

Energy Fluxes in the Intense Neutron Facilities

1. Fission Reactors for Irradiation Testing of Materials

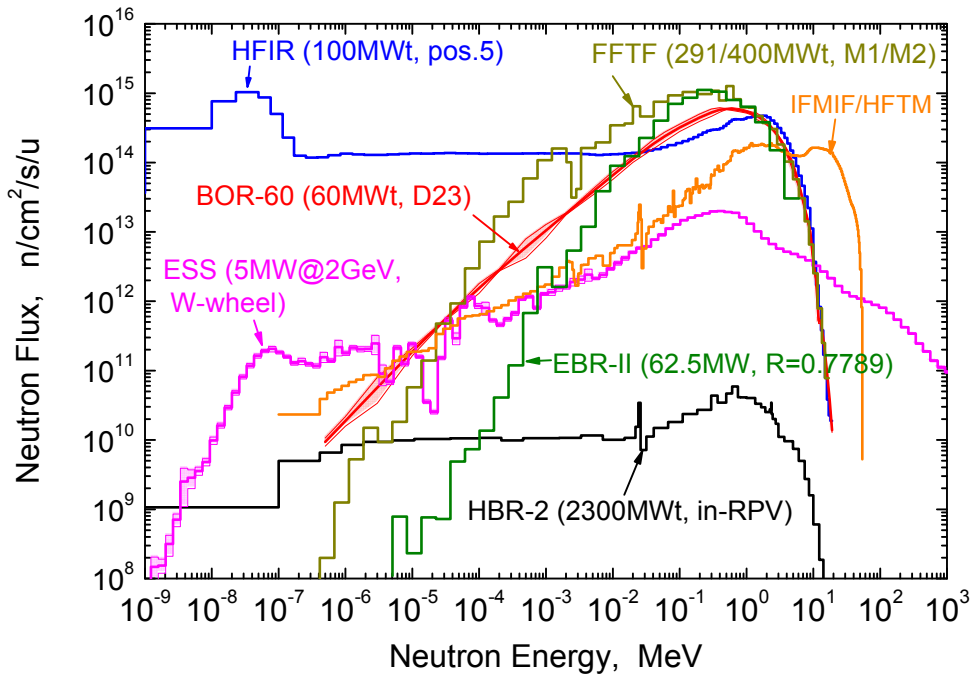


Fig. 1. Neutron Fluxes in the Research Reactors or Material Testing at/near midplane: (i) *position 5* in HFIR [1], *D23 channel* in BOR-60 [2] ([3] - is not BOR-60 data), *M1/M2 channels* of FFTF (MOTA) [4] and EBR-II [5] (IFMIF, ESS and HBR-2 are plotted for comparison).

2. Power Plants: before or inside of the Reactor Pressure Vessels (RPV).

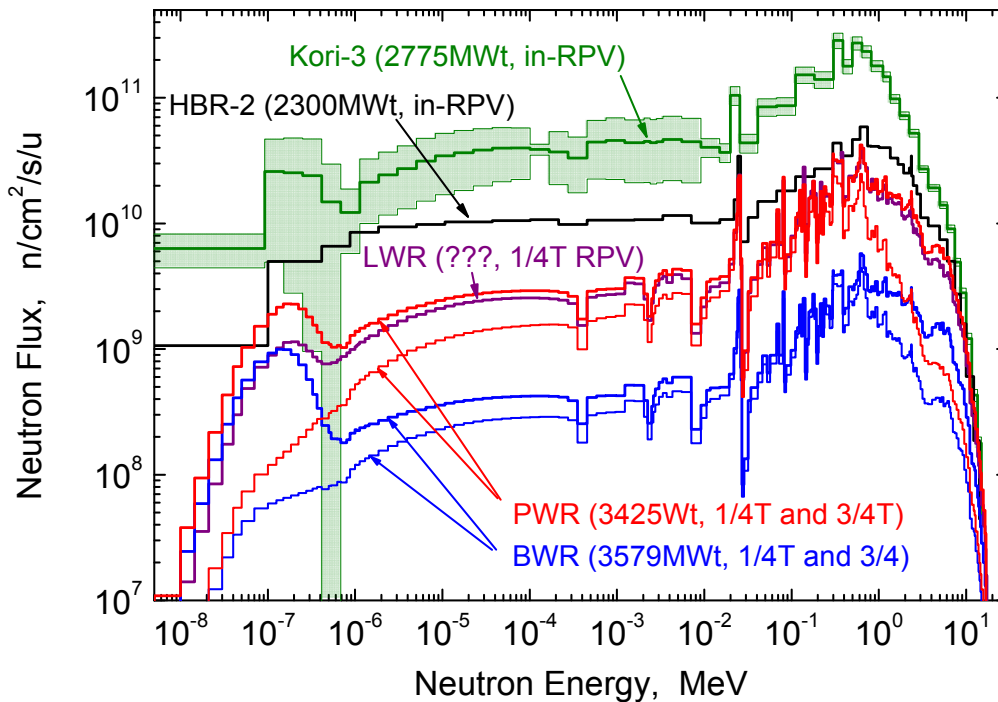


Fig. 1. Neutron Fluxes at/near midplane/beltline for: *1/4T of RPV* for LWR [6, 7], *inside RPV* of PWR Robinson-2 [8] and LWR Kori-3 [9], *1/4T and 3/4 of RPV* for PWR and BWR [10].

3. Fusion and Spallation Facilities: ITER, DEMO, IFMIF, ESS.

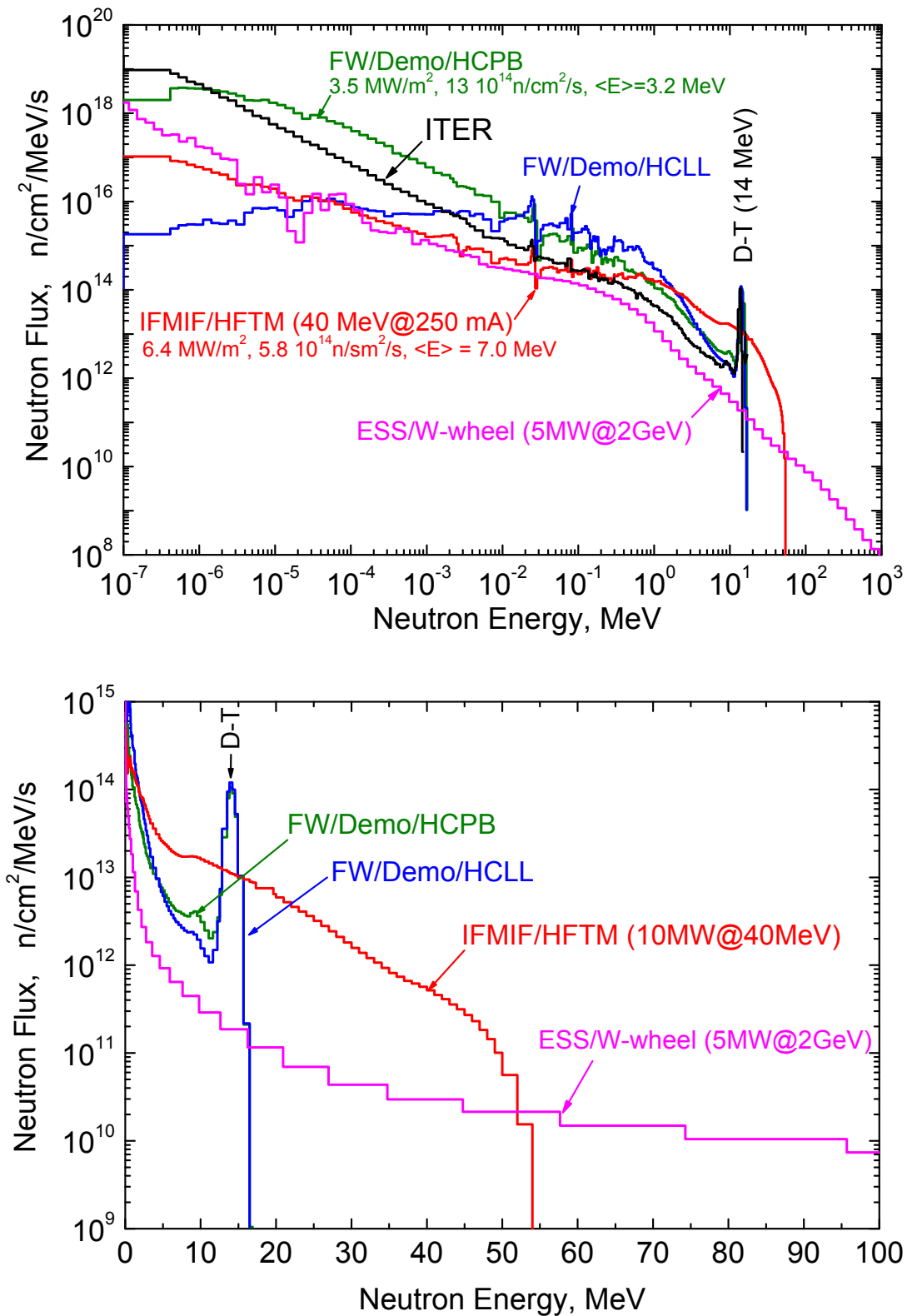


Fig. 2. Energy differential neutron fluxes in ITER, DEMO (HCPB or HCLL blankets) [11], IFMIF/HFTM [12] and ESS [13] plotted either log (top) or linear (bottom) energy scale.

References

1. L. Greenwood, R. Smither, Report ANL/FPP/TM-197, 1985; data available in the SPECTER code package from <https://www-nds.iaea.org/irdf2002/codes/index.htmlx>
2. D.K. Ryazanov, Spectroscopy and Dosimetry of Neutrons at Research Reactors, Dimitrovgrad, 2013; ISBN 978-5-7262-1648-5 (*in Russian*)
3. V.D. Sevast'ianov, A.S. Koshelev, G.N. Maslov, "Kharakteristiki polei neitronov: istochniki mgnovennykh neitronov delenia, generatory 14 MeV neitronov, issledovatel'skie i energeticheskie reaktory, ustroistva, konvertiruiushchie neitronnoe izluchenie", Handbook, 2nd Edition, 2 volumes, Mendeleev, VNIIFTRI, 2014; ISBN 978-5-903232-38-3 (*in Russian*); data available from <http://www.gsssd-rosatom.mephi.ru/DB-nspectra/fission/550/598.php>
4. A.M. Erni, L.R. Greenwood and H.L. Heinisch, "Irradiation Parameters for FFTF Materials Open Test Assemblies from 1983 through 1992" http://web.ornl.gov/sci/physical_sciences_directorate/mst/fusionreactor/pdf/mar1995/paper4.pdf
5. L.R. Greenwood, "Neutron Source Characterization for Fusion Materials Studies", CONF-810831-101, Seattle 1981, http://www.iaea.org/inis/collection/NCLCollectionStore/_Public/14/765/14765741.pdf
L.R. Greenwood, PNNL-12200, 1999
http://www.pnl.gov/main/publications/external/technical_reports/PNNL-12200.pdf
6. M. Pescarini, V. Sinitisa, R. Orsi, M. Frisoni, "ENEA-Bologna Multi-Group Cross Section Libraries for LWR Shielding and Pressure Vessel Dosimetry Applications", Report RdS/2011/122, ENEA, Bologna, 2011; available from http://www.enea.it/it/Ricerca_sviluppo/documenti/ricerca-di-sistema-elettrico/nuovo-nucleare-fissione/lp5/rds-122-lp5.pdf
7. J.E. White, D.T. Ingersoll, R.Q. Wright, H.T. Hunter, C.O. Slater, N.M. Greene, R.E. MacFarlane, R.W. Roussin, "Production and Testing of the Revised VITAMIN-B6 Fine-Group and the BUGLE-93 Broad-Group Neutron/Photon Cross-Section Libraries Derived From ENDF/B-VI.3 Nuclear Data", Report NUREG-6214, Rev. 1 or ORNL/TM-6795/R1, available from <http://www.osti.gov/scitech/biblio/779795>
8. I. Remec, F.B.K. Kam, "H. B. ROBINSON-2 Pressure Vessel Benchmark", NUREG/CR-6453 or ORNL/TM-13204, ORNL, Oak Ridge 1997, available https://rsicc.ornl.gov/DOSIMETRY/HB_Robinson/hb_robinson.pdf
9. C.S. Yoo et al. "Evaluation of Fast Neutron Fluence for KORI Unit 3 Pressure Vessel", Nucl. Eng. Techn. 38(2006)665, available from <http://www.kns.org/jknsfile/v38/JK0380665.pdf>
10. T.E. Albert, M.L. Gritzner, G.L. Simmons and E.A. Straker, "PWR and BWR Radiation Environments for Radiation Damage Studies," EPRI NP-152, Electric Power Research Institute, Palo Alto, CA, September 1977
11. U. Fischer et al. FED 89(2014)1880
12. S. Simakov et al. FED 75-79(2005)813
13. B. Marcinkevičius, "Shielding and Activation studies for ESS target station for derivation of the radioactive waste, Master Thesis, Vilnius University, 2014