

## NEO-2 Quick Start Manual

1) VMEC / NEMEC / V3FIT equilibria from Erika Strumberger and David Terranova:  
e.g., /proj/plasma/Neo2/ASDEX-U/32138/

comment:

Erika's file format → out\_neo-2\_XXX (Boozer file)

David's file format – wout\_XXX.nc (VMEC) → Konvertierung in Boozer file notwendig

Ad David's VMEC / V3FIT equilibria:

/proj/plasma/Neo2/NTV/Boozer\_files\_perturbation\_field/ASDEX\_U/vmec2boozer/

./run\_boozerpy.sh wout\_XXX.nc NSURF

2) Converting Boozer files into the NEO-2 format:

i.e., decomposition with respect to toroidal mode number ,n'

e.g., /proj/plasma/Neo2/NTV/Boozer\_files\_perturbation\_field/ASDEX\_U/32138/

comment:

Copy / link Boozer file from 1) into the working directory.

Launch Matlab script extract\_pert\_field\_asedex.m.

If necessary, adapt line 1-3 of the Matlab script (e.g., filename).

3) Plasma profiles for multi-species NEO-2 computations:

e.g.,

/proj/plasma/Neo2/NTV/ASDEX\_INPUT\_CONVERTER/30835\_MULTISPEC\_TEST/

a) Template for single-species computations:

impurity\_profile\_1spec.m

a) Template for multi-species computations:

impurity\_profile.m

comment:

Profile data is provided by experimentalists in (usually) different formats.

Therefore a manual pre-processing of input data is nearly always necessary.

The necessary HDF5 input file for NEO-2 is generated in the Matlab script (line 458-EOF).

Look for „h5write()“ for necessary input.

4) Preparatory work for a NEO-2 run (example):

/temp/andfmar/NTV\_220917\_profileAUG32169woHelCore\_vmecAUG32138\_nspec2\_VphiProfFSAV/

a) Create „CODE“-directory:

git clone /proj/plasma/Git/NEO-2-MODULAR.git/ .

Change to „NEO-2-QL“-directory and create „Build“-directory.

Compile NEO-2 in „Build“-directory – cmake .. && make

Debug flags can be activated - cmake -DCMAKE\_BUILD\_TYPE=DEBUG . . && make

b) Create „RUN“-directory:

These input-files are required by NEO-2:

.) profile - multi\_spec\_aug32169\_t4.1500.in

.) Boozer files – „aug\_2\_rmp-n0.bc“ (axisymmetric) + „aug\_2\_rmp-n1.bc“ (perturbation)

Please mind the length of the filename („aug-XXX.bc“) which has to be specified within „neo.in“.

If Condor is used, a copy of the Boozer files should be stored in „/temp“.

.) Link executable neo\_2.x from „Build“-directory into the „RUN“-directory

.) Copy neo.in into the „RUN“-directory und set switches properly:

For ASDEX-U following switches must be set -

„in\_file=aug\_2\_rmp-n0.bc“, „lab\_swi=10“ and „inp\_swi=9“.

.) Copy neo.in into the „RUN“-directory und set switches properly:

For ASDEX-U following switches must be set

*! settings for multi-species computations*

*&multi\_spec*

*lsw\_multispecies = .true.*

*isw\_multispecies\_init = 1*

*fname\_multispec\_in='multi\_spec\_aug32169\_t4.0210.in'*

*isw\_coul\_log = 0 ! 0: Coulomb logarithm species independent*

*isw\_calc\_Er = 1*

*isw\_calc\_MagDrift = 1*

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*! settings for NTV computations*

*&ntv\_input*

*isw\_ntv\_mode = 0 ! unused at the moment*

*isw\_qflux\_NA = 1 ! turn on(=1)/off(=0) computation of non-axisymmetric part*

*in\_file\_pert = 'aug\_2\_rmp-n1.bc' ! 'tok-synch2-n3.bc' ! perturbation field file*

*MtOvR = 0.0d0 ! toroidal Mach number (only important for Mach num scans)*

*B\_rho\_L\_loc = 0.0d0 ! Larmor radius times B*

*isw\_ripple\_solver = 3 ! ripple\_solver version*

*isw\_mag\_shear = 1 ! turn on(=1)/off(=0) non-local computations (mag. shear)*

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5) Launch ./neo\_2.x

NEO-2 runs in „profile“-mode und generates directories „es\_XXX“

6) Change to directory „es\_XXX“, generate hostfile „hosts“ and launch ./run\_neo2.sh

7) Output „neo2\_multispecies\_out.h5“ is computed:

See /proj/plasma/Neo2/NTV/RIPPLE\_SOLVER\_NORMALIZATION/ for further documentation

8) Finally there exists a possibility to merge the HDF5 output files:

/temp/andfmar/NTV\_220917\_profileAUG32169woHelCore\_vmecAUG32138\_nspec2\_VphiProfFSAV/CODE/MULTI-SPEC-TOOLS/h5merge\_multispec.f90

„final\_neo2\_multispecies\_out.h5“ will be generated

Please mind that NEO-2 Output is given in cgs-units.

9) Plot NEO-2 output:

/proj/plasma/Neo2/NTV/AUG32169\_DATA/NEO2\_MULTISPEC\_DATA\_VMEC31021\_  
PROF32169/

see Matlab script „plot\_4spec\_ZWav\_wHelCore.m“