Status on SDT simulation

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Calculation (density/Mass fraction)

Case) gas-A: 80%, gas-B:20%
density : ρ_A (g/cm^3), ρ_B (g/cm^3)
molecular weight : N_A, N_B

Density of gas mixture :

$\rho_{AB} = (N_A*0.80 + N_B*0.20) / 22.4 / 1000$ [g/cm^3]

a check) C_4H_{10} only, N=58.12 (from a list)

ρ = 58.12 / 22.4 / 1000 = 2.595E-3[g/cm^3]

1mol = 22.4L (0° C) ➔
1mol = 22.4*(273+20)/273=24.04 L

ρ = 58.12 / 24 / 1000 = 2.422E-3[g/cm3]

a bit different . Though it is enough for current study …

Atomic and nuclear properties of butane (C_4H_{10})

Quantity	Value	Units	Value	Units
<Z/A>	0.59497			
Specific gravity (20° C, 1 atm)	2.489E-03	g cm^{-3}		
Mean excitation energy	48.3	eV		
Minimum ionization	2.278	MeV g^{-1}cm^2	5.670E-03	MeV cm^{-1}
Nuclear collision length	55.5	g cm^{-2}	2.231E+04	cm
Nuclear interaction length	77.1	g cm^{-2}	3.098E+04	cm
Pion collision length	83.2	g cm^{-2}	3.342E+04	cm
Pion interaction length	109.0	g cm^{-2}	4.377E+04	cm
Radiation length	45.23	g cm^{-2}	1.817E+04	cm
Critical energy	131.26	MeV (for e^-)	128.44	MeV (for e^+)
Molière radius	7.31	g cm^{-2}	2935.	cm
Plasma energy $\hbar\omega_p$	1.11	eV		
Muon critical energy	1557.	GeV		
Melting point	134.9	K	-138.2	C
Boiling point @ 1 atm	272.6	K	-0.5000	C

Composition:

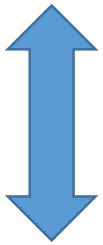
Elem	Z	Atomic frac*	Mass frac
H	1	10.00	0.173408
C	6	4.00	0.826592
* calculated from mass fraction data			

Example 1) He: 90%, C_4H_{10} : 10% , N_{He} = 4.003, N_{C4H10} = 58.12

ρ = (4.003*0.90 + 58.12*0.10) / 24 / 1000 = 3.923E-4[g/cm^3]

mass fraction :
He (90%) : C_4(10%) : H_{10}(10%) = 4.003*0.90 :
12.0107*4*0.10 : 1.008*10*0.10 = 3.6027 : 4.80428 : 1.008
= 0.38265 : 0.51028 : 0.10706

	Atomic mass [g/mole]
H	1.008
C	12.0107
O	15.999
He	4.0026
Ar	39.948



comparison with previous settings which was done using rough numbers (e.g. H=1) and referring FCC examples

```
<!-- He :  isoC4H10 =  90% : 10% -->
  <material name="GasHe_90Isob_10">
    <D value="0.00039839999999999" unit="g/cm3" />
    <fraction n="0.3826351004462046" ref="He"/>
    <fraction n="0.10637193737128589"   ref="H" />
    <fraction n="0.5109929621825095" ref="C" />
  </material>
```

again, the precision might be enough . . .

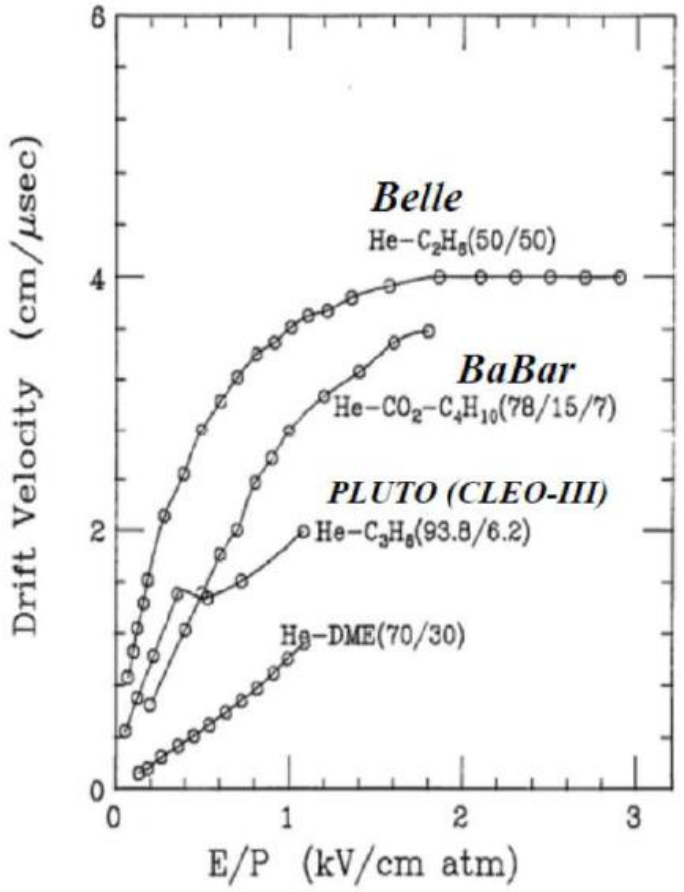
Next

- A trial , He (50%) : isoC_4H_{10} (50%)

- Make a simple guide(shell scripts?)

for my current procedure to reproduce the plots regarding dE/dx study
(today ?)

- From a discussion that try to reproduce the IP/momentum resolution plots, done at LDTv2.0, with the CEPCSW



-- confirmation of the LDT code/materials

-- check the CEPCSW framework (possibly with the latest version) , to know how we can achieve it