Improvement of radiation dosimetry: contribution of the IAEA

Ahmed Meghzifene
Section Head
Dosimetry & Medical Radiation Physics Section
Division of Human Health

IAEA
International Atomic Energy Agency

Radiation and Our Life (1)

FACTS

Each year

- Over 4 billion diagnostic medical radiation procedures
- 50 million nuclear medicine procedures
- 5.5 million patients treated with radiotherapy

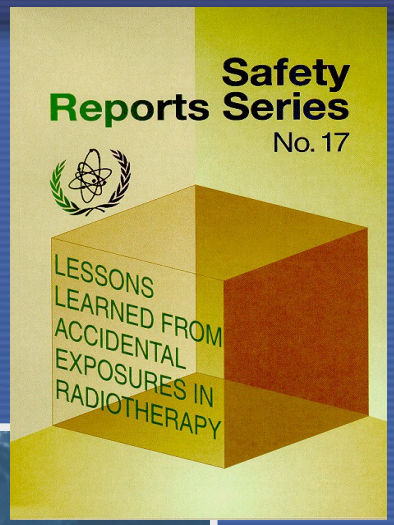
Radiation and Our Life (2)

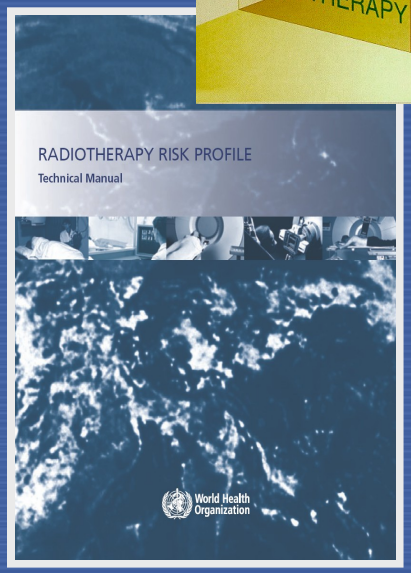
Radiotherapy

- Approximately one in three people will develop cancer during his/her lifetime
- Up to 60% of all cancer cases receive radiation therapy as part of their treatment

Accuracy is vital in radiotherapy

- The major risk in treatment delivery is incorrect beam calibration
- Incorrect beam calibration would result in a systematic error that could affect hundreds or thousands of patients

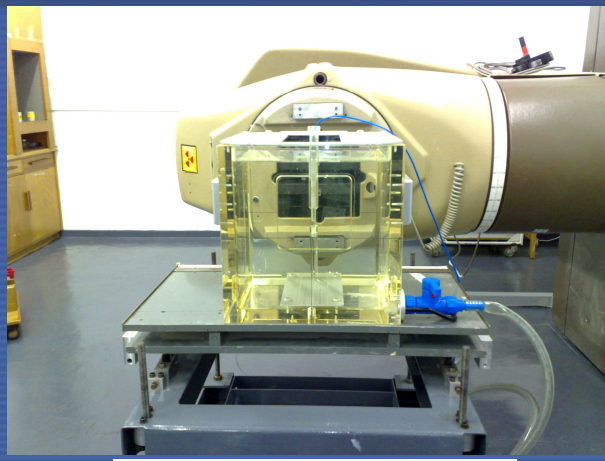


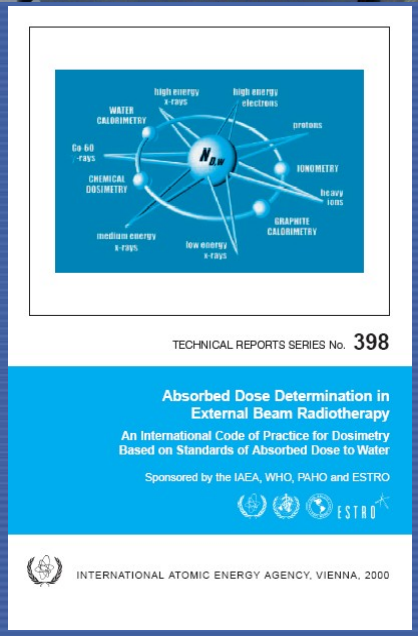


I do not mind lying, but I hate inaccuracy by Samuel Butler

Key issues… to achieve accuracy

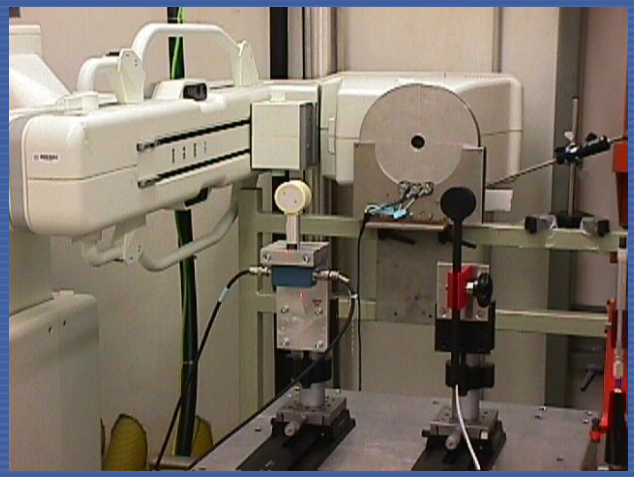
- Well trained staff
- Use of suitable and calibrated instruments for dosimetry measurements (S.I traceability)
- Use of standardized dosimetry protocol
- Participation in independent dosimetry audits to verify beam calibration
- Well maintained equipment





Accuracy is important in imaging

- Diagnostic radiology: 20% for absolute risk assessment, 7% for deterministic effects and potential risk of paediatric examinations)
- Nuclear Medicine: 5-10% for therapy



Why the IAEA??

The IAEA: A unique mandate in the UN system

"The Agency shall seek to accelerate and enlarge the contribution of atomic energy to peace, **health** and prosperity throughout the world"

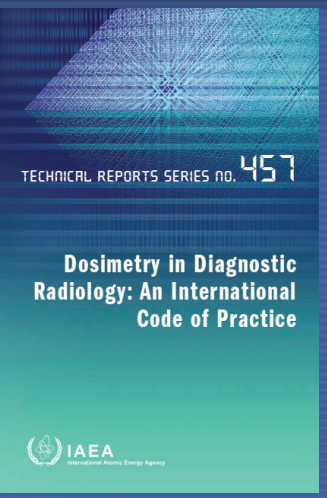
Article II of the Statutes of IAEA

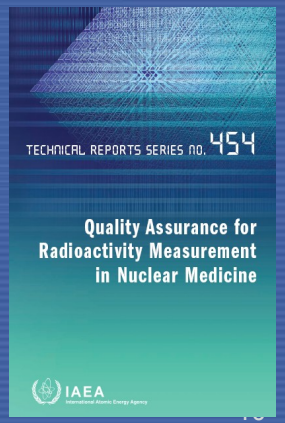
IAEA contribution

- Contribute to harmonization of dosimetry worldwide through the publication of international dosimetry protocols
- Provide calibration, dose auditing and comparison services (to countries…)
- Support the establishment of national calibration laboratories (Tech Coop)
- Capacity building in radiation dosimetry

Harmonization of radiation dosimetry

Worldwide standardization





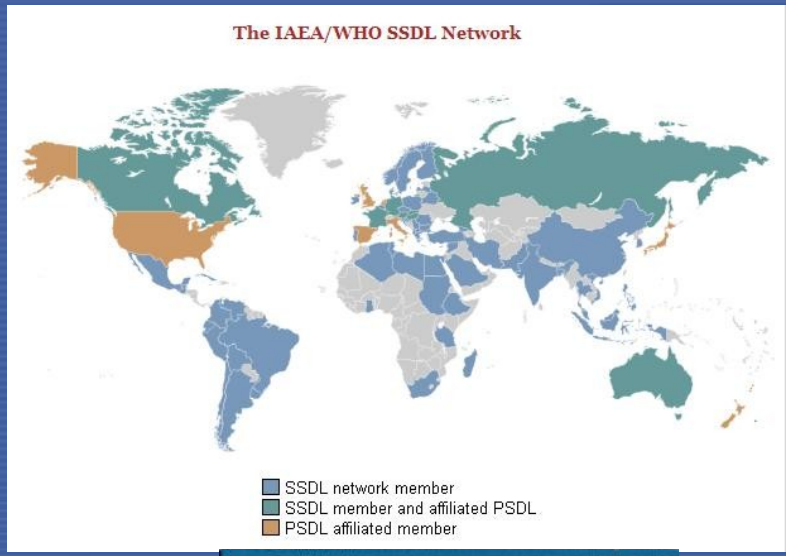
30 years

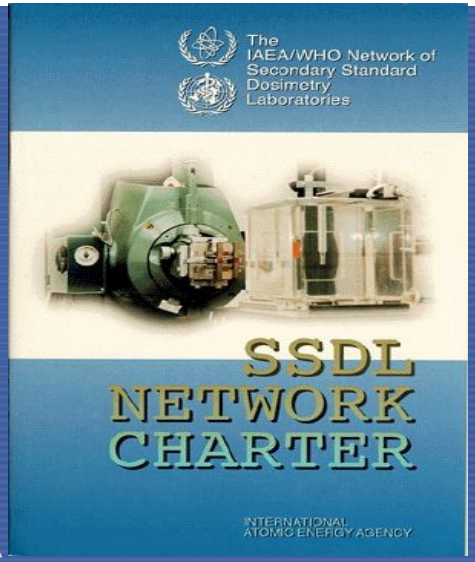
IAEA

IAEA/WHO SSDL Network of SSDLs

Members

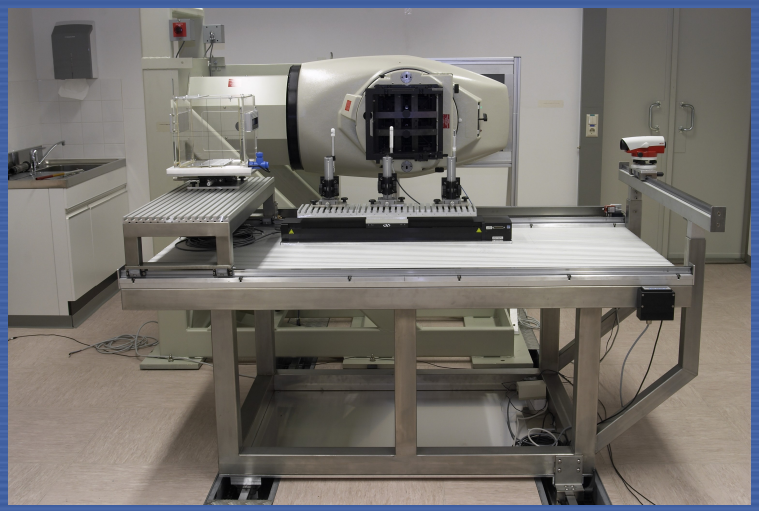
- 80 laboratories and 6 SSDL organizations in 67 countries
- 15 Primary Standards Dosimetry Laboratories (PSDLs)
- Five collaborating international organizations: ICRU, IOMP, IOML, IEC and BIPM
- Advisory committee (SSC)

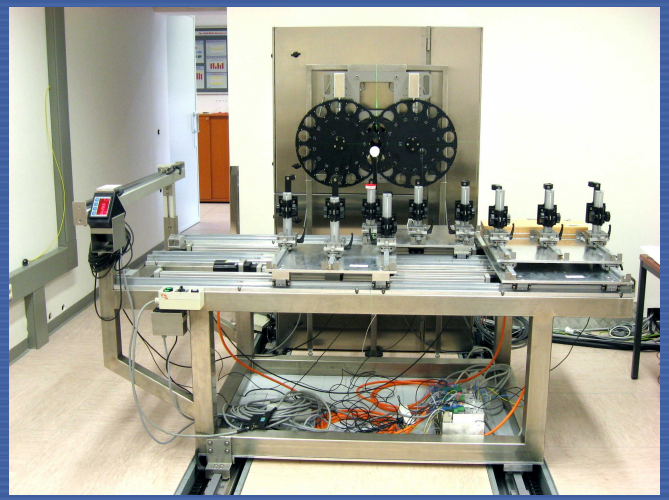


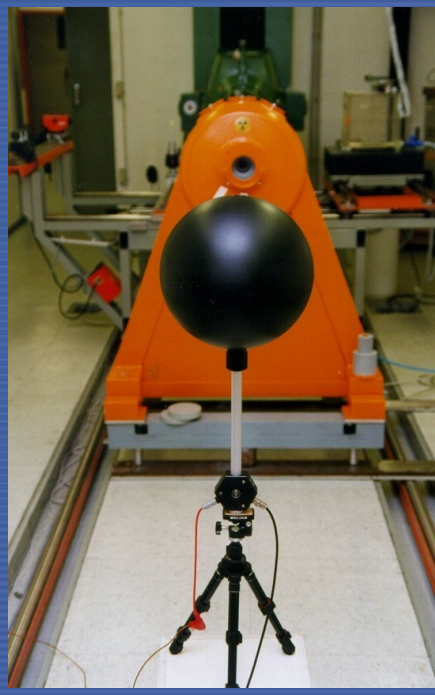


IAEA/WHO SSDL Network of SSDLs

The IAEA laboratory is the central laboratory for the IAEA/WHO Network of SSDLs

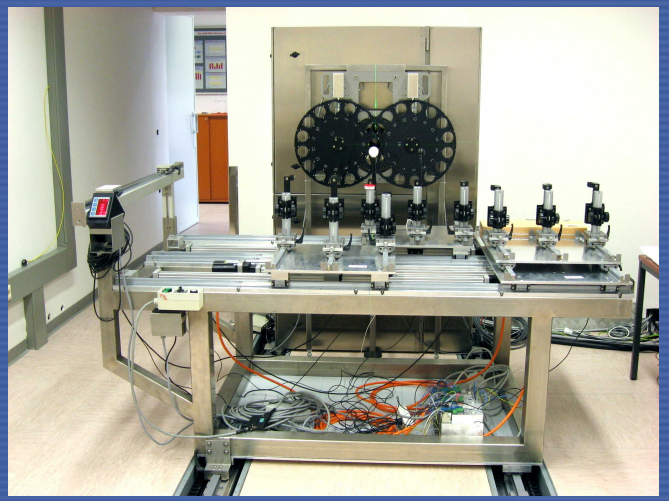


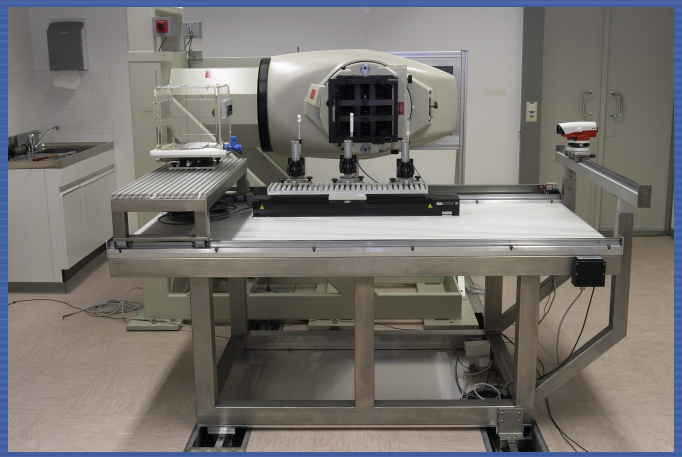




IAEA Calibration services-SSDLs

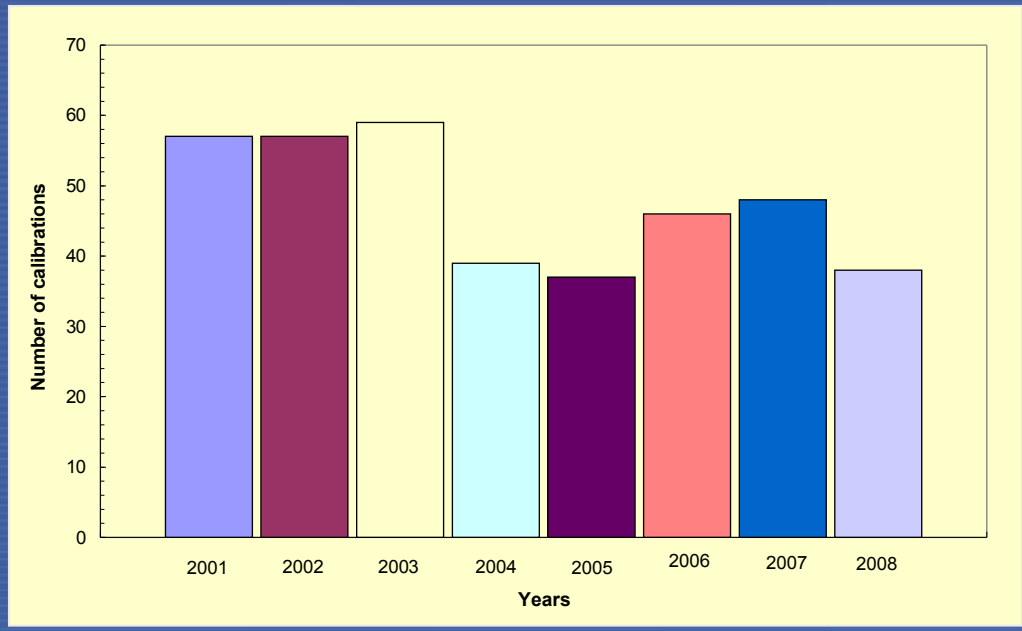
- IAEA CMCs approved by the JCRB and listed in the BIPM KCDB
- Services provided to IAEA/WHO SSDL members, especially to those who are not signatories of the meter convention





IAEA Calibration services-SSDLs

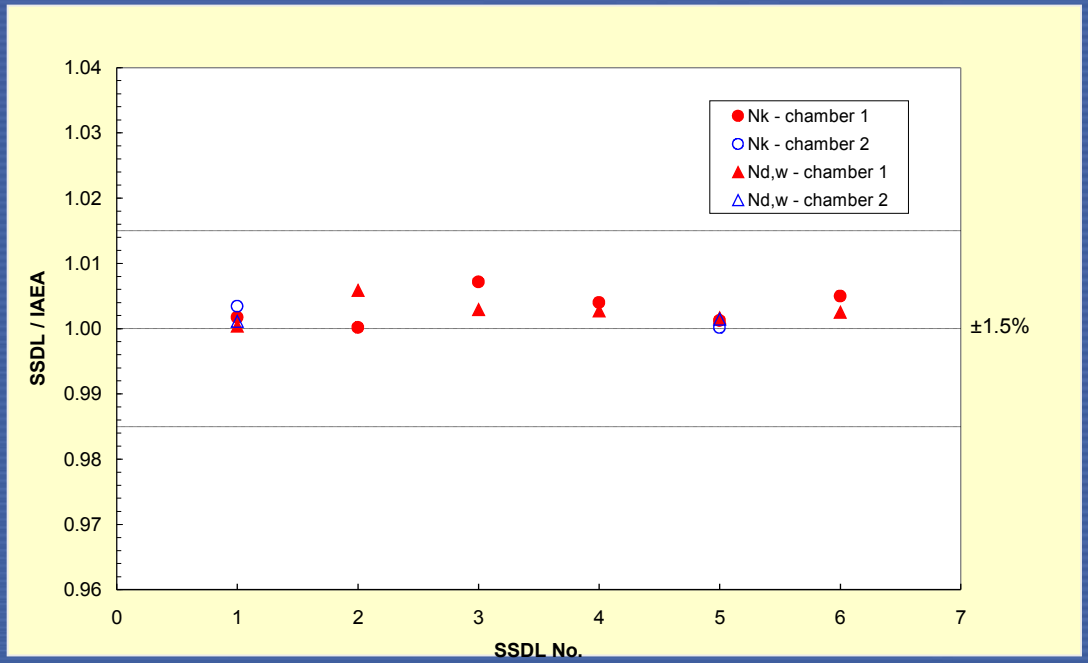
- Radiotherapy: 63%
- Rad. protec: 29%
- Mammography: 8%



- 79% for SSDLs
- 21% for hospitals

IAEA Comparison services-SSDLs

Proficiency testing for SSDLs to check their calibration procedures



It is possible to use of IAEA-SSDLs comparisons to support SSDLs' CMCs

IAEA support in Africa (1)

Supported the establishment of 12 SSDLs: (Algeria, Tunisia, Morocco, Libya, Sudan, Ethiopia, Kenya, Ghana, Nigeria, Madagascar, Tanzania, C.I (new)

- Supply of standardized calibration equipment
- Support for equipment commissioning
- Training of staff

Limited support to SSDL of SAF and Egypt

IAEA support in Africa (2)

- Organization of workshops on radiation dosimetry
- Organization of a pilot dosimetry comparison in X-ray dosimetry

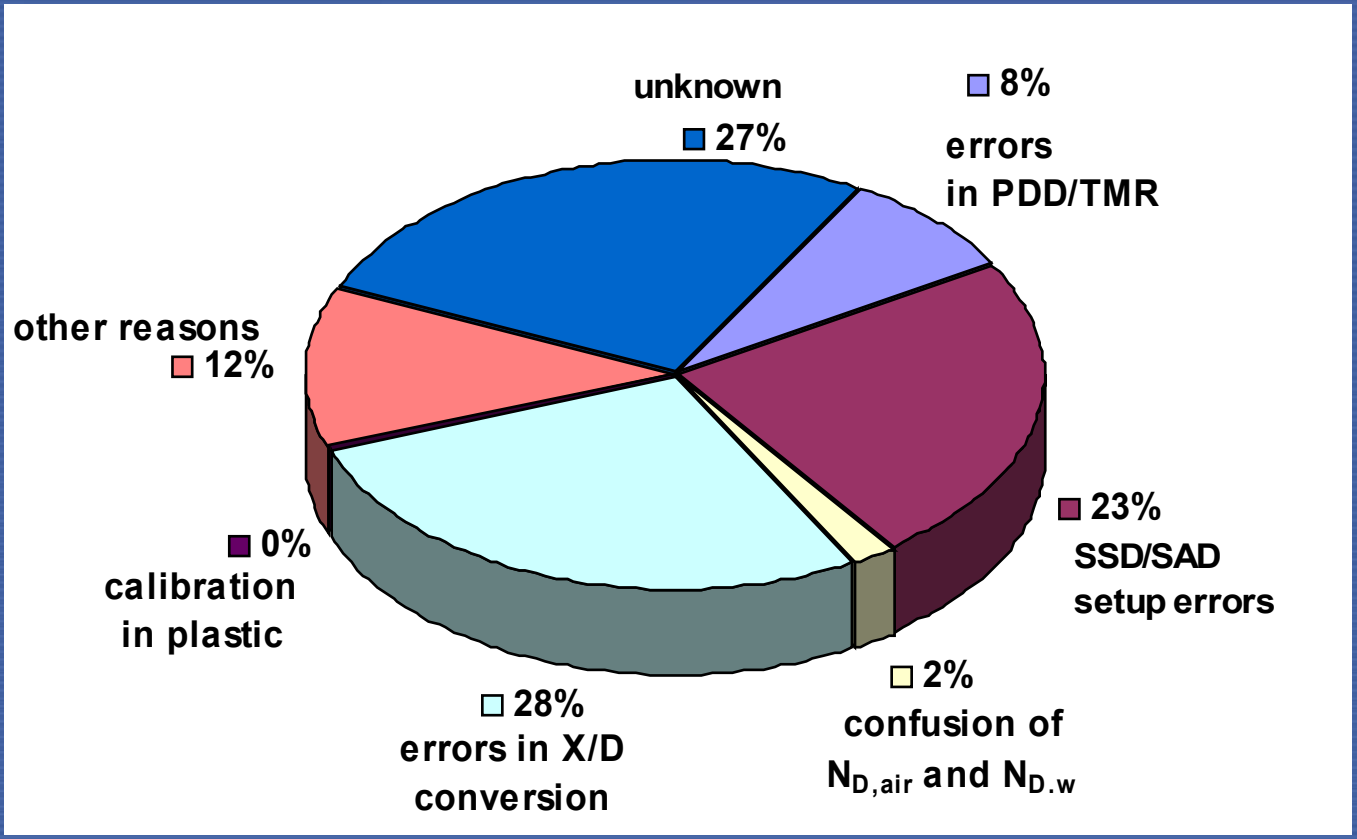
Support to end-users in dosimetry: Verification of clinical beam calibration Through the IAEA/WHO postal TLD service

TLD Postal dosimetry service for hospitals

- Objective: to ensure the quality of the entire dosimetric chain for radiotherapy to the end-user level in Member States by means of independent verification (via TLD)
- Discrepancies are followed up, if necessary by an expert visit
- About 500 beams per year
- Includes Co-60 and High Energy X-ray beams since 1991
- Coordinated with national audit networks and assisted by BIPM, PSDLs and other reference institutions

IAEA/WHO TLD Postal dosimetry service for hospitals

Dosimetry audits for hospitals



It is possible to store the mind with a million facts and still be entirely uneducated
Alec Bourne

Main source of dosimetry mistakes: lack of training of staff

Challenges

- Existing SSDLs to be linked to metrology org.
- Lack of well established SSDLs with internationally recognized capabilities
- Lack of established capabilities in critical health areas (diagnostic radiology, brachytherapy, nuclear medicine)
- Sustainability of some existing SSDLs
- Lack of qualified experts in dosimetry
- Lack of financial support

Where we cannot invent, we may at least improve

Charles Caleb Colton

Acknowledgements



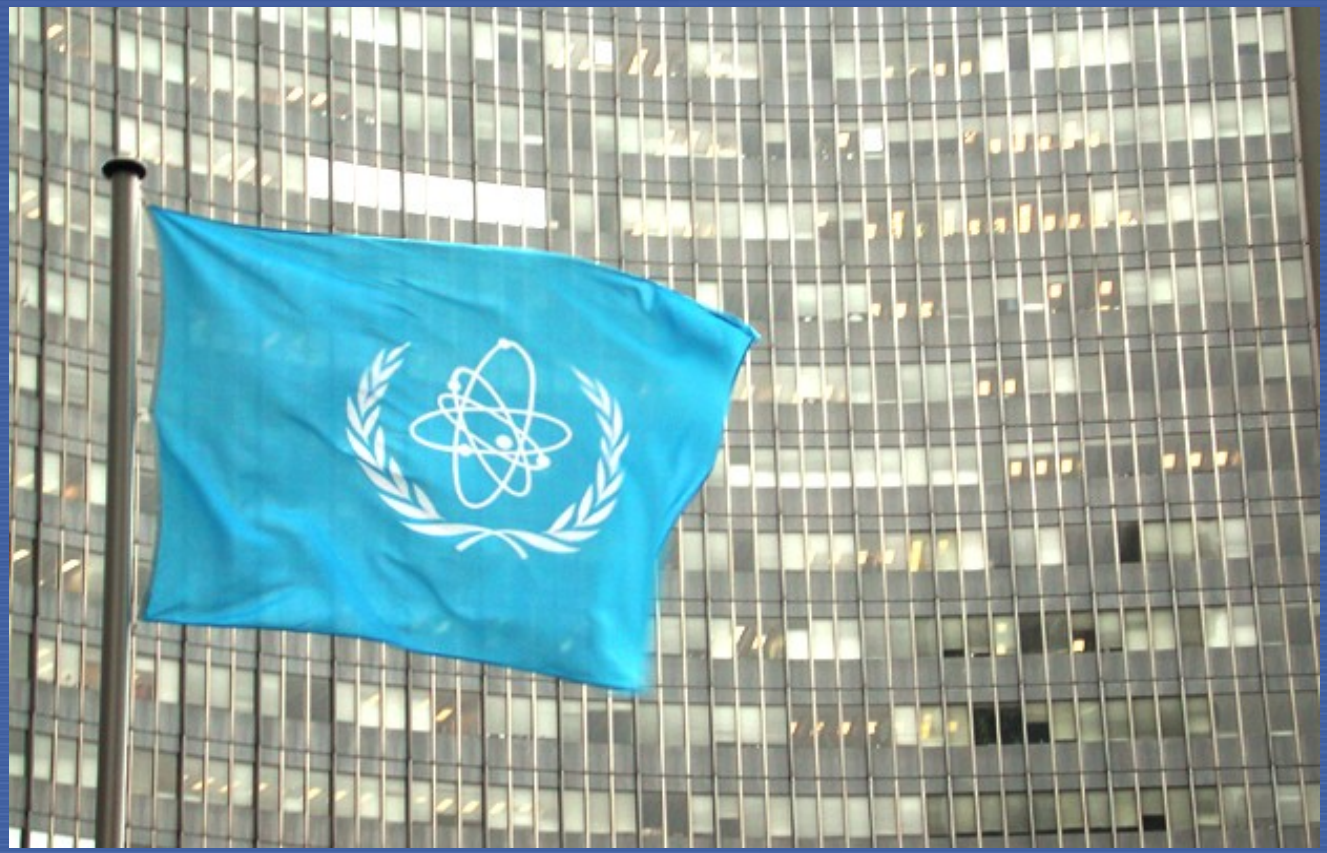







Dosimetry &
Medical Radiation
Physics Section

Thank You



IAEA…atoms for peace

IAEA…atoms for health