Language and its modules used

Since the code for Subchannel Analysis was written in Python, and Python provides good libraries for numerical computations, graph plotting and user interface designing, we used Python. It is a great general-purpose high-level language.

Used to plot and embed curves in the GUI

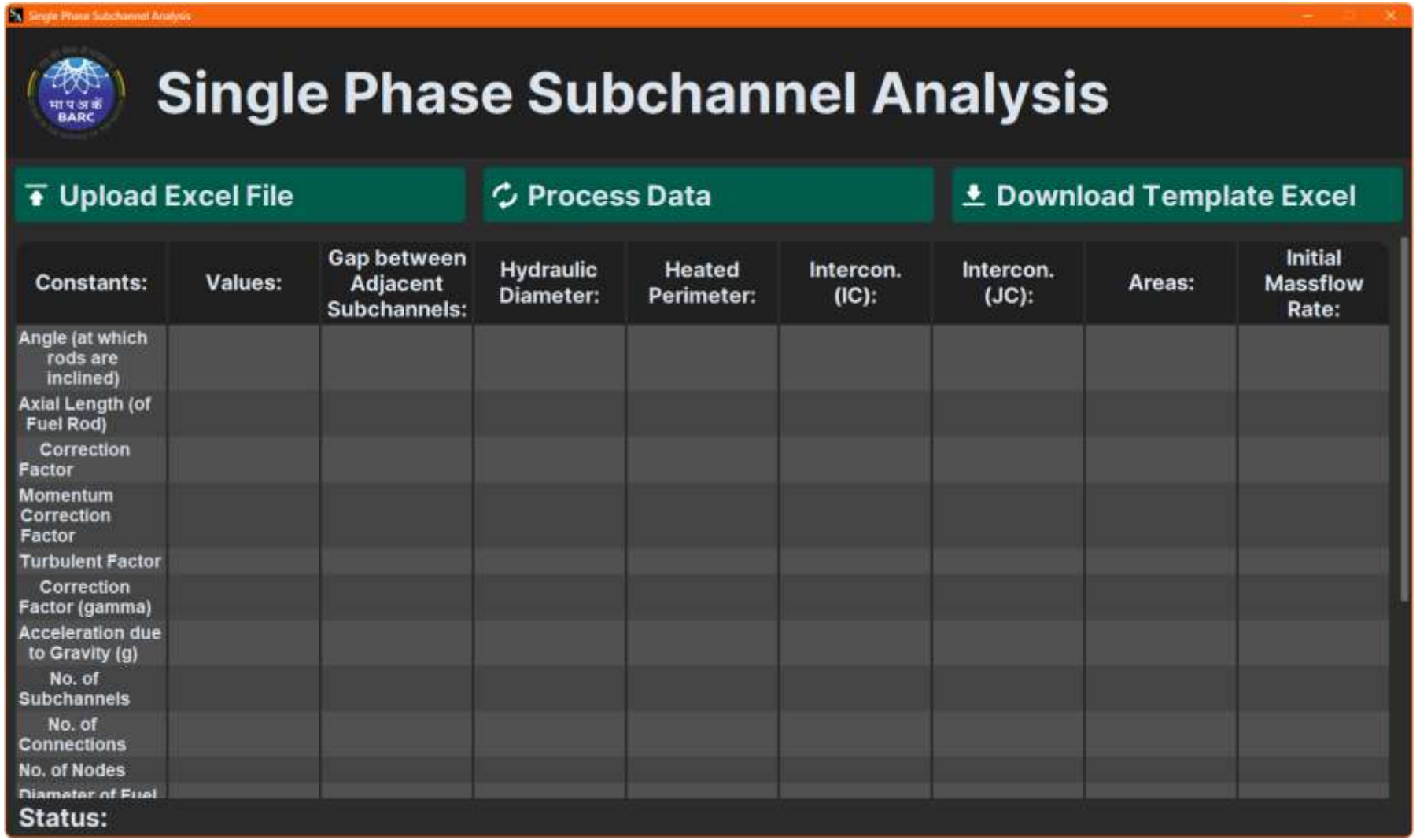
Used to make the GUI (includes all GUI elements)

Modern version of Tkinter, used to make and enhanced GUI (cross compatible with Tkinter elements). (Poor documentation!)

Used to Read and write the result files.

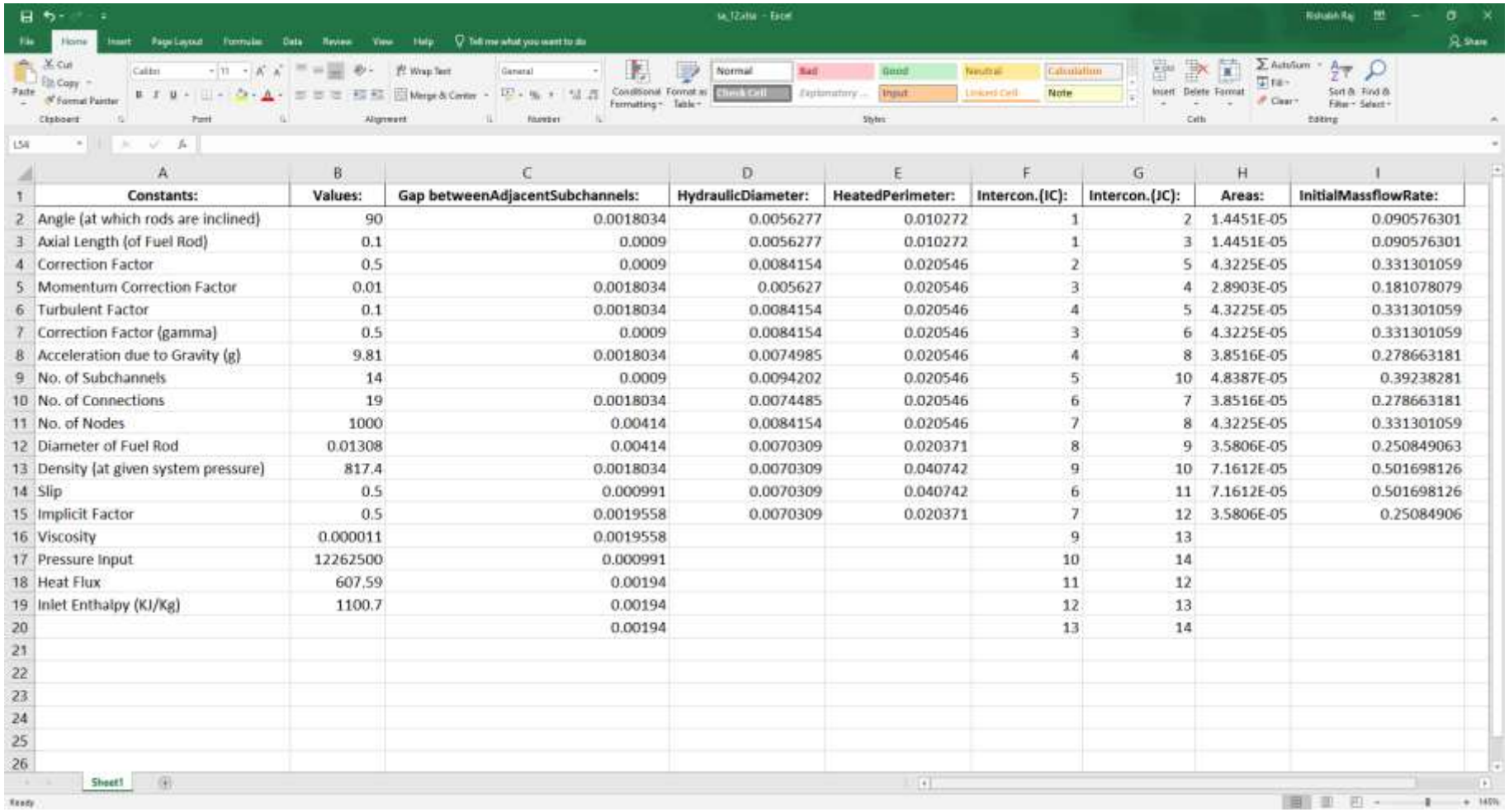
GUI

Opening Interface:



GUI

Template standardized data:

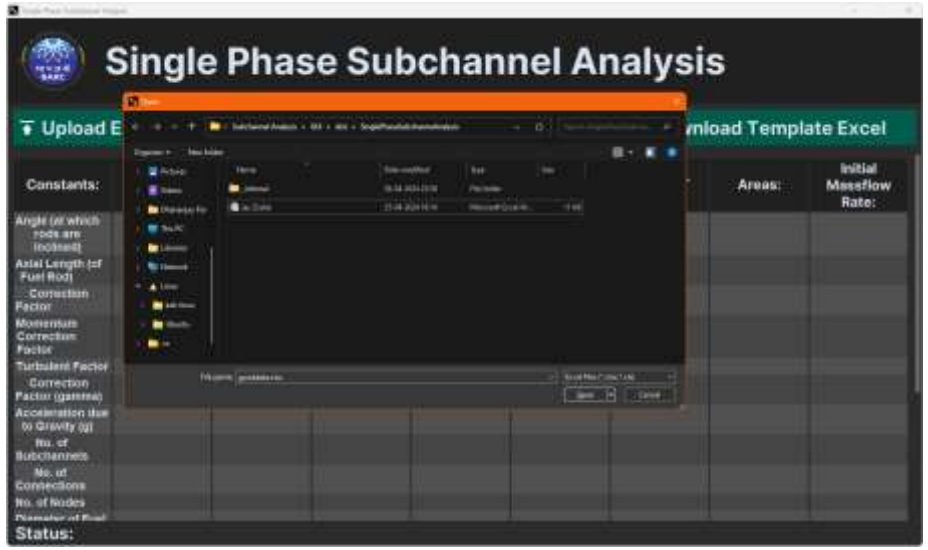


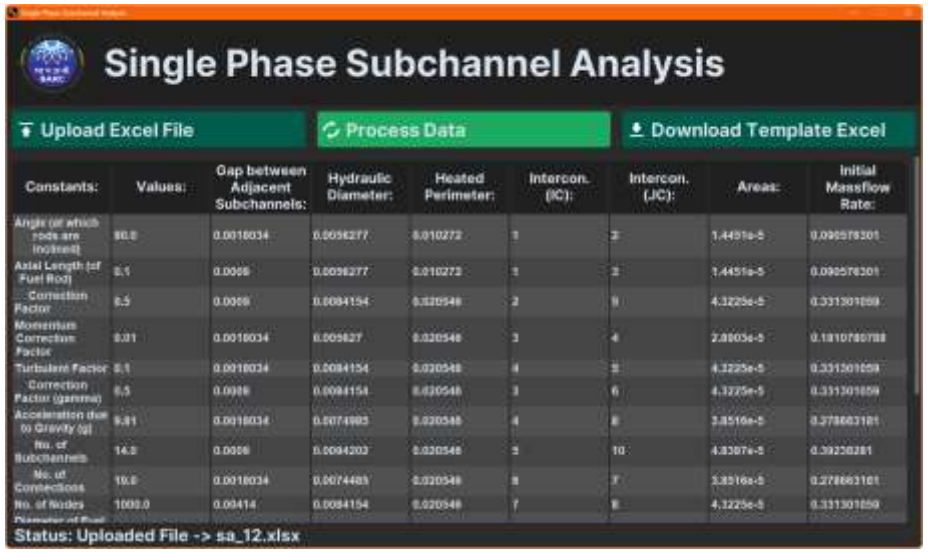
	A	B	C	D	E	F	G	H	I
1	**Constants:**	**Values:**	**Gap betweenAdjacentSubchannels:**	**HydraulicDiameter:**	**HeatedPerimeter:**	**Intercon.(IC):**	**Intercon.(JC):**	**Areas:**	**InitialMassflowRate:**
2	Angle (at which rods are inclined)	90	0.0018034	0.0056277	0.010272	1	2	1.4451E-05	0.090576301
3	Axial Length (of Fuel Rod)	0.1	0.0009	0.0056277	0.010272	1	3	1.4451E-05	0.090576301
4	Correction Factor	0.5	0.0009	0.0084154	0.020546	2	5	4.3225E-05	0.331301059
5	Momentum Correction Factor	0.01	0.0018034	0.005627	0.020546	3	4	2.8903E-05	0.181078079
6	Turbulent Factor	0.1	0.0018034	0.0084154	0.020546	4	5	4.3225E-05	0.331301059
7	Correction Factor (gamma)	0.5	0.0009	0.0084154	0.020546	3	6	4.3225E-05	0.331301059
8	Acceleration due to Gravity (g)	9.81	0.0018034	0.0074985	0.020546	4	8	3.8516E-05	0.278663181
9	No. of Subchannels	14	0.0009	0.0094202	0.020546	5	10	4.8387E-05	0.39238281
10	No. of Connections	19	0.0018034	0.0074485	0.020546	6	7	3.8516E-05	0.278663181
11	No. of Nodes	1000	0.00414	0.0084154	0.020546	7	8	4.3225E-05	0.331301059
12	Diameter of Fuel Rod	0.01308	0.00414	0.0070309	0.020371	8	9	3.5806E-05	0.250849063
13	Density (at given system pressure)	817.4	0.0018034	0.0070309	0.040742	9	10	7.1612E-05	0.501698126
14	Slip	0.5	0.000991	0.0070309	0.040742	6	11	7.1612E-05	0.501698126
15	Implicit Factor	0.5	0.0019558	0.0070309	0.020371	7	12	3.5806E-05	0.25084906
16	Viscosity	0.000011	0.0019558			9	13		
17	Pressure Input	12262500	0.000991			10	14		
18	Heat Flux	607.59	0.00194			11	12		
19	Inlet Enthalpy (KJ/Kg)	1100.7	0.00194			12	13		
20			0.00194			13	14		
21									
22									
23									
24									
25									
26									

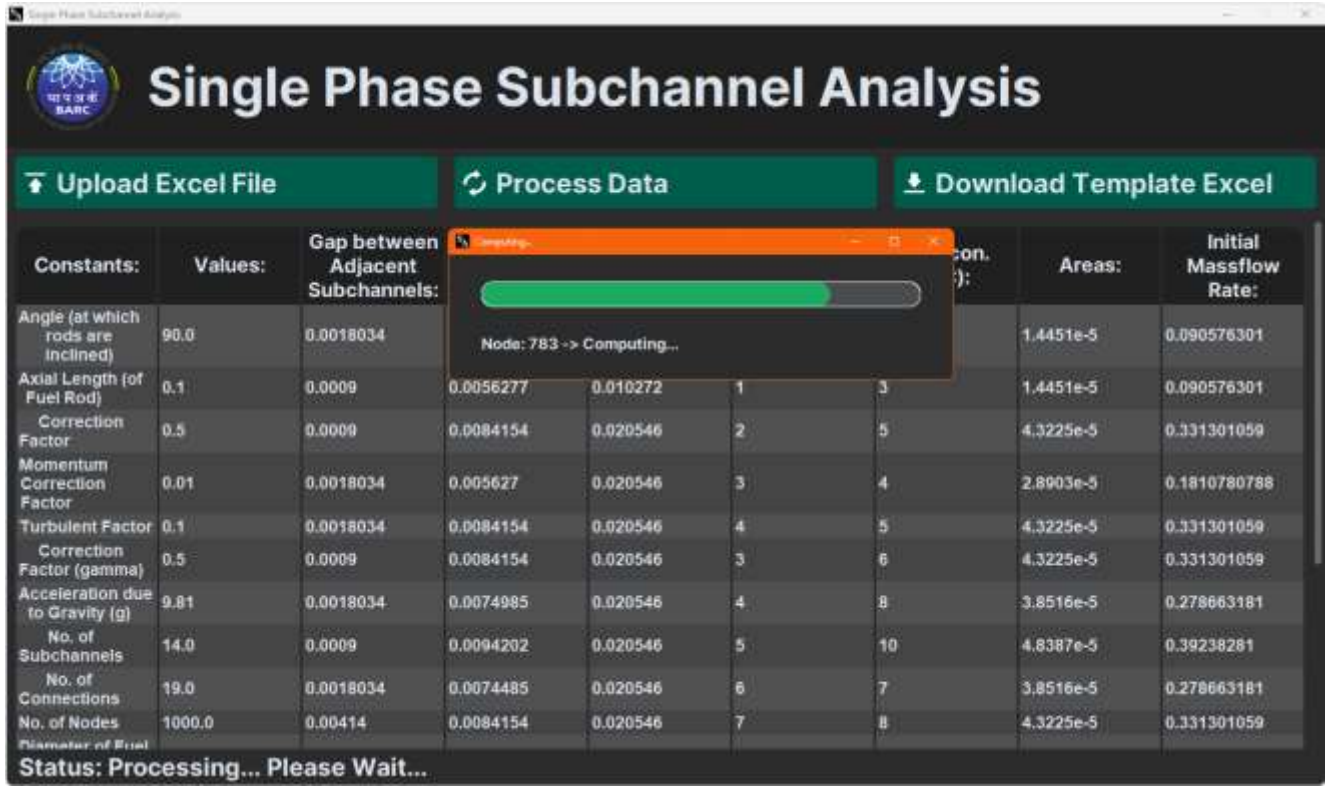
(verified input data)

GUI

Data file uploading, preview and computation:

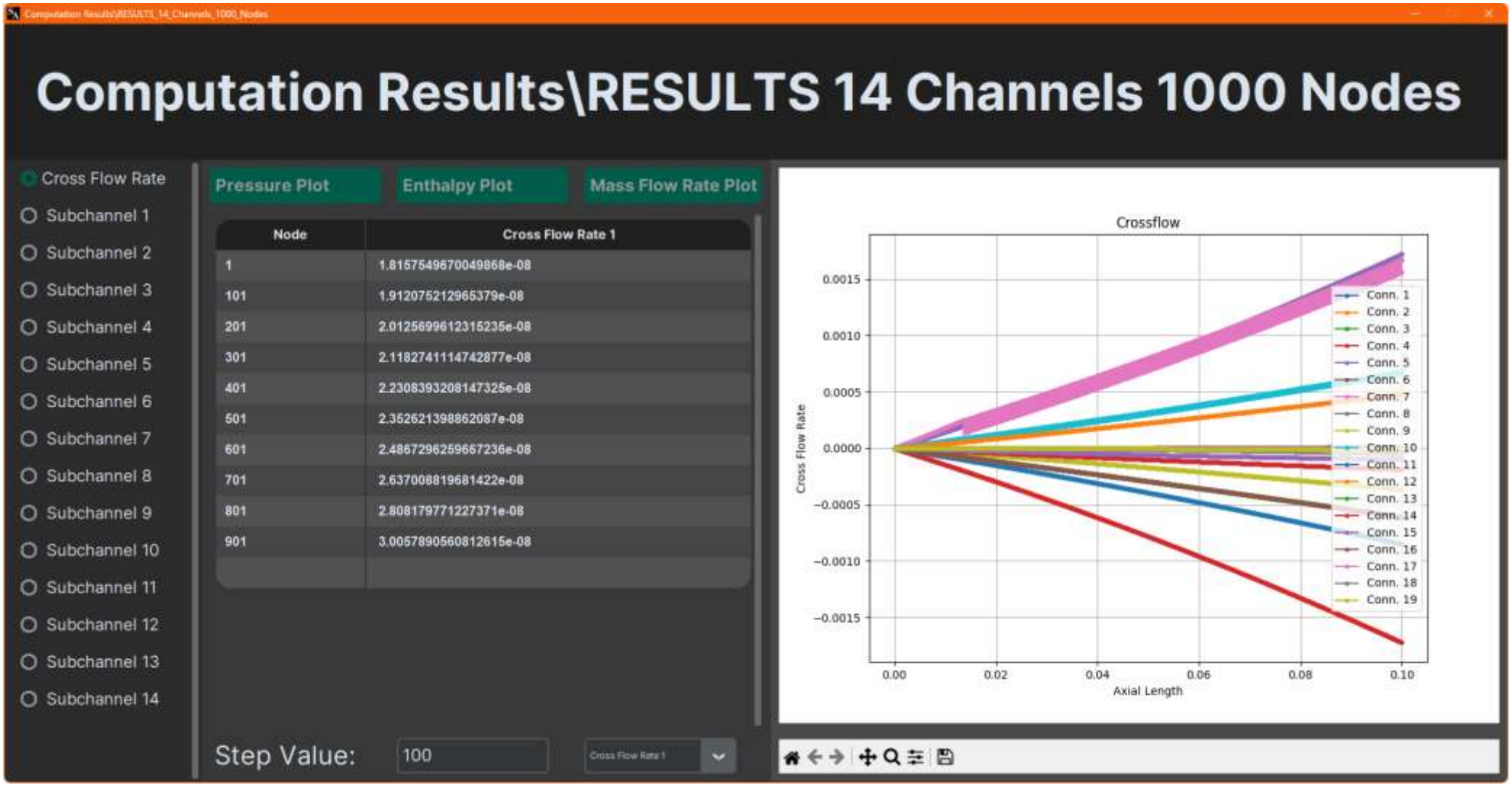






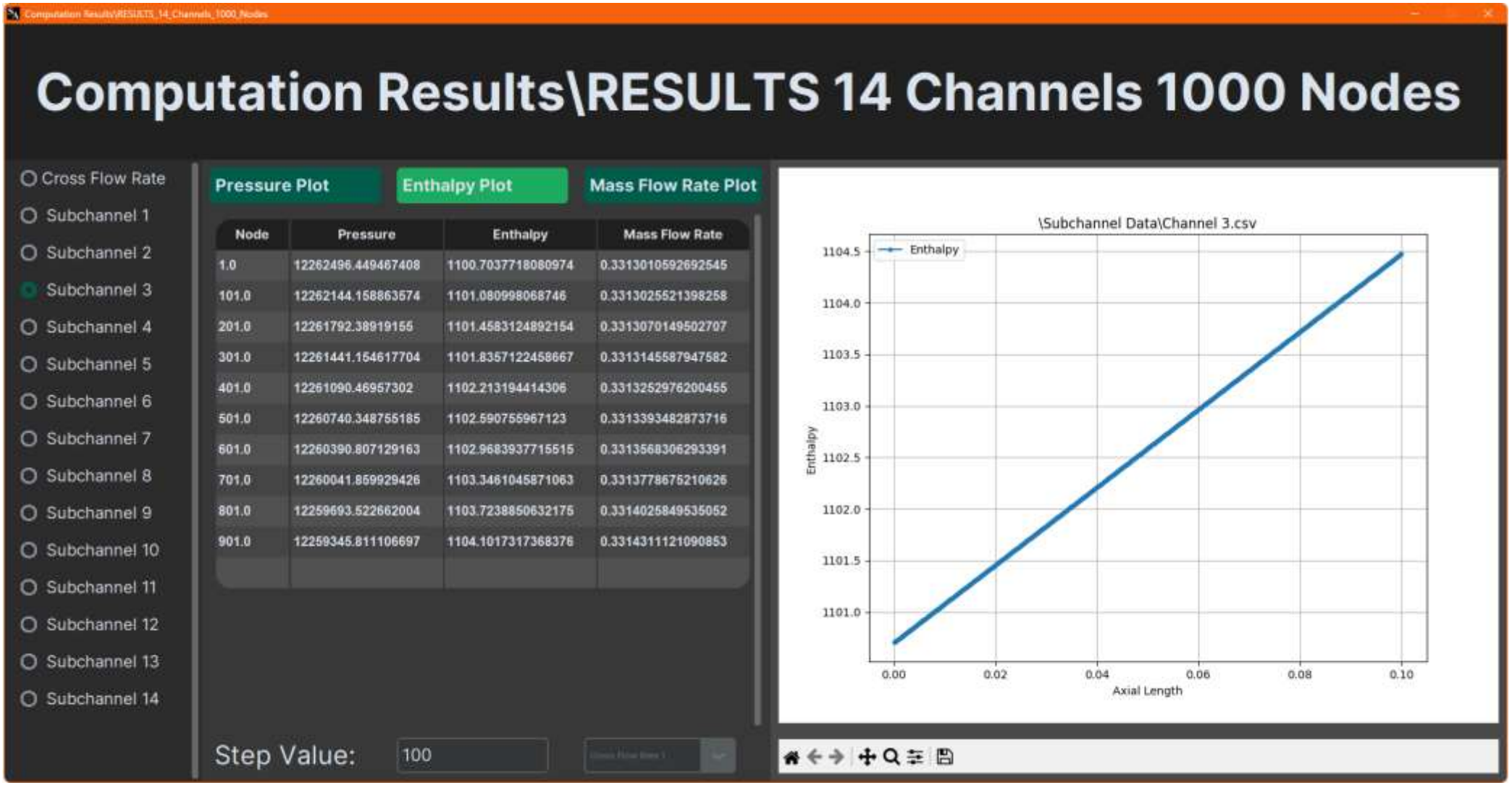
GUI

Final result preview:



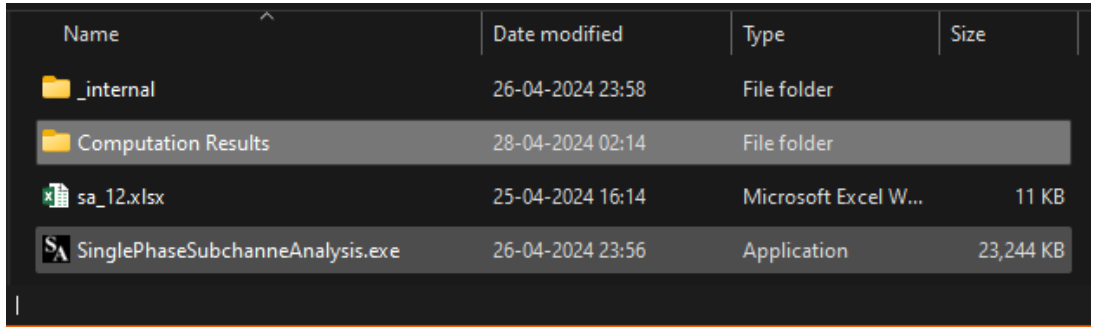
GUI

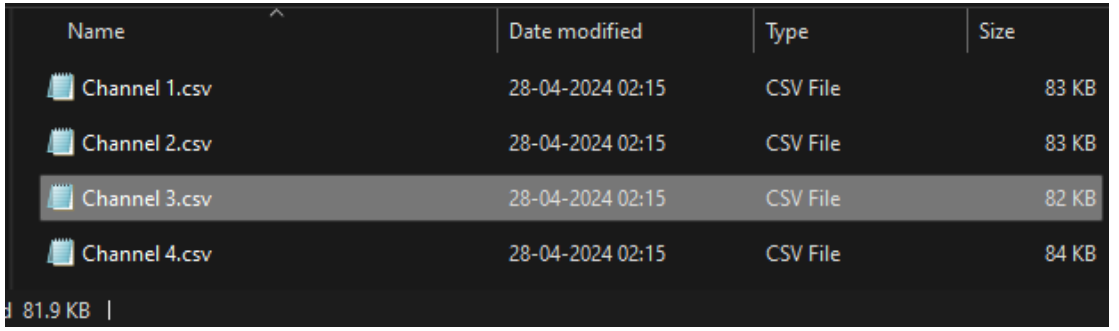
Final result preview:

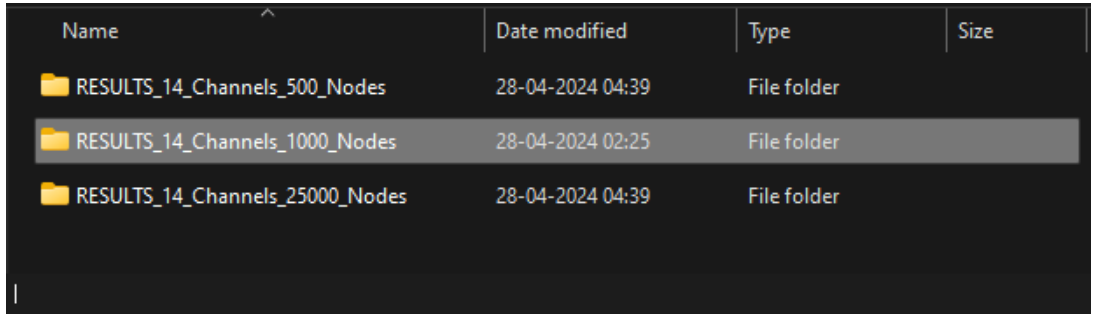


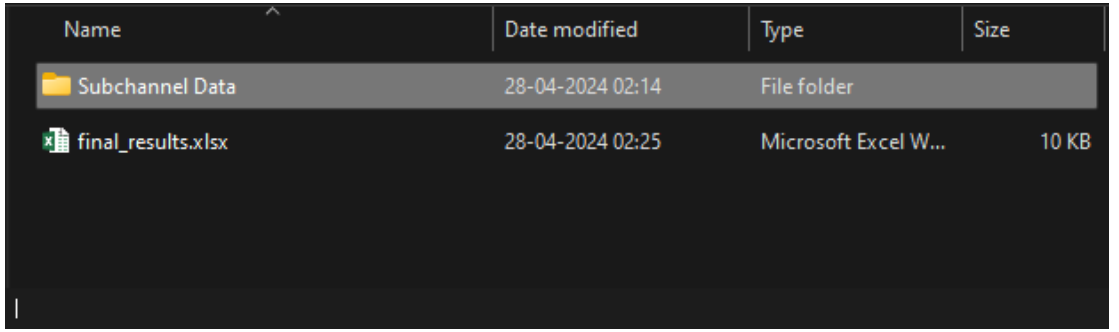
The GUI

File tree:



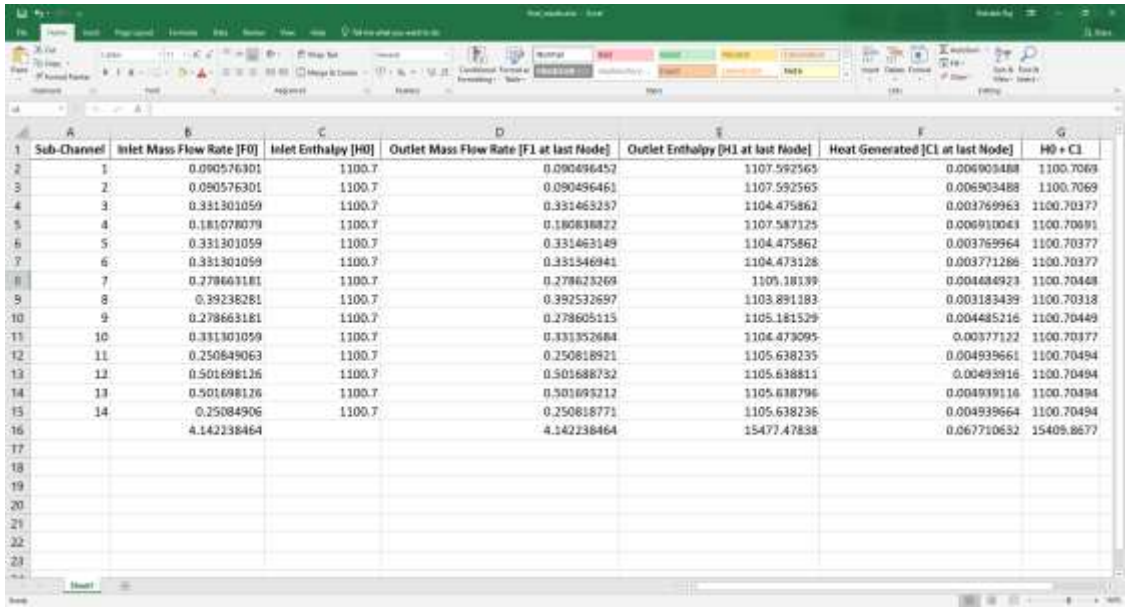






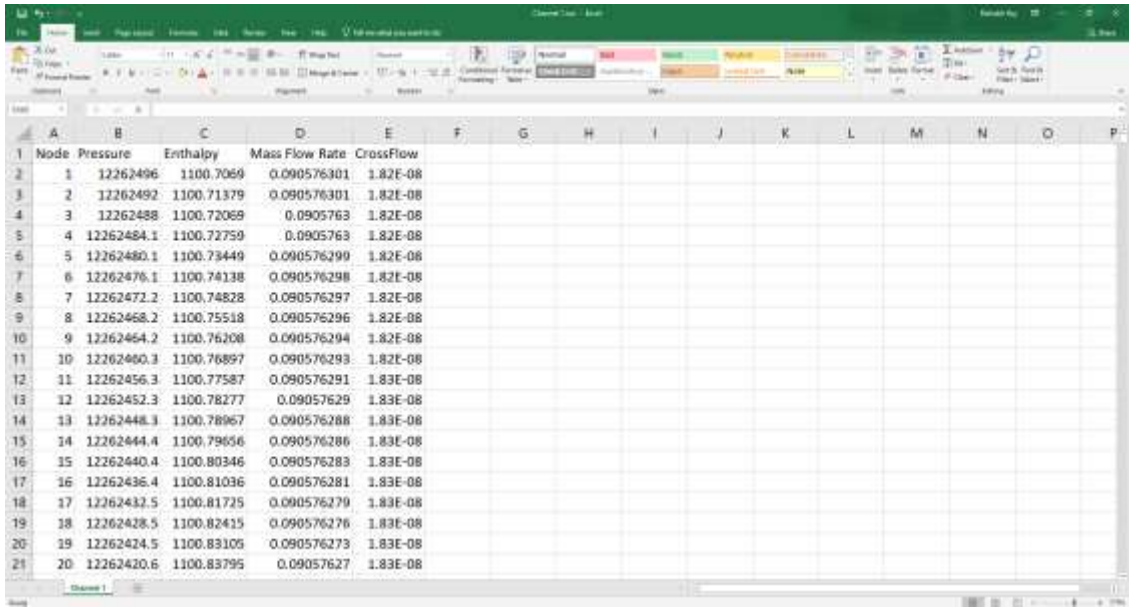
The GUI

Results in Excel sheet:



Sub-Channel	Inlet Mass Flow Rate [F0]	Inlet Enthalpy [H0]	Outlet Mass Flow Rate [F1 at last Node]	Outlet Enthalpy [H1 at last Node]	Heat Generated [C1 at last Node]	H0 + C1
1	0.090576301	1100.7	0.090496452	1107.592565	0.006903488	1100.7069
2	0.090576301	1100.7	0.090496461	1107.592565	0.006903488	1100.7069
3	0.331301059	1100.7	0.331463237	1104.475862	0.003769963	1100.70377
4	0.181078079	1100.7	0.180838822	1107.587125	0.006910043	1100.70691
5	0.331301059	1100.7	0.331463149	1104.475862	0.003769964	1100.70377
6	0.331301059	1100.7	0.331546941	1104.473128	0.003771286	1100.70377
7	0.278663181	1100.7	0.278623269	1105.18139	0.004484923	1100.70448
8	0.39238281	1100.7	0.392532697	1103.891183	0.003183439	1100.70318
9	0.278663181	1100.7	0.278605115	1105.181529	0.004485216	1100.70449
10	0.331301059	1100.7	0.331352684	1104.473095	0.00377122	1100.70377
11	0.250849063	1100.7	0.250818921	1105.638235	0.004939661	1100.70494
12	0.501698126	1100.7	0.501688732	1105.638811	0.00493916	1100.70494
13	0.501698126	1100.7	0.501693212	1105.638796	0.004939116	1100.70494
14	0.25084906	1100.7	0.250818771	1105.638236	0.004939664	1100.70494
	4.142238464		4.142238464	15477.47838	0.067710632	15409.8677

(Final results)



Node	Pressure	Enthalpy	Mass Flow Rate	CrossFlow
1	12262496	1100.7069	0.090576301	1.82E-08
2	12262492	1100.71379	0.090576301	1.82E-08
3	12262488	1100.72069	0.0905763	1.82E-08
4	12262484.1	1100.72759	0.0905763	1.82E-08
5	12262480.1	1100.73449	0.090576299	1.82E-08
6	12262476.1	1100.74138	0.090576298	1.82E-08
7	12262472.2	1100.74828	0.090576297	1.82E-08
8	12262468.2	1100.75518	0.090576296	1.82E-08
9	12262464.2	1100.76208	0.090576294	1.82E-08
10	12262460.3	1100.76897	0.090576293	1.82E-08
11	12262456.3	1100.77587	0.090576291	1.83E-08
12	12262452.3	1100.78277	0.09057629	1.83E-08
13	12262448.3	1100.78967	0.090576288	1.83E-08
14	12262444.4	1100.79656	0.090576286	1.83E-08
15	12262440.4	1100.80346	0.090576283	1.83E-08
16	12262436.4	1100.81036	0.090576281	1.83E-08
17	12262432.5	1100.81725	0.090576279	1.83E-08
18	12262428.5	1100.82415	0.090576276	1.83E-08
19	12262424.5	1100.83105	0.090576273	1.83E-08
20	12262420.6	1100.83795	0.09057627	1.83E-08

(Results for each node for every subchannel)