IPB1 29B CORE RUN SUMMARY

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11/1/2016

We have done two helium and two h2 runs on IPB1 29 core. This note is the summary of four runs. Table 1 through Table 4 list four runs data; and Figure 1 through Figure 4 are the time series of four runs, and Figure 5 through Figure 8 are the mean of each sequence with the standard deviation as the error bars for "Heater Power". Note: Run3 has no valid coreQPower data, we replace them from Run4. The "Blank" in the tables means no valid data has been retrieved.

Two COP calculations have been applied here. The formulas are the below:
[1] "Calorimetry of the IPB System" 9/2/2016
[2] "IPB Reactor Calibration, for discussion purpose only" 11/2/2016

1. COP = (HP drop + m * coreQPower*correctFactor + b) / (coreQPower*correctFactor)

2. COP = (HP drop $+k_{as}*(T_a-T_s) +k_{bs}*(T_b-T_s)$)/coreQPower

Where HP drop is Heater Power (No QPulse)-Heater Powe r(with QPulse)

coreQPower is Q Pulse power deposited to the core.

correctFactor is determined by calibrating COP to approximately 1.0 with helium runs.

k_{as} and k_{bs} are determined by calibrating COP to approximately 1.0 with helium runs

T_a is core temperature
T_s is surrounding temperature (outer block temperature)
T_b is inner block temperature

Table 5 & Table 6 are COP results of four runs from formula 1.

Table 7 & Table 8 are COP results of four runs from formula 2.

Table 1. Run1, 10/4/2016-10/6/2016 He

	Heater Power(W)						coreQPower(W)				
QpulseWidth(ns)	NQ	300	150	100	150	300	300	150	100	150	300
Temp											
150	9.40	6.94	6.70	6.71	6.67	6.69	4.93	5.08	5.28	5.08	4.92
200	14.00	11.11	10.92	10.84	10.82	10.82	5.24	5.43	5.64	5.42	5.25
250	19.11	15.57	15.23	15.15	15.18	15.34	5.28	5.87	6.10	5.86	5.62
300	24.86	20.75	20.28	19.91	20.20	20.50	5.08	6.29	6.36	6.11	5.70
350	31.25	26.97	26.84	26.77	26.76	26.66	4.92	6.20	6.35	6.18	5.93
400	38.26	33.75	33.81	33.58	33.78	33.48	6.16	6.32	6.39	6.31	6.14

Table 2. Run2, 10/19/2016-10/20/2016 He

	Heater Power(W)						coreQPower(W)				
QpulseWidth(ns)	NQ	300	150	100	150	300	300	150	100	150	300
Temp											
150	9.48	7.03	6.88	6.93	6.89	6.77	5.14	5.13	5.22	5.13	5.16
200	14.08	11.17	11.00	11.09	11.05	10.96	5.51	5.48	5.58	5.48	5.52
250	19.17	15.74	15.47	15.36	15.33	15.49	5.93	5.94	6.11	5.95	5.93
300	24.86	20.71	20.29	20.25	20.46	20.59			6.64	6.44	6.36
350	31.31	28.07	27.41	26.96	26.87	26.80	5.75	6.47	6.54	6.47	6.58
400	38.32	33.77	33.84	34.05	33.81	33.56	6.82	6.58	6.55	6.60	6.83

Table 3. Run3, 10/27/2016-10/28/2016 H2

	Heater Power(W)				coreQPower(W)		
QpulseWidth(ns)	NQ	150	100	150	150	100	150
Temp							
9.40	7.58	7.58	7.26	7.43	2.66	3.06	2.66
14.17	11.87	11.87	11.56	11.76	2.88	3.26	2.87
19.36	16.48	16.48	16.17	16.37	3.18	3.59	3.18
25.19	21.51	21.51	21.11	21.44	3.57	4.03	3.56

Table 4. Run4, 10/29/2016-10/31/2016 H2

	Heater Power(W)				coreQPower(W)		
QpulseWidth(ns)	NQ	150	100	150	150	100	150
Temp							
150	9.49	7.45	7.38	7.37	2.66	3.06	2.66
200	14.17	11.76	11.65	11.58	2.88	3.26	2.87
250	19.37	16.28	16.40	16.27	3.18	3.59	3.18
300	25.20	21.30	21.15	21.17	3.57	4.03	3.56
350	31.71	28.20	28.10	28.00	3.45	3.86	3.44
400	38.92	35.53	35.73		3.40	3.68	

Table 5. Run1 & Run2, COP (1)

QpulseWidth(ns)	CorrectFactor	300	150	100	150	300	300	150	100	150	300
Temp		Run1:COP					Run2:COP				
150	1.00	0.99	1.02	1.00	1.03	1.04	0.97	1.00	0.98	1.00	1.02
200	1.10	1.02	1.04	1.03	1.06	1.08	1.00	1.03	1.01	1.03	1.04
250	1.30	1.06	1.05	1.04	1.06	1.06	0.99	1.02	1.02	1.04	1.02
300	1.50	1.11	1.05	1.08	1.08	1.08			1.03	1.02	1.01
350	1.50	1.15	1.05	1.04	1.06	1.09	0.95	0.98	1.02	1.03	1.03
400	1.60	1.06	1.05	1.06	1.05	1.09	1.02	1.03	1.01	1.03	1.04

Table 6. Run3 & Run4, COP (1)

QpulseWidth(ns)	CorrectFactor	150	100	150	150	100	150
		Run3:COP			Run4:COP		
150	1.00	1.15	1.16	1.20	1.23	1.15	1.26
200	1.10	1.20	1.20	1.24	1.23	1.17	1.29
250	1.30	1.20	1.19	1.23	1.25	1.14	1.25
300	1.50	1.22	1.21	1.23	1.26	1.20	1.29
350	1.50				1.25	1.19	1.29
400	1.60				1.19	1.11	

Table 7. Run1 & Run2, COP (2)

QpulseWidth(ns)	k_{as}/ k_{bs}	300	150	100	150	300	300	150	100	150	300
Temp		Run1:COP					Run2:COP				
150	0.0100	1.00	1.01	0.96	1.02	1.05	0.96	0.98	0.96	0.98	1.00
200	0.0070	1.01	1.00	0.97	1.02	1.06	0.97	1.00	0.97	1.00	0.99
250	0.0046	1.00	1.00	0.98	0.99	1.03	0.92	0.96	0.95	0.99	0.97
300	0.0030	0.95	0.98	1.00	1.01	1.05		0.96	0.94	0.92	0.92
350	0.0030	1.05	1.01	1.01	1.04	1.09		0.92	0.96	0.98	0.98
400	0.0030	1.10	1.06	1.07		1.13	0.99	1.00	0.99	1.01	1.01

Table 8. Run3 & Run4, COP (2)

QpulseWidth(ns)	k_{as}/ k_{bs}	150	100	150	150	100	150
		Run3:COP			Run4:COP		
150	0.0100	1.59	1.49	1.65	1.68	1.48	1.71
200	0.0070	1.62	1.53	1.67	1.66	1.50	1.73
250	0.0046	1.54	1.44	1.57	1.60	1.38	1.60
300	0.0030	1.48	1.41	1.50	1.54	1.40	1.58
350	0.0030				1.57	1.43	1.62
400	0.0030				1.63	1.46	

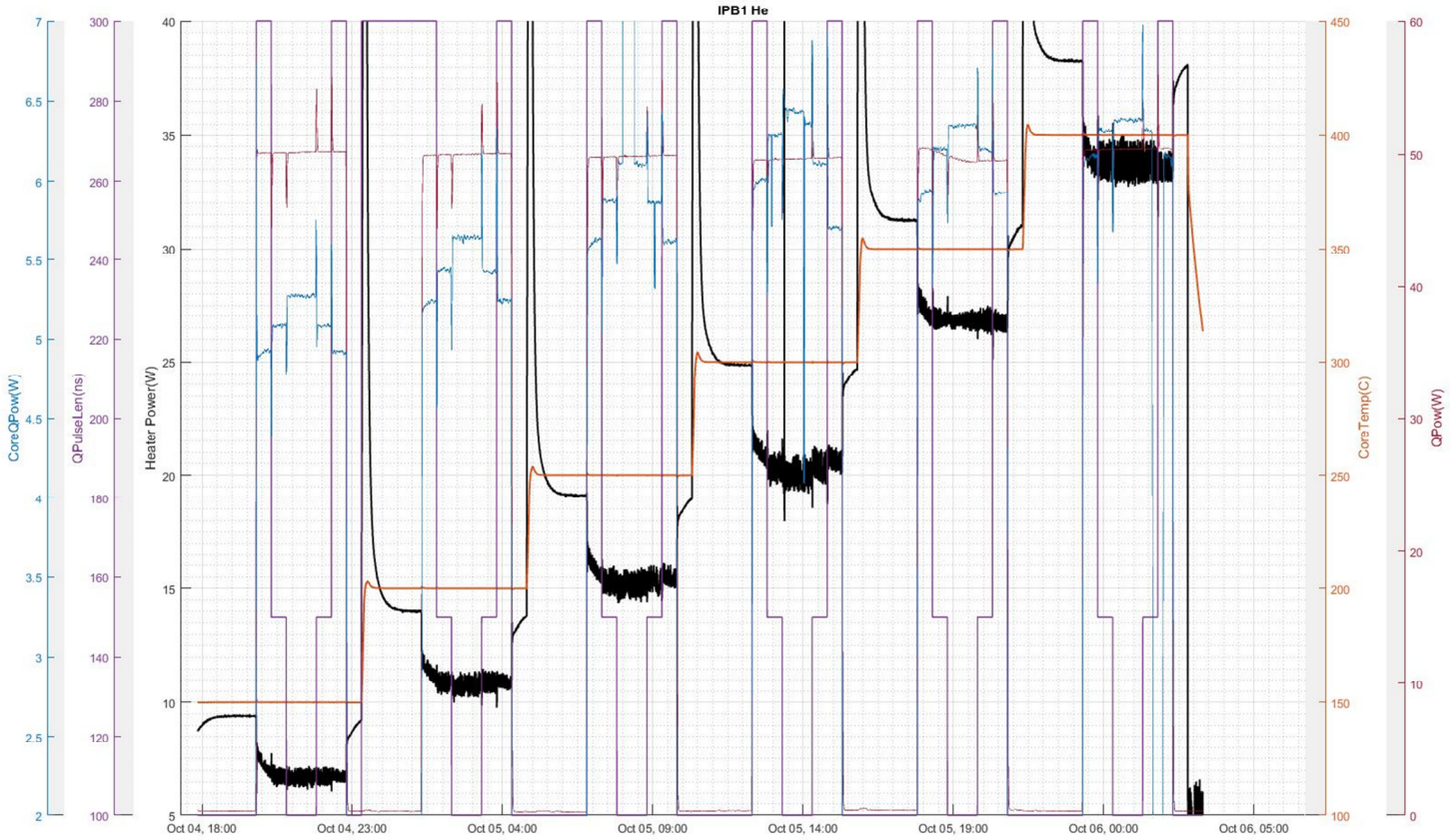

Figure 1. Run1 He 10/04/2016

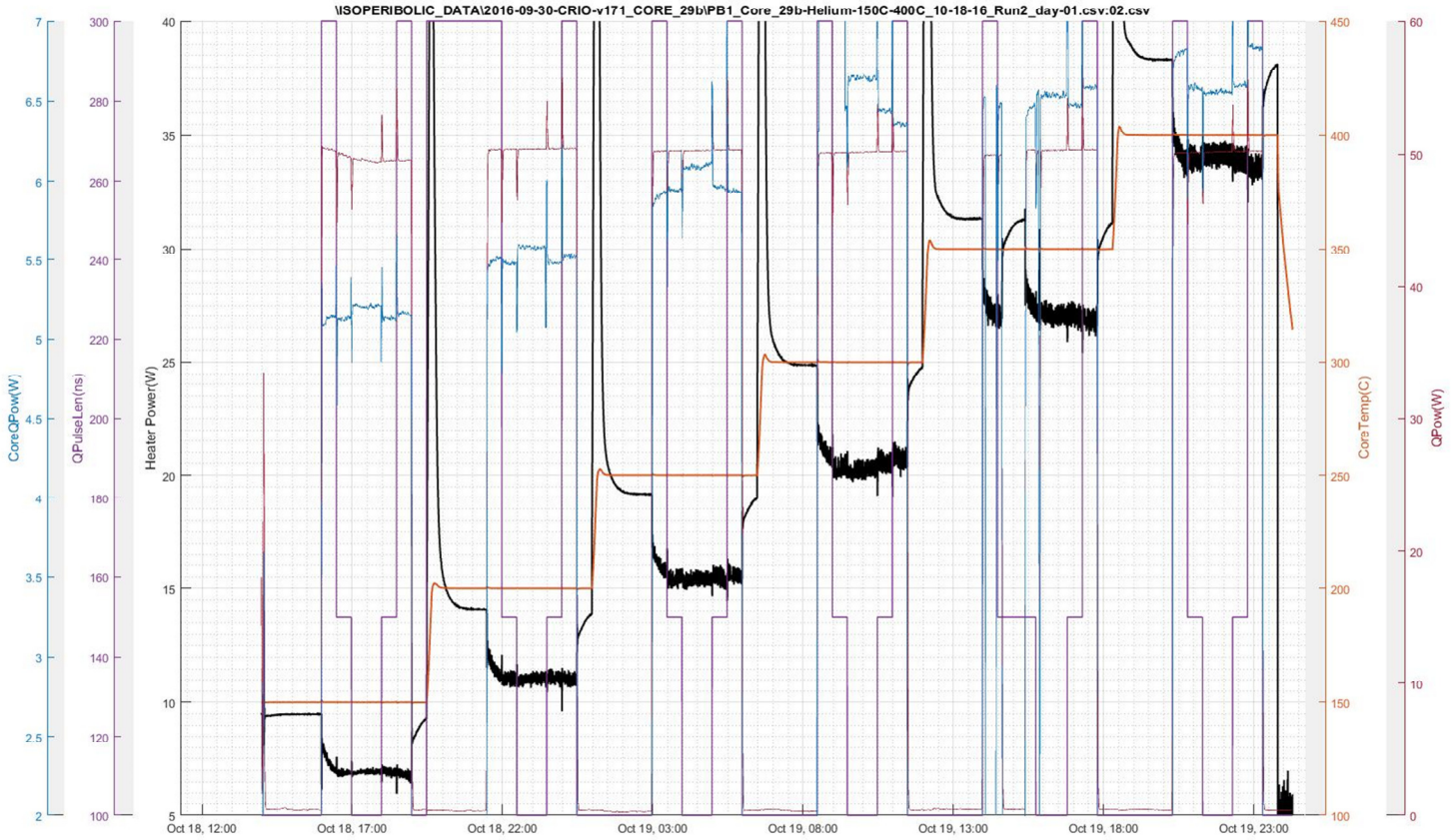

Figure 2. Run2 He 10/18/2016

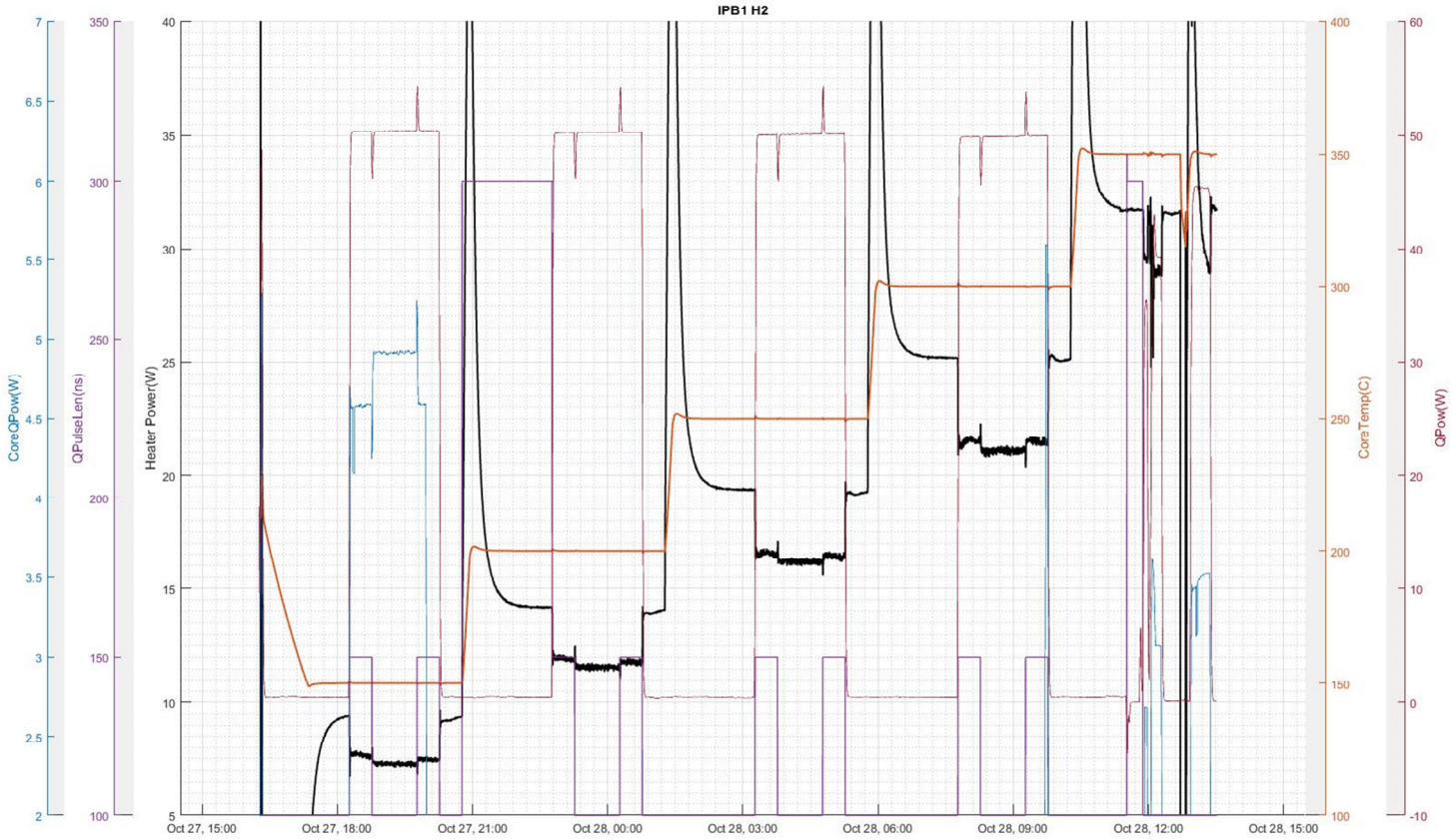

Figure 3. Run3 H2 10/27/2016

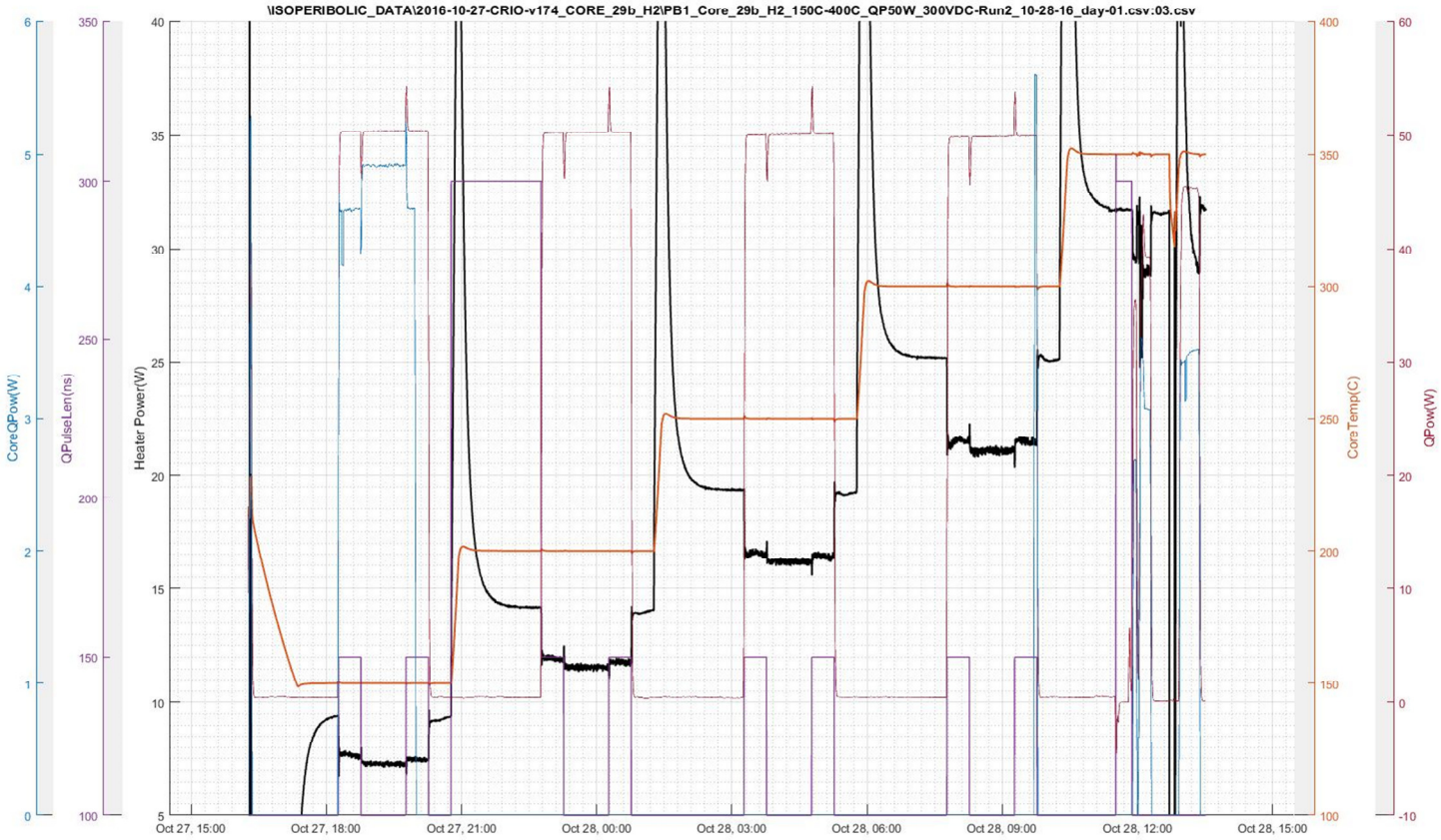

Figure 4. Run4 H2 10/28/2016

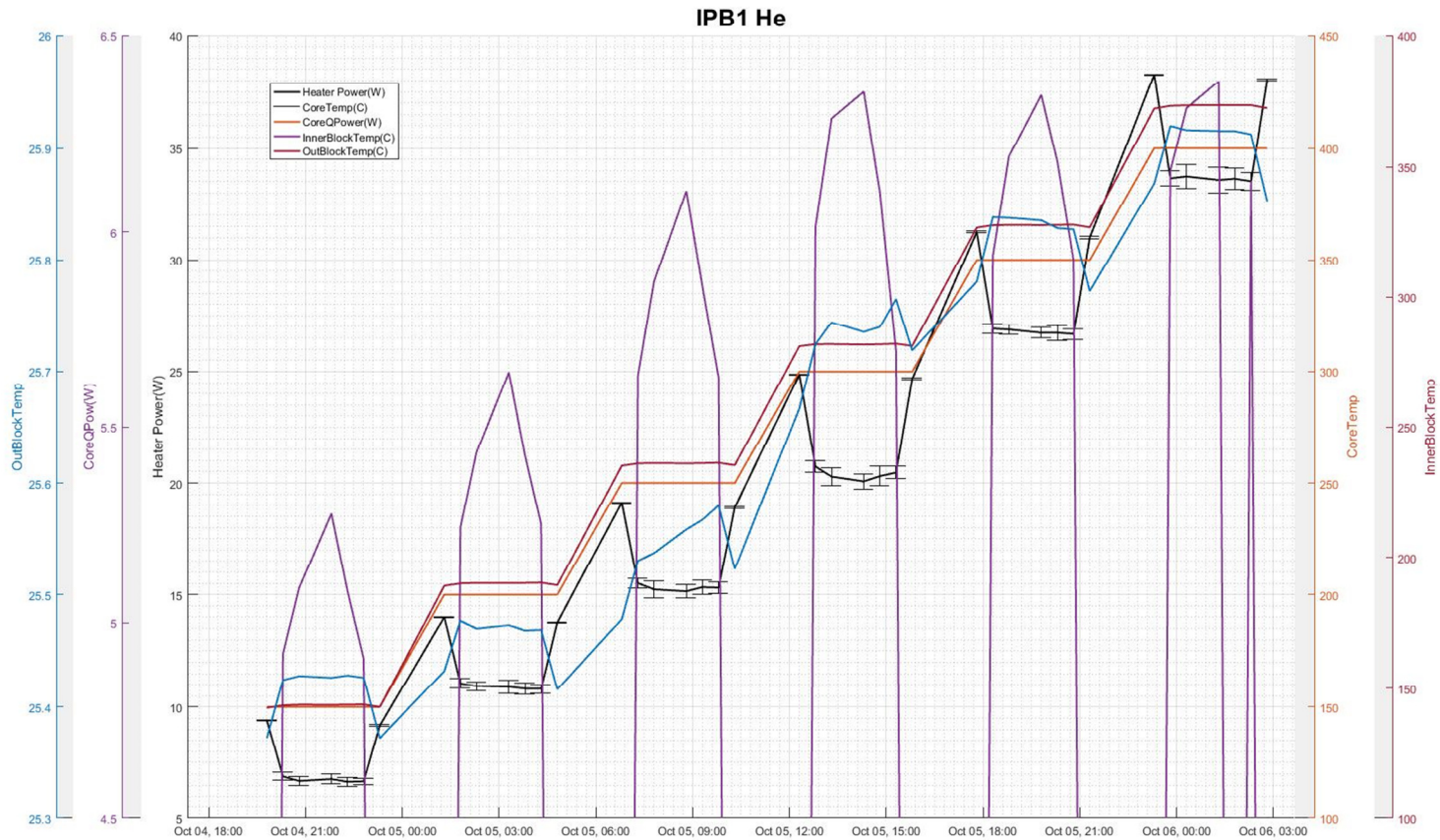

Figure 5. Run1 He with error bar of heater power 10/4/2016

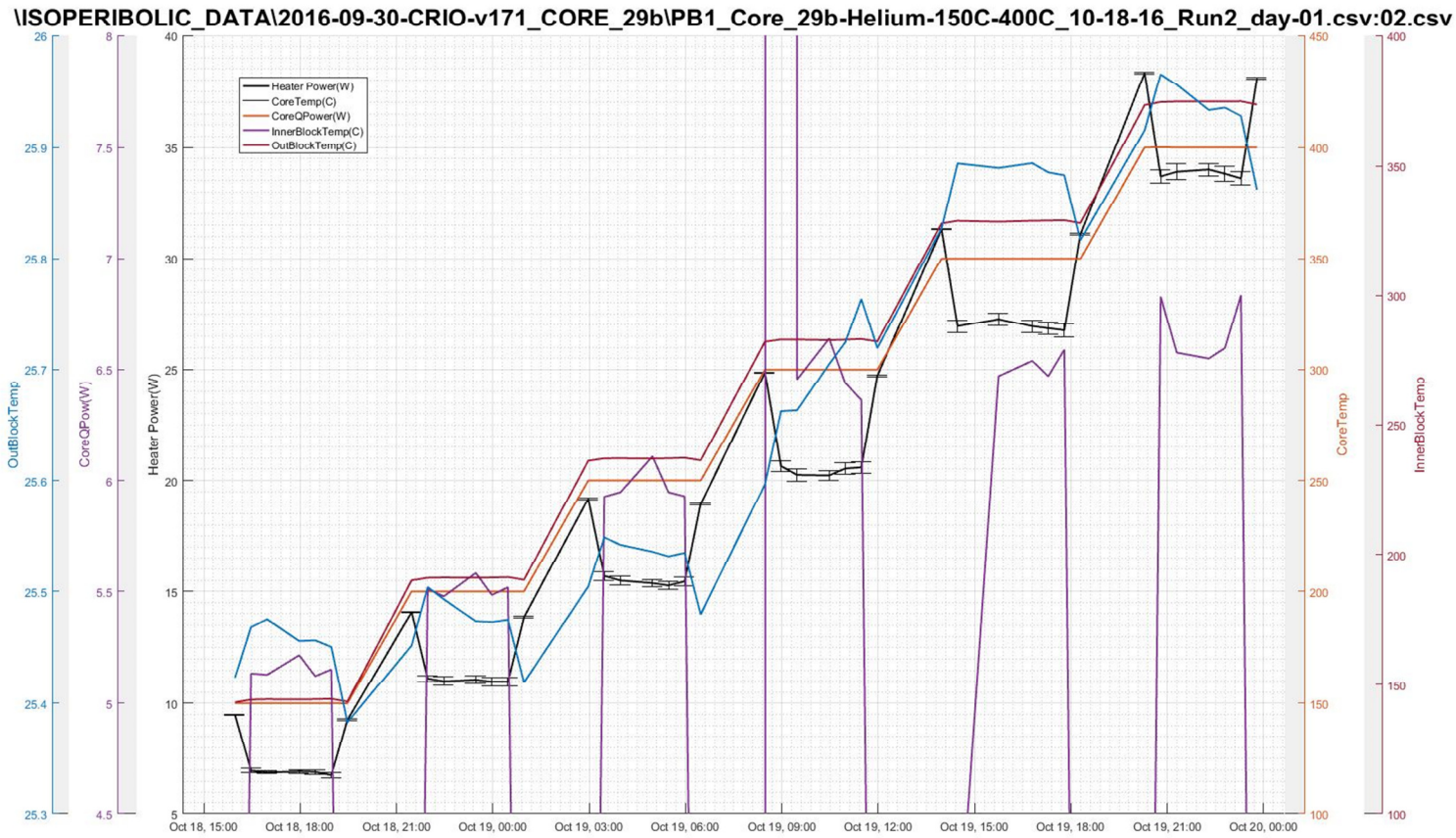

Figure 6. Run2 He with error bar of heater power 10/18/2016

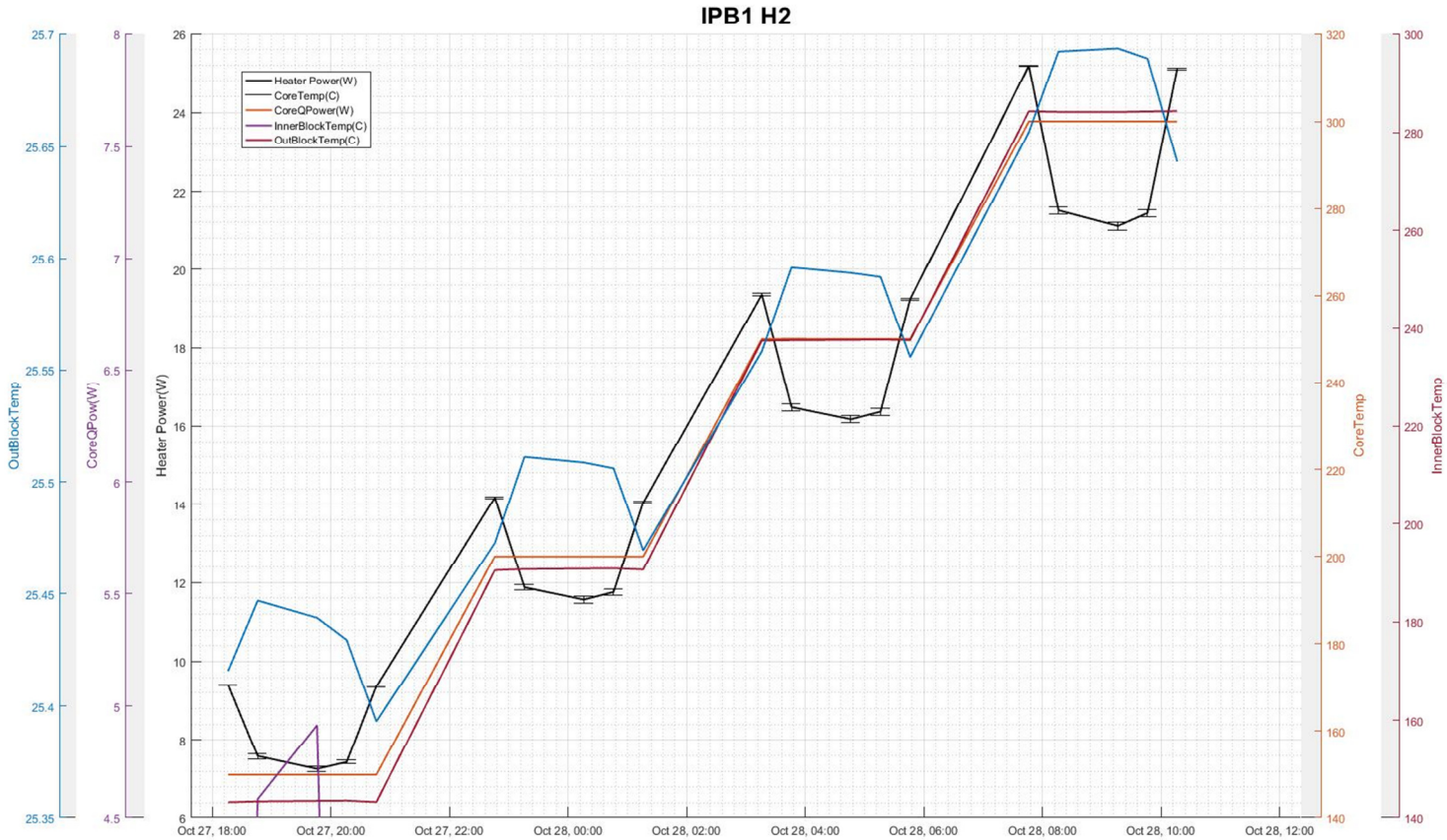

Figure 7. Run3 H2 with error bar of heater power 10/27/2016

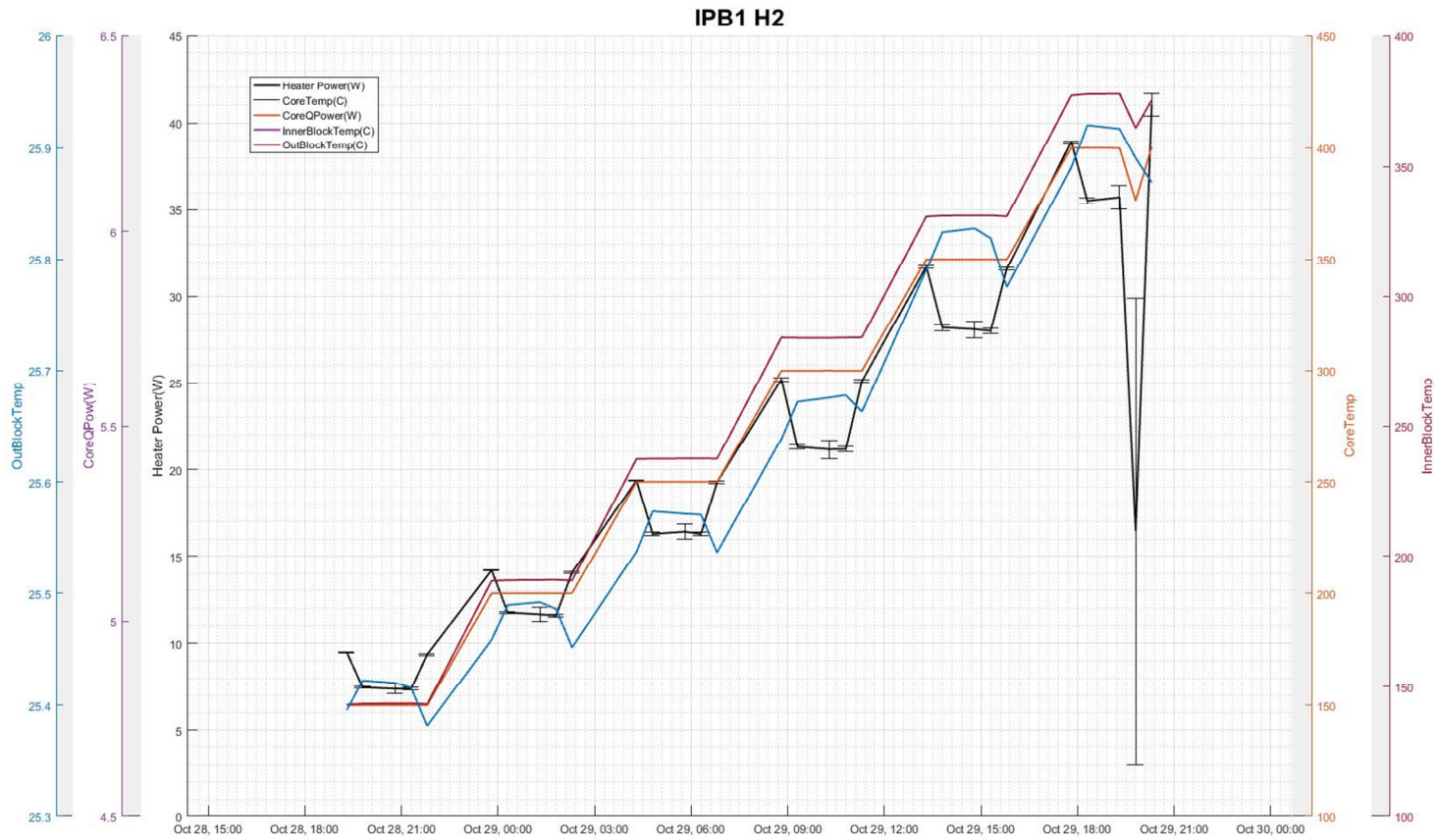

Figure 8. Run4 H2 with error bar of heater power 10/28/2016