Report on Gun-4.2 run at PITZ in 2014-2015

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## 0. PITZ beamline and gun-4.2

**A. Oppelt**

The Photo Injector Test facility at DESY, Zeuthen site (PITZ), develops high brightness electron sources for modern free electron lasers like the Free-electron Laser in Hamburg, FLASH, and the European X-ray Free-Electron Laser, European XFEL. The stringent requirement …

## RF conditioning

**Y. Renier**

The conditioning of the gun 4.2 has taken place at PITZ from …

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| N:\4groups\zn_pitz\sim\KRAS\Formal\RunWeeks\RC2013\gun-4.3report\couplers_upgr_v2.bmp |
| Figure 1.1.1: RF system overview |

The conditioning procedure which was applied to the gun 4.2 was similar to the THALES RF window conditioning.

…

Thresholds of gun IL signals are summarized in Table 1.1.1.

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| --- | --- | --- |
| Name | Threshold | Comment |
| PMT coupler | 1.5 V | light(lux)=0,3 x signal(V) |
| PMT window | 2.5 V | light(lux)=3,4 x signal(V) |
| e-det coupler | 1.5 V -0.6 V offset | 100k -->0,8 V |
| e-det window | 2.0 V 0 V offset | 100k -->0,8 V |
| Low.IGP1 | - | 1 e -6 mbar |
| Gun.IGP1 | 3,5 V | = 7 e-9 mbar |
| Gun.PG1 | 4,5 V | = 1 e-7 mbar |
| Cath.IGP4 | - | 1 e -6 mbar |
| Reflected power | 93 dBm per waveguide | 2 MW per waveguide |

Table 1.1.1: Gun interlock signals with corresponding threshold

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| --- |
| Q:\group\pitz\data\Isaev\gun\conditioning_reports\rf_spectra\650usfw1.bmp Q:\group\pitz\data\Isaev\gun\conditioning_reports\rf_spectra\650usfw2.bmpQ:\group\pitz\data\Isaev\gun\conditioning_reports\rf_spectra\650usre1.bmpQ:\group\pitz\data\Isaev\gun\conditioning_reports\rf_spectra\650usre2.bmp |
| Figure 1.7.3: RF signals from 10MW directional coupler for 650 s rf pulse length: forward power –upper row, reflected power –bottom row. A channel number in the horizontal axis corresponds to 1 s |

**Conclusions**

The established procedure applied to gun-4.2 …

## 2. Dark current

**M. Krasilnikov**

High electric fields at the inner surface of the RF gun can result in unwanted field emission, called dark current. The dark current was usually measured with LOW.FC1 which could be inserted in the DDC (~0.8 m downstream of the cathode). The first dark current monitor (DCM1, located at z=2.36m from the cathode) was used to monitor the evolution of the dark current.

### 2.1 History of the dark current

Available history of the dark current monitoring using the DCM1 is shown in Fig. 2.1.1 …

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| Figure 2.1.1: Dark current history during RF conditioning, Dark current monitor (DCM1) readouts for the RF peak power >5MW are plotted versus date. |

**References**

[2.1] D. Malyutin et al, “First Results of a Longitudinal Phase Space Tomography at PITZ”, in proceedings of FEL 2013 conference.