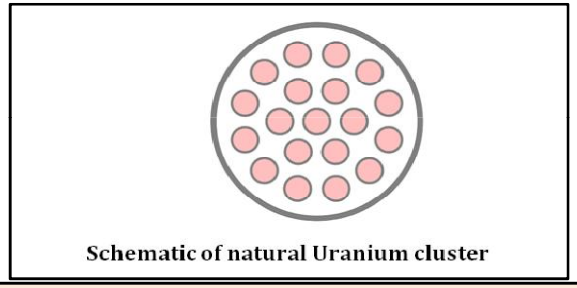
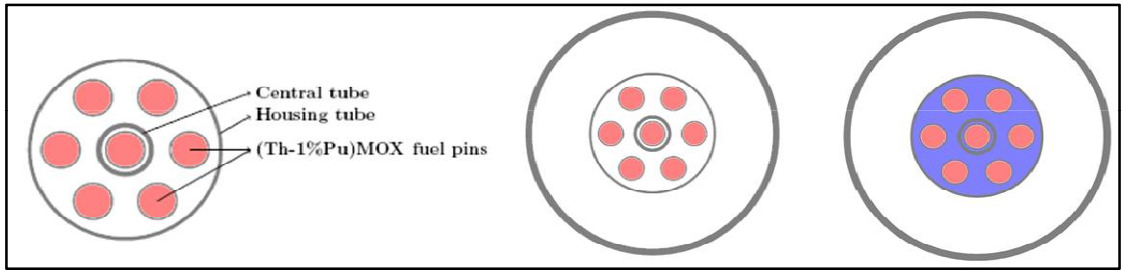
Experimental measurement of void reactivity with one 7-pin (Th-1%Pu)MOX experimental cluster in CF Extended core

- ❑The Experiment was designed and conducted to measure void reactivity using a 7-pin (Th-1%Pu)MOX experimental cluster with pins having AHWR type dimensions at E5 location of AHWR-CF Extended core.
- ❑The critical heights were measured twice – once with experimental cluster filled with light water coolant, and then without the coolant.
- ❑ The measured critical heights along with level coefficient values were used to calculate void reactivity.
- ❑The difference in estimated and observed void reactivity value was 0.1 mk for the 100% voiding case.
- ❑This experimental result was in very good agreement with the theoretically estimated value which validate and enhances our confidence in methodologies and computational tools used for AHWR physics design.





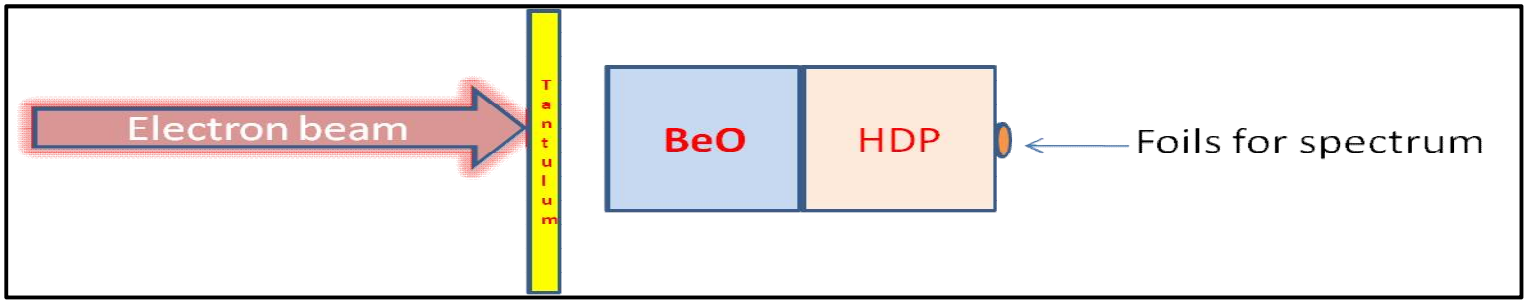
Schematic diagram of horizontal cross section of experimental cluster placed inside the outer housing tube (a) filled with water and (b) without water

Comparison of measured and estimated critical height for CF Extended core with one 7-pin (Th,1%Pu)MOX experimental cluster at E5 location

Experimental cluster at E5 location	Critical Height (cm)		Difference (cm)
	ESTIMATED	OBSERVED	
WITHOUT coolant	229.6	229.5	0.1
WITH light water coolant	232.4	232.1	0.3

Experiment for feasibility study of Mo-99 production with accelerator

- ❑Mo-98(n,γ) cross section in Epithermal region (136 b) high by orders of magnitude than Thermal (0.13 b)
- ❑Spectrum may be tuned to epithermal region by controlled moderation
- ❑Use of Electron Accelerator at EBC Kharghar: (e-γ-n) cascade: Mo-98(n,γ)Mo-99
- ❑Experimental setup: e-beam -> Ta target (gamma) -> BeO (fast neutrons) –> HDP (moderation)-> Sample
- ❑Flux monitors (27 No) irradiated in setup consisting of BeO block (for photo neutron generation) and HDP (for moderation).
- ❑The induced gamma activity in monitors are being counted using HPGE detector. Data analysis will be carried out.
- ❑Next set of experiment will be done based on the results of this data analysis.



Determination of Spectrum shaping factor in nuclear reactor AHWR-CF by Monte Carlo method for material characterization using neutrons

- Spectrum shaping factor α is determined in central location in Advanced Heavy Water Reactor Critical Facility (AHWR-CF) by number of flux monitors, in various methods.

- The reaction rates and nuclear data of neutron flux monitors are the basic input required for determination of α.
- The reaction rates of various activation monitors were estimated by modelling the reactor using in-house developed Monte Carlo code PATMOC.
- The value of α was determined by processing these reaction rates using five different methods as follow:

S. No	Activation monitors used	Estimated value of α
Cd cover dual monitor method		
1	Au^{197}, Mn^{55}	-0.0558
2	Au^{197}, Zr^{94}	-0.0871
Cd cover dual monitor using K_0 method		
3	Au^{197}, Co^{59}	-0.0641
4	Au^{197} , Mn^{55}	-0.0614
5	Au^{197} , Zr^{94}	-0.0877
Cd cover Multi monitor method		
6	Au^{197}, Co^{59} , Zr^{94}	-0.0880
7	Au^{197} , Mn^{55} , Co^{59}	-0.0621
8	Au^{197}, Mn^{55} , Co^{59} , Zr^{94}	-0.0860

S. No	Activation monitors used	Estimated value of α
Cd ratio dual monitor method		
9	Au^{197}, Zr^{94}	-0.0892
10	Au^{197} , Co^{59}	-0.0658
11	Au^{197}, Mn^{55}	-0.0597
Cd ratio multi monitor method		
12	Au^{197} , Co^{59} , Mn^{55}	-0.0613
13	Au^{197}, Zr^{94} , Co^{59}	-0.0895
14	Au^{197}, Zr^{94} , Co^{59} , Mn^{55}	-0.0873

- The value of alpha was also obtained by an independent approach i.e. by fitting the Monte Carlo computed neutron spectrum, and was found to be in good agreement with the one obtained by analytical methods.