P2017-10

NDPCI Progress report: Nuclear Data Activities in India 2016-2017

by Lalremruata Bawitlung

I. Conference organized(NDPCI specific)

1. Nuclear Reaction and Applications, BARC, 2-12th November 2016
2. 7th DAE-BRNS Workshop on Compilation of Experimental Nuclear Reaction Data(EXFOR-2017), NEHU, Shillong, India 6-10th March 2017
3. Error Propagation in Nuclear Reaction Data Measurement (EPNRDM-2017), Mizoram University, Aizawl, 13-14th March 2017.

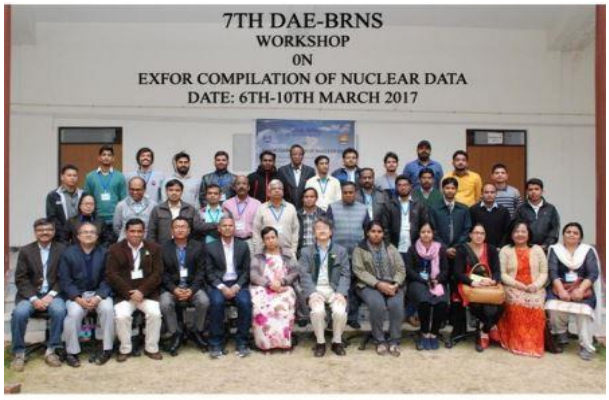

FIG. 1. A photograph of EXFOR-2017 workshop

FIG. 2. A photograph of EPNRDM-2017

FIG. 3. A photograph of Cultural dance (Chheih Lam) in EPNRDM-2017

The Fourth DAE-BRNS Theme Meeting on Generation and use of Covariance Matrices in the Applications of Nuclear Data will be held on December 09-13, 2017.

Following figures 4 and 5 shows EXFOR entries prepared by NDPCI and submitted to NDS, IAEA from regular and workshop activities respectively during 2016-2017.

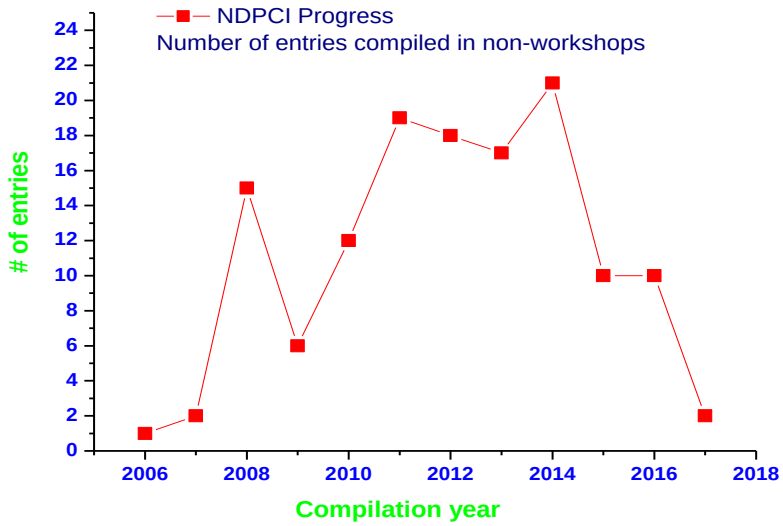

FIG. 4. Total number of entries for non workshop/regular activity since 2006

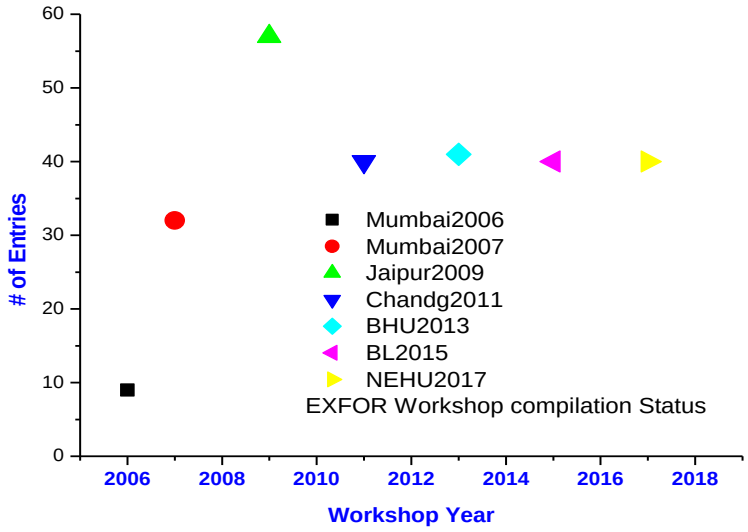

FIG. 5. Total number of entries for workshop since 2006

Fig.6 shows the yearwise contributions/number of total number of entries submitted by NDPCI for the past 11 years.

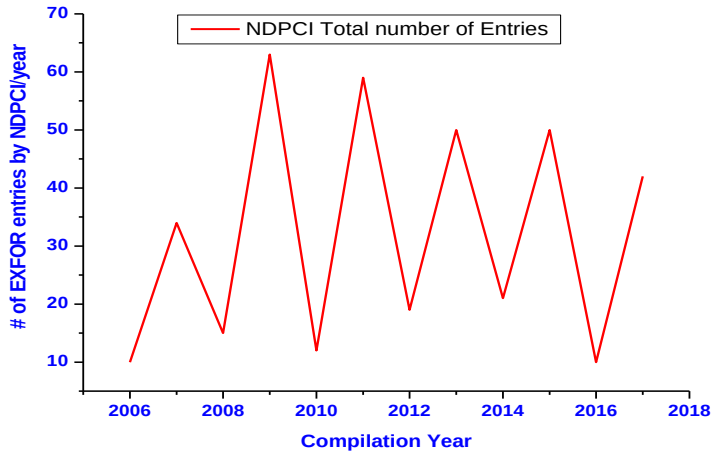

FIG. 6. Total number of entries since 2006 = 385 including 2017 workshop which is 1.7% of entries in EXFOR database

Summary of NDPCI EXFOR activity:

- During 2016-2017, NDPCI submitted **52** entries to NDS.
- From Regular compilation activity = 23%.
- Charged particle induced = 34 Entries.
- Neutron induced reactions = 18 Entries.
- From EXFOR workshop = 77 %.
- About 90% entries are recent publications.
- All new articles published till 2016 are completed, few old articles from Vidya's scanning remains.

III. Other developments(Softwares, EXFOR-I)

III. 1. Software Developments- EPEN

- ^{7}Li(p,n)^{7}Be neutron spectrum code (EPEN) from threshold to 4 MeV have been developed in collaboration with NDS, IAEA.
- In India, the FOTIA (Folded Tandem Ion Accelerator) and 14 UD Pelletron Facility at TIFR, Mumbai are the facility used for performing neutron induced cross section measurement using ^{7}Li(p,n)^{7}Be as neutron source.
- However, due to the continuous beam structure and low flux, ToF technique cannot be employed for neutron energy-flux spectrum for data reduction procedure. Experimentalist therefore has to rely on simulated neutron spectra.

Figs.7 and 8 shows typical neutron spectrum of EPEN code.

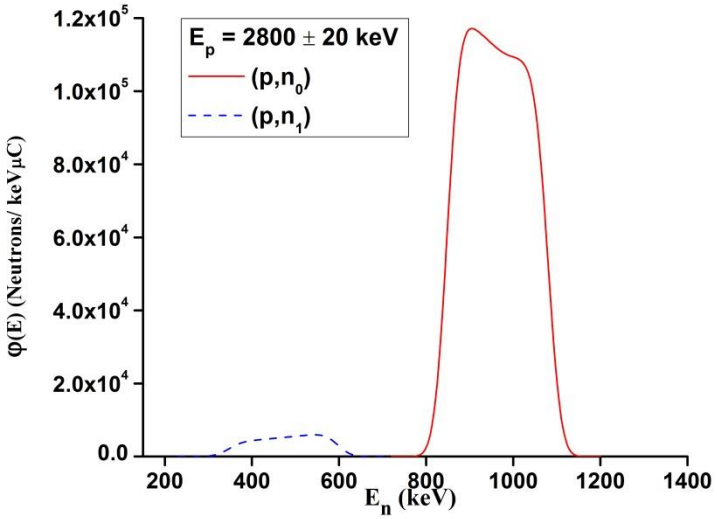

FIG. 7. EPEN neutron energy spectrum at E_p = 2800 ± 20 keV

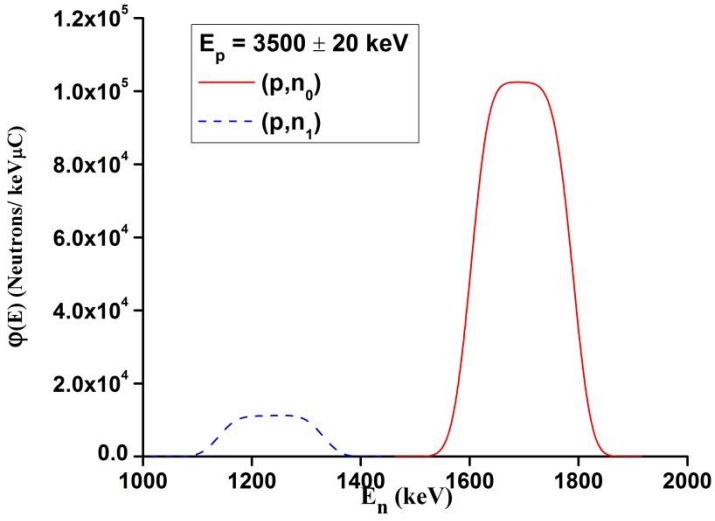

FIG. 8. EPEN neutron energy spectrum at E_p = 3500 ± 20 keV

Such neutron spectra are utilized for experimental data analysis and for background neutron simulations using Monte Carlo codes

Validation:

EPEN reproduces experimental spectra well as shown in Figures 9 and 10.

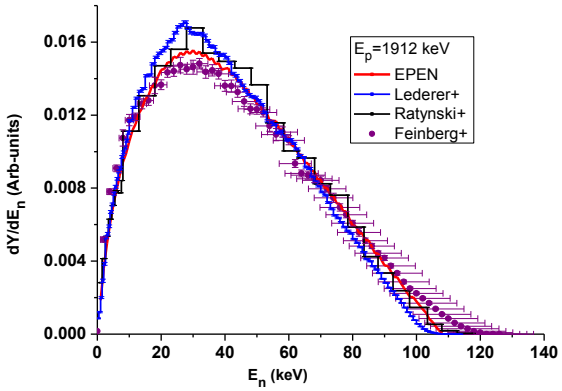

FIG. 9. Comparison of EPEN energy spectra for a thick natural lithium target at E_p = 1912 ± 0 keV with experimental results.

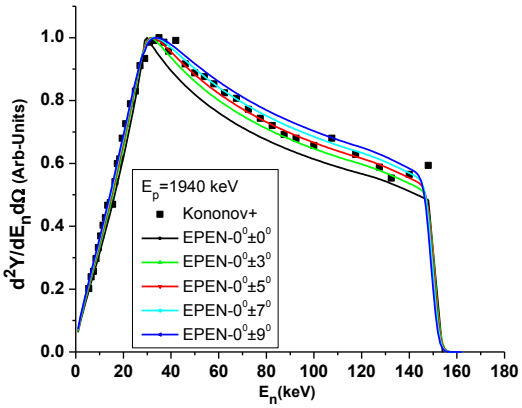

FIG. 10. Comparison of EPEN energy spectra for a thick natural lithium target E_p = 1940 keV for various angular ranges with experimental results for a thick natural lithium target.

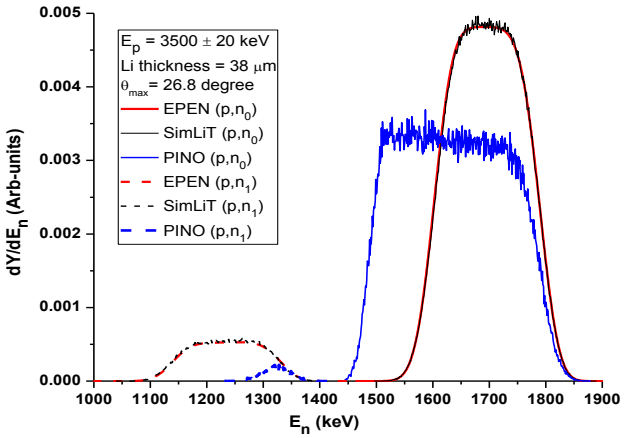

FIG. 11. Comparison among EPEN, SimLiT, and PINO neutron energy spectra for thin lithium target thickness 38 μm at (a) E_p = 2800 ± 20 keV and (b) E_p = 3500 ± 20 keV.

III. 2. Software Developments- EXFOR-I

"EXFOR-I" Editor :

- Being developed and tested by Abhijit Bhattacharyya, Nuclear Data Physics Centre (NDPCI), Bhabha Atomic Research Centre, Mumbai, INDIA.
- EXFOR-I is an Indian initiative like Russian and Japanese.
- EXFOR-I is platform independent, offline, simple and minimalist software.
- EXFOR-I automates simple jobs.
- EXFOR-I provides handles for CHEX and JANIS checker besides it's own simple checker.
- EXFOR-I will provide live hints for possible error during compilation.
- EXFOR-I uses IAEA dictionaries without any further modification for the code resulting in easy update

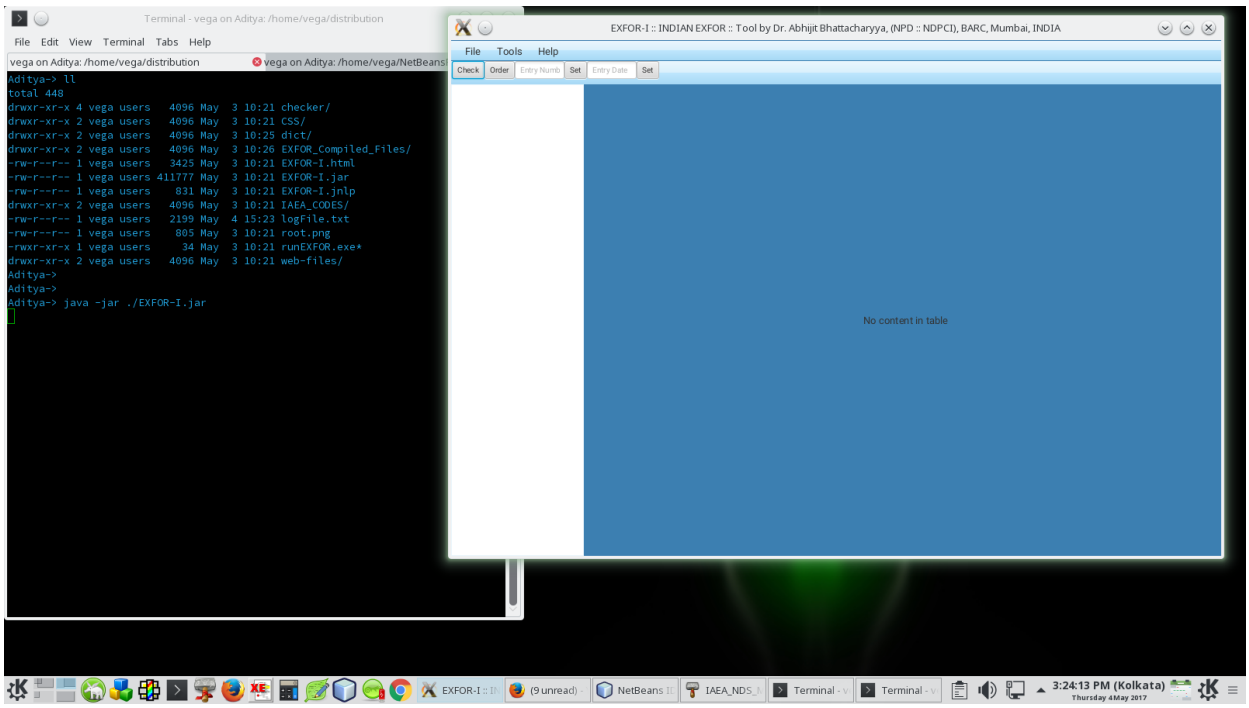

FIG. 16: A photo of EXFOR-I (Launch)

EXFOR-I could be launched by clicking the “jar” file or by “java -jar EXFOR-I.jar” from the command prompt.

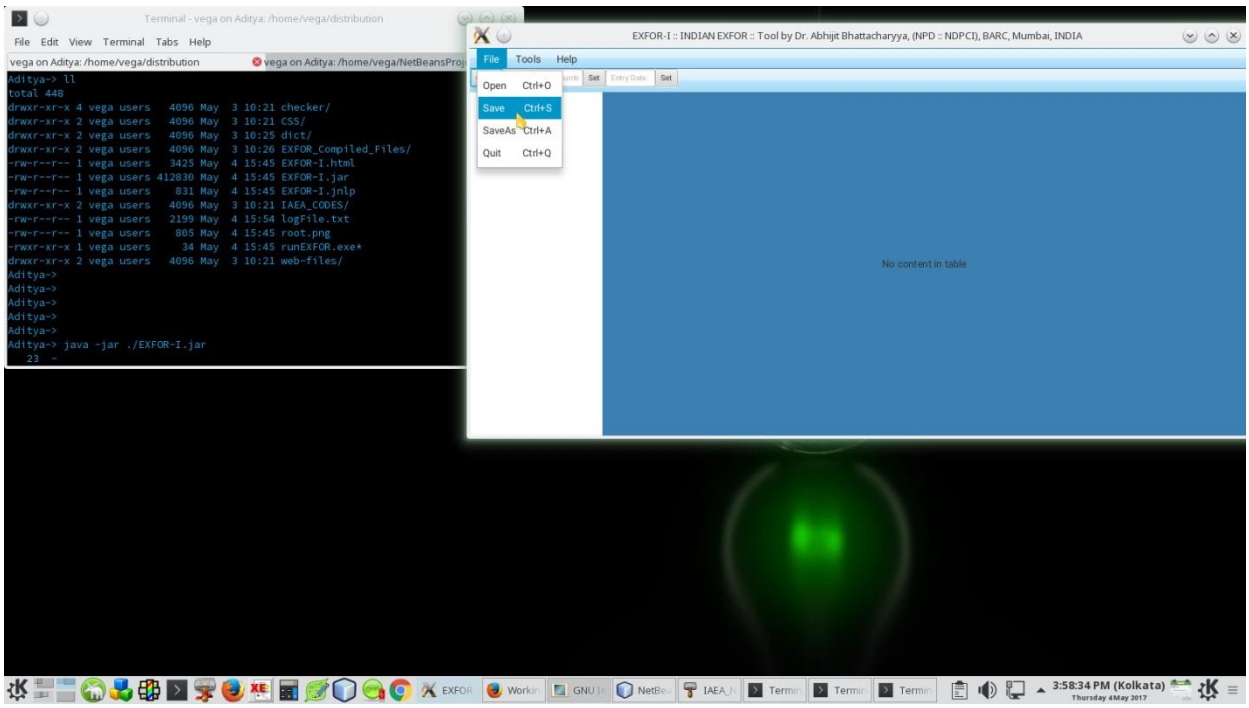

FIG. 17: A photo of EXFOR-I (File Menu options)

- An old file can be opened from “File” menu.
- Also file in edit can be saved from “File” menu.

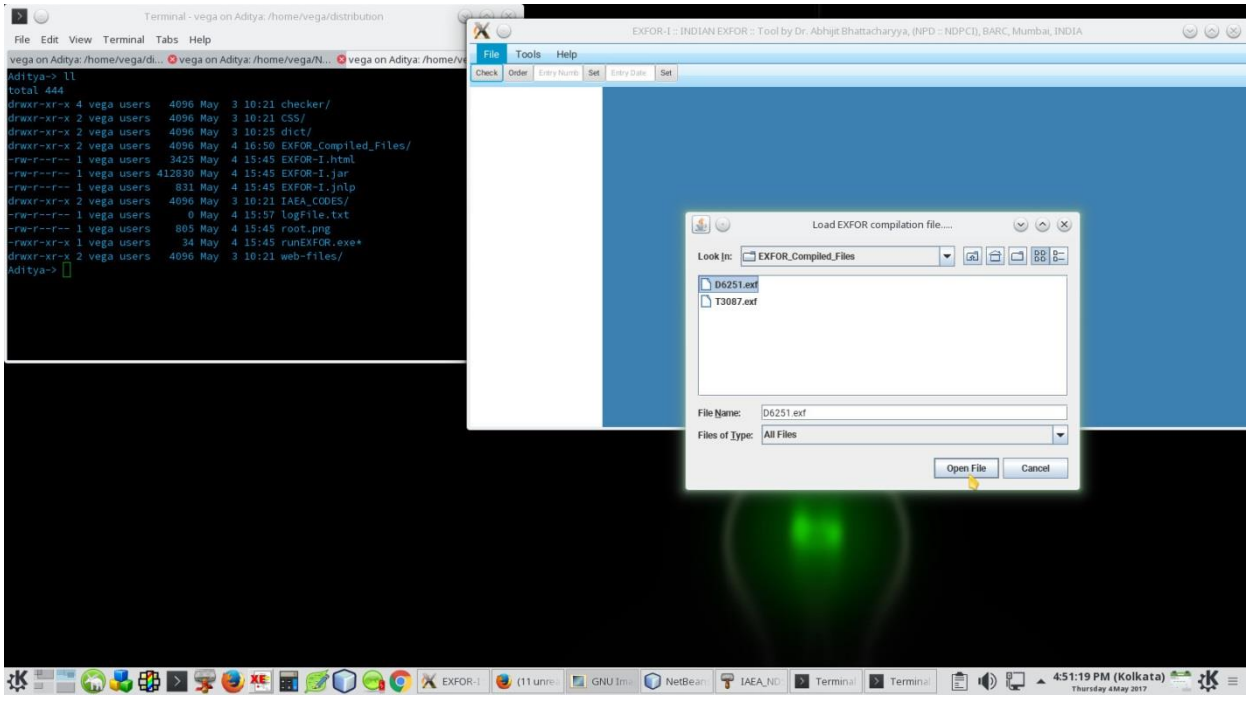

FIG. 18: A photo of EXFOR-I (File open dialog)

“File -> OPEN” opens a dialog box showing EXFOR files. The directory can be changed while this directory is default for loading and saving so that all EXFOR files may be available in one single directory.

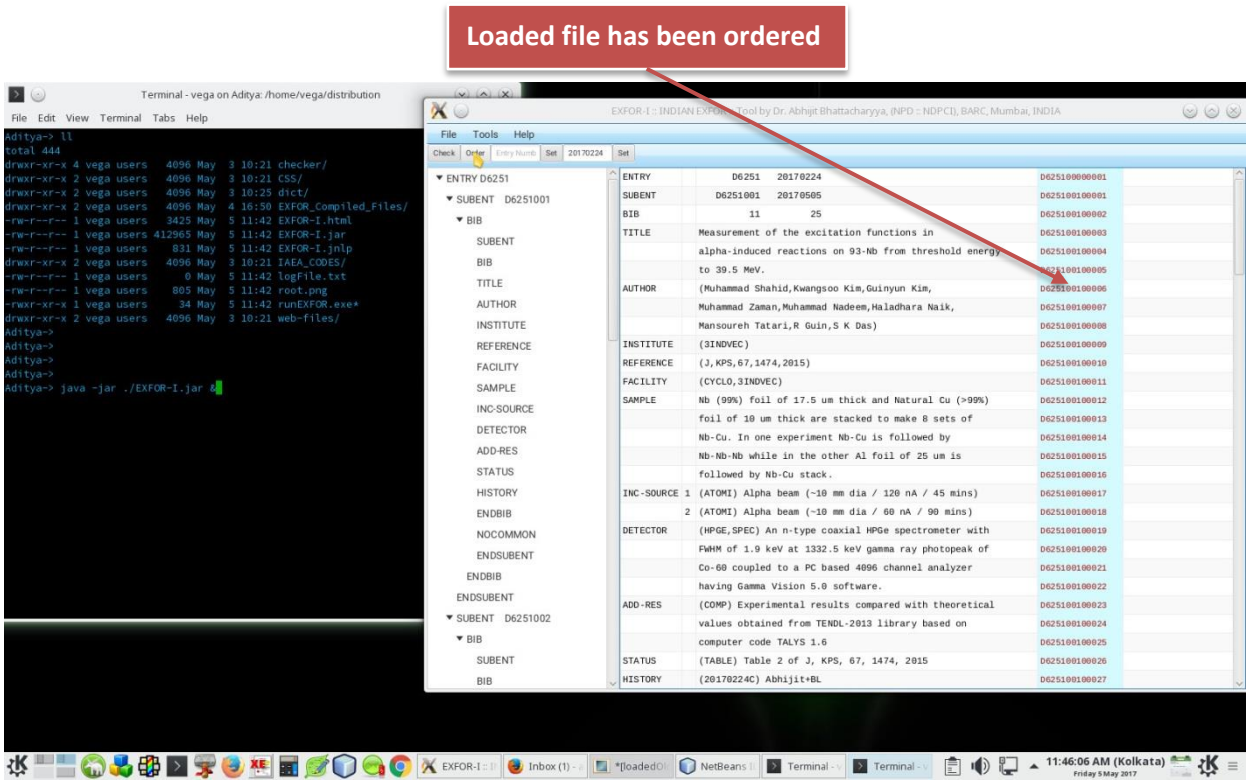

FIG. 19: A photo of EXFOR-I (Loaded file ordered)

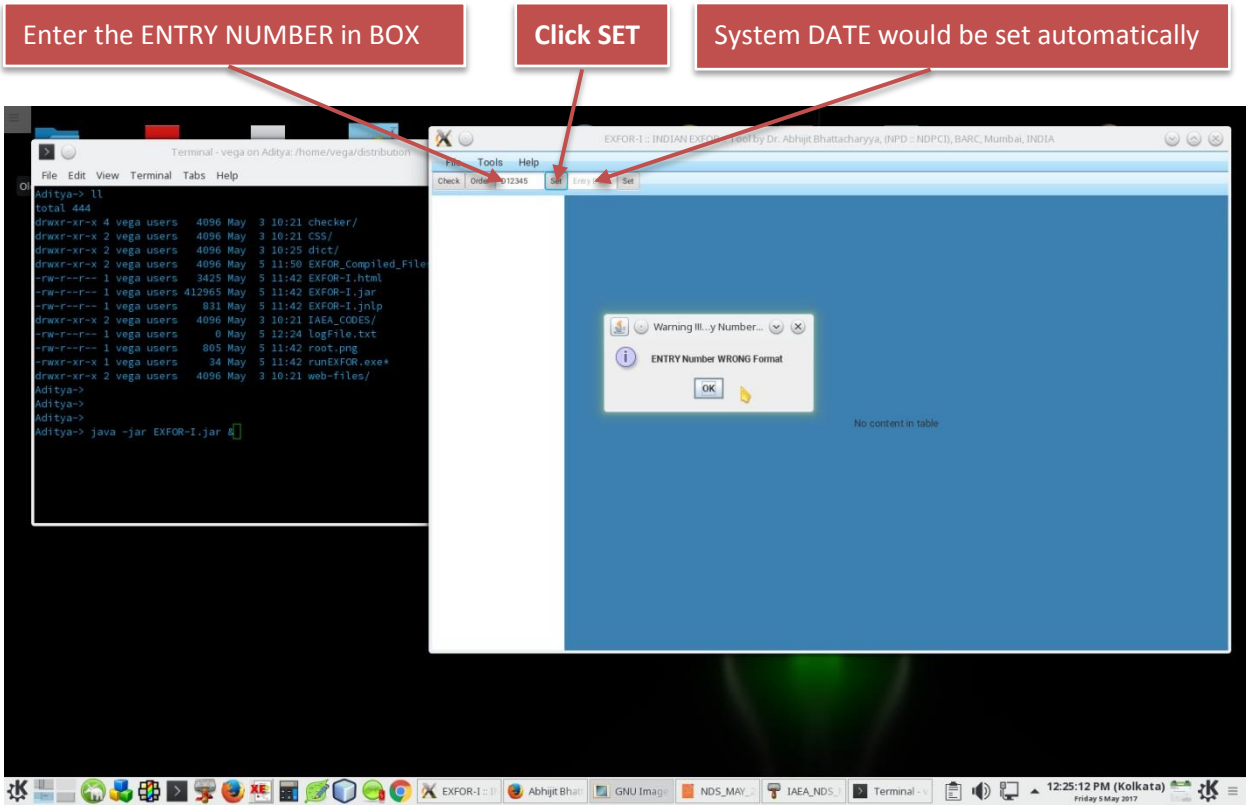

FIG. 20: A photo of EXFOR-I (Type entry number to create new EXFOR file)

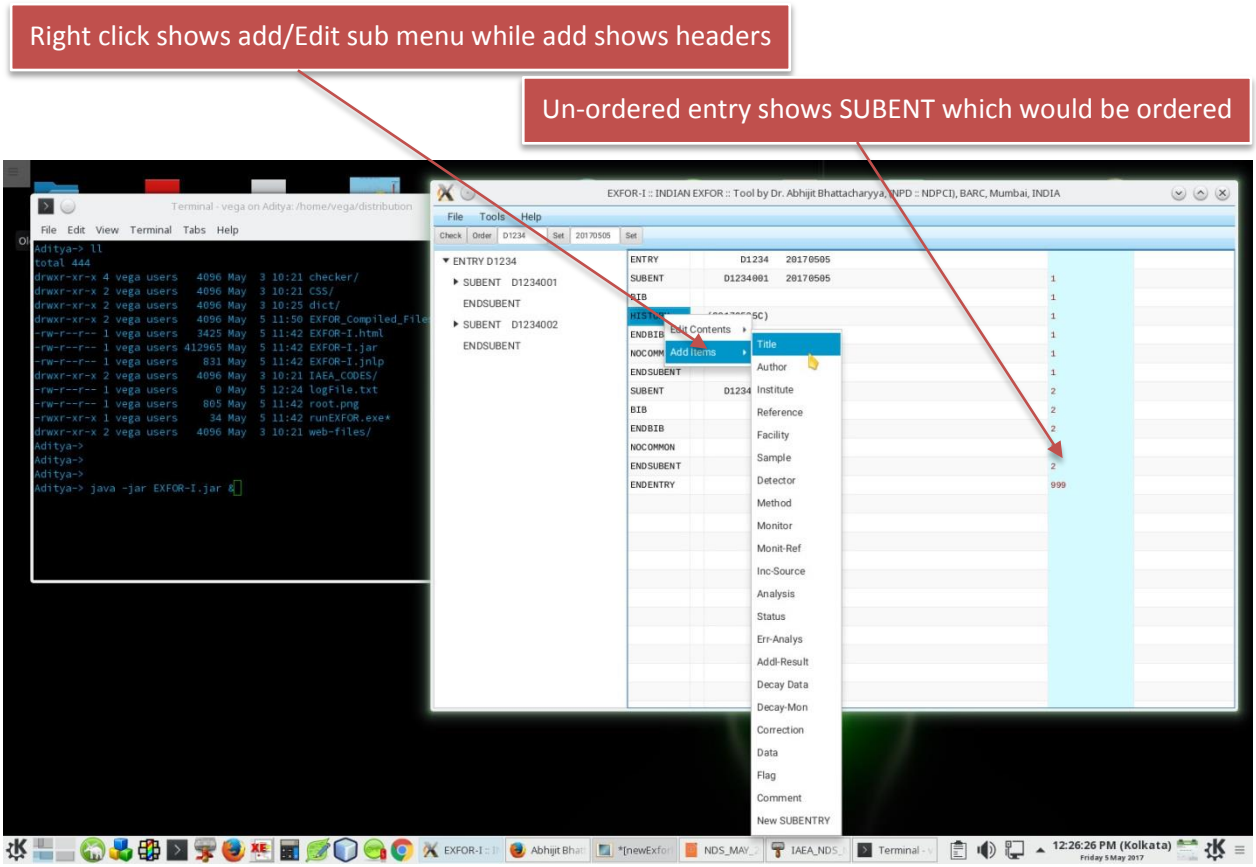

FIG. 21: A photo of EXFOR-I (Right-Click shows headers to be added)

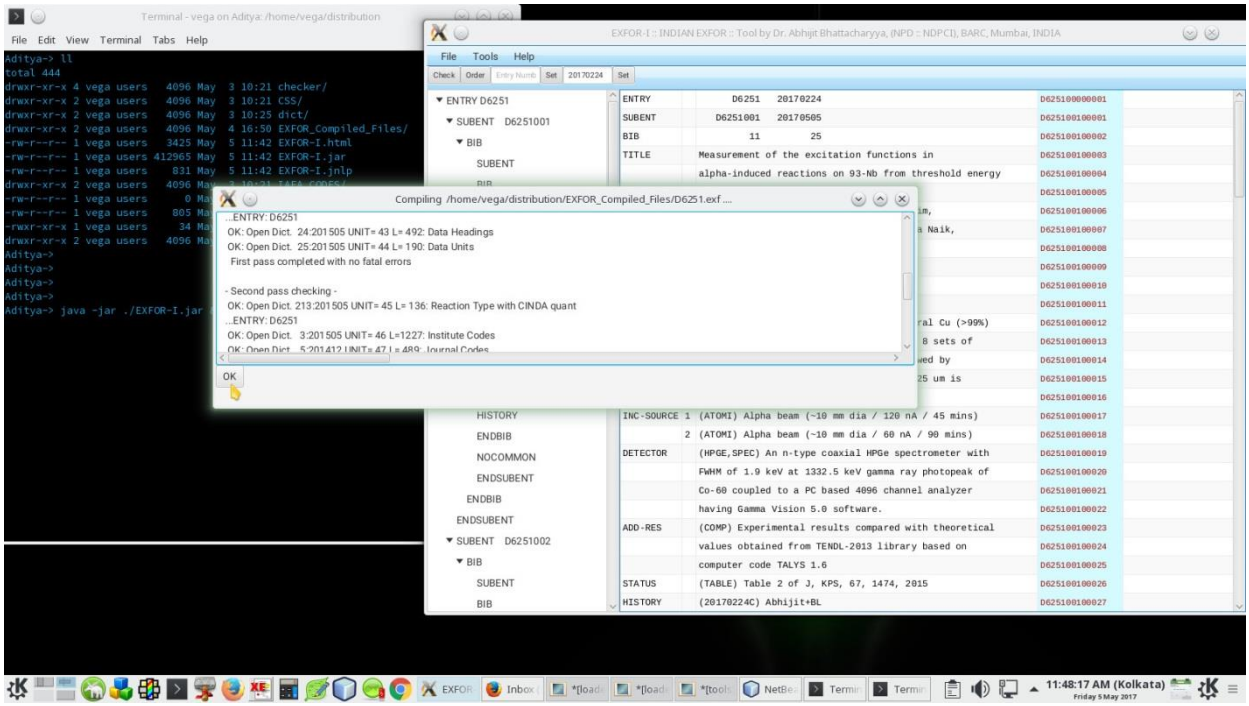

FIG. 22: A photo of EXFOR-I (CHEX dialog)

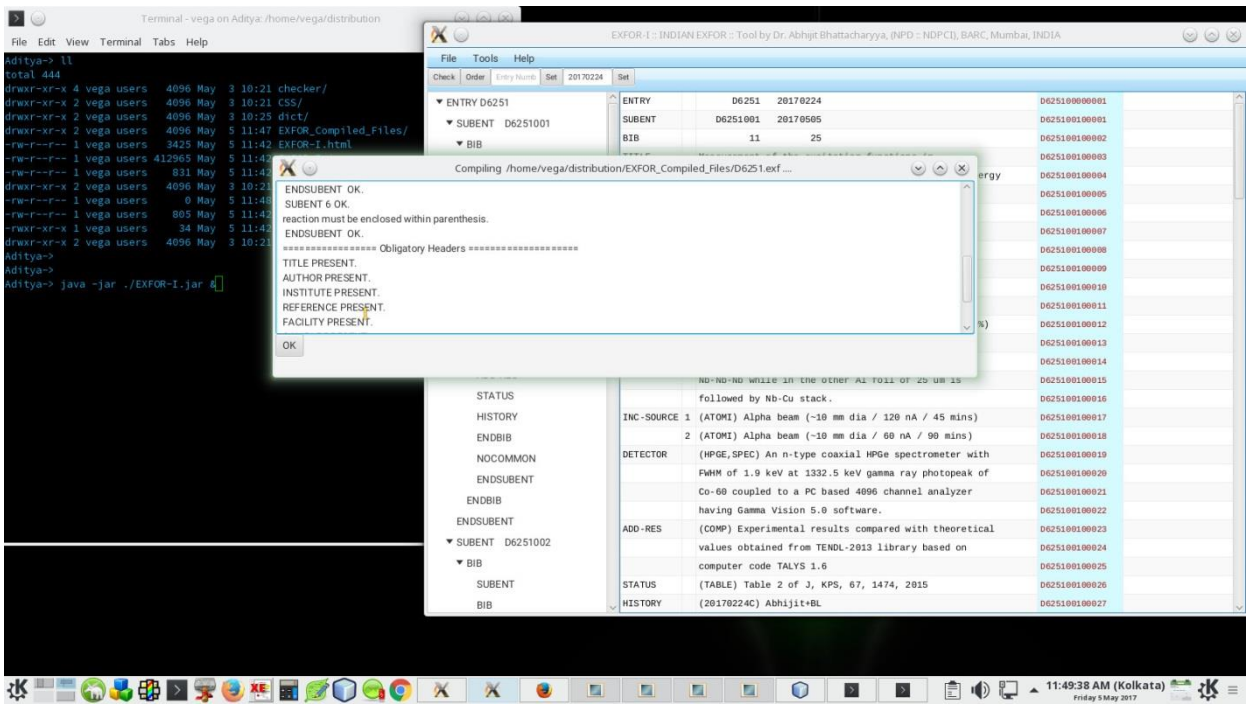

FIG. 23: A photo of EXFOR-I (own checker)

EXFOR-I: I => India :: I => Intelligent Interface

- EXFOR-I: demands continuous input from users for continuous evolution in the line of user-friendliness, automated correction etc.
- EXFOR-I: *requests NDS to think on modification of grammers to implement proper English language grammer specially punctuation, spaces etc.*
- *Entries tested: 33087, D6191, D6196, D6199, D6211 and D6251.*