

Concept of a novel high-bandwidth arrival time monitor for very low charges as a part of the all-optical synchronization systems at XFEL and FLASH

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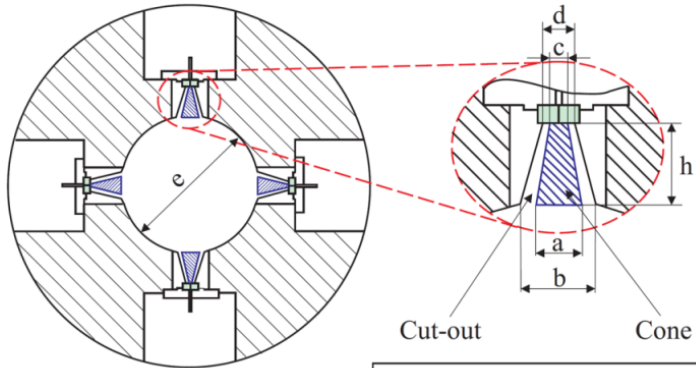


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Motivation

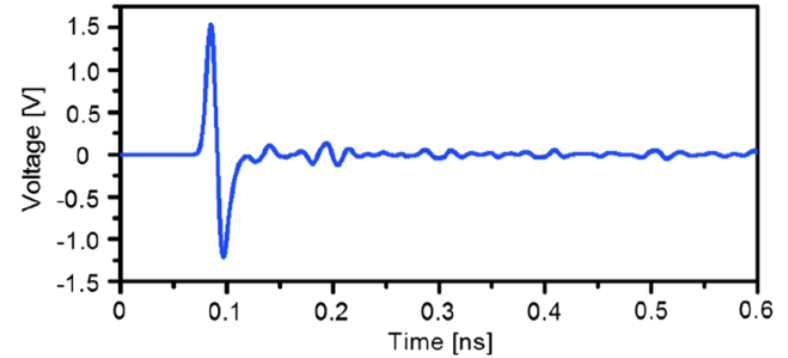
- New experiments need a few fs X-ray FEL pulses
 - Ultra short X-ray pulses require an ultra-low charge mode (a few pC)
 - Therefore synchronization with fs precision is necessary for pC bunches
- ⇒ Development of novel high-bandwidth **B**unch **A**rrival-time **M**onitor (BAM)

BAM Principle

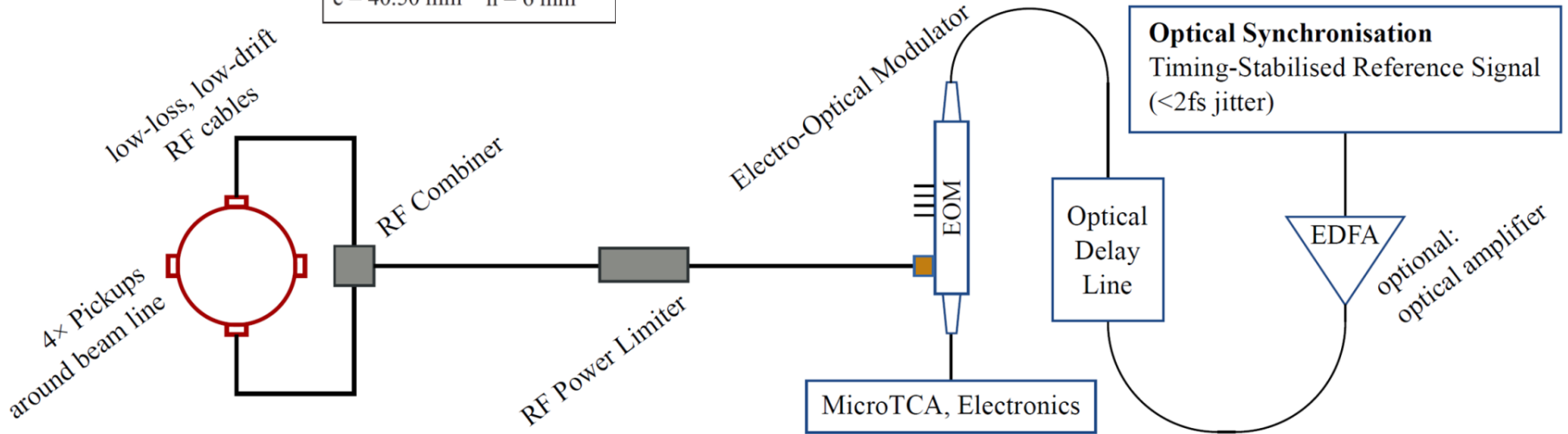


Pickup geometry [1]

a = 2.42 mm	c = 0.70 mm
b = 5.60 mm	d = 1.62 mm
e = 40.50 mm	h = 6 mm



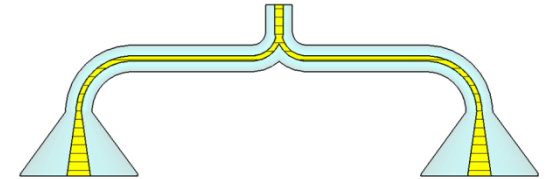
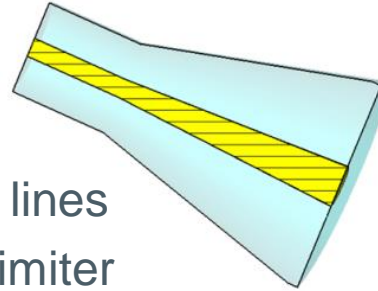
Simulation results of one pickup [1]



Basic layout of the cabling scheme of a single channel (picture taken from [3])

Proposed Pickup Structure

- Higher Bandwidth up to 100GHz
- Combination of at least 8 pickups
- Use of coaxial or substrate guided lines
- Omitting external cabling and RF-limiter
- Reduced distance Pickup to EOM



Simulation example of a ultra-broadband combination of two pickups

Conclusion

- ✓ First CST simulations done
- ? Limits of the proposed EOM from KIT
- ? Dispersion and losses of the structure
- ? Minimization of Wakefield excitation

