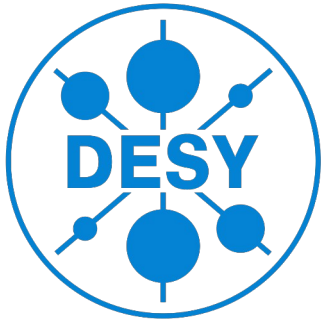
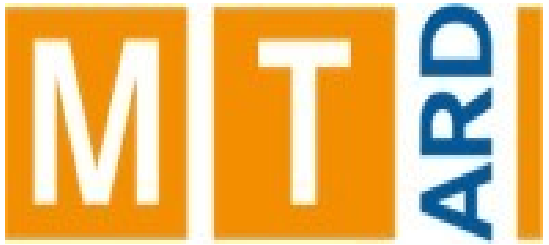
Investigation on Microstrip based Pickup Monitor for Ultra Low Charge Beam at 100 GHz



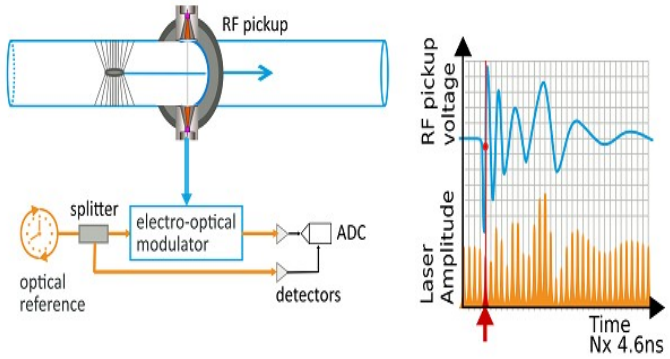
Nisamol Thevaruparambu Abdul Nazer, Marie Czwalinna, Andreas Penirschke, Bernhard Scheible, Holger Schlarb

11TH ARD-ST3 MEETING 2023 DRESDEN-ROSSENDORF



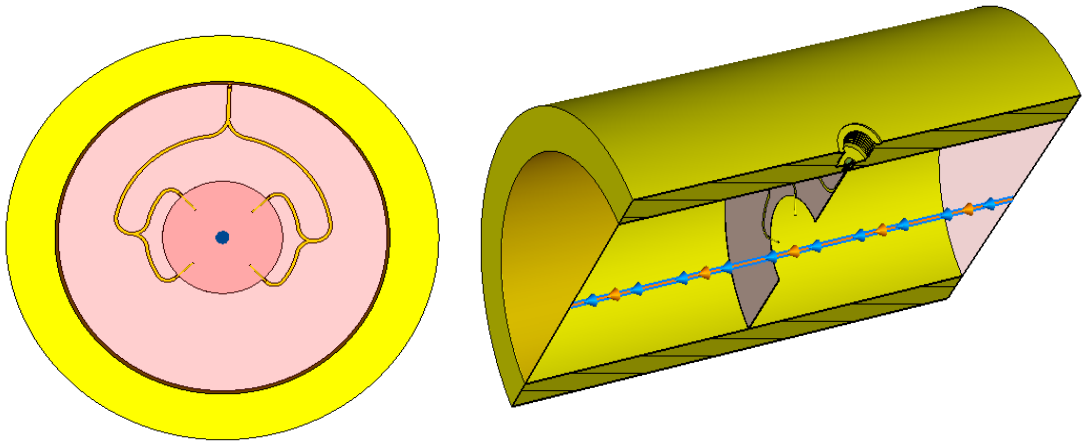
Jul 5 – 7, 2023 Dresden

ARRIVAL TIME MONITORS



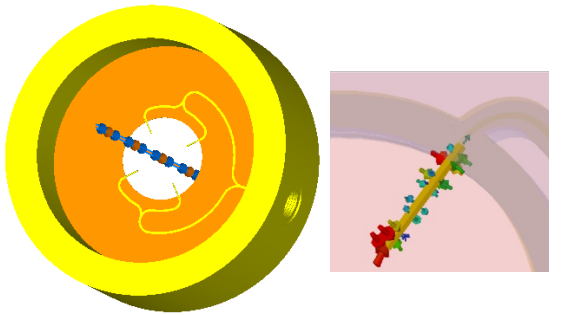
Here updating the efforts made toward creating a BAM that uses rod-shaped pickups installed on a printed circuit board and ultra-wideband travelling-wave electro-optic modulators with low operating voltages.

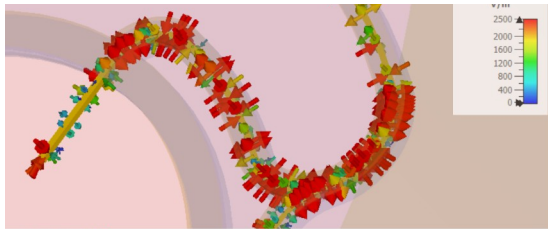
- Particle dynamics studio of CST (PS)
- Indirect interfaces
- 300 m wakelength gaussian excitation.
- σ = 1 mm and velocity = c m/s
- maximum beam frequency as 102 GHz
- Beam charge - 1 pC.



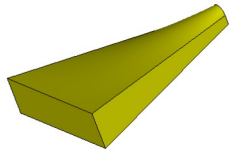
- Rod shaped pickups
- Microstrip combiner

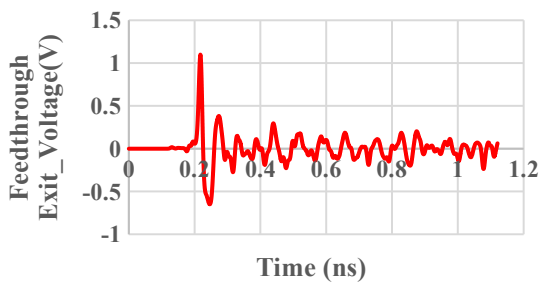
Rod Shaped Pickups



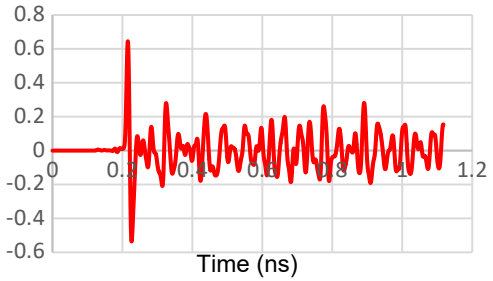


a





b



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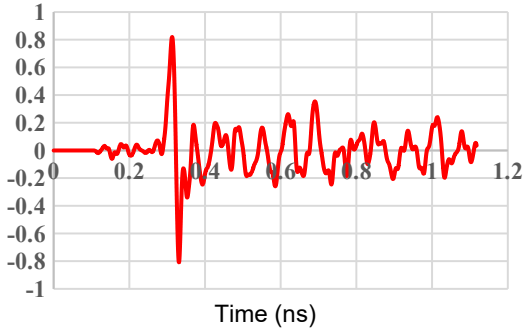
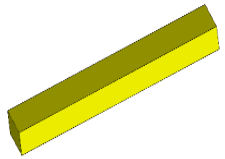
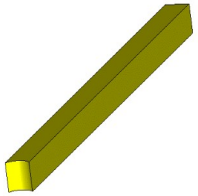
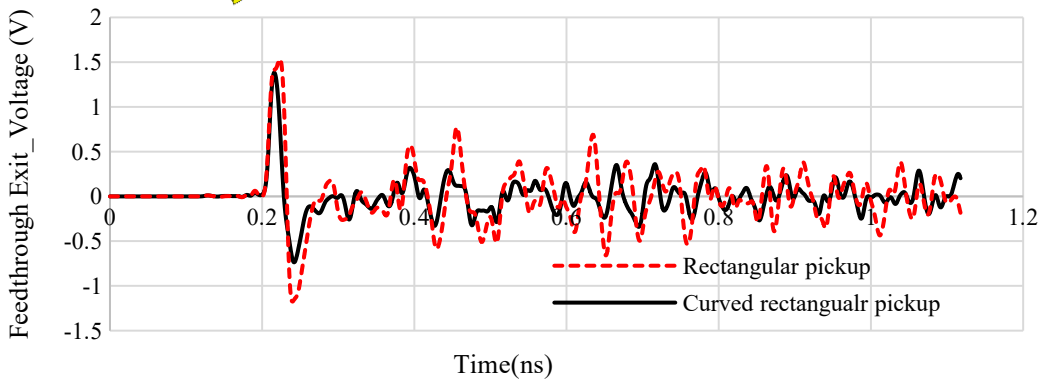


d

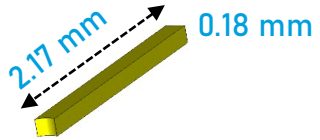


e

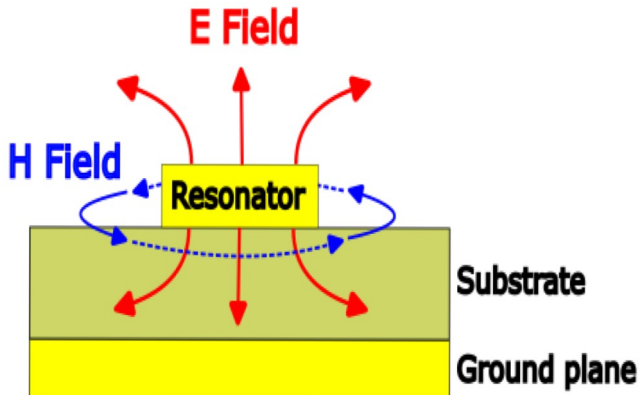


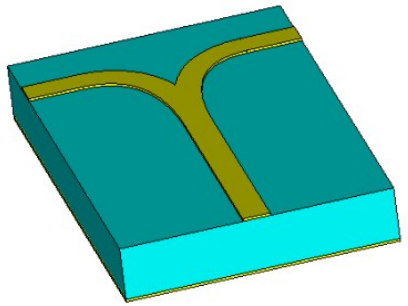


- Sharp slope → d, higher postbunch WF.
- low prebunch WF → b, higher postbunch WF.
- Low post bunch WF → e, less enhanced slope
- High Vpp → d, higher postbunch WF.
- Trade-off →e. Curved Rectangular rod could be used.

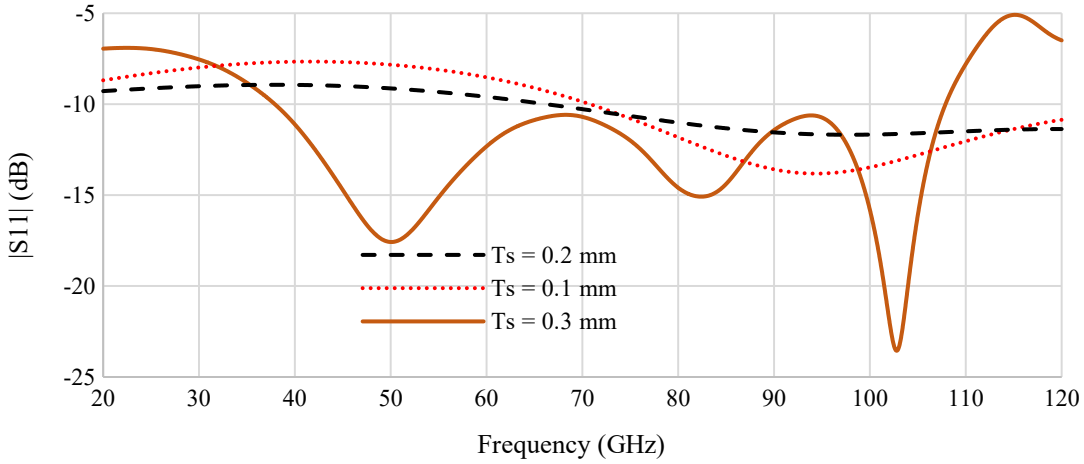


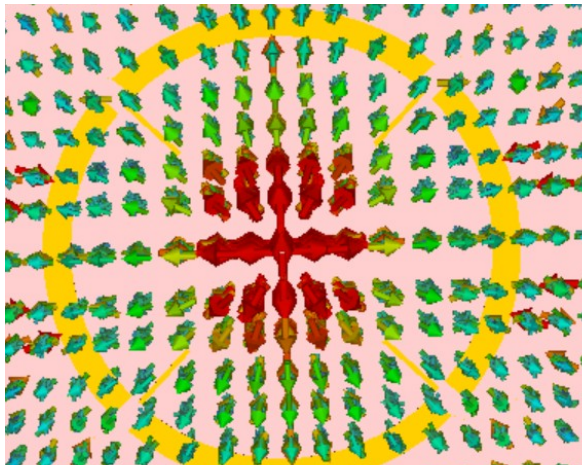
Microstrip Combiner Design

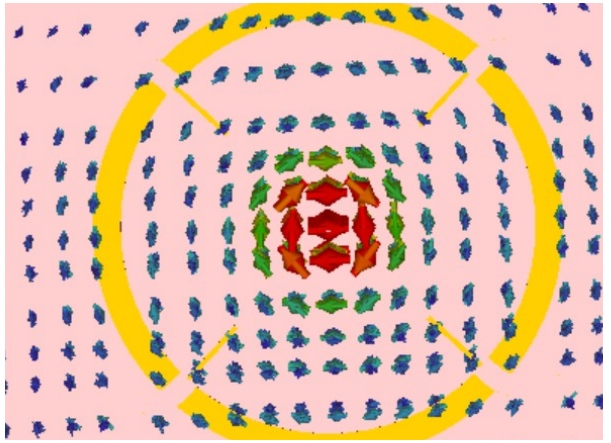




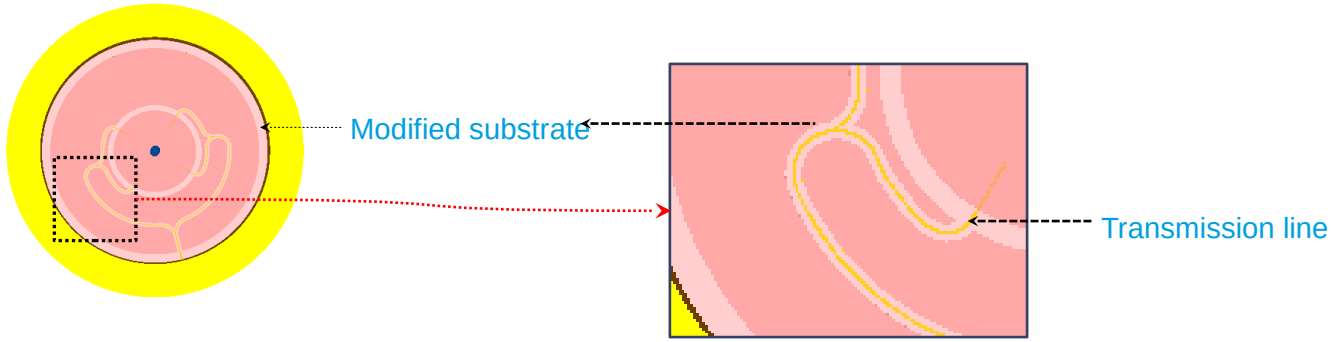
No.	Material under investigation	Dielectric Constant	Thickness
1	Silica	3.8	0.1-0.2
2	RO3010	11.2	0.1-0.3
3	Quartz	3.76	0.1-0.3

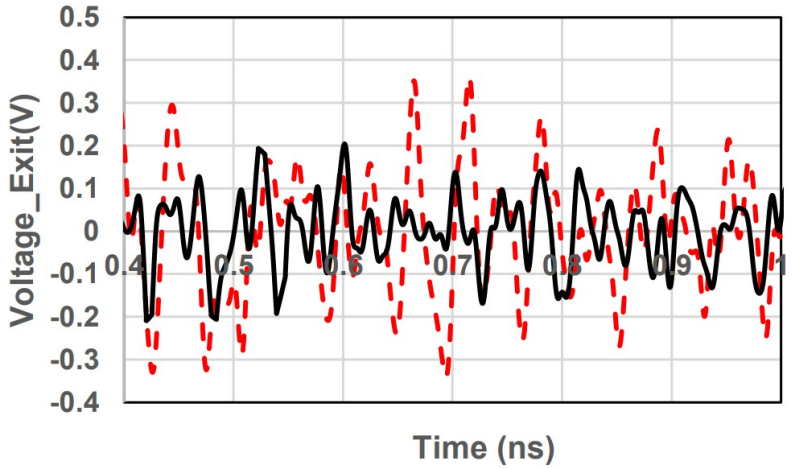


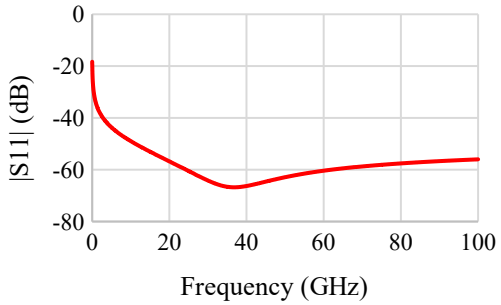


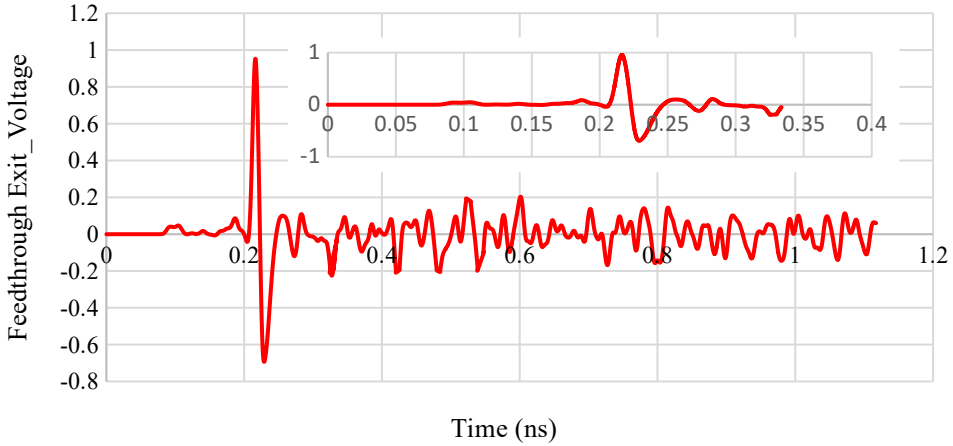


Modified Substrate Model (MSM)









Future actions to be done

- Testing the material properties in vacuum cavity.
- Measure reflection characteristics of the microstrip combiner.
- Further optimization of voltage characteristics with silica.
- Final realization of ultra low charge BAM installation for 100 GHz at FLASH.

THANK YOU

Collaboration partners: