

Metrological feedback on ISO 21909:2015 and performance assessment of the neutron dose measurement process of LANDAUER

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BACKGROUND AND OBJECTIVES

Context

- Dosimetry is a regulated activity in France
 - ISO/IEC 17025 accreditation required
 - Conformity against EN 62387 for γ/β dosimeters and ISO 21909 for neutron dosimeters required
- New version ISO 21909:2015 completely different: tests, performance limits, interpretation of the results
- Previous ISO 21909:2005 withdrawn

Objectives

- Type test our neutron dosimetry measurement process against new standard
- Improve response of the system if need be
- Provide a user's feedback to the authors

INTERNATIONAL
STANDARD

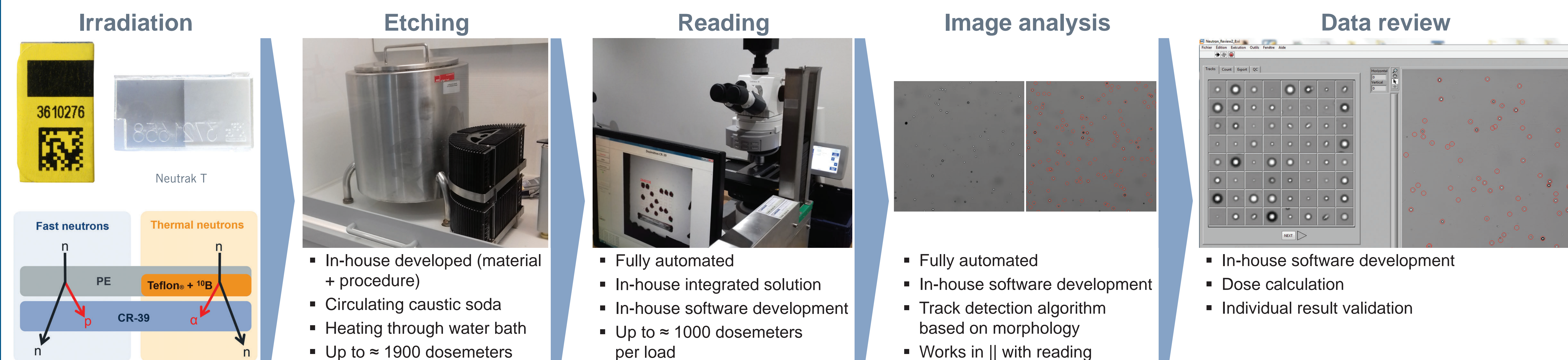
ISO
21909-1

First edition
2018-12-15
Corrected version
2019-12-15

Passive neutron dosimetry systems —
Part 1:
Performance and test requirements
for personal dosimetry

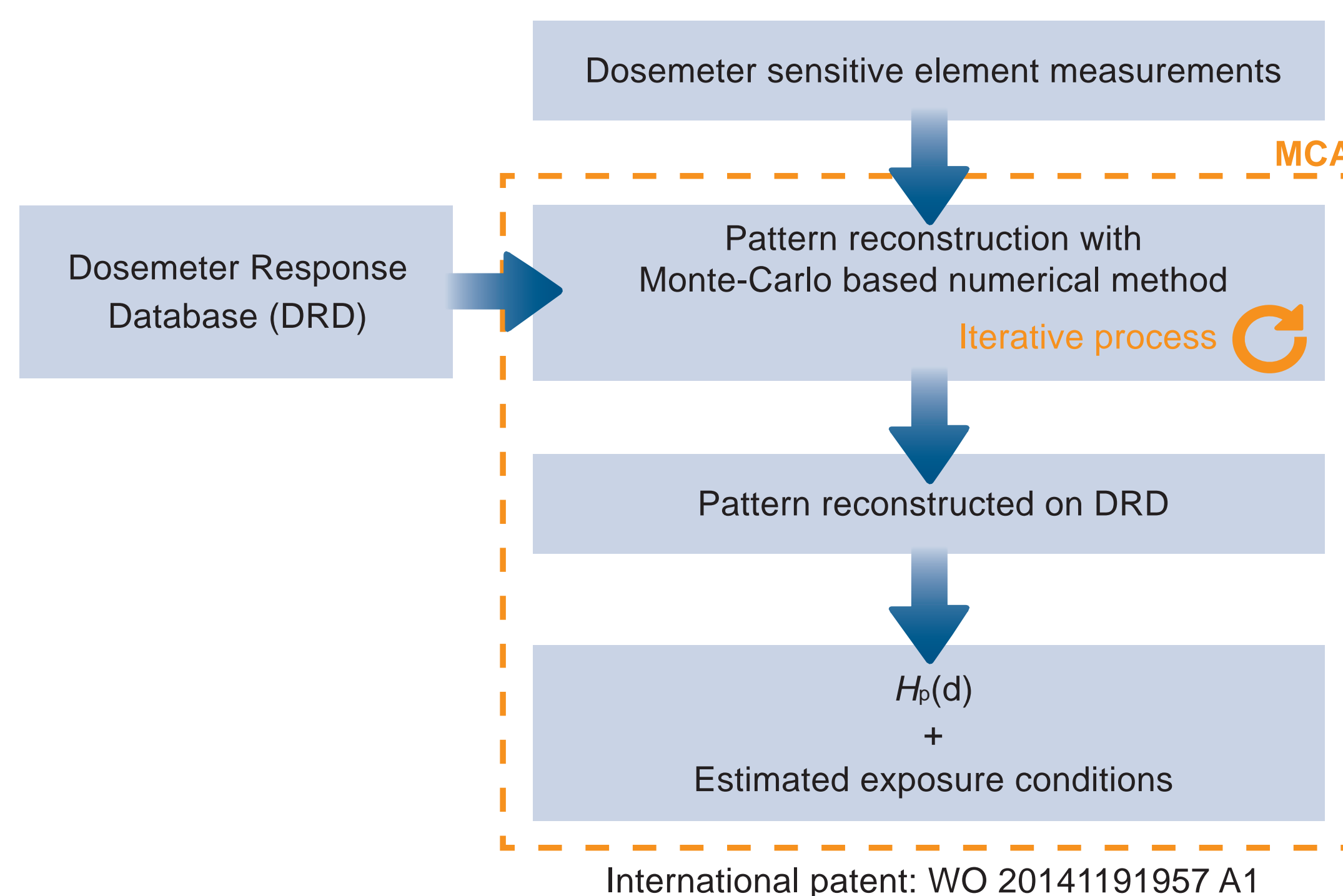
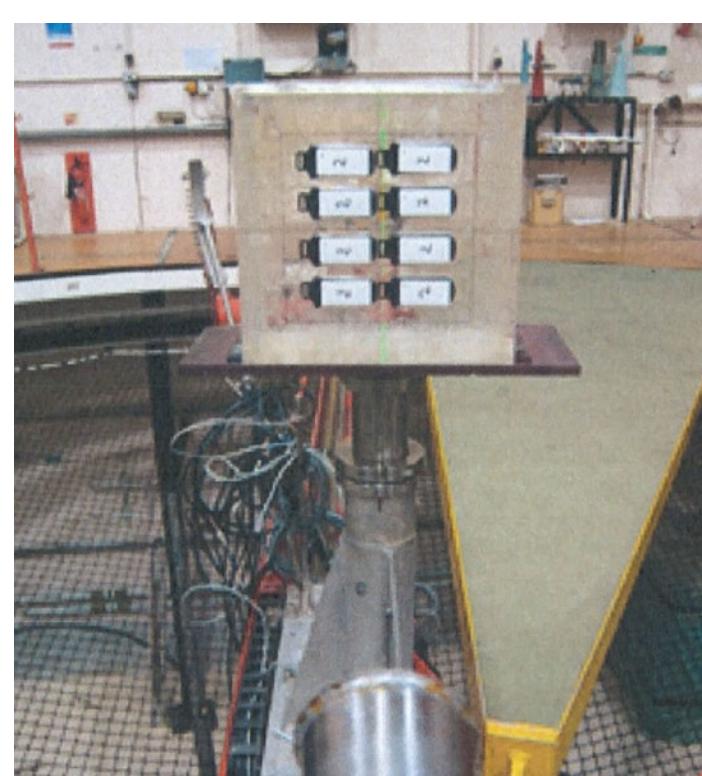
MATERIALS AND METHODS

BASIC PRINCIPLES OF LANDAUER NEUTRON DOSIMETRY SYSTEM



ISO 21909 TYPE TEST

- Test performed by a third party
- National Physics Laboratory (NPL) in UK
- NPL is accredited against ISO/IEC 17025 for all the work covered by the test
- Dosimeters tested for fast, thermal and 16.5 MeV neutrons
- ≈ 3000 dosimeters irradiated
- Standard dose estimation as base test
- Optimization of dose response by developing:
 - Branching algorithm
 - Monte-Carlo based algorithm (adapted from γ/β dosimeter, see <https://doi.org/10.1093/rpd/ncw217>)
- All responses tested and compared



Advantages

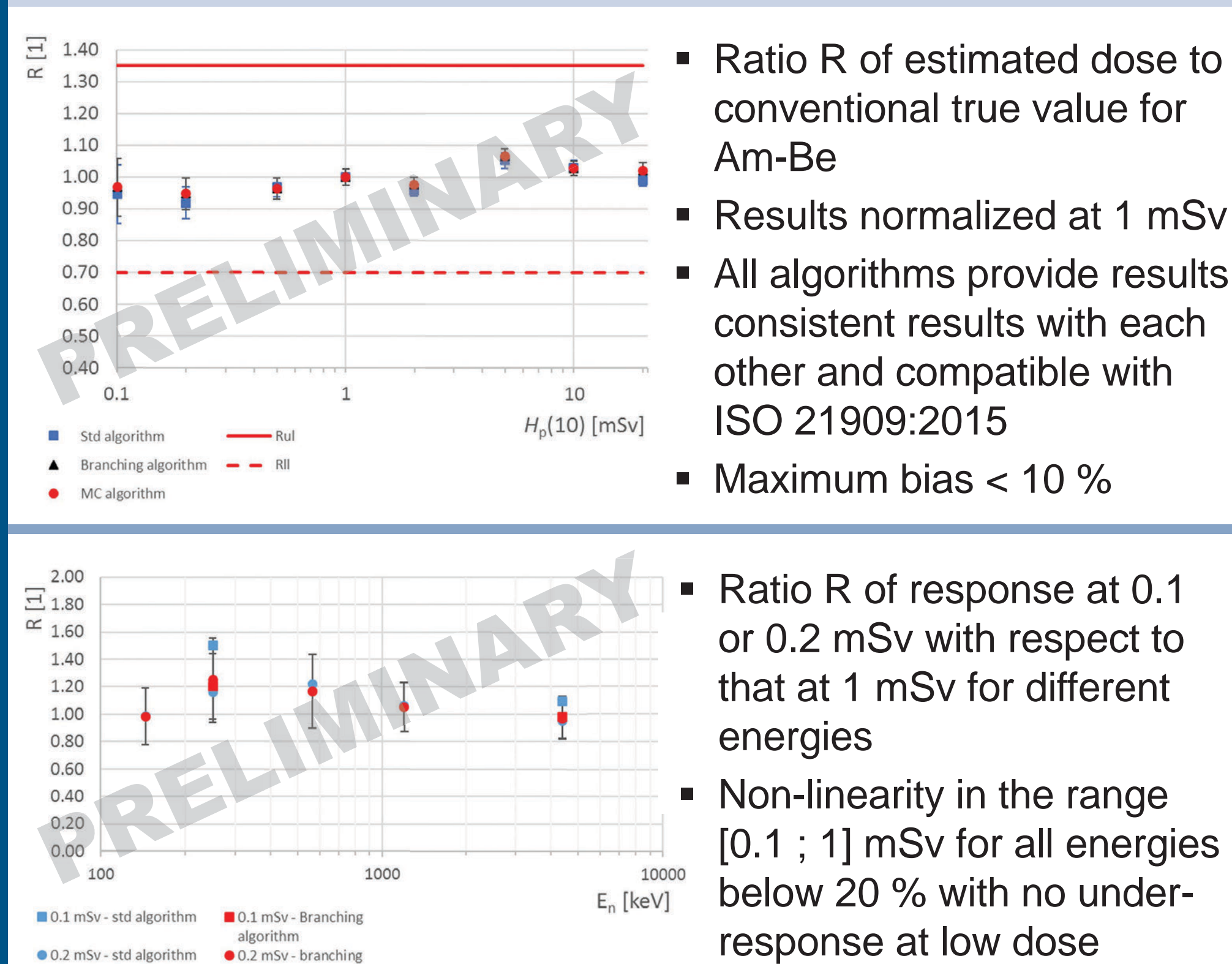
- Dosemeter independent algorithm: all dosimeter specific information contained in DRD
- Modular algorithm: possibility to assess dose with different DRD configurations
- Basic spectroscopy (energy/angle, particle type)
- Estimation of dose components possible

Drawback

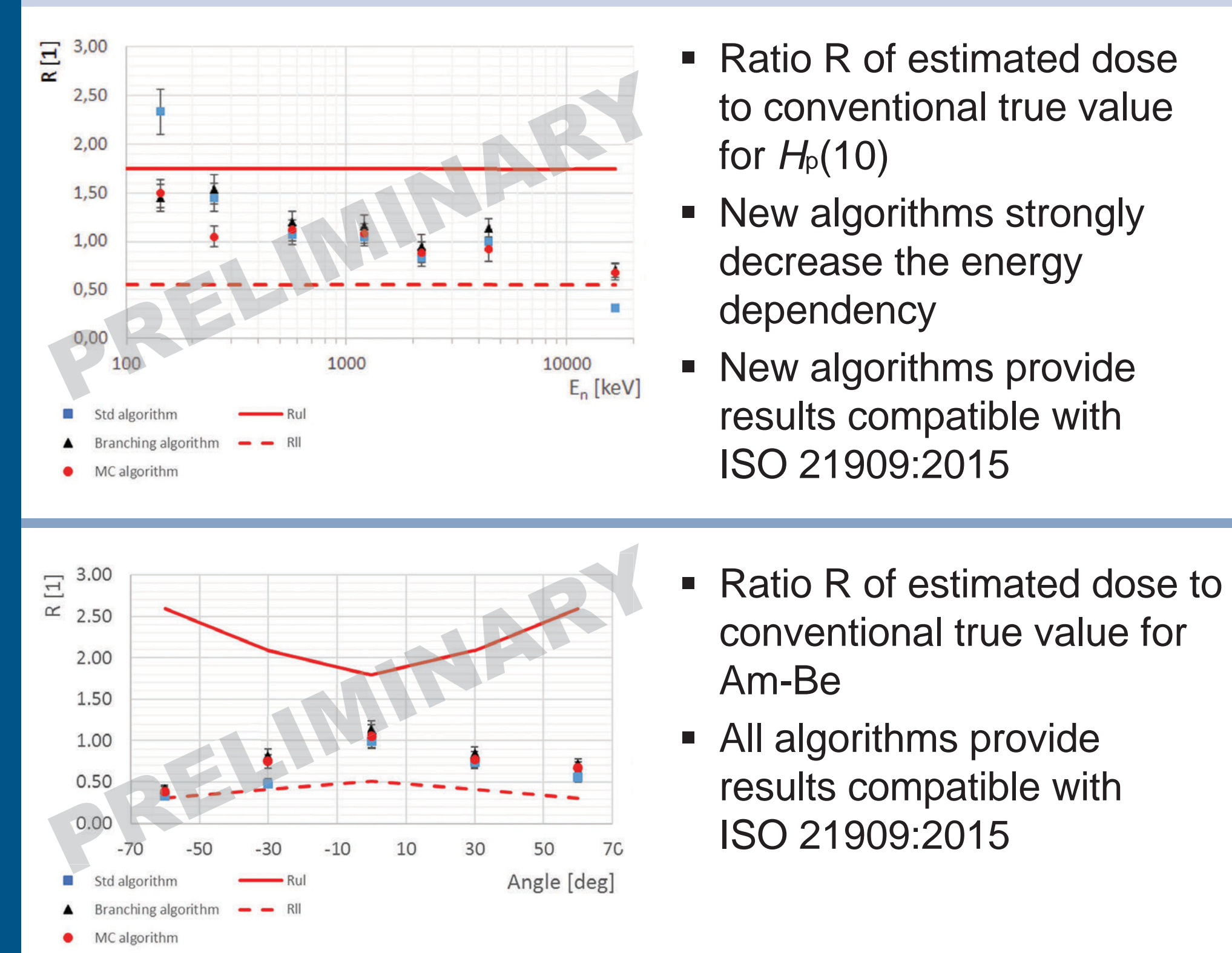
By hand calculations impossible (Monte-Carlo method)

PRELIMINARY RESULTS/PERFORMANCES

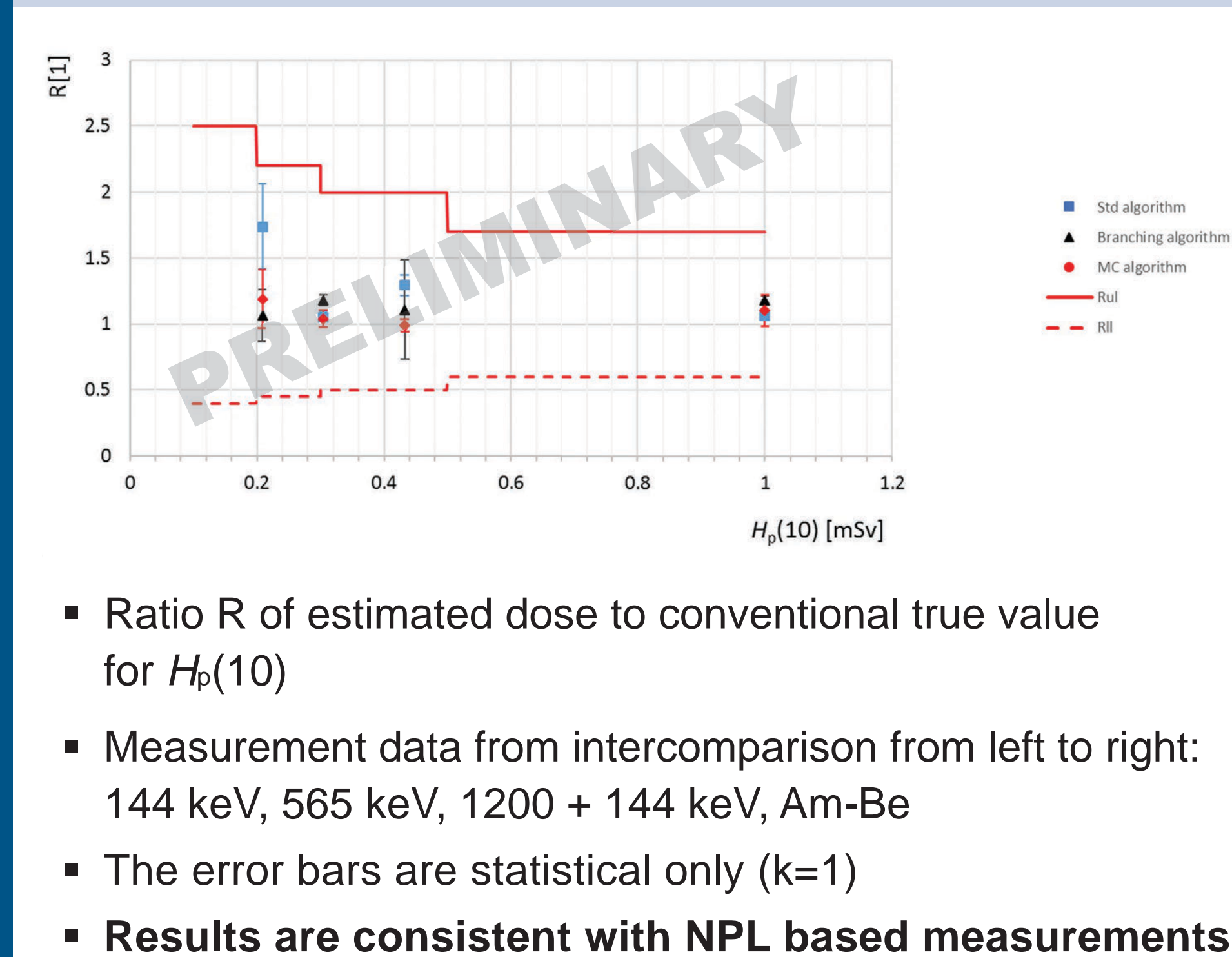
LINEARITY



ENERGY-ANGLE DEPENDENCY



USE OF ALGORITHMS ON INDEPENDENT PAST DATA



CONCLUSIONS

New development provide results **compliant with latest ISO 21909** requirements

- Non-linearity effects below 10 %
- Energy response effects < 12 % (for 144 keV and 16.5 MeV <50%)
- Algorithms successfully used on NPL independent dataset