

EXPERIMENT 2**Critical Heat Flux of Non-Treated Sample***Safety Precautions:*

Please make sure all the equipment is in safe condition before and after conducting the experiment.

Objectives:

1. To determine the critical heat flux of non-treated sample

Introduction:

Nucleate pool boiling is known to be very effective mechanism of phase change heat transfer to achieve a much higher heat transfer coefficient than a single phase at a given temperature difference condition. In the nucleate boiling regime, a number of bubbles are produced from the heat-generating surface, and the heat is rapidly transferred by their latent heat transport and local convection enhancement. However, the nucleate boiling regime is limited by a certain heat flux condition, so-called critical heat flux (CHF).

The CHF is a maximum heat flux value to sustain the nucleate boiling regime. After the CHF point, the heated surface is covered with the vapor film, and the surrounding liquid is not able to touch the heated surface. Hence, the heat transfer mode changes from nucleate boiling to transition boiling and eventually film boiling. In such a case, it leads to dramatic decrease in the heat transfer performance and a sudden increase in the surface temperature, and consequently results in a failure of the heater surface.

Direct Joule heating method is used. This method easily supplies steady state heat flux and exhibits fast thermal response. Applied heat flux can be calculated using the Joule's heat flux equation, Equation 2.1

$$q'' = \frac{\text{Power}}{\text{Heated area}} = \frac{VI}{WL} \quad (2.1)$$

where, V is the measured voltage drop across the test material, I is the measure current, W is the width of the heat transfer area, and L is the heated length. Uncertainty of the measured heat flux is estimated 5.2% based on the propagation of error method.

Equipment and materials:

1. Pool boiling chamber:
 - Size: 300 mm × 300 mm × 300 mm
 - Material: Polycarbonate 8 mm thick
2. Immersion heaters:
 - Type: U type cartridge water heater continuously adjustable.
 - Material: S.S304
 - Capacity: 500 watts
 - Capacity: 1000 watts
3. Test section:
 - Copper blocks
 - Copper cover
 - Polyether ether ketone PEEK block
 - Test specimen:
 - Material: Stainless steel grade 304L
 - Size: L-25 mm × W-10 mm × T-2 mm
4. DC power supply:
 - Type: Switched mode power supply
 - Output: 0-10 volts & 1200A DC
 - Regulation: 0.5% to 1% at full load
 - Efficiency: 85%-95% at full load
 - Cooling: Forces air cooled
 - Remote control: Digital voltmeter & ammeter with 3 m flexible connection cable from main power supply unit.
5. Data acquisition device:
 - Make: National instruments
 - Model: NI USB 6001
 - Inputs: 8 analog input
 - Output: 2 analog output

Procedure:

1. Insert non-treated specimen in the test specimen block. Secure the bolt and nut as per Figure 2.1
2. Fill distilled water into pool boiling chamber up to heater levels.
3. Give single phase electric supply to trainer and switch on Mains.
4. Give three phase electric supply to DC power supply and switch on Mains.

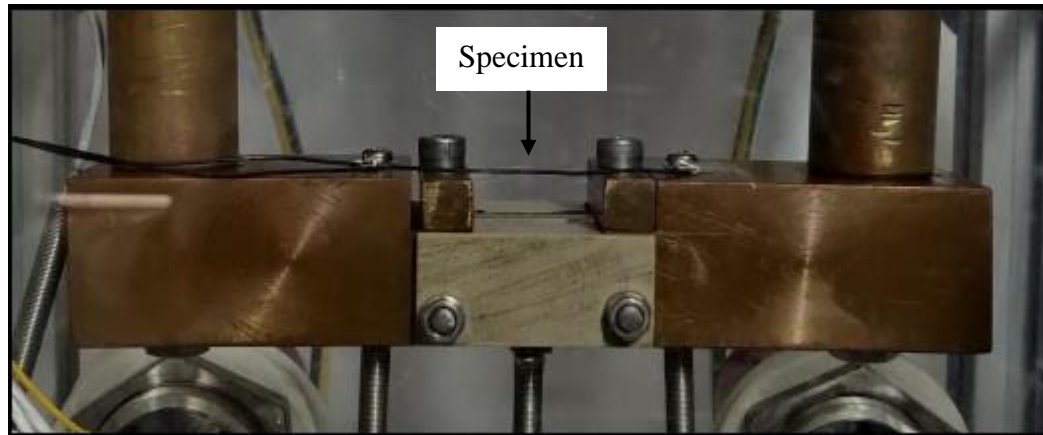


Figure 2.1 Peek block (middle part) containing sample, hold by cooper block (left and right part)

5. Secure connection from pool boiling to computer.
6. Turn on heater and heat the water until achieve saturated temperature. (start boiling)
7. After reaching saturation temperature, turn on DC power supply for power pass through the specimen.
8. Open SCITECH DAQ application to collect real time data.
9. From software, pass initially 1 volt to DC power supply.
10. Increase gradually voltage and current from DC power supply.
11. Observe the bubbles formation at the test specimen.
12. Record data.
13. Now after supplying current and voltage, the specimen will reach at its critical point of heat transfer and it will break at maximum capacity which is its CHF. Thus, CHF can be calculated as per data collected and formula given in introduction section (Equation 2.1)
14. After completion of the experiment, let the specimen cool down at room temperature with distilled water and switch of mains.

Data Analysis:

1. Plot a graph between Time versus Voltage for non-treated sample
2. Determine and calculate the critical heat flux of the specimen
3. Why we use distilled water instead of tap water in the experiment?

T1 : Temperature sensor mounted on left side cooper block

T2 : Temperature sensor mounted below PEEK block

T3 : Temperature sensor mounted on right side cooper block

TC : Temperature sensor mounted below test specimen

Non-treated Sample. (320 sandpaper)

Date	Time	Observation	T1 (C)	T2 (C)	T3 (C)	TC (C)	Voltage (V)
28/09/2020	11:30:34 AM	927	107.642	109.239	109.374	112.413	-1.681
28/09/2020	11:30:34 AM	928	107.516	109.105	109.711	112.569	-1.673
28/09/2020	11:30:35 AM	929	107.705	109.307	109.441	112.569	-1.644
28/09/2020	11:30:35 AM	930	107.642	109.037	109.576	112.725	-1.71
28/09/2020	11:30:36 AM	931	107.642	109.239	109.509	112.829	-1.691
28/09/2020	11:30:36 AM	932	107.642	109.172	109.644	112.777	-1.687
28/09/2020	11:30:37 AM	933	107.642	109.239	109.307	112.829	-1.703
28/09/2020	11:30:37 AM	934	107.895	109.105	109.644	113.037	-1.701
28/09/2020	11:30:38 AM	935	107.642	109.307	109.509	113.193	-1.691
28/09/2020	11:30:38 AM	936	107.642	109.037	109.509	113.245	-1.797
28/09/2020	11:30:39 AM	937	107.579	109.172	109.711	113.401	-1.684
28/09/2020	11:30:39 AM	938	107.642	109.307	109.441	113.453	-1.731
28/09/2020	11:30:40 AM	939	107.705	109.374	109.778	113.609	-1.597
28/09/2020	11:30:41 AM	940	107.958	109.172	109.509	113.765	-1.716
28/09/2020	11:30:41 AM	941	108.147	109.307	109.711	114.024	-1.716
28/09/2020	11:30:42 AM	942	108.21	109.307	109.374	113.972	-1.718
28/09/2020	11:30:42 AM	943	108.21	109.441	109.711	114.076	-1.783
28/09/2020	11:30:43 AM	944	108.21	109.307	109.576	114.336	-1.803
28/09/2020	11:30:43 AM	945	108.274	109.239	109.644	114.388	-1.825
28/09/2020	11:30:44 AM	946	108.274	109.239	109.576	114.596	-1.824
28/09/2020	11:30:44 AM	947	108.463	109.239	109.644	114.908	-1.827
28/09/2020	11:30:45 AM	948	108.4	109.239	109.576	115.116	-1.814
28/09/2020	11:30:45 AM	949	108.274	109.374	109.778	115.376	-1.672
28/09/2020	11:30:46 AM	950	108.337	109.239	109.913	115.48	-1.694
28/09/2020	11:30:46 AM	951	108.4	109.105	109.441	115.844	-1.692

28/09/2020	11:30:47 AM	952	108.274	109.172	109.441	116.208	-1.712
28/09/2020	11:30:47 AM	953	108.21	109.172	109.846	116.675	-1.753
28/09/2020	11:30:48 AM	954	108.21	108.97	109.778	116.935	-1.712
28/09/2020	11:30:48 AM	955	108.21	109.037	109.576	117.455	-1.74
28/09/2020	11:30:49 AM	956	108.21	109.172	109.644	117.923	-1.723
28/09/2020	11:30:49 AM	957	107.895	108.835	109.711	118.391	-1.747
28/09/2020	11:30:50 AM	958	107.895	109.239	109.307	118.859	-1.803
28/09/2020	11:30:50 AM	959	107.832	109.374	109.644	119.378	-1.872
28/09/2020	11:30:51 AM	960	107.895	109.172	109.441	120.054	-2.026
28/09/2020	11:30:51 AM	961	107.895	109.239	109.711	120.522	-1.984
28/09/2020	11:30:52 AM	962	107.958	109.374	109.509	120.938	-2.021
28/09/2020	11:30:52 AM	963	108.021	109.374	109.441	121.509	-2.015
28/09/2020	11:30:53 AM	964	108.084	109.105	109.576	121.925	-1.965
28/09/2020	11:30:53 AM	965	107.895	109.239	109.576	122.601	-1.973
28/09/2020	11:30:54 AM	966	108.021	109.307	109.374	123.121	-1.986
28/09/2020	11:30:55 AM	967	107.958	109.239	109.441	123.537	-1.929
28/09/2020	11:30:55 AM	968	107.895	109.307	109.644	124.16	-1.974
28/09/2020	11:30:56 AM	969	108.021	109.105	109.644	124.524	-1.993
28/09/2020	11:30:56 AM	970	108.021	109.239	109.846	125.044	-1.987
28/09/2020	11:30:57 AM	971	108.021	109.441	109.576	125.616	-2.001
28/09/2020	11:30:57 AM	972	108.021	109.172	109.711	125.98	-1.974
28/09/2020	11:30:58 AM	973	107.958	109.172	109.441	126.603	-1.982
28/09/2020	11:30:58 AM	974	107.958	109.105	109.509	127.071	-1.992
28/09/2020	11:30:59 AM	975	107.895	109.239	109.441	127.591	-2.004
28/09/2020	11:30:59 AM	976	107.958	109.172	109.644	128.215	-1.961
28/09/2020	11:31:00 AM	977	108.084	109.172	109.644	128.735	-1.97
28/09/2020	11:31:00 AM	978	107.958	109.105	109.509	129.41	-1.978
28/09/2020	11:31:01 AM	979	108.084	109.105	109.778	129.982	-2.004
28/09/2020	11:31:01 AM	980	108.021	109.239	109.644	130.71	-1.939
28/09/2020	11:31:02 AM	981	108.021	109.172	109.644	131.386	-1.959
28/09/2020	11:31:02 AM	982	108.021	109.105	109.644	132.009	-2.001
28/09/2020	11:31:03 AM	983	108.021	109.105	109.576	132.685	-1.986
28/09/2020	11:31:03 AM	984	108.084	109.172	109.846	133.413	-1.991
28/09/2020	11:31:04 AM	985	107.958	109.172	109.644	134.244	-1.996
28/09/2020	11:31:04 AM	986	108.021	109.307	109.644	135.128	-2.01
28/09/2020	11:31:05 AM	987	107.832	109.307	109.644	135.856	-1.975
28/09/2020	11:31:05 AM	988	107.832	109.239	109.509	136.843	-1.957
28/09/2020	11:31:06 AM	989	107.895	109.239	109.711	137.831	-1.981
28/09/2020	11:31:06 AM	990	107.895	109.239	109.711	138.767	-1.949
28/09/2020	11:31:07 AM	991	107.832	109.239	109.576	140.17	-1.959
28/09/2020	11:31:08 AM	992	107.579	109.172	109.576	141.626	-1.977
28/09/2020	11:31:08 AM	993	107.705	109.307	109.576	143.341	-1.993
28/09/2020	11:31:09 AM	994	107.642	109.374	109.441	145.524	-1.964
28/09/2020	11:31:09 AM	995	107.958	109.239	109.711	147.863	-1.977
28/09/2020	11:31:10 AM	996	107.768	109.239	109.576	150.462	-1.984
28/09/2020	11:31:10 AM	997	107.705	109.307	109.374	153.373	-1.957

28/09/2020	11:31:11 AM	998	107.832	109.307	109.644	156.388	-1.957
28/09/2020	11:31:11 AM	999	107.768	109.239	109.711	159.559	-2.028
28/09/2020	11:31:12 AM	1000	107.768	109.172	109.98	163.145	-2.012
28/09/2020	11:31:12 AM	1001	107.832	109.239	109.576	166.784	-1.838
28/09/2020	11:31:13 AM	1002	107.832	109.172	109.711	170.37	-1.968
28/09/2020	11:31:13 AM	1003	107.705	109.172	109.576	174.165	-1.993
28/09/2020	11:31:14 AM	1004	107.705	109.172	109.576	177.907	-1.982
28/09/2020	11:31:14 AM	1005	107.579	109.172	109.509	181.754	-1.974
28/09/2020	11:31:15 AM	1006	107.579	109.172	109.778	185.652	-2
28/09/2020	11:31:15 AM	1007	107.516	109.172	109.778	189.499	-2.013
28/09/2020	11:31:16 AM	1008	107.516	109.105	109.644	193.397	-1.993
28/09/2020	11:31:16 AM	1009	107.642	109.374	109.711	197.348	-1.988
28/09/2020	11:31:17 AM	1010	107.453	109.307	109.644	201.402	-2.006
28/09/2020	11:31:17 AM	1011	107.453	109.307	109.644	205.56	-2.008
28/09/2020	11:31:18 AM	1012	107.516	109.307	109.644	209.459	-2.03
28/09/2020	11:31:18 AM	1013	107.453	109.307	109.711	213.461	-2.005
28/09/2020	11:31:19 AM	1014	107.453	109.307	109.644	217.724	-2.006
28/09/2020	11:31:19 AM	1015	107.389	109.374	109.644	221.726	-2.027
28/09/2020	11:31:20 AM	1016	107.453	109.239	109.711	225.936	-2.023
28/09/2020	11:31:20 AM	1017	107.453	109.441	109.711	229.939	-2.053
28/09/2020	11:31:21 AM	1018	107.2	109.307	109.644	233.941	-2.015
28/09/2020	11:31:22 AM	1019	107.263	109.172	109.576	237.996	-2.039
28/09/2020	11:31:22 AM	1020	107.326	109.374	109.98	241.842	-2.039
28/09/2020	11:31:23 AM	1021	107.2	109.239	109.576	245.689	-2.03
28/09/2020	11:31:23 AM	1022	107.2	109.307	109.644	249.483	-2.084
28/09/2020	11:31:24 AM	1023	107.326	109.105	109.509	253.278	-2.088
28/09/2020	11:31:24 AM	1024	107.263	109.172	109.711	256.916	-2.077
28/09/2020	11:31:25 AM	1025	107.2	109.172	109.711	260.503	-2
28/09/2020	11:31:25 AM	1026	107.137	109.172	109.778	262.946	-2.121
28/09/2020	11:31:26 AM	1027	107.2	108.902	109.509	263.206	-2.092
28/09/2020	11:31:26 AM	1028	107.074	109.307	109.441	263.206	-2.093
28/09/2020	11:31:27 AM	1029	107.263	109.172	109.576	263.154	-2.121
28/09/2020	11:31:27 AM	1030	107.326	109.172	109.576	263.102	-2.076
28/09/2020	11:31:28 AM	1031	107.137	109.307	109.711	263.102	-2.09
28/09/2020	11:31:28 AM	1032	107.074	109.239	109.576	263.05	-2.067
28/09/2020	11:31:29 AM	1033	107.074	109.239	109.711	262.998	-2.098
28/09/2020	11:31:29 AM	1034	107.074	109.239	109.644	262.998	-2.089
28/09/2020	11:31:30 AM	1035	107.01	109.307	109.711	262.946	-2.143
28/09/2020	11:31:30 AM	1036	107.01	109.307	109.913	262.894	-2.083
28/09/2020	11:31:31 AM	1037	107.137	109.239	109.576	262.894	-2.088
28/09/2020	11:31:31 AM	1038	107.074	109.172	109.711	262.842	-2.075
28/09/2020	11:31:32 AM	1039	107.137	109.172	109.576	262.79	-2.09
28/09/2020	11:31:32 AM	1040	107.074	109.239	109.441	262.79	-2.097
28/09/2020	11:31:33 AM	1041	107.074	109.037	109.441	262.686	-2.084
28/09/2020	11:31:34 AM	1042	107.01	109.172	109.778	262.686	-2.014
28/09/2020	11:31:34 AM	1043	107.074	109.239	109.644	262.686	-2.112

28/09/2020	11:31:35 AM	1044	107.01	109.239	109.509	262.634	-2.075
28/09/2020	11:31:35 AM	1045	107.01	109.239	109.711	262.582	-2.084
28/09/2020	11:31:36 AM	1046	107.074	109.105	109.307	262.53	-2.092
28/09/2020	11:31:36 AM	1047	107.01	109.239	109.576	262.53	-2.081
28/09/2020	11:31:37 AM	1048	107.074	109.172	109.509	262.426	-2.067
28/09/2020	11:31:37 AM	1049	107.01	108.97	109.576	262.478	-2.115
28/09/2020	11:31:38 AM	1050	107.074	109.307	109.846	262.426	-2.196
28/09/2020	11:31:38 AM	1051	107.074	109.441	109.778	262.374	-2.089
28/09/2020	11:31:39 AM	1052	107.137	109.239	109.509	262.322	-2.075
28/09/2020	11:31:39 AM	1053	107.137	109.374	109.441	262.27	-2.112
28/09/2020	11:31:40 AM	1054	107.074	109.172	109.576	262.27	-2.116
28/09/2020	11:31:40 AM	1055	107.01	109.172	109.374	262.218	-2.09
28/09/2020	11:31:41 AM	1056	107.074	109.374	109.846	262.166	-2.132
28/09/2020	11:31:41 AM	1057	107.137	109.239	109.644	262.114	-2.108
28/09/2020	11:31:42 AM	1058	106.947	109.239	109.711	262.062	-2.102
28/09/2020	11:31:42 AM	1059	107.137	109.172	109.441	262.062	-2.105
28/09/2020	11:31:43 AM	1060	107.137	109.172	109.374	261.958	-2.09
28/09/2020	11:31:43 AM	1061	107.074	109.239	109.441	261.958	-2.081
28/09/2020	11:31:44 AM	1062	106.947	109.105	109.441	261.906	-2.092
28/09/2020	11:31:44 AM	1063	107.137	109.037	109.711	261.854	-2.092
28/09/2020	11:31:45 AM	1064	106.947	109.441	109.374	261.802	-2.115
28/09/2020	11:31:45 AM	1065	107.01	109.239	109.576	261.802	-2.108
28/09/2020	11:31:46 AM	1066	107.074	109.172	109.509	261.75	-2.112
28/09/2020	11:31:47 AM	1067	106.947	109.307	109.509	261.646	-2.111
28/09/2020	11:31:47 AM	1068	107.01	109.239	109.374	261.646	-2.097
28/09/2020	11:31:48 AM	1069	107.01	109.239	109.374	261.594	-2.15
28/09/2020	11:31:48 AM	1070	106.947	109.307	109.778	261.542	-2.084
28/09/2020	11:31:49 AM	1071	106.947	109.105	109.509	261.49	-2.111
28/09/2020	11:31:49 AM	1072	107.01	109.239	109.239	261.438	-2.132
28/09/2020	11:31:50 AM	1073	107.01	109.105	109.711	261.438	-2.24
28/09/2020	11:31:50 AM	1074	106.947	109.441	109.307	261.335	-2.308
28/09/2020	11:31:51 AM	1075	107.074	109.307	109.509	261.283	-2.377
28/09/2020	11:31:51 AM	1076	107.01	109.441	109.509	261.335	-2.367
28/09/2020	11:31:52 AM	1077	107.01	109.307	109.576	261.231	-2.296
28/09/2020	11:31:52 AM	1078	107.074	109.374	109.576	261.179	-2.346
28/09/2020	11:31:53 AM	1079	107.074	109.037	109.711	261.127	-2.394
28/09/2020	11:31:53 AM	1080	107.137	109.239	109.441	261.075	-2.377
28/09/2020	11:31:54 AM	1081	107.2	109.509	109.576	261.075	-2.383
28/09/2020	11:31:54 AM	1082	107.2	109.374	109.711	261.023	-2.395
28/09/2020	11:31:55 AM	1083	107.074	109.441	109.576	260.971	-2.388
28/09/2020	11:31:55 AM	1084	107.137	109.374	109.778	260.971	-2.349
28/09/2020	11:31:56 AM	1085	107.2	109.307	109.509	260.867	-2.393
28/09/2020	11:31:56 AM	1086	107.137	109.307	109.441	260.867	-2.342
28/09/2020	11:31:57 AM	1087	107.137	109.172	109.711	260.763	-2.408
28/09/2020	11:31:57 AM	1088	107.074	109.307	109.576	260.763	-2.34
28/09/2020	11:31:58 AM	1089	106.947	109.239	109.644	260.711	-2.269

28/09/2020	11:31:59 AM	1090	106.947	109.374	109.576	259.567	-2.371
28/09/2020	11:31:59 AM	1091	107.137	109.441	109.778	256.292	-2.389
28/09/2020	11:32:00 AM	1092	107.01	109.307	109.576	253.018	-2.372
28/09/2020	11:32:00 AM	1093	107.01	109.374	109.441	249.639	-2.105
28/09/2020	11:32:01 AM	1094	107.074	109.307	109.441	246.26	-2.142
28/09/2020	11:32:01 AM	1095	106.884	109.239	109.374	242.934	-2.13
28/09/2020	11:32:02 AM	1096	106.947	109.105	109.441	239.659	-2.125
28/09/2020	11:32:02 AM	1097	106.947	109.105	109.644	236.28	-2.181
28/09/2020	11:32:03 AM	1098	106.947	109.441	109.441	233.11	-2.15
28/09/2020	11:32:03 AM	1099	106.821	109.509	109.644	229.939	-2.176
28/09/2020	11:32:04 AM	1100	106.884	109.441	109.576	226.82	-2.203
28/09/2020	11:32:04 AM	1101	106.884	109.374	109.644	223.597	-2.119
28/09/2020	11:32:05 AM	1102	106.821	109.374	109.509	220.531	-2.16
28/09/2020	11:32:05 AM	1103	106.947	109.307	109.711	217.724	-2.147
28/09/2020	11:32:06 AM	1104	107.01	109.307	109.509	214.969	-2.125
28/09/2020	11:32:06 AM	1105	106.947	109.239	109.374	212.058	-2.149
28/09/2020	11:32:07 AM	1106	107.01	109.374	109.711	209.407	-2.191
28/09/2020	11:32:07 AM	1107	106.947	109.307	109.644	206.808	-2.282
28/09/2020	11:32:08 AM	1108	107.01	109.441	109.374	204.313	-2.181
28/09/2020	11:32:08 AM	1109	107.01	109.307	109.576	201.922	-2.146
28/09/2020	11:32:09 AM	1110	107.01	109.374	109.711	199.531	-2.147
28/09/2020	11:32:09 AM	1111	106.884	109.307	109.576	197.296	-2.167
28/09/2020	11:32:10 AM	1112	107.01	109.374	109.576	195.061	-2.152
28/09/2020	11:32:10 AM	1113	106.947	109.509	109.711	193.033	-2.152
28/09/2020	11:32:11 AM	1114	106.947	109.239	109.576	190.954	-2.177
28/09/2020	11:32:12 AM	1115	106.884	109.307	109.711	188.875	-2.156
28/09/2020	11:32:12 AM	1116	107.01	109.307	109.374	187.004	-2.199
28/09/2020	11:32:13 AM	1117	106.884	109.509	109.239	184.977	-2.149
28/09/2020	11:32:13 AM	1118	107.01	109.374	109.576	183.313	-2.048
28/09/2020	11:32:14 AM	1119	106.884	109.374	109.441	181.546	-2.088
28/09/2020	11:32:14 AM	1120	106.884	109.307	109.509	179.779	-2.152
28/09/2020	11:32:15 AM	1121	106.884	109.307	109.509	178.115	-2.185
28/09/2020	11:32:15 AM	1122	106.821	109.239	109.441	176.452	-2.164
28/09/2020	11:32:16 AM	1123	106.821	109.441	109.239	174.996	-2.128
28/09/2020	11:32:16 AM	1124	106.821	109.374	109.576	173.333	-2.182
28/09/2020	11:32:17 AM	1125	106.884	109.239	109.509	171.826	-2.196
28/09/2020	11:32:17 AM	1126	106.758	109.576	109.374	170.422	-2.143
28/09/2020	11:32:18 AM	1127	106.695	109.441	109.441	169.071	-2.145
28/09/2020	11:32:18 AM	1128	106.695	109.441	109.441	167.615	-2.146
28/09/2020	11:32:19 AM	1129	106.695	109.307	109.509	166.42	-2.185
28/09/2020	11:32:19 AM	1130	106.695	109.441	109.576	165.068	-2.193
28/09/2020	11:32:20 AM	1131	106.758	109.307	109.374	163.821	-2.154
28/09/2020	11:32:20 AM	1132	106.821	109.441	109.644	162.469	-2.156
28/09/2020	11:32:21 AM	1133	106.821	109.307	109.307	161.326	-2.161
28/09/2020	11:32:21 AM	1134	106.758	109.374	109.509	160.182	-2.151
28/09/2020	11:32:22 AM	1135	106.758	109.307	109.576	159.143	-2.133

28/09/2020	11:32:22 AM	1136	106.758	109.374	109.846	158.051	-2.15
28/09/2020	11:32:23 AM	1137	106.758	109.374	109.576	156.908	-2.15
28/09/2020	11:32:24 AM	1138	106.758	109.374	109.307	155.868	-2.185
28/09/2020	11:32:24 AM	1139	106.695	109.374	109.374	154.88	-2.15
28/09/2020	11:32:25 AM	1140	106.695	109.374	109.509	153.893	-2.18
28/09/2020	11:32:25 AM	1141	106.631	109.509	109.374	152.801	-2.159
28/09/2020	11:32:26 AM	1142	106.631	109.307	109.509	152.021	-2.154
28/09/2020	11:32:26 AM	1143	106.631	109.239	109.307	151.138	-2.181
28/09/2020	11:32:27 AM	1144	106.631	109.307	109.509	150.202	-2.146
28/09/2020	11:32:27 AM	1145	106.631	109.307	109.441	149.319	-2.171
28/09/2020	11:32:28 AM	1146	106.568	109.307	109.576	148.487	-2.183
28/09/2020	11:32:28 AM	1147	106.631	109.307	109.441	147.603	-2.185
28/09/2020	11:32:29 AM	1148	106.505	109.441	109.509	146.824	-2.16
28/09/2020	11:32:29 AM	1149	106.695	109.374	109.576	145.888	-2.158
28/09/2020	11:32:30 AM	1150	106.631	109.239	109.441	145.212	-2.159
28/09/2020	11:32:30 AM	1151	106.631	109.374	109.509	144.536	-2.183
28/09/2020	11:32:31 AM	1152	106.505	109.374	109.576	143.653	-2.156
28/09/2020	11:32:31 AM	1153	106.568	109.509	109.576	143.081	-2.158
28/09/2020	11:32:32 AM	1154	106.695	109.576	109.441	142.405	-2.217
28/09/2020	11:32:32 AM	1155	106.695	109.374	109.441	141.678	-2.171
28/09/2020	11:32:33 AM	1156	106.505	109.172	109.576	141.054	-2.171
28/09/2020	11:32:33 AM	1157	106.631	109.509	109.644	140.326	-2.205
28/09/2020	11:32:34 AM	1158	106.568	109.441	109.576	139.806	-2.203
28/09/2020	11:32:34 AM	1159	106.568	109.441	109.509	139.131	-2.214
28/09/2020	11:32:35 AM	1160	106.505	109.374	109.644	138.507	-2.181
28/09/2020	11:32:35 AM	1161	106.568	109.239	109.509	137.831	-2.273
28/09/2020	11:32:36 AM	1162	106.568	109.441	109.576	137.259	-2.155
28/09/2020	11:32:37 AM	1163	106.568	109.374	109.374	136.687	-2.165
28/09/2020	11:32:37 AM	1164	106.631	109.374	109.441	136.168	-2.176
28/09/2020	11:32:38 AM	1165	106.505	109.441	109.509	135.7	-2.196
28/09/2020	11:32:38 AM	1166	106.568	109.172	109.576	135.128	-2.165
28/09/2020	11:32:39 AM	1167	106.631	109.374	109.576	134.556	-2.13
28/09/2020	11:32:39 AM	1168	106.695	109.307	109.374	134.037	-2.155
28/09/2020	11:32:40 AM	1169	106.631	109.172	109.307	133.569	-2.111
28/09/2020	11:32:40 AM	1170	106.631	109.239	109.441	132.997	-2.165
28/09/2020	11:32:41 AM	1171	106.695	109.239	109.711	132.685	-2.203
28/09/2020	11:32:41 AM	1172	106.631	109.509	109.509	132.113	-2.176
28/09/2020	11:32:42 AM	1173	106.695	109.441	109.576	131.645	-2.18
28/09/2020	11:32:42 AM	1174	106.695	109.374	109.576	131.282	-2.181
28/09/2020	11:32:43 AM	1175	106.695	109.441	109.644	130.866	-2.155
28/09/2020	11:32:43 AM	1176	106.568	109.509	109.576	130.398	-2.164
28/09/2020	11:32:44 AM	1177	106.695	109.374	109.441	129.982	-2.19
28/09/2020	11:32:44 AM	1178	106.568	109.374	109.509	129.566	-2.196
28/09/2020	11:32:45 AM	1179	106.631	109.374	109.846	129.046	-2.165
28/09/2020	11:32:45 AM	1180	106.568	109.105	109.644	128.839	-2.159
28/09/2020	11:32:46 AM	1181	106.631	109.307	109.509	128.475	-2.156

SKTN 3224 Thermal Hydraulics & Lab

28/09/2020	11:32:46 AM	1182	106.631	109.239	109.374	128.007	-2.176
28/09/2020	11:32:47 AM	1183	106.695	109.374	109.576	127.695	-2.171
28/09/2020	11:32:47 AM	1184	106.568	109.239	109.441	127.331	-2.13
28/09/2020	11:32:48 AM	1185	106.631	109.441	109.307	126.863	-2.185
28/09/2020	11:32:49 AM	1186	106.568	109.509	109.374	126.655	-2.164
28/09/2020	11:32:49 AM	1187	106.631	109.509	109.509	126.292	-2.172
28/09/2020	11:32:50 AM	1188	106.505	109.509	109.509	125.824	-2.168
28/09/2020	11:32:50 AM	1189	106.568	109.307	109.576	125.668	-2.168
28/09/2020	11:32:51 AM	1190	106.631	109.374	109.239	125.2	-2.151
28/09/2020	11:32:51 AM	1191	106.568	109.644	109.509	124.992	-2.16