Instruction to use Oxbash shell model code

The shell model code Oxbash is installed on ksf121 Linux PC of KO group. There exists a *guest* account for those who do not belong to KO group and who wish to use Oxbash. There are several ways to access ksf121:

- from any IKS Windows machine using `putty` program which is available from

  `\\iks222\setup win98\IP Network\Putty`

  (use `ssh`-type connection, i.e. port 22);

- from any IKS Linux machine (e.g., ksf122, ksf123 in the Computer room: ask Luc for a password) using `ssh`:

  ```
  ssh guest@ksf121.fys.kuleuven.ac.be
  ```

- From any Linux machine from outside IKS through iks32 using `ssh`:

  ```
  ssh loginname@iks32.fys.kuleuven.ac.be
  password
  ssh guest@ksf121.fys.kuleuven.ac.be
  ```

Then follow the instructions. The manual on using Oxbash code can be found in the directory `~/ko/Oxbash/txt/shell.tex` or `~/ko/Oxbash/txt/shell.txt`.

1. Input the password for *guest* (ask Luc, Marcus or Valentin for it). Your current directory is

   `/home/nis/guest`

2. Type

   `cd ../ko`

   Your current directory is

   `/home/nis/ko`

3. Type

   ```
   csh
   source .oxbashlogin
   cd Oxbash/rsh
   ```

4. Create your subdirectory, where you will do your calculations, e.g.

   ```
   mkdir yourname
   cd yourname
   ```

5. Choose from the appropriate model space and interaction for your calculation from the file `label.dat` (it is in `~/ko/Oxbash/sps`).

6. Run the Oxbash `shell` program:

   ```
   shell
   ```

7. Input interactively the information required for your nucleus, consulting the list of model spaces and interactions (see `label.dat`). Please, discuss your choice of the model space and interaction with Nadya, before performing the calculations.

   Sample input to `shell` for calculation of the spectrum of ^{20}Ne . Input is shown in " " (do NOT type " " when introducing your data !) <CR> stands for carriage return.

   ```
   Name for command file (<CR>=SHELL) :"ne20"

   Option (vec, lpe, den, st or h) :  "vec"
   Single-particle state file :  "sd"
   Total number of valence particles :  "4"
   Any restrictions ?  (y/n) :  "n"
   Interaction filename :  "w"
   Min.  J, Max.  J : (2F) : "0.,2."
   Min.  T, Max.  T : (2F) : "0.,0."
   Bad J, T values (2F) (or <CR> for no more) :
   Parity (0=+VE, 1=-VE, 2=both) :  "0"

    b0004w  :+basis +proj +matrix +lanczos mvec b0004w

    b2004w  :+basis +proj +matrix +lanczos mvec b2004w

    b4004w  :+basis +proj +matrix +lanczos mvec b4004w
   Option (vec, lpe, den, st or h) :  "st"

   File ne20.shl has been created
   Remember to set the +x bit on the file before execution.
   ```

   Two output files are created: `ne20.shl` and `ne20.ans`. Make the file `ne20.shl` executable:

   ```
   chmod u+x ne20.shl
   ```

8. Execute `ne20.shl` :

   ```
   source ne20.shl
   ```

9. Use `level` program to arrange the calculated energy levels:

   ```
   level
   ```

   Sample input to `level` for arrangement the levels of ^{20}Ne in increasing order.

   ```
   Name of .eig file :  "b0004w"
   Min J, Max J,EGS (F): For no change in EGS leave EGS blank:  "0.,2., ,"
   Min T, Max T, N(hw) (F): Leave N blank if nhw is not desired in *.LEV:
   ```

```
"0.,0., ,"
Min Parity, Max Parity (I) : "0,0,"
Max number for state nos.(CR for all):  "10,"
***** SET IPLOT = 1 IF PLOT FILE IS DESIRED
***** SET IPUB = 1 if "Latex" FILE IS DESIRED
***** SET ITP = 0 IF *.LEV SANS 2*T IS DESIRED
***** SET ITP = 1 IF *.LEV WITH 2*T IS DESIRED
***** SET ITP = 2 IF *.LEV WITH 2*T & NHW IS DESIRED Input output options
defined above, Carriage return for defaults of ITP,IPUB,IPLOT = 0,0,0:
ITP,IPUB,IPLOT = "0,0,0,"
Elapsed time is 15.  seconds.


TEXT OUTPUT IS IN FILE: bjt04w.lpt
LIST OUTPUT IS IN FILE: bjt04w.lev
```

The final spectrum can be found in file bjt04w.lpt. Compare with the experimental spectrum.

10. Use `shell` again to calculate the one-body transition densities (OBTD), necessary further for the calculation of matrix elements of different operators.

    Sample input necessary for calculating $B(\mathrm{E2})$ value for the transition from the first excited 2^+ state to the 0^+ ground state in ^{20}Ne:

```
Name for command file (<CR>=SHELL) :"ne20tr"

Option (vec, lpe, den, st or h) :  "den"
d,c,1,2,t,4,is,iv,it,at,bt or (h)elp ?  :  "t"
Initial state m-scheme eigenfunctions filename :  "b4004w"
Min.,Max.  vectors reqd.  (-1,-1 FOR ALL) : "1,1"
Final state m-scheme eigenfunctions filename :  "b0004w"
Min.,Max.  vectors reqd.  (-1,-1 FOR ALL) : "1,1"
 b4004w  Min.  J, Max.  J : (F) : 2.,2.
 b4004w  Min.  T, Max.  T : (F) : 0.,0.
Bad J, T values (2F) (or <CR> for no more) :
 b0004w  Min.  J, Max.  J : (F) : "0.,0."
 b0004w  Min.  T, Max.  T : (F) : "0.,0."
Bad J, T values (2F) (or <CR> for no more) :
Restrict coupling for operator :  "n"
01 01
mvec b4004w
mvec b0004w
tramp b4004w b0004w b4004w000.trd
```

```
Option (vec, lpe, den, st or h) :  "st"

File ne20tr.shl has been created
Remember to set the +x bit on the file before execution.
```

Two output files are created: `ne20tr.shl` and `ne20tr.ans`. Make the file `ne20tr.shl` executable:

```
chmod u+x ne20tr.shl
```

11. Execute `ne20tr.shl` :

    ```
    source ne20tr.shl
    ```

12. Use `trans` program[1] to calculated the transition probabilities, static moments or β-decay rates. Compare with the experimental data.

[1] At this moment, it is not working yet. Those who wish to calculate particular transition rates, electromagnetic moments, β-decay rates, including realistic Woods-Saxon or Hartree-Fock wave functions, contact Nadya for her own programs.