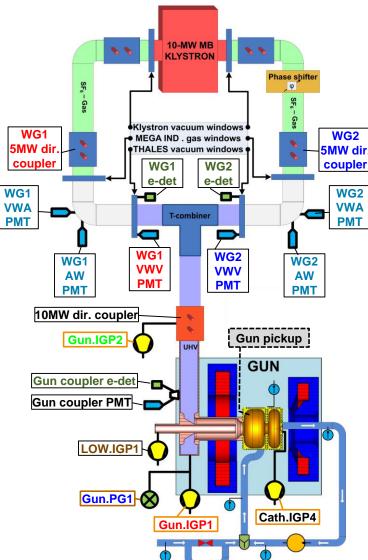
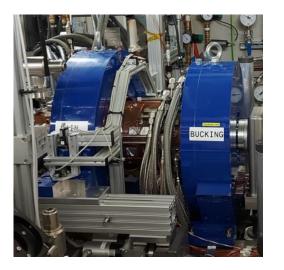
Gun5.1 at PITZ: RF conditioning and first characterization



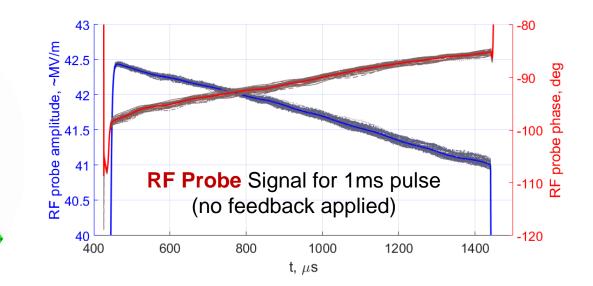
M. Krasilnikov for the PITZ team





1st prototype of new generation of NC 1.3 GHz RF gun for FLASH and European XFEL:

- up to 1 ms at 10 Hz repetition rate
- high gradients Ecath~60 MV/m
- elliptical shape of cells / irises / cathode hole
- Improved cooling
- **RF probe** in the full cell



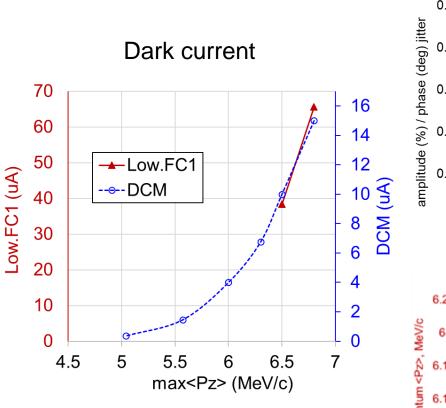
Gun5.1 at PITZ: RF conditioning

regular pulse mini breakdown Gun5.1 Conditioning Goals 8.5 Data labels = average power in kW: $P_{RF,aver} = P_{RF,peak} \cdot PL \cdot RR$ 7.5 mBD-start mBD-stop PITZ ഥ 산 10 Peak power , MW 9 2:9 XFEL achieved at PITZ t, μs ASH 5.5 ш/ЛМ~ 40 F **Status** Status 11/2021 06/2022 mBD-start stunoo 40 mBD-stop 4.5 4h statistics , porder, 50 RF pulse length (PL), us BD

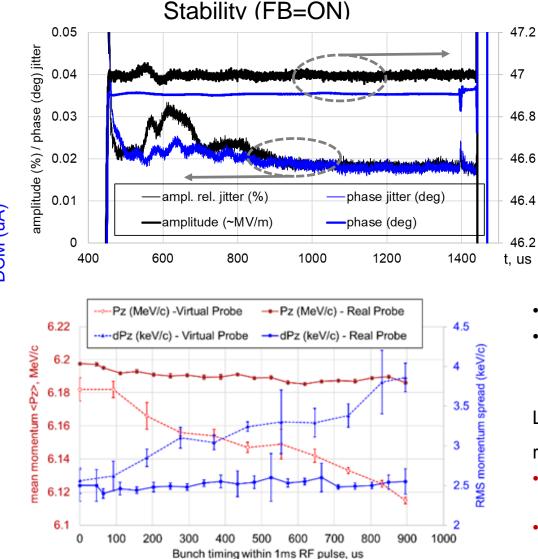
Mini-breakdown events

t, μs

Gun5.1 at PITZ: first characterization



Comparison with the corresponding dark current measurements for Gun4.2 demonstrates a reduction of a factor 3 to 5.



Shot-to-shot rms jitter (500 shots): • amplitude ~0.02%

• phase ~0.02 deg (~40 fs)

Beam stability along the RF pulse

- $\langle P_z \rangle$ at MMMG for **1ms** pulses
- Virtual probe (10 MW DC) versus RF pickup (real probe)

Linear slope $\frac{1}{\langle P_z \rangle_0} \left| \frac{d \langle P_z \rangle}{dt} \right|$

(MV/m) / phase (deg)

amplitude

real probe 0.0016 (ms)⁻¹ \rightarrow :

- ×7 smaller than virtual probe (0.011 (ms)⁻¹)
- significantly better than for Gun4.1 with a virtual probe (2021): 0.021 (ms)⁻¹ within a 200 µs pulse