**supercapacitor test conditions**

**First test – minimising solar panels**

Input – 1 solar panel, with x1 1F supercapacitor, using a shortened beacon cycle

It was a cloudy day, about 18 deg Celsius

Radio settings – Tx Power 15dBm

Default (2) settings – slow & long range

* BW – 31.25kHz
* Coding rate – 4/8
* Spreading factor – 9 = 512 chips/symbol
* CRC on

**Results**

One supercapacitor was able to sustain operation, but it required approx. 1 minute for the capacitor to charge up before the beacon would initialise. It would only operate in full sunlight with the solar panel facing the sun (90 deg incidence). When the number of 1F capacitors was increased to 5 then it took much longer (7 minutes) for the capacitors to charge up and enable initialisation. When the beacon was initialised then operation was sustained when full sunlight was available.

**Second Test – time to charge (no load)**

The capacitors were charged via the solar panels with no load to check how long it takes to charge (when the voltage plateaus) with the voltage of the capacitor being measured

**Results**

*2 solar panels –*

1. 0 -> 6.05V – 495 Sec (8 min 15 sec)
2. 0 -> 6.3236 – 473 Sec (7 min 53 sec)
3. 0 -> 6.3173 – 514 Sec (8 min 34 sec)

*1 solar panel*

1. 0 -> 6.38V – 1325 Sec (22 min 5 sec)
2. 0 -> 6.42V – 1530 Sec (25 min 30 sec)

**Third Test – time to discharge (operating the satellite beacon)**

The fully charged capacitors are connected to the satellite radio beacon on the breadboard to determine how long the beacon remains operational (it completes all transmissions) with the capacitor voltage being measured

**Results**

1. Discharge - ~5V -> ~3V, time - 1943:06 -> 2031:42 – 48min 36sec (initial testing)
2. Discharge – 6.172V -> 3.03V, time - 0850:37 -> 1002:35 – 1hr 11min 58sec
3. Discharge – 6.05V -> 3.09V, time - 1028:29 -> 1140:25 – 1hr 11min 54sec
4. Discharge – 6.244V -> 3.07V, time - 1253:00 -> 1410:25 – 1hr 17min 25sec
5. Discharge – 6.424V -> 2.8V, time - 1446:46 -> 1603:34 – 1hr 16min 50sec
6. Discharge – 6.228V -> 2.855V, time - 0934:37 -> 1046:39 – 1hr 12min 2sec
7. Discharge – 6.2354V -> 3.012V, time - 1135:21 -> 1247:43 – 1hr 12min 12sec