

# DIN ISO 12789-1:2013-01 (E)

## Reference radiation fields - Simulated workplace neutron fields - Part 1: Characteristics and methods of production (ISO 12789-1:200 8)

---

| <b>Contents</b>  |  | <b>Page</b> |
|--|--|-------------|
| National foreword .....  |  | 3           |
| National Annex NA (informative) Bibliography .....   |  | 3           |
| Introduction .....   |  | 4           |
| 1 Scope .....  |  | 5           |
| 2 Normative references .....   |  | 5           |
| 3 Terms and definitions .....  |  | 5           |
| 4 Simulated workplace neutron fields .....   |  | 7           |
| 5 General requirements for the production of simulated workplace neutron spectra .....   |  | 7           |
| 6 Characterization of simulated workplace neutron fields .....   |  | 8           |
| 7 Fluence to dose-equivalent conversion coefficients .....   |  | 10          |
| 8 Sources of uncertainty .....   |  | 11          |
| 9 Expression and reporting of uncertainties .....  |  | 11          |
| Annex A (informative) Examples of simulated workplace neutron fields .....   |  | 12          |
| Bibliography .....   |  | 26          |
| Figures Figure A.1 -- Schematic diagram of the PTB irradiation facility (vertical cross-section) .....   |  | 15          |
| Figure A.2 -- Fluence rate spectra behind a shadow object for various calibration sources in the PTB .....   |  | 16          |
| Figure A.3 -- Schematic cross-sectional view of the IPSN-CEA Cadarache Laboratory simulated workplace neutron field facility .....   |  | 17          |
| Figure A.4 -- Measured and calculated neutron spectra produced at the IPSN-CEA Cadarache facility (238U-induced fission by 14,6 MeV neutrons with additional moderation) ..... |  | 18          |
| Figure A.5 -- Neutron spectrum measured at the IPSN-CEA Cadarache facility .....   |  | 19          |
| Figure A.6 -- GRENF facility (horizontal cross-section at the plane of the beam) .....   |  | 20          |
| Figure A.7 -- Unfolded spectral neutron fluence per log energy interval in the GRENF facility .....  |  | 21          |
| Figure A.8 -- Plan view of SILÉNE reactor facility (ground view) .....   |  | 22          |
| Figure A.9 -- Neutron spectra produced at the reference position using different shields in the SILÉNE facility .....  |  | 23          |

**Figure A.10 -- Cross-sectional diagram of the CERN reference neutron facility (vertical cross-section) ..... 24**

**Figure A.11 -- Calculated and measured neutron energy spectra produced in the CERN facility ..... 25**

**Tables Table 1 -- Ambient and personal dose equivalent per unit neutron fluence,  $h^*(10)$  and  $h_p$ , slab(10,), in units of  $\mu\text{Svcm}^2$ , for monoenergetic neutrons incident on the ICRU sphere and ICRU tissue slab phantom ..... 9**