

January 12th 2001

GM

Evolution of PMTs characteristics on a quarter of the whole production

The data provided with the tubes by Hamamatsu include

- the photocathode sensibility distribution, S_K , expressed in μA per lumen,
- the anode sensibility, S_A , expressed in A per lumen, measured for 800 Volts
- the nominal voltage H_{vnom} ,
- the dark current, I_{dc} , measured in nA at 800 Volts,
- from batches #2, the ON/OFF drift measured for an anode current of $0,5 \mu\text{A}$

All these data should be stable during the production. Hereafter are some plots to check what is the status after production of 2500 tubes; that is a quarter of the whole production.

1. Photocathode sensibility, S_K , as a function of the PMT serial number is shown on figure (1). This characteristic is rather constant all along the production.
2. Anode sensibility, S_A , as a function of the PMT serial number is shown on figure (2). S_A is stable during the production..
3. Hamamatsu nominal voltage is also constant, as shown on figure (3).
4. Figure (4) shows evolution of the 800 volts dark current as a function of the PMT serial number. This distribution indicates clearly that something changes after PMT serial number $\sim\text{AA4400}$. The dark current is significantly lower than $0,1 \text{ nA}$. **Up to serial number AA4400 mean value of the dark current is 213 pA. After serial number AA4400, the mean value of the dark current is 130 pA. So concerning this characteristic, we could conclude that last produced tubes are better**
5. Figure (5) shows evolution of the $0,5 \mu\text{A}$ ON/OFF drift as a function of the PMT serial number.

Mean value of the absolute value of the drift is equal to 0,93 % up to PMT $\sim\text{AA4000}$. After AA4000 the mean absolute value is 1,14 %. So here we could conclude that quality of tubes is worse

There were not so many tubes with negative drift in batch #2 and batch #3,

PMTs of batch #4 could be sorted in two subsets: those with serial number lower than AA4000 with a substantial number of PMTs with $\sim-0,5\%$ drift, those with serial number larger than AA4000 with no negative ON/OFF values

Cathode Sensitivity

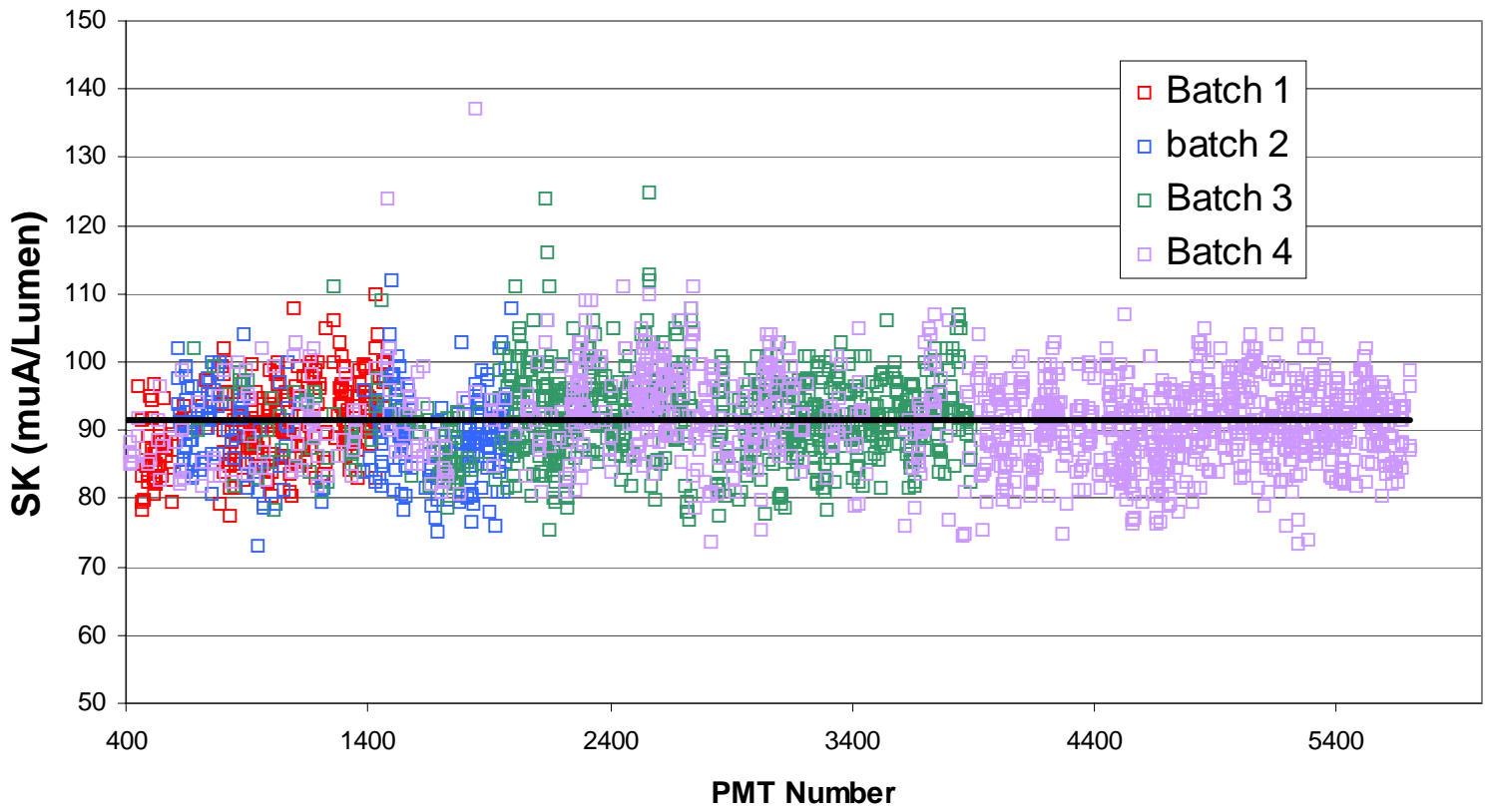


Figure (1) : Cathode sensitivity ($\mu\text{A}/\text{lumen}$) as a function of the PMT serial number

Anode Sensitivity

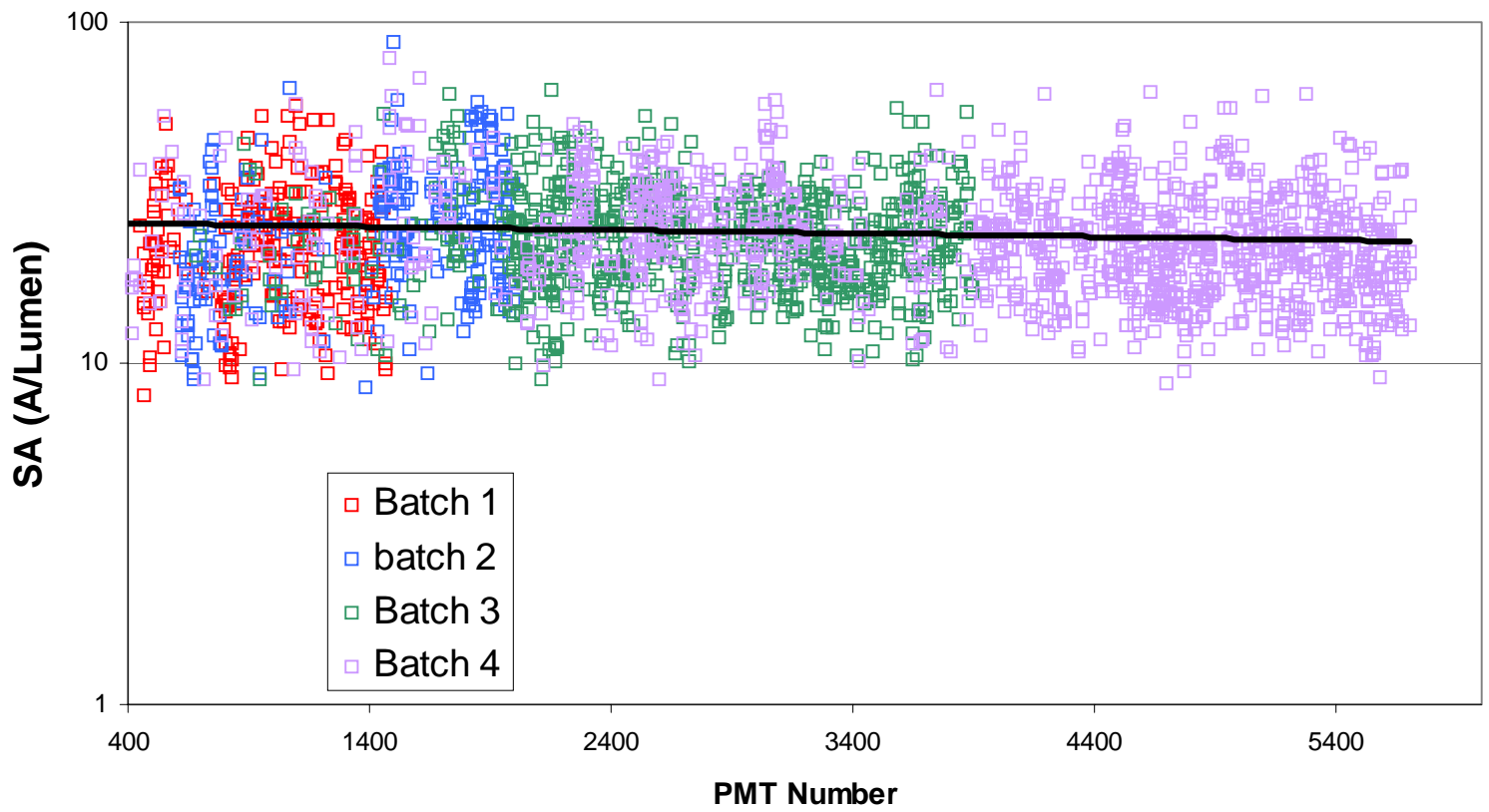


Figure (2) : Anode sensitivity (A/lumen) as a function of the PMT serial number

Nominal Voltage

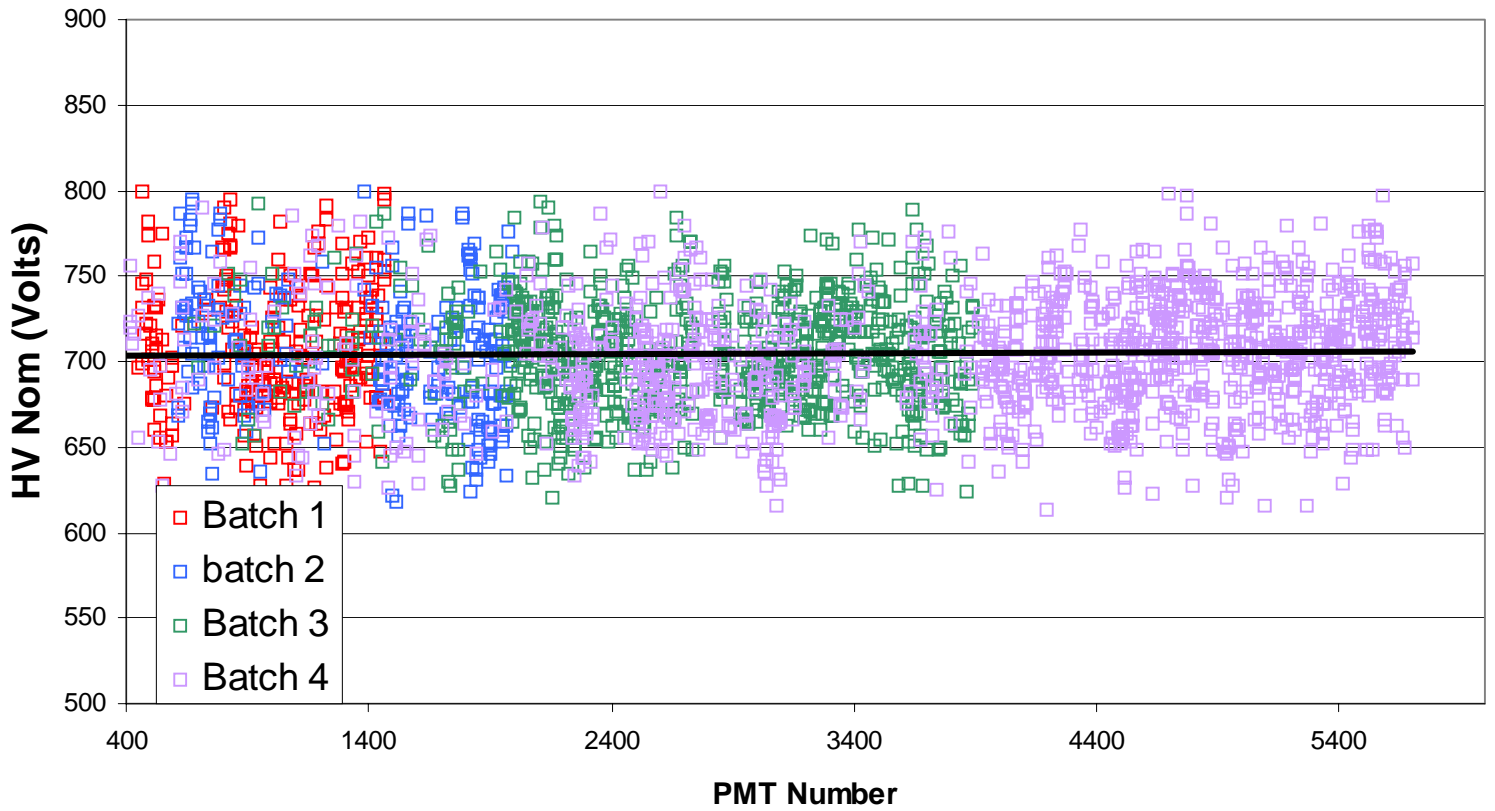


Figure (3) : Nominal Voltage as a function of the PMT serial number

800 Volts Dark Current

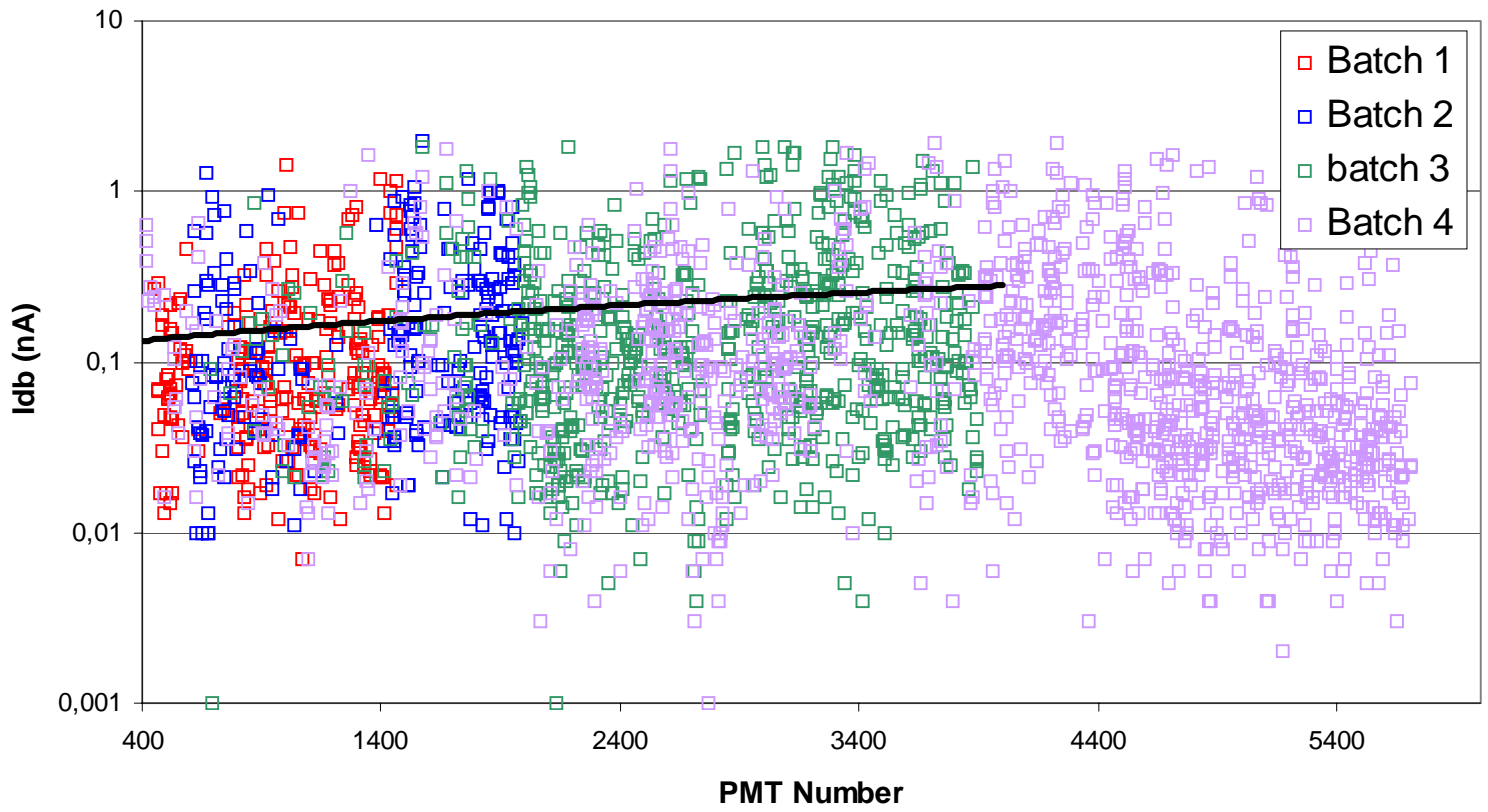


Figure (4) : 800 Volts measured dark current (nA) as a function of the PMT serial number

ON/OFF Drift

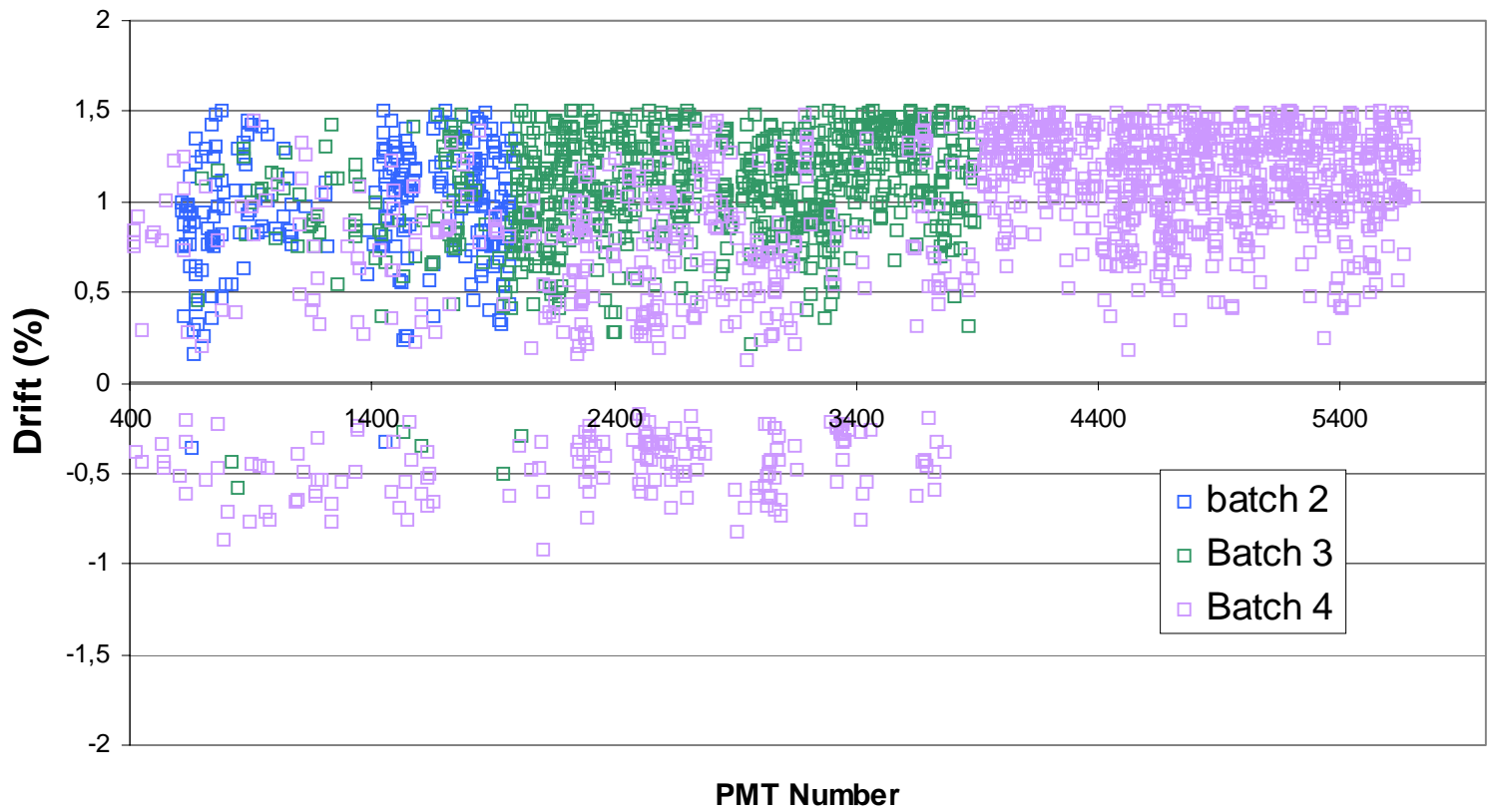


Figure (5) : $0,5 \mu\text{A}$ measured ON/OFF drift (%) as a function of the PMT serial number