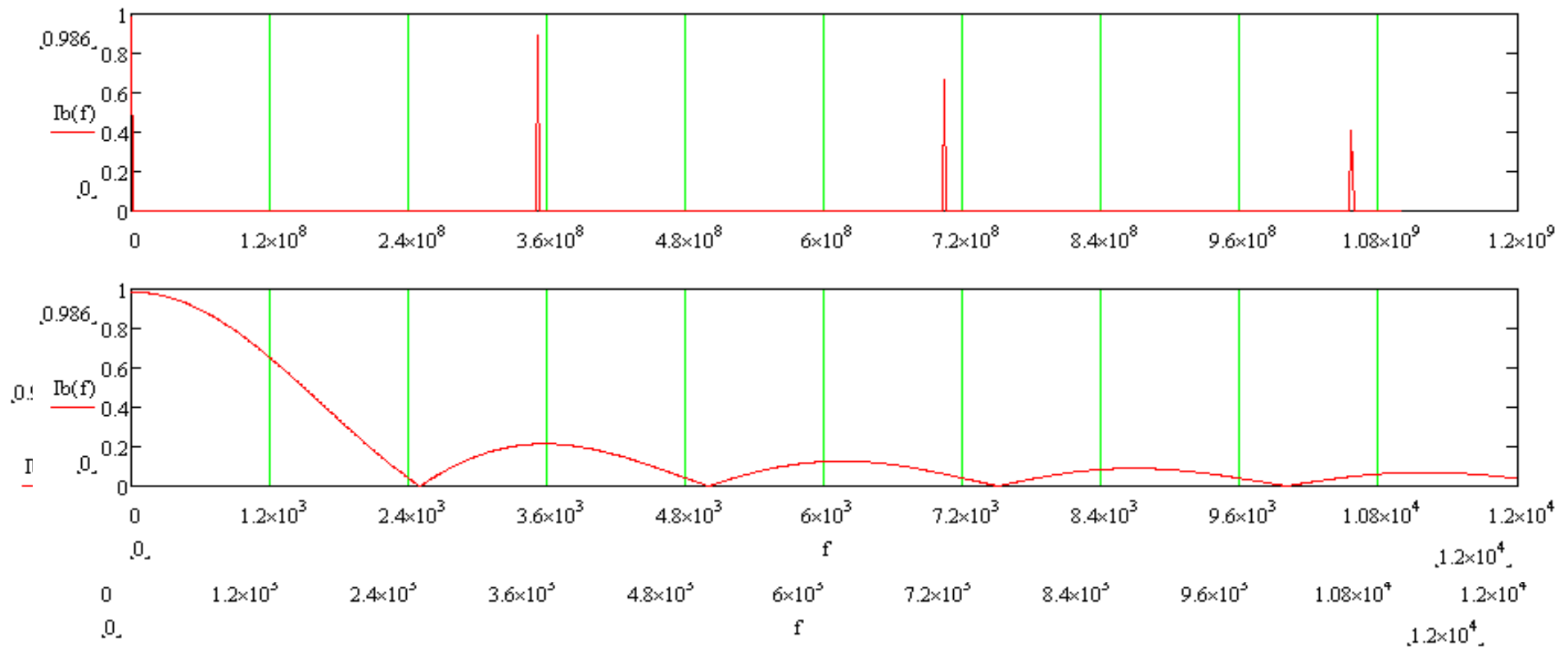
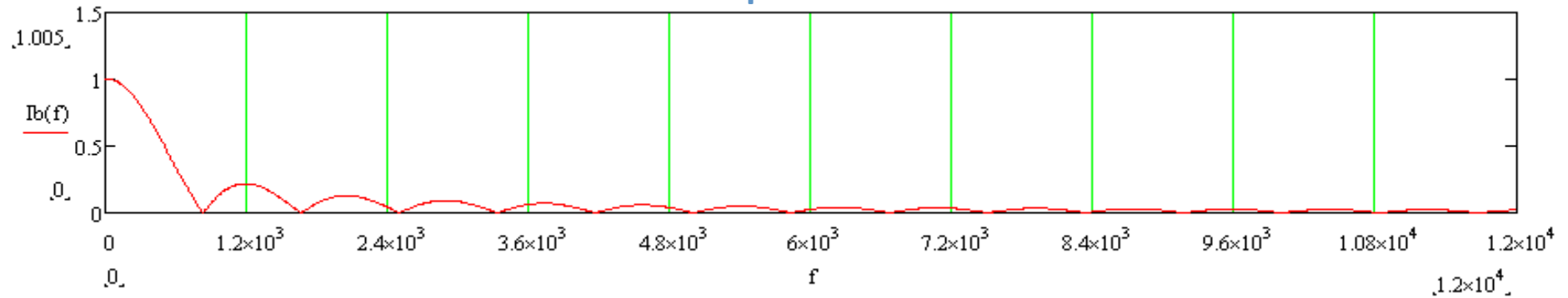


Linac4 beam spectra for 400us beam

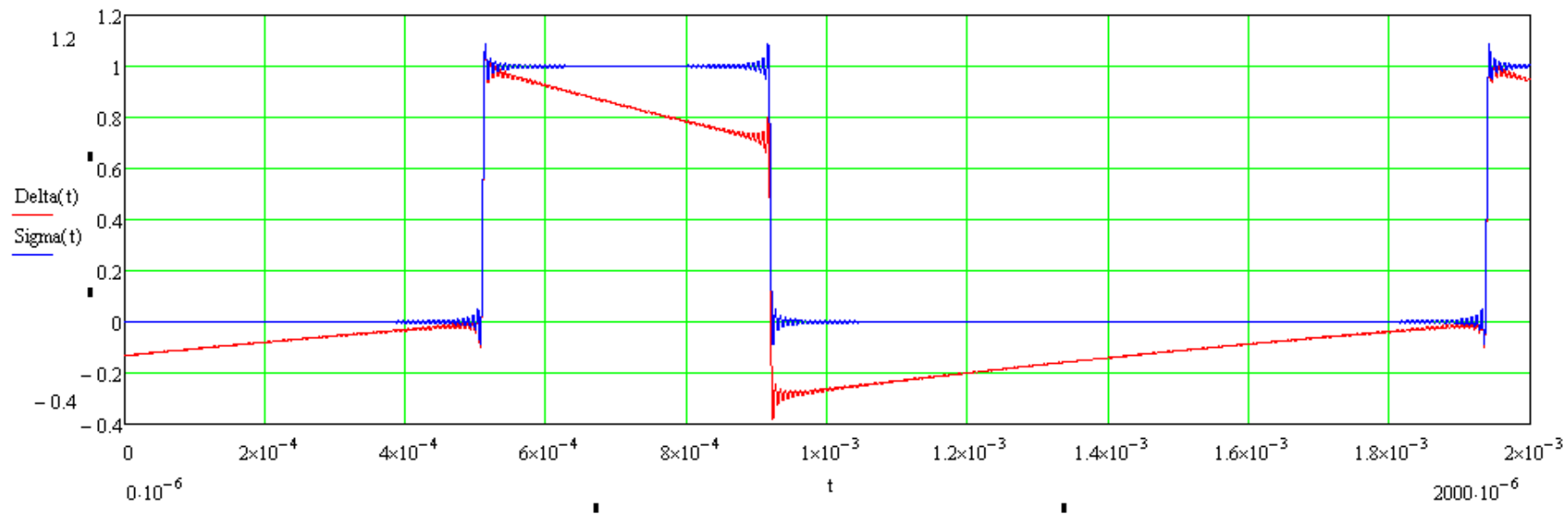


Linac4 beam spectra for 1.2ms beam

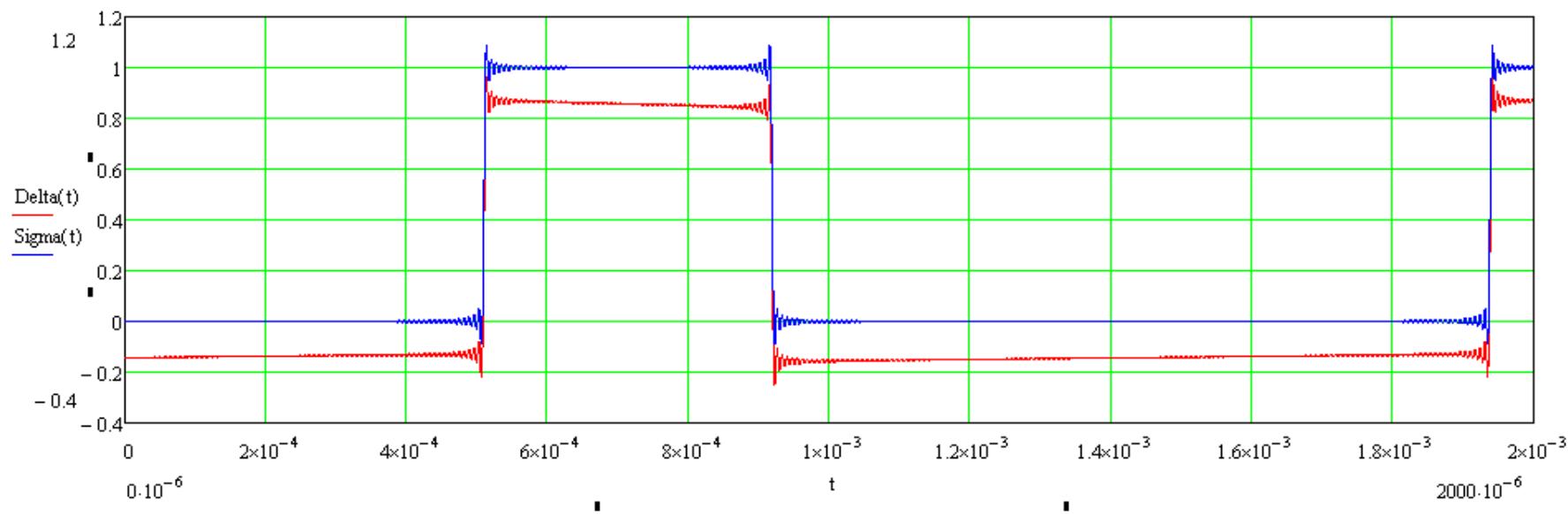


Beam de-bunched at the end of transfer line!!

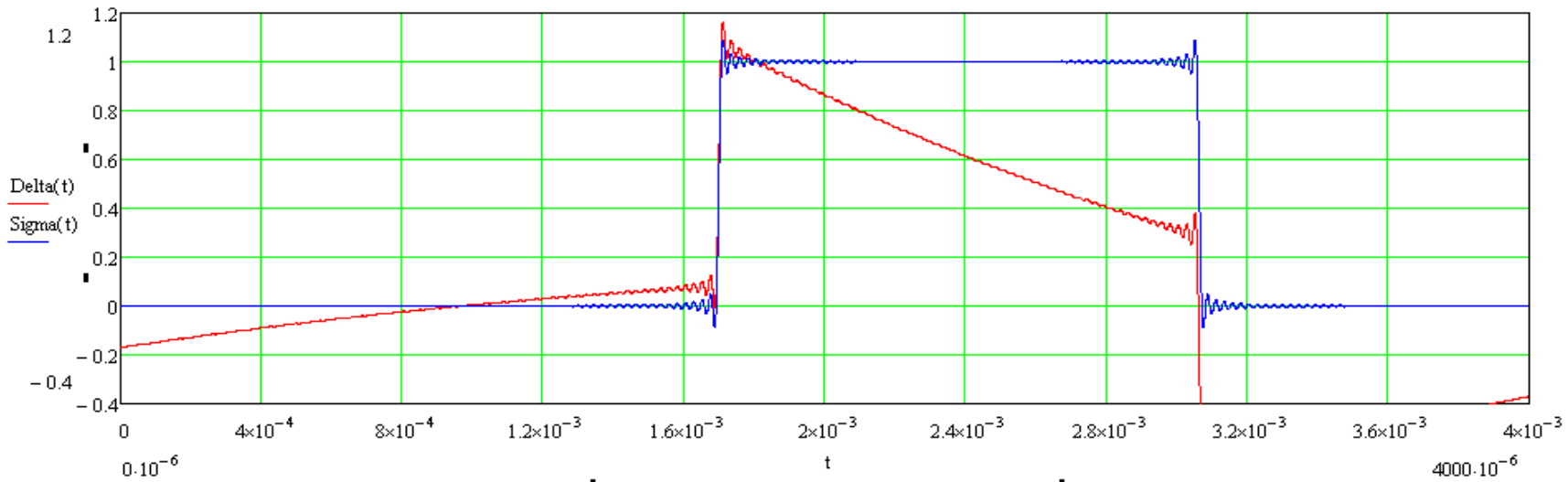
400us pulse, with low frequency cutoff 150Hz, tau 1ms, I.e Linac2 IPU



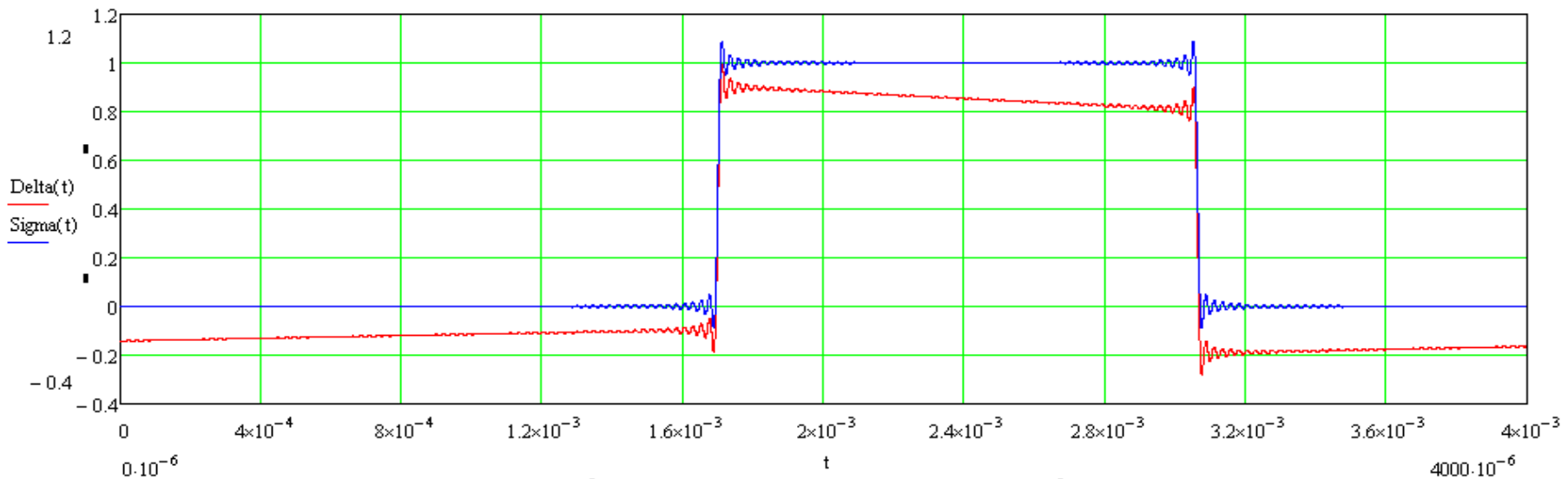
400us pulse, with low frequency cutoff 15Hz, tau 10ms



1.2ms pulse, with low frequency cutoff 150Hz, tau 1ms, I.e Linac2 IPU



1.2ms pulse, with low frequency cutoff 15Hz, tau 10ms,



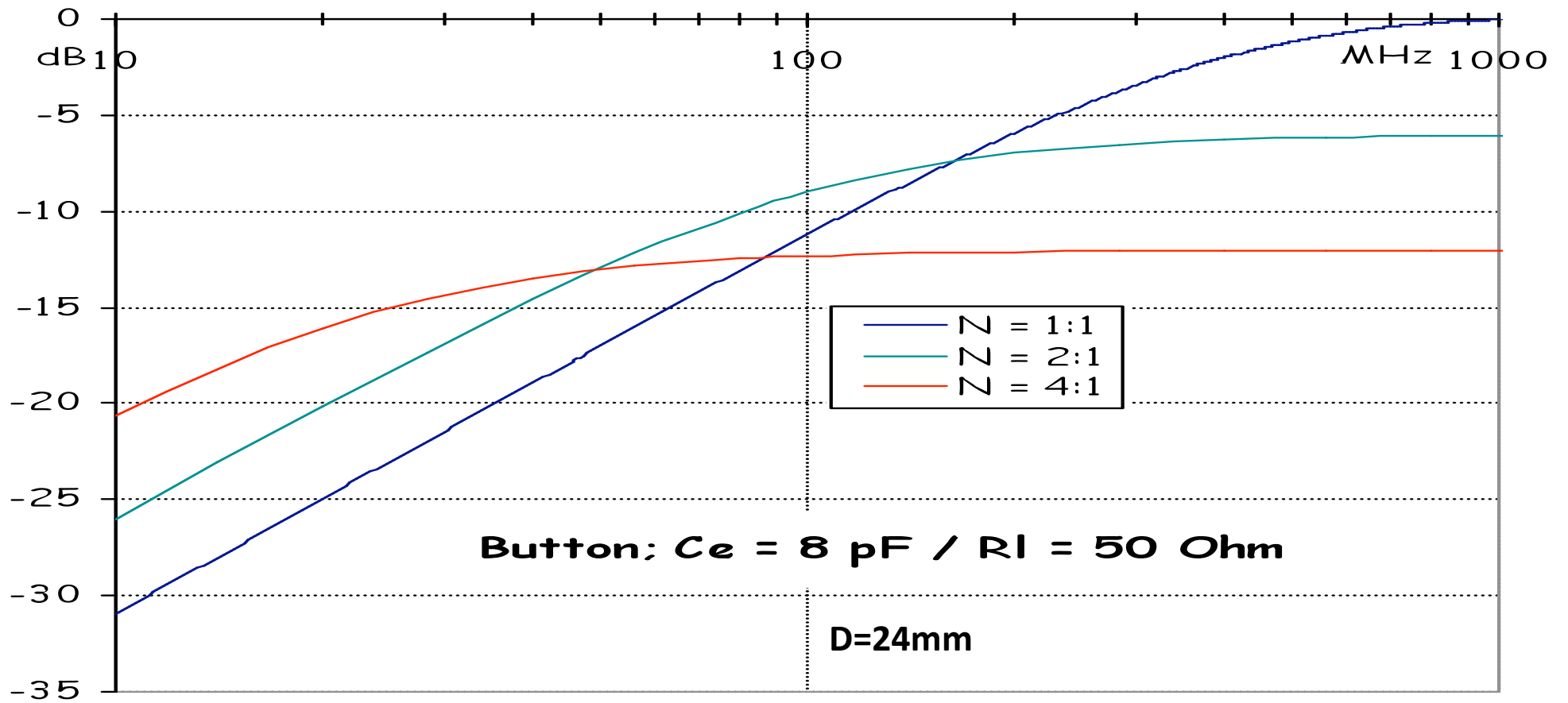
PU candidates



	Capacitive	Button	Strip line	Inductive
Linearity	Good	Poor	Fair	Fair
Sensitivity	Good	Fair	Fair	Fair
Low frequency cutoff	~100Hz	~100MHz	~100MHz	~100Hz
Price	10kCHF	10kCHF	10kCHF	20kCHF
Comments	Sensitive to spray particles etc	Simple ✓ 100 LEP Buttons are available		Real current measurement ✓ Different time constants

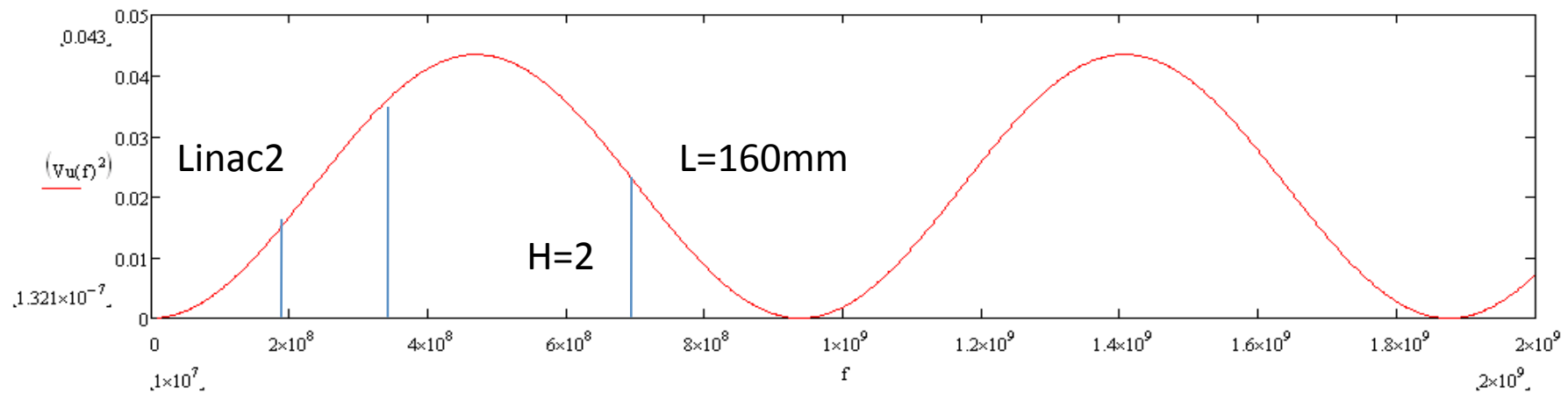
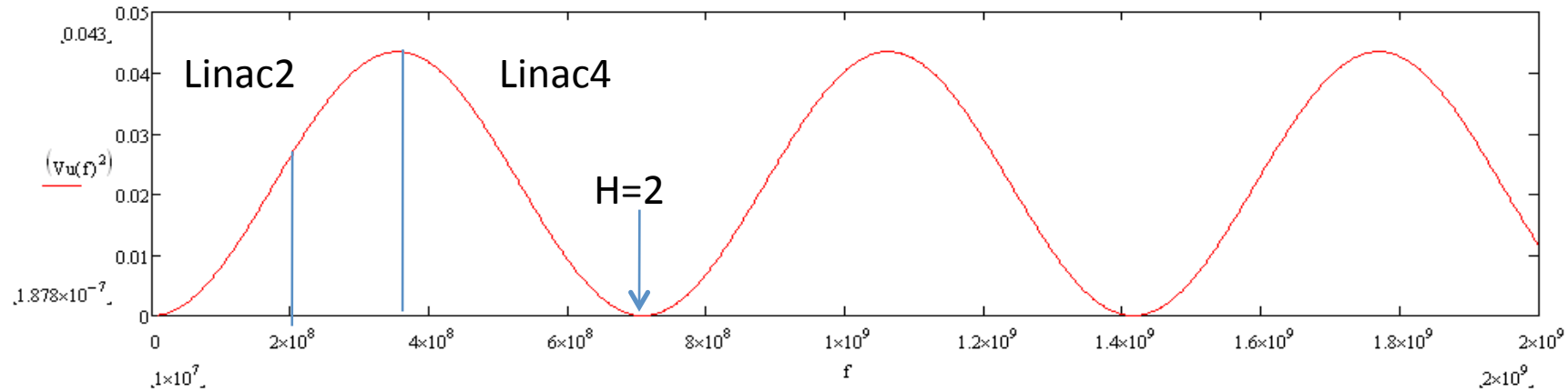
1. New IPU time constant of 1ms cannot be improved by a factor 10. Price 20kCHF. Not suitable for current measurements due to droop.
2. BCT has 128ms time constant, price 20kCHF, better suited for current measurement.
3. Strip lines and buttons are also suited for Linac2 operation, since 200MHz frequency bunching. **How much 352MHz / 200MHz is left at the end of the transfer line ?**

LEP Button



Strip line PUs





L=212mm, W=39mm, R=50mm, H=10mm



Is a bunch shape observation wanted?

Beam de-bunched at the end of transfer line!!

• LTU+BIU

1. 2* LT +3*LTB after BHZ20 + 12 *BIU (4+2*4)= 18 UMAs
2. Tau: 600us, but compensated in electronics to???.properly not enough to cover 1.2ms pulse. LF of HA is 16HZ=10ms tau.
Will measure time constant in shutdown.
3. Noise level **specification**: 25mA*mm  0.6mm @40mA
4. **Measured** 20mVpp ~ 3mV rms  0.2mm rms @40mA 
(cal = 400mV = 25mm40mA = 16mV/mm)
5. Diameter 120mm, length 596mm
6. Timing problem when switching between Linac2 and Linac4.
7. Not same acquisition system as strip lines. 

Conclusions

- Button PU seems like a good simple and cheap choice for position measurement. **But we need to verify the amount of 352 / 200MHz left.**
- **Strip lines can also be used. Same acquisition system as rest of LINAC4.**
- The existing UMA's should be able to give a precision $<0.5\text{mm}$ (thermal noise only), **but the time constant must be verified.**
- **The new IPU is not suitable for Linac4.**
- **What happens with the transfer line when we will have the SPL?**
- **Will we be switching between Linac2 and Linac4?**