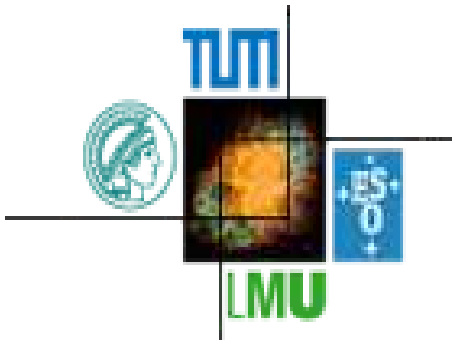


ASDBLR for large signals

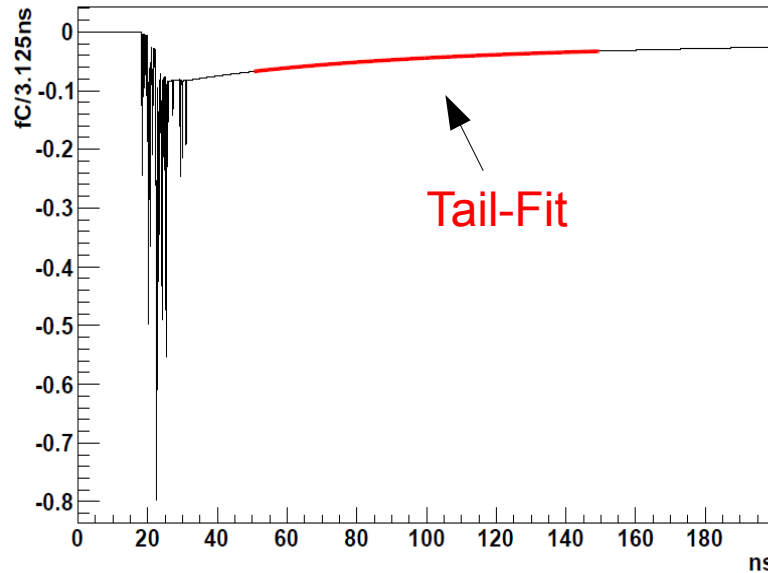


Contents:

- Signal shapes
- ToT for high threshold
- Behaviour of the ASDBLR in detail
- Summary



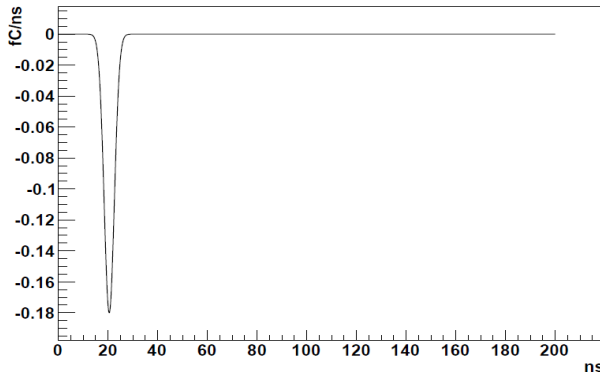
Signal shapes



Signal by a 5 GeV Pion at 1 mm wire distance
(no signal propagation in the wire applied)
 dE/dX about 1 keV

- Extract tail shape by fitting two exponentials between 50 and 150ns
- Signal at 20 ns quite complicated, but likely not realistic for streamer mode
- => Take parameters from this any play around
- Scale not correct (used a correction factor of ~ 25 in my thesis)

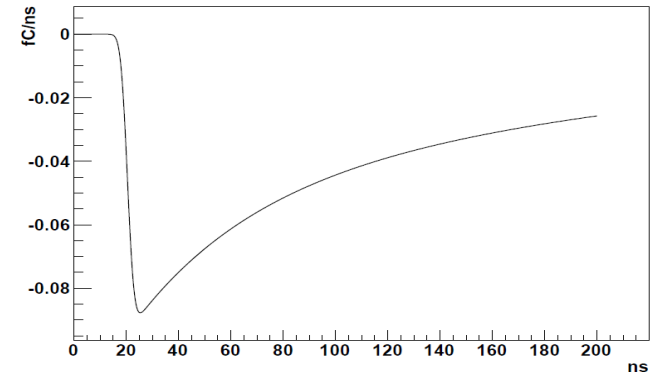
Creating signal shapes



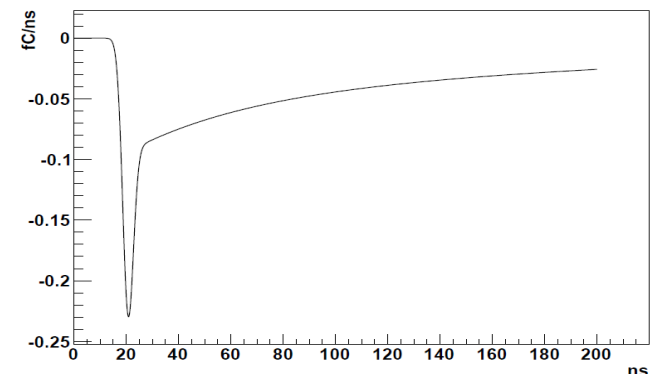
Gauss with same area as the pion signal

$$e(x) = \int \frac{g(\tilde{x}) * l(\tilde{x} - x)}{\int g(\hat{x}) d\hat{x}} d\tilde{x}$$

$$l(x)_{x \geq 0} = p_0 e^{p_1 x} + p_2 e^{p_3 x}$$

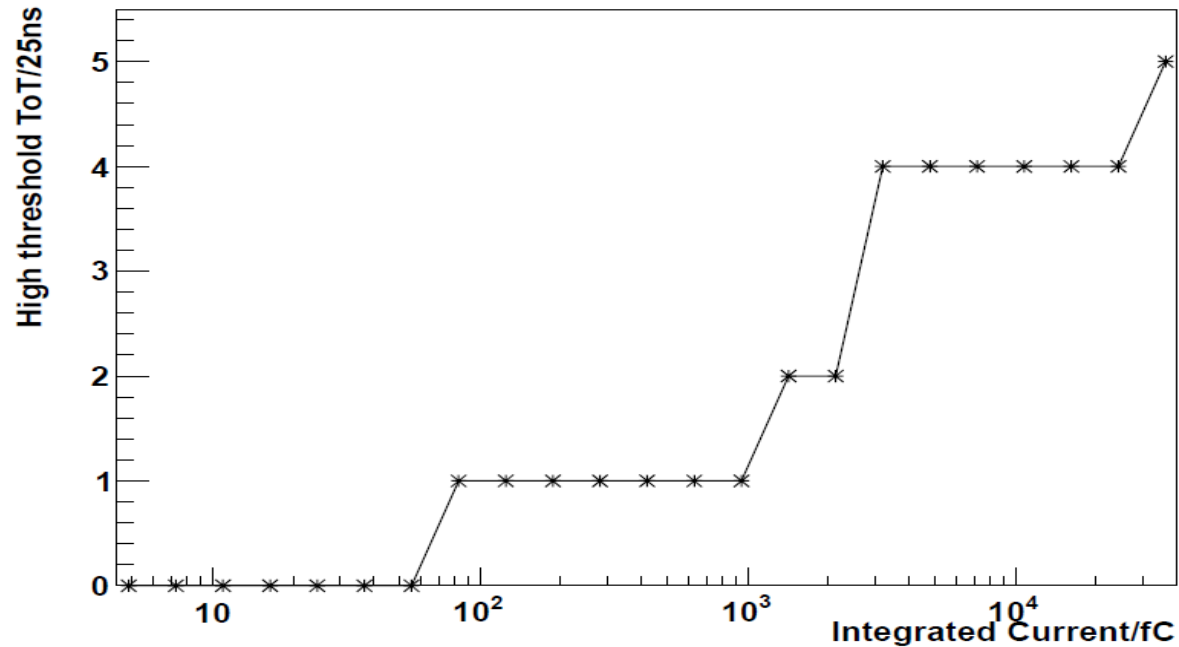


- Method gives some freedom to the ratio between ion tail and and electron signal
- It avoids waiting for Garfield (30 seconds for a single signal with precalculated ion signal table!)



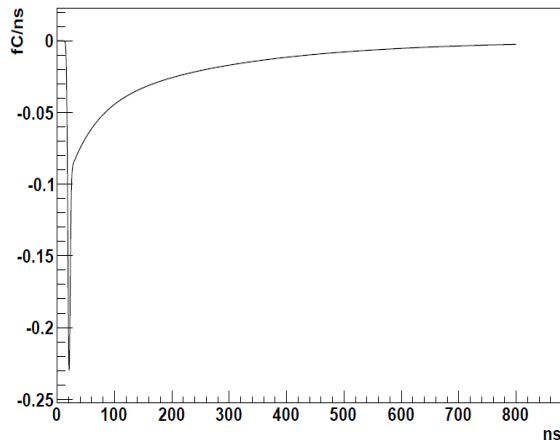
Sum of Gauss and e(x)

ToT for high treshold

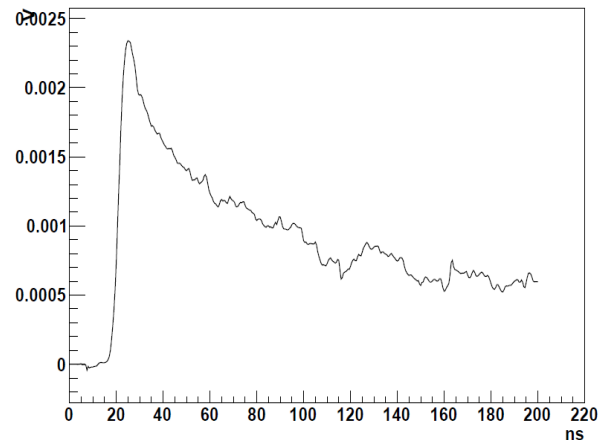


- Risky assumption : 68.5 magnetic charge can be treated identically to electric charge for HIPs
- Garfield++ (Heed++ and Magboltz) would produce a similar signal as for a pion, but much “denser” (propably more gaussian)
- Signal scale should be at about $68.5^2 \sim 5000$ that of a pion
- A pion track usually has something < 100 fC

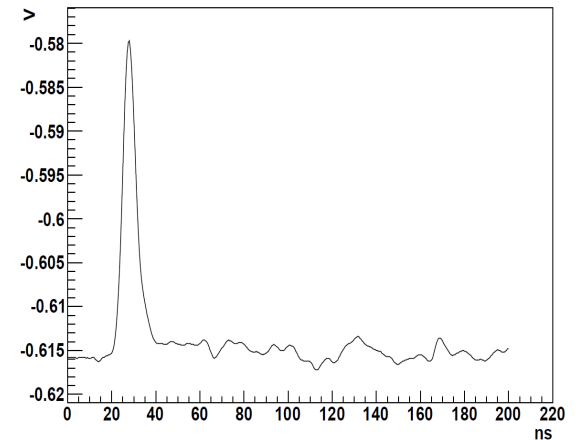
Behaviour in detail



Unscaled signal



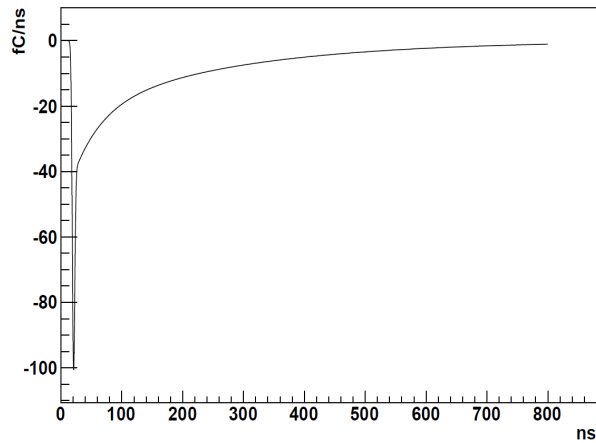
Preamplifier Output



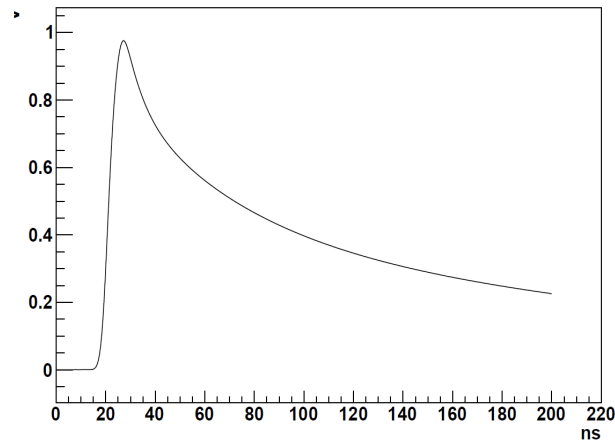
Shaper Output

- Shaper output has very little remaining tail, might indicate a wrong setting in the HSpice netlist (CF4 instead of XE)
- Neither low nor high threshold is triggered (which is correct)

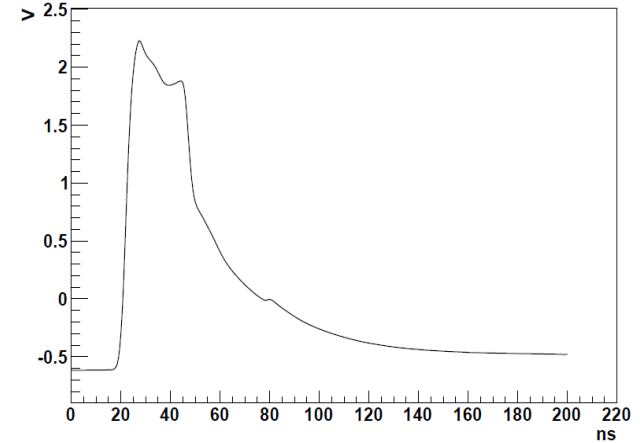
Behaviour in detail



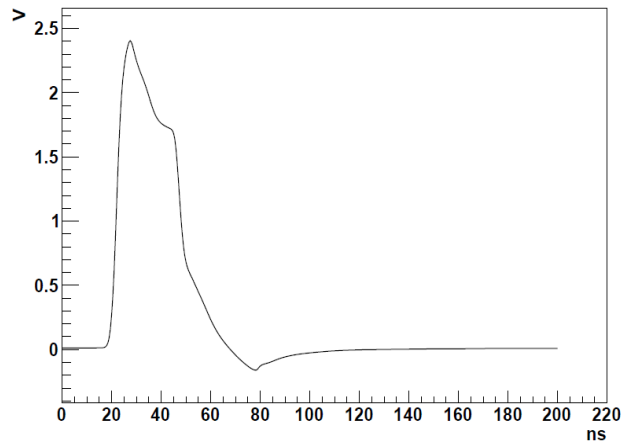
Signal scaled by $\sim 437,9$



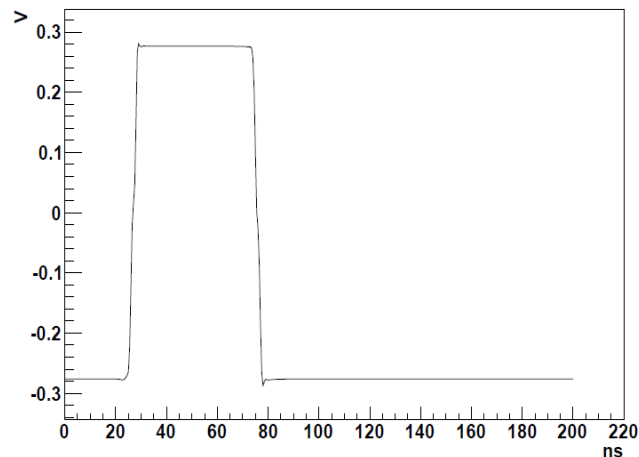
Preamplifier Output



Shaper Output



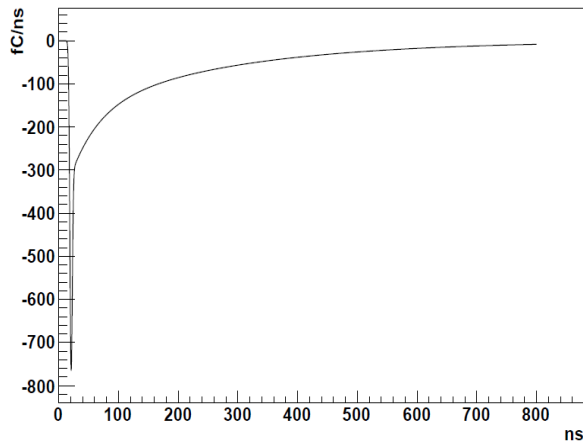
BLR Output



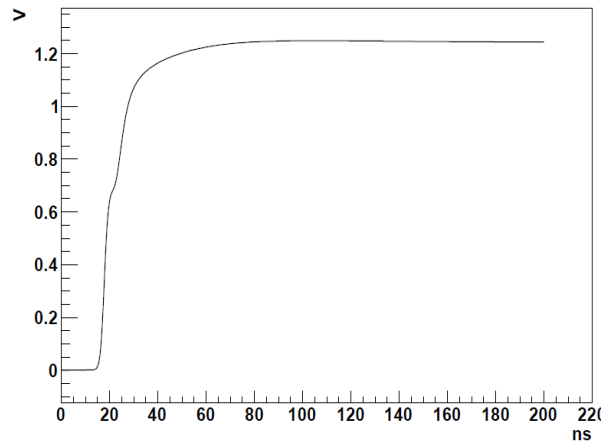
Ternary Output

- This signal is still too small
- Behaviour still realistic, but Shaper Output has tail now

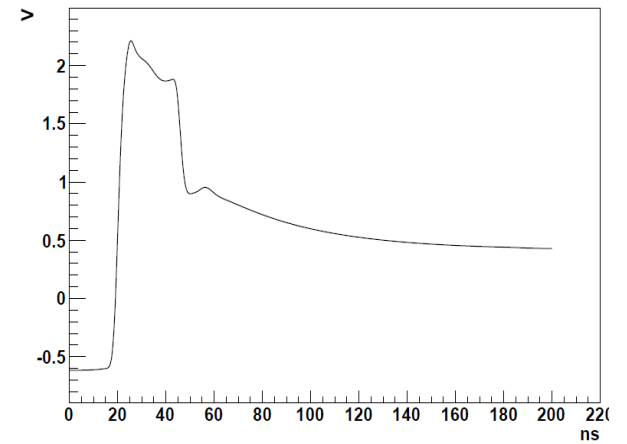
Behaviour in detail



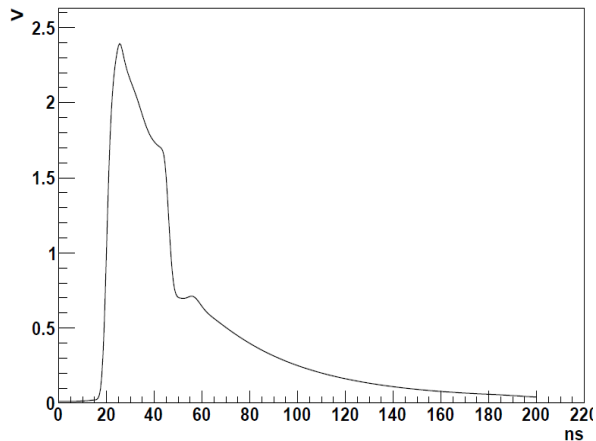
Signal scaled by ~ 3325



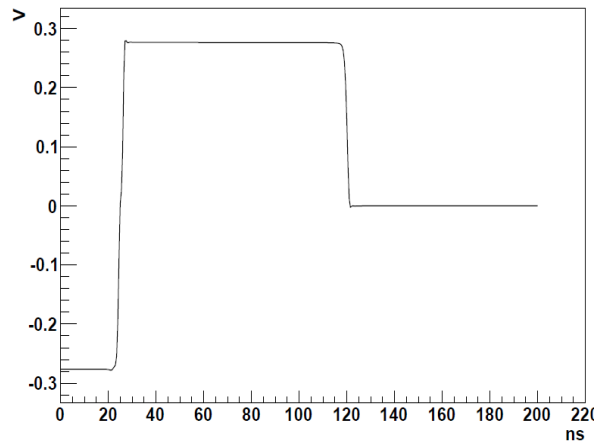
Preamplifier Output



Shaper Output



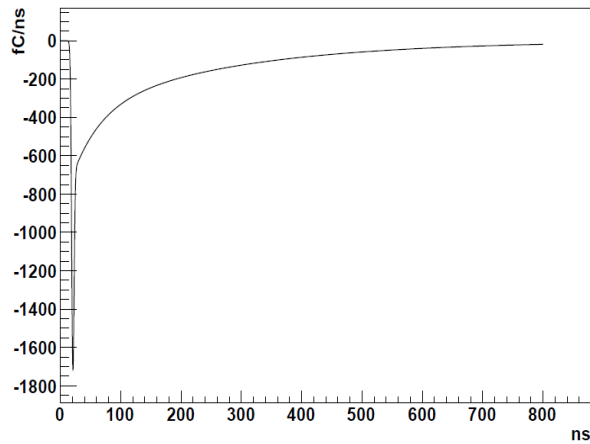
BLR Output



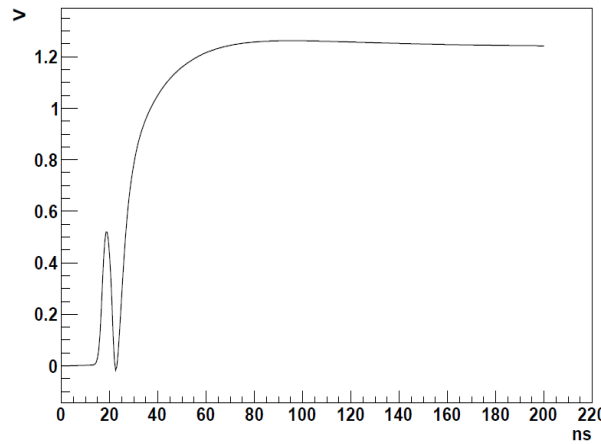
Ternary Output

- Preamplifier has no decay
- Shaper output returns to zero after 450 ns
- BLR compensates
- High ToT at 4

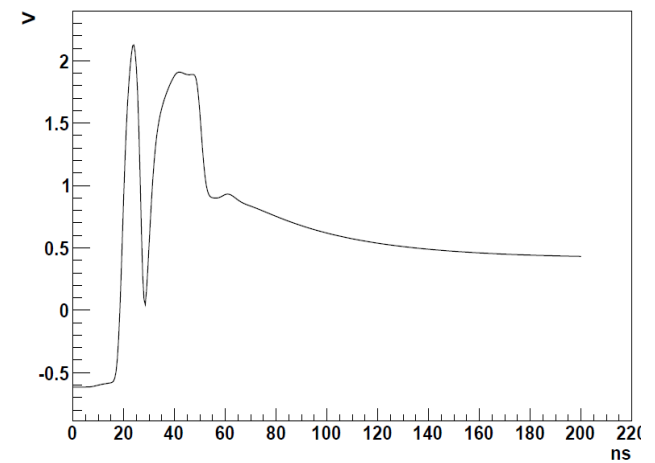
Behaviour in detail



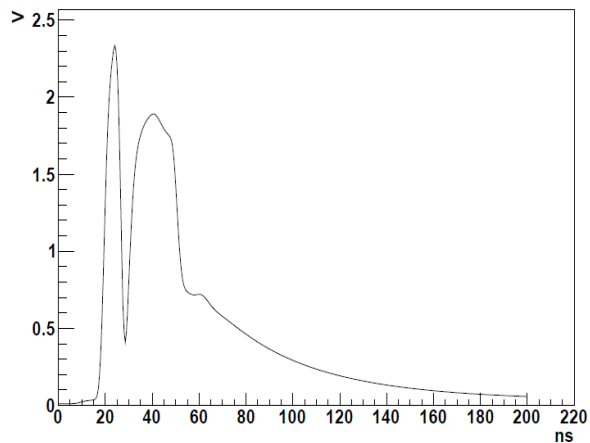
Signal scaled by ~ 7481



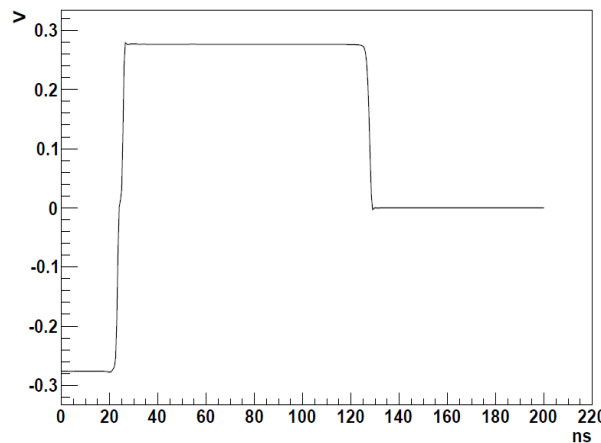
Preamplifier Output



Shaper Output



BLR Output



Ternary Output

- Preamplifier has a small peak before integrating to a maximum value(?)
- Shaper output returns to zero after 650 ns
- High ToT at 5, but barely

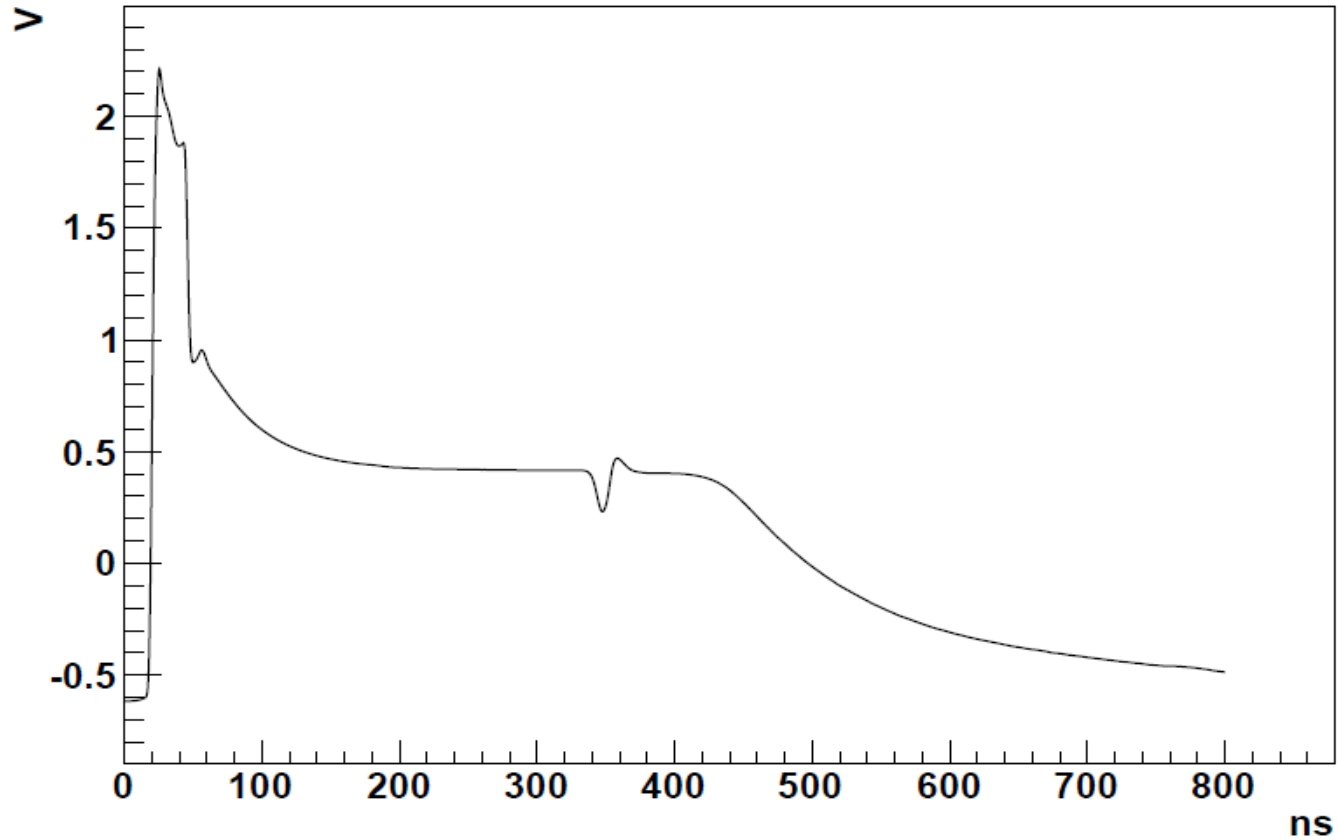
Summary

- Shape of the actual signal not yet well understood
- Sum of gaussian signal and exponentials as a starting point
- Dependency between HT ToT and signal amplitude is non linear
- Behaviour of Hspice simulation for very large signals not fully understood

Possible things to do

- Actually solve the PAI model for monopoles or implement a simpler model based on the average energy loss
- Implement and run a simulation to produce signals in streamer mode
- Verify the HSpice ASDBLR simulation and check with real hardware
- Sending in slowly decaying signal without peaks as an alternative to HSpice

450ns Shaper Signal



650ns Shaper Signal

