1. Beam penetration
   a. Ionization + CX data Beam emission (yes\no)
   b. Cx spectra

Proposal > Uniform plasma and codes calculate attenuation (dependence on magnetic field ?) mono-energetic beam.

Exercise 1. **Hydrogen**. Beam penetration only. **Atomic data (Rates) must be visible**

Modify the code if required…(the author must be able to do this ☺)

Parameter set: density(cm-3): 1e10   1e13   1e14

Temperature(eV): 100   1000   10000

Beam energy(keV):   25   50   100   500   1000

Length (cm):   first point 0 (beam intensity 1), 1000 points .. last point 5 m…

Impurity(individual)):   (H+) (He2+) (Be4+) (C6+) (Ne10+) (Ar18+)

Impurity(Zeff=2): H + X (X =He, BE, C, Ne, Ar; all are fully ionized)

Output: Populations: total, n=1, n=2, n=3,… all states that are in the model...

Exercise 2. Realistic scenarios. ITER-Scenario2. Input from HU.

1. Profiles are specified by the Input table (HU)
2. A) pure H plasma
   B) DT plasma scenario,
   C) Impurities from input table….

Output: Populations as in the exercise 1.

Exercise 3. Beam – emission modelling

a) Results from exercise 1
b) Results from exercise 2

Output: L-alpha, H-alpha,beta, gamma

KSTAR-Experiment

Input from HU… preferable the same conditions as for MSE-KSTAR

Exercise 4. MSE Data.

Hydrogen

Temperature(eV): 1000

Beam energy (keV): 50 100 500

Density (cm-3): 1e10   1e13   1e14

Magnetic field (T): 0 1 3   5 (magnetic field is perpendicular to the beam)

Output: Impulses at L-alpha, H-alpha,beta, gamma, populations of substates.

 KSTAR-Scenario , Input from KO….

Beam into gas as well

Pressure of the D2 molecules, energy of the beam, magnetic field

   Testing> Plasma would be semi-infinite (0.le.x), uniform, normally including a uniform magnetic field in the y-direction. Plasma electron density might be 1e14/cm3 always; bulk species is deuterium. Plasma temperature might be 100 eV, 500 eV, 2 keV, 10 keV. If there is an impurity then we might agree that Z_eff=2 in each case, and there is only a single impurity; say Be, C, N, Ne or Ar. (Need some care if the impurity would not be fully stripped.) Maybe consider some tungsten impurity as well.

Beam is propagating in the positive x-direction along the x-axis; ignore beam width on entry. The beam species would be deuterium and the energy might be 50 keV, 200 keV, 1 MeV. Initial state is pure, D(1s) or D(2s) or D(2p) in any polarization. Ignore beam density effects; assume independent beam particle model.

2. Beam emission . L-alpha emission / H-alpha, beta gamma
    a. Li beam and Na beam ,He beam (who else except for Hungary and ADAS, US ?)
    b. Beam-gas emission (tests)
    c. Approach reality (KSTAR as working experiment/horse,)

    The same conditions as in case of testing.

3. MSE Codes.

4.   Emission from "halo" (beam) Emission coefficients . But only atomic data ….