BPMs for FETS

Calculations on BPM signals for FETS

Data as provided by E-Mail on 06.02.2012:

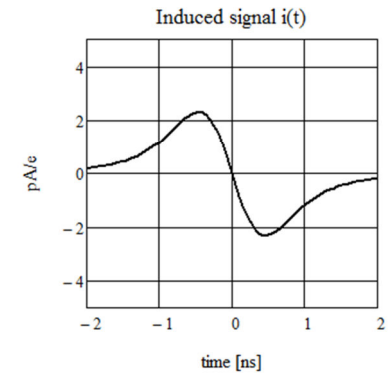
> Particle	H-
> Energy	3 MeV
> Single- macro- pulses	Bunch train 2ms long @ 50 Hz
> CW	N/A
> RF	324MHz
> Bunch length	0.25 to 0.5 ns (30 to 60 degrees of the RF) / 16mm
> Bunch charge	-1.85185e-10 Coulombs
> Vacuum chamber size	Beam pipe inner diameter = 40mm
> Flange type	DN40KF
> Vacuum quality	1 x 10-7 mbar
> Resolution required	Approx 0.5mm (beam diameter approx 10mm)
> Absolute precision required	?
> Output bandwidth	324MHz

1. Case for 0.25 ns

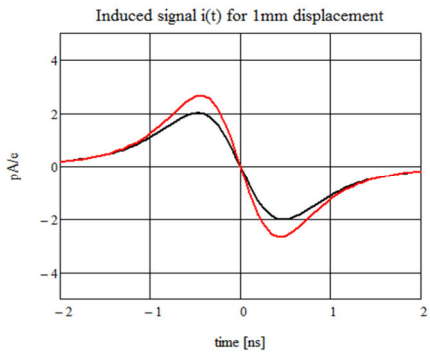
(Re is the radius of the button)

$\beta = 0.08$ DT = 0.25 ns

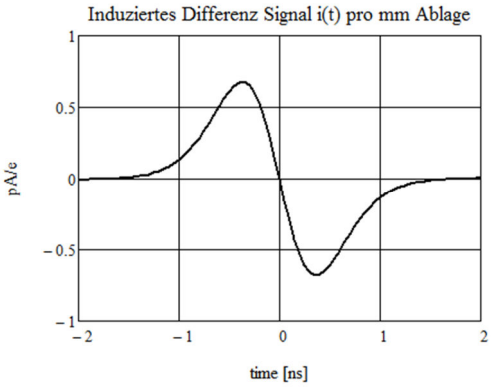
h = 20 mm R_e = 5 mm



The signal on opposing uttons for 1 mm displacement…



…and the difference signal for 1 mm displacement.



Since we have $1.156*10^9$ particles per bunch we have:

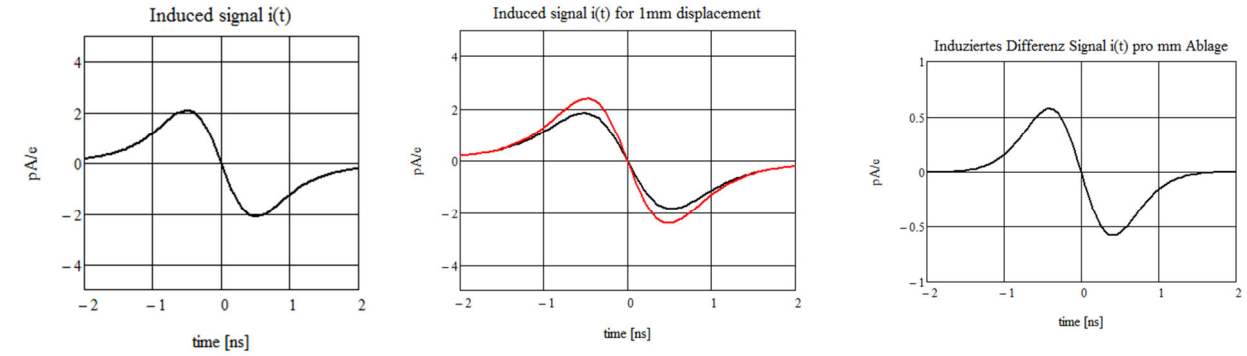
U_{max} = 0.7 pA * $1.156*10^9$ * 50 Ω = **40 mV**

Judging from that number a displacement of 0.1 mm can easily be measured with broadband amplification.

2. Case for 0.5 ns

$\beta = 0.08$ DT = 0.5 ns

h = 20 mm $R_e = 5$ mm



We come to rather the same conclusion as above.