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Workshop 4 – Experimental Techniques

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- This workshop had an attendance of about 15 participants.
- On calculation discrepancies of gamma heating and DPA in stainless steel or low carbon steel with high depth inside EPR, a question was raised on how to benchmark TRIPOLI with experimental heating techniques. The experiences with heating measurements at Cadarache with special differential calorimeters were discussed. The importance of these measurements concerning JHR (need to define) was mentioned.
- On the implementation of mass spectrometric techniques in measuring stable products in dosimeters, experience in precisely carrying out the measurements was addressed. One of the issues is that the initial sample needs a careful characterization to make sure that transmuted isotopes exceed the level of the starting impurities. In general, stable isotopes can be measured reliably. As an example, the production of helium due to the transmutation of ^{58}Ni to ^{59}Ni (which has a high thermal neutron (n,α) cross section) and ^{10}B has been cited, a phenomenon that is famous within the fusion community due to the high production of helium similar to fusion reactor conditions. Although these transmutations were very well studied, some discrepancies were noticed under very high fluence conditions. An ongoing experiment at Cadarache to address high Helium production in the VVER's has been cited.
- Difficulties related to mixed neutron/gamma field measurements, especially owing to the lack of measured photon spectra, were discussed. New techniques are needed to reliably measure the gamma spectra in reactors separately from the neutron spectra.
- On the issue of modeling secondary gammas, the capability of the newest MCNP version in taking this effect into account was addressed.
- On the issue of availability of alloyed dosimeters for high temperature applications (Co-V alloys for instance), the participants agreed upon looking out for a manufacturer who could deliver such products. This is a general problem since many useful dosimeters are no longer being produced such as depleted uranium and ^{237}Np fission monitors. The reactor dosimetry community needs to push this issue with potential sources of such materials, such as Oak Ridge National Lab in the US or IRMM, Geel. It is also nearly impossible to obtain ^{252}Cf which is very useful for testing of reactor dosimetry reactions, as cited in recent work by the IAEA in the validation of the IRDFF evaluated cross section library for reactor dosimetry.
- On the issue of fluorescence effects in the measurement of the reaction product ^{93m}Nb, the filter paper technique, coupled to x-ray measurements, is deemed to provide good results while

suppressing the fluorescence effects caused mainly due to the nuclides ^{94}Nb and ^{182}Ta. Especially, the contribution from ^{182}Ta can be largely avoided by using Nb dosimeters with a very low Ta impurity. Nb with a Ta impurity of less than 0.3 ppm is currently available at IRMM, Geel. LSC measurements of ^{93m}Nb were also discussed but this method requires a standard for calibration that does not have any interfering nuclides such as ^{94}Nb and ^{182}Ta . However, owing to the importance of this dosimetric reaction, research on alternative measurement techniques which deliver highly reliable activity measurements of ^{93m}Nb are strongly encouraged.