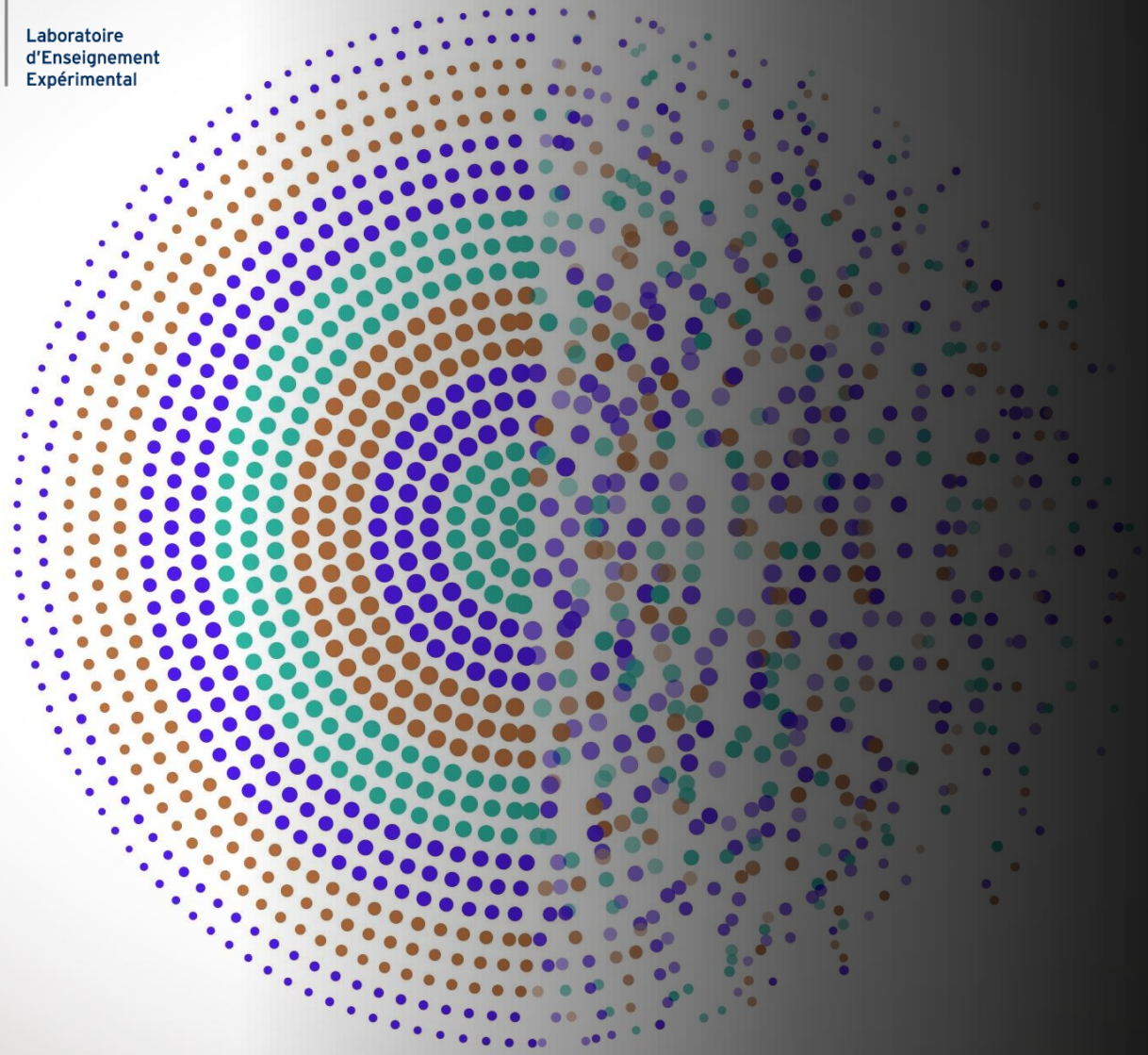
INSTITUT d'OPTIQUE GRADUATE SCHOOL ParisTech | LEnsE Laboratoire d'Enseignement Expérimental



LEDs

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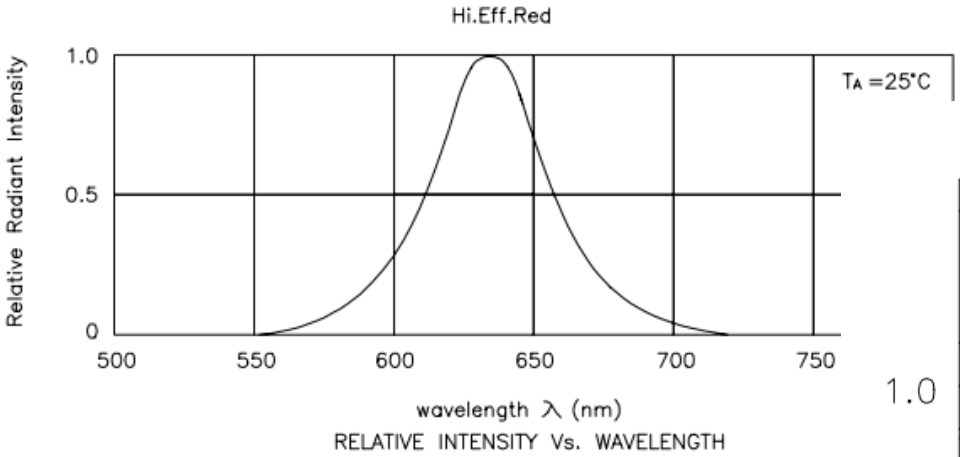
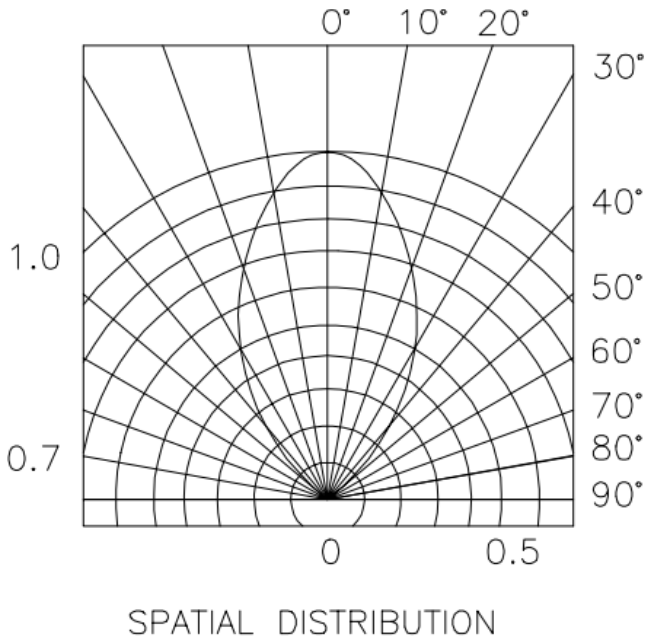
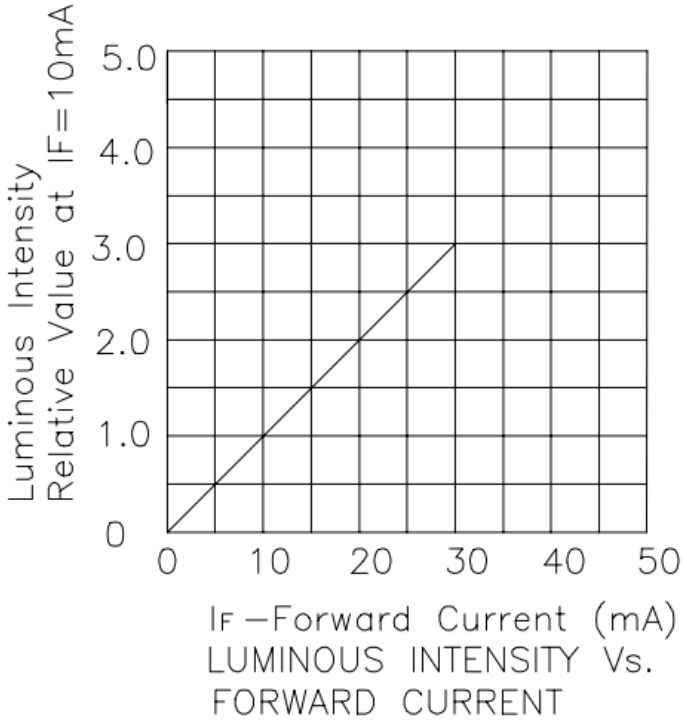
LEDs et circuits d'émission

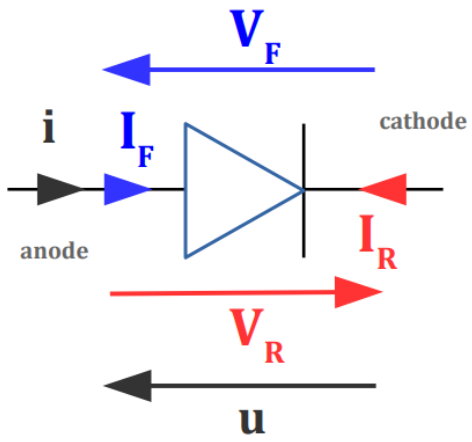






Caractéristiques électriques d'une LED

DIODE



I_F : **courant direct**

souvent $I_F < I_{FMAX}$

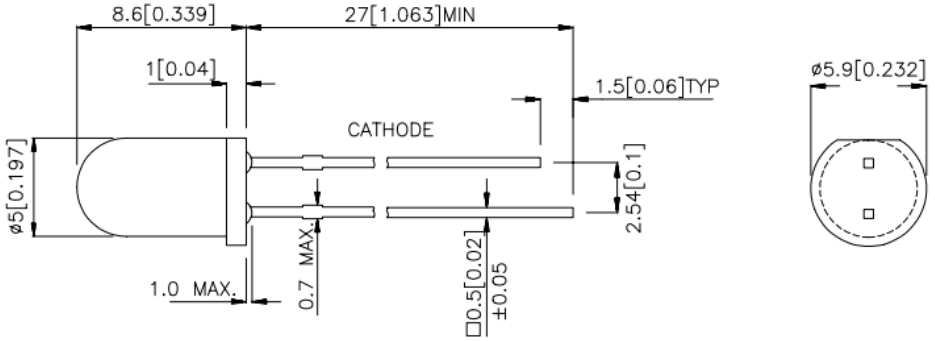
V_F : **tension directe**

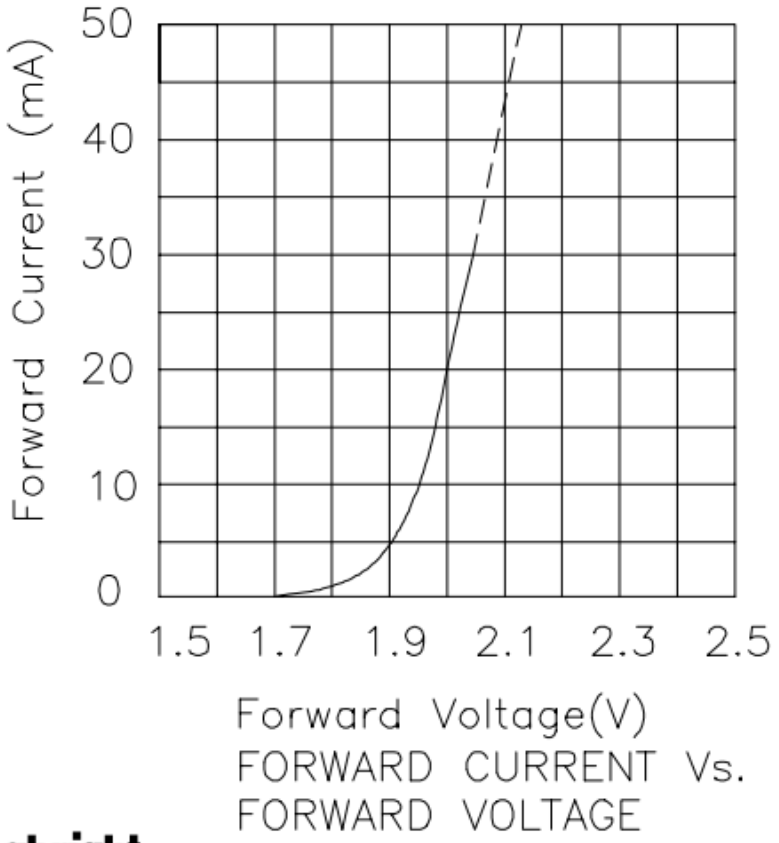
aussi appelée seuil

I_R : **courant inverse**

V_R : **tension inverse**

souvent $V_R < V_{RMAX}$





Kingbright

High Efficiency Red **L-53ID**

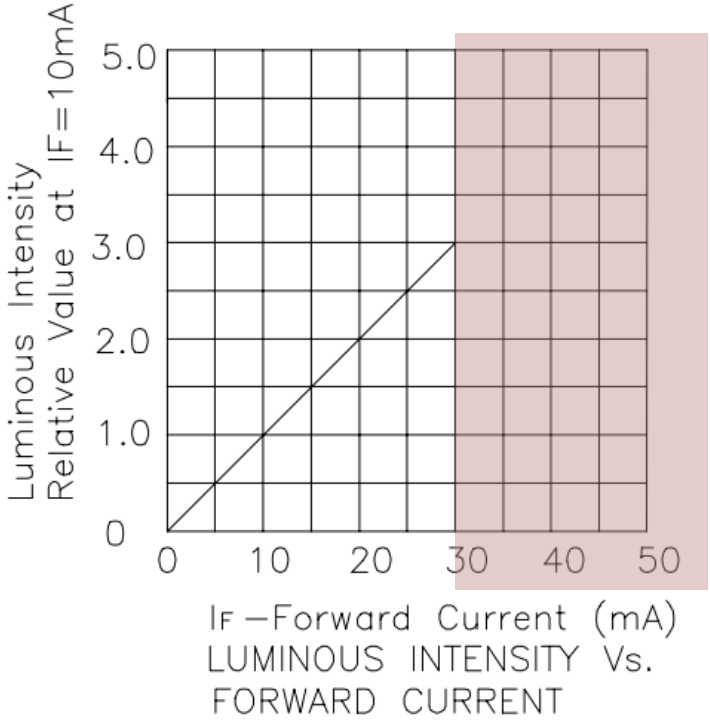
Caractéristiques électriques d'une LED

Idéalement : source de courant

Absolute Maximum Ratings at T_A=25°C

Parameter	High Efficiency Red	Units
Power dissipation	105	mW
DC Forward Current	30	mA
Peak Forward Current [1]	160	mA
Reverse Voltage	5	V
Operating/Storage Temperature	-40°C To +85°C	
Lead Solder Temperature [2]	260°C For 5 Seconds	

Notes:
1. 1/10 Duty Cycle, 0.1ms Pulse Width.
2. 2mm below package base.



Kingbright

High Efficiency Red **L-53ID**

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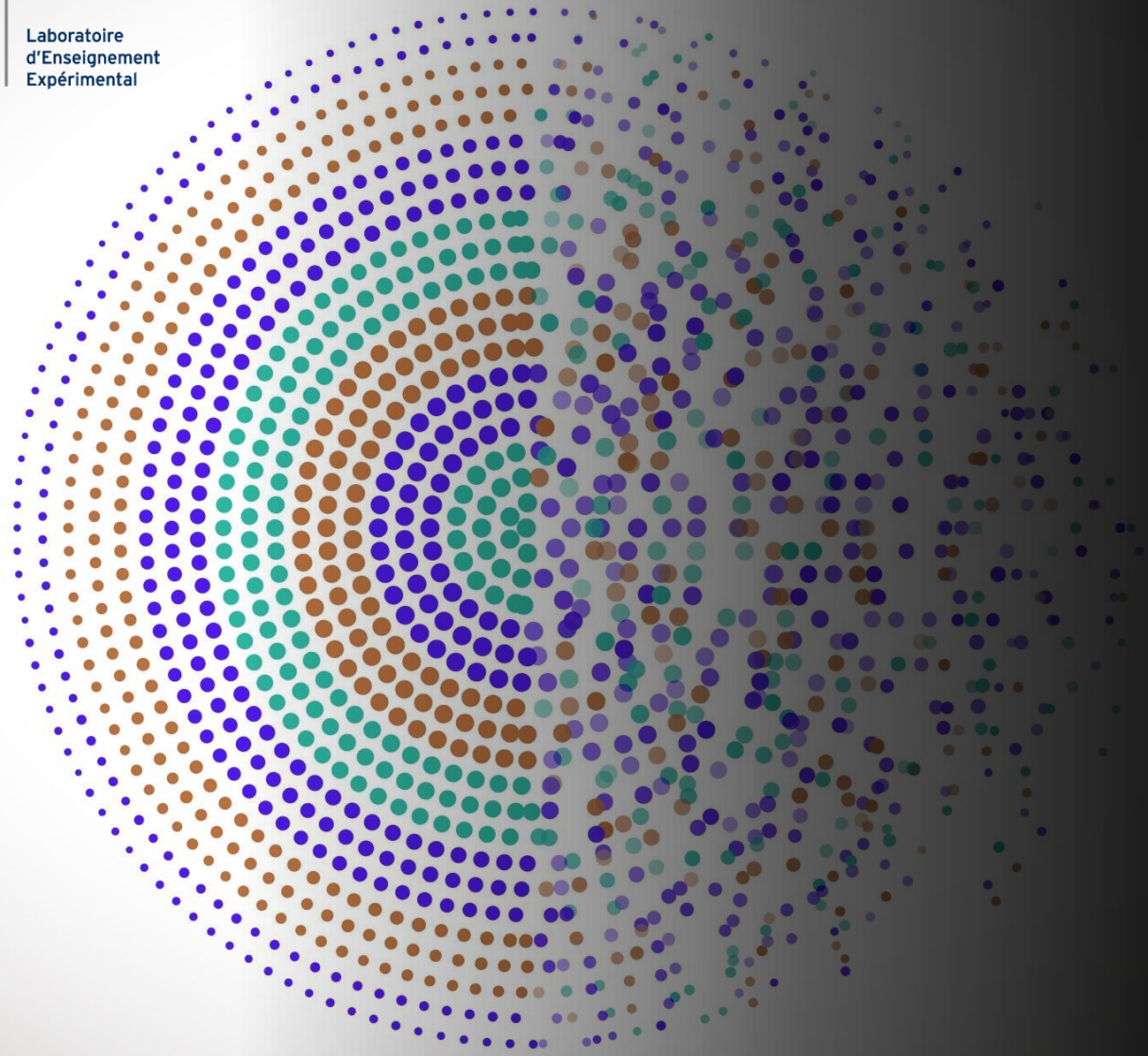

Photodétection

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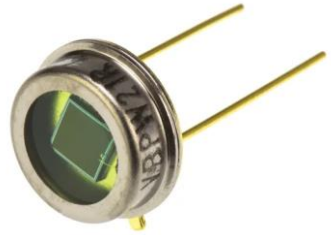
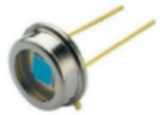
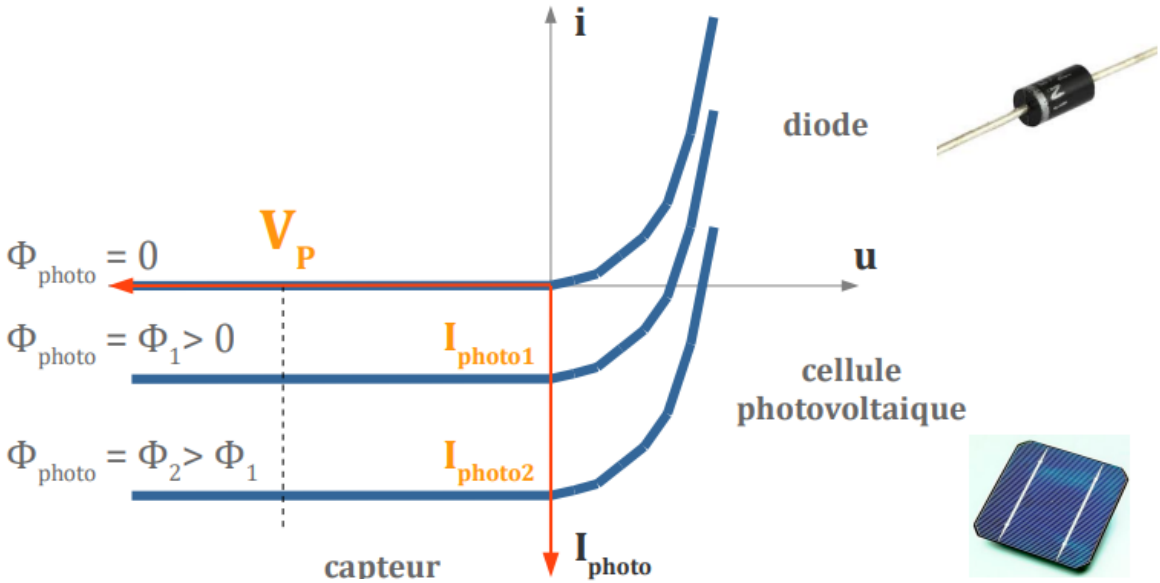
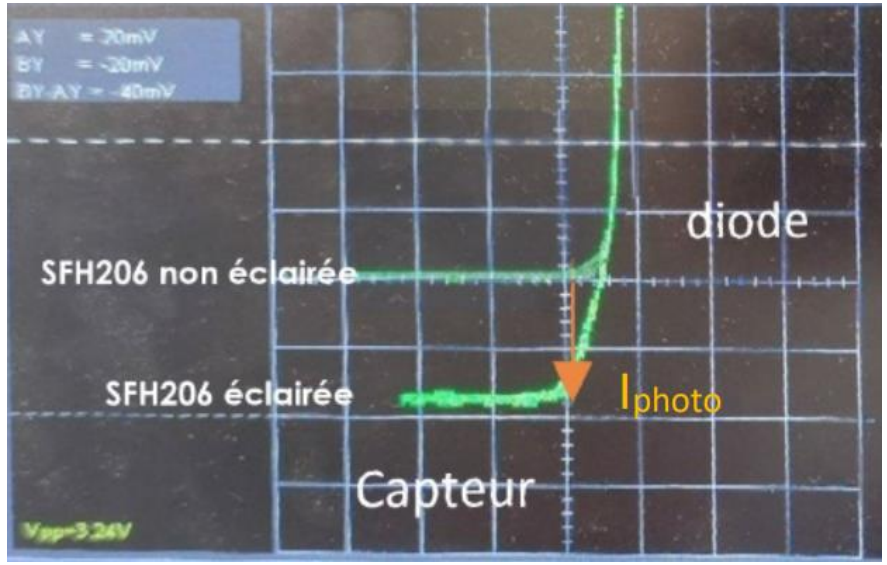
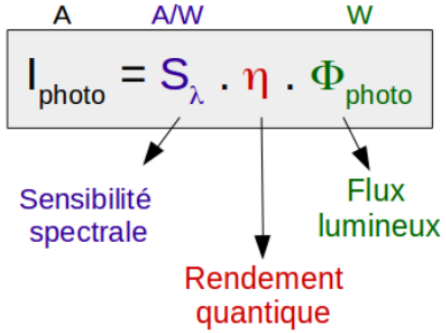
Photodiode, une diode mais…







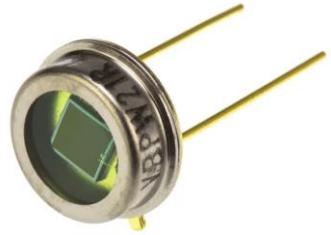


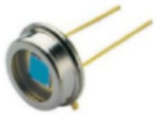


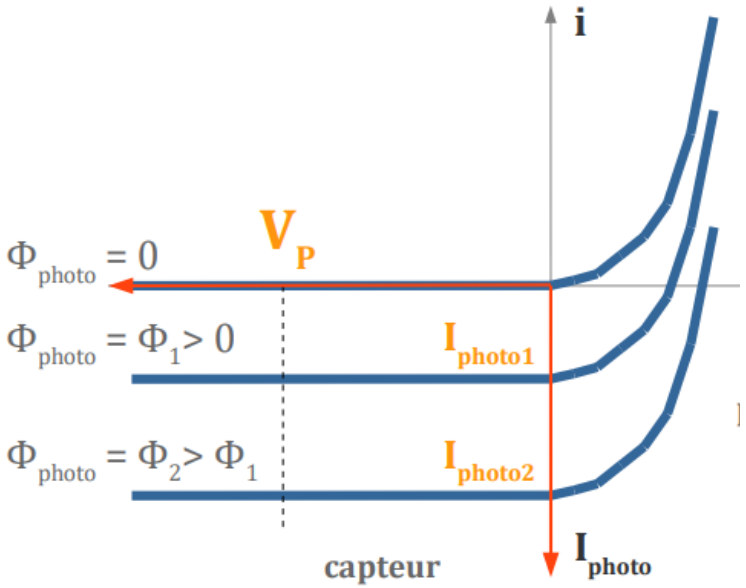
https://www.youtube.com/watch?v=KgKcbW77txY

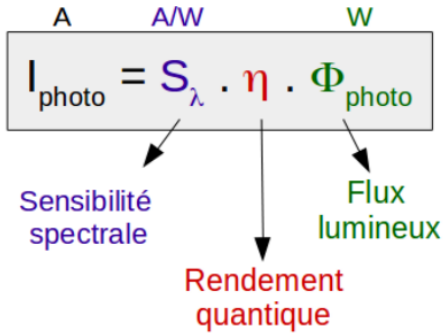
https://www.youtube.com/watch?v=rNoHLOumplk

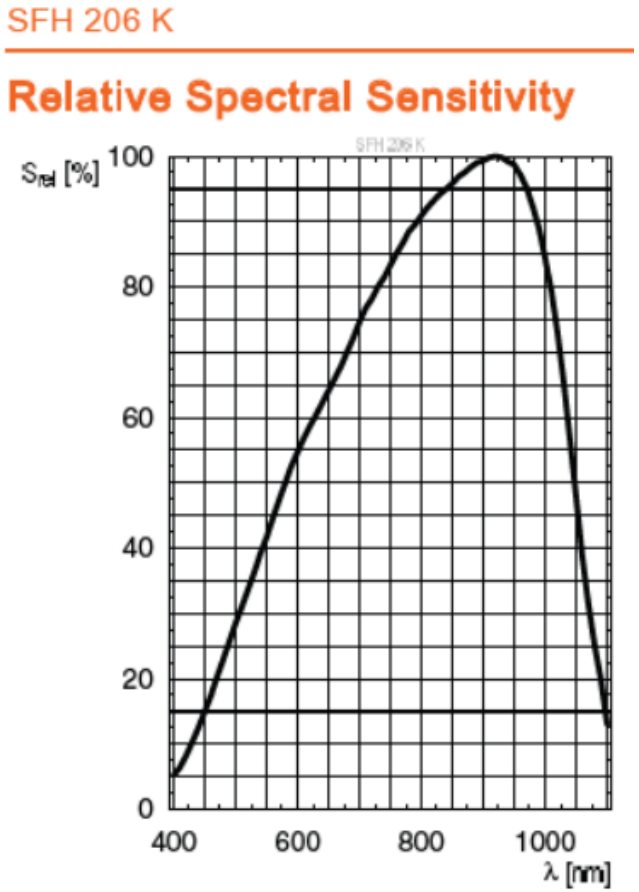
Photodiode, une diode mais…

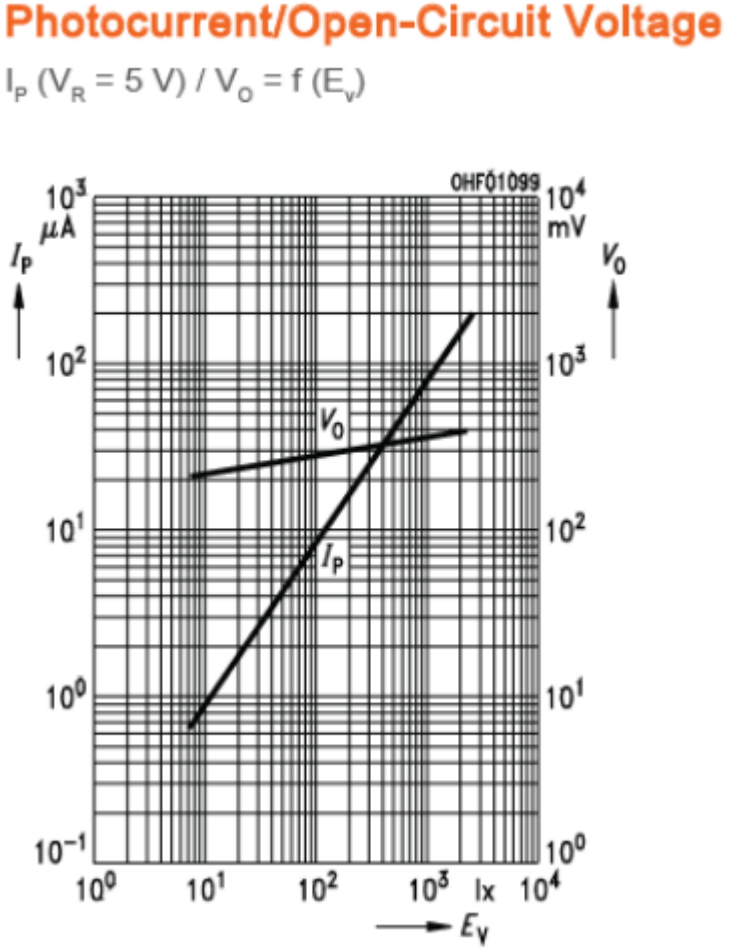












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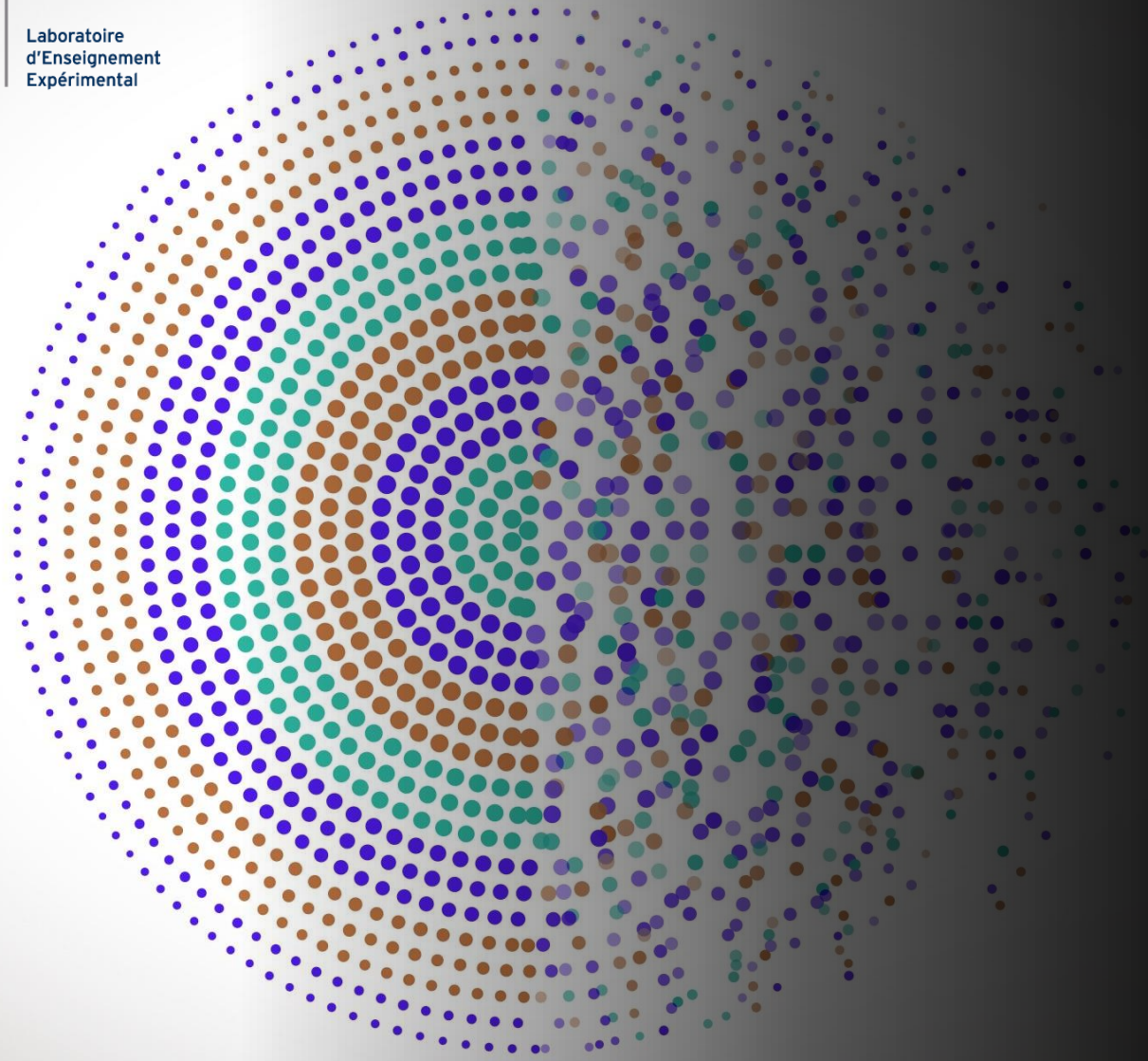


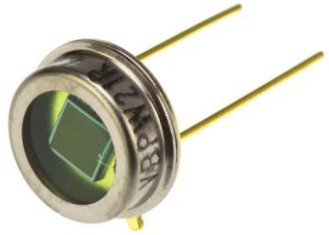
Photodétection

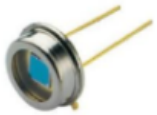
Montage simple

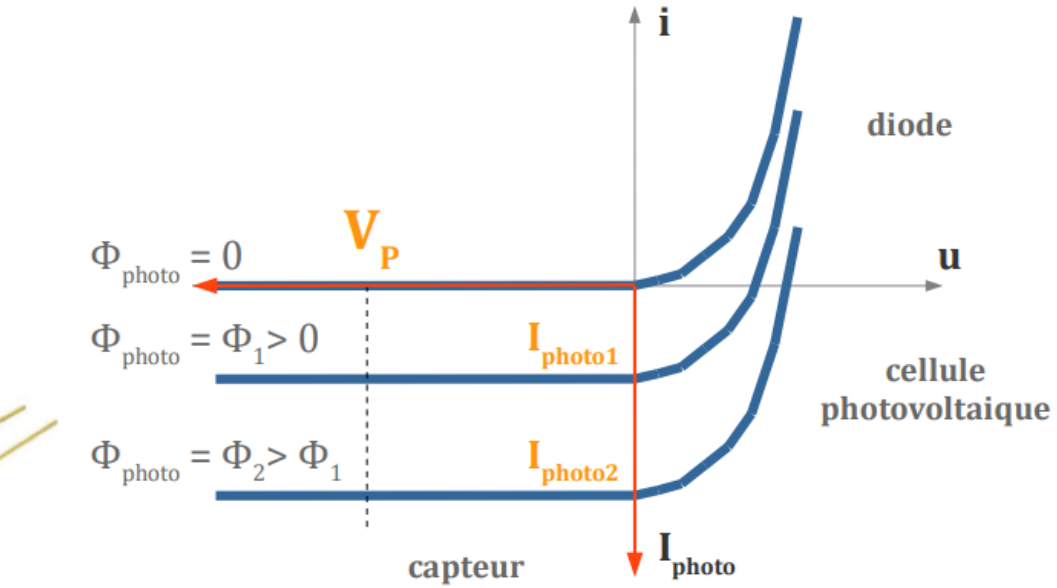
Opto-Electronique / Semestre 5
Institut d'Optique

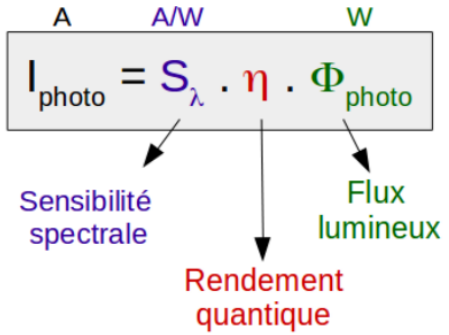
Julien VILLEMEJANE

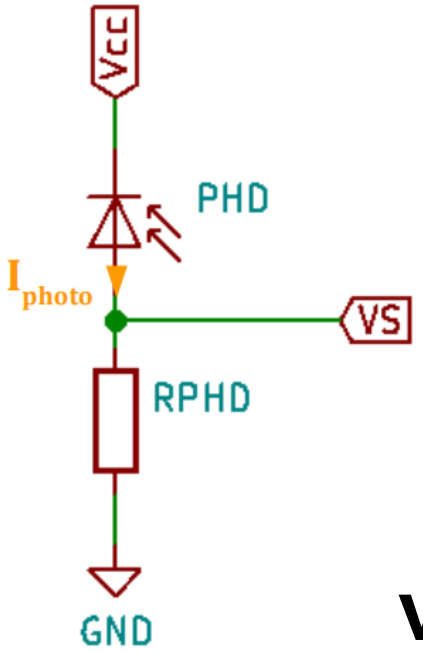
Montage de photodétection





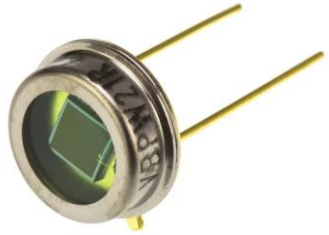


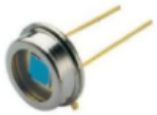


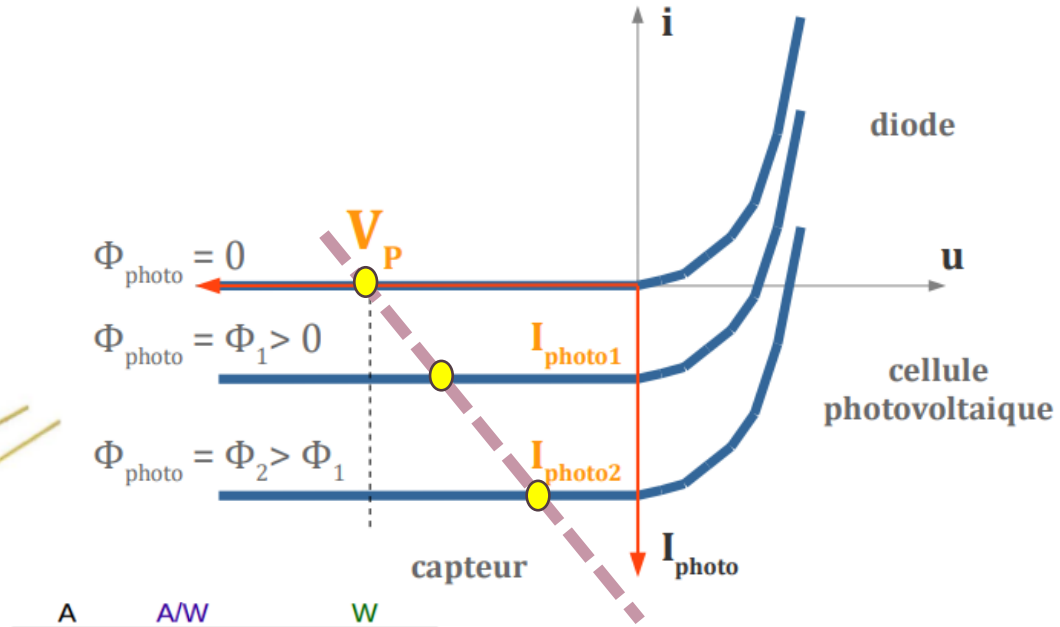


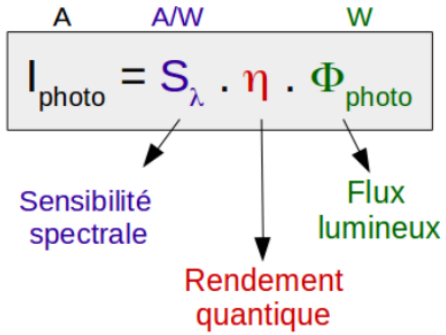
$$V_S = R_{PHD} \cdot I_{photo}$$

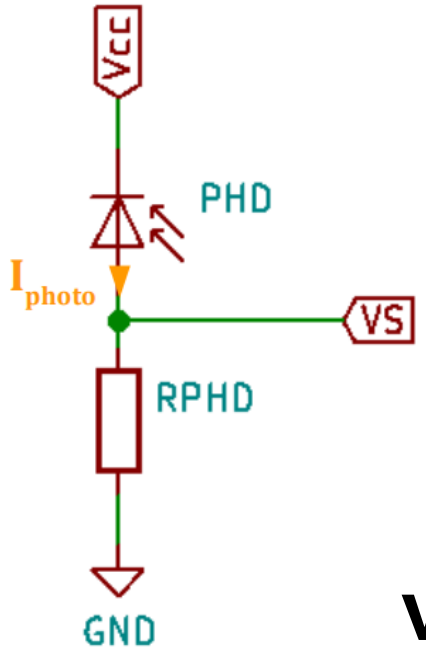
Montage de photodétection







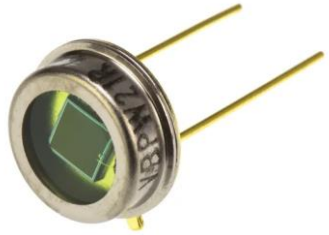


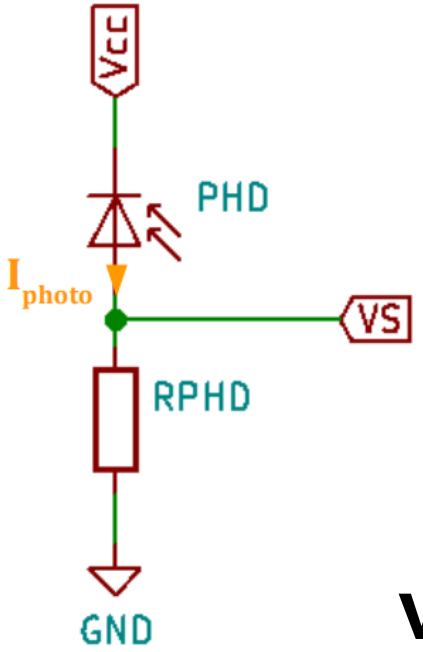


$$V_S = R_{PHD} \cdot I_{photo}$$

Tension de polarisation non constante

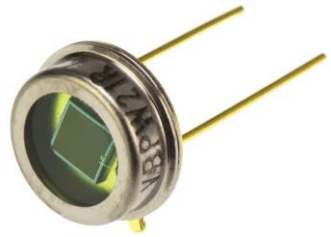
Etude expérimentale



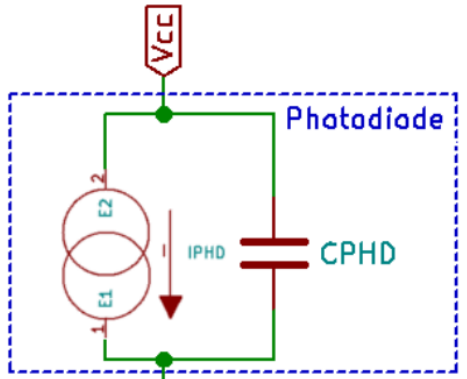


$$V_S = R_{PHD} \cdot I_{photo}$$

Modélisation



Bande passante réduite (à cause du système de mesure)



$$\frac{V_S}{I_{Phd}} = \frac{R_{eq}}{1 + j \cdot \omega \cdot R_{eq} \cdot C_{eq}}$$

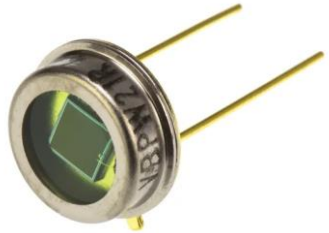
Avec :

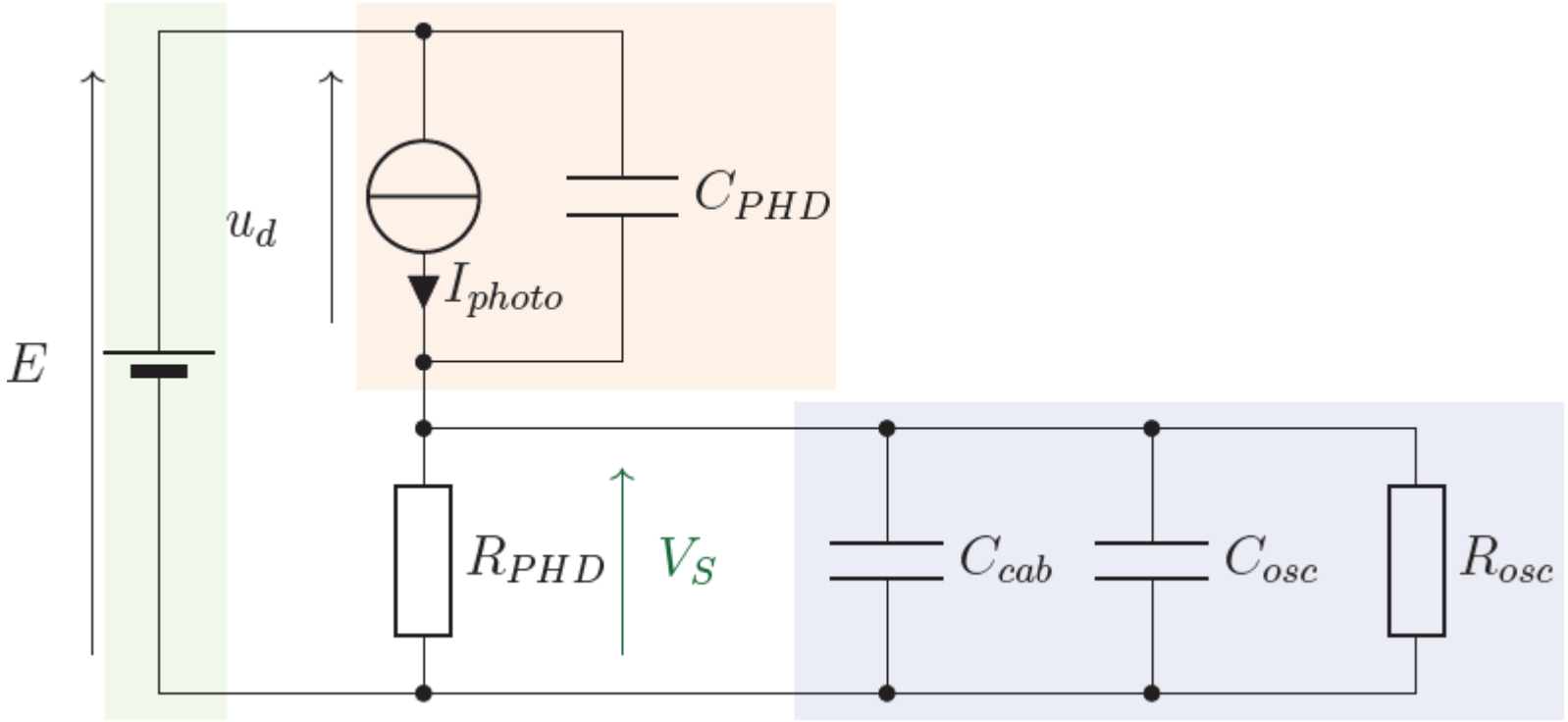
$$R_{eq} = \frac{R_{phd} \cdot R_e}{R_{phd} + R_e}$$

$$C_{eq} = C_{phd} + C_e$$

$$f_C = \frac{1}{2 \cdot \pi \cdot R_{eq} \cdot C_{eq}}$$

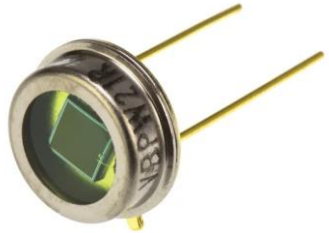
Modélisation

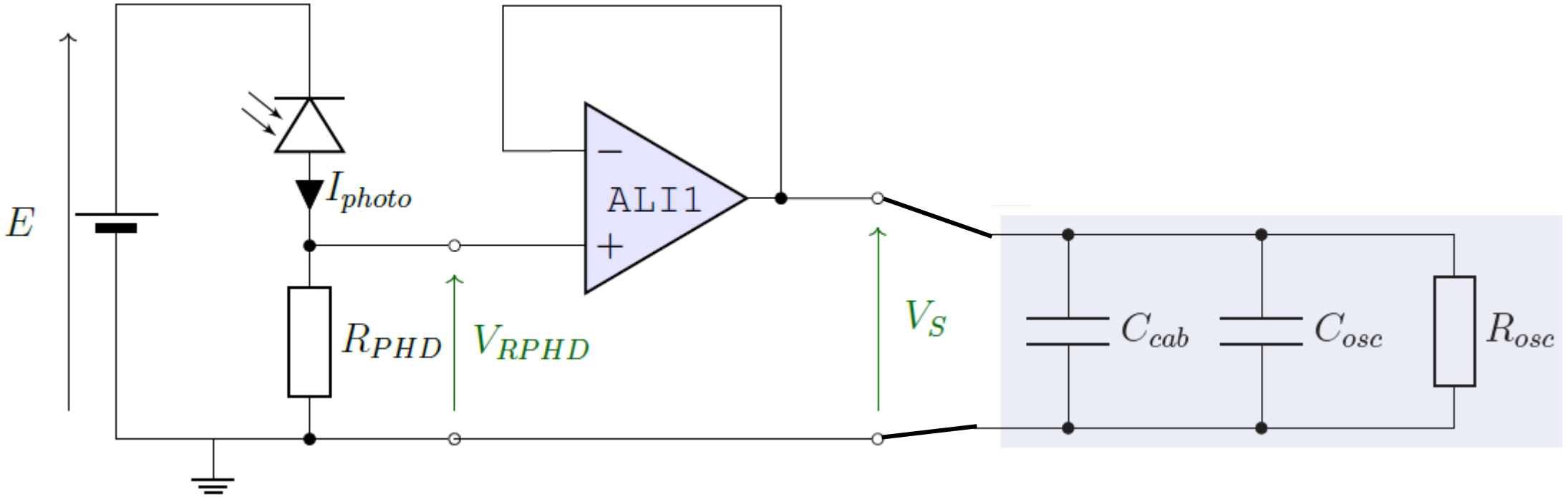




Bande passante réduite (à cause du système de mesure)

Amélioration / Montage Suiveur





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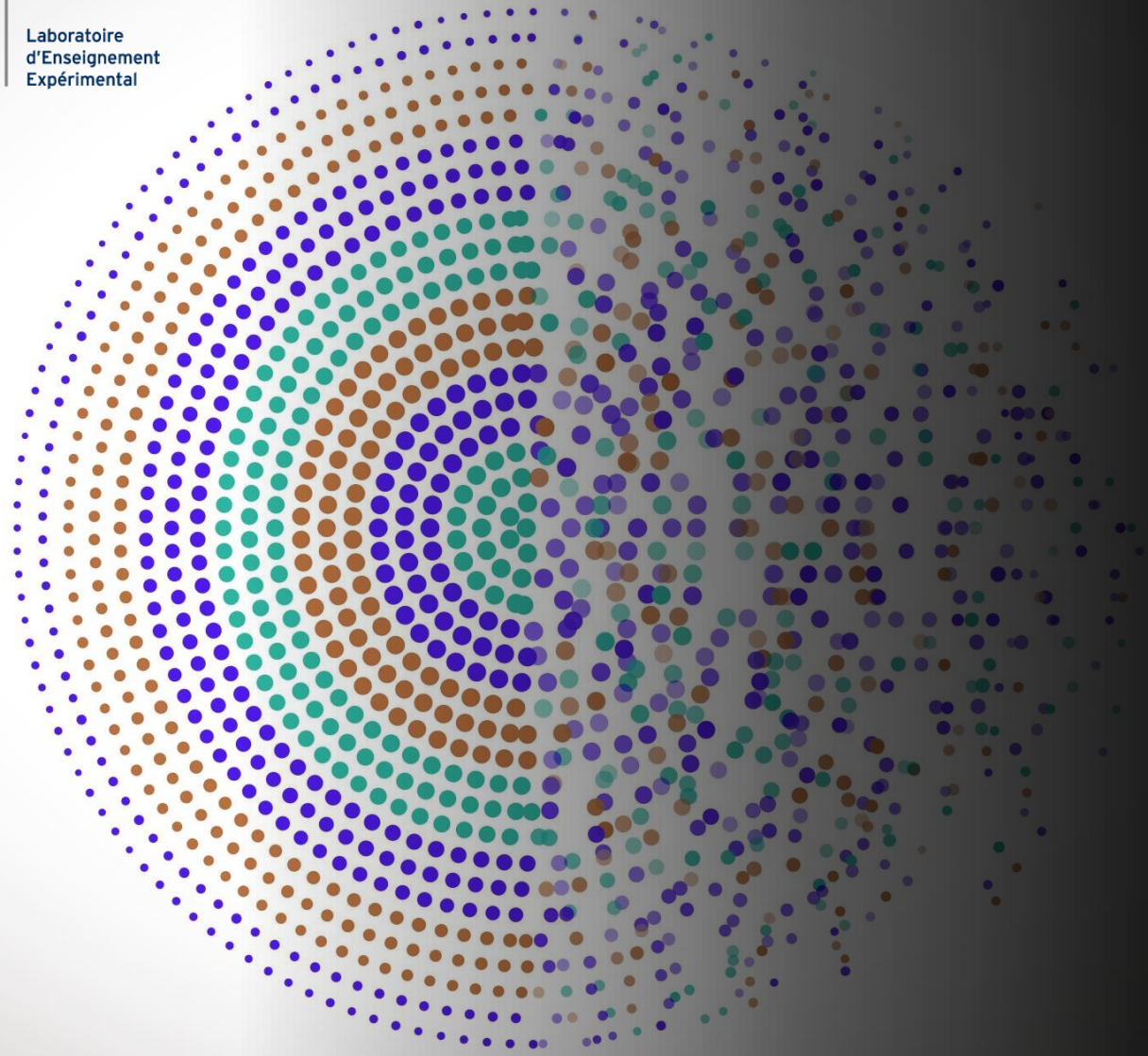


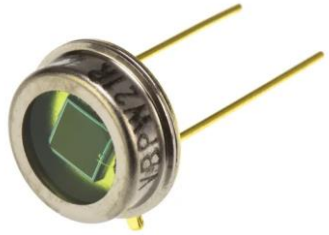
Photodétection

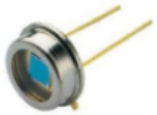
Montage transimpédance

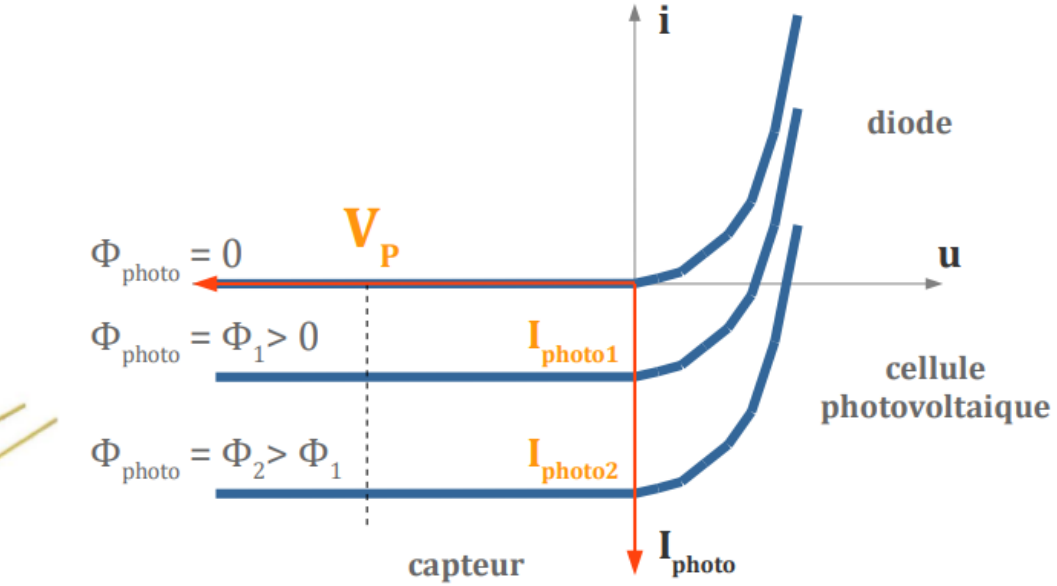
Opto-Electronique / Semestre 5
Institut d'Optique

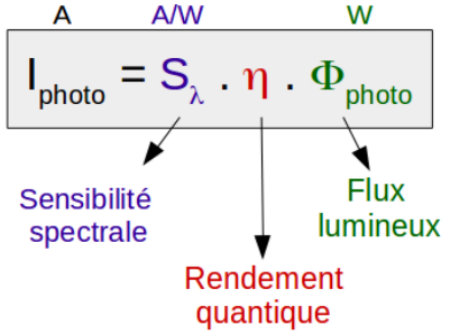
Julien VILLEMEJANE

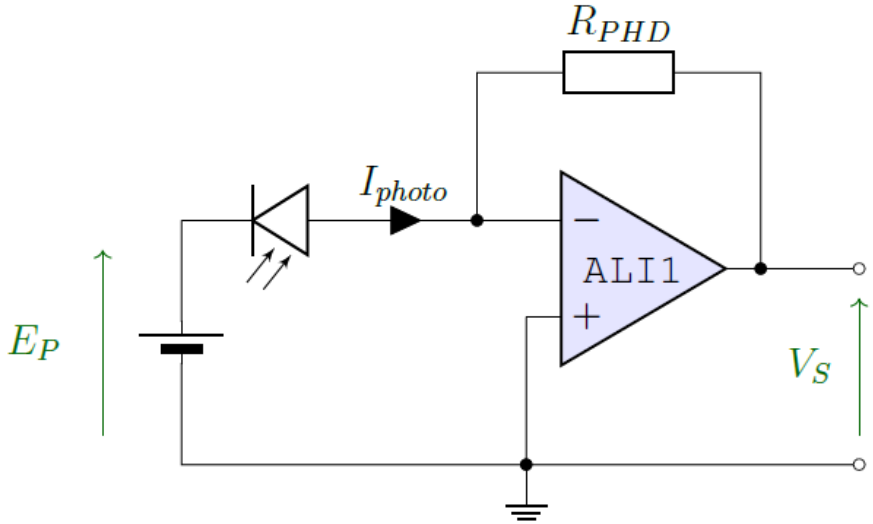
Montage transimpédance





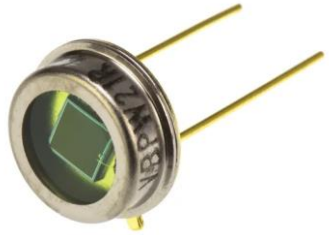


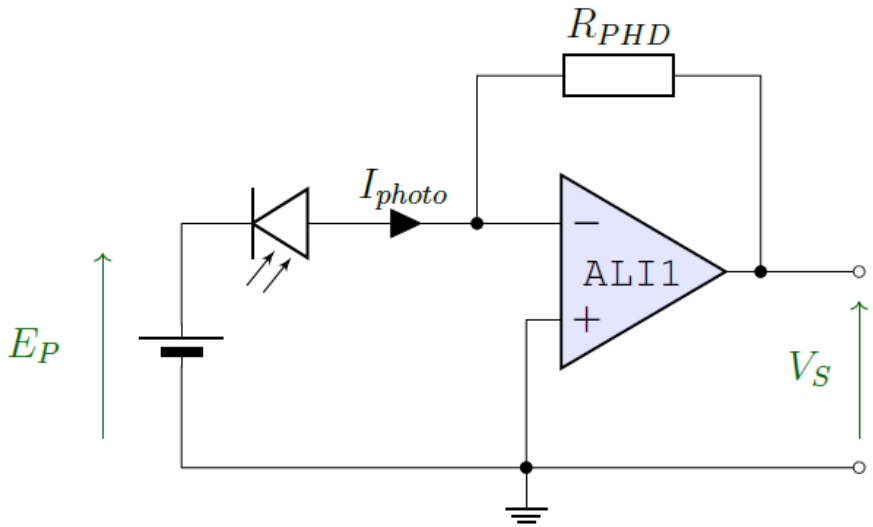




$$V_S = - R_{PhD} \cdot I_{photo}$$

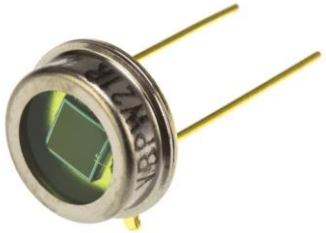
Etude expérimentale

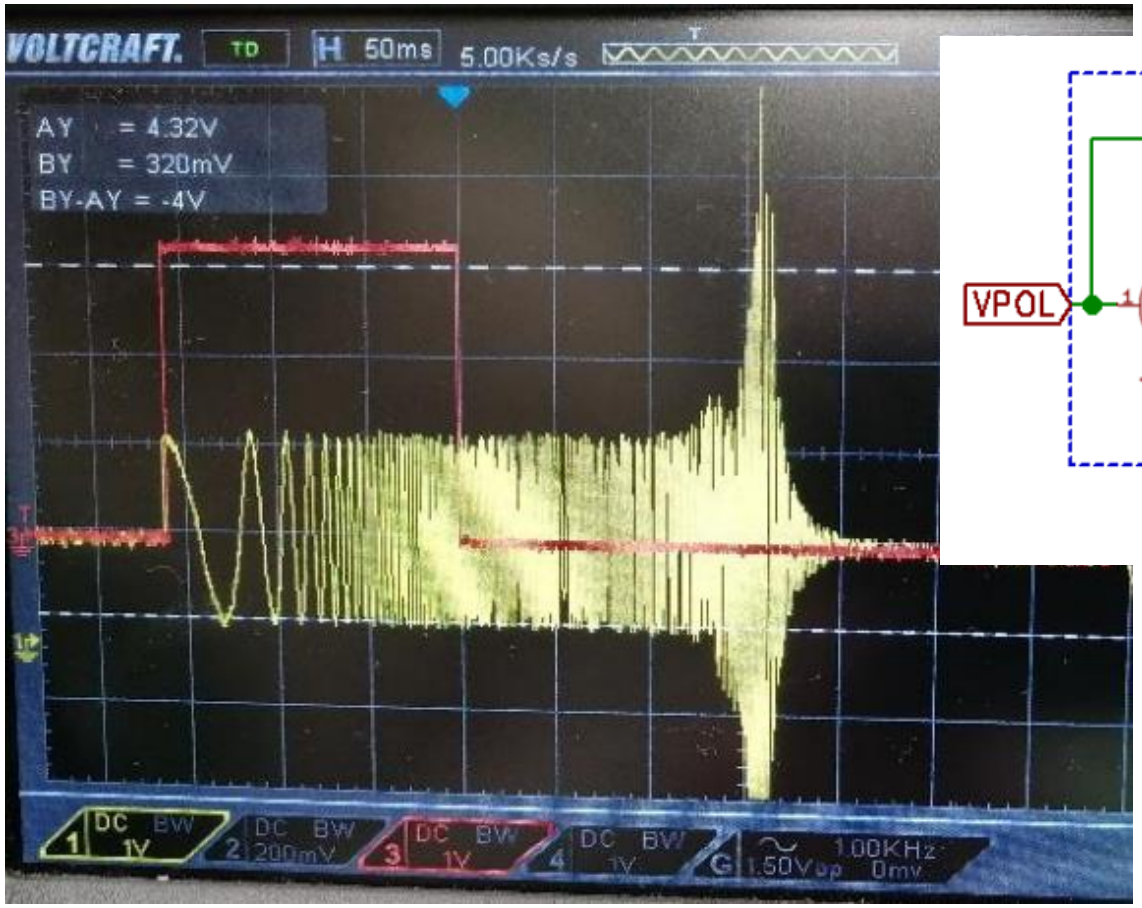


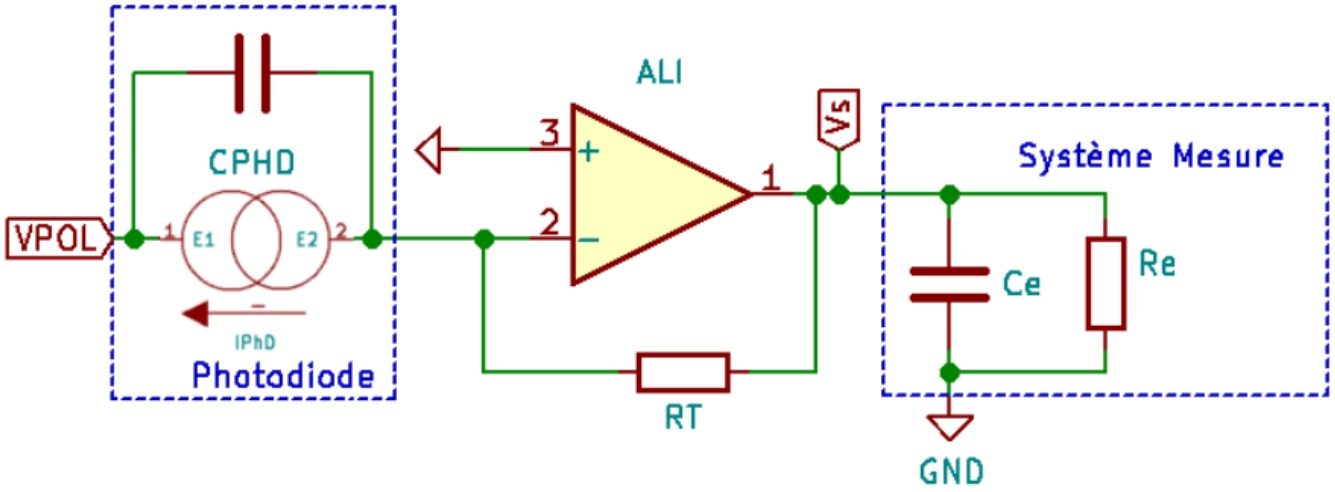


$$V_S = - R_{PhD} \cdot I_{photo}$$

Modélisation







ALI / Passe-bas

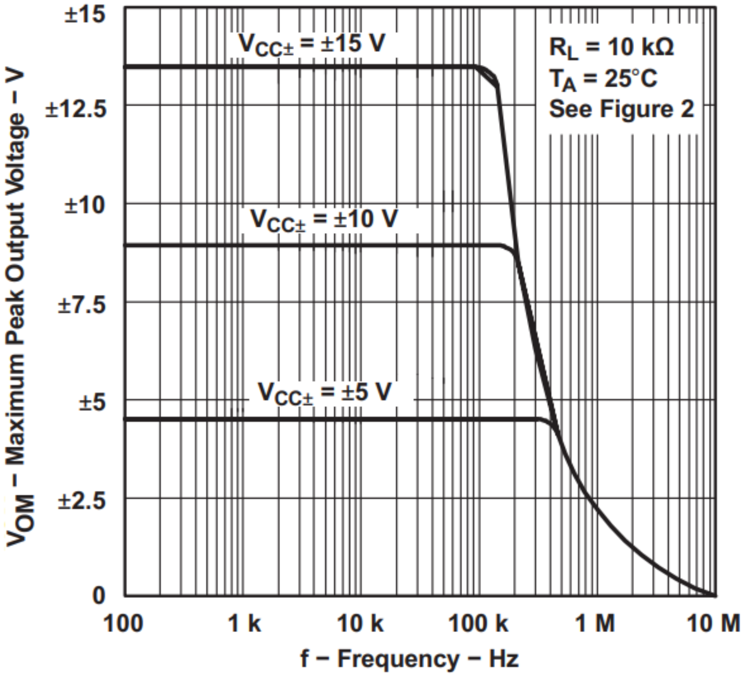


Figure 6-41. Maximum Peak Output Voltage vs Frequency

INPUT CAPACITANCE						
Z_{ID}	Differential			100 || 2		MΩ || pF
Z_{ICM}	Common-mode			6 || 1		TΩ || pF
OPEN-LOOP GAIN						
A_{OL}	Open-loop voltage gain	V_S = 40 V, $V_{CM} = V_S / 2$, $(V_{CC-}) + 0.3\ V < V_O < (V_{CC+}) - 0.3\ V$	118	125		dB
A_{OL}	Open-loop voltage gain	V_S = 40 V, $V_{CM} = V_S / 2$, R_L = 2 kΩ, $(V_{CC-}) + 1.2\ V < V_O < (V_{CC+}) - 1.2\ V$	115	120		dB
FREQUENCY RESPONSE						
GBW	Gain-bandwidth product			5.25		MHz
SR	Slew rate	V_S = 40 V, G = +1, C_L = 20 pF		20		V/µs

ALI asservi / Modélisation

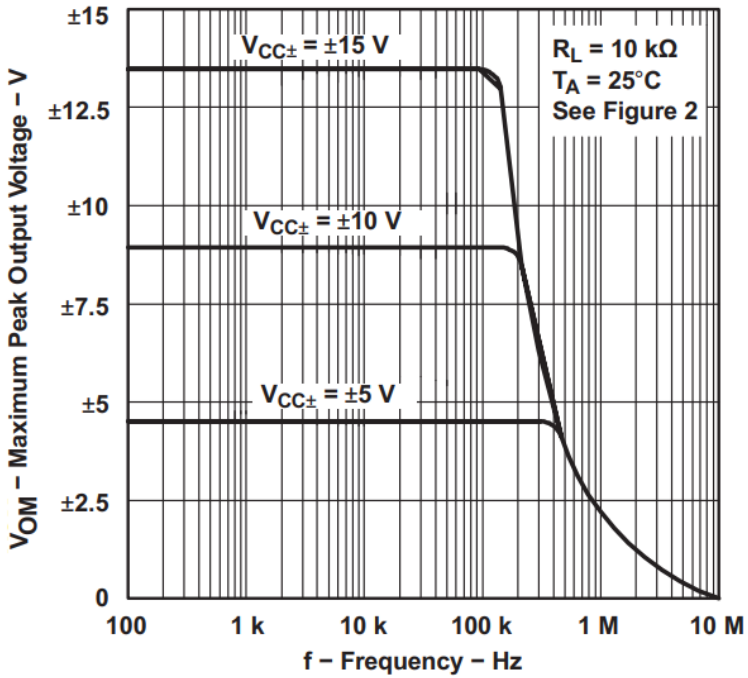
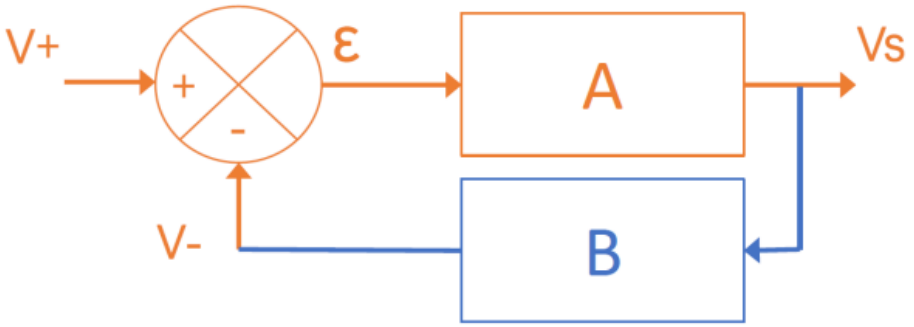


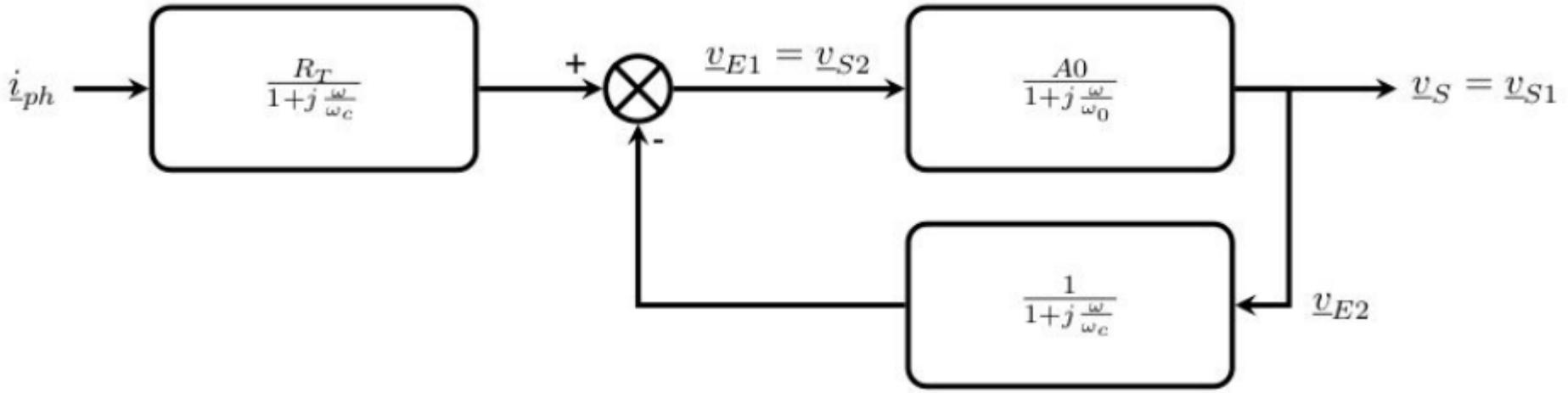
Figure 6-41. Maximum Peak Output Voltage vs Frequency

$$A(j\omega) = \frac{A_{MAX}}{1 + j\frac{\omega}{\omega_c}}$$



$$V_S = \frac{A(j\omega)}{1 + A(j\omega) \cdot B(j\omega)} V_E$$

Transimpédance / Modélisation



$$\frac{V_S}{I_{Phd}} = \frac{R_T \cdot A_0}{\left(1+\frac{j\cdot\omega}{\omega_0}\right)\cdot\left(1+\frac{j\cdot\omega}{\omega_c}\right)+A_0}$$

$$V_S = \frac{A(j\omega)}{1 + A(j\omega)\,.\,B(j\omega)}\ V_E$$