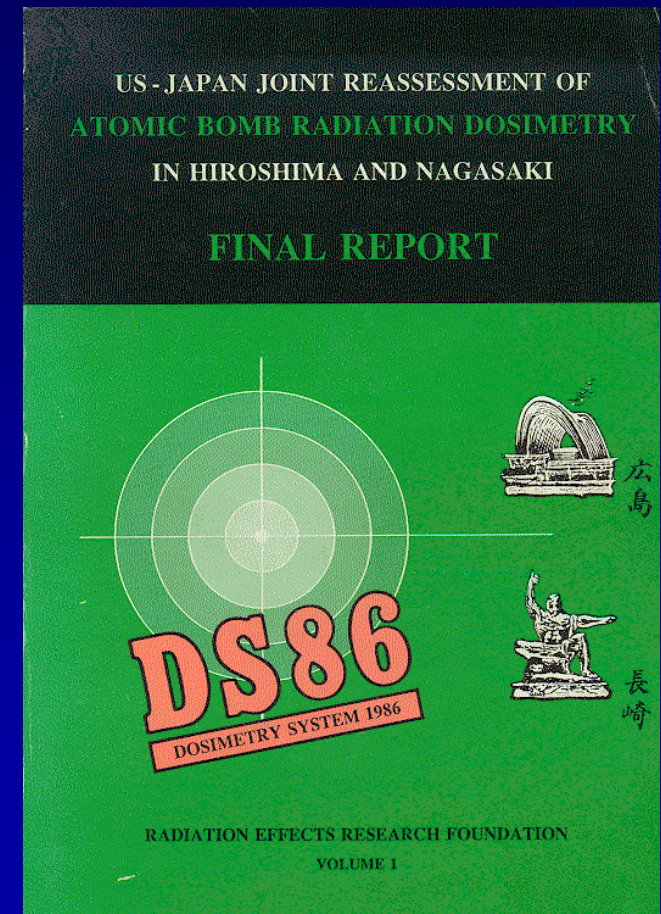
- UNSCEAR
- Established by UN General Assembly
- Assesses and reports on exposures to ionising radiation in general
- Latest report *UNSCEAR 2008*



Radiation Effects Research Foundation

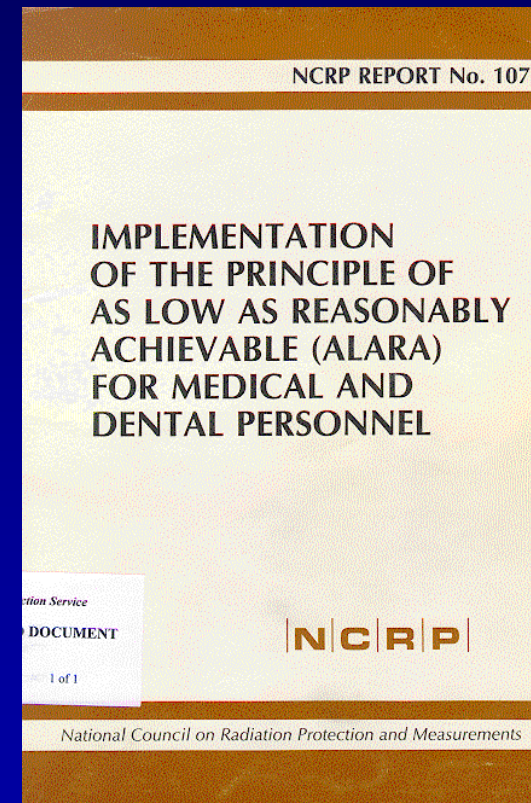


- Formerly the Atomic Bomb Casualty Commission (ABCC)
- Laboratories in Hiroshima and Nagasaki
- Funded jointly by Japan and USA
- Epidemiological research
- Major publications on A-bomb dosimetry (T65D and DS86)



|N|C|R|P|

- US version of NRPB
- National meetings organised
- Publications include;
 - Reports, Commentaries, Reviews etc



Health Protection Agency

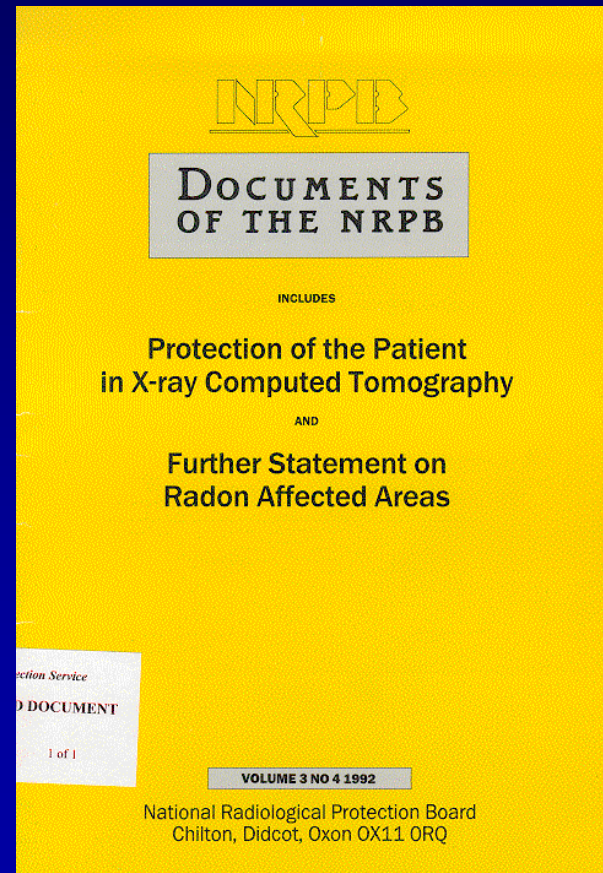
- Established to
 - advance knowledge of radiation protection
 - provide information
- Publications
 - “At-a-glance”; Bulletin; Reports; Documents of the NRPB, Software
- Provides RP services





Protecting people
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E-Mail Lists

- (UK) Medical-Physics-Engineering
- (UK) Radiation Protection
- (US) MedPhys
- (US) Health Physics



Why Audit?

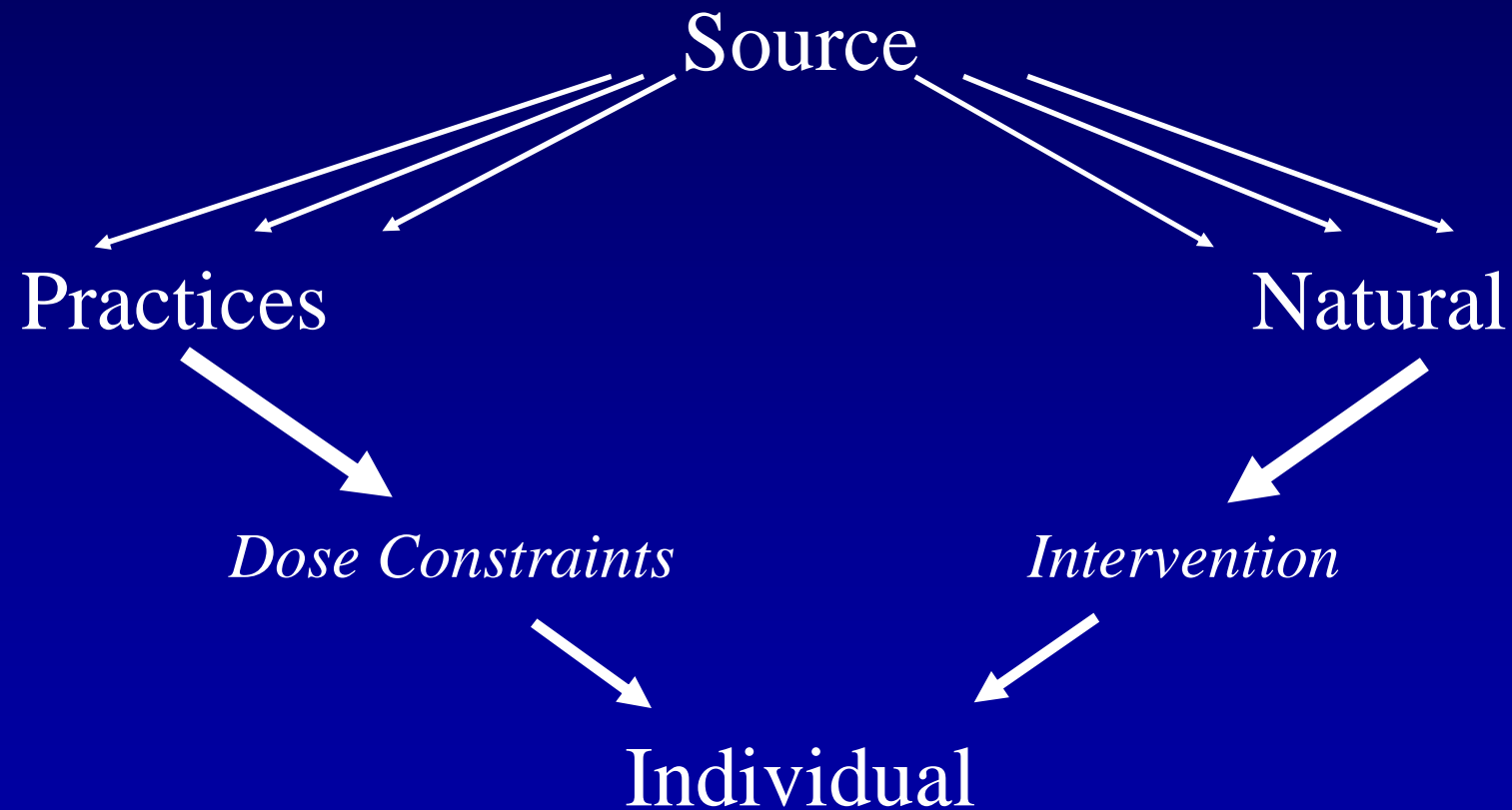
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How Are Laws Made?



ICRP Framework for Radiation Protection



ICRP 103 Framework

For *PRACTICES* :

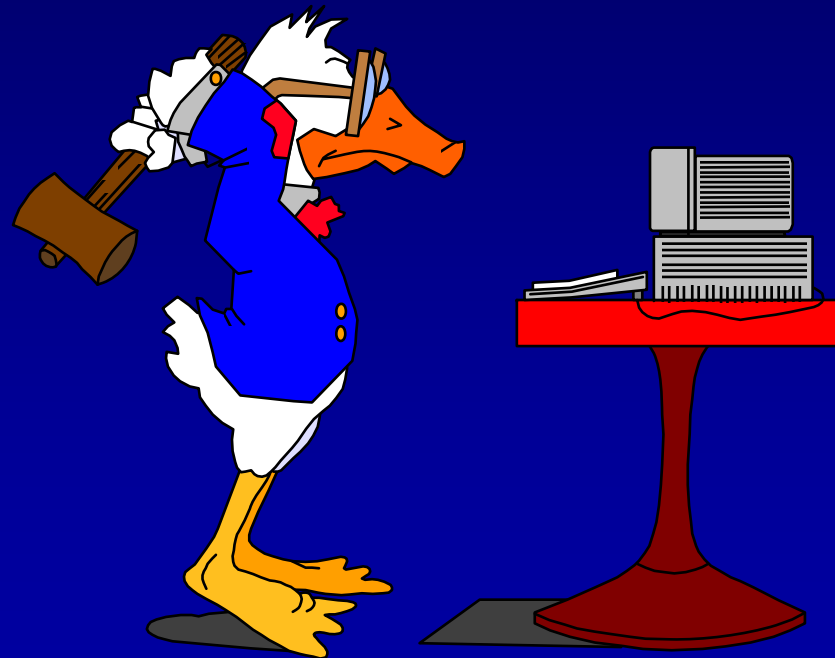
- *Justification*
- *Optimisation*
 - *dose constraints*
- *Limitation*



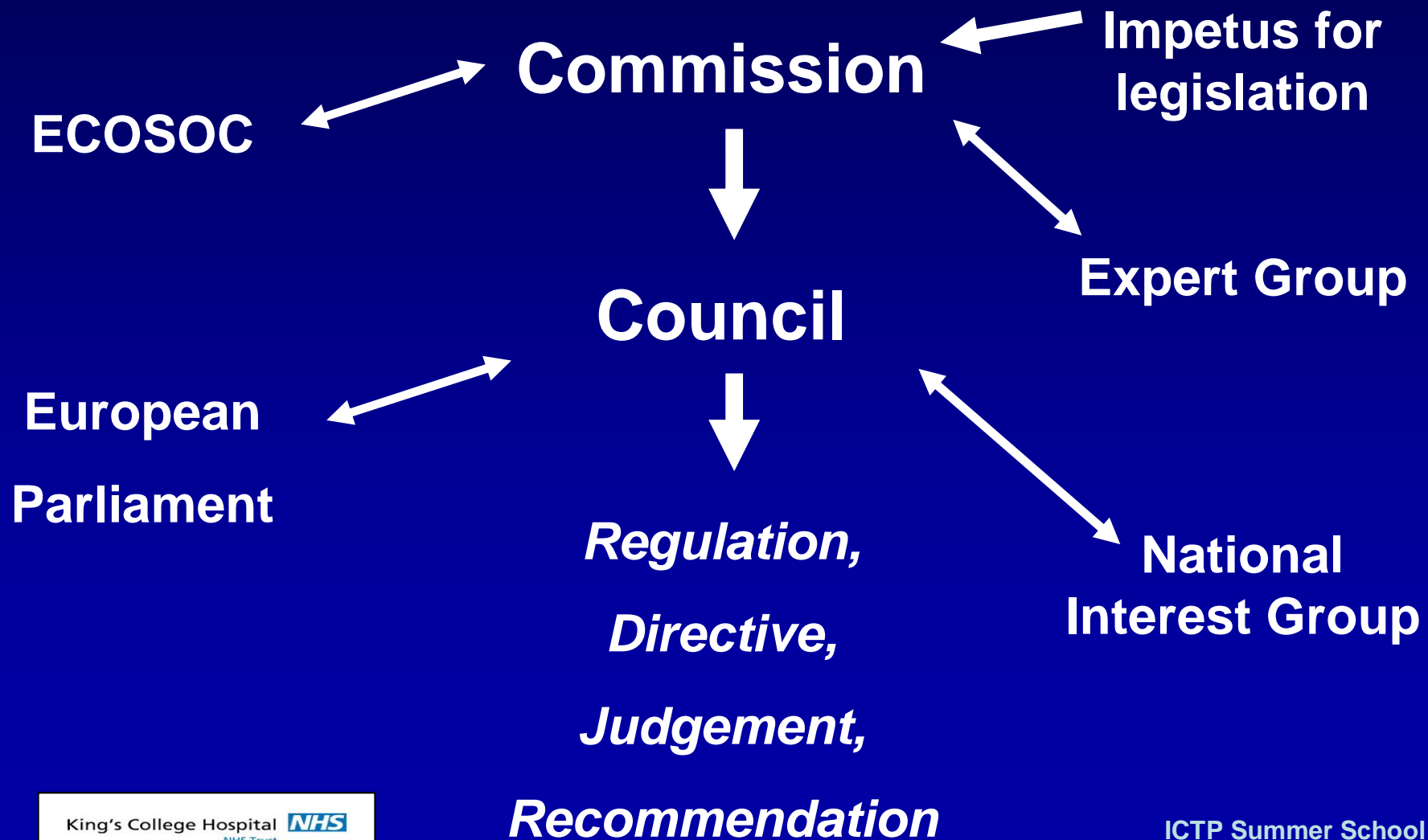
ICRP 103 Framework

For *INTERVENTIONS*:

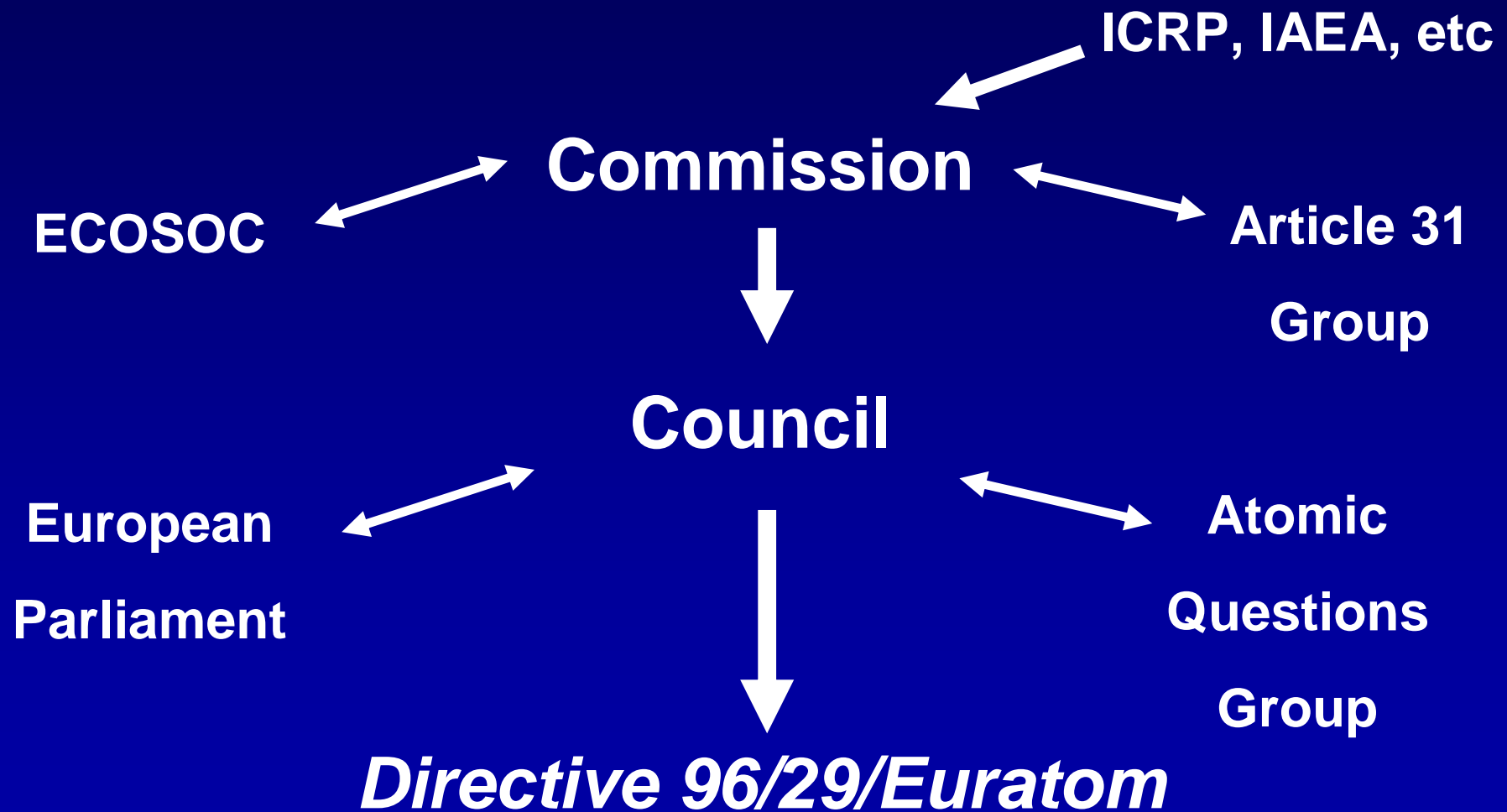
- *Justification*
- *Optimisation*



EU Legislative Process



EU Legislative Process - *Basic Safety Standards*



UK Legislative Process - *Ionising Radiations Regulations*

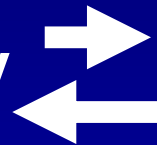
EU Directive



Dep. Trade and Industry

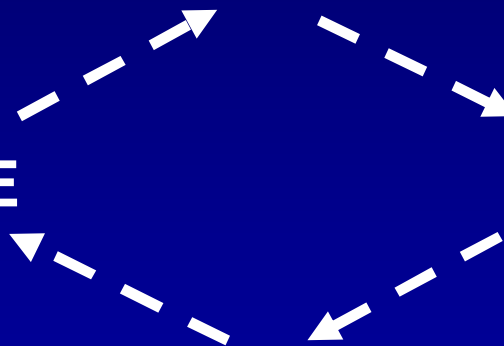


Parliament



HSE

Topic Groups

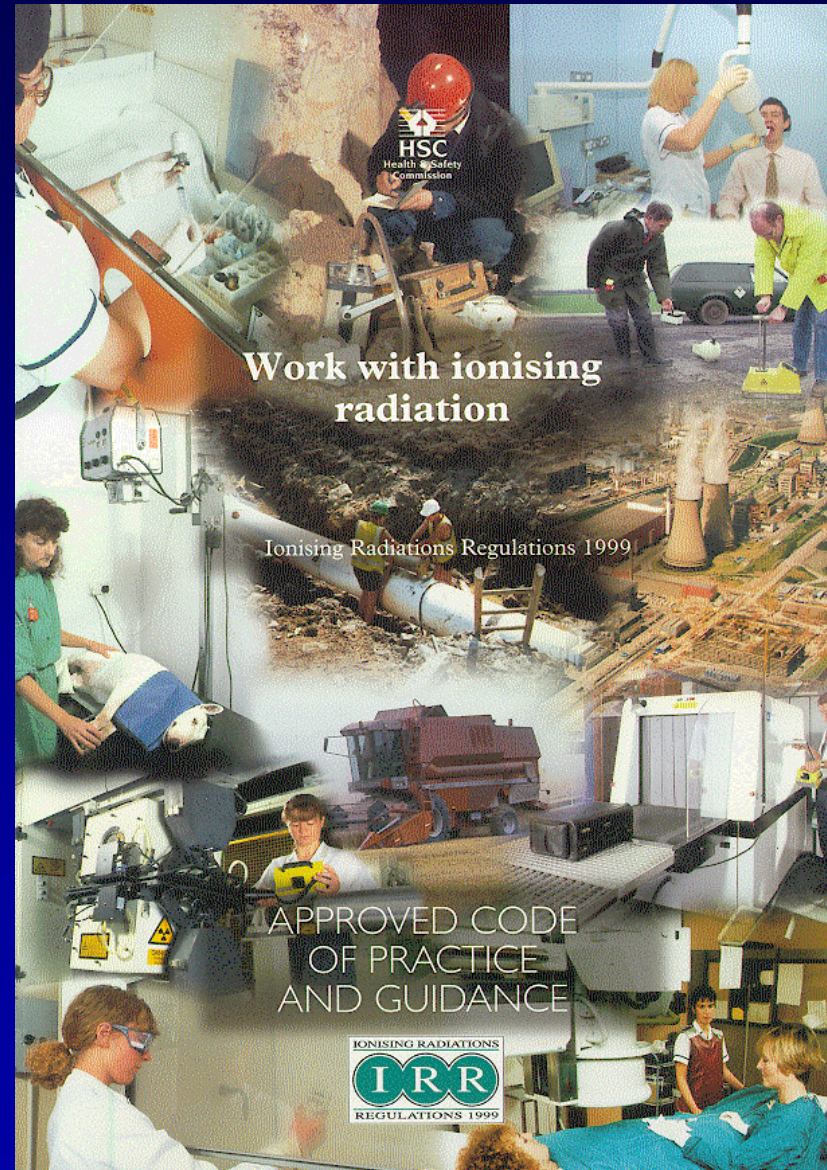


HSE

Consultation

IRR99

Ionising Radiations Regulations 1999, Approved Code of Practice and Statutory Guidance

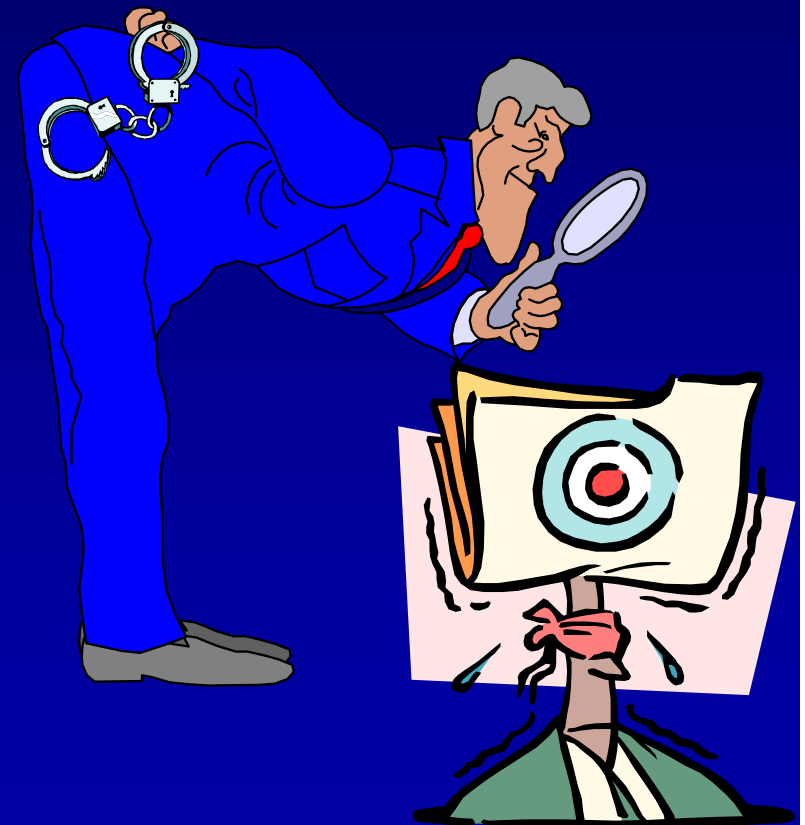


Governmental Bodies



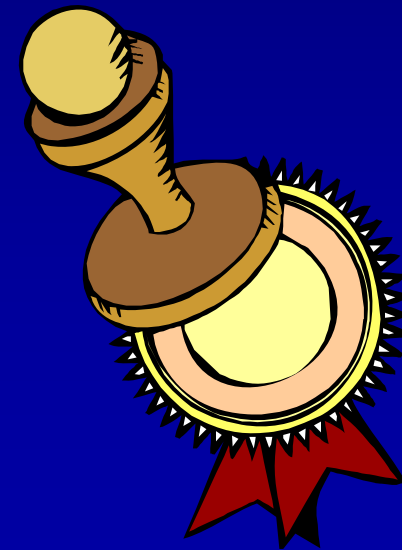
Compliance with Regulations

- Inspectorate
- Warrant cards
- Powers of enforcement
 - improvement notice
 - prohibition notice
 - prosecution



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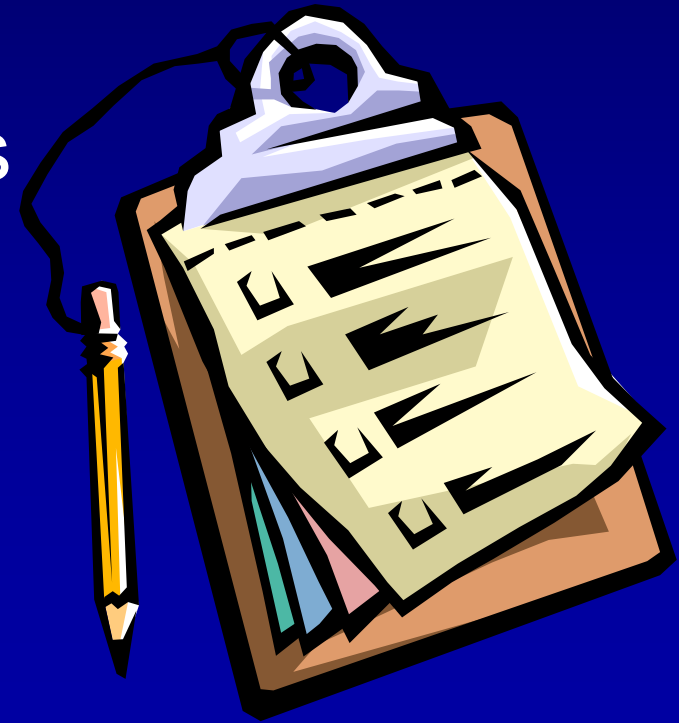


The Audit Process

- Arrange time for visit
 - allow sufficient time
 - ensure all responsible persons available
- Follow systematic protocol (audit checklist)
- Provide written report
- Follow up on action points

Audit checklist categories

- Follow up of previous recommendations
- General questions
- Records
- Modality-specific questions



General questions

- Current workload
- Staff issues
- Follow up of visits from external agencies
- Awareness of latest information/documentation/regulation

Records

General

- Personnel monitoring
- Staff training

X-ray

- QA
- Equipment maintenance
- PPE checks

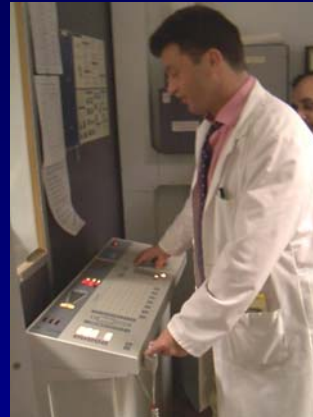
Unsealed Sources

- Contamination
- Storage and Waste disposal



Specific issues : X-ray examples

- Warning lights
- Warning signs
- Room shielding
- Film reject analysis
- Gonad protection



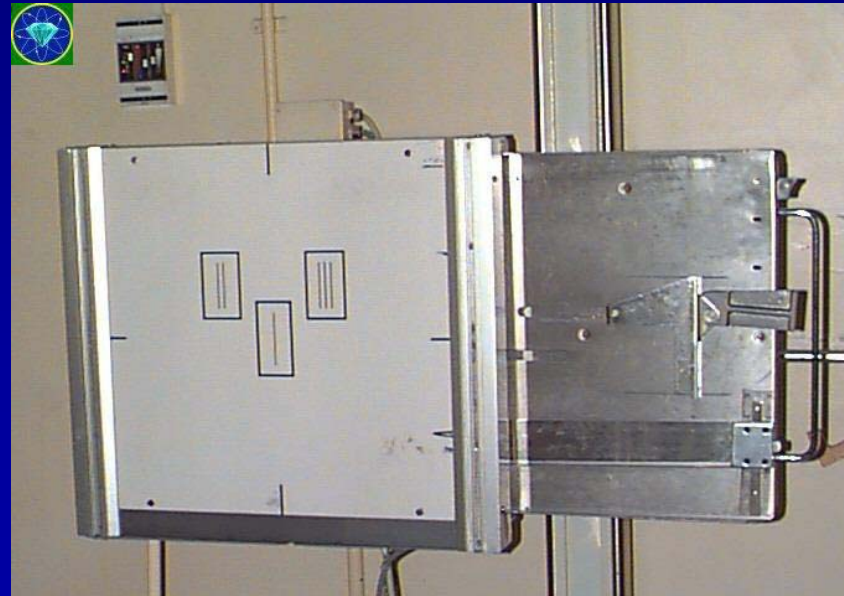
Tube Assembly

- Beam limiting devices
- Filtration
 - Minimum filtration
 - Filtration combinations



Exposure Control

- Use of AEC
- Hand and foot switches
- Emergency shut-off



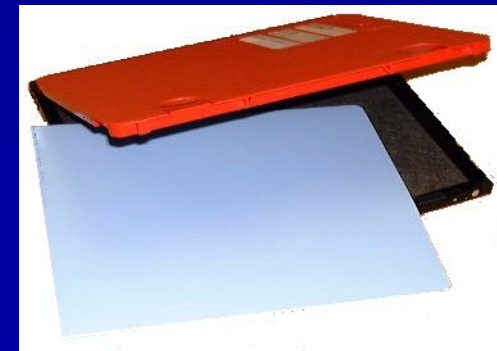
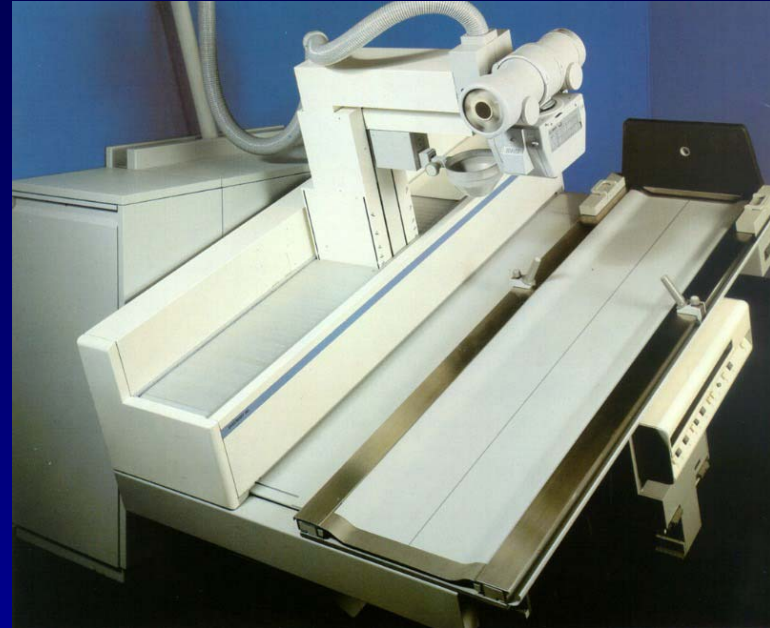
Fluoroscopy

- Automatic brightness control
- Last image hold
- Pulsed fluoroscopy



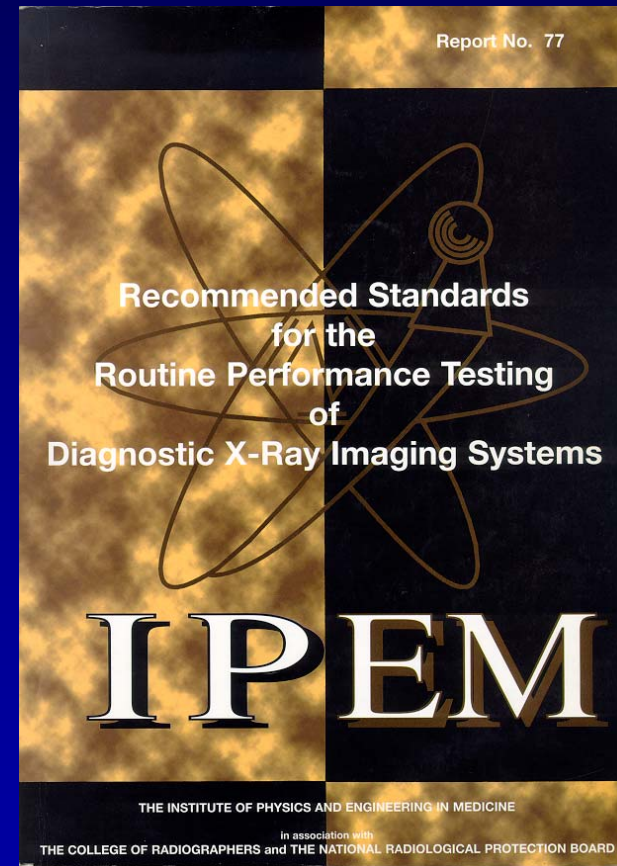
Design features

- Low attenuation materials
- Dose monitoring equipment



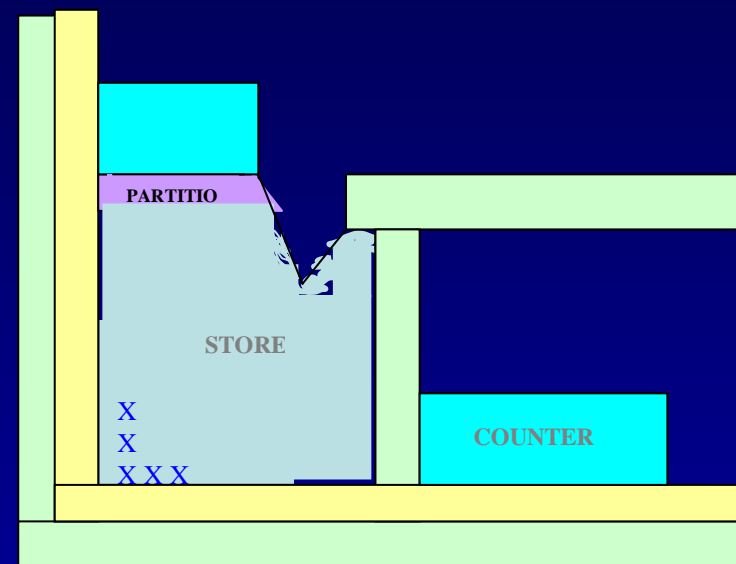
Testing and Maintenance

- Regular servicing
- Approved service agent
- Regular QA
 - Frequent baseline QA
 - QA after servicing



Specific issues : Unsealed sources

- Adequacy of facilities
 - floor covering, sinks, drainpipes
- Storage of radioisotopes
- Accumulation/disposal of radioactive waste
- Availability of spill kit
- Contamination monitor(s) condition/calibration



Radioactive Material



Radioactive Material



Radioactive Material



Radioactive Material

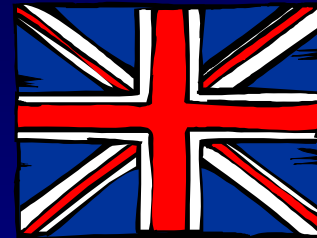


Training

- Practitioner and Operator
- Theoretical and practical



Inspectors' Comments



BSS IRR99

Health and Safety Executive

BSS RSA93

Environment Agency

MED IR(ME)R2000

Care Quality Commission

IRR99 (BSS)

- Poor Supervision and Training
- Inadequate Local Rules/SoW
 - some too long, some too short
- RPS not of sufficient standing
- Inadequate QA
- Poor understanding of radiation dose concepts
- Poor control of external engineers



RSA93 (BSS)

- Records not up to date
- Records inaccurate
- Certificates not displayed
- Storage areas inadequate
- Facilities in disrepair



IR(ME)R2000 (MED)

- Responsibilities not clarified
- Prescribers (Referrers) not properly identified
- Referral guidelines not available/not disseminated
- Poor procedures for
 - identification of patient
 - determining pregnancy

