EVALUATION OF LARGE AREA PHOTOMULTIPLIERS FOR USE IN A NEW BAKSAN LARGE NEUTRINO TELESCOPE PROJECT

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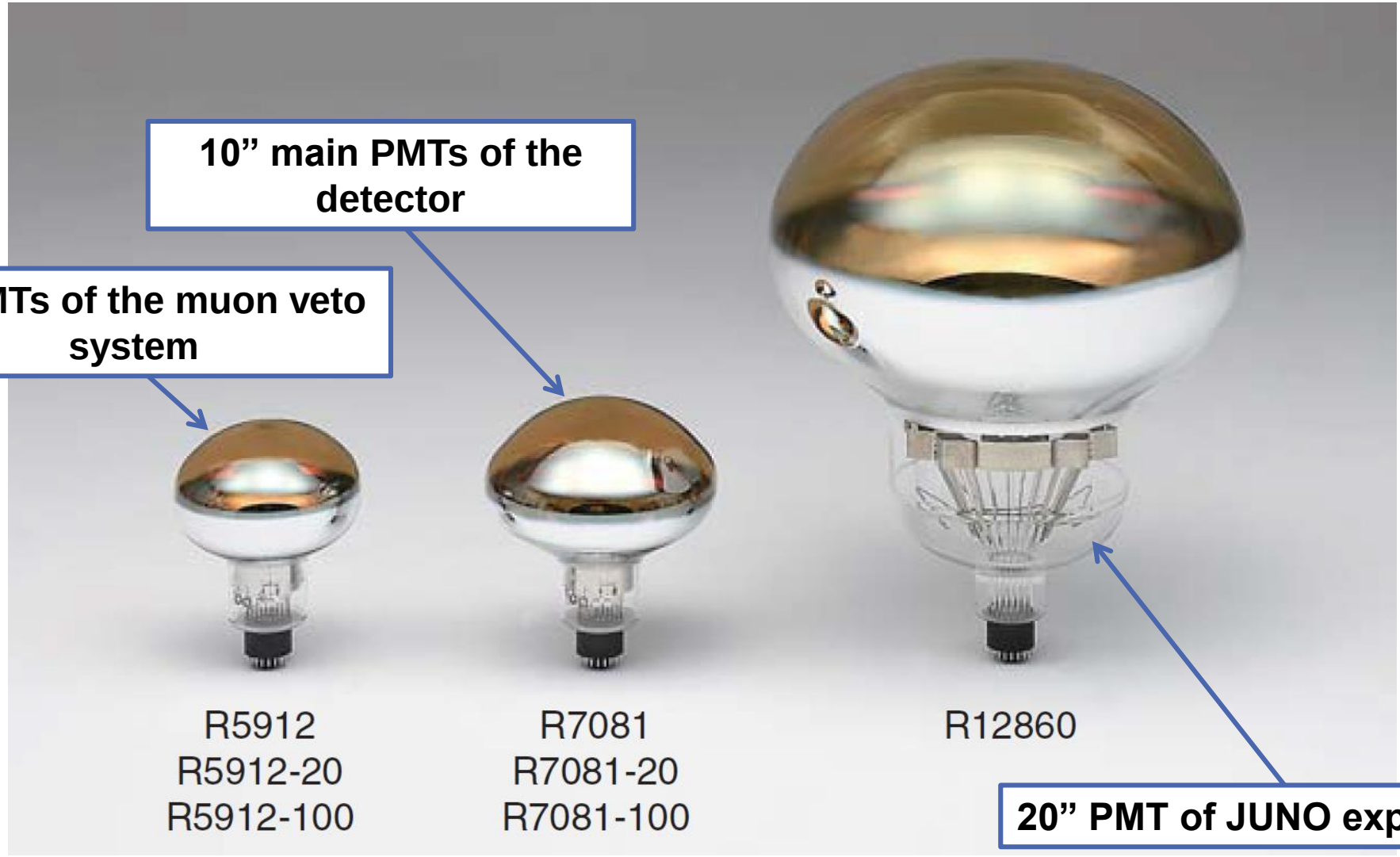
37th International Cosmic Ray Conference,
Berlin, Germany
12–23 July, 2021

Large area photomultipliers by Hamamatsu



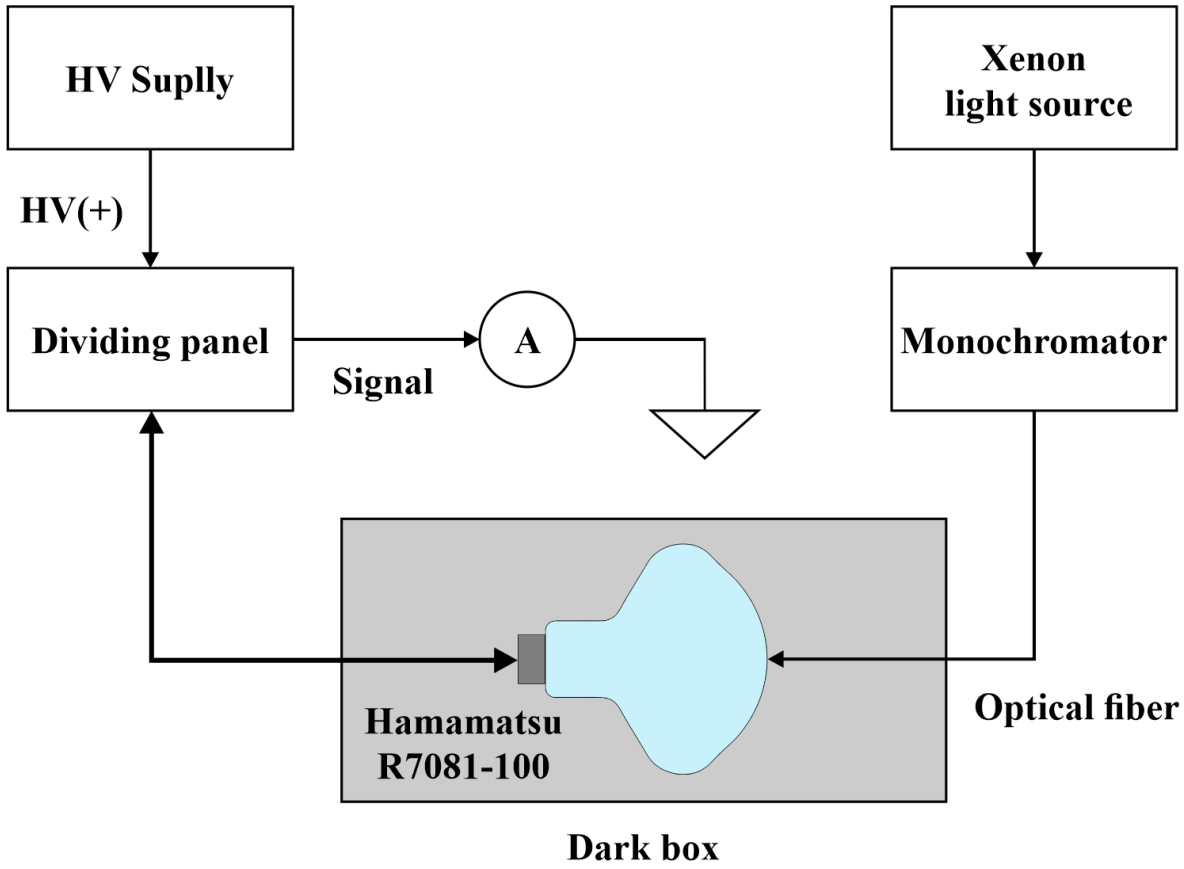
Comparison of PMTs

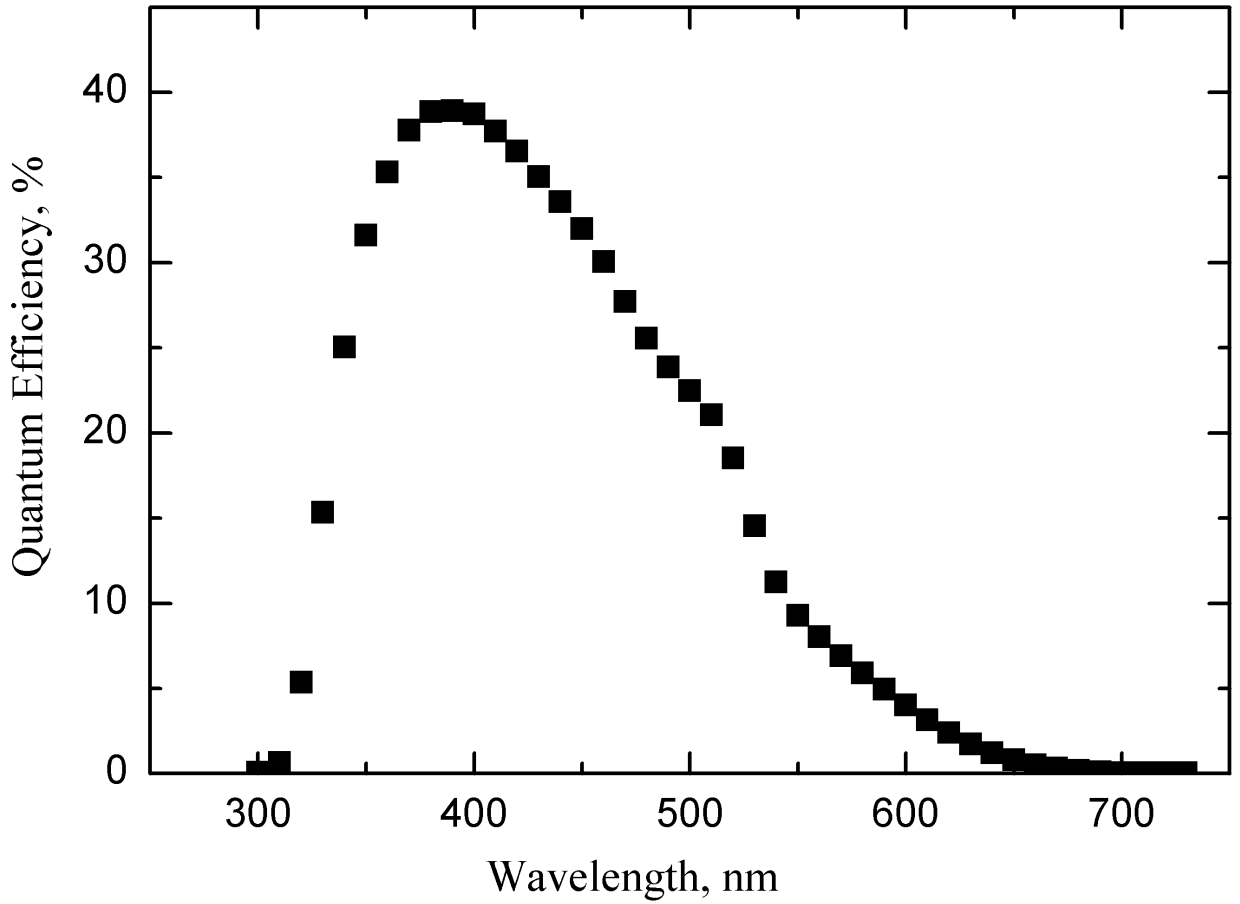
R7081-100 vs. R12860
± Less area of the photocathode (4.3 times), but smaller dimensions (length R12860 without divider 66 cm, and this is too much for 0.5 and 5-t prototypes)
+ 5% more quantum efficiency (35 vs. 30)
+ The counting rate of the dark current is ~ 10 times less (for R12860 ~ 15 kHz)
+ Higher amplitude of a single-photoelectron pulse at the same gain
+ Less influence of external magnetic field

R7081-100 vs. R7081-20
+ 10% more quantum efficiency
- Less dinodes (10 vs 14) => Less typical gain (10^7 vs. 10^9)
+ Less anode dark count rate
+ Timing characteristics is better (jitter, duration pulse and rise time)

R7081-100 vs. XP1802, XP1804, XP1805, XP1807
+ 10% more quantum efficiency
- Slightly worse timing characteristics
+ Less anode dark count rate
Other parameters are about the same

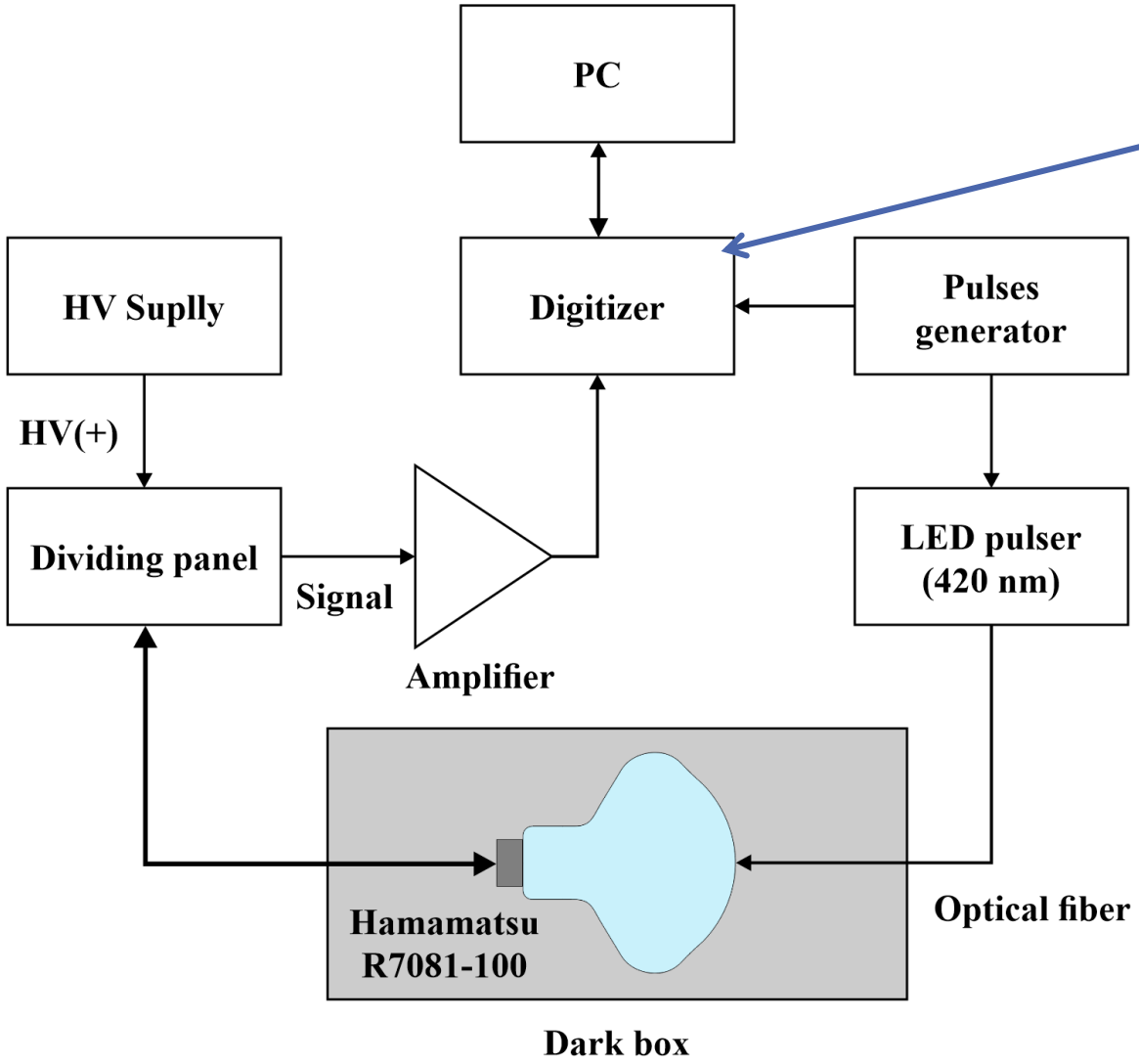
Quantum efficiency of R7081-100 and R5912-100





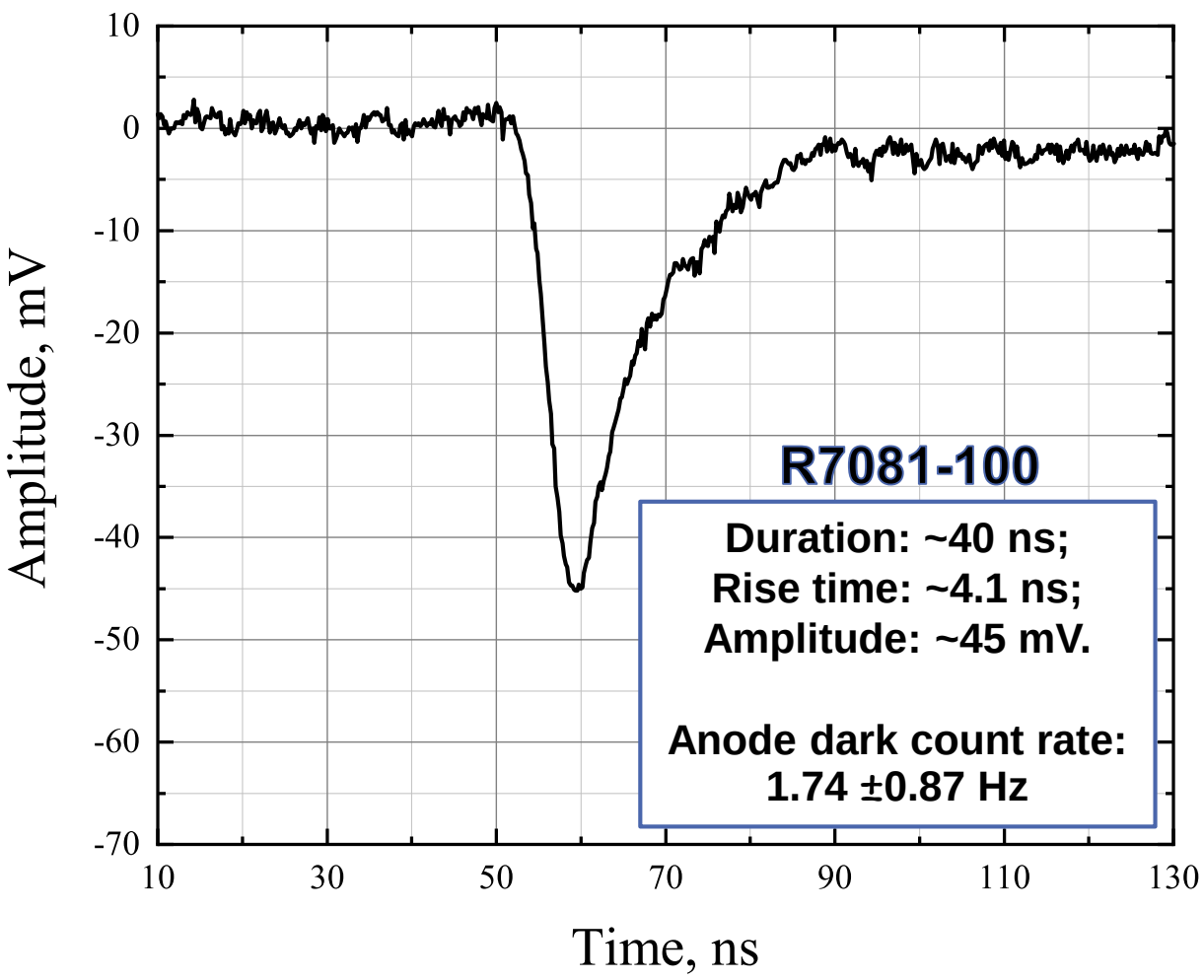
Quantum efficiency reaches almost **40%** at **390 nm**

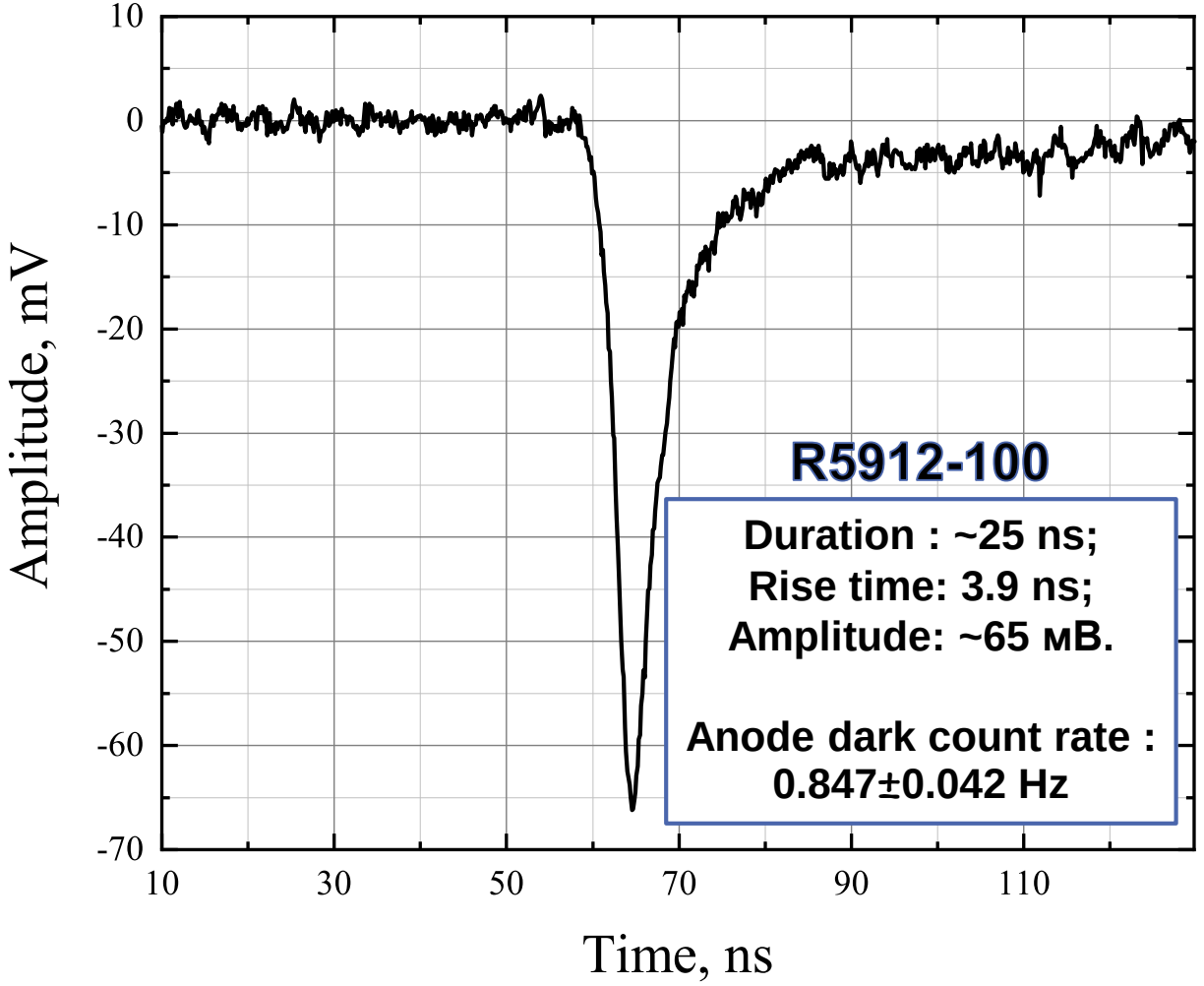
Setup for measuring PMTs characteristics



- **DRS4 with sampling rate of 5 GS/s**
- **CAEN V1730 with sampling rate of 500 MS/s for long afterpulses measuring**

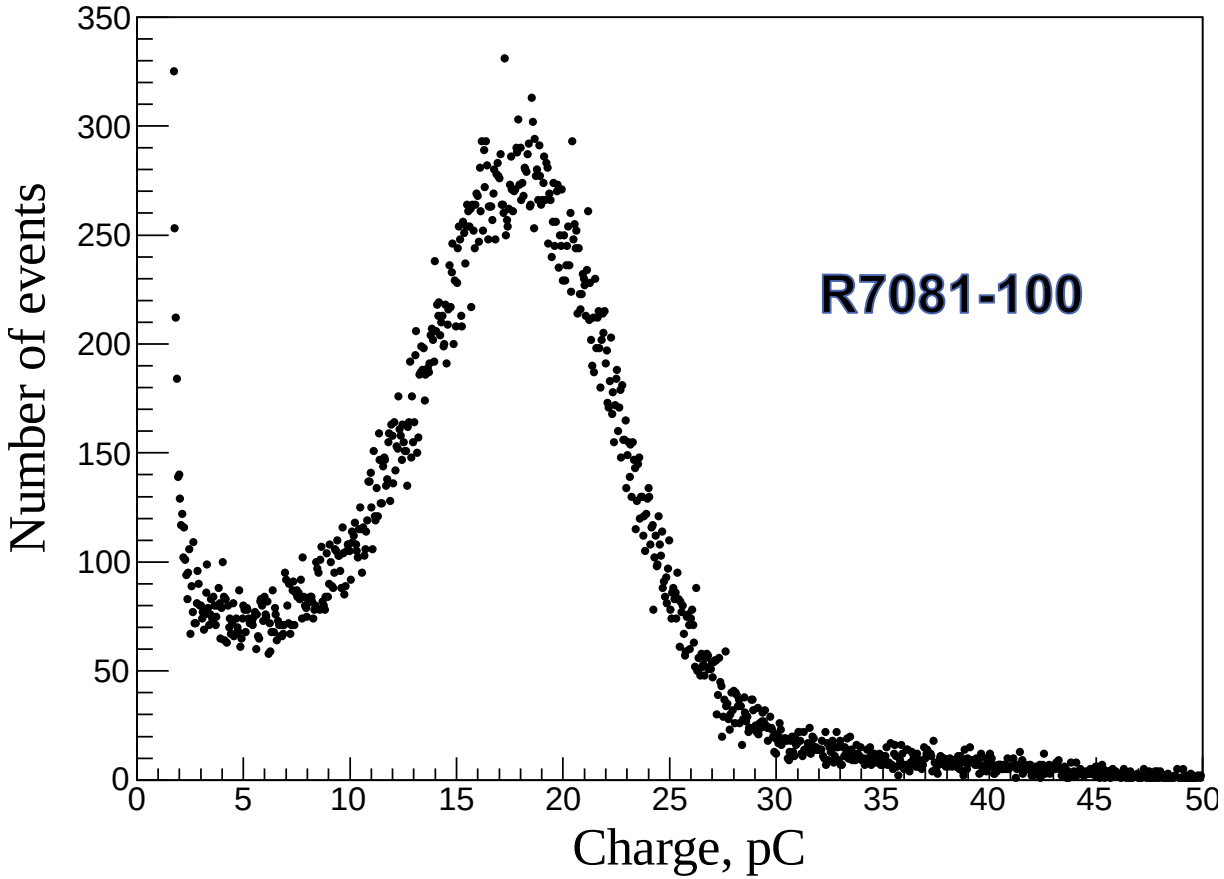
SPE response

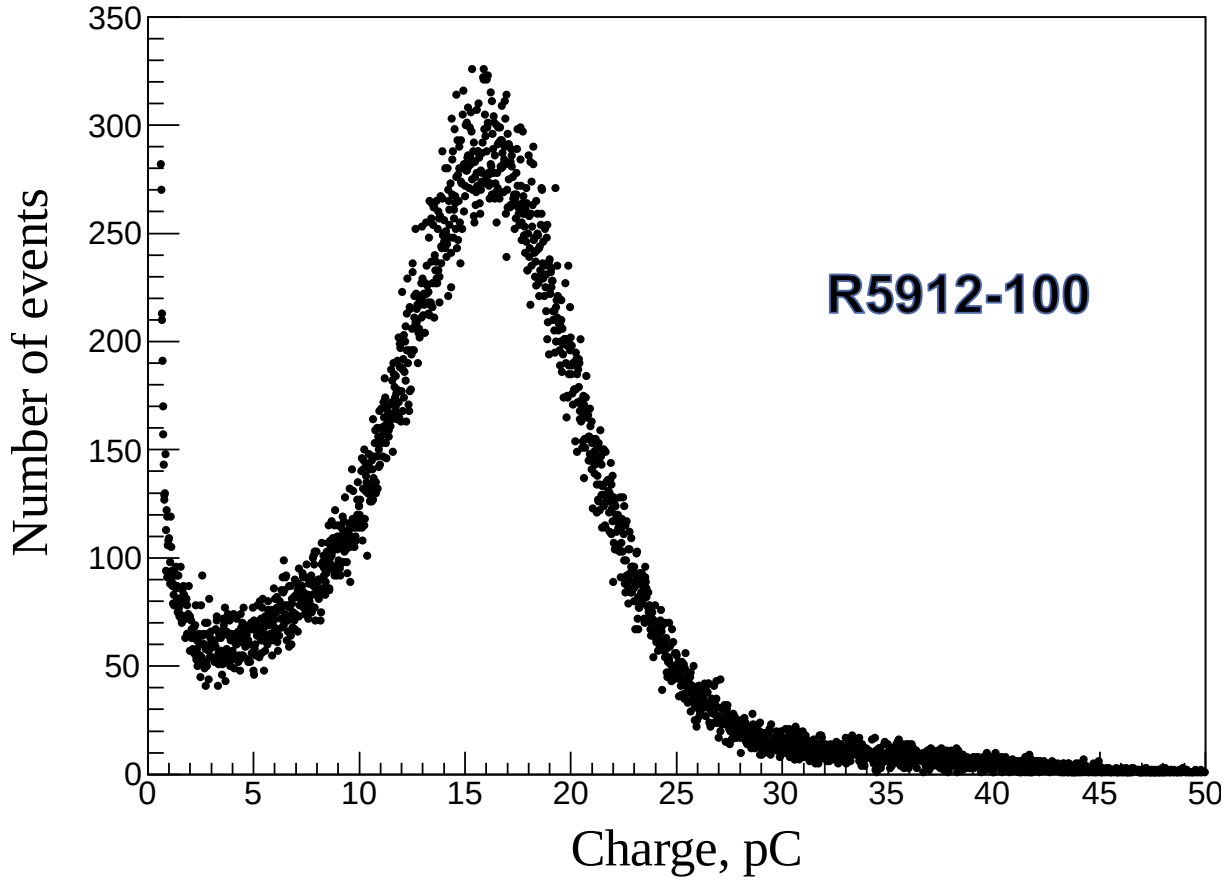




The SPE pulse waveforms with a PMT gain of **~10^7** and an amplifier gain of **10**.

SPE distribution





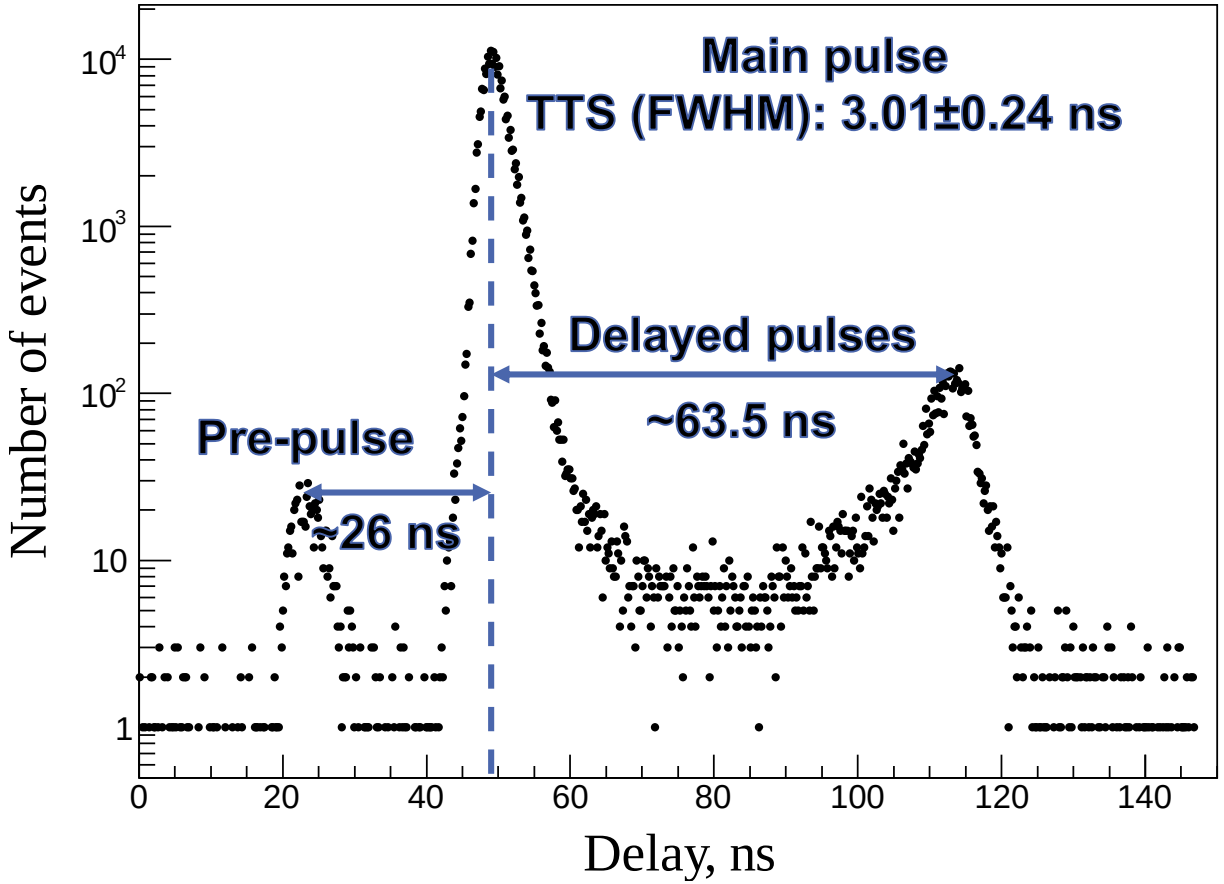
The peak-to-valley ratio is 3.73±0.56

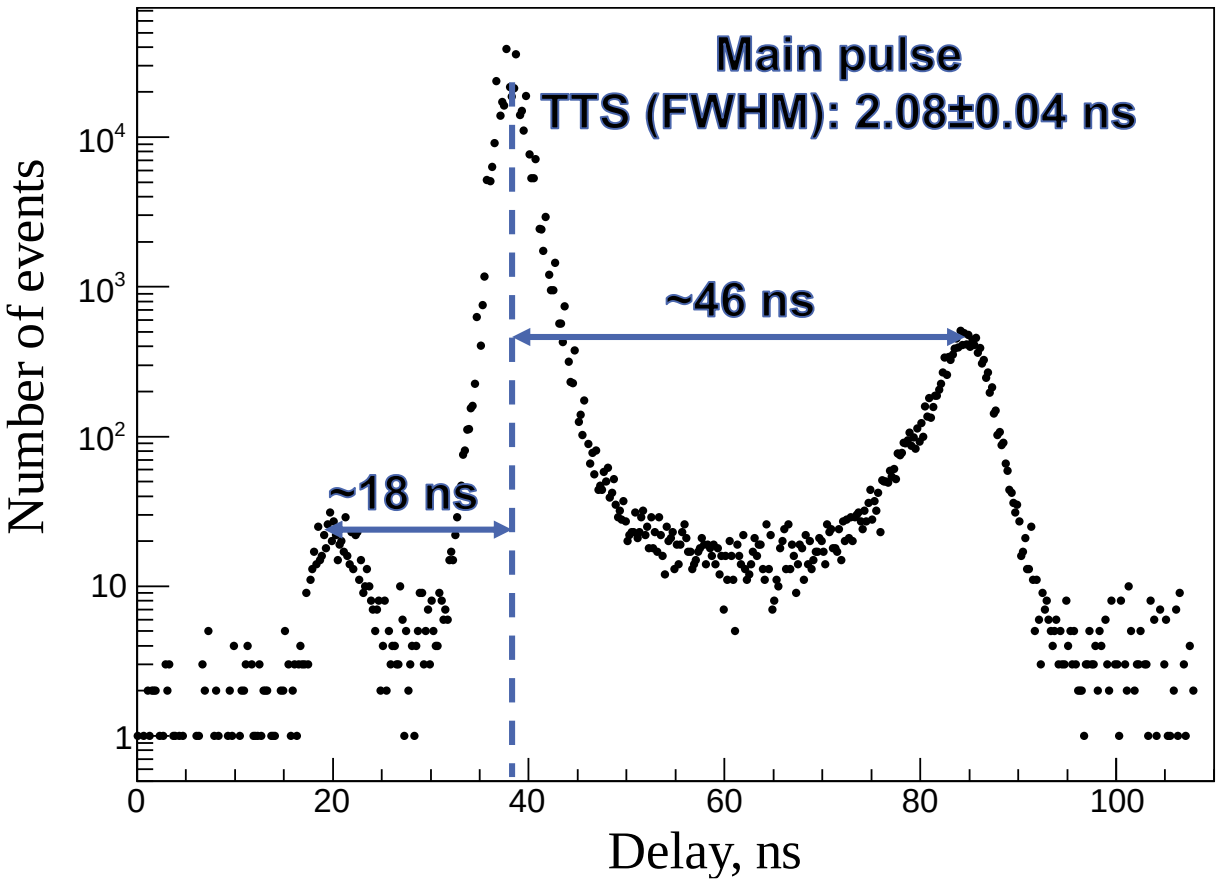
SPE resolution 0.68±0.06

The peak-to-valley ratio is 4.54±0.52

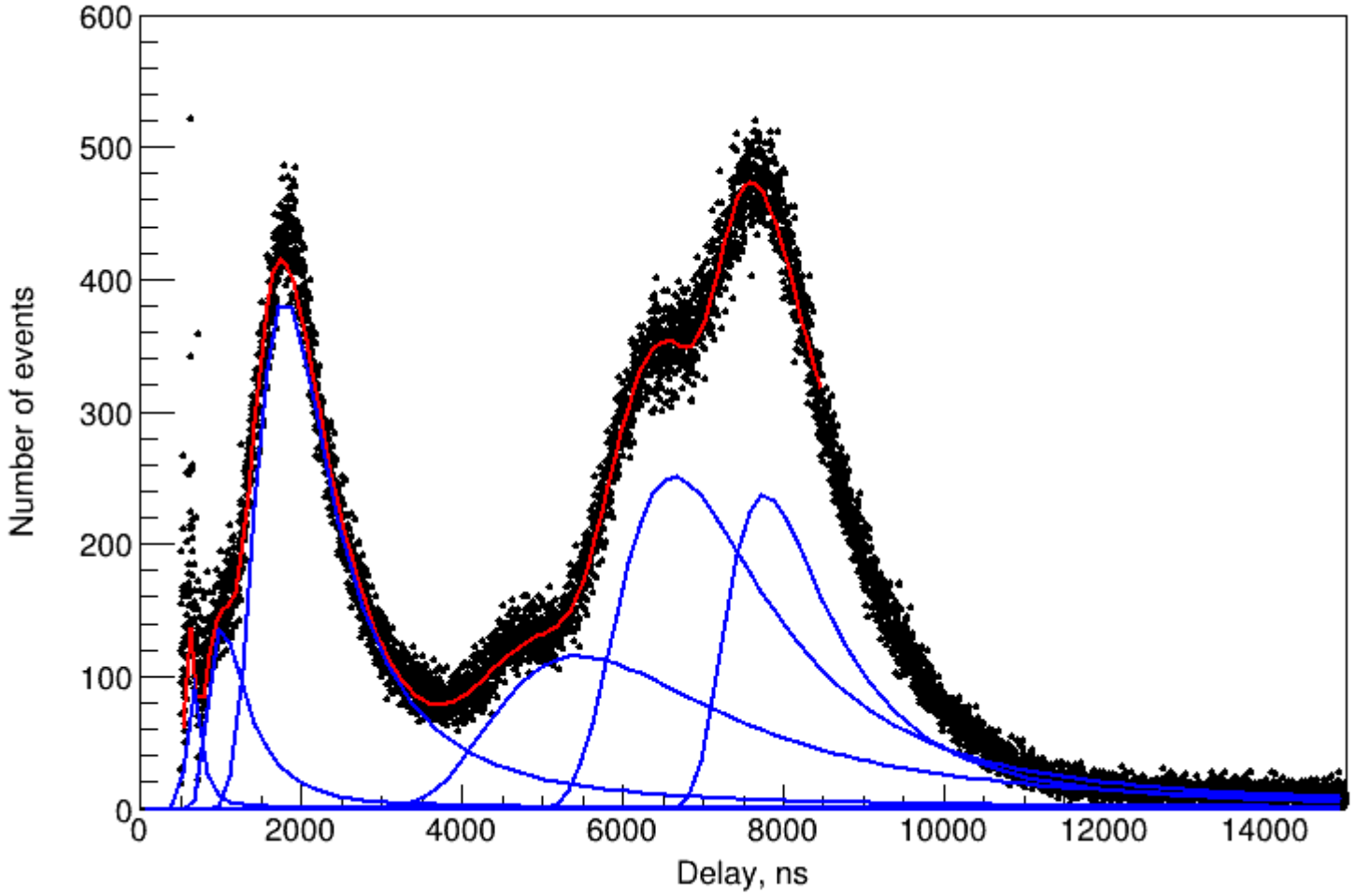
SPE resolution 0.67±0.04

Transit time spread





Long afterpulses of R7081-100



Peak position, μs	Possible source	The probability of occurrence, %
0.605	H^+	0.02
1.047	H_2^+	0.08
1.854	He^+	0.44
5.657	Ions of some K-containingor organic compounds	0.37
6.768	K_2O^+	0.53
7.848	Xe^+	0.35

Thanks for attention!