**Test 1 – Solar panel checks, No capacitors**

**Clear and sunny day, temp approx. 34\*C.**

The solar panel test runs through the program Basic cycle checks where the systems runs through the Basic satellite program, Satellite launch (turns everything off for 3 seconds), then the satellite collects data, sends data, enters RX mode for 30 seconds, goes into the low power mode for 4 minutes and then repeats this process without the satellite launch. The SP value should count sequentially for every transmit if the radio/microprocessor does not reset, it the count resets to 1 then the beacon has reset itself as there was not enough power from the solar panels. The size of the data packet being sent is 50 Bytes and the voltage regulator used is the adafruit LM3671 Buck converter for power regulation (fed to the RAW pin of the APM module).

**3 solar panels connected results**

10:08:53.066 -> Feather LoRa RX Test!

10:08:53.168 -> LoRa radio init OK!

10:08:53.168 -> Set Freq to: 437.00

10:12:04.028 -> Received:

10:12:04.028 -> 49 44 3A 20 54 72 61 76 53 61 74 31 2C 42 56 3A

10:12:04.028 -> 20 32 38 37 2C 53 50 3A 20 31 2C 44 31 2C 20 38

10:12:04.028 -> 34 2C 44 32 3A 20 38 31 2C 44 33 3A 20 38 30 0

10:12:04.028 -> 0 0

10:12:04.028 -> Got: ID: TravSat1,BV: 287,SP: 1,D1, 84,D2: 81,D3: 80

10:12:04.028 -> number of Bytes is: 50

10:16:48.895 -> Received:

10:16:48.895 -> 49 44 3A 20 54 72 61 76 53 61 74 31 2C 42 56 3A

10:16:48.895 -> 20 35 30 2C 53 50 3A 20 32 2C 44 31 2C 20 31 32

10:16:48.895 -> 2C 44 32 3A 20 31 31 2C 44 33 3A 20 31 32 0 0

10:16:48.895 -> 0 0

10:16:48.895 -> Got: ID: TravSat1,BV: 50,SP: 2,D1, 12,D2: 11,D3: 12

10:16:48.895 -> number of Bytes is: 50

10:21:33.746 -> Received:

10:21:33.746 -> 49 44 3A 20 54 72 61 76 53 61 74 31 2C 42 56 3A

10:21:33.746 -> 20 31 32 2C 53 50 3A 20 33 2C 44 31 2C 20 31 2C

10:21:33.746 -> 44 32 3A 20 31 2C 44 33 3A 20 31 0 31 32 0 0

10:21:33.746 -> 0 0

10:21:33.746 -> Got: ID: TravSat1,BV: 12,SP: 3,D1, 1,D2: 1,D3: 1

10:21:33.746 -> number of Bytes is: 50

**2 solar panels connected results**

10:26:46.771 -> Feather LoRa RX Test!

10:26:46.908 -> LoRa radio init OK!

10:26:46.908 -> Set Freq to: 437.00

10:27:13.925 -> Received:

10:27:13.925 -> 49 44 3A 20 54 72 61 76 53 61 74 31 2C 42 56 3A

10:27:13.959 -> 20 31 39 32 2C 53 50 3A 20 31 2C 44 31 2C 20 32

10:27:13.959 -> 39 2C 44 32 3A 20 32 38 2C 44 33 3A 20 32 37 0

10:27:13.959 -> 0 0

10:27:13.959 -> Got: ID: TravSat1,BV: 192,SP: 1,D1, 29,D2: 28,D3: 27

10:27:13.959 -> number of Bytes is: 50

10:32:00.685 -> Received:

10:32:00.685 -> 49 44 3A 20 54 72 61 76 53 61 74 31 2C 42 56 3A

10:32:00.685 -> 20 33 2C 53 50 3A 20 32 2C 44 31 2C 20 30 2C 44

10:32:00.685 -> 32 3A 20 30 2C 44 33 3A 20 30 0 3A 20 32 37 0

10:32:00.685 -> 0 0

10:32:00.685 -> Got: ID: TravSat1,BV: 3,SP: 2,D1, 0,D2: 0,D3: 0

10:32:00.685 -> number of Bytes is: 50

10:36:46.288 -> Received:

10:36:46.288 -> 49 44 3A 20 54 72 61 76 53 61 74 31 2C 42 56 3A

10:36:46.288 -> 20 37 2C 53 50 3A 20 33 2C 44 31 2C 20 30 2C 44

10:36:46.288 -> 32 3A 20 30 2C 44 33 3A 20 30 0 3A 20 32 37 0

10:36:46.288 -> 0 0

10:36:46.288 -> Got: ID: TravSat1,BV: 7,SP: 3,D1, 0,D2: 0,D3: 0

10:36:46.288 -> number of Bytes is: 50

**1 solar panel connected results (5dBm)**

10:40:42.546 -> Feather LoRa RX Test!

10:40:42.682 -> LoRa radio init OK!

10:40:42.682 -> Set Freq to: 437.00

10:41:01.474 -> Received:

10:41:01.474 -> 49 44 3A 20 54 72 61 76 53 61 74 31 2C 42 56 3A

10:41:01.474 -> 20 31 39 32 2C 53 50 3A 20 31 2C 44 31 2C 20 32

10:41:01.474 -> 39 2C 44 32 3A 20 32 38 2C 44 33 3A 20 32 37 0

10:41:01.474 -> 0 0

10:41:01.474 -> Got: ID: TravSat1,BV: 192,SP: 1,D1, 29,D2: 28,D3: 27

10:41:01.474 -> number of Bytes is: 50

10:45:48.073 -> Received:

10:45:48.073 -> 49 44 3A 20 54 72 61 76 53 61 74 31 2C 42 56 3A

10:45:48.073 -> 20 33 2C 53 50 3A 20 32 2C 44 31 2C 20 30 2C 44

10:45:48.073 -> 32 3A 20 30 2C 44 33 3A 20 30 0 3A 20 32 37 0

10:45:48.073 -> 0 0

10:45:48.073 -> Got: ID: TravSat1,BV: 3,SP: 2,D1, 0,D2: 0,D3: 0

10:45:48.073 -> number of Bytes is: 50

10:50:35.019 -> Received:

10:50:35.019 -> 49 44 3A 20 54 72 61 76 53 61 74 31 2C 42 56 3A

10:50:35.019 -> 20 33 2C 53 50 3A 20 33 2C 44 31 2C 20 30 2C 44

10:50:35.019 -> 32 3A 20 30 2C 44 33 3A 20 30 0 3A 20 32 37 0

10:50:35.019 -> 0 0

10:50:35.019 -> Got: ID: TravSat1,BV: 3,SP: 3,D1, 0,D2: 0,D3: 0

10:50:35.019 -> number of Bytes is: 50

10:55:20.685 -> Received:

10:55:20.685 -> 49 44 3A 20 54 72 61 76 53 61 74 31 2C 42 56 3A

10:55:20.685 -> 20 34 2C 53 50 3A 20 34 2C 44 31 2C 20 30 2C 44

10:55:20.685 -> 32 3A 20 30 2C 44 33 3A 20 30 0 3A 20 32 37 0

10:55:20.685 -> 0 0

10:55:20.685 -> Got: ID: TravSat1,BV: 4,SP: 4,D1, 0,D2: 0,D3: 0

10:55:20.685 -> number of Bytes is: 50

**1 solar panel connected results (10dBm)**

11:06:04.144 -> Feather LoRa RX Test!

11:06:04.280 -> LoRa radio init OK!

11:06:04.280 -> Set Freq to: 437.00

11:06:51.076 -> Received:

11:06:51.076 -> 49 44 3A 20 54 72 61 76 53 61 74 31 2C 42 56 3A

11:06:51.076 -> 20 32 30 38 2C 53 50 3A 20 31 2C 44 31 2C 20 34

11:06:51.076 -> 34 2C 44 32 3A 20 34 32 2C 44 33 3A 20 34 31 0

11:06:51.076 -> 0 0

11:06:51.076 -> Got: ID: TravSat1,BV: 208,SP: 1,D1, 44,D2: 42,D3: 41

11:06:51.076 -> number of Bytes is: 50

11:11:37.473 -> Received:

11:11:37.473 -> 49 44 3A 20 54 72 61 76 53 61 74 31 2C 42 56 3A

11:11:37.506 -> 20 35 2C 53 50 3A 20 32 2C 44 31 2C 20 30 2C 44

11:11:37.506 -> 32 3A 20 30 2C 44 33 3A 20 30 0 3A 20 34 31 0

11:11:37.506 -> 0 0

11:11:37.506 -> Got: ID: TravSat1,BV: 5,SP: 2,D1, 0,D2: 0,D3: 0

11:11:37.506 -> number of Bytes is: 50

11:16:24.397 -> Received:

11:16:24.397 -> 49 44 3A 20 54 72 61 76 53 61 74 31 2C 42 56 3A

11:16:24.397 -> 20 33 2C 53 50 3A 20 33 2C 44 31 2C 20 30 2C 44

11:16:24.397 -> 32 3A 20 30 2C 44 33 3A 20 30 0 3A 20 34 31 0

11:16:24.397 -> 0 0

11:16:24.397 -> Got: ID: TravSat1,BV: 3,SP: 3,D1, 0,D2: 0,D3: 0

11:16:24.432 -> number of Bytes is: 50

**1 solar panel connected results (15dBm)**

11:19:42.043 -> Feather LoRa RX Test!

11:19:42.179 -> LoRa radio init OK!

11:19:42.179 -> Set Freq to: 437.00

11:20:18.724 -> Received:

11:20:18.724 -> 49 44 3A 20 54 72 61 76 53 61 74 31 2C 42 56 3A

11:20:18.724 -> 20 32 30 37 2C 53 50 3A 20 31 2C 44 31 2C 20 34

11:20:18.724 -> 30 2C 44 32 3A 20 33 39 2C 44 33 3A 20 33 38 0

11:20:18.724 -> 0 0

11:20:18.724 -> Got: ID: TravSat1,BV: 207,SP: 1,D1, 40,D2: 39,D3: 38

11:20:18.724 -> number of Bytes is: 50

11:25:05.560 -> Received:

11:25:05.560 -> 49 44 3A 20 54 72 61 76 53 61 74 31 2C 42 56 3A

11:25:05.560 -> 20 33 2C 53 50 3A 20 32 2C 44 31 2C 20 30 2C 44

11:25:05.560 -> 32 3A 20 30 2C 44 33 3A 20 30 0 3A 20 33 38 0

11:25:05.560 -> 0 0

11:25:05.560 -> Got: ID: TravSat1,BV: 3,SP: 2,D1, 0,D2: 0,D3: 0

11:25:05.560 -> number of Bytes is: 50

11:29:52.791 -> Received:

11:29:52.791 -> 49 44 3A 20 54 72 61 76 53 61 74 31 2C 42 56 3A

11:29:52.826 -> 20 33 2C 53 50 3A 20 33 2C 44 31 2C 20 30 2C 44

11:29:52.826 -> 32 3A 20 30 2C 44 33 3A 20 30 0 3A 20 33 38 0

11:29:52.826 -> 0 0

11:29:52.826 -> Got: ID: TravSat1,BV: 3,SP: 3,D1, 0,D2: 0,D3: 0

11:29:52.826 -> number of Bytes is: 50

**1 solar panel connected results (23dBm)**

11:35:02.728 -> Feather LoRa RX Test!

11:35:02.864 -> LoRa radio init OK!

11:35:02.864 -> Set Freq to: 437.00

11:35:42.534 -> Received:

11:35:42.534 -> 49 44 3A 20 54 72 61 76 53 61 74 31 2C 42 56 3A

11:35:42.534 -> 20 32 30 35 2C 53 50 3A 20 31 2C 44 31 2C 20 34

11:35:42.534 -> 32 2C 44 32 3A 20 34 30 2C 44 33 3A 20 34 30 0

11:35:42.534 -> 0 0

11:35:42.534 -> Got: ID: TravSat1,BV: 205,SP: 1,D1, 42,D2: 40,D3: 40

11:35:42.534 -> number of Bytes is: 50

11:35:49.469 -> Received:

11:35:49.469 -> 49 44 3A 20 54 72 61 76 53 61 74 31 2C 42 56 3A

11:35:49.469 -> 20 31 39 39 2C 53 50 3A 20 31 2C 44 31 2C 20 33

11:35:49.469 -> 38 2C 44 32 3A 20 33 36 2C 44 33 3A 20 33 35 0

11:35:49.469 -> 0 0

11:35:49.469 -> Got: ID: TravSat1,BV: 199,SP: 1,D1, 38,D2: 36,D3: 35

11:35:49.469 -> number of Bytes is: 50

11:35:56.398 -> Received:

11:35:56.398 -> 49 44 3A 20 54 72 61 76 53 61 74 31 2C 42 56 3A

11:35:56.398 -> 20 32 30 31 2C 53 50 3A 20 31 2C 44 31 2C 20 33

11:35:56.398 -> 36 2C 44 32 3A 20 33 35 2C 44 33 3A 20 33 34 0

11:35:56.398 -> 0 0

11:35:56.398 -> Got: ID: TravSat1,BV: 201,SP: 1,D1, 36,D2: 35,D3: 34

11:35:56.398 -> number of Bytes is: 50

\***The system is constantly resetting after transmission**

**1 solar panel connected results (23dBm) with 11 millifarads of capacitance**

11:59:50.019 -> Feather LoRa RX Test!

11:59:50.158 -> LoRa radio init OK!

11:59:50.158 -> Set Freq to: 437.00

12:02:36.078 -> Received:

12:02:36.078 -> 49 44 3A 20 54 72 61 76 53 61 74 31 2C 42 56 3A

12:02:36.078 -> 20 32 31 35 2C 53 50 3A 20 31 2C 44 31 2C 20 34

12:02:36.078 -> 36 2C 44 32 3A 20 34 34 2C 44 33 3A 20 34 33 0

12:02:36.113 -> 0 0

12:02:36.113 -> Got: ID: TravSat1,BV: 215,SP: 1,D1, 46,D2: 44,D3: 43

12:02:36.113 -> number of Bytes is: 50

12:07:22.104 -> Received:

12:07:22.104 -> 49 44 3A 20 54 72 61 76 53 61 74 31 2C 42 56 3A

12:07:22.104 -> 20 36 2C 53 50 3A 20 32 2C 44 31 2C 20 30 2C 44

12:07:22.104 -> 32 3A 20 30 2C 44 33 3A 20 30 0 3A 20 34 33 0

12:07:22.104 -> 0 0

12:07:22.104 -> Got: ID: TravSat1,BV: 6,SP: 2,D1, 0,D2: 0,D3: 0

12:07:22.104 -> number of Bytes is: 50

12:12:09.023 -> Received:

12:12:09.023 -> 49 44 3A 20 54 72 61 76 53 61 74 31 2C 42 56 3A

12:12:09.023 -> 20 32 2C 53 50 3A 20 33 2C 44 31 2C 20 30 2C 44

12:12:09.023 -> 32 3A 20 30 2C 44 33 3A 20 30 0 3A 20 34 33 0

12:12:09.023 -> 0 0

12:12:09.023 -> Got: ID: TravSat1,BV: 2,SP: 3,D1, 0,D2: 0,D3: 0

12:12:09.023 -> number of Bytes is: 50

12:16:56.302 -> 49 44 3A 20 54 72 61 76 53 61 74 31 2C 42 56 3A

12:16:56.302 -> 20 32 2C 53 50 3A 20 34 2C 44 31 2C 20 30 2C 44

12:16:56.302 -> 32 3A 20 30 2C 44 33 3A 20 30 0 3A 20 34 33 0

12:16:56.337 -> 0 0

12:16:56.337 -> Got: ID: TravSat1,BV: 2,SP: 4,D1, 0,D2: 0,D3: 0

12:16:56.337 -> number of Bytes is: 50

**\*When the capacitors were added then enough energy was stored for a transmit that the system did not reset. There were 5 25V 2200uF capacitors used to store the energy.**