test\_1: no switch, plant and radio attached directly through BQ

test\_2: BQ with OK HYST at 3 V, OK PROG at 2 V, 470 microF cap, plant input

test\_3: full system! OK HYST at 3 V, OK PROG at 2 V, 470 microF cap, plant input, mic94071yc6-tr and bftag with covered PV

channel A: BQ input, plant voltage

channel B: BFtag VDD, output of switch

channel C: V bat sec

Channel D: TXE

VDD of bftag spikes but immediately brings down V stor, leading to switch closure

This could be due to the capacitors in the tag, which have a much higher inrush current than the 7 microA which are needed to charge the bftag with the sourcemeter

test\_4: detached bftag, just light power on uncovered PV

channel B: BFtag VDD, output of switch

Channel D: TXE

Compare with test 3 and figure out why it cannot transmit in that case

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TO DO:

RADIO ONLY TEST, with PV

Check voltage level of radio activation (I thought it was 3 and something from test 1, but from test 4 it looks like it is around 2.4 V with panel only)

Check if this voltage level of radio activation is compatible with the V\_bat ok signal

TO DO: BYPASS BFTAG CAPACITORS

OK hyst: 3.06 V

OK prog: 2 V

GOAL: cold start the system only once, make sure that sending a radio message does not make us go below cold start again by isolating system load.

IDEA: I think that with test 1, plant was charged enough to be able to get system over cold start even with radio attached.

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test\_5: just radio - verify test\_4

Radio working with PV + phone light

Channel A: VDD

Channel B: TXE

Channel C: BTH

Channel D: WFE

Compare with test 3

test\_6: just radio - zoom on a single beacon

Channel A: VDD

Channel B: TXE

Channel C: BTH

Channel D: WFE

test\_7: full system (but simulated plant cause it is momentaneously dead)

Monitor VIN of plant (input of BQ), VDD (== VSTOR, output of BQ), TXE, V\_BAT\_OK

Plant simulation: current source with source meter, 150 ohm in parallel to source

440 microF moved from BFTAG to BQ! Now it transmits!

Channel A: TXE

Channel B: VDD

Channel C: VIN

Channel D: VBATOK

WEIRD DROP BETWEEN VSTOR AND VDD, ON SWITCH

- Test fall between VDD and VSTOR

If voltage input to switch is below 0.8 V, there is a drop between switch input and output.

Otherwise, with voltages higher than that, no drop happens

- Test Vstor and Vbatsec with new capacitors

BQ behaves as expected, after 1.95 V Vbatsec is shorted to Vstor

- Test switch with no load, but driven by BQ

Even if I use same signal as input and as enable, the output has a 1 V drop wrt the input

WHY DOES DROP HAPPEN??

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test\_8: simulated plant, BQ and switch, 1k load on Vstor when Vbat ok goes high

System was rebuilt on breadboard, NO MORE DROP across switch!!

After Vstor reaches 3.3 V, 1k load is attached to Vstor, then after some time input from source meter is also turned off

Channel A: VOUT of switch

Channel B: VSTOR

Channel C: VBATOK

Channel D: VBATSEC

test\_9: simulated plant, BQ and switch, BFTAG on Vout, covered PV

EVERYTHING WORKING!!

Channel A: VOUT of switch

Channel B: VSTOR

Channel C: VBATOK

Channel D: TXE

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Tests executed in the early afternoon: in the morning, plant had OCV of 796 mV

test\_10: real plant, BQ and switch, BFTAG on Vout, covered PV

Channel A: VOUT of switch

Channel B: VSTOR

Channel C: VIN,plant

Channel D: TXE

test\_10\_bad: something detached during test, don't consider

test\_10: good test, more than one transmission but we don't see when vbatok falls

test\_10\_post: good test, one single transmission and we see where vbatok falls

test\_11: same setup as test\_10, but STRESS TEST for plant

At around 11 mins I removed V\_bat\_ok to detach load from BQ and checked how plant OCV recovers

test\_11\_v1; panel was slightly uncovered, plant was fresh from rest

test\_11\_v2: panel is covered and plant is tired from test\_11\_v1

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test\_12: tag original code

flashed from Roberto’s working binaries.

Ch A: TXE

CH B: VDD

We can see the 6 beacons and the drop to 2.4 V when in wait

test\_13: tag modified code (MCU side)

Ch A: TXE

CH B: VDD

we want tag to consume less in wait time: so I set

My\_Set\_PVD(PWR\_PVDLEVEL\_5, PWR\_PVD\_MODE\_IT\_RISING)

right after tag is in wait.

Actually, this pushes down voltage interrupt level, so I try with PWR\_PVDLEVEL\_2.

Also, 20 seconds between beacons aren’t respected, as tim1 interrupt is preceded by the PVD interrupt.

test\_14: tag modified code (MCU side)

Ch A: TXE

CH B: VDD

My\_Set\_PVD(PWR\_PVDLEVEL\_2, PWR\_PVD\_MODE\_IT\_RISING)

20 seconds are respected but voltage level drop in wait seems the same as before

test\_15: tag modified code (MCU side)

Ch A: TXE

CH B: VDD

My\_Set\_PVD(PWR\_PVDLEVEL\_0, PWR\_PVD\_MODE\_IT\_RISING)

20 seconds are respected but voltage level drop in wait seems the same as before

CHECK THIS!

test\_16: tag modified code (MCU side)

Ch A: TXE

CH B: VDD

My\_Set\_PVD(PWR\_PVDLEVEL\_4, PWR\_PVD\_MODE\_IT\_RISING)

20 seconds are respected but voltage level drop in wait seems the same as before

CHECK THIS!

test\_16\_withBTH: added ch C attached on BTH pin, CH D attached to MCU\_NRST.

test\_17: tag modified code (BLE side)

Unmodified MCU code, variation to BLE code is just changing TAG\_RX\_TIMEOUT\_TH from 10 to 2. IT WORKS!!

Ch A: VDD

CH B: TXE

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test\_18: full demo

code from test\_17, bftag with removed caps and bq in place with voltage dividers

Ch A: Vstor

CH B: Vbatok

CH C: Vbatsec

CH D: Vdd tag

after two communication rounds, load applied to vstor to see when vbatok signal drops

test\_19: full demo

code from test\_17, bftag with removed caps and bq in place with voltage dividers

Ch A: Vstor

CH B: txe

CH C: Vbatsec

CH D: Vdd tag

after two communication rounds, load applied to vstor to see when vbatok signal drops

test\_20: full demo, neat setup

code from test\_17, bftag with removed caps and bq in place with voltage dividers

Ch A: bth

CH B: vdd tag

CH C: txe

CH D: Vbatsec

after two communication rounds, load applied to vstor to see when vbatok signal drops

test\_20\_detail shows just one communication round and a wait round, to see better what bth and txe are doing

PROBLEM!! roberto method stopped working

by changing line 343 of the MCU code, from pvd level 4 to level 6, we are able to obtain something similar

test\_21: full demo, neat setup, new method of having reduced consumption in wait

code from test\_17, bftag with removed caps and bq in place with voltage dividers

Ch A: bth

CH B: vdd tag

CH C: txe

CH D: Vbatsec

change\_of\_capacitance picture describes the problem. Halfway through the test i changed capacitance across vdd of bftag with mounted 440 microF caps + external 470 microF cap.

Initially, I had 440+470, which lead to wrong behaviour in wait.

After, I removed the 470 cap and i had normal behaviour. Why? see code

