Sample Results 1.3B

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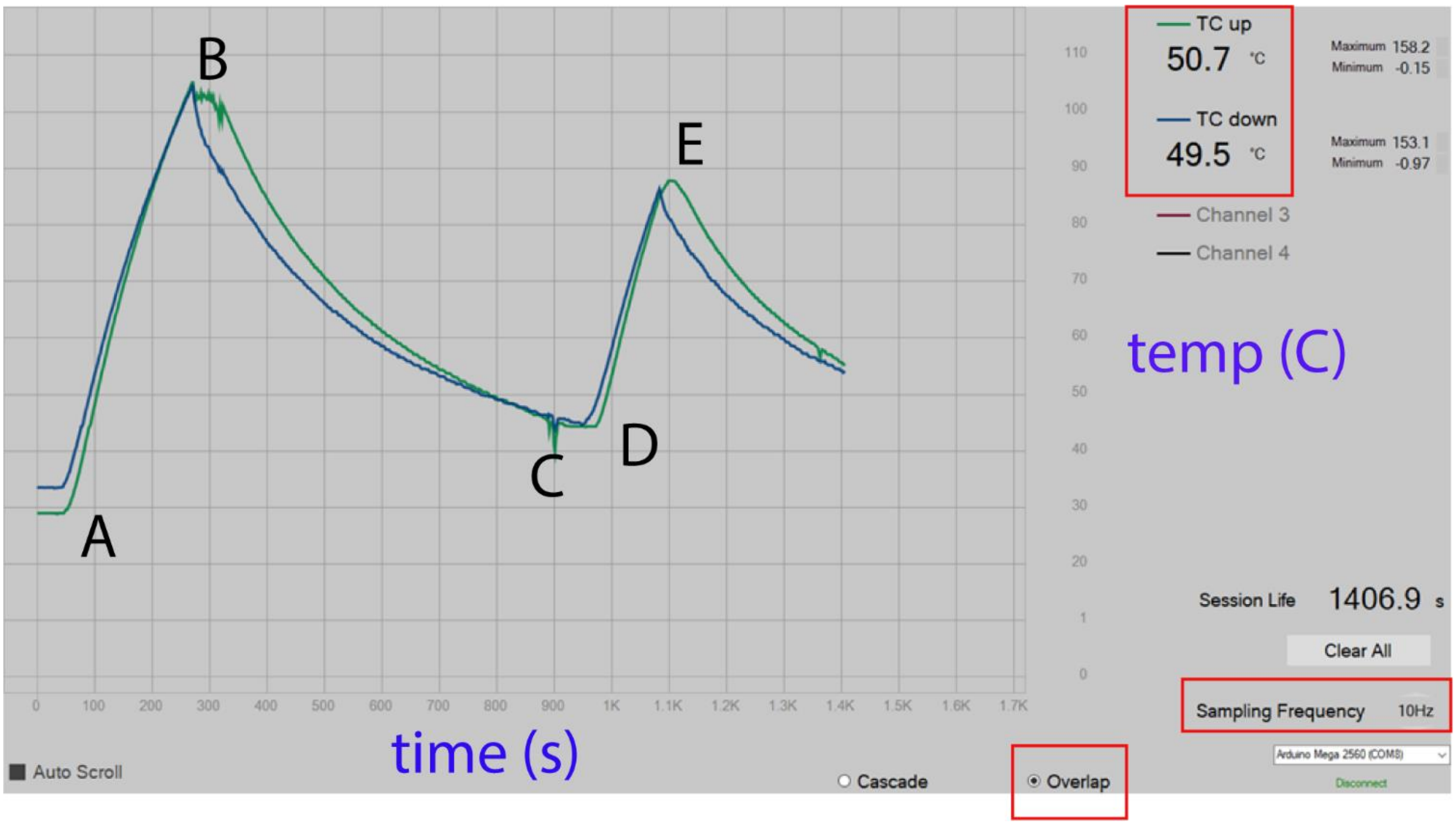

Point A:

The heater is turned on. The lower thermocouple (TC down) is closer to the heater but is attached to a large heat sink. Hence it has the tendency to cool faster or heat slower compared to the upper thermocouple (TC up). Both thermocouples are attached to a copper rod which has excellent thermal conductivity.

Point B:

The heater is switched off while the fan is off. Both thermocouples cool down. It is in this region, that we expect students to linearize the plot and estimate the rate of cooling. Linearization can be performed by taking the log of the temperature. Notice that the two

thermocouples eventually reach the same temperature. This is when the copper rod is in thermal equilibrium with its surroundings.

Point C:

We momentarily turn on the fan. Rapid drop in the temperature is observed. The noise level also goes up. The fan uses a motor which is an inductive device and it interferes with the long cables of the thermocouples.

Point D:

We switch on the heating again. Note that the upper thermocouple lags in its response, since it is further away from the source of heat. Therefore, even though copper is an excellent thermal conductor, its conductivity and specific heat are finite. The size of the copper rod also plays a crucial role in determining the amount of delay. This lag is also seen at points B and E.

Point E:

Heater is switched off and fan is activated. Observe the lag in the thermocouple's response that is distal from the heater. Also observe the purely exponential decay.