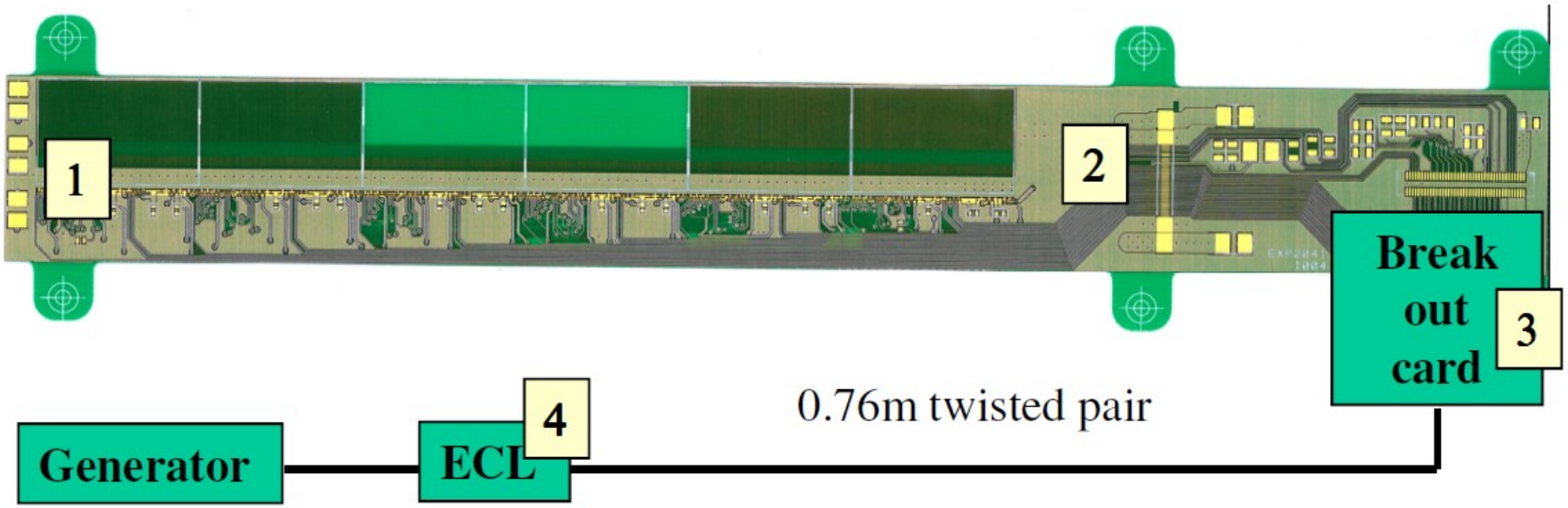
CLOCK PROPAGATION MEASUREMENTS & IMPEDANCE SIMULATIONS

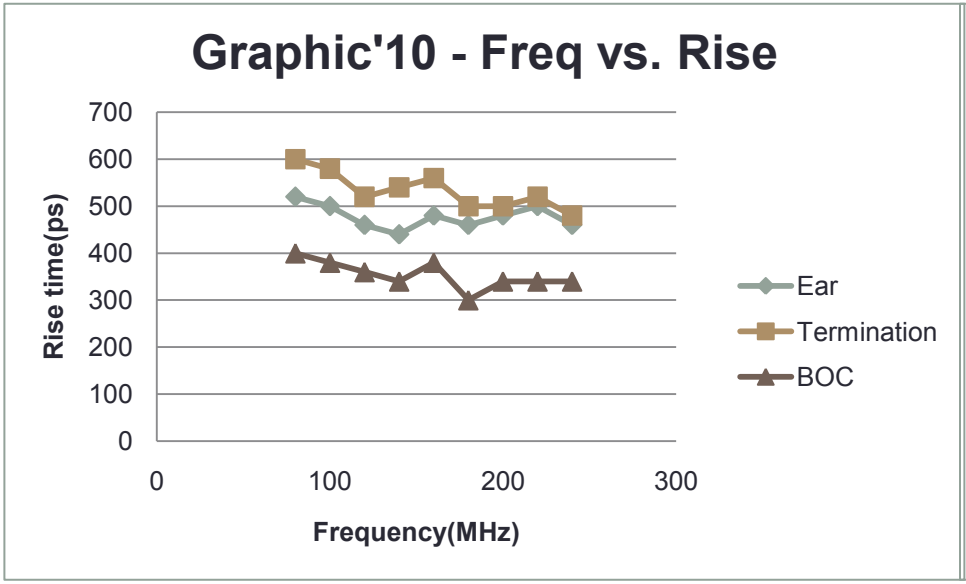
Rhorry Gauld, PLUME Meeting – 3rd May 2011

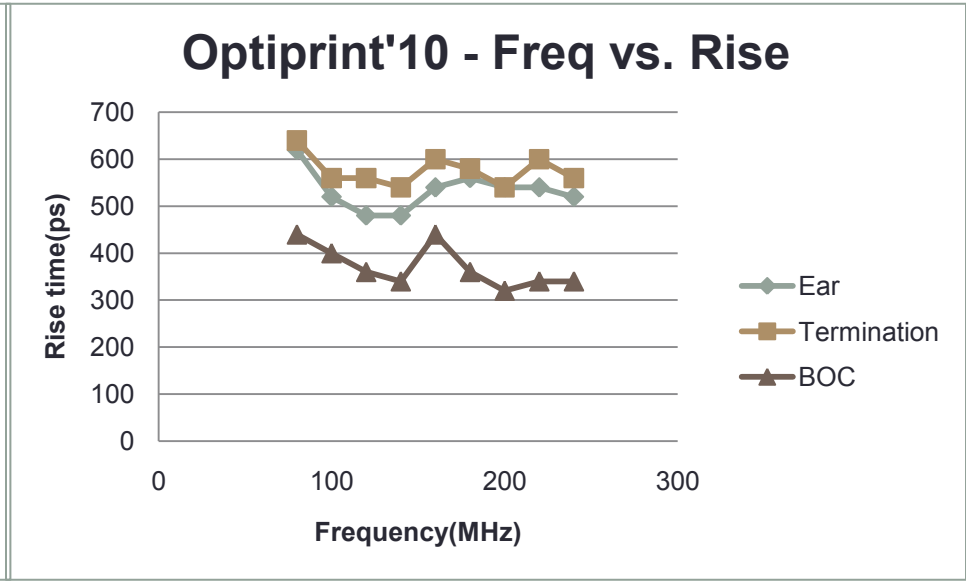
Clock Propagation



- Input signal ranging from 80MHz – 240MHz
- Absolute peak-peak measurements taken at;
  [1] – 100 Ohm `Termination'
  [2] – `Ears'
  [3] – Break out card(BOC)
- 1GHz Oscilloscope + 1.5GHz Differential Probe used

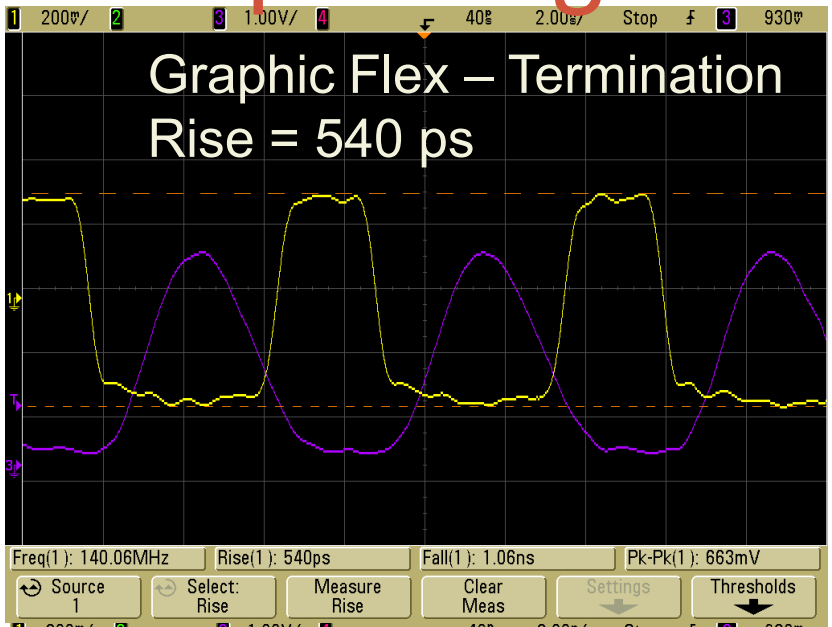
Results – Graphic'10 vs. Optiprint'10

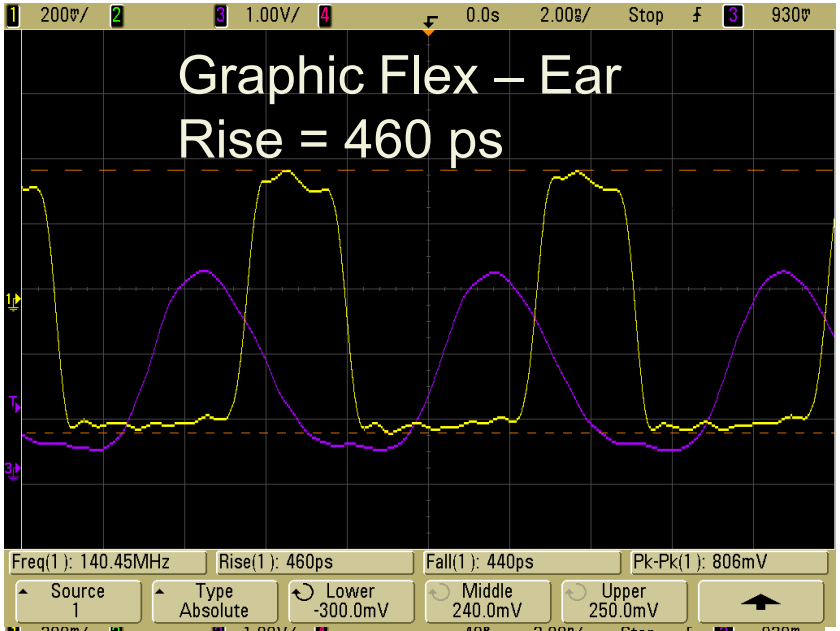


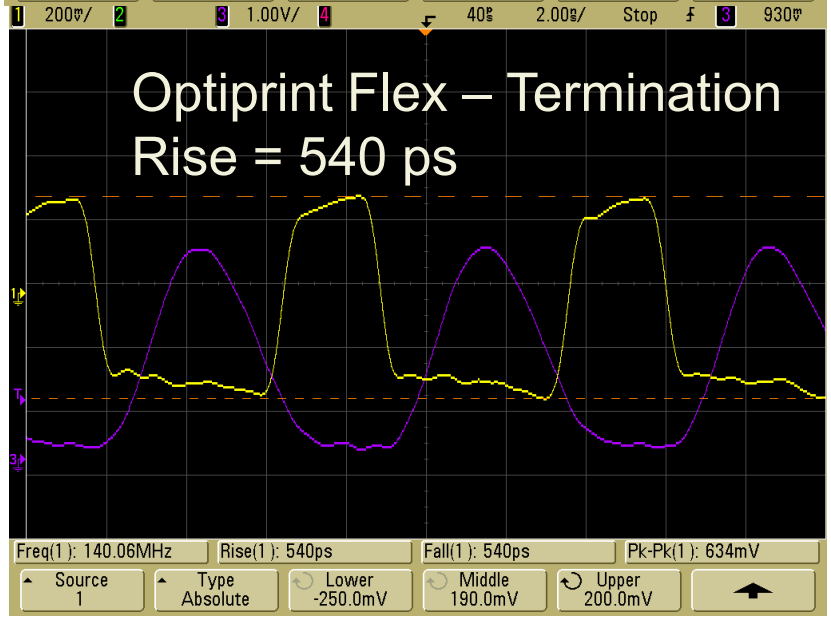


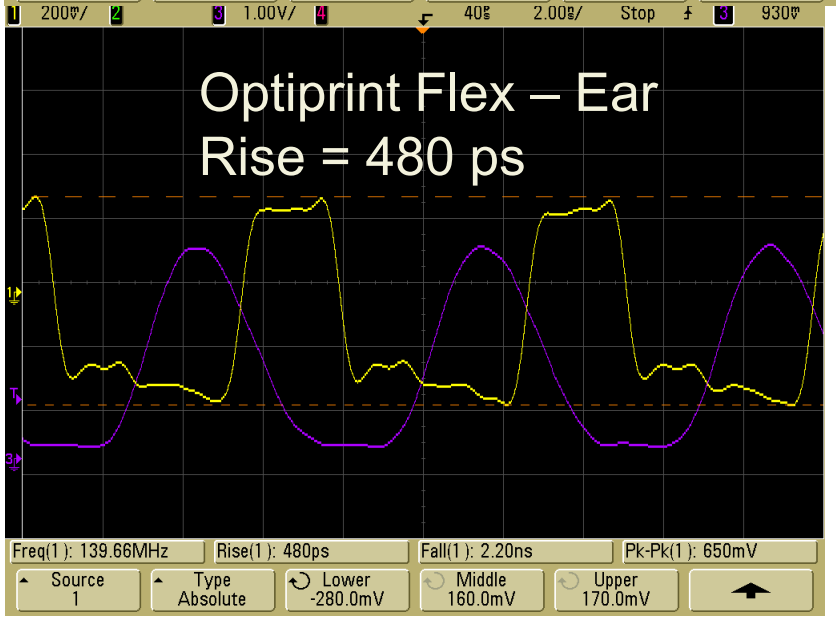
- Comparable rise times for both flexes
- Slower rise time at termination as expected – due to degradation of signal along clock path

Scope images – 140MHz



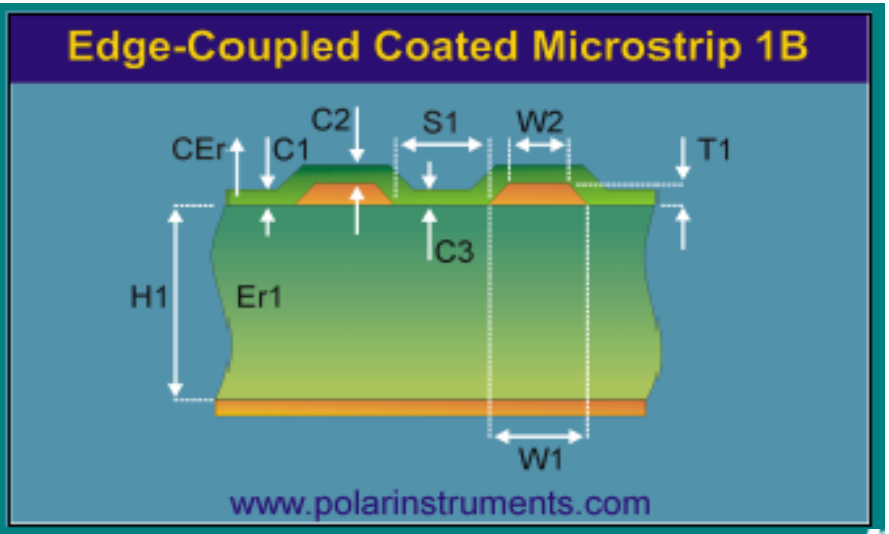




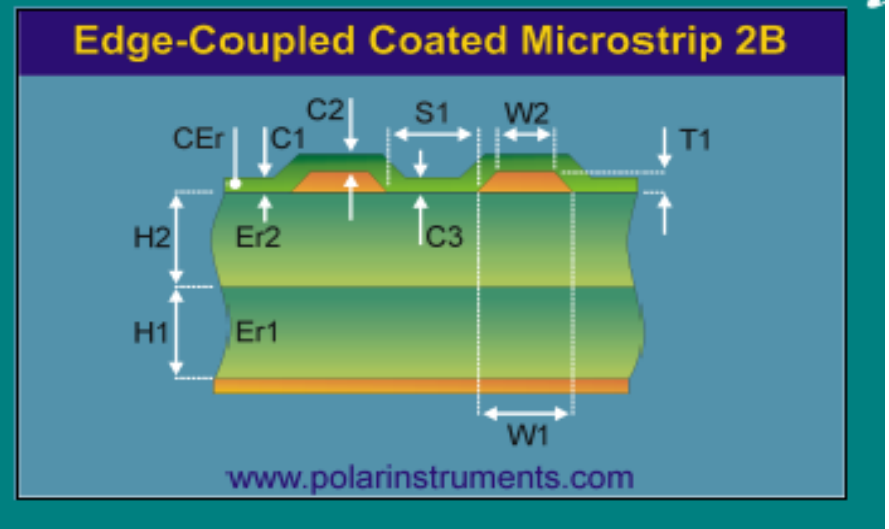


Impedance Simulations

- Simulations done using: Polar Instruments SI9000 v7.1.0



1b – simulating impedance with a ground plate



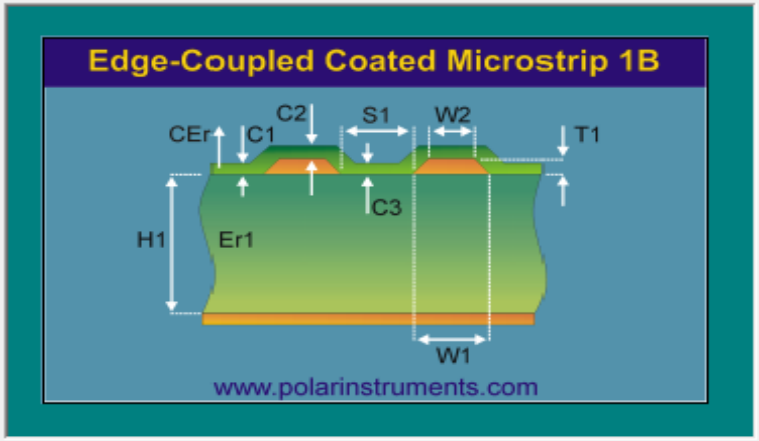
2b – simulating impedance with no ground plate or plate not at ground by increasing the
Distance H1 to maximum and using a dielectric constant of 1 (Er1)

Assumptions

Polyimide Dielectric 3.4
Trace Width 60 microns
Trace Seperation 75 microns
Coating ~25 microns?

Trace Thickness
Graphic'10 17 microns
Optiprint'10 20 microns
Optiprint'11 13 microns

Height between trace and ground
Graphic'10 50 microns
Optiprint'10 25 microns
Optiprint'10 12 microns



				Tolerance	Minimum	Maximum	
Substrate 1 Height	H1	50.0000	+/-	0.0000	50.0000	50.0000	Calculate
Substrate 1 Dielectric	Er1	3.4000	+/-	0.0000	3.4000	3.4000	Calculate
Lower Trace Width	W1	60.0000	+/-	0.0000	60.0000	60.0000	
Upper Trace Width	W2	60.0000	+/-	0.0000	60.0000	60.0000	Calculate
Trace Separation	S1	75.0000	+/-	0.0000	75.0000	75.0000	Calculate
Trace Thickness	T1	17.0000	+/-	0.0000	17.0000	17.0000	Calculate
Coating Above Substrate	C1	25.4000	+/-	0.0000	25.4000	25.4000	
Coating Above Trace	C2	25.4000	+/-	0.0000	25.4000	25.4000	
Coating Between Traces	C3	25.4000	+/-	0.0000	25.4000	25.4000	
Coating Dielectric	CEr	3.4000	+/-	0.0000	3.4000	3.4000	

Notes
Add your comments here

Graphic '10 – with ground plate

Interface Style
- Standard
- Extended

G.S. Convergence
- Fine (Slower)
- Coarse (Faster)

Differential Impedance	Zdiff	97.48		97.48	97.48

More Information — 144.24 ps/in

			<--- Range --->		
Differential Impedance	Zdiff	97.48	97.48	97.48	Close
Delay (Odd Mode) (ps/m)	D	5678.959	5678.959	5678.959	
Odd Mode Impedance	Zodd	48.74	48.74	48.74	
Even Mode Impedance	Zeven	67.88	67.88	67.88	
Common Mode Impedance	Zcommon	33.94	33.94	33.94	

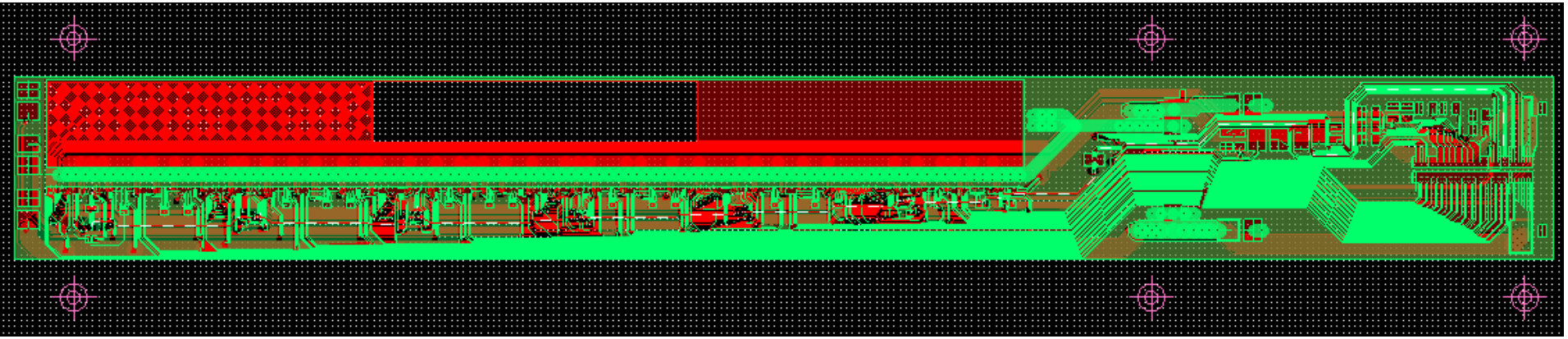
Results

	Graphic'10	Optiprint'10	Optiprint'11
Impedance (ohm)	97.48	71.34	47.91
Delay (ps/in)	144	147	151
Impedance-no ground(ohm)	137.21	141.33	157.09
Delay-no ground(ps/in)	128	120.75	116.18

Removing the ground plate increases the differential impedance

Both the change in trace thickness and in substrate height between Optiprint versions ~equally contribute to change in impedance of '10-'11

Is this acceptable?



As a rough estimate this seems okay

Since the majority of the clock path is ground this should bring us down to the 100 Ohm value we need