Table of contents

1 Introduction	5
2 Construction of the facility	5
2.1 Construction design	5
2.2 Graphite moderator assembly	7
2.3 ²⁴¹ Am-Be sources	7
3 Reference fluence rate measurements by means of gold activation method	8
3.1 Set-up for the irradiations	8
3.2 Determination of the gold activity	10
3.3 Determination of the thermal neutron fluence rate and dose equivalent rate	11
3.3.1 Determination of the neutron fluence rate	11
3.3.2 Reference values for fluence rates and dose equivalent rates	12
4 Comparison with results of the last CCRI key comparison	13
4.1 Results of CCRI(III)-K8	13
4.2 Measurements at the PTB Thermal Neutron Calibration Facility	14
5 Fast neutron contribution	15
5.1 Bonner sphere measurements	15
5.2 Estimation of ambient dose equivalent from fast neutrons using bubble detectors	19
6 Photon contribution to the ambient dose equivalent	21
6.1 Measurement of the photon dose equivalent by means of a GM counter	21
6.2 Estimation of photon dose-equivalent rate by means of TLDs	21
7 Spatial distributions	22
7.1 Measurements of thermal neutron fluence rate by means of a ³ He counter	22
8 Monte Carlo calculations	23
8.1 Set-up	23
8.2 Results of calculations	24
8.2.1 Energy distributions	24
8.2.2 Angular distributions	25
8.2.3 Spatial distributions	27
8.2.4 Calculated reference values and comparison to measurements	27
9 Summary and conclusions	29
10 Acknowledgements	31
11 References	32
A1. Technical layout of the graphite block with holes	34
A2. Technical information on graphite from GrafTech	35
A3. Certificate of graphite analysis issued by BAM	36
A4. Neutron source strength values	37



A5. Measurement certificate for the mass of the gold foil	38
A6. Result of the gold activation with uncertainty	39
A7. Result for the neutron fluence rate with uncertainty budget	43
A8. Measurements similar to those performed in CCRI(III)-K8	50
A9. Measurements with Bonner spheres	51
A10. Parameterized spectrum used for the Bayesian analysis	52
A11. Neutron energy distributions (Bonner sphere evaluation)	53
A12. Measurements of the photon dose with the GM counter	57
A13. Measurements of the photon dose with TLD700 behind ⁶ Li shield	58
A14. Measurements of spatial distribution of thermal neutron fluence rate	59
A15. Comparison of SP9 detectors as used for different measurements	60
A16. Drawings (PHITS code)	61
A17. Calculated neutron energy distribution (PHITS code)	63
A18. Calculated photon energy distribution (PHITS code)	66
A19. Calculated angular distribution (PHITS code)	70
A20. Calculated spatial distribution (PHITS code)	71