

# Contents

<b>1</b>	<b>Introduction</b>	<b>9</b>
<b>2</b>	<b>Bunch Arrival-time Monitors at FLASH</b>	<b>13</b>
2.1	Principle of Operation	14
2.2	State-of-the-art Pickups	19
2.3	Requirements for the Pickup Design	24
<b>3</b>	<b>Cone-shaped Pickup Electrodes for a High-bandwidth BAM</b>	<b>25</b>
3.1	Theoretical Analysis	26
3.2	Simulation and Optimization of the Cone-shaped Pickups	30
3.3	Non-hermetic Pickup Demonstrator	34
3.4	Hermetically-sealed Pickup Prototype	42
3.5	Upgrade of the Cone-shaped Pickups for a High-peak Voltage	47
<b>4</b>	<b>BAM RF-frontend characterization and simulation</b>	<b>56</b>
4.1	High-charge Channel Components Characterization	57
4.1.1	RF Splitter/Combiner ATM 213H	57
4.1.2	Limiter N9356C	59
4.2	Low-charge Channel Components Characterization	61
4.2.1	RF Splitter/Combiner PS2-55-450	61
4.2.2	Limiter N9355F	64
4.2.3	RF-coaxial Cables	64
4.3	RF-frontend Simulation	65
4.3.1	RF-signal Path for the High-charge Channel	66
4.3.2	RF-signal Path for the Low-charge Channel	68
<b>5</b>	<b>Time-Domain Characterization of the Cone-shaped Pickups</b>	<b>73</b>
5.1	Measurements at FLASH	73
5.2	Measurements at ELBE	80
5.3	Measurements at the SwissFEL Injector Test Facility	85

<b>6</b>	<b>Pickups for Energy Beam Position Monitor</b>	<b>88</b>
6.1	State-of-the-art Pickups . . . . .	90
6.2	Requirements for the New Pickup Design . . . . .	92
6.3	Microstrip Transimission Line Pickup for the EBPM at the European XFEL . . . . .	93
6.4	Grounded Coplanar Waveguide Pickup Design . . . . .	101
<b>7</b>	<b>Summary and outlook</b>	<b>104</b>