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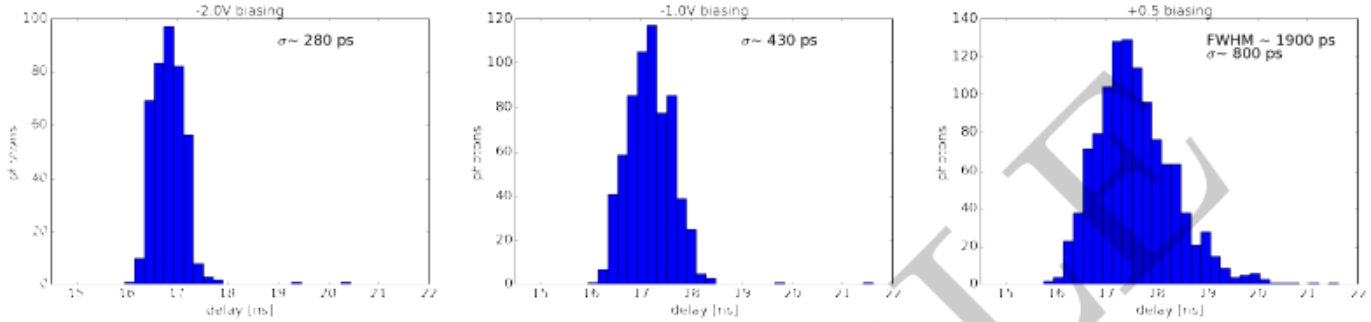
Characterization report

mrongen
Custom picosecond light sources

- **SN#6, 385 nm / 10 pF, 2017/12/13**

Timing Characteristics

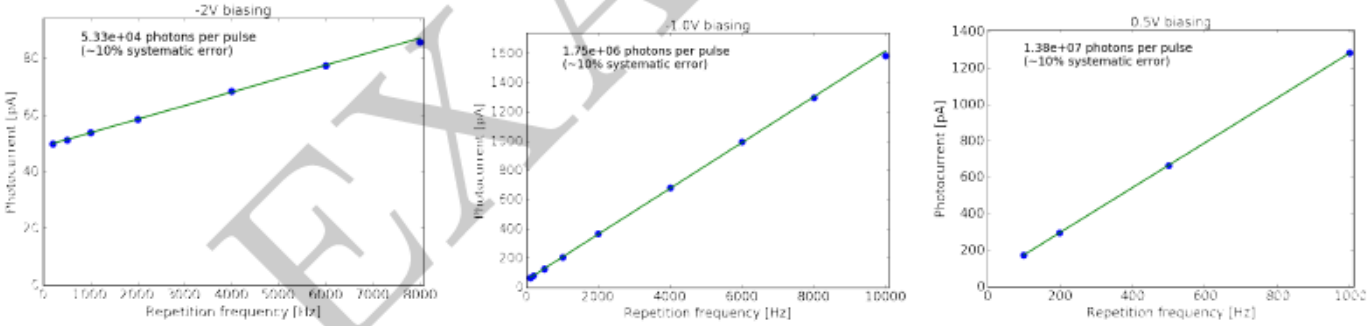
Light curves are measured as the distribution of timing delays between the internal trigger pulse of the light source and the arrival time of single photons at a 50μm *IDQ ID-100* avalanche photodiode (APD, IRF ~40 ps). For this purpose a *TDC7200* evaluation board is being used as Time to Digital Converter. As the APD can not distinguish the number of registered photons, the occupancy, that is the increase in APD detection rate relative to the trigger rate, needs to be small (~10%) to guarantee mostly single photons. In order to measure the occupancy, the APD rate is monitored with a custom frequency counter.



No light could be detected at bias voltages smaller -2.0V.
For non-symmetric light curves, with a long tailing edge, the standard deviation is unreliable and the FWHM as obtained from the fit of a power log-normal distribution is a better characterization of the timing profile.
The optical trigger jitter has not been evaluated for this configuration. It is expected to be similar to the jitter as measured with the same pulser being equipped with an 850nm VCSEL, where it was found to be unresolvable (<40 ps).

Intensity Characteristics

In order to quantify the pulse intensity (photons per pulse) a *Hamamatsu S2281* photodiode is used in conjunction with a custom picoammeter. The average pulse intensity is measured as the slope of the dark noise corrected photocurrent as a function of the light source repetition frequency taking into account the quantum efficiency of the photodiode. As the photodiode is not calibrated beyond the datasheet specifications a 10% systematic error is assumed.



The maximum repetition frequency in this measurement is limited by the dynamic range of the picoammeter (max. ~ 3000 pA). The intensity per pulse starts to become non-linear for large repetition frequencies. The fit has been restricted to the linear range.