BPS Status Report

SUMMARY OF TAU COMPENSATION TEST

- Test performed at CERN AB-BI/PI Labs during the 30th week.
- One of the important features of the BPS is to let pass the sensed beam pulse without a significant droop in the pulse flat-top. This is determined by the low cut-off frequencies of the sensed signals: Σ(sum) and ΔV, ΔH (difference). The low cut-off frequencies: f_{Σ} , $f_{\Delta H}$, $f_{\Delta V}$; set the τ_{droop} for each of this pulse signals. The lower the low cut-off frequencies the higher droop time, so: $\tau_{droop} \sim 100\ t_{pulse}$ for a pulse duration of t_{pulse} , in order to see a flat-top response of the Σ and Δ signals.
- For TBL the maximum pulse duration is: $t_{pulse} = 140$ns, so a low cut-off frequencies below 10KHz would be enough for Σ and Δ signals.
- In the BPS1 prototype we got the following low cut-off frequencies and droop times:
  - For Wire/beam input excitation: $f_{\Sigma} = 1.76$ KHz, $f_{\Delta H} = f_{\Delta V} = 282$KHz
    $\tau_{droop\ \Sigma} = 90$us, $\tau_{droop\ \Delta} = 564$ns
  - For Calibration +/- inputs excitation: $f_{\Sigma[cal]} = 1.76$ KHz, $f_{\Delta H[cal]} = f_{\Delta V[cal]} = 180$KHz
    $\tau_{droop\ \Sigma\ [cal]} = 90$us, $\tau_{droop\ \Delta\ [cal]} = 884$ns
- Therefore f_{Δ} was lowered to 3KHz with an RC filter designed for compensating at 282KHz in the amplifier, compensating also the Δ droop and getting aprox. the same droop for Σ and Δ signals: $\tau_{droop\ \Sigma} \approx \tau_{droop\ \Delta}$.

BPS Status Report

SUMMARY OF TAU COMPENSATION TEST

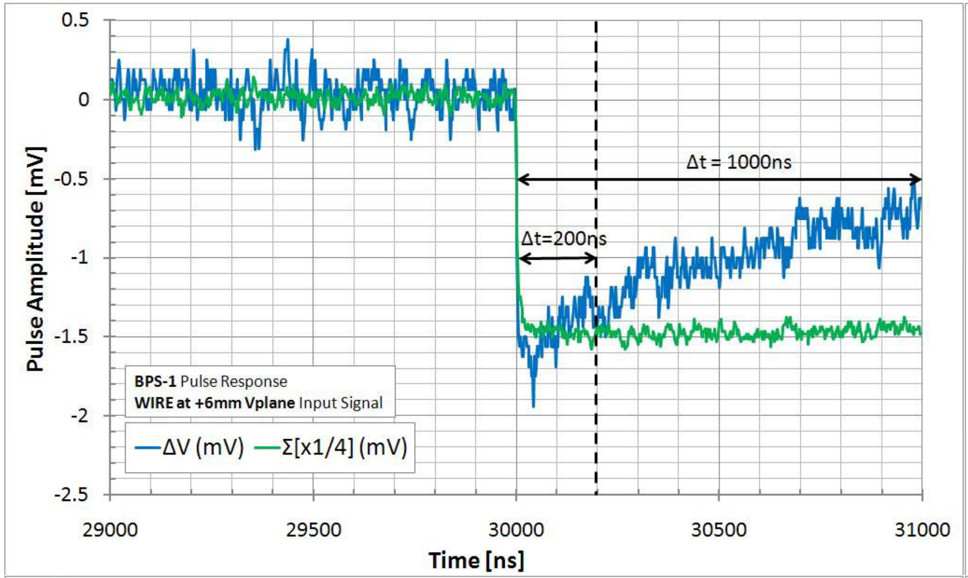
- The compensation was good for the wire/beam-Δ signal, f_{Δ}, but we faced a problem of different low cut-off freq, $f_{\Delta[calin]}$, for calibration-Δ signal (100KHz of diff.). In the amplifier we can compensate exactly only for one cut-off frequency: f_{Δ} = 282KHz, and we got overcompensation (a pulse raise instead of a droop) for calibration calibration-Δ signal.
- After several tests and modifications in the RC filter of the amplifier and the BPS1 to make the cut-off freqs. Equal and then could compensate both correctly, the difference between them was kept constant (100KHz).
- Therefore a compromise solution was taken to improve the first tau compensation made only for the wire/beam-Δ signal, f_{Δ} = 282KHz:
  - For having better tau response only with the BPS1, both low cut-off freqs were low down to: f_{Δ} = 170KHz (wire/beam) and $f_{\Delta[cal]}$ = 70KHz (calibration); changing the some resistor values in the BPS1 PCBs.
  - We set the compensation frequency in the amplifier equal as the lower Δ cut-off frequency that it's the Δ-calibration low cut-off frequency, $f_{\Delta[calin]}$.
- This was the best compromise solution since we obtain flat pulse transmission, like Σ signal, for the time windows of interest in both cases:
  - Wire/beam input excitation: flat pulse transmission until 200ns [see PLOTS in slide-3];
  - Calibration inputs excitation: flat pulse transmission until 2000ns [see PLOTS in slide-4].

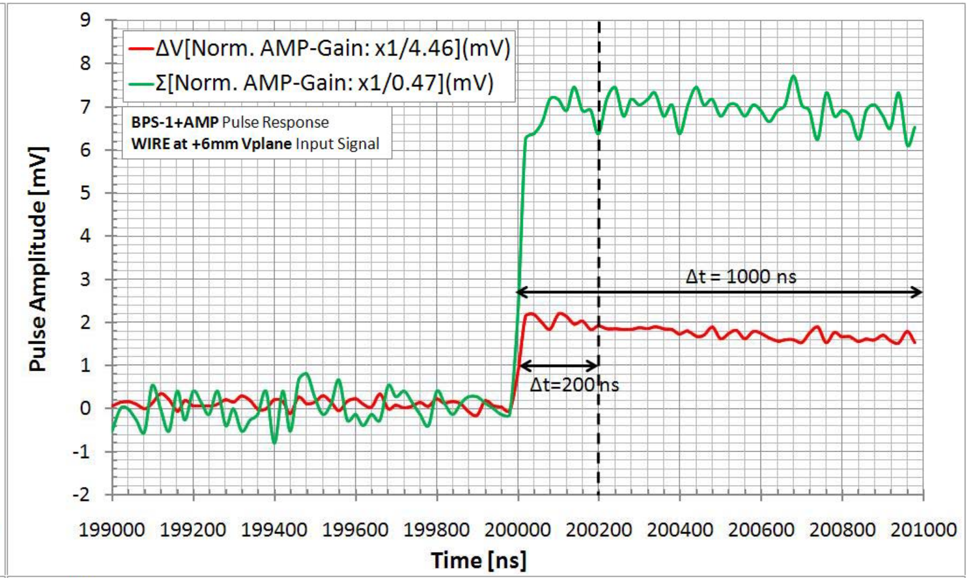
SUMMARY OF TAU COMPENSATION TEST

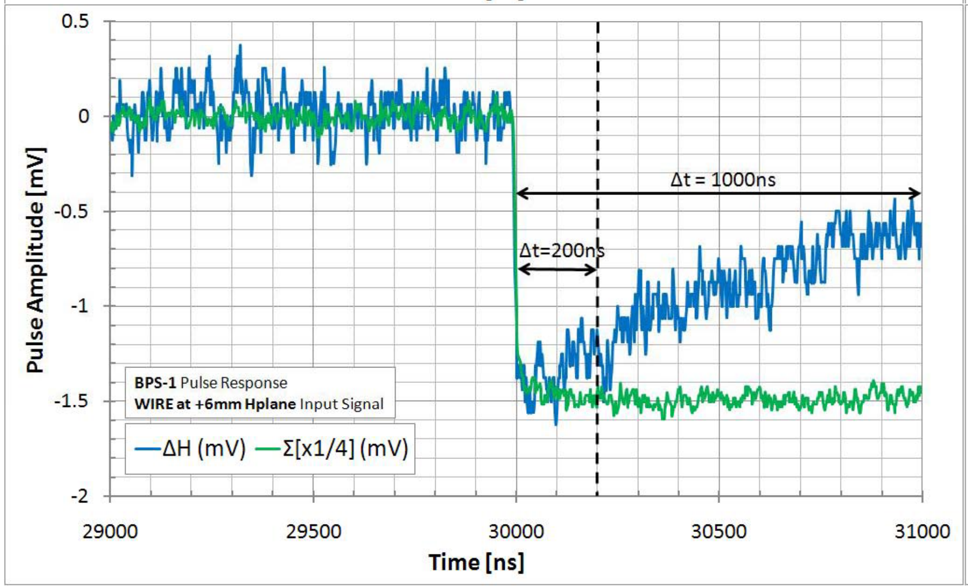
BPS-1 Wire at +6mm V,H Excitation

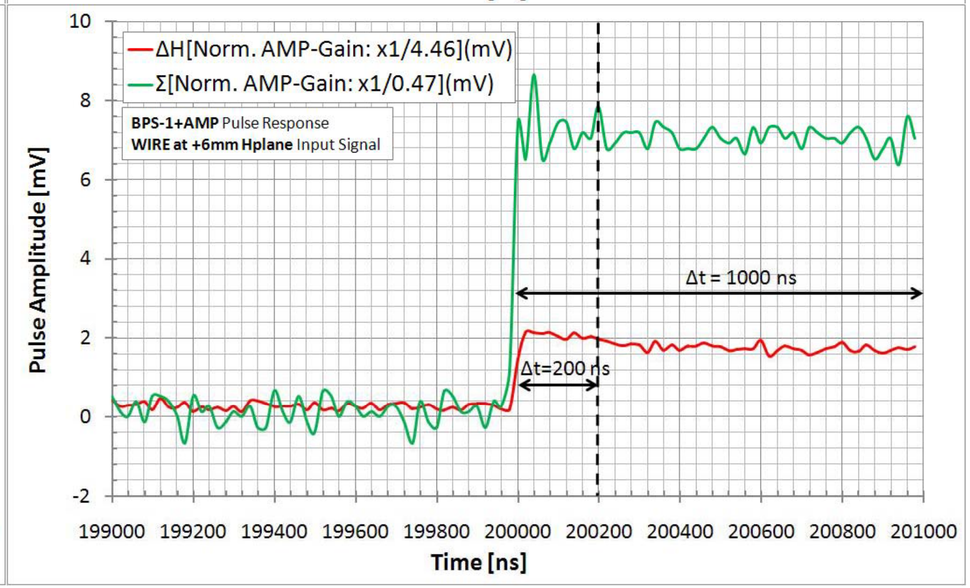
Naked BPS-1 Pulse response
ΔV, ΔH **without** τ_{droop} by Amplifier
(ΔV, ΔH signals compared with Σ pulse)

BPS-1+AMPLIFIER Pulse response
ΔV, ΔH **with** τ_{droop} by Amplifier
(ΔV, ΔH signals compared with Σ pulse)







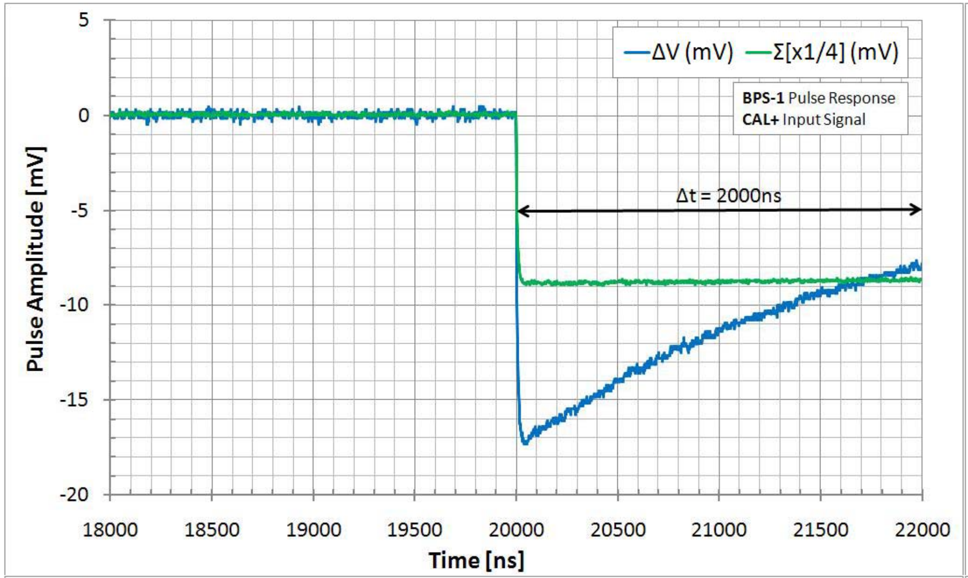


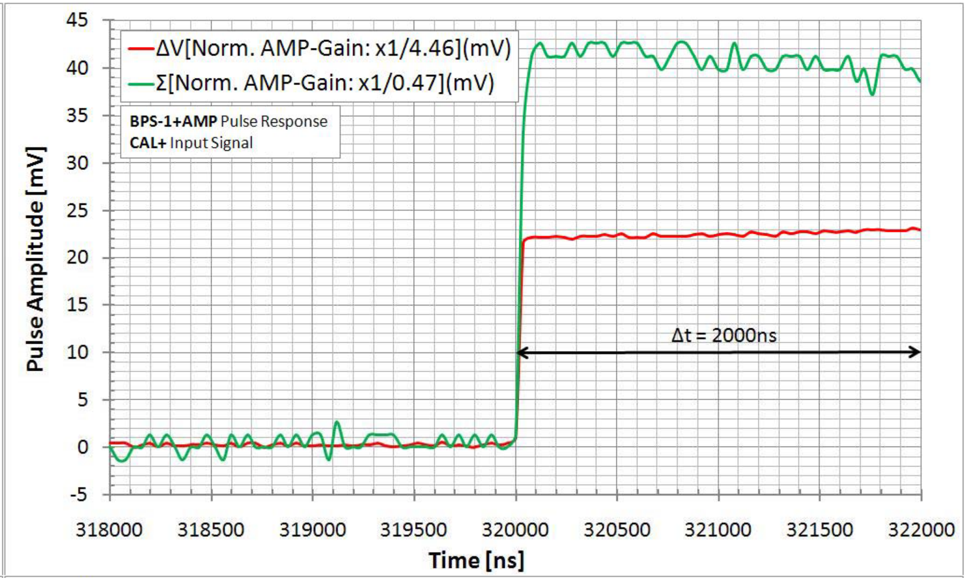
SUMMARY OF TAU COMPENSATION TEST

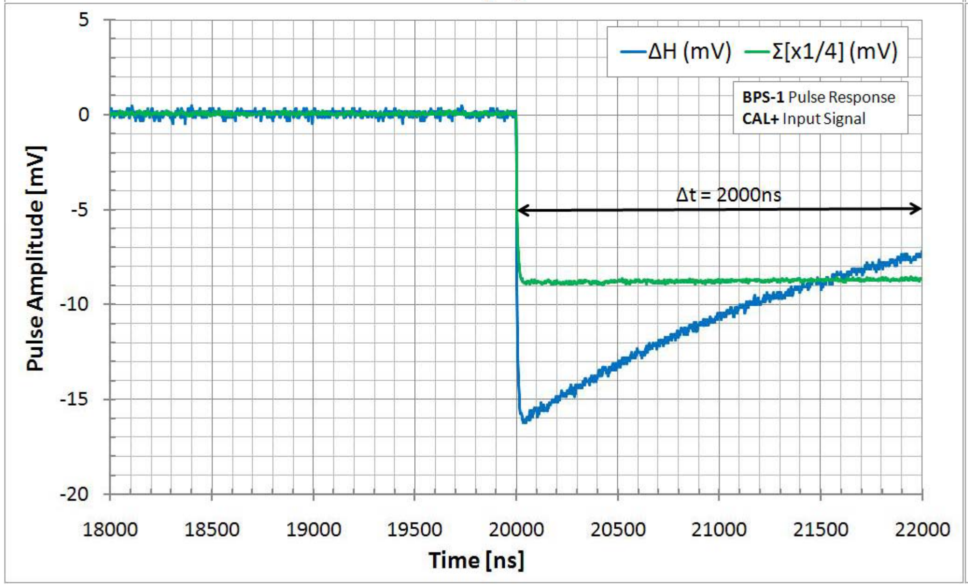
BPS-1 Calibration + (V+,H+) Excitation

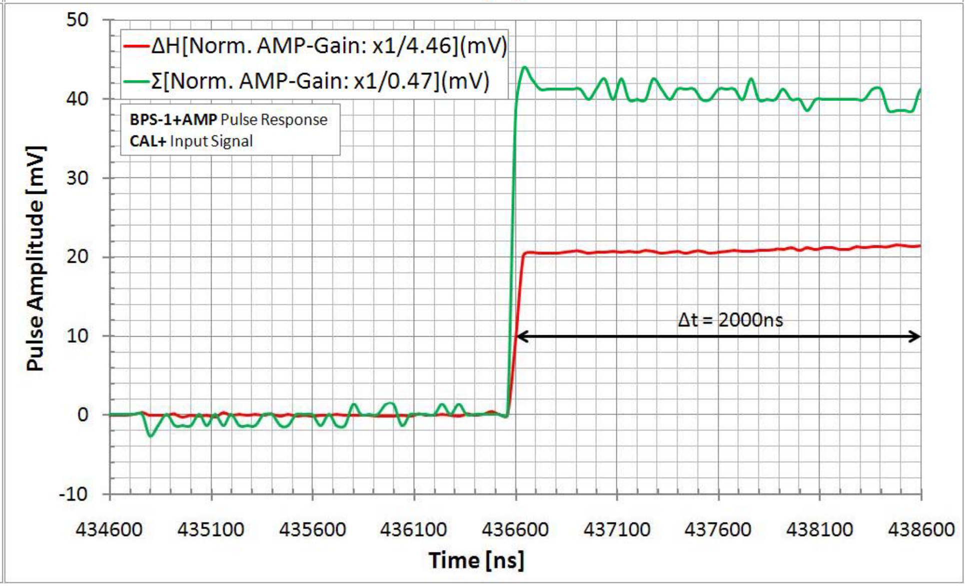
Naked BPS-1 Pulse response
ΔV, ΔH **without** τ_{droop} by Amplifier
(ΔV, ΔH signals compared with Σ pulse)

BPS-1+AMPLIFIER Pulse response
ΔV, ΔH **with** τ_{droop} by Amplifier
(ΔV, ΔH signals compared with Σ pulse)









BPS Status Report

SUMMARY OF TAU COMPENSATION TEST

- As a result of the changes in the PCB, all BPS1 characterization measurements were repeated.
- With BPS2 at IFIC, we are searching for the cause of Δ-calibration and Δ-wire/beam low cut-off frequency difference, in order to have the best pulse transmission performance, which is making: $f_{\Delta[cal]} \approx f_{\Delta}$, and compensate them with the amplifier. This will ensure two things:
  - Flat-response until 2000ns for both, Δ-calibration and Δ-wire/beam, like Σ signal.
  - $\tau_{droop\ \Sigma} \approx \tau_{droop\ \Delta}$, which means the same pulse response for all signals beyond 2000ns.

BPS Status Report

- Wire test and High Frequency testbenches construction [IFIC, week 39]
- Software development for the new wire-test setup [IFIC, week 42] (automatization of the BPS series measurements)
- Startup of 15 BPS series construction with its 30 PCBs and mechanical supports [depends on the tendering process, IFIC, week --]
- Assembling of BPSs and PCBs mounting [IFIC, week --]
- Calibration and characterization measurements of the BPS series with new wire test and HF setup [IFIC, week --]
- Delivery of BPS series and supports to be installed in TBL [IFIC, week --]