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Type No. : R5916U-50MOD. 2
Serial No. : BT0104

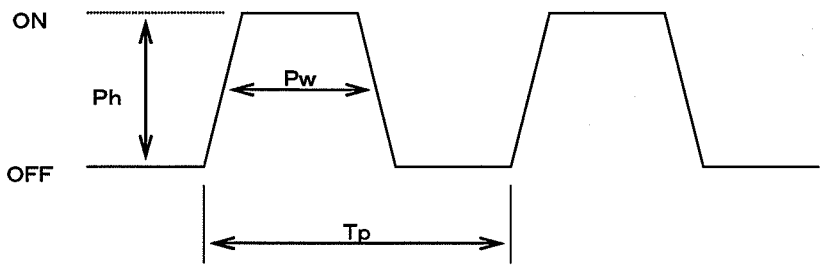
1) Test Parameters and Results

a. Photocathode Spectral Response and Quantum Efficiency ..... Fig. 1
b. Photocathode Luminous Sensitivity Note 1) ..... 200 μA/lm
c. Average Current Gain and Dark Current Characteristics Note 2) ..... Fig. 2
Average Current Gain at -3600 V ..... 2.5×10^6
Average Dark Current at -3600 V ..... 4.4 nA
d. Output Waveform ..... Fig. 3
Rise Time Note 3) ..... 187 ps
e. Instrument Response Function (IRF) Note 4) ..... Fig. 4
IRF at FWHM ..... 93.2 ps
f. Pulse Height Distribution (PHD) Note 5) ..... Fig. 5
Dark Counts ..... 9 s^{-1} (cps)
g. Switching Ratio Note 6) ..... 1.1×10^6
h. Switching Noise Note 7) ..... Fig. 6
i. Gate Rise Time Note 8) ..... 627 ps

2) Maximum Ratings

a. Maximum Supply Voltage ..... -4200 V
b. Recommended Supply Voltage ..... -3200 ~ -3600 V
c. Maximum Anode Current
Continuous ..... 100 nA
Pulsed Peak Note 9) ..... 350 mA
Ambient Temperature in both Operation and Storage ..... -50~+50 ℃

3) Input Gate Pulse Specifications



Pw : 5 (ns) ~ 10 (μs)
Ph : +10 (V) ~ +15 (V)
Duty Cycle : Pw/Tp ≦ 0.1

4) Dimensional Outlines ..... Fig. A

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Hamamatsu Photonics K. K. Electron Tube Division
314-5, Shimokanzo, Iwata-city, Shizuoka-pref., 438-0193 Japan, Telephone: 0539/62/5248, Fax: 0539/62/2205

5) Block diagrams of the measuring apparatus and drawings

a. Output waveform measuring apparatus..... Fig. B
b. IRF measuring apparatus..... Fig. C
c. PHD measuring apparatus..... Fig. D
d. Switching Ratio measuring apparatus..... Fig. D
e. Switching Noise measuring apparatus..... Fig. E
f. Gate Rise Time measuring apparatus..... Fig. F

(Notes)

1) The light source used to measure the luminous sensitivity is a halogen lamp operated at a distribution temperature of 2856 K. The input light is approximately 10^{-4} lumen and 20 V is applied between photocathode and other electrodes connected all together. The measurements were done under room temperature.
2) The entire photocathode was illuminated by the halogen lamp operated at continuous current.
3) It is defined as a mean time difference from 10 to 90 % of peak amplitude on the output waveform.
4) IRF is a convolution of δ-response function of the measuring apparatus and a function of laser, including pulse width and time jitters. It is defined as FWHM. The TTS stands for Transit Time Spread which is a function in transit time between individual pulse and specified as an FWHM (full width at half maximum) with the incident light having a single photoelectron state. The TTS value calculated herein contains a time jitters of all electronics and laser used in IRF measurement.
   TTS can be estimated temporarily by the following equation:
   $$(IRF)^2 = (TTS)^2 + Tw^2$$
   where Tw is a pulse width of the laser. The IRF is given as shown in Figure 4.
5) The input light intensity was reduced by a ND filter to produce single photon events. A peak of the PHD was set at the 200 channel on the MCA by adjusting a gain of linear amplifier. The low discriminator level was set at the 50 channel. It is usually recommended to use a cooler with a tube having an extended multialkali photocathode (similar to S-25 response) or S-1 photocathode to reduce dark noise. Continuation of flowing high dark current will result in shortening its life period of time.
6) The light source used for this measurement is a halogen lamp. The switching ratio is given by the following equation:
   $$\text{Switching Ratio} = \text{Count Rate (A)} / \text{Count Rate (B)}$$
   where (A) is the count rate while gate is on and (B) is while gate is off.
7) The gate pulse generator used for this measurement produces a gate pulse which shows its rise time faster than 1ns, pulse width of approximately 5 ns and pulse height of 15 V. The noise is generated due to induced affect between electrodes and anode when applied a gate pulse. High and fast input gate pulse cause a larger noise than low and slow pulse.
8) It is defined as a mean time difference from 10 to 90 % of peak amplitude on the output waveform.
9) This is specified under the operating conditions that the repetition rate light input is 100 Hz or below and its pulse width is 70 ps.

Warning !

During the measurements, **MAKE SURE THAT AN AMPLIFIER IS NOT SATURATED BY THE MCP-PMT OUTPUT**. If it is saturated, it may cause a deterioration of the IRF because of increasing time jitters in signal processing in the CFD. We, therefore, recommend to install an attenuator (1/2 ~ 1/5) between the MCP-PMT output and the input of the amplifier to insure an appropriate input pulse height to prevent it.

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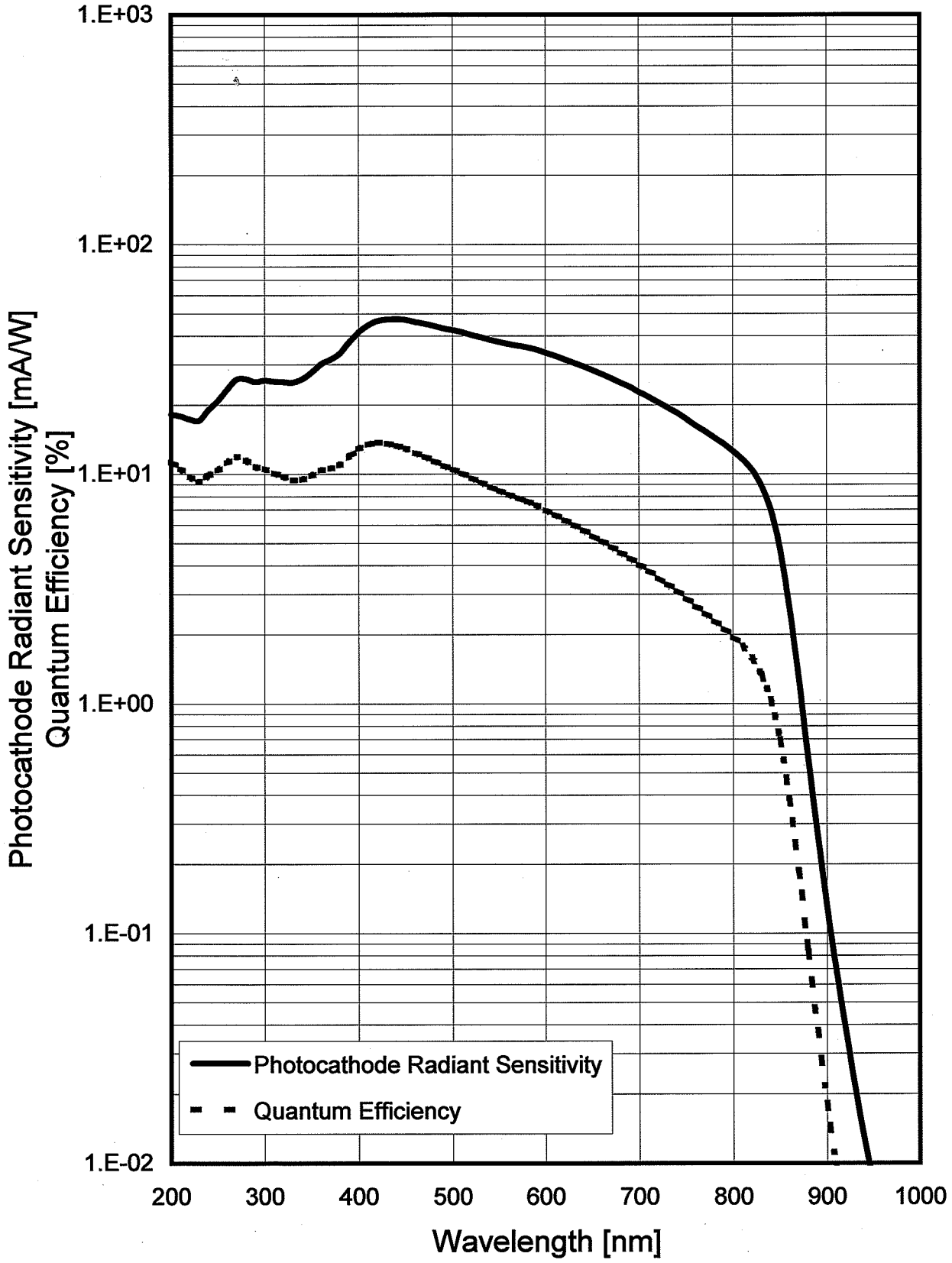
Spectral Response Characteristics

Tube Type R5916U-50MOD.2
Serial No. BT0104
Date Dec.09, 2005

Tested by J.Ohmura
Note + 20 V



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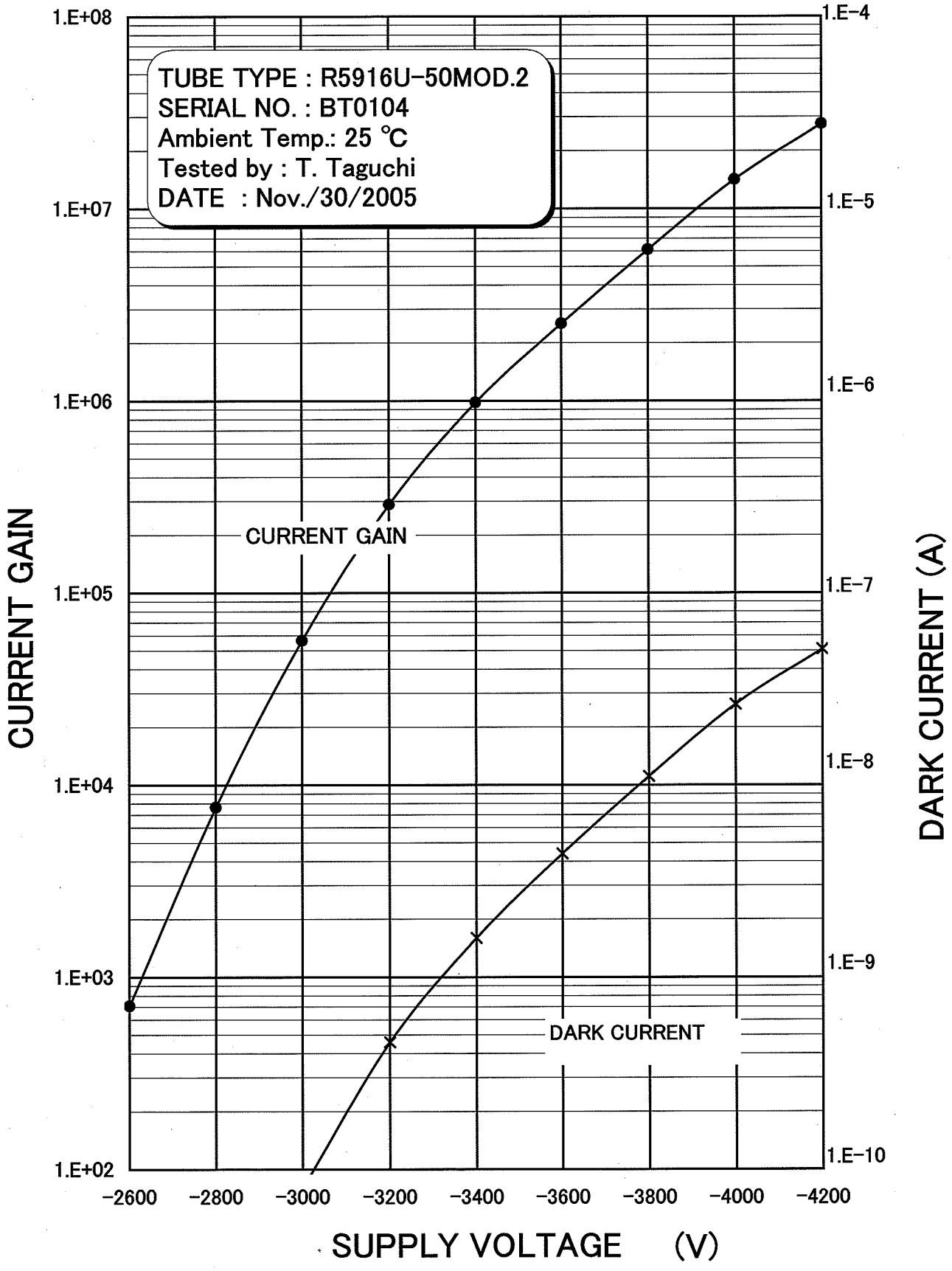
CURRENT GAIN. & DARK CURRENT VS. SUPPLY VOLTAGE



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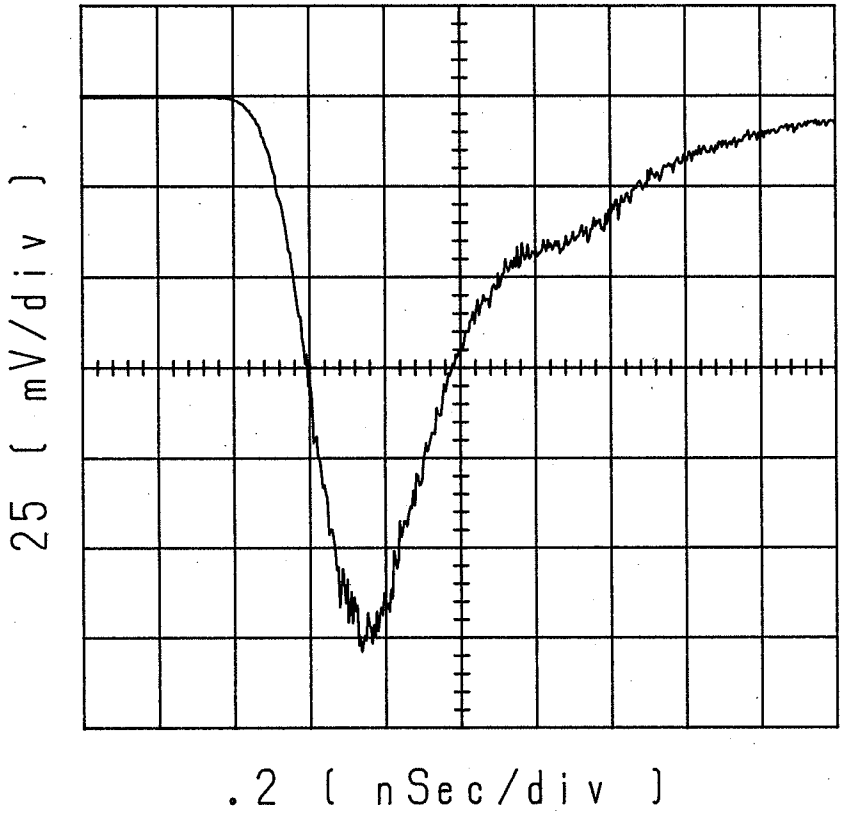
R5916U-50 WAVEFORM



SERIAL NUMBER : BT0104
SUPPLY VOLTAGE = -3500 (V)
RISE TIME = 187 (ps)
FALL TIME = 792 (ps)
WIDTH = 380 (ps)
LOAD RESISTANCE = 50 (ohm)
COMMENT
REP RATE:10KHz

TESTED BY T. TAGUCHI
DATE JAN./13/'06

STATUS : MULTI PHOTON STATE
provided by HAMAMATSU PHOTONICS K. K.

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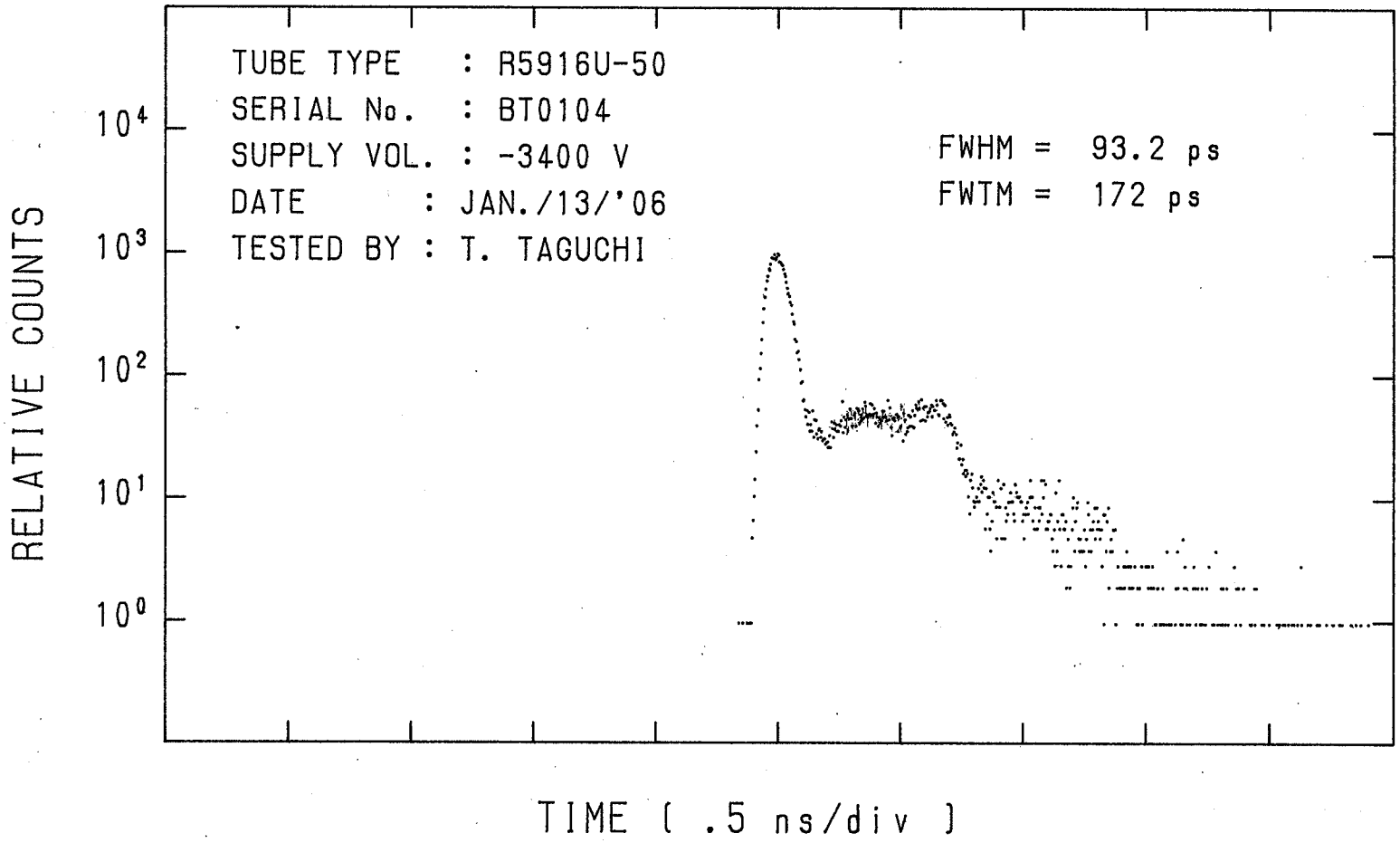
Fig. 3

IRF CHARACTERISTIC



*SINGLE PHOTOELECTRON STATE
*FULL ILLUMINATION ON PHOTOCATHODE
*Threshold=-799 mV Time-Walk=-22.6 mV Count Rate= 362/ 916 s^{-1}(cps)
DC:10 % GATE VOLT:1

Fig. 4

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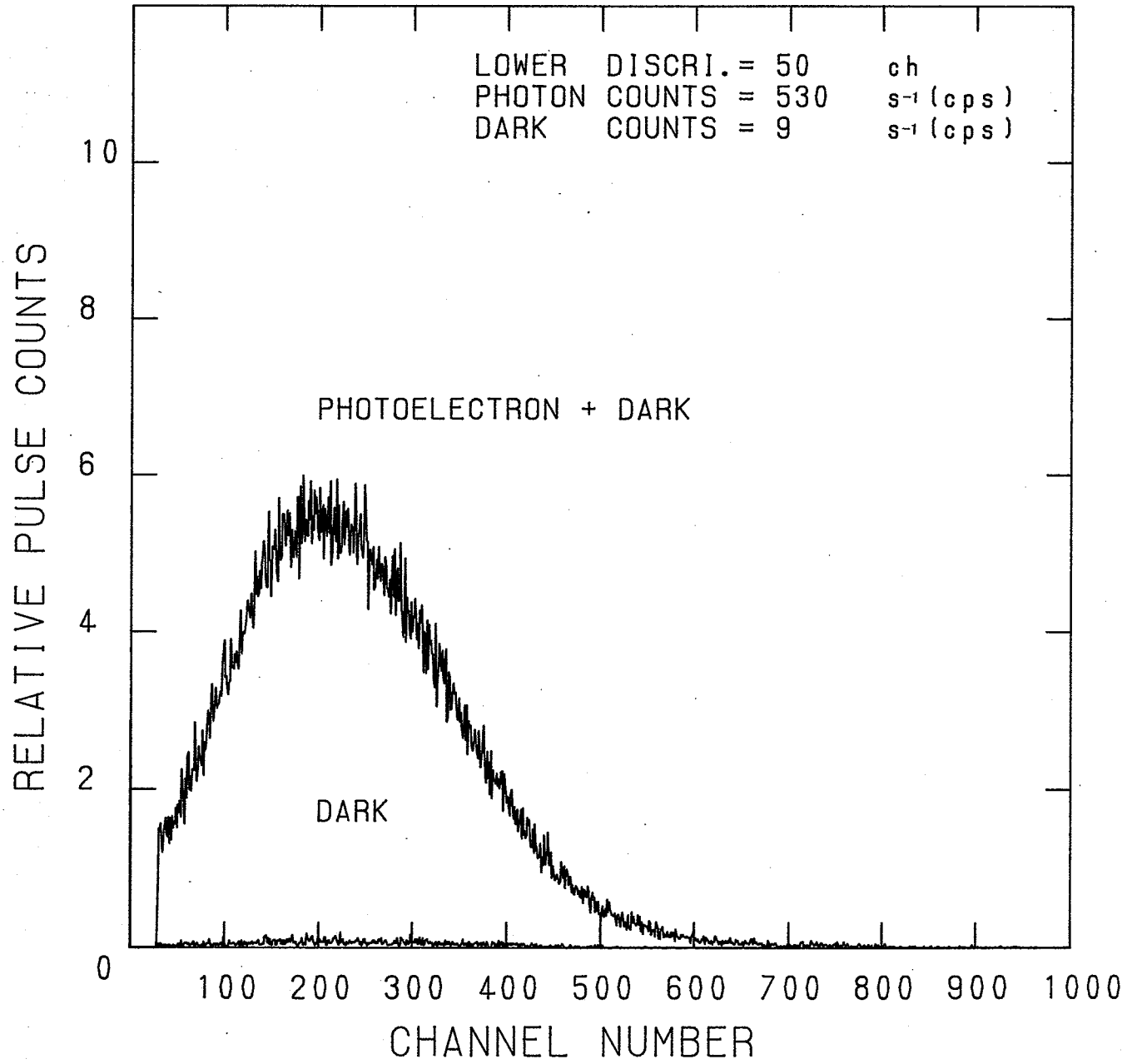
PULSE HEIGHT DISTRIBUTION

TUBE TYPE : R5916U-50
SERIAL NUMBER : BT0104
SUPPLY VOLTAGE : -3600 (V)
TEMPARATURE : 25 (℃)
DATE : JAN./13/'06
TESTED BY : T. TAGUCHI



*AMP GAIN :64-00
*DC:10 % GATE VOLT:13V

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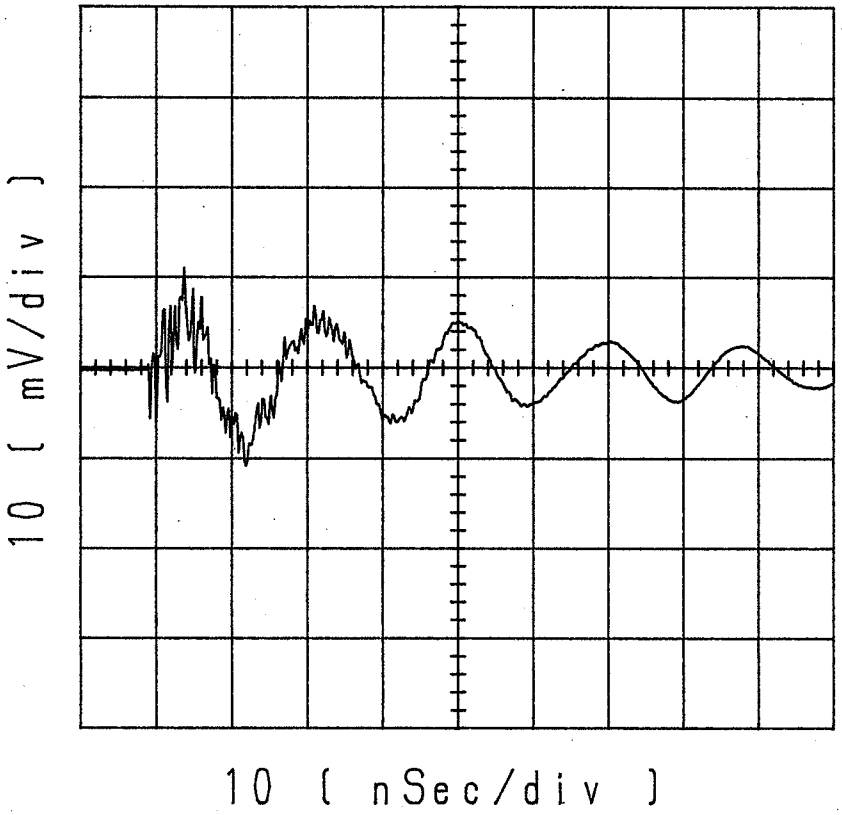
R5916U-50 WAVEFORM



SERIAL NUMBER : BT0104
SUPPLY VOLTAGE = +15V [V]
RISE TIME = 54 [ps]
FALL TIME = 462 [ps]
WIDTH = 586 [ps]
LOAD RESISTANCE = 50 [ohm]
COMMENT
SWITCHING NOISE

TESTED BY T. TAGUCHI
DATE JAN./16/'06

STATUS : MULTI PHOTON STATE
provided by HAMAMATSU PHOTONICS K. K.

Fig. 6

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