

REPORT II ON PROGRESS: CORRECTNESS CRITERIA & RESULTS

By:

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1. introduction:

in this report I represent the results of the calculated elastic differential cross-sections for different gases Vs the NIST Database for three different gases.

2. On the NIST Database:

in the NIST Database The differential elastic-scattering cross sections (DCSs) were calculated using the relativistic Dirac partial-wave method, as described by Walker [3]. The scattering potential was obtained from the self-consistent Dirac-Hartree-Fock electron density for free atoms.

3. the gas-choice criteria:

three different gases were chosen, at different energies, based on the following:

1. Hydrogen [H]: the simplest atomic system.
2. Nitrogen [N]: complex system non-noble gas.
3. Argon [Ar]: noble and more complex than the Nitrogen.

4. correctness and accept-ness criteria:

the Root Mean Square Error (RMSE) method was chosen as a method to judge the correctness of the method. And the model will be considered powerful if the $RMSE < 0.5$

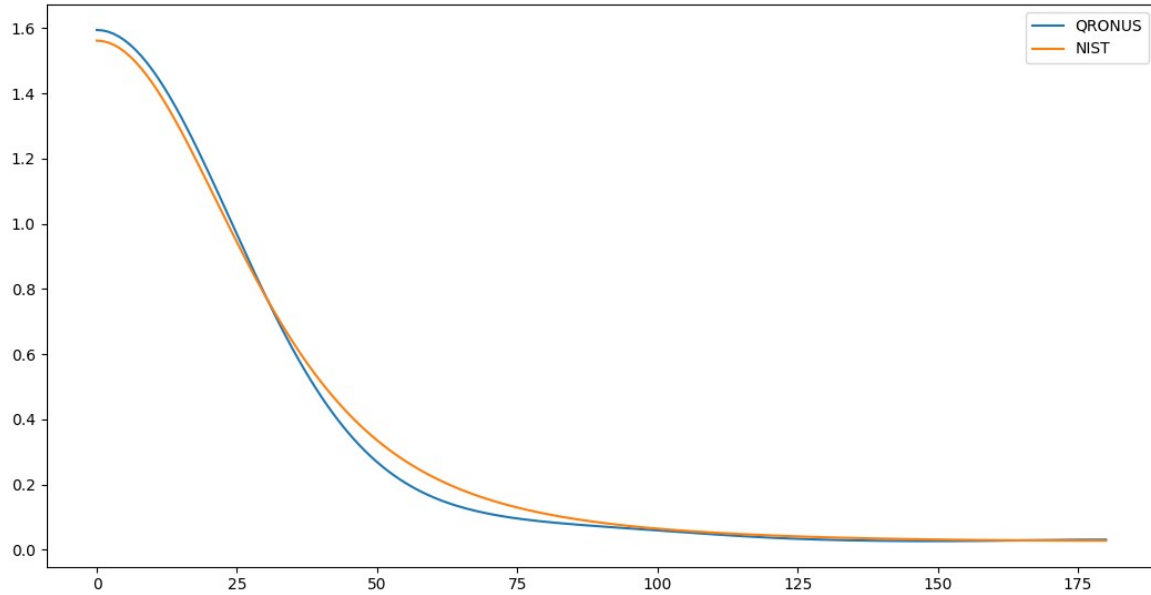
note on the system of units: the differential cross-sections was calculated in terms of (a_0^2) were a_0 is the Bohr radius (which is set to 1 in atomic units system)

note on the choice of electron instead of muon: the available online data on electron is much more than that available on the muon, but mathematically there is no real distinction between muons and electrons other than the mass. Accordingly, in principle, both muon-atom and ion-atom interactions can be handled in the same way described in the first report: Introducing QRONUS

5. Results:

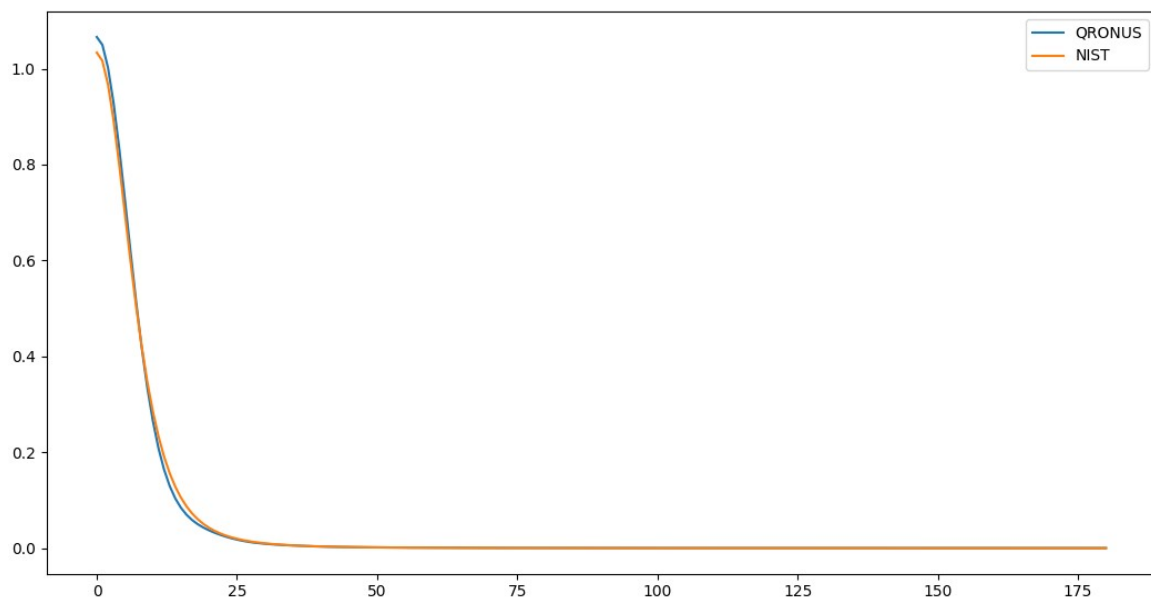
5.1. HYDROGEN [H]:

5.1.1: 50 eV:



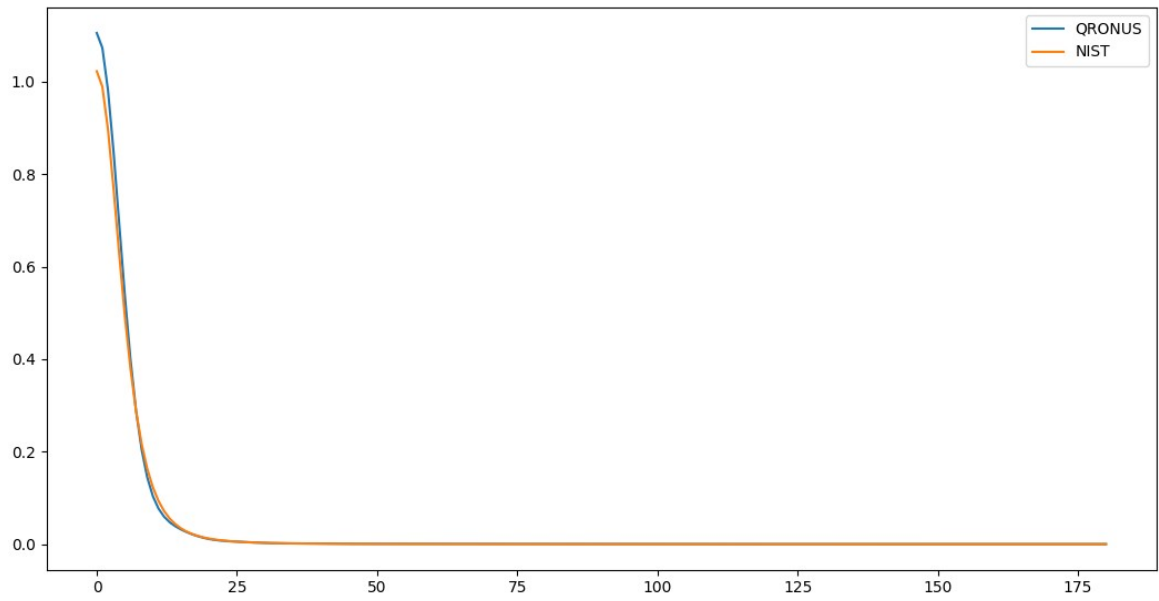
(elastic differential cross-section [ao^2] y-axis Vs the scattering angle [degree] x-axis)
RMSE=0.03

5.1.2: 1000eV



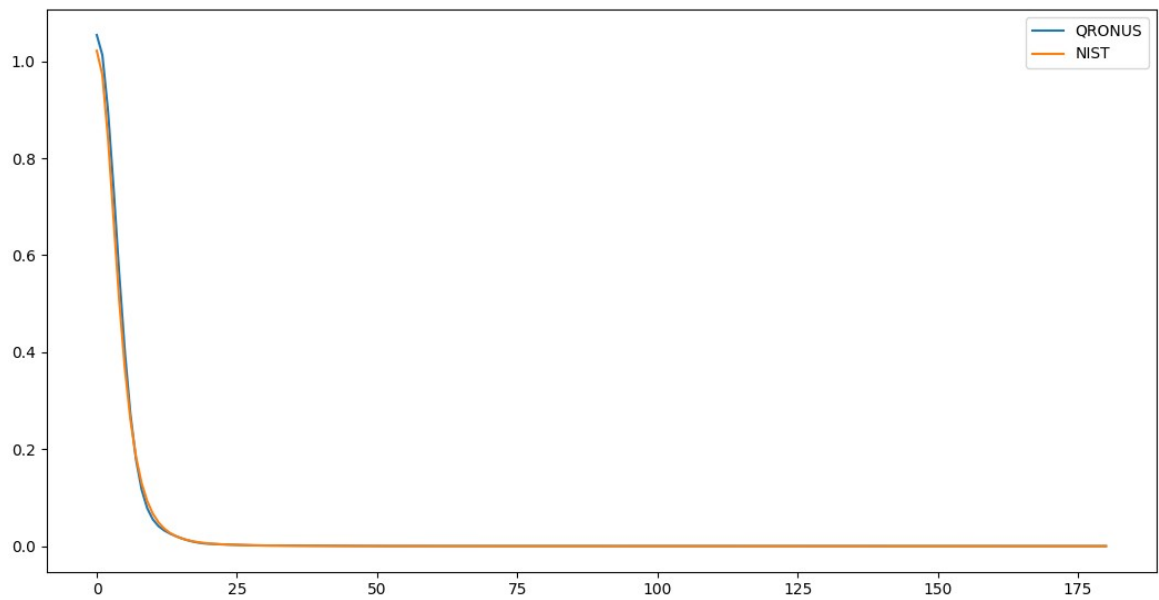
(elastic differential cross-section [ao^2] y-axis Vs the scattering angle [degree] x-axis)
RMSE=0.008

5.1.3: 2000eV:



(elastic differential cross-section [ao^2] y-axis Vs the scattering angle [degree] x-axis)
RMSE=0.014

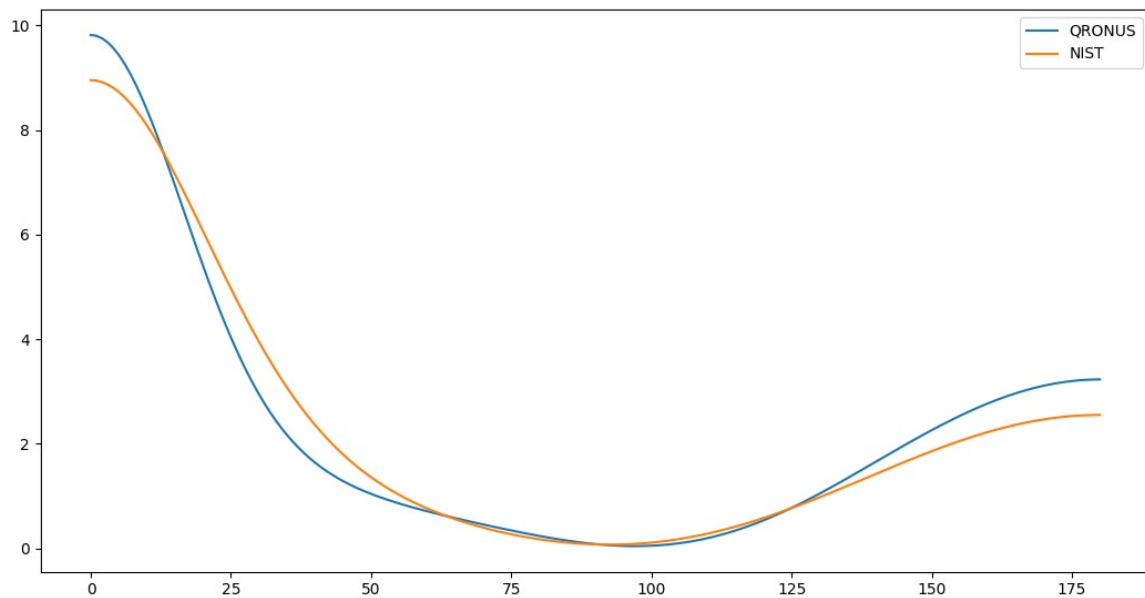
5.1.4: 3000eV:



(elastic differential cross-section [ao^2] y-axis Vs the scattering angle [degree] x-axis)
RMSE=0.009

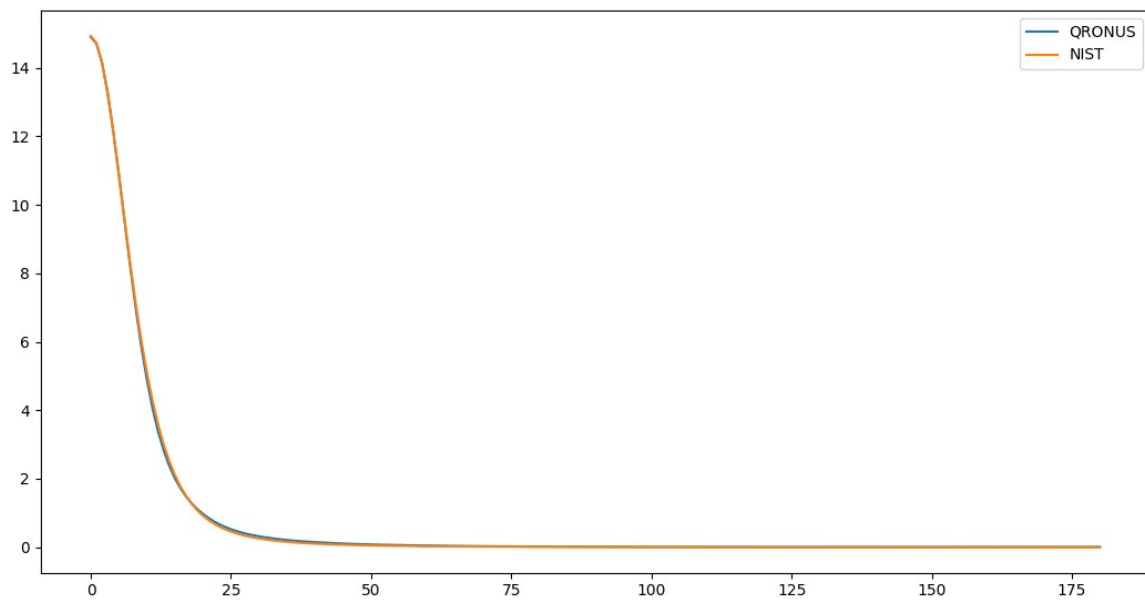
5.2: NITROGEN [N]:

5.2.1: 50eV:



(elastic differential cross-section [ao^2] y-axis Vs the scattering angle [degree] x-axis)
RMSE=0.457

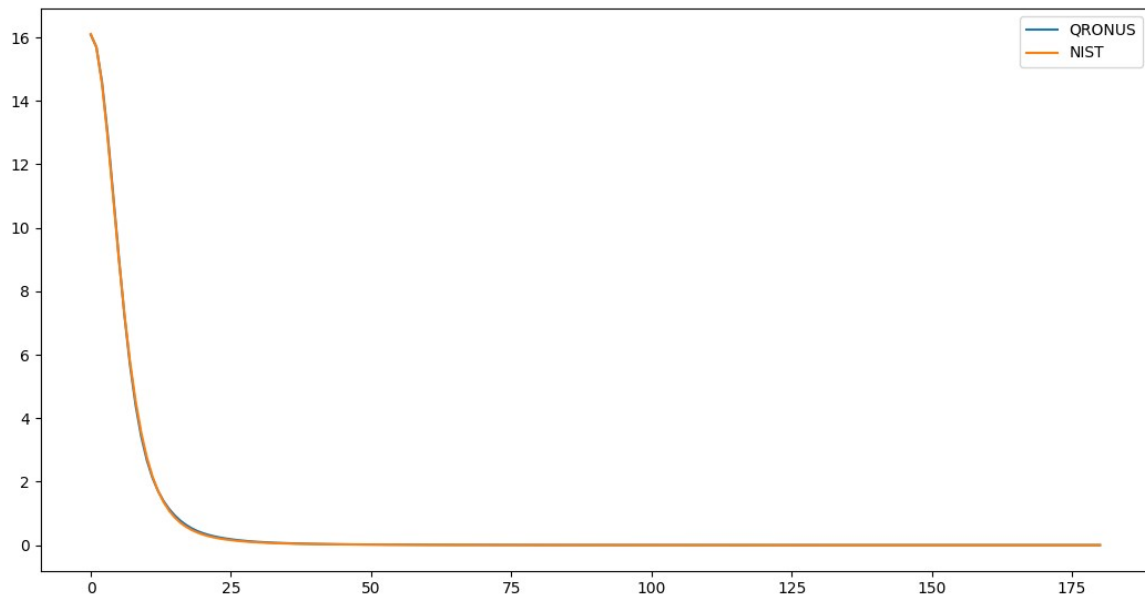
5.2.2: 1000 eV:



(elastic differential cross-section [ao^2] y-axis Vs the scattering angle [degree] x-axis)

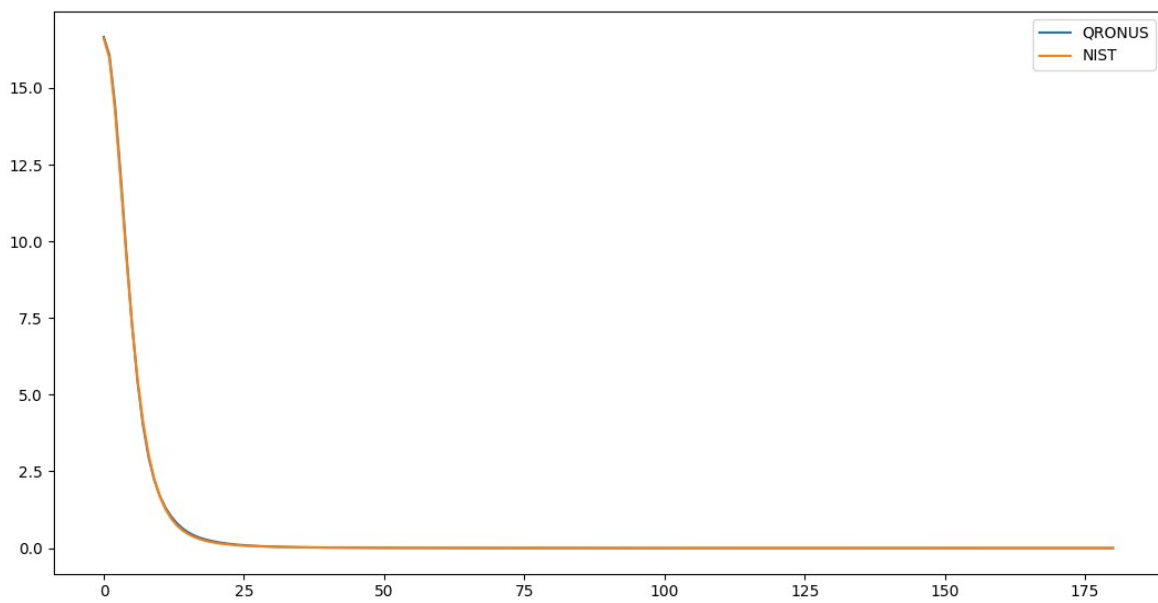
RMSE=0.04

5.2.3: 2000eV:



(elastic differential cross-section [ao^2] y-axis Vs the scattering angle [degree] x-axis)
RMSE=0.025

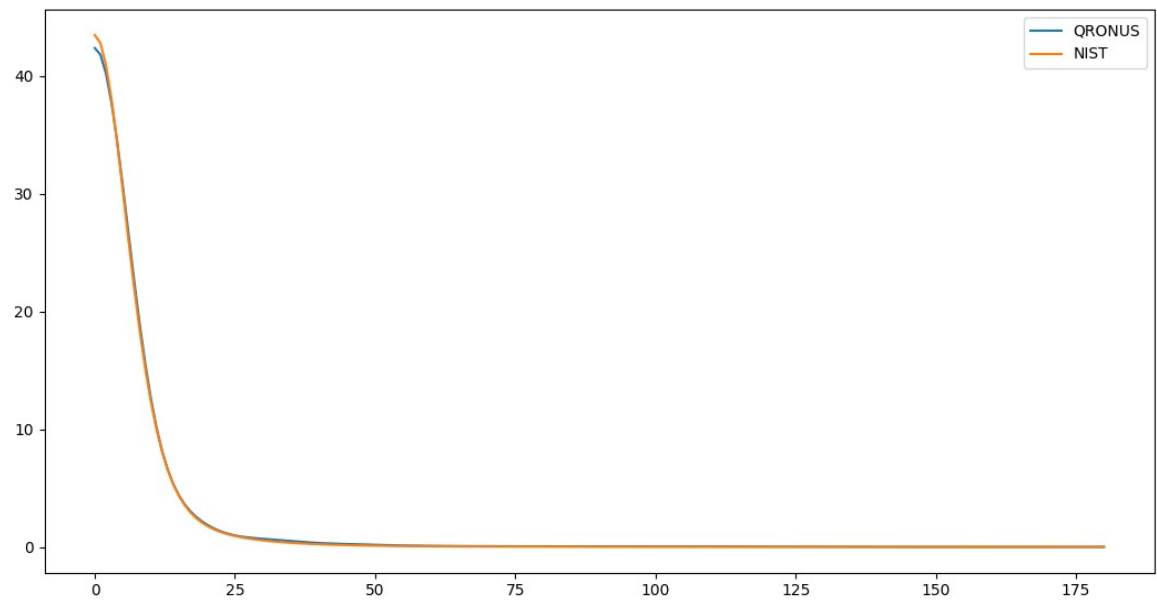
5.2.4: 3000eV



(elastic differential cross-section [ao^2] y-axis Vs the scattering angle [degree] x-axis)
RMSE=0.029

5.3: ARGON [Ar]:

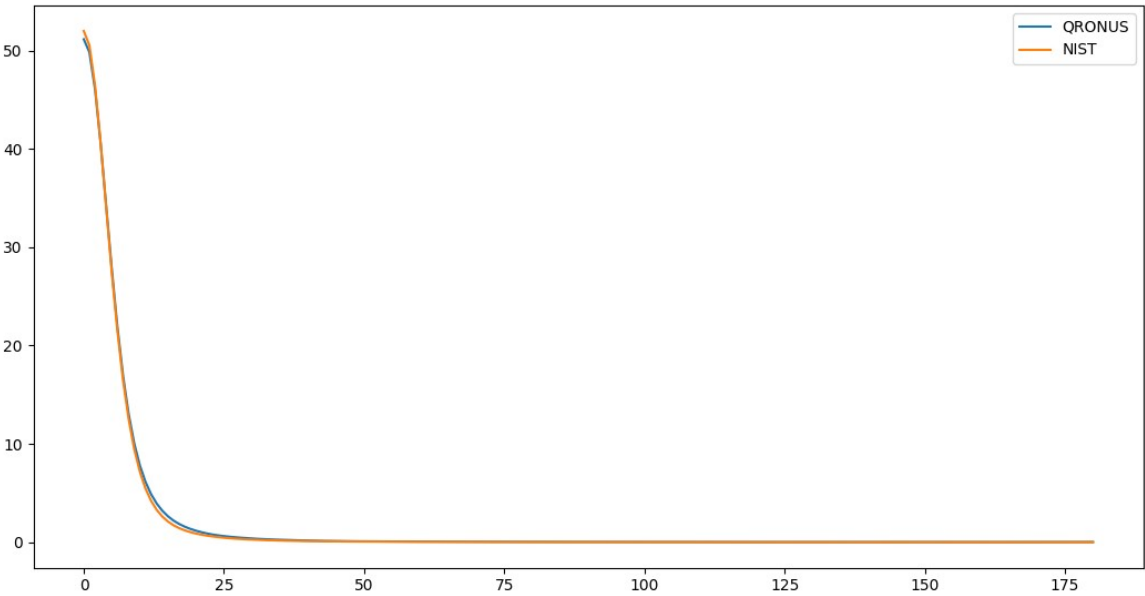
5.3.1: 1000eV:



(elastic differential cross-section [a^2] y-axis Vs the scattering angle [degree] x-axis)

RMSE=0.16

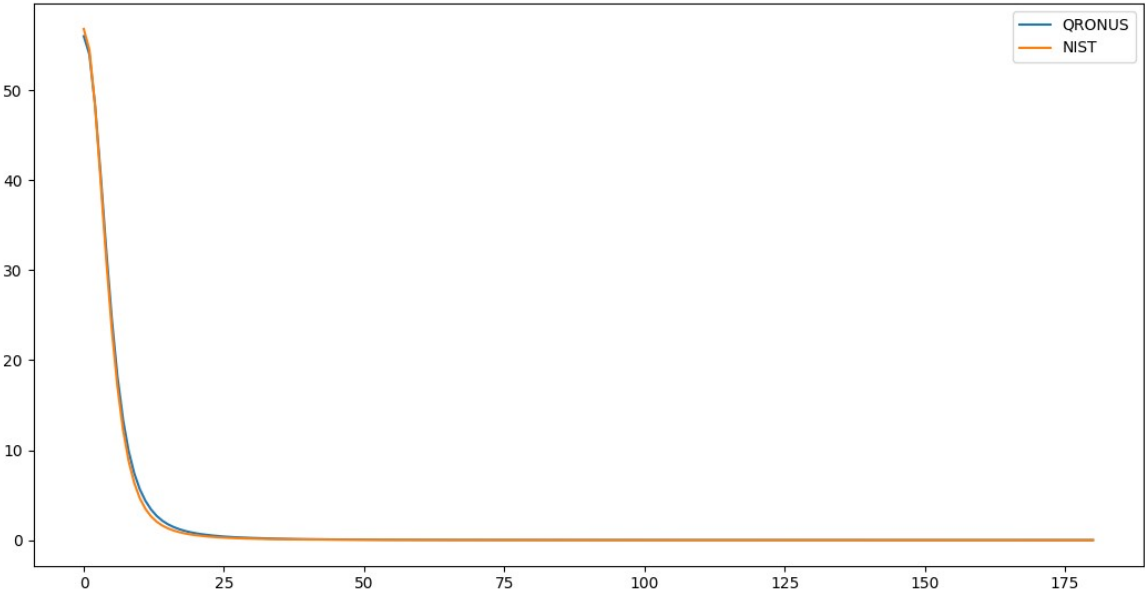
5.3.2: 2000eV:



(elastic differential cross-section [ao^2] y-axis Vs the scattering angle [degree] x-axis)

RMSE=0.18

5.1.3: 3000eV:



(elastic differential cross-section [ao^2] y-axis Vs the scattering angle [degree] x-axis)

RMSE=0.27