

12W triplet gain study

CBPM group

CBPM meeting

Feb 24, 2023

12W waveform (from time sweep)

12W waveform

Compare time sweep waveform for 12W at:

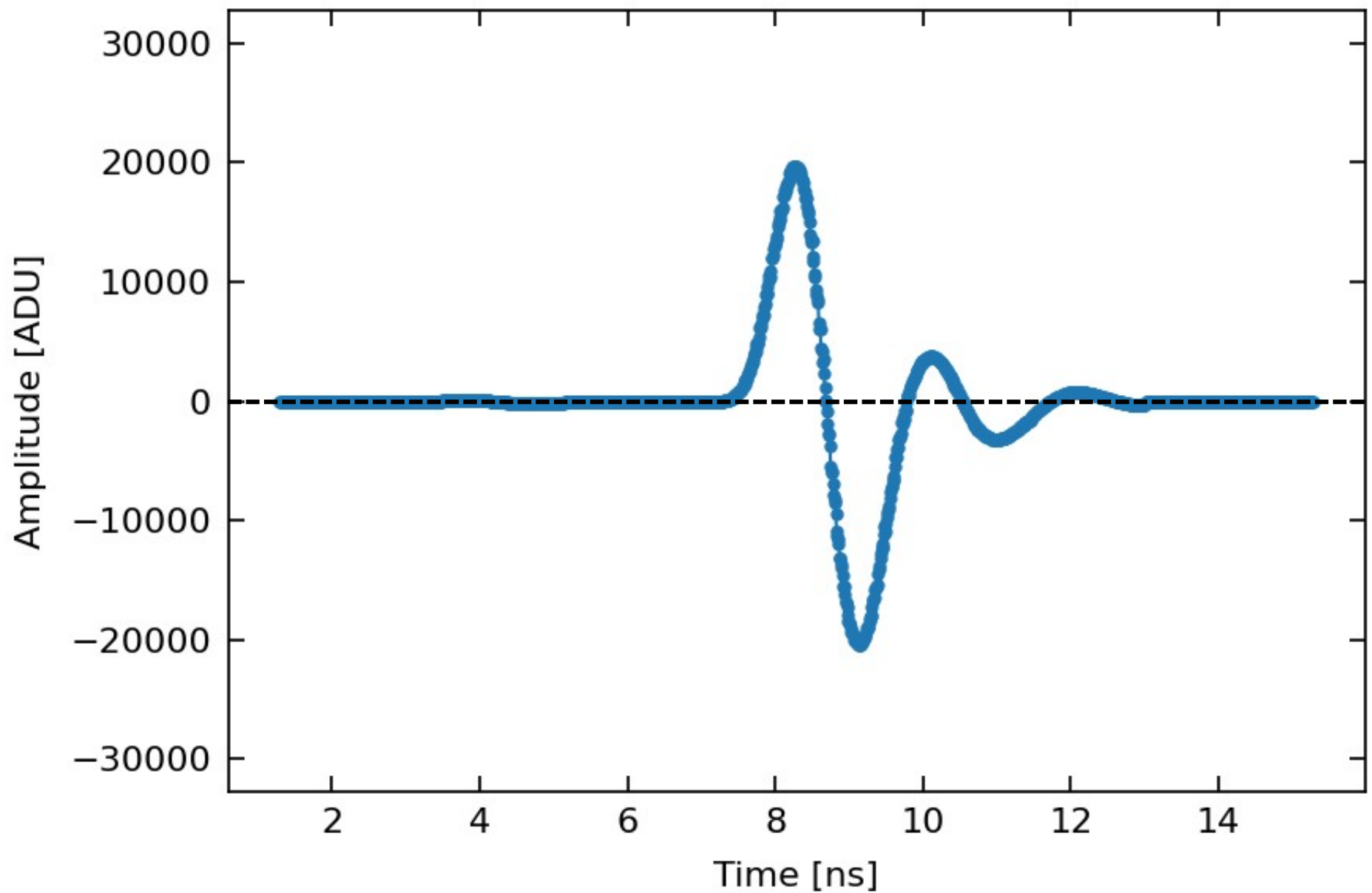
- × 0.7 mA **before** resistor removal

- × 5 mA **after** resistor removal

12W waveform

0.7 mA, with resistor

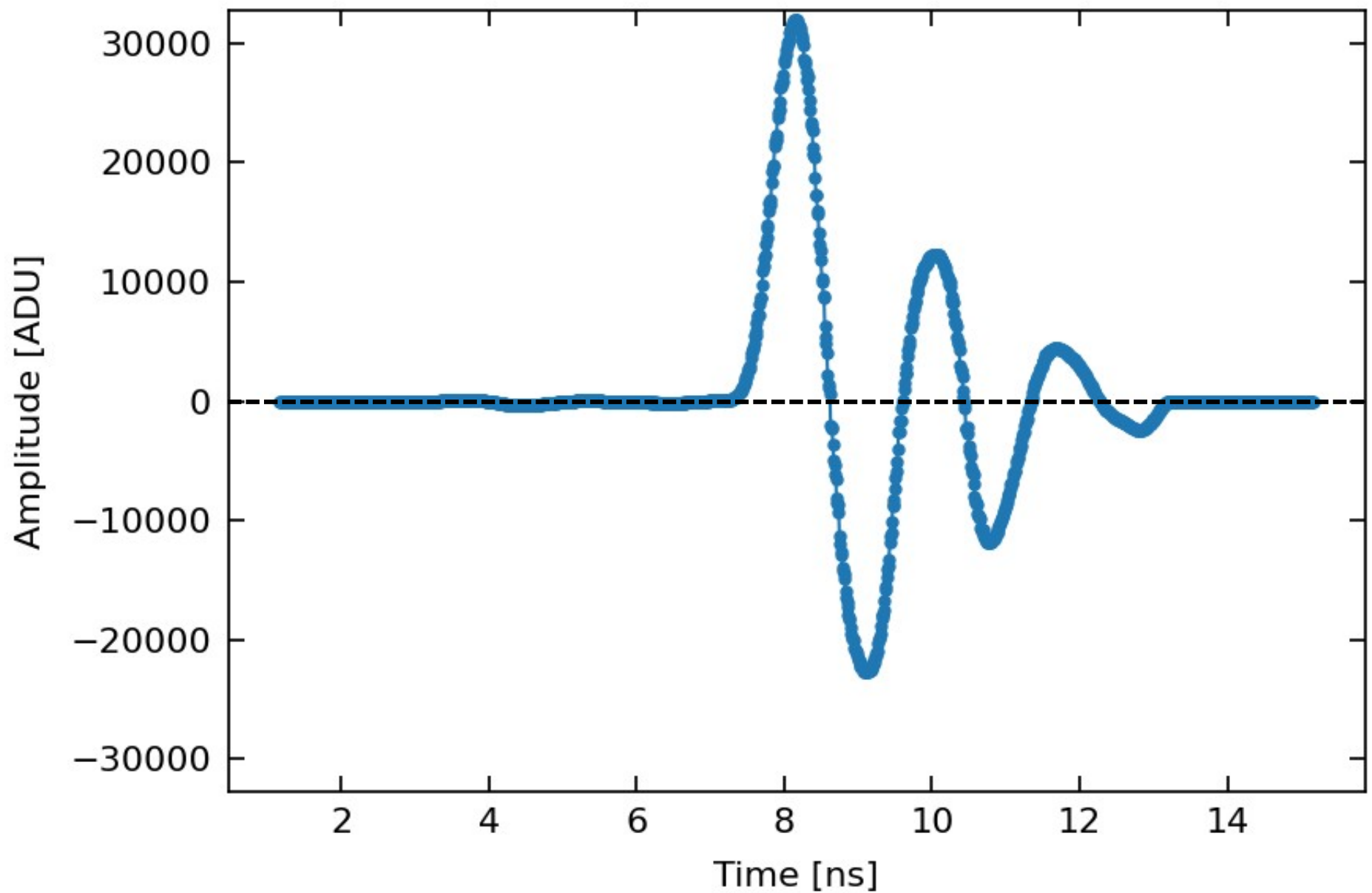
top in (b3)



12W waveform

5 mA, without resistor

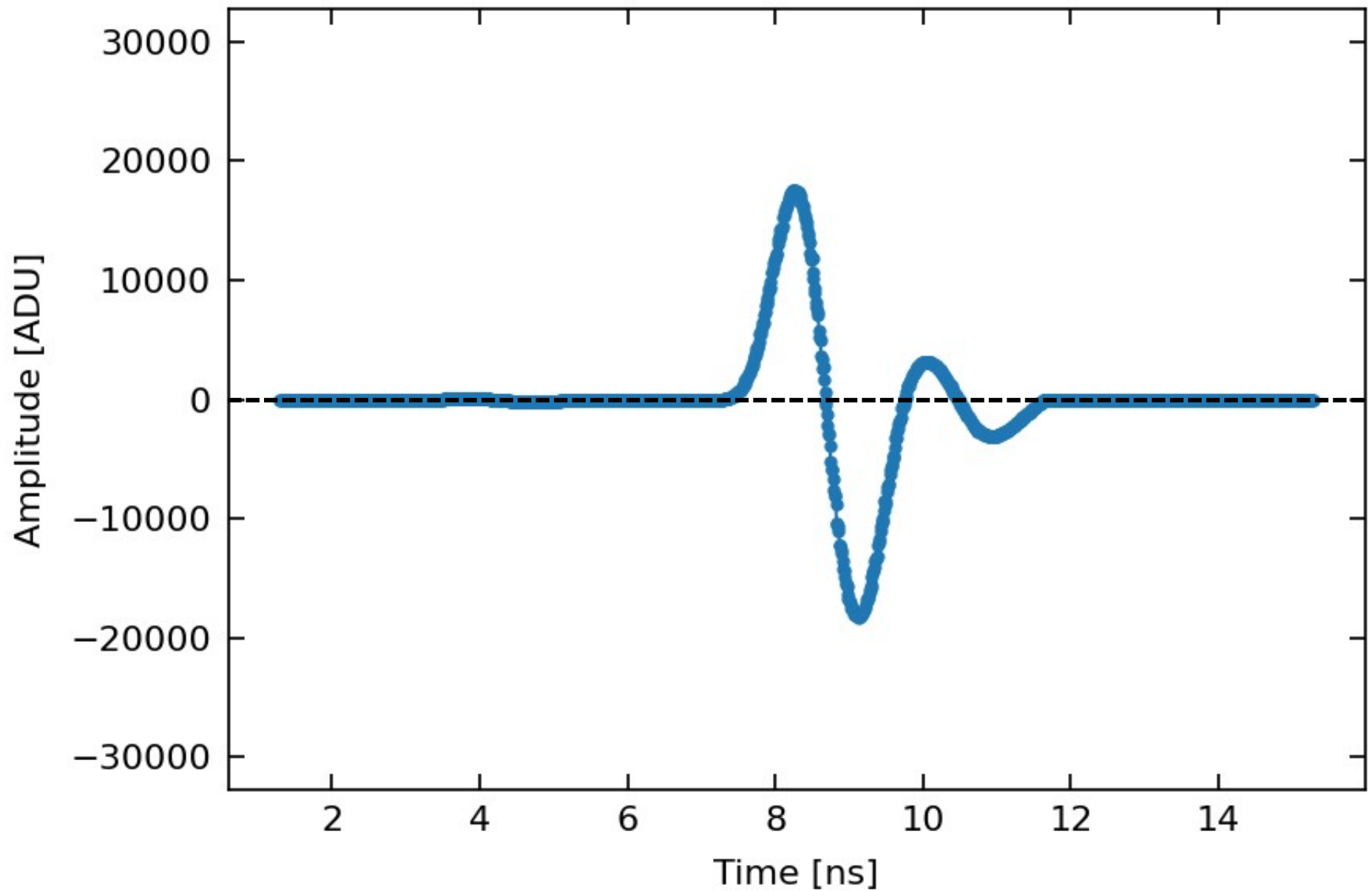
top in (b3)



12W waveform

0.7 mA, with resistor

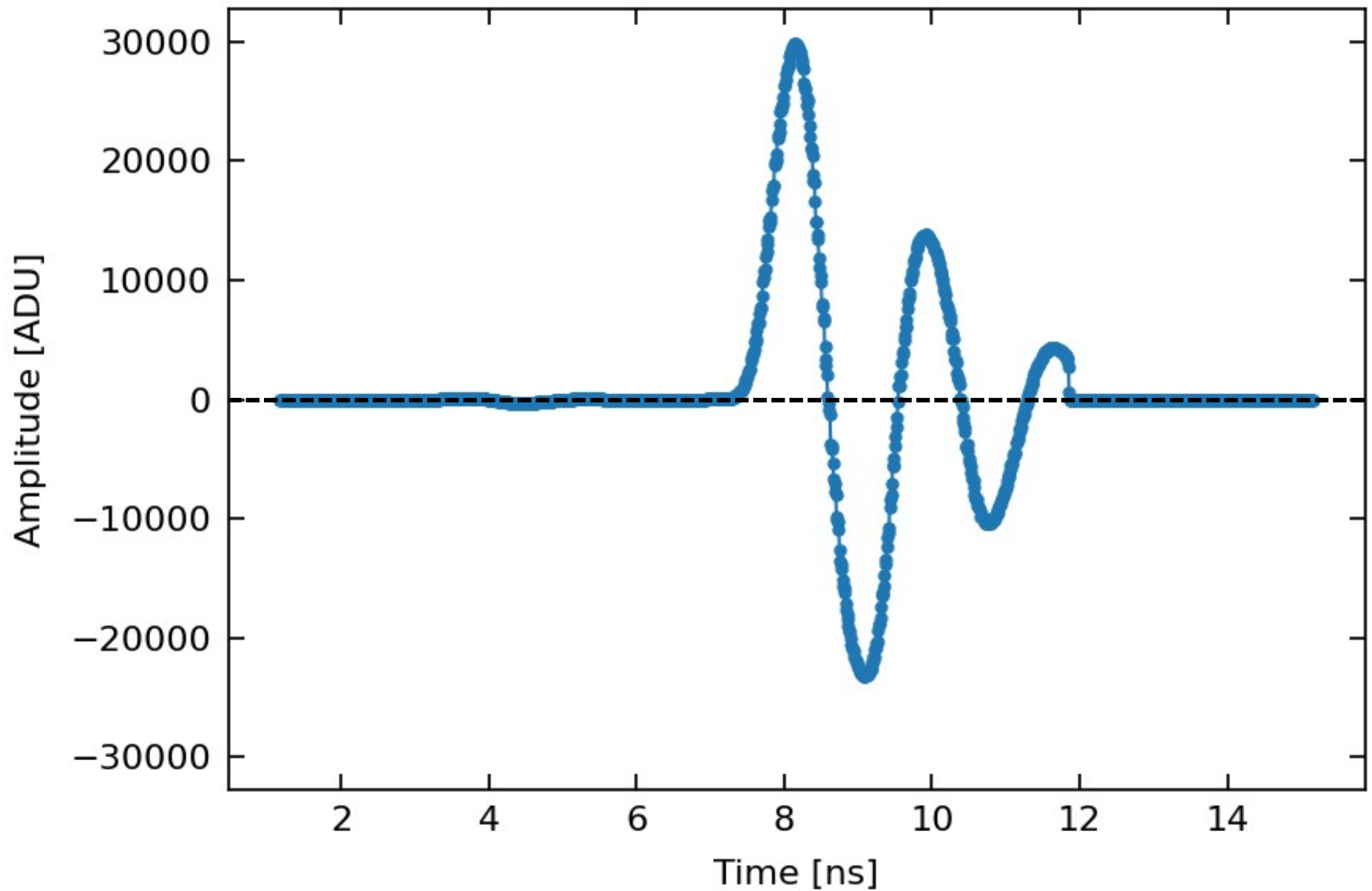
bot in (b1)



12W waveform

5 mA, without resistor

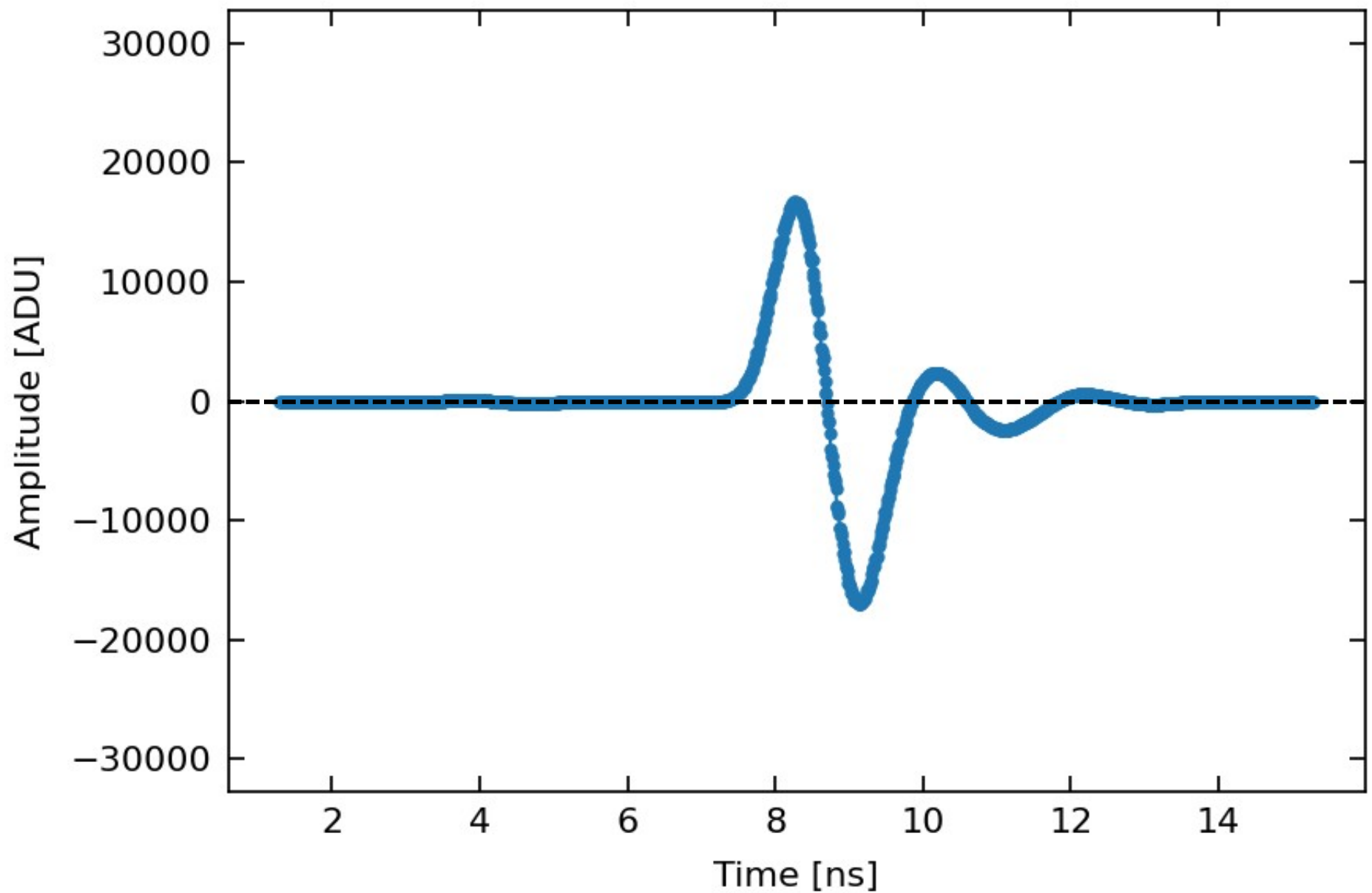
bot in (b1)



12W waveform

0.7 mA, with resistor

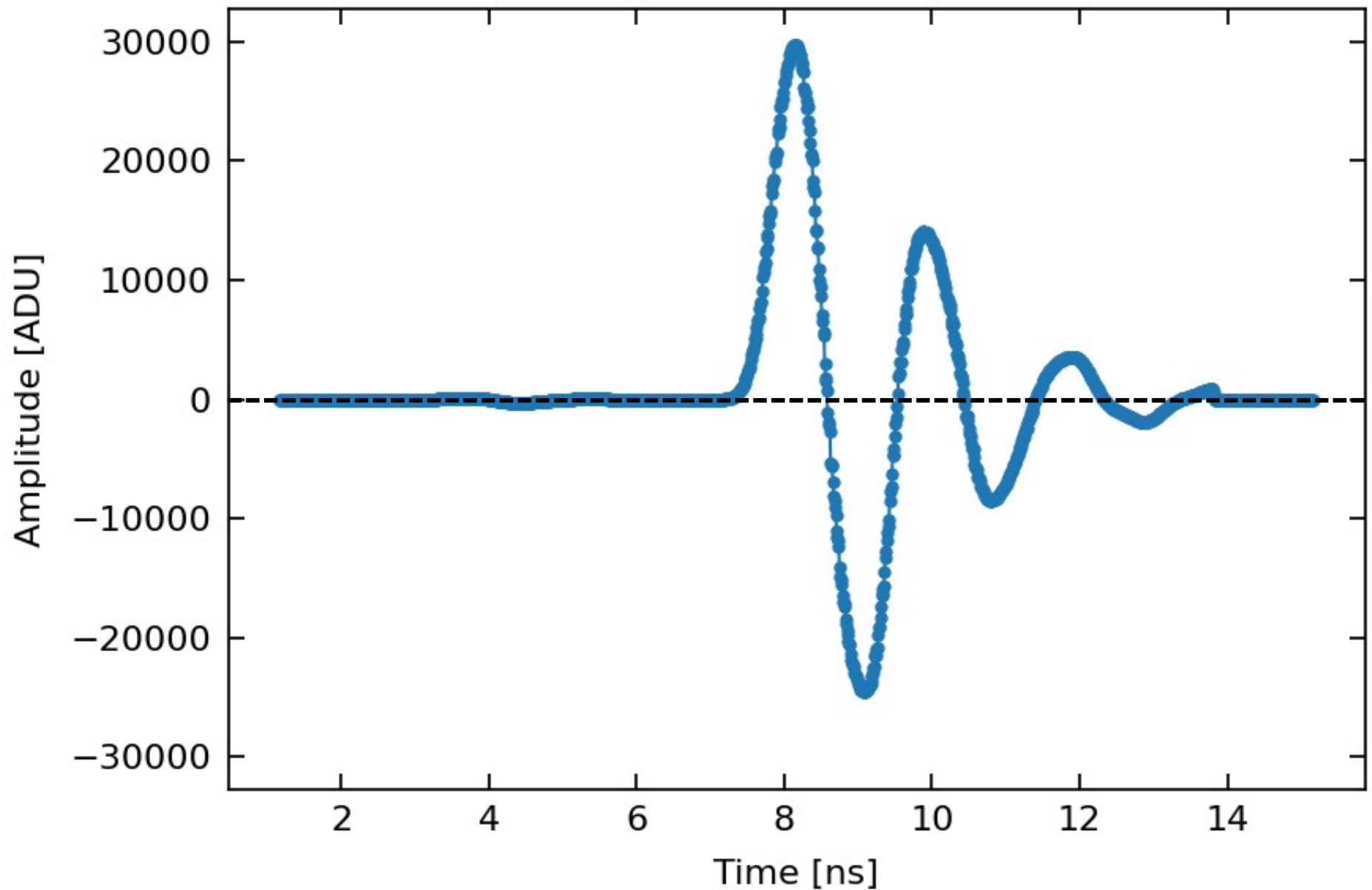
bot out (b2)



12W waveform

5 mA, without resistor

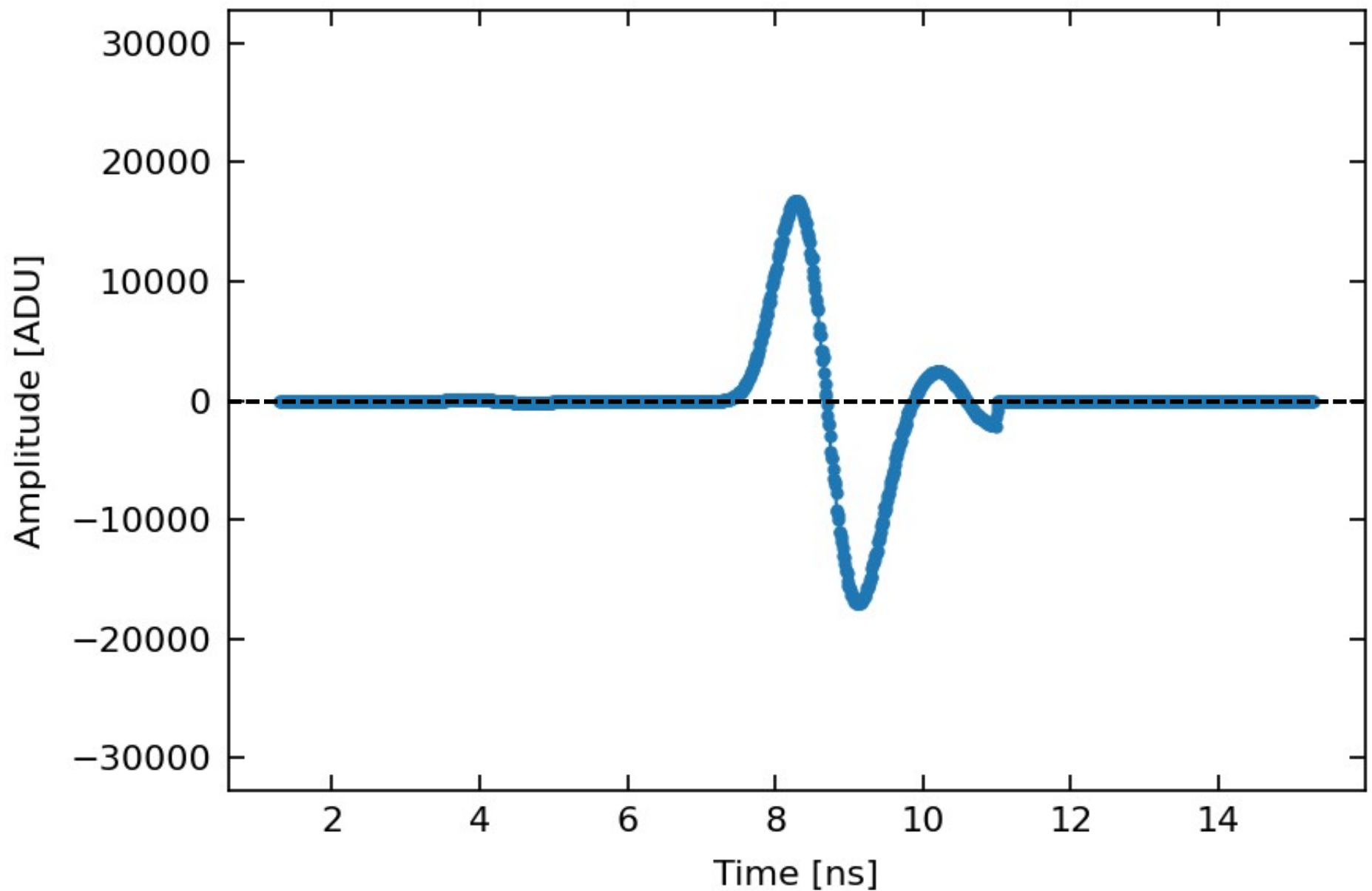
bot out (b2)



12W waveform

0.7 mA, with resistor

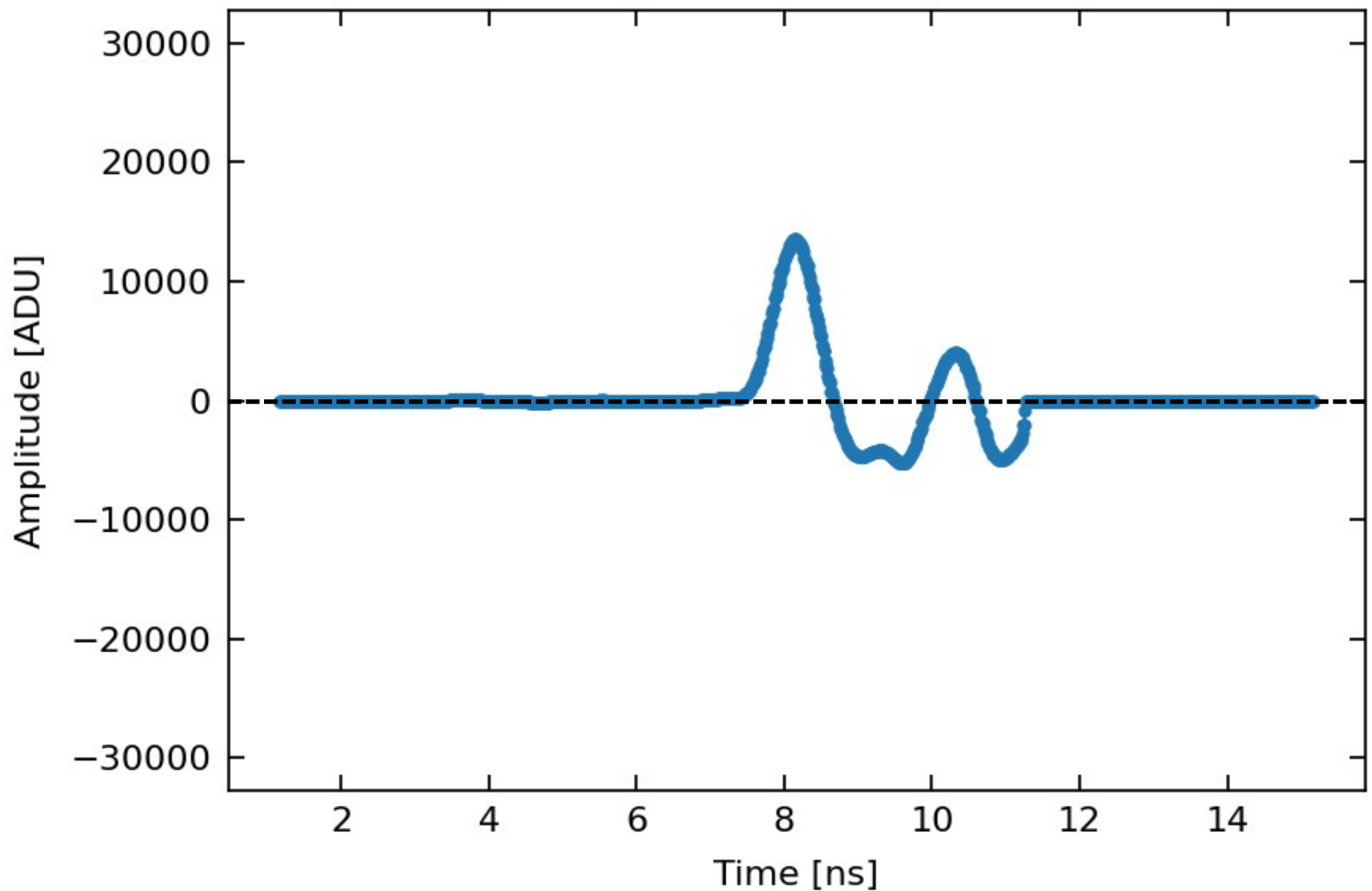
top out (b4)



12W waveform

5 mA, without resistor

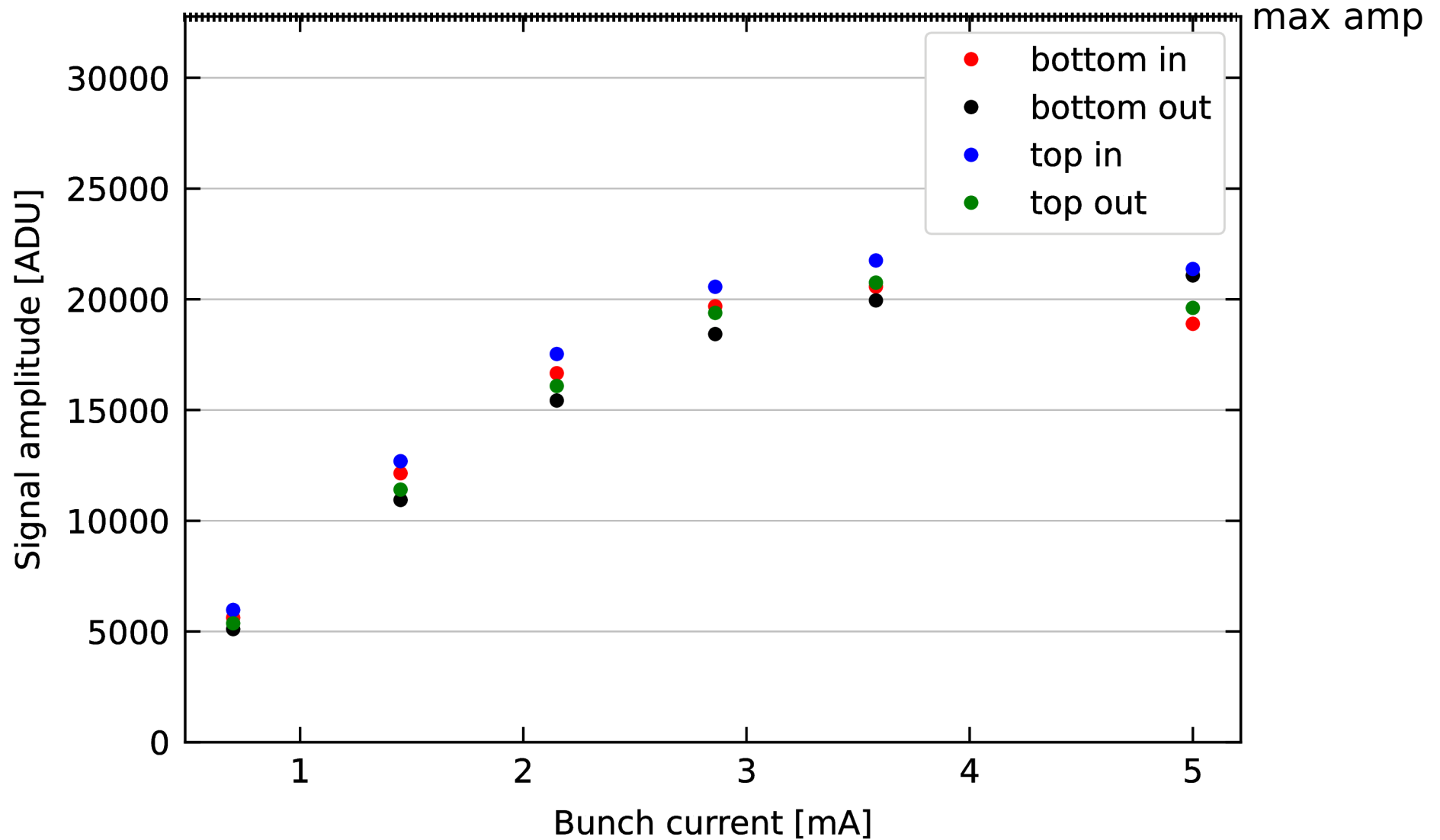
top out (b4)



12W2 with and without 1.2 GHz filter

Previously: 12W2 saturating

12W2 did not have the 1.2 GHz input filters installed



New filters, new data

Tunnel investigation by Bob, Will and Jonathan (Feb 21, 2023):

- × 12W2 1.2 GHz input filters missing (see [isntr elog 2069](#)) → filters were installed

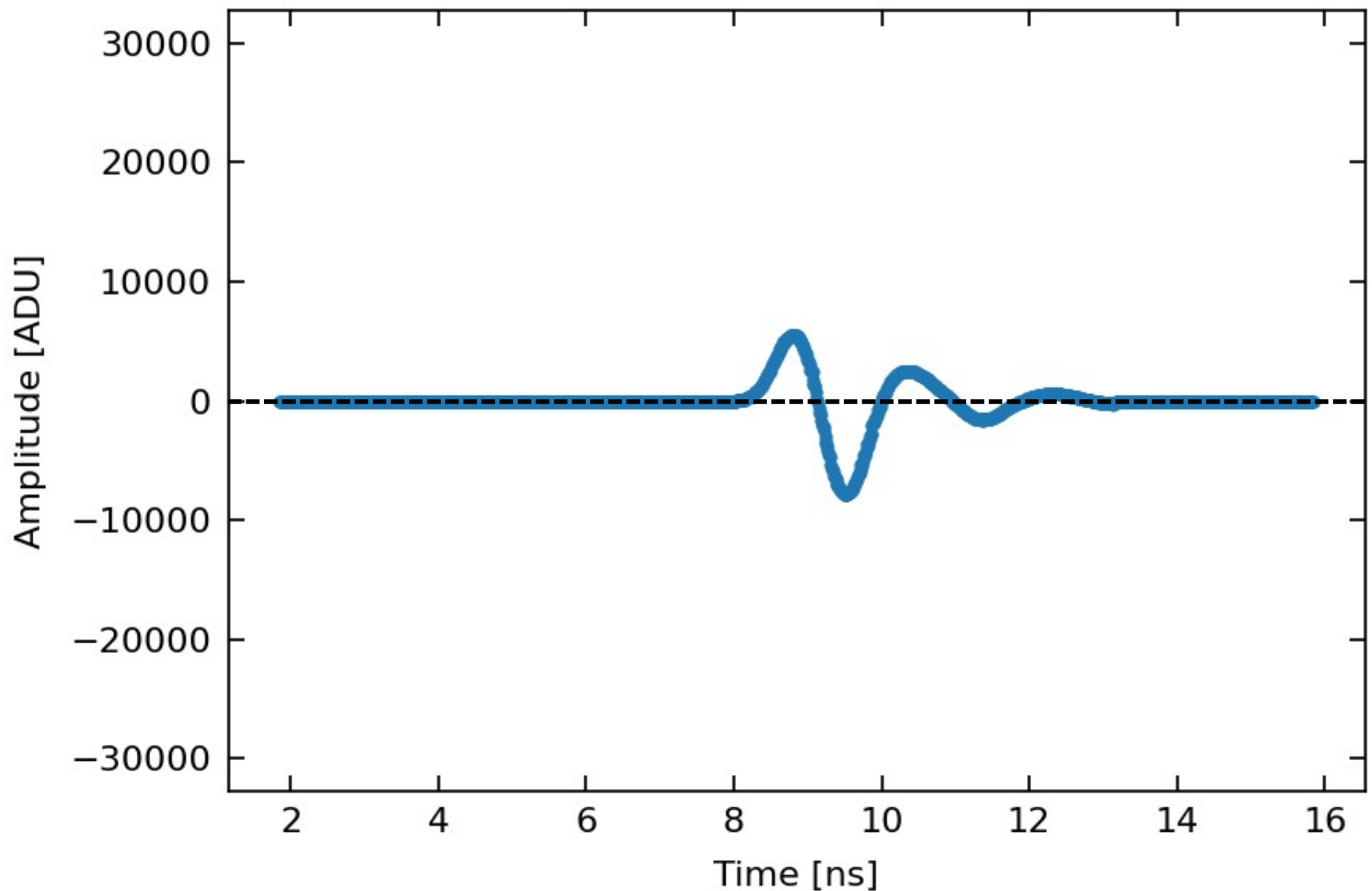
Machine study time by Mike (Feb 22, 2023):

- × last minute time slot became available and Mike (many thanks!) used it to collect data for 12W2 at both 0.7 mA and 5 mA current (see [instr elog 2073](#))

12W2 waveform

0.7 mA, without resistor

top in (b3)

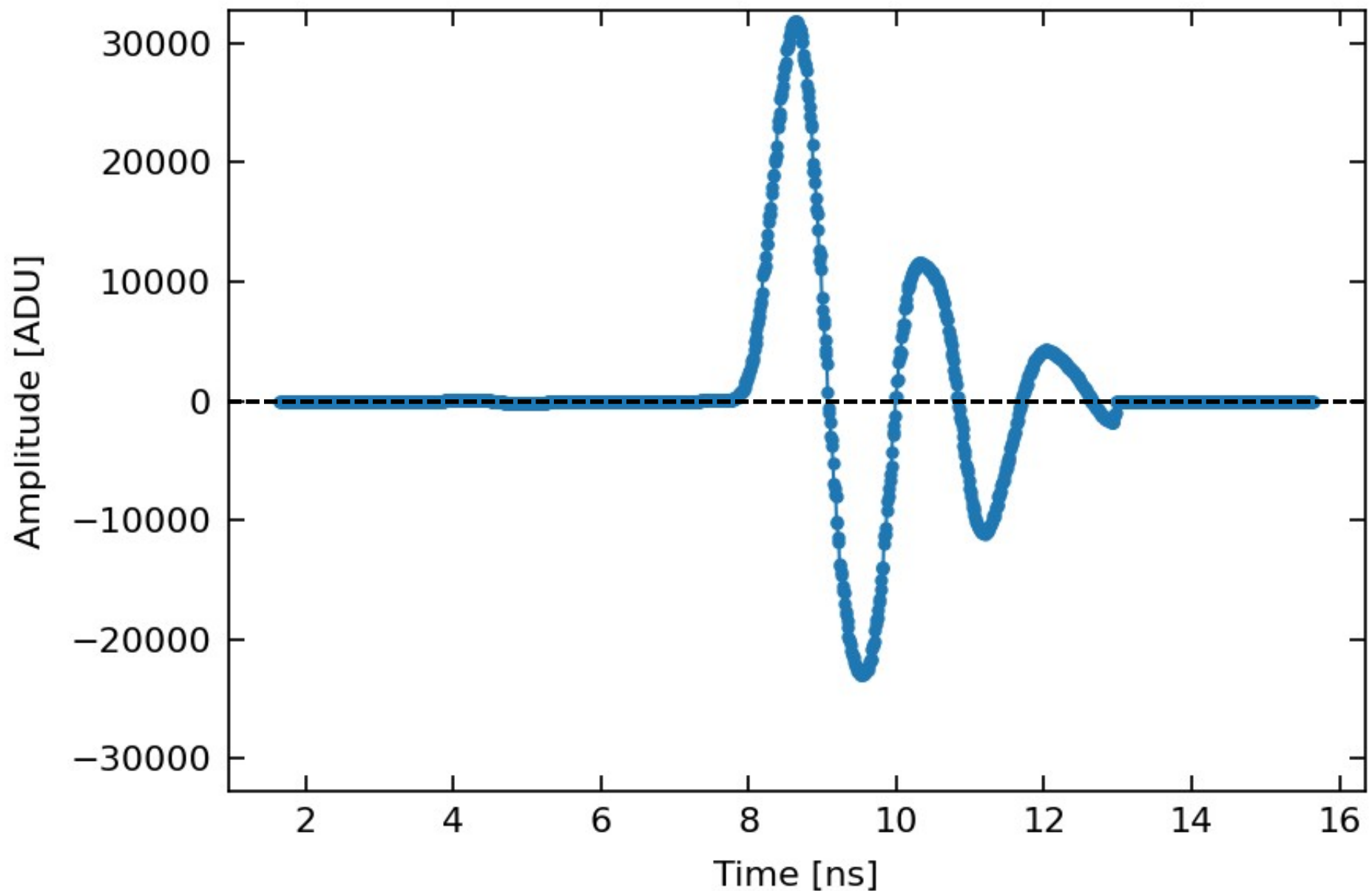


TS-051227-065.dat

12W2 waveform

5 mA, without resistor

top in (b3)

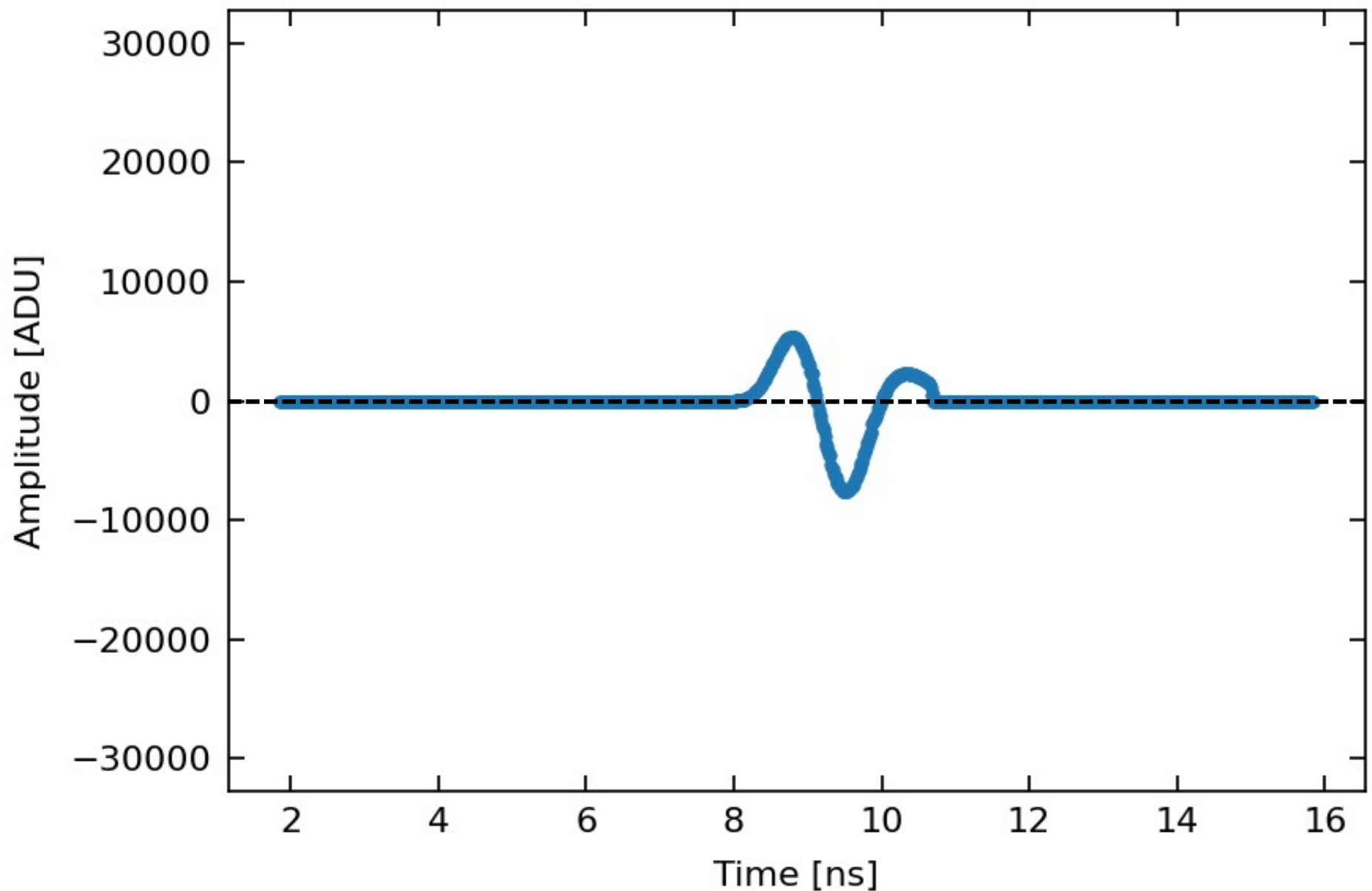


TS-051224-065.dat

12W2 waveform

0.7 mA, without resistor

bot in (b1)

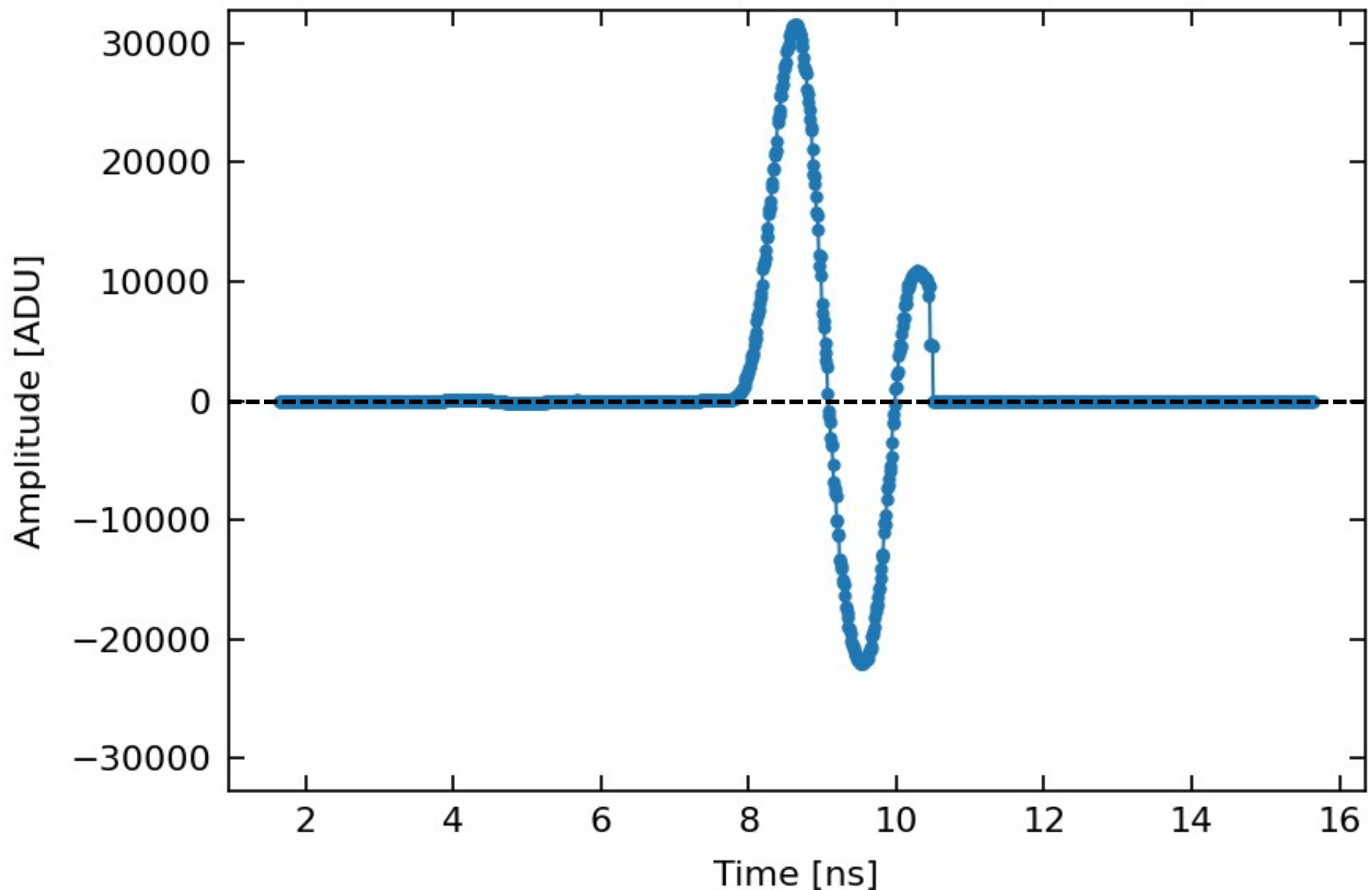


TS-051227-065.dat

12W2 waveform

5 mA, without resistor

bot in (b1)

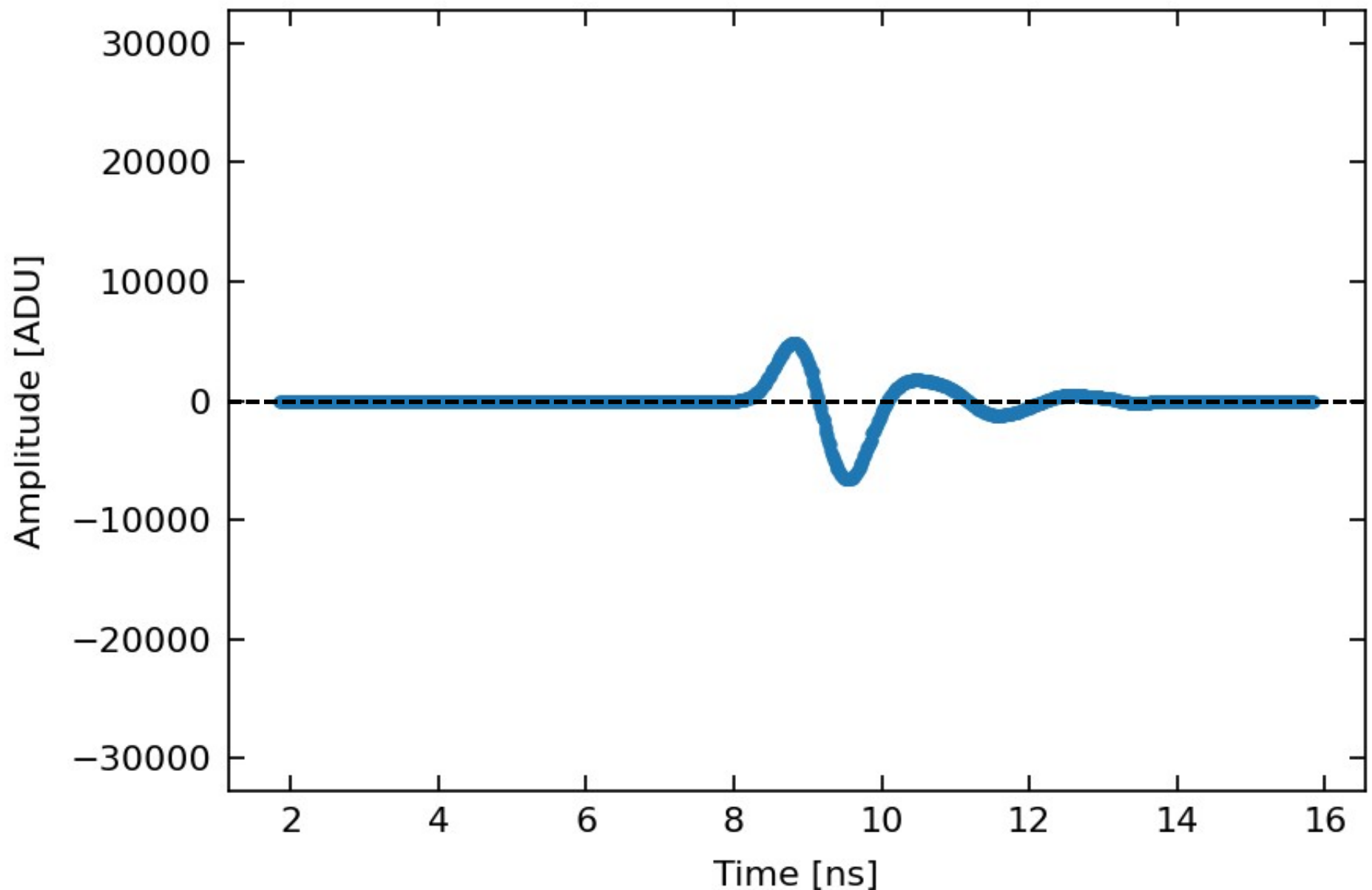


TS-051224-065.dat

12W2 waveform

0.7 mA, without resistor

bot out (b2)

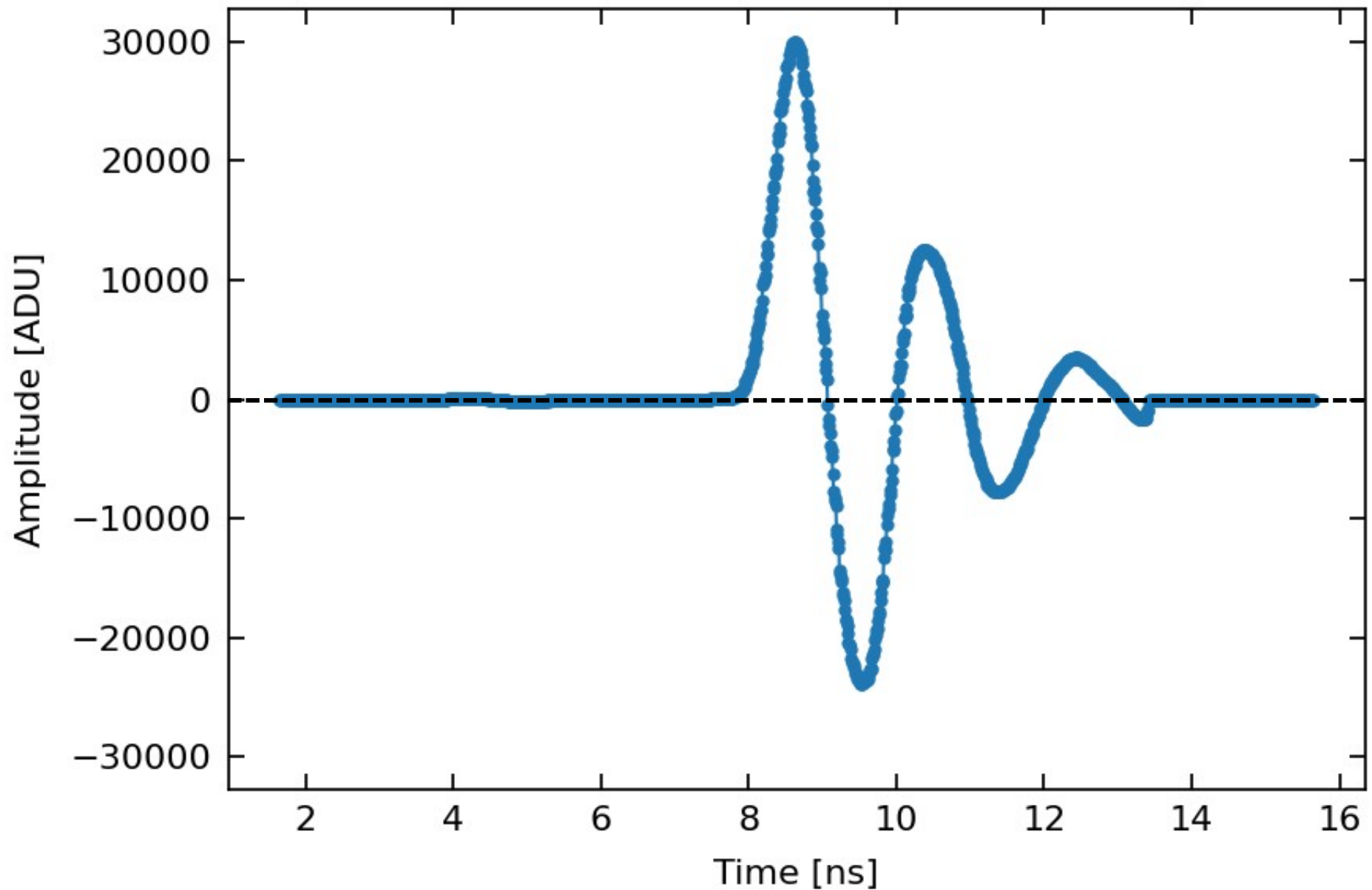


TS-051227-065.dat

12W2 waveform

5 mA, without resistor

bot out (b2)

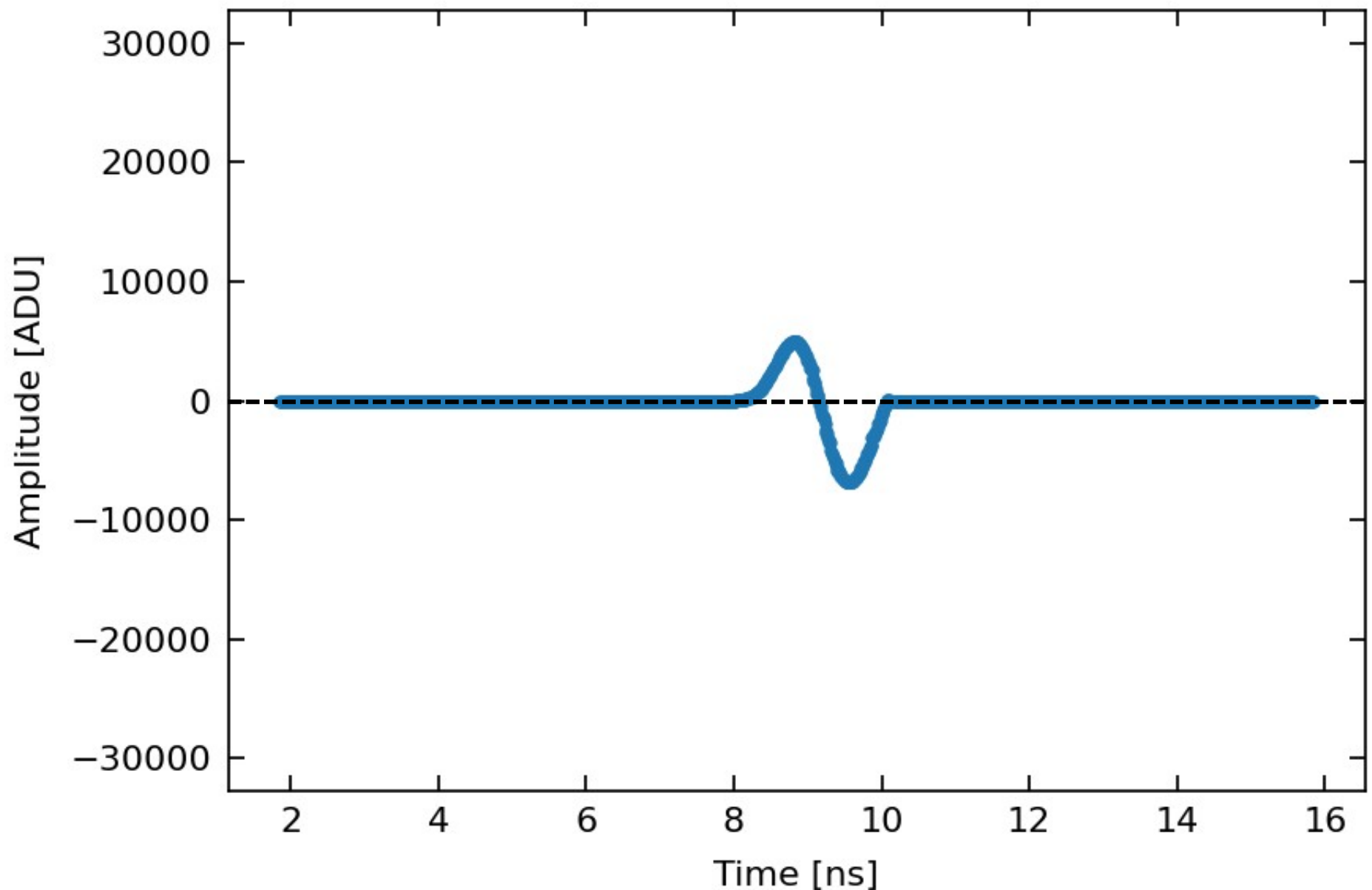


TS-051224-065.dat

12W2 waveform

0.7 mA, without resistor

top out (b4)

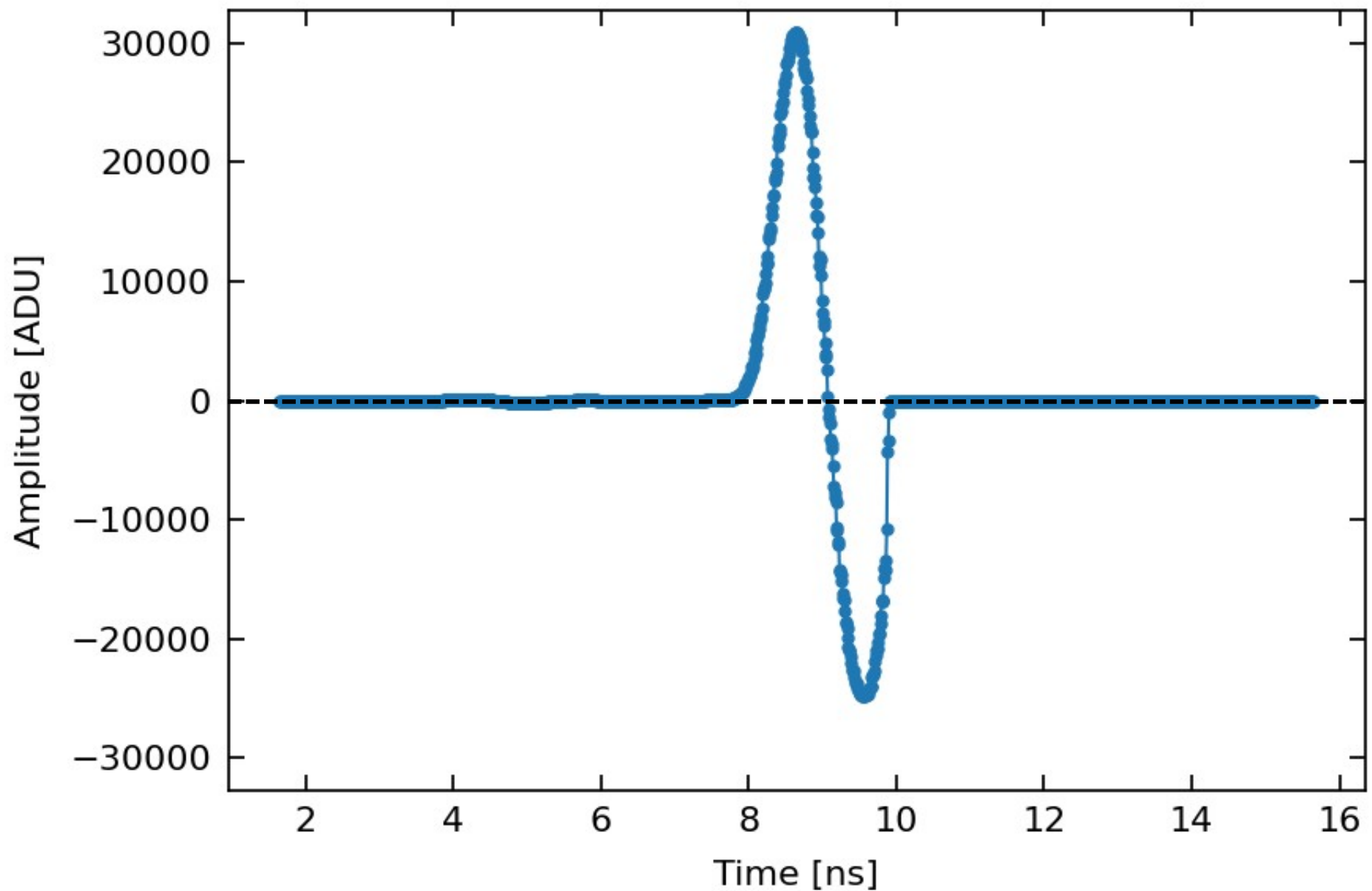


TS-051227-065.dat

12W2 waveform

5 mA, without resistor

top out (b4)



TS-051224-065.dat

1.2 GHz filter is required

12W2 signal amplitudes now scale about as expected given a 7 times increased in bunch current and known nonlinearities

| | b3 | b1 | b2 | b4 |
|--------|-------------|-------------|-------------|-------------|
| 0.7 mA | 5530 | 5410 | 4895 | 4953 |
| 5 mA | 31846 | 31574 | 29960 | 30914 |
| ratio | 5.76 | 5.84 | 6.12 | 6.24 |

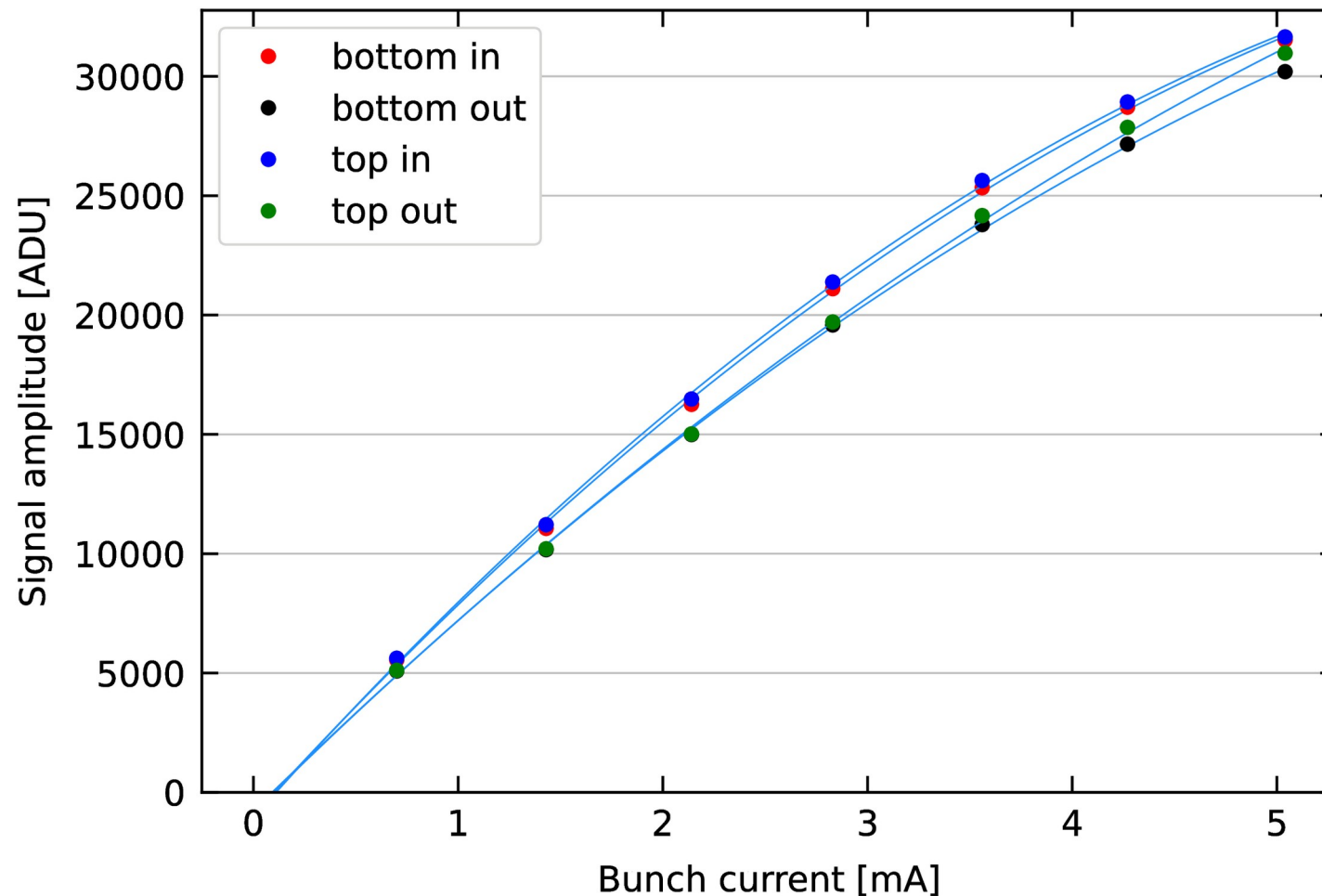
Takeaway: 1.2 GHz filters are required to operate at current higher than ~2 mA for a unity gain hardware

More 12W2 data

Machine study time by Mike, Antoine (Feb 23, 2023):

× 4-hour block became available to us and we used it well: [instr elog 2075](#)

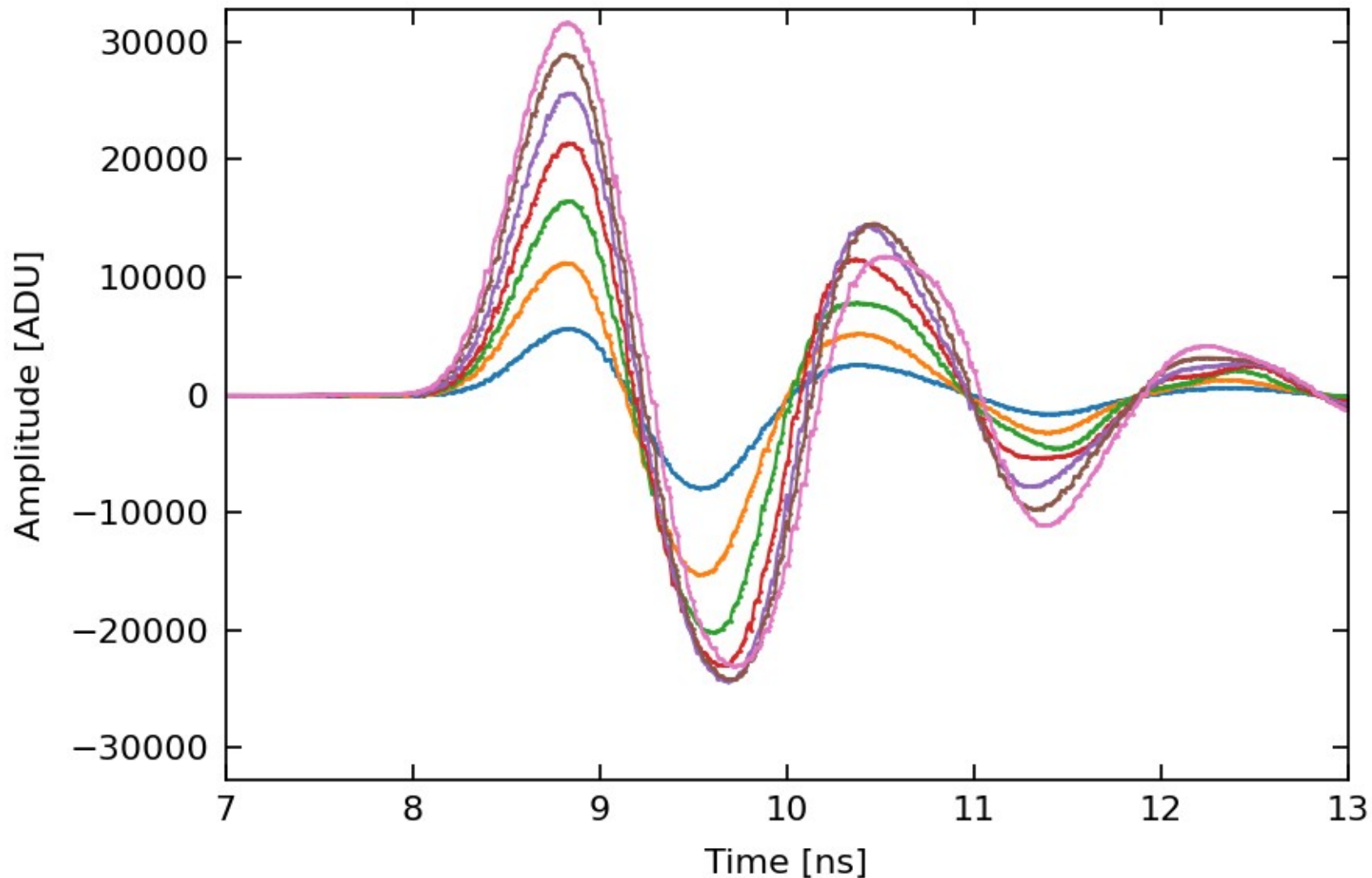
× new bunch current scan: this time timing modules for each current step



More 12W data

Comparing waveforms as current increases:

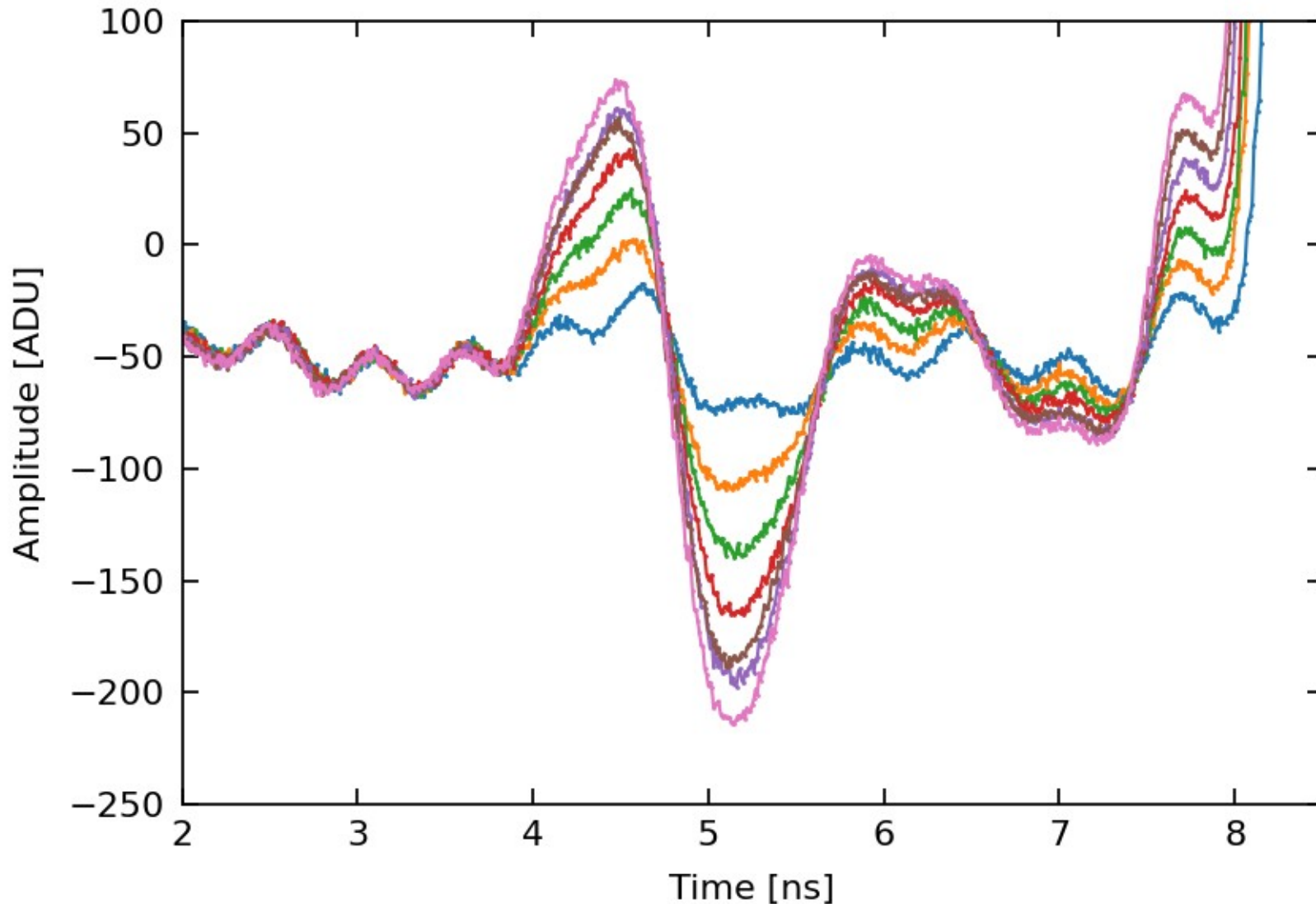
× pedestal variation cannot account for nonlinearities (need 1,000s ADU)



More 12W data

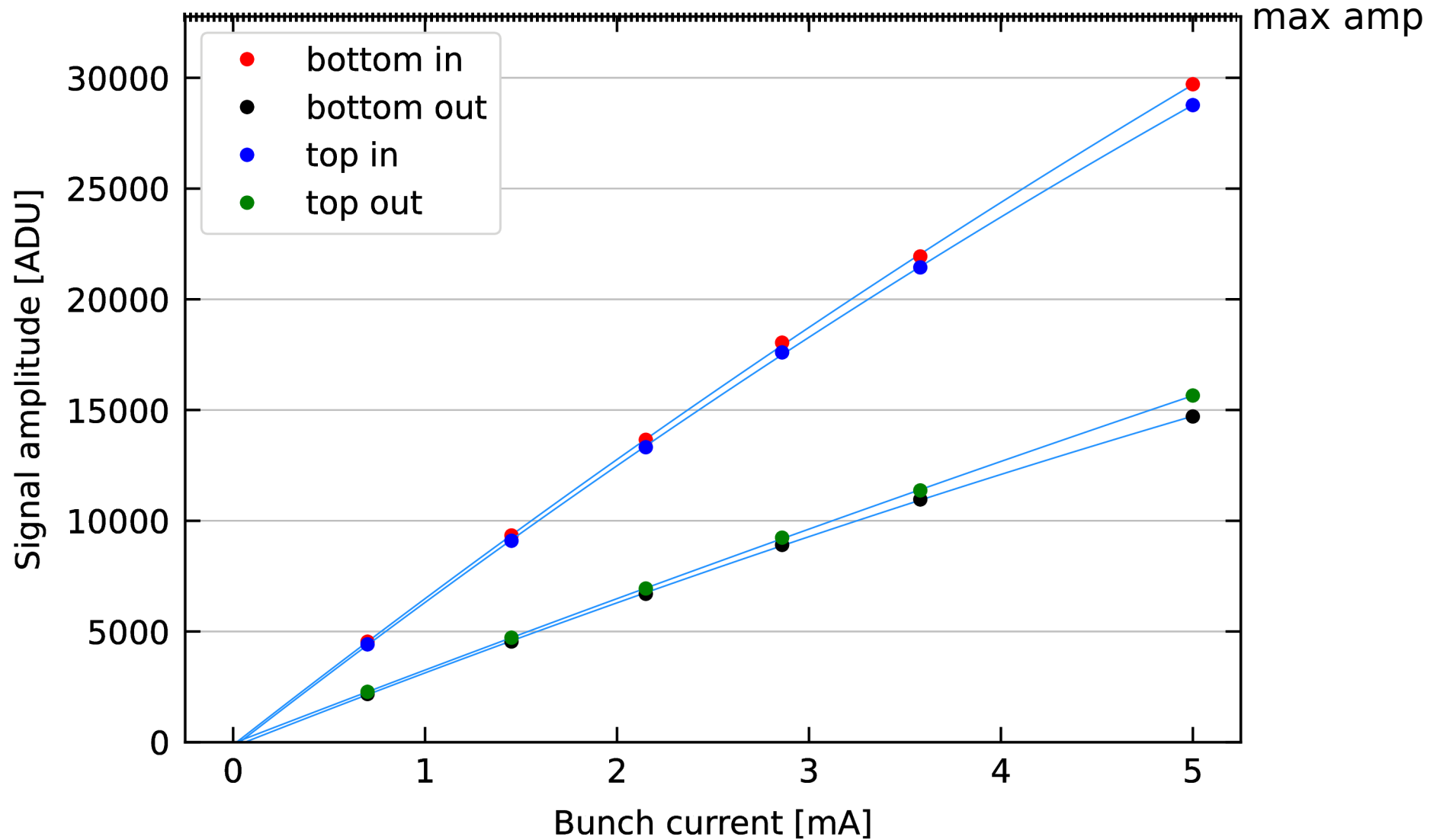
What about pedestal (before the bunch arrives):

× early (small) signal? reflection from previous bunch? time sweep artifact?



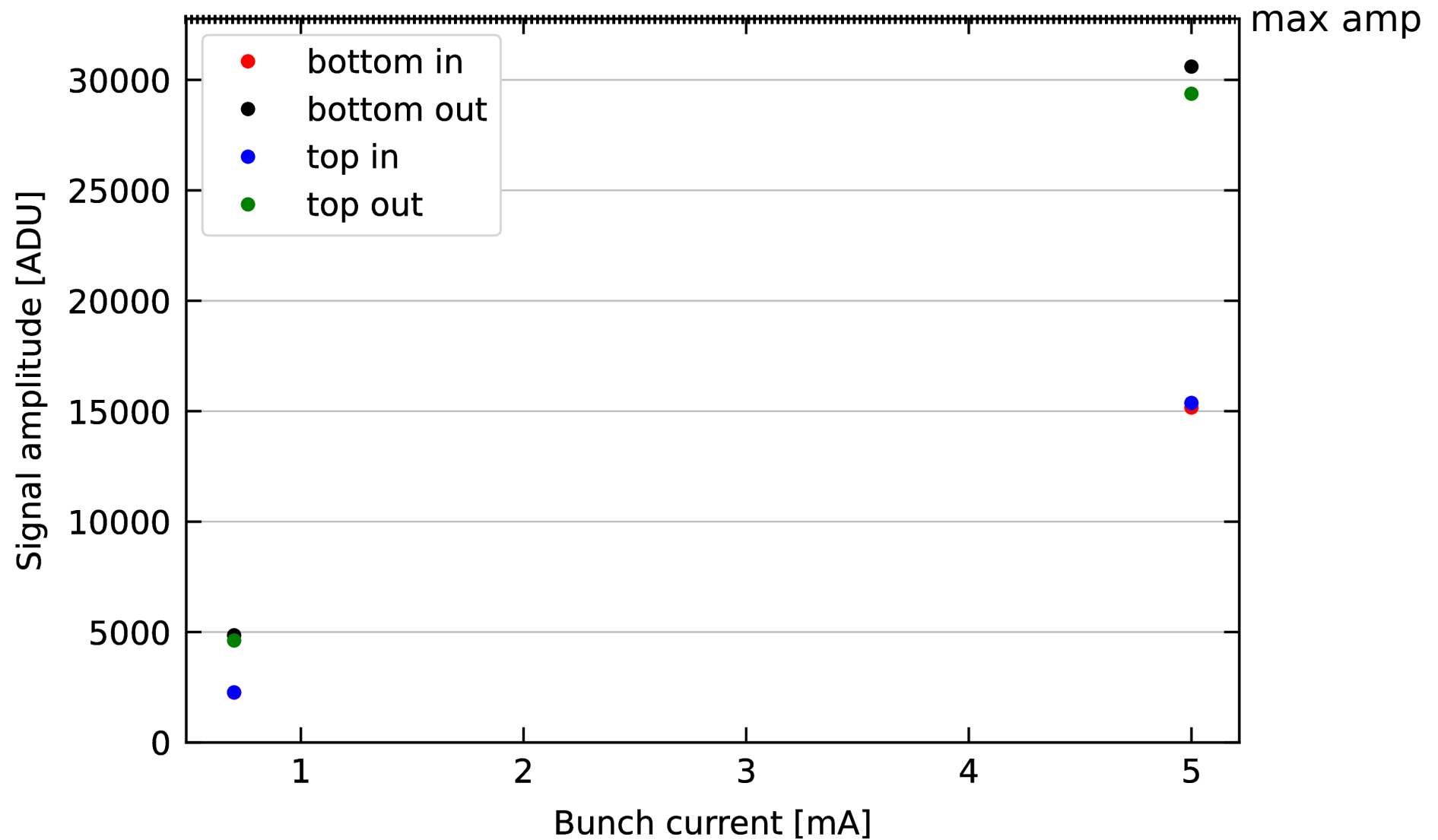
12W3: swapping signal cables

Two channels behaved as expected (bot out, top out), two did not (bot in, top in)



We swapped the signal cables (see : [instr elog 2075](#))

Difference tracks with readout card



Waveform frequency