Communications optiques en espace libre

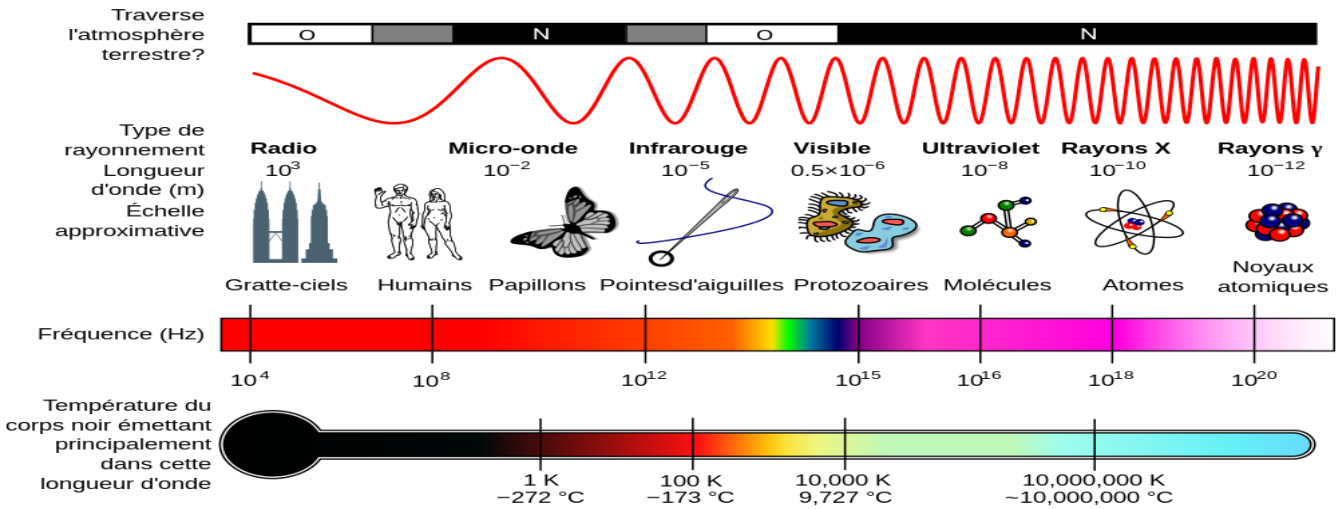
F5HRS F4FEY F8CED F1PYR F4GSX (Loire atlantique)

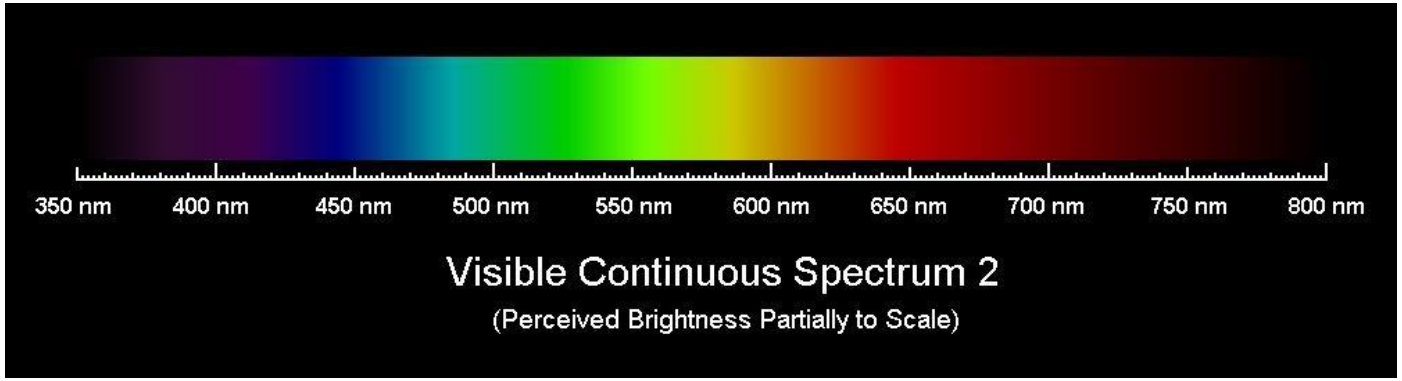
F6DBI (Bretagne lointaine)

F1SRC /F5LWX (Bretagne sud, un jour peut-être…)

CJ 2023

Où sommes nous dans le spectre ?





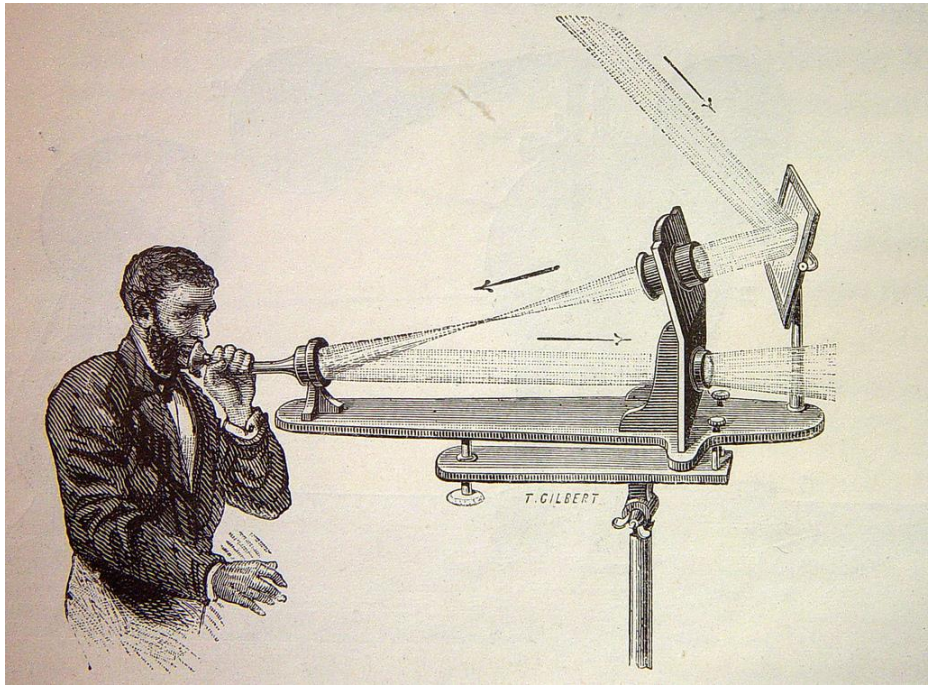
Atténuation en espace libre

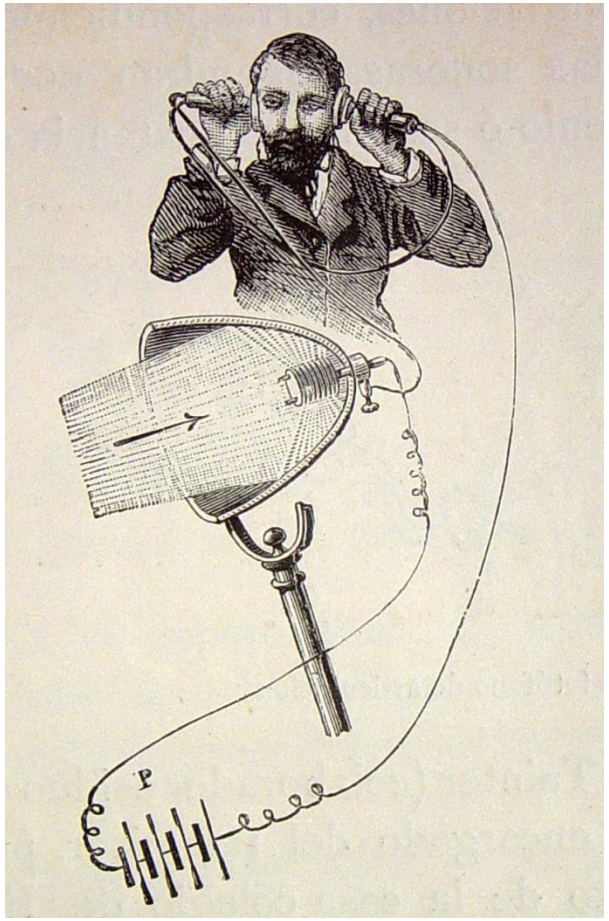
Météo	Longueur d'onde, λ	Atténuation en dB à la distance L		
		1 km	10 km	100 km
Conditions	Micromètres (µ)			
Temps clair (au niveau de la mer)	0,53, 1,06	0,06	0,6	6
	10,6	0,54	5,4	54
Brume (densité : 0,1 mg/m³)	0,53, 1,06	1,4	14	140
	10,6	0,66	6,6	66
Brouillard léger (taille : 0,5-10 µm ; densité : 0,5 mg/m³; visibilité : ~2 km)	0,53, 1,06	0,1-5	1-50	10-500
	10,6	.9	9	90
Brouillard (taille : 0,5-10 µm ; densité : 1 mg/m³; visibilité : ~0,5 km)	0,53, 1,06	0,2-10	2-100	20-1000
	10,6	1,9	19	190
Pluie 5 mm/hr	0,53, 1,06	1,6	16	160
Pluie 25 mm/hr	0,53, 1,06	4,2	42	420
Pluie 75 mm/hr	0,53, 1,06	0,7	7	70
Pluie légère (taille : 1000 µ ; densité : 50 mg/m³)	10,6	1,6	16	160
Neige légère	0,53, 1,06	1,9	19	190
Neige lourde	0,53, 1,06	6,9	69	690

Source : Edmunds Optics

Au début, étaient les héliographes

Photophone de Bell





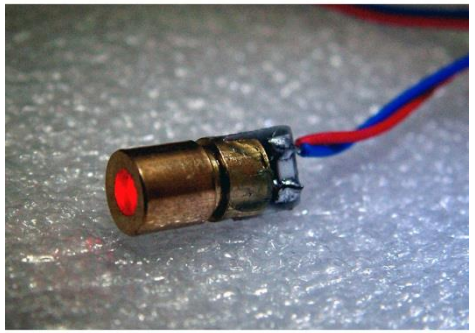
1880 : Le Photophone de Graham Bell
Le soleil à l'émission, sélénium en réception.
Distance : 200 m

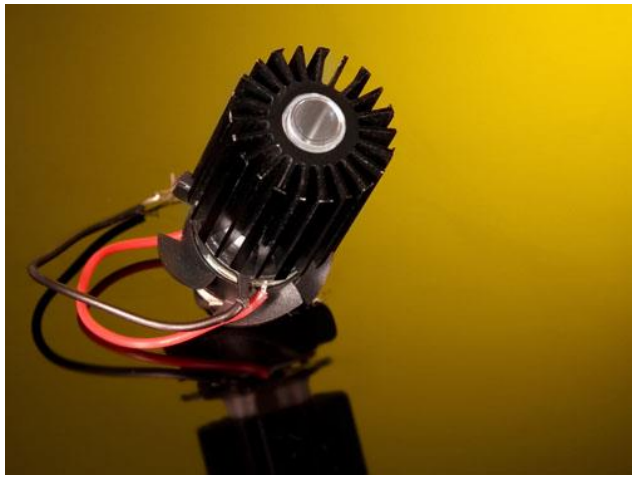
Et aujourd’hui ?

- Quelles sont les sources à l’émission ?
- Comment les mettre en œuvre ?
- Comment moduler ?
- Et du coté de la réception ?
- Les réalisations en images

Sources possibles pour l'émission

Sources cohérentes monochromatiques : LASER

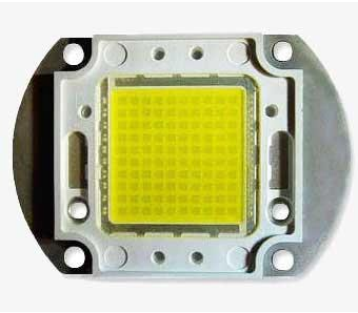


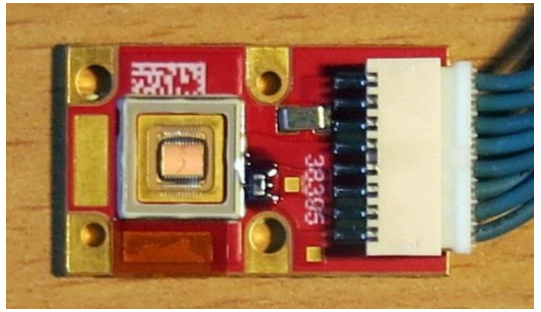


- Très faible divergence
- Facilement modulable en amplitude
- Difficulté de pointage ?
- Densité énergétique forte
- Dangereux même à faible puissance
- Image dans le public, le mot peut faire peur….

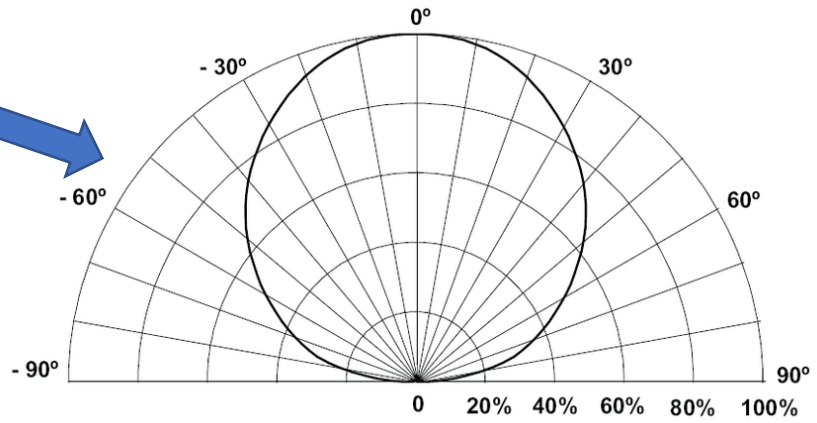
Sources possibles pour l'émission

Sources non cohérentes monochromatiques : LED





- Divergence élevée : Rayonnement lambertien
- nécessité de collimater
- Facilement modulable en amplitude
- Pointage facile
- Densité énergétique forte car LED de forte puissance
- Eblouissement possible
- Image dans le public, le mot fait moins peur….

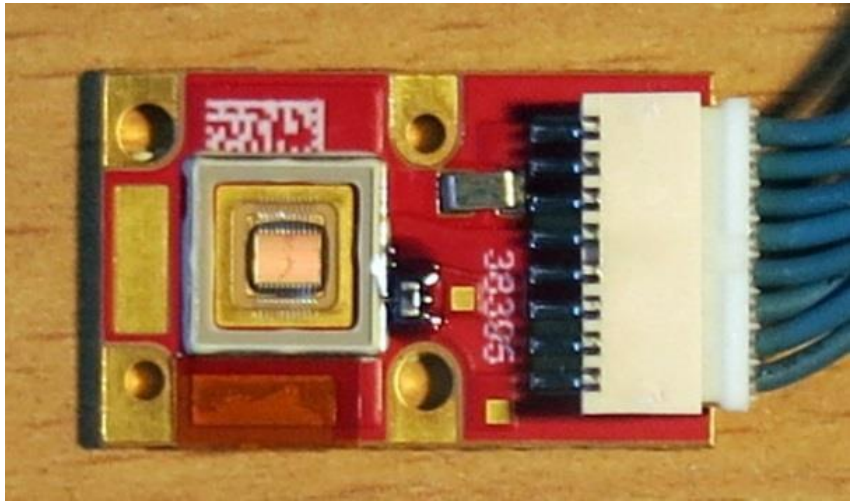


Deux solutions intéressantes 1/2

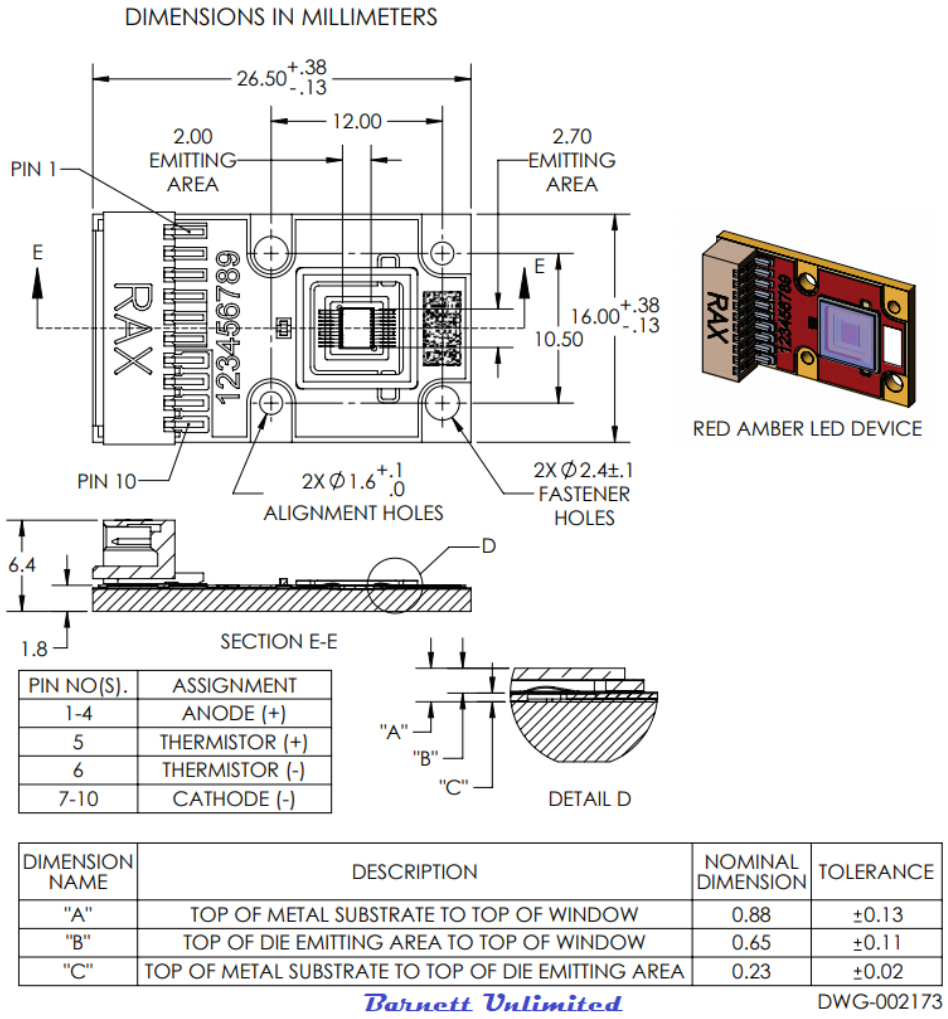
Luminus PhlatLight

Disponible chez Barnett Ebay US

- *Dimensions LED faibles*
- *Très grande densité de courant 2,5 A / mm2*
- *Courant nominal 8 A, 16 A max.*



Mechanical Dimensions - PT-54 -RAX -Common Cathode Package



PIN NO(S).	ASSIGNMENT
1-4	ANODE (+)
5	THERMISTOR (+)
6	THERMISTOR (-)
7-10	CATHODE (-)

DIMENSION NAME	DESCRIPTION	NOMINAL DIMENSION	TOLERANCE
"A"	TOP OF METAL SUBSTRATE TO TOP OF WINDOW	0.88	±0.13
"B"	TOP OF DIE EMITTING AREA TO TOP OF WINDOW	0.65	±0.11
"C"	TOP OF METAL SUBSTRATE TO TOP OF DIE EMITTING AREA	0.23	±0.02

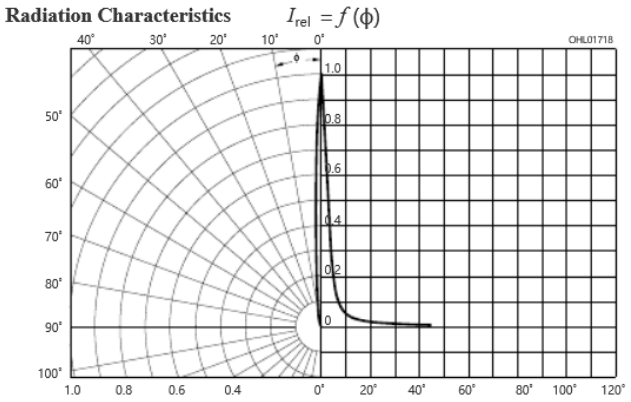
Barnett Unlimited DWG-002173

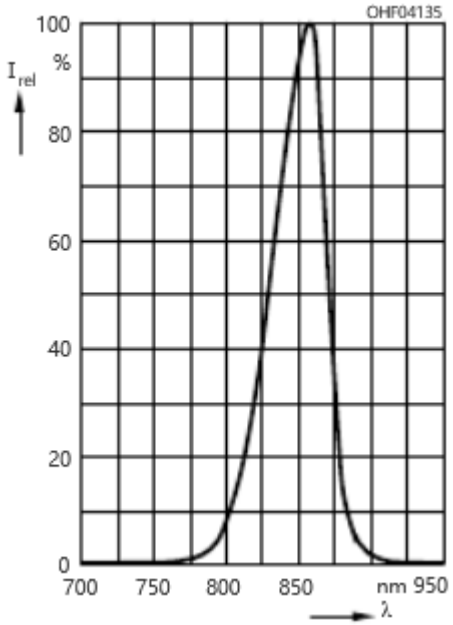
Deux solutions intéressantes 2/2

SFH 4550

100 mA 180 mW

- *6° ouverture*
- *IR 850 nm*





Features

- High Power Infrared LED
- Narrow emission angle ± 3°
- Very high radiant intensity
- Short switching times
- UL version available

Collimation

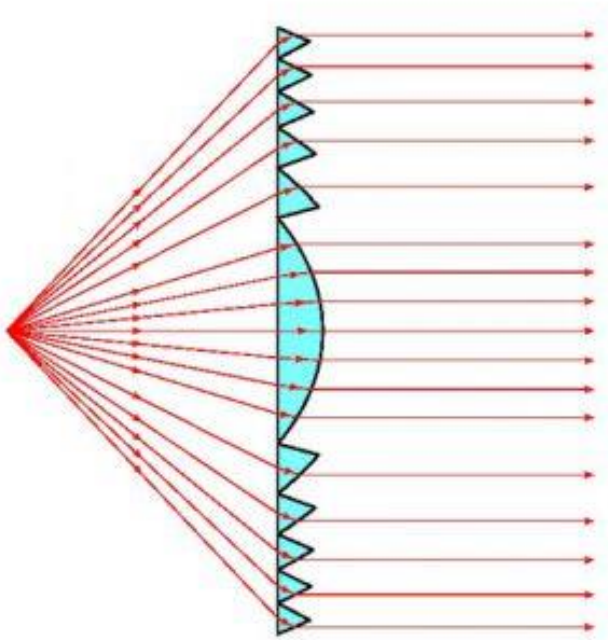
SFH 4550

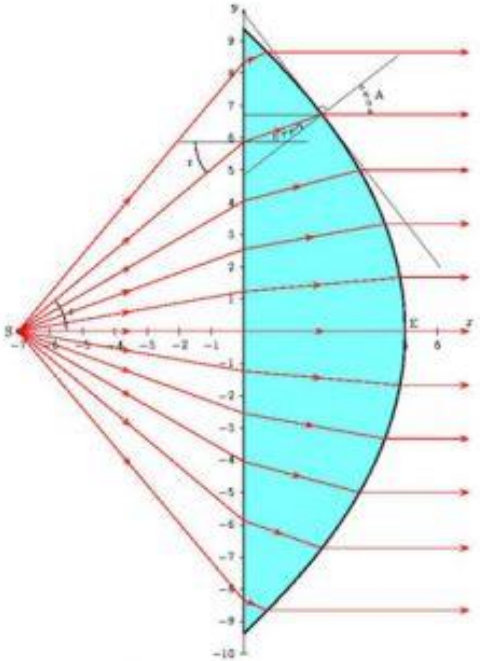
Pas de collimation, groupements
Série Parallèle de diodes

Diode laser

Pas de collimation,

Collimation



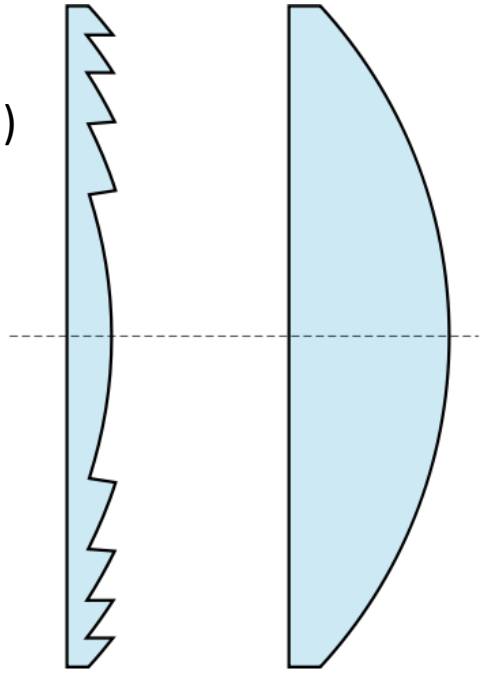


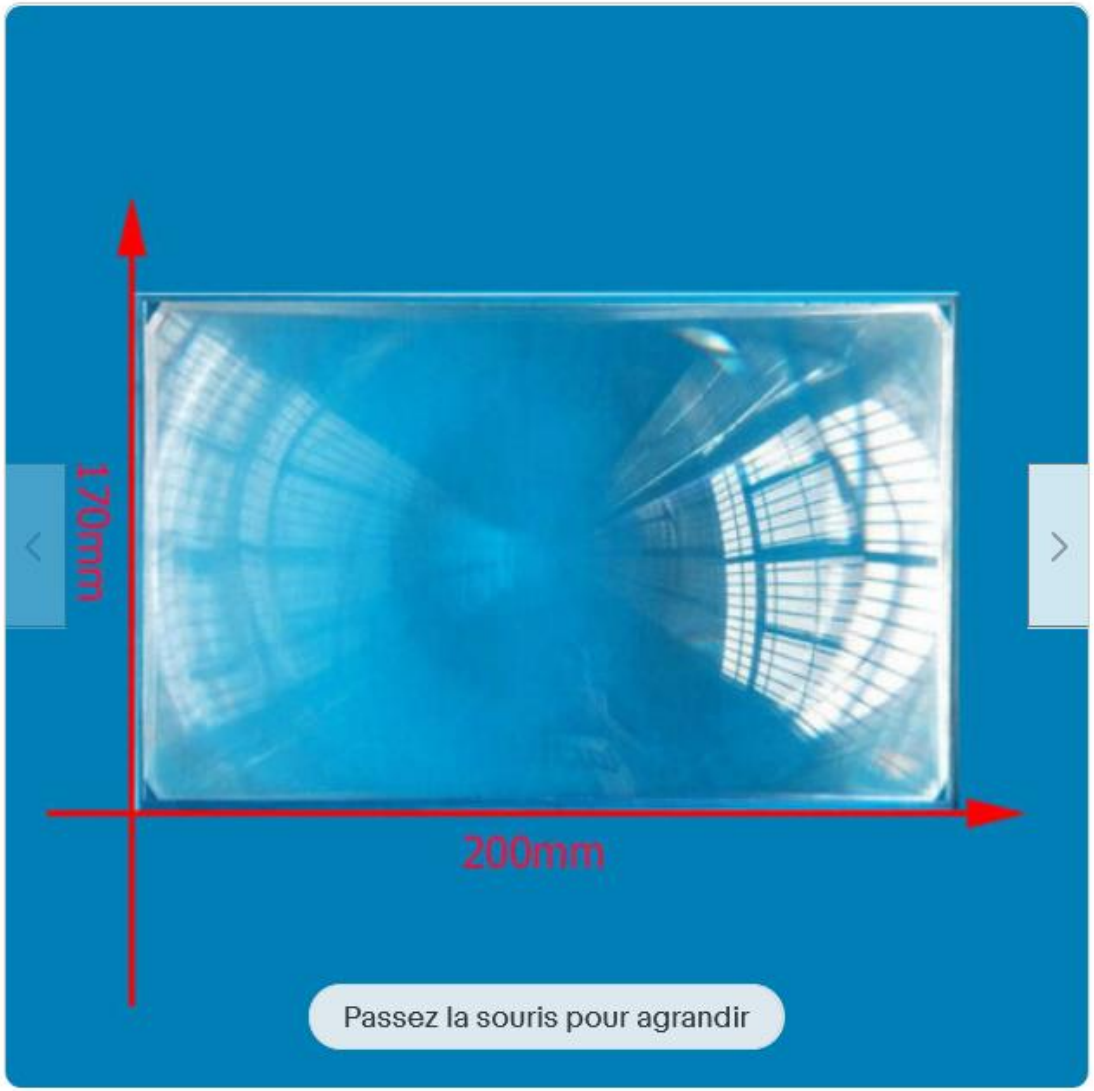
Collimation utilisant une lentille qui joue le rôle d'antenne

Le gain apporté est le rapport entre la surface de la lentille et celui de la zone active du détecteur (pour une illumination totale).

1 lentille de Fresnel (merci Augustin)

2 lentille plan convexe





Objectif optique en plastique Fresnel à faire soi-même projecteur concentrateur d'énergie solaire - Afficher le titre d'origine

État : **Neuf**

Fin de la promotion : 7 j 9 h

Focal Length: 170mm

Quantité : 1 2 disponibles / 6 vendus

Prix : **14,81 USD**

Environ 14,03 EUR

Prix de vente initial : ~~15,59 USD~~

Économisez 0,78 USD (-5 %)

Achat immédiat

Ajouter au panier

Suivre cet objet

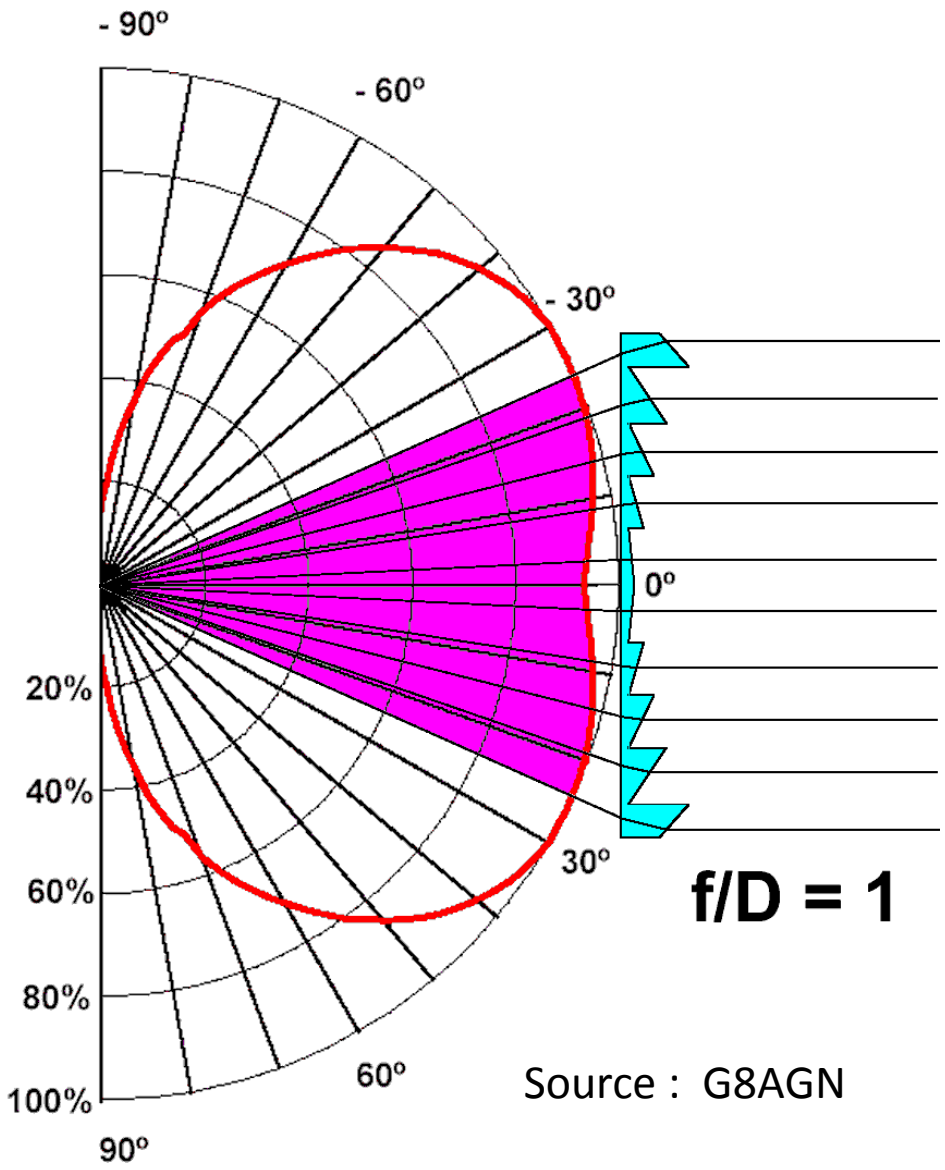
Vous avez déjà acheté auprès de ce vendeur

Retours acceptés

Livraison : **4,79 USD (environ 4,54 EUR)** Economy Shipping from Greater China to worldwide. Afficher les détails

Provenance : 南阳, Chine

Collimation

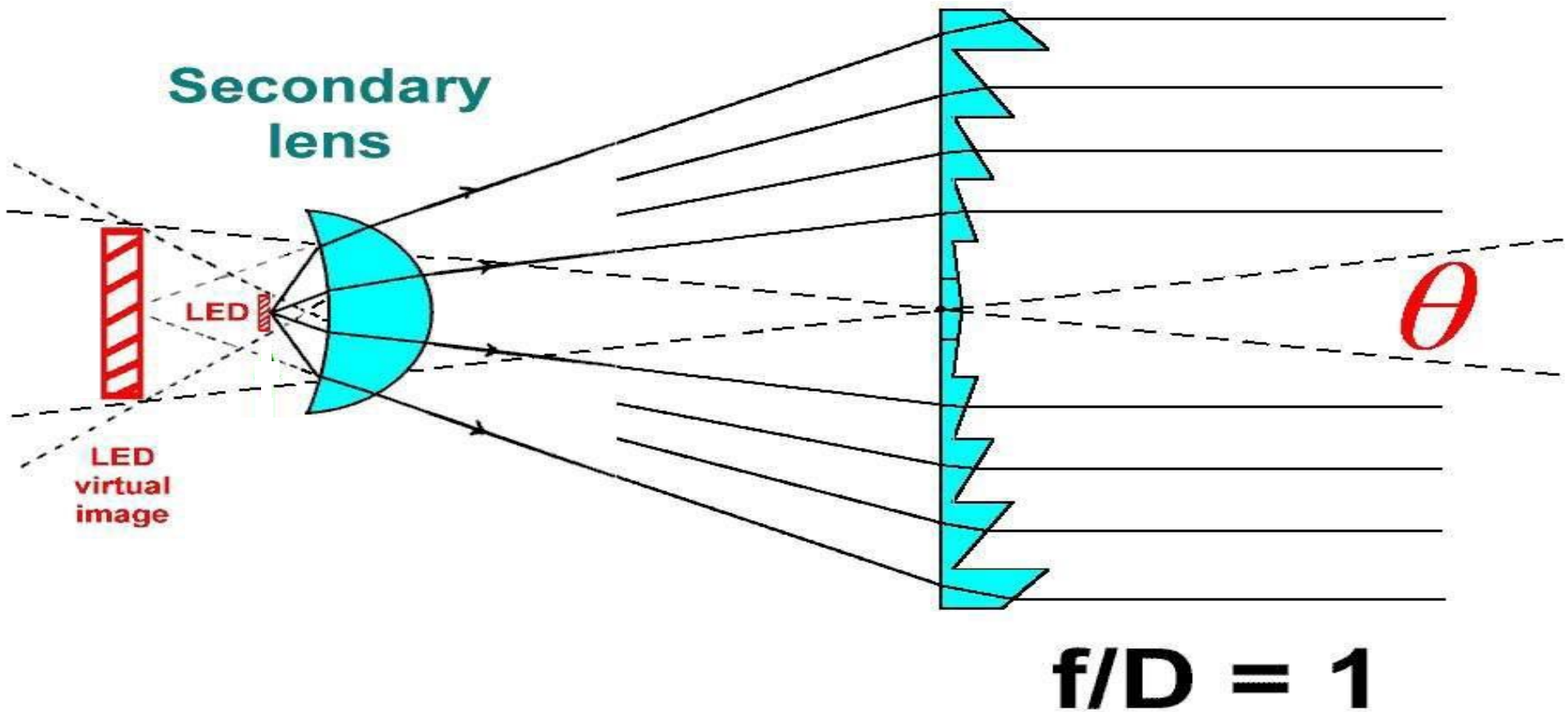


Source : G8AGN

- Pb : spill over au niveau de la lentille de Fresnel.
- Une partie de l'énergie n'est pas focalisée.

- Solution : Déformer le rayonnement lambertien avec une lentille secondaire

Collimation

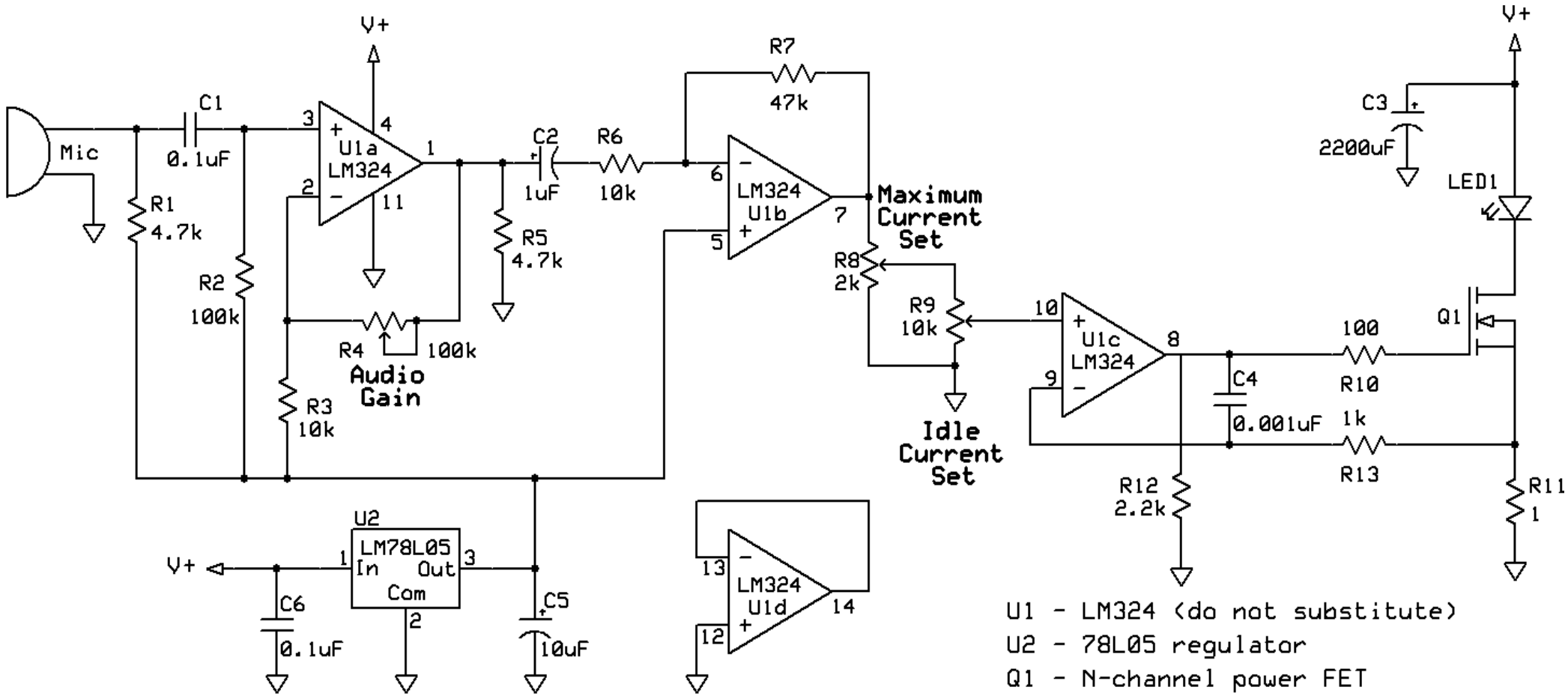


Modulation

- Le plus simple : Modulation d’amplitude.
- Le courant LED est proportionnel à l’amplitude du signal modulant.
- Réglage d’un courant de repos.

- Un peu plus compliqué : Utilisation d’une sous porteuse BF.
- Pour aller plus loin : conversion hétérodyne HF.

Modulation



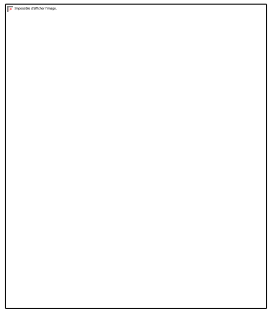
Simple high-current, adjustable LED modulator

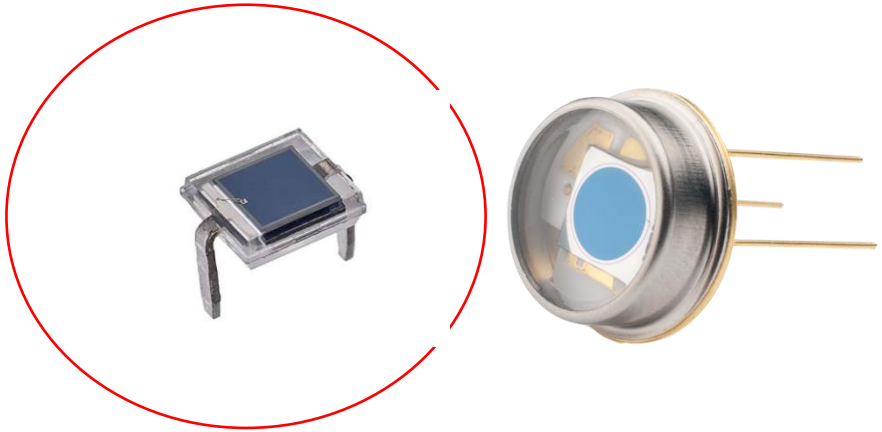
Ver. 1.03b KA7OEI

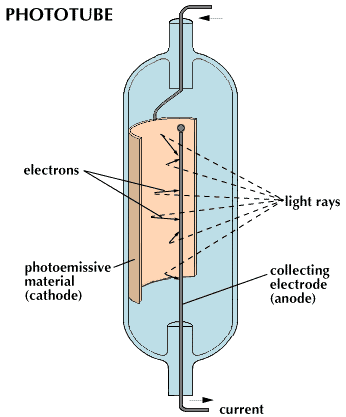
U1 - LM324 (do not substitute)
U2 - 78L05 regulator
Q1 - N-channel power FET
LED1 - High-power LED
Mic - Electret Microphone

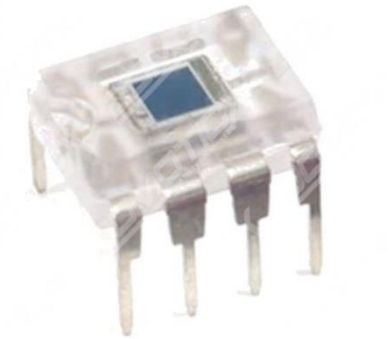
Détection

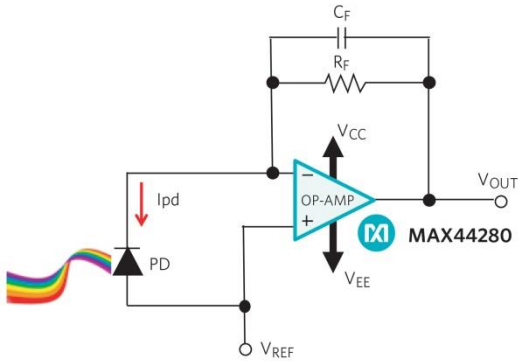
- Photorésistance
- Diode LED
- Photodiode PIN
- Photodiode à avalanche
- phototube
- Photomultiplicateur
- Photodiode + transconductance



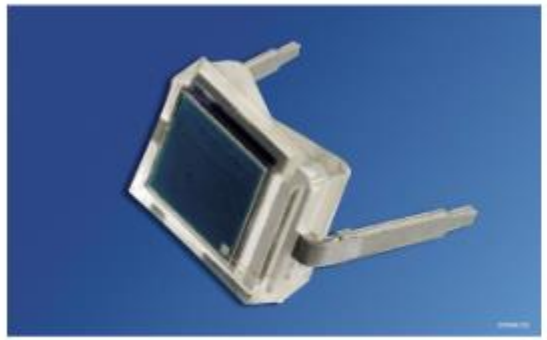




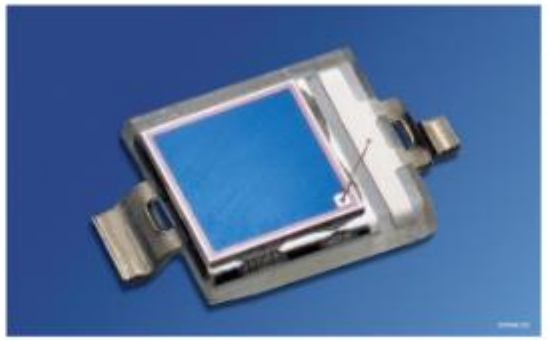




Choix : BPW34 en mode Photopile ou photo-conductance

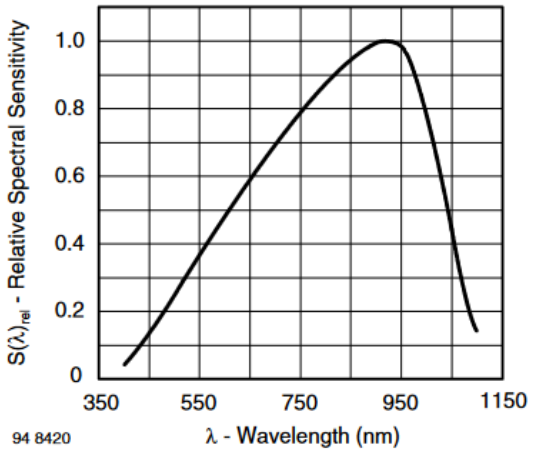


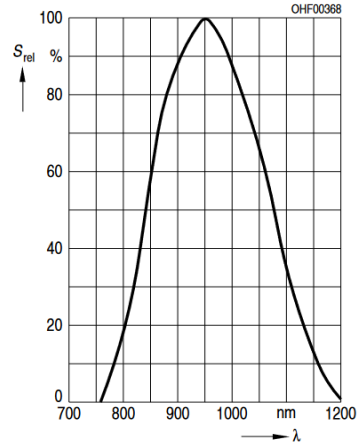
BPW 34



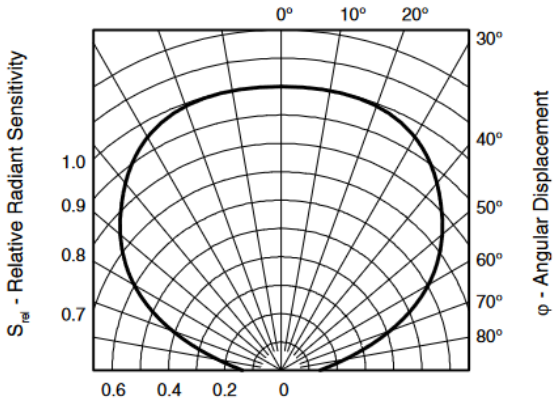
BPW 34 S

BPW 34 S (E9087)

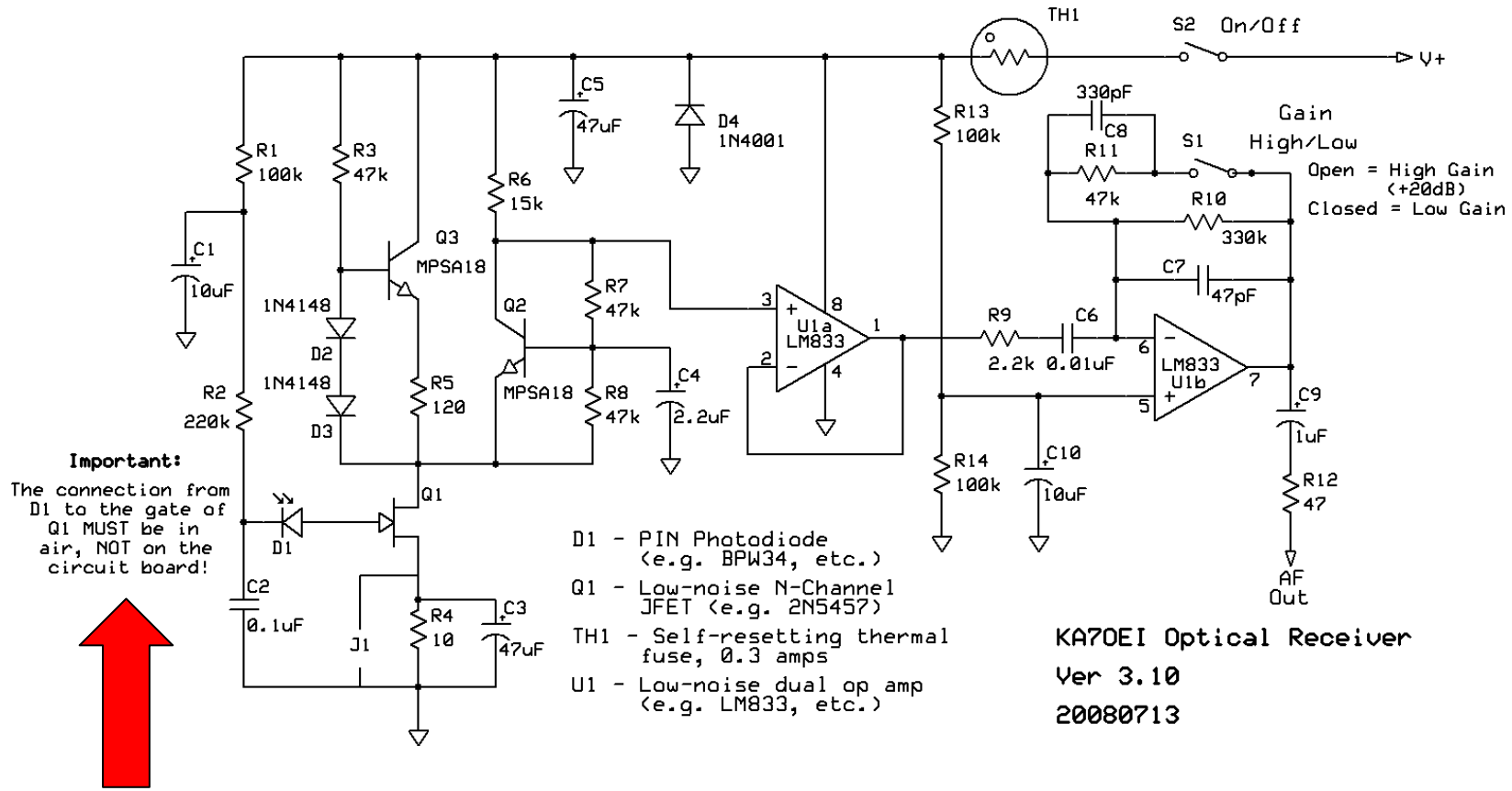




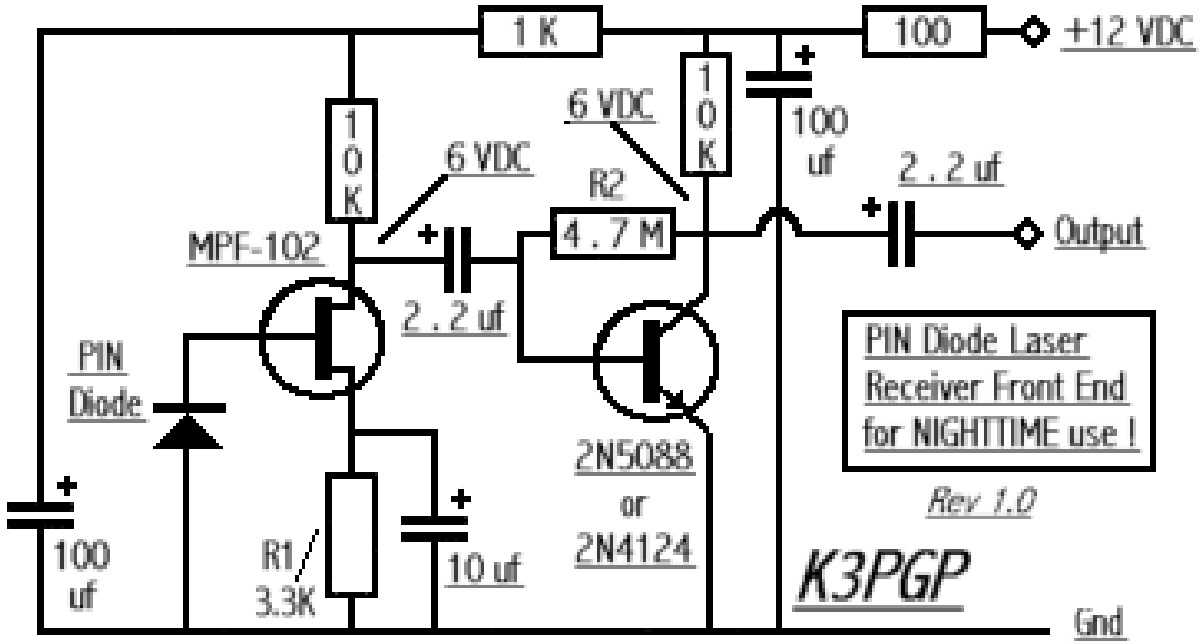
BPW34FS

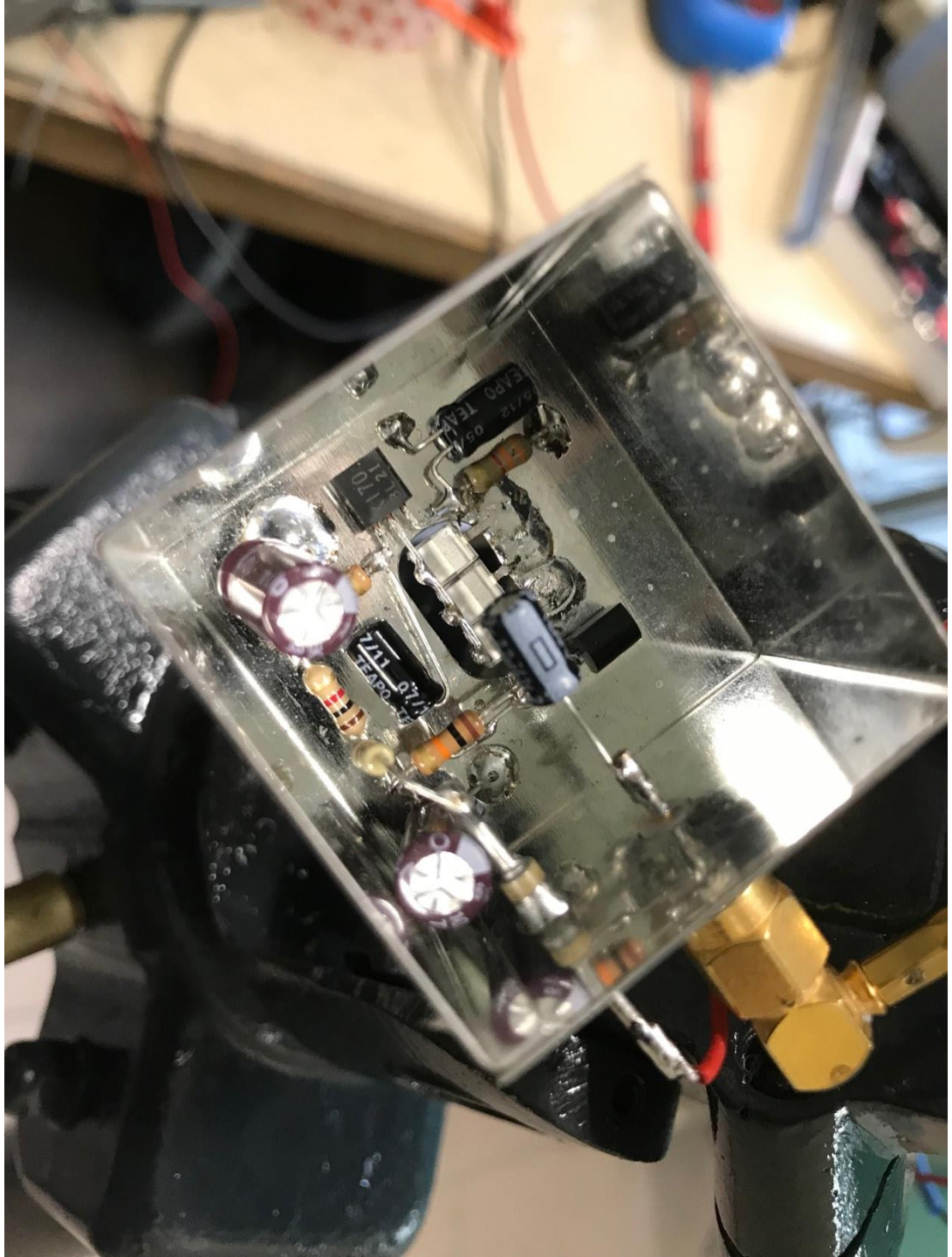


Première solution : KA7OEI



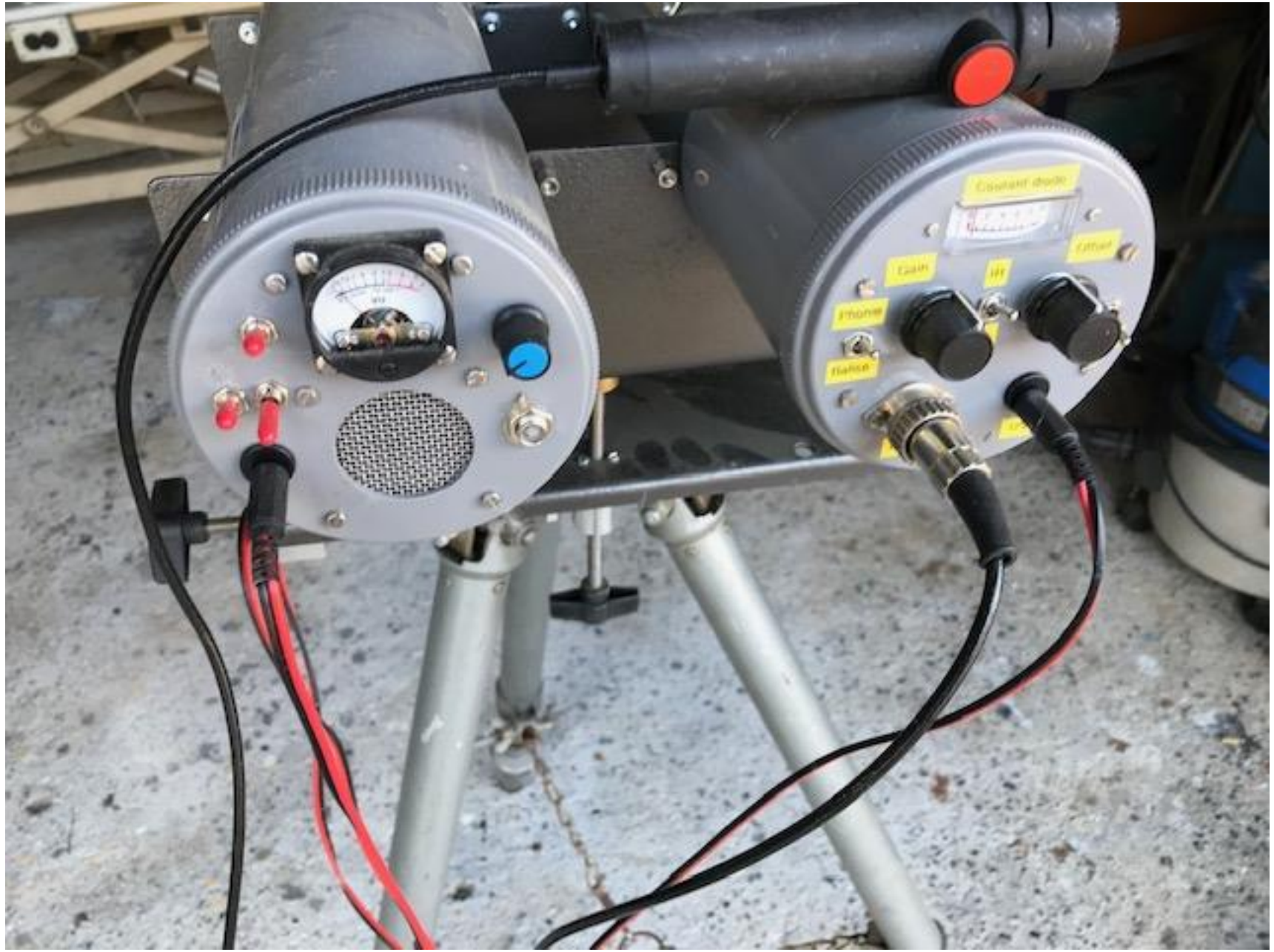
Seconde solution : K3PGP

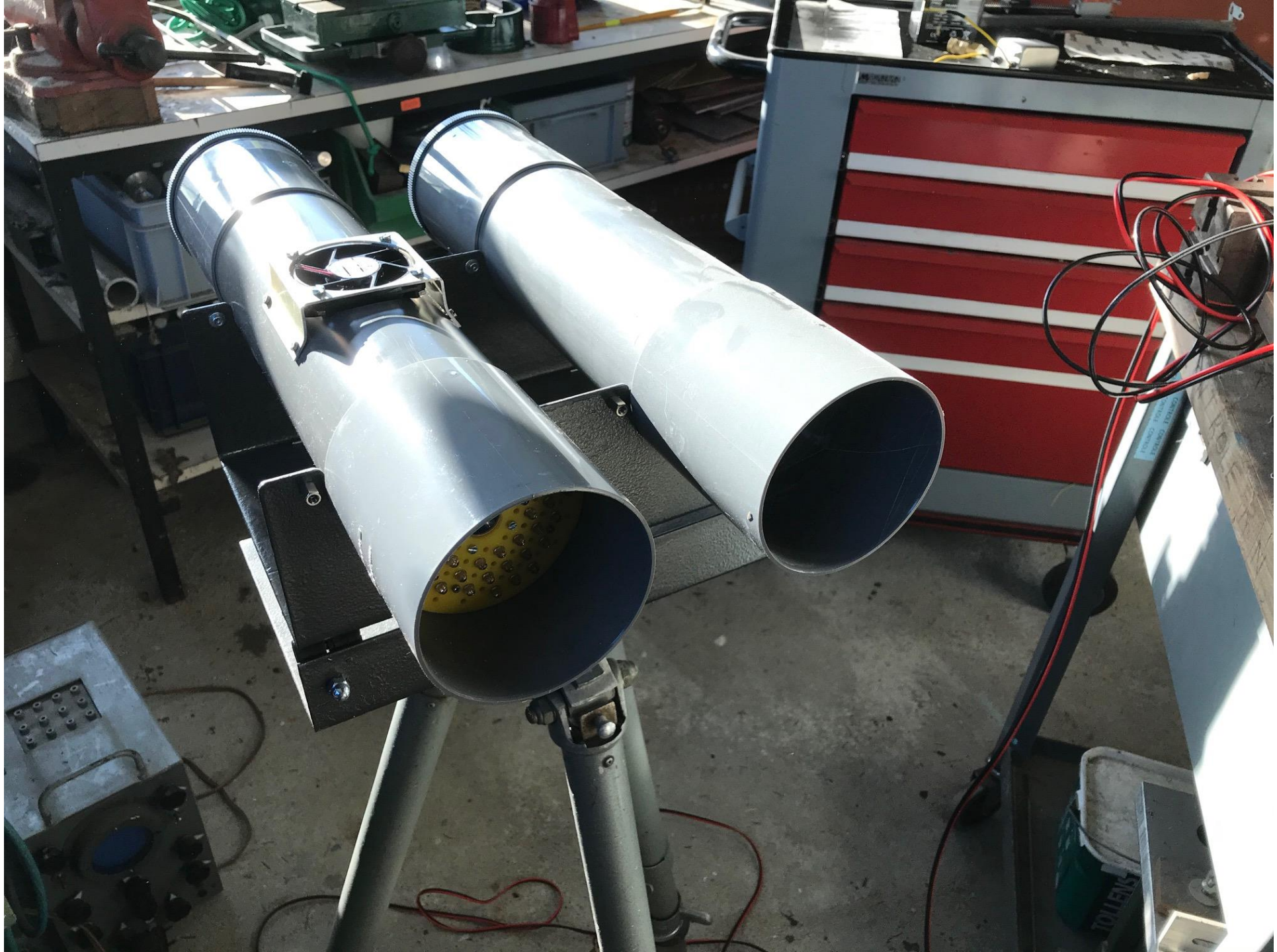


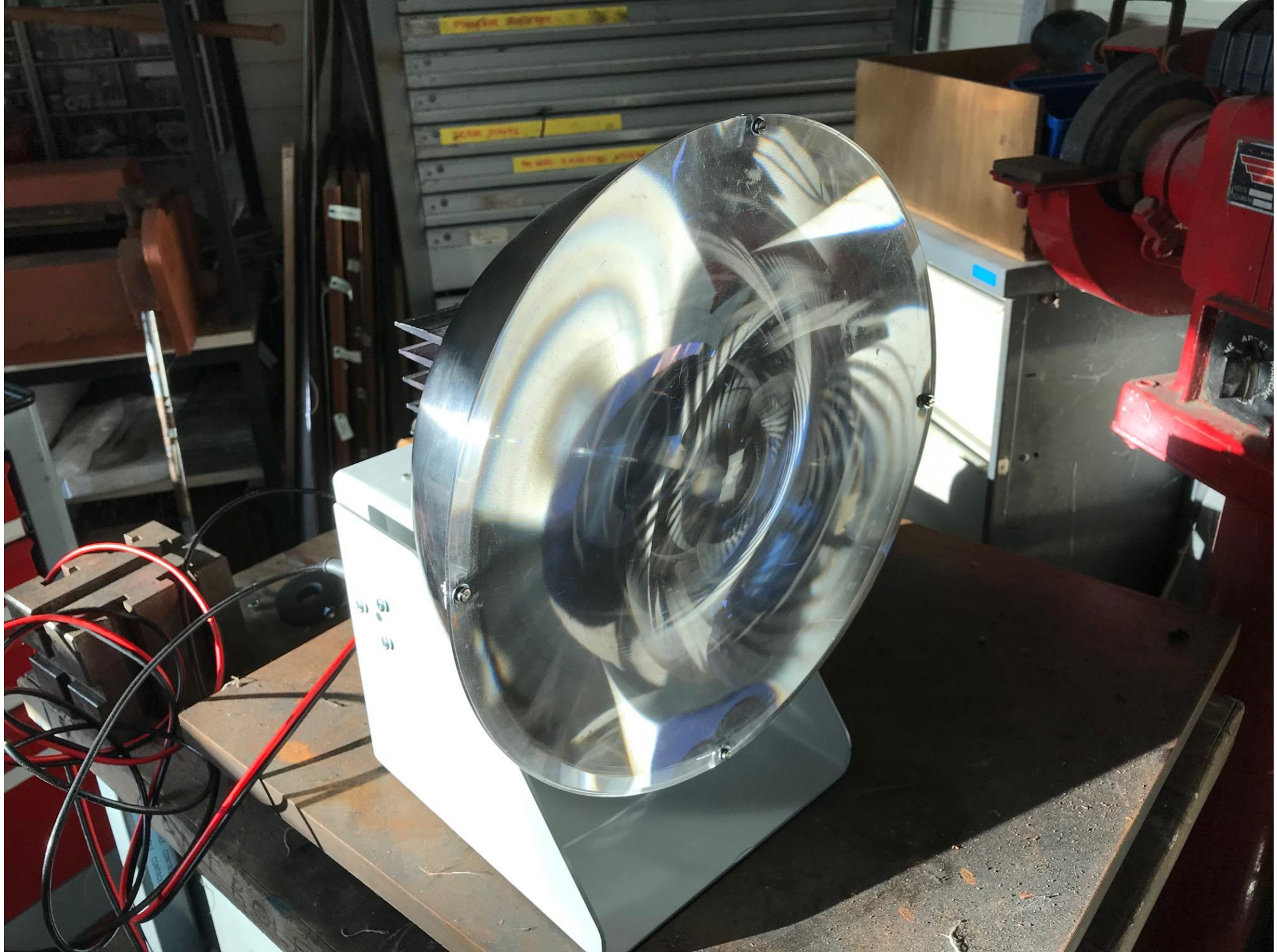


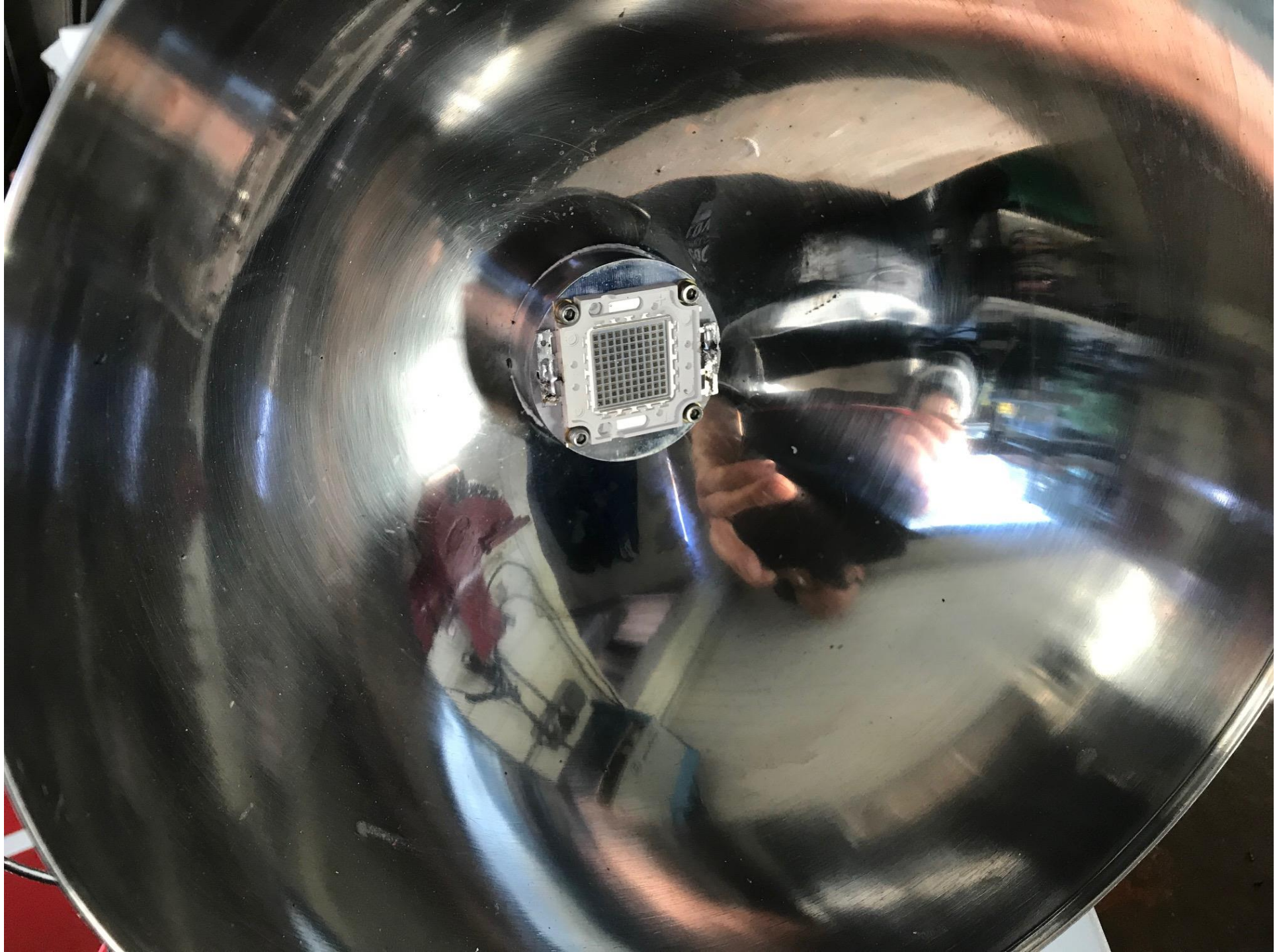

K170
BC21
CR ECR

F5HRS en images

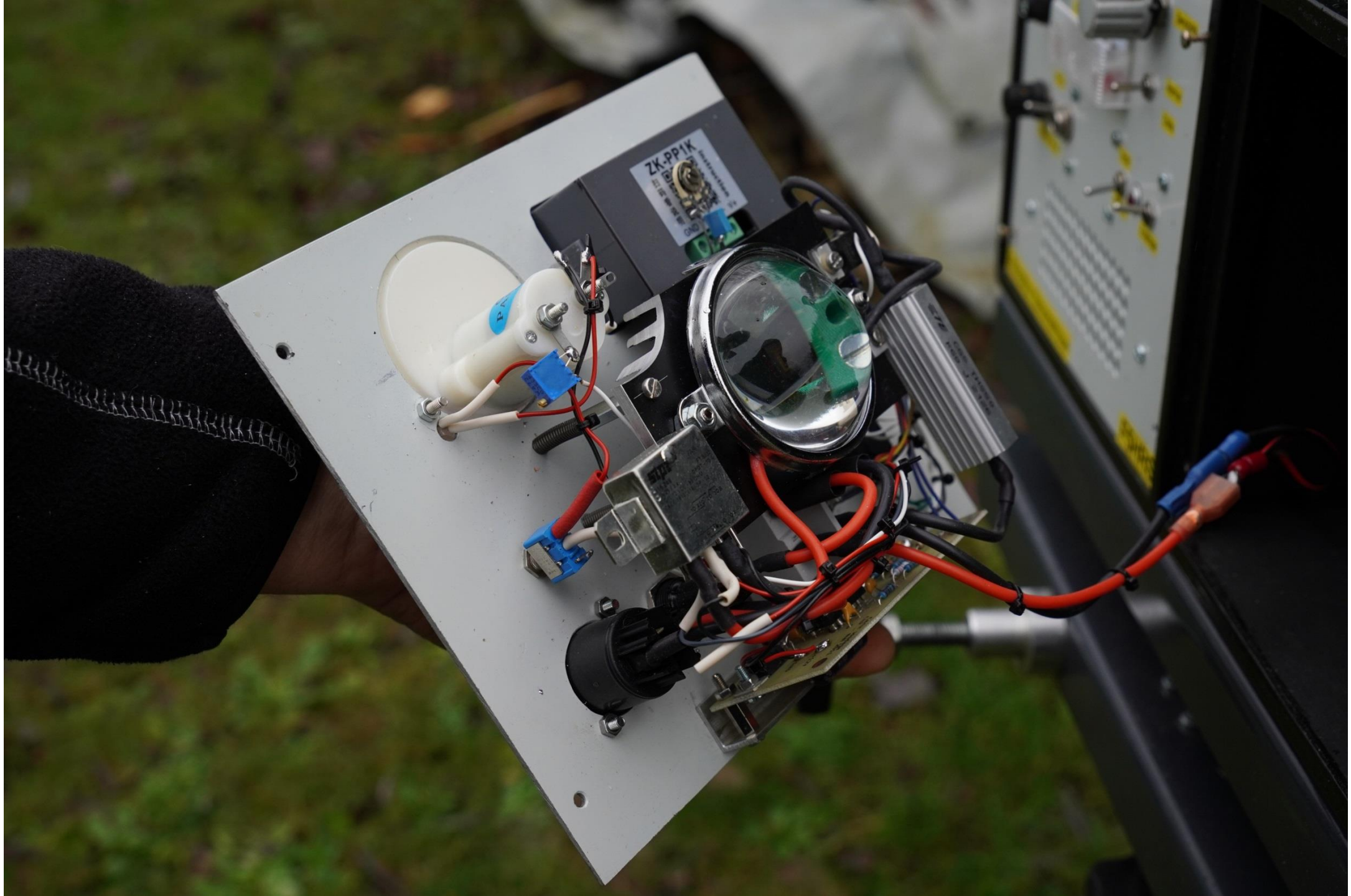

Coolant diode
Cathode
Gain
HT
Phone
Balun

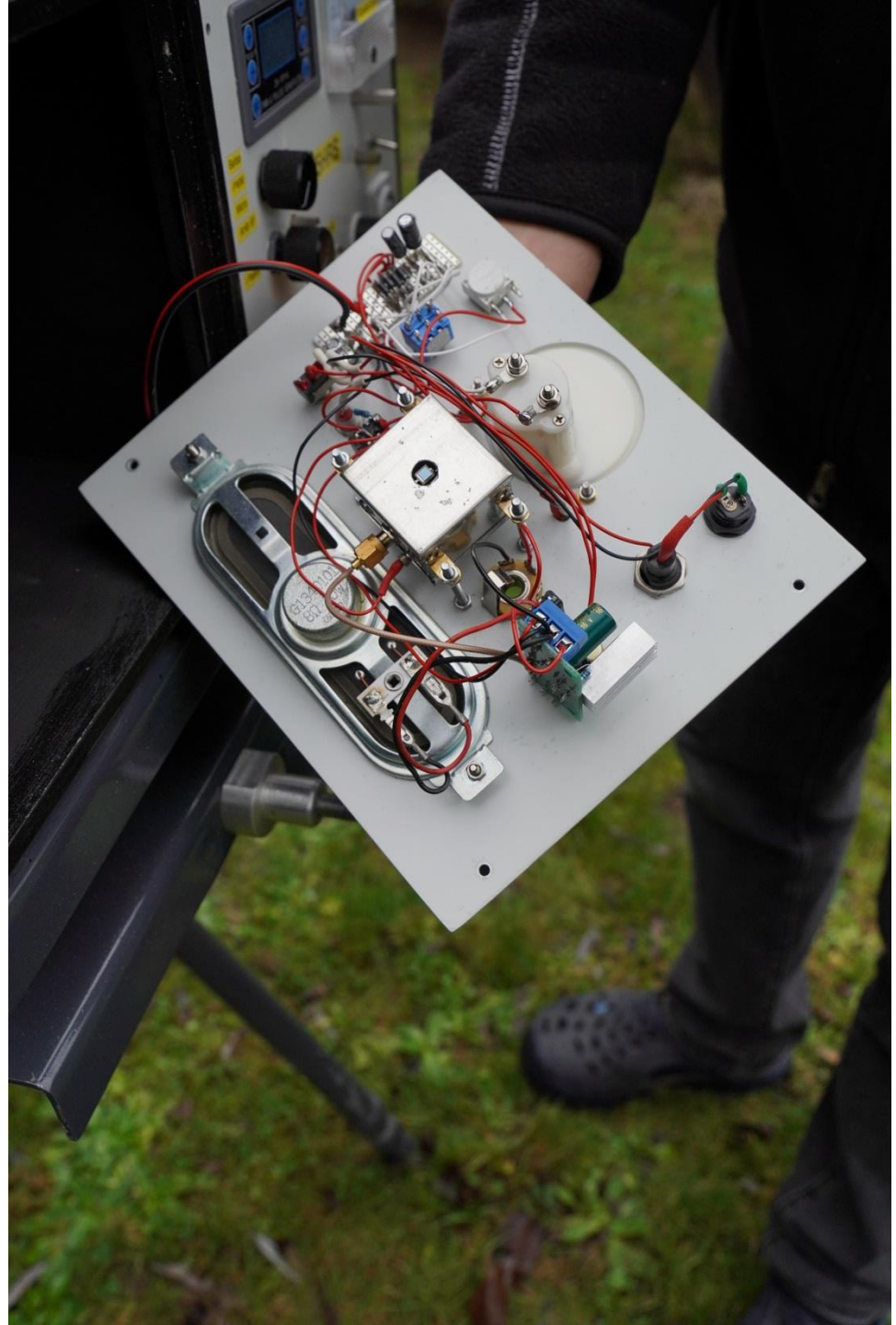


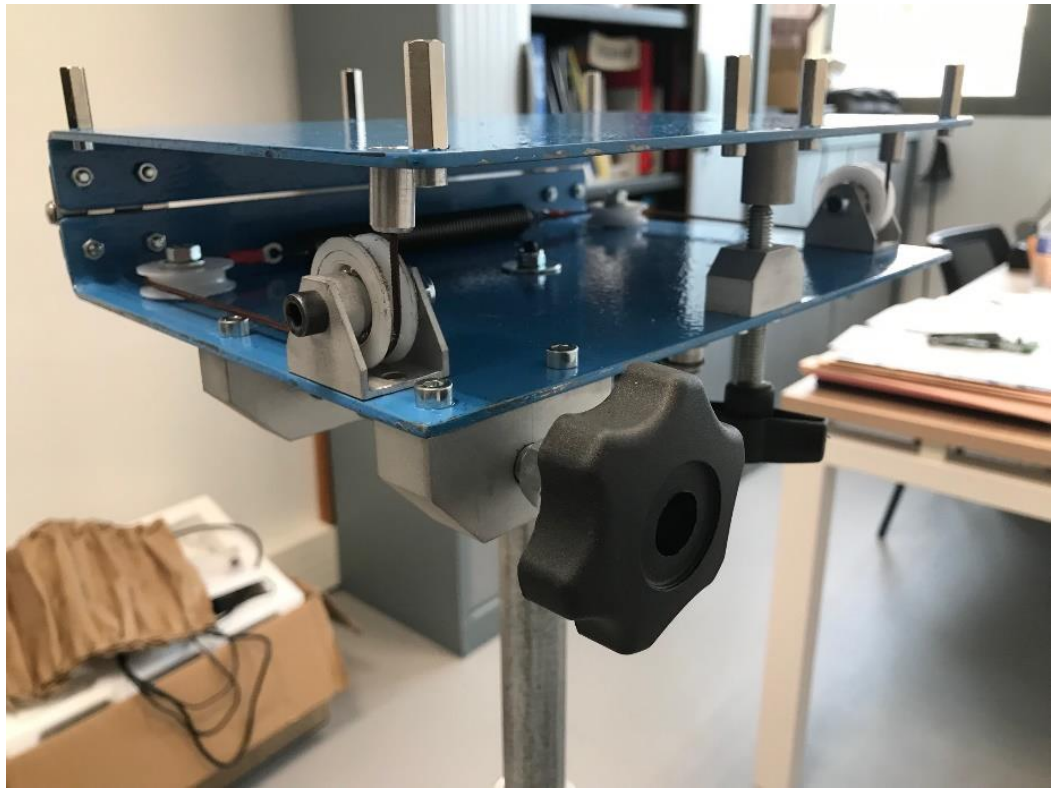


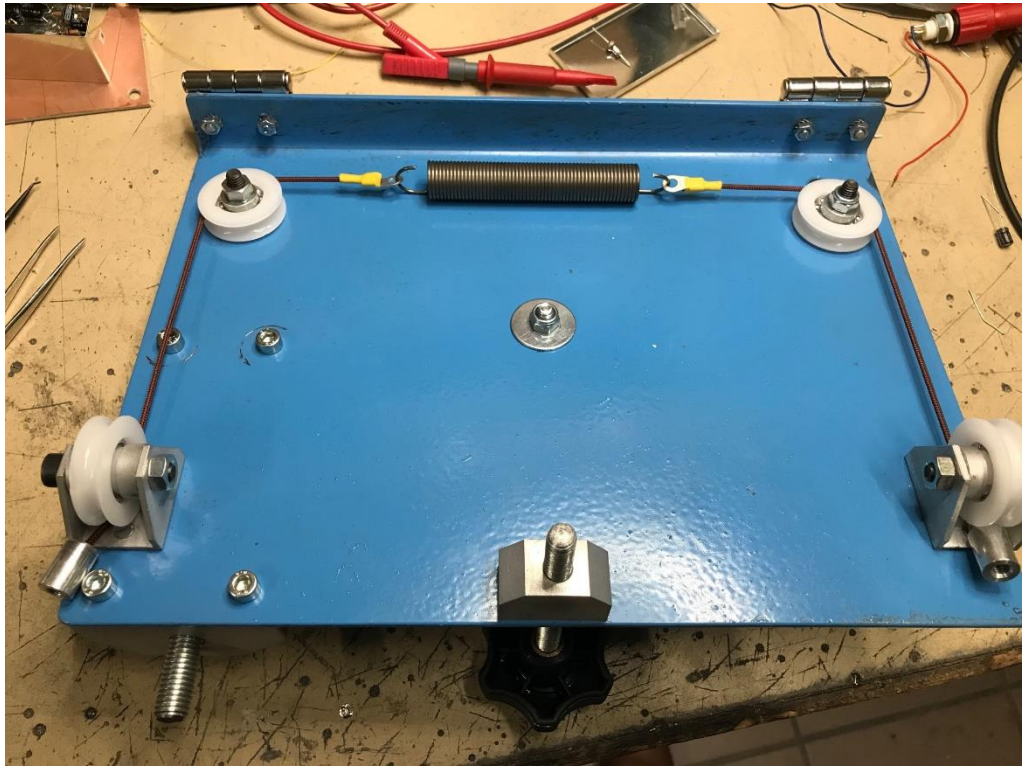


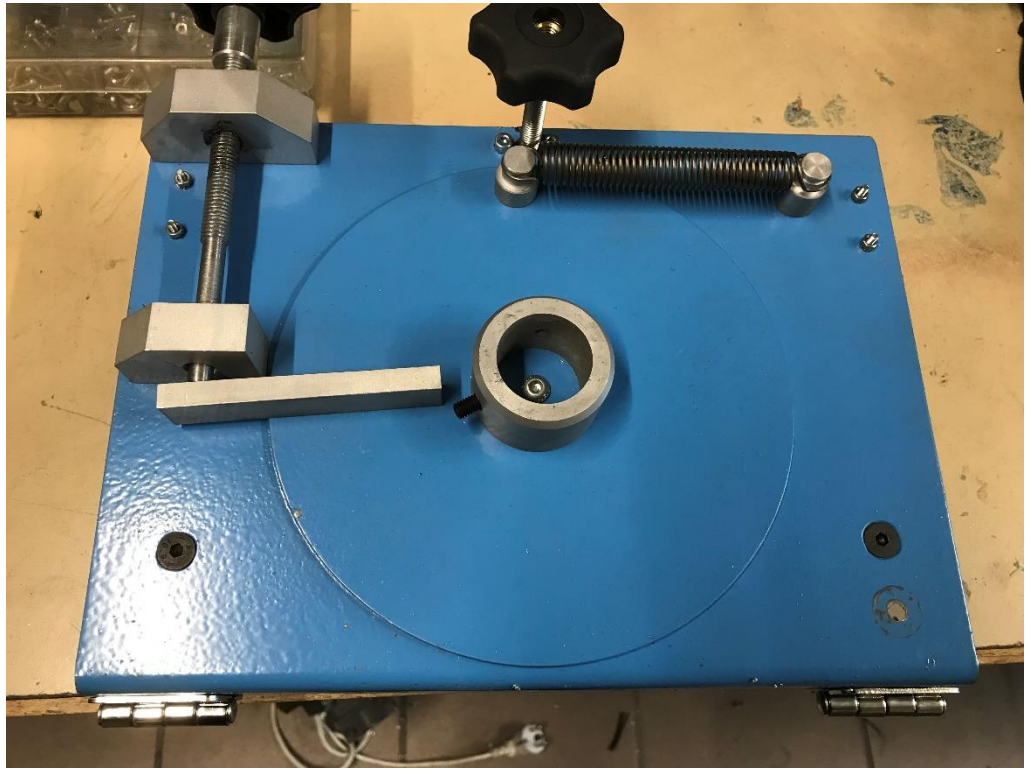

Sensibilité
Normal
Crête
Arrêt
Marche
Eclairage
Récepteur Nanométrique
F5HRS
ZK-PP1K
PWM & PULSE GENERATOR
Courant Diode
F5HRS
Eclairage
Arrêt
Modulation
Marche
Alim. 12 V
Emetteur 650 nm


ZK-PP1K



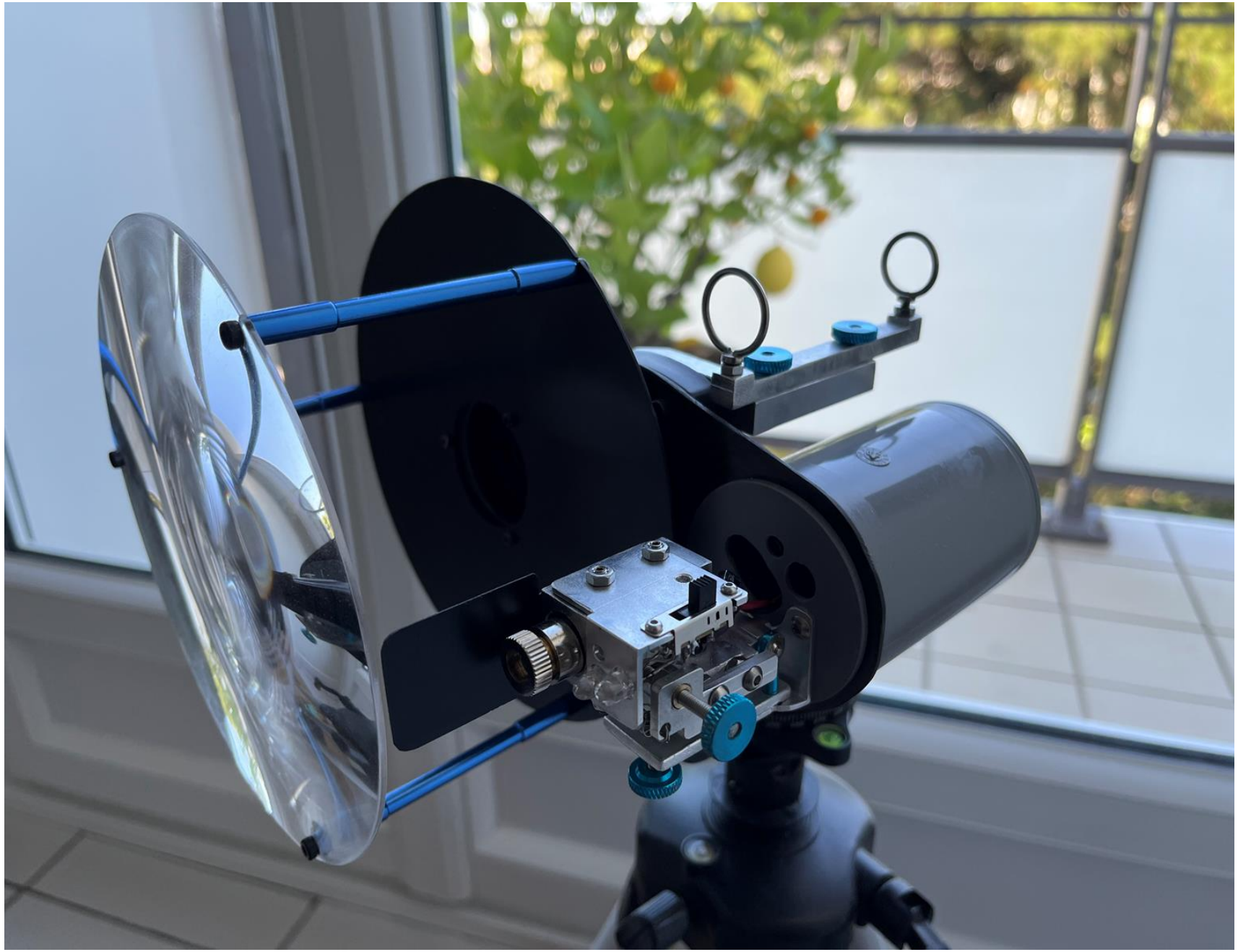


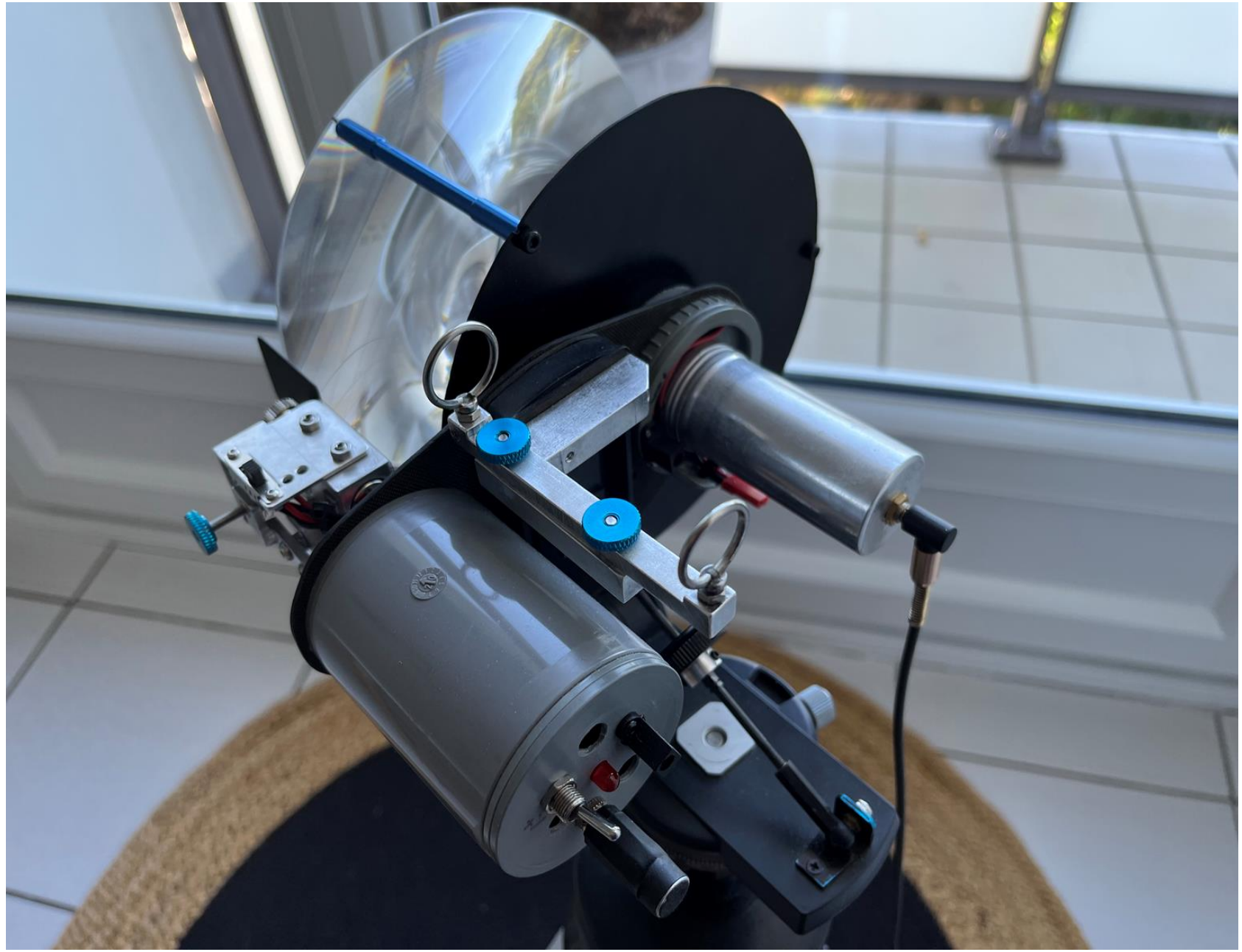


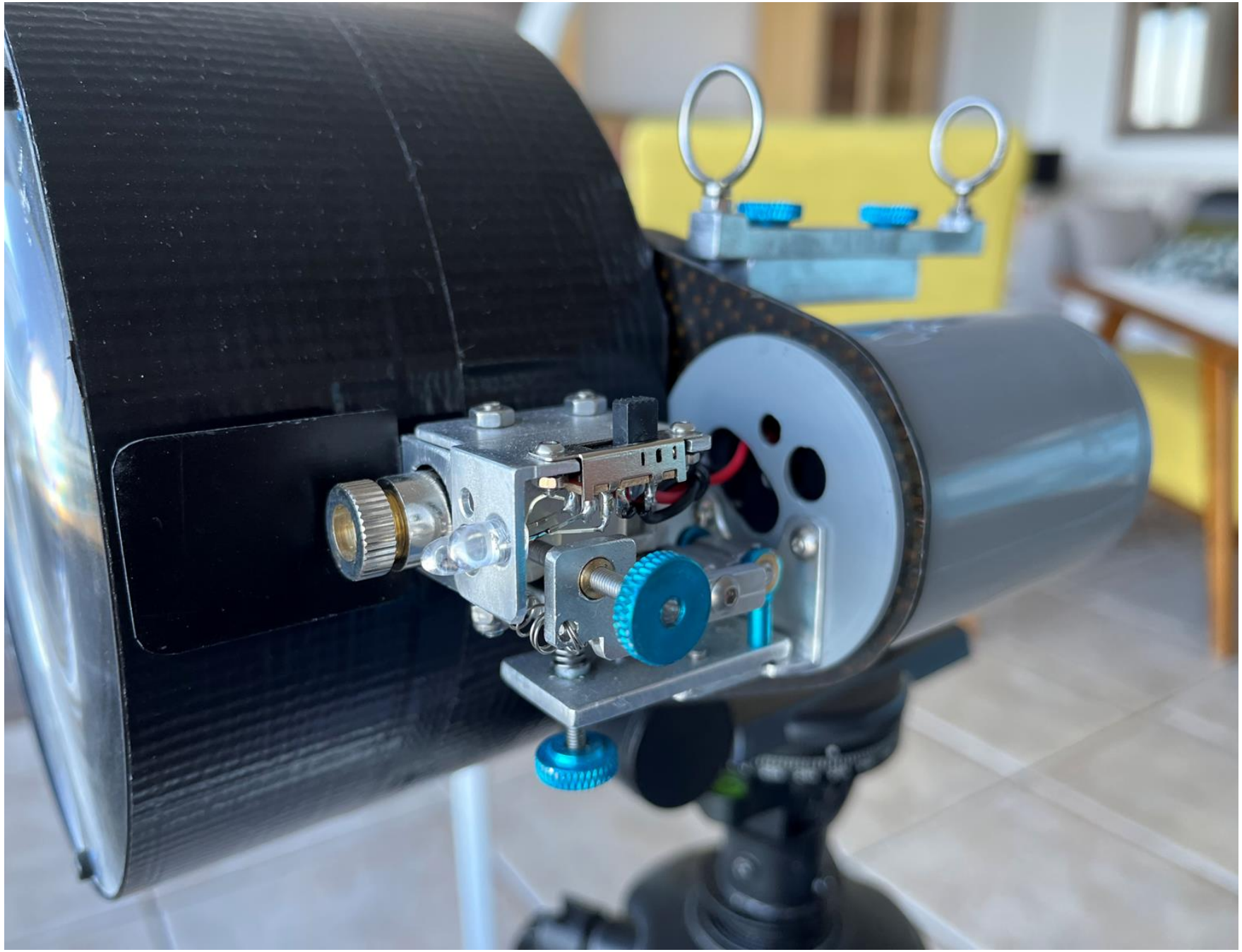


F1PYR en images

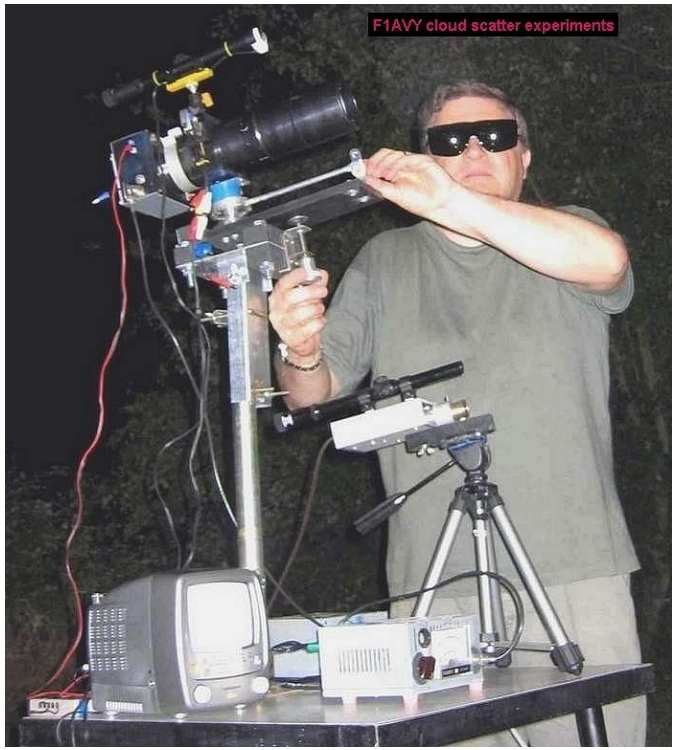
F4FEY en images



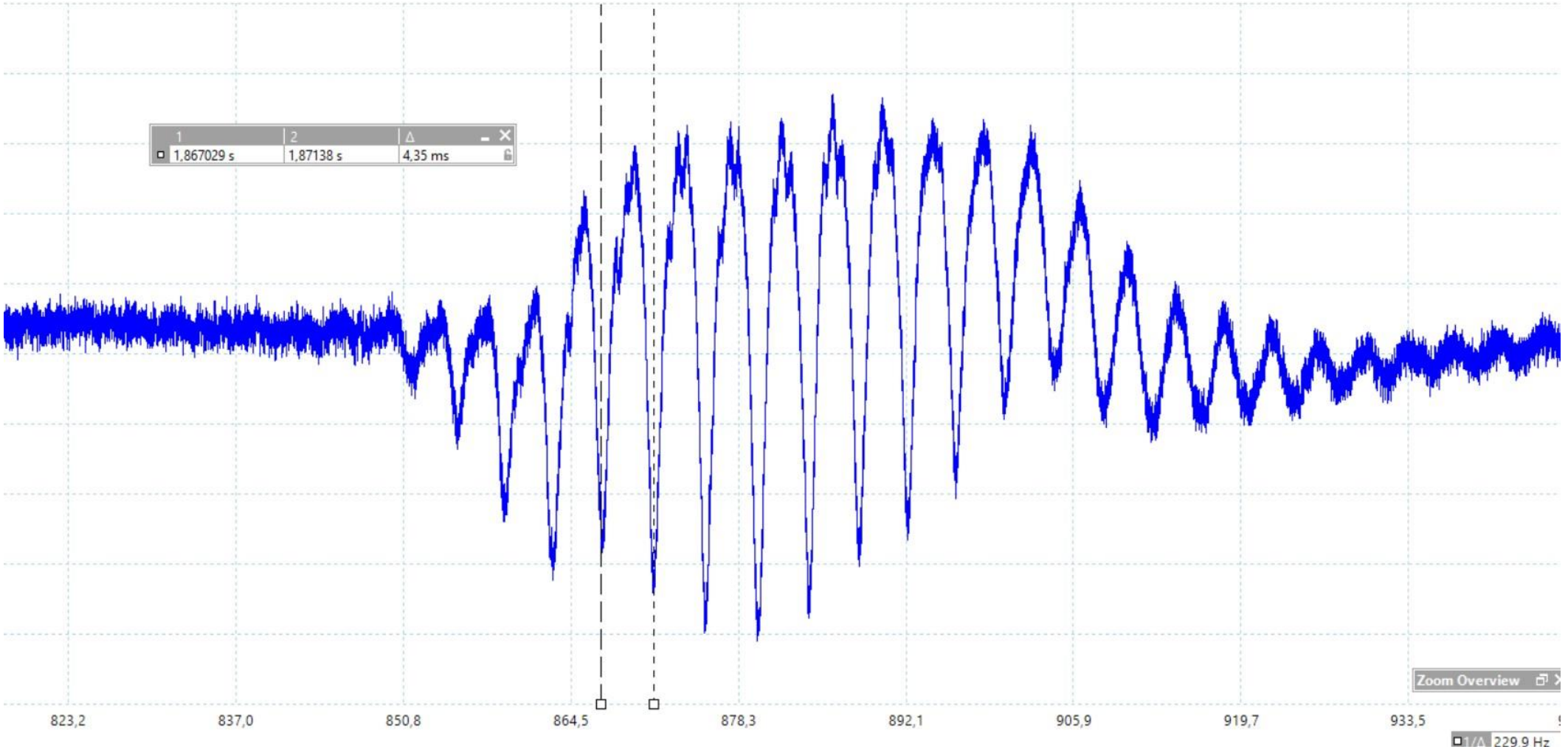




Un grand merci à :
F1AVY Yves et F8DO Marius



Bonus … Les mouches



Dans la littérature…

Applied Physics B (2020) 126:28 https://doi.org/10.1007/s00340-019-7361-2

Applied Physics B
Lasers and Optics

Mosquito counting system based on optical sensing

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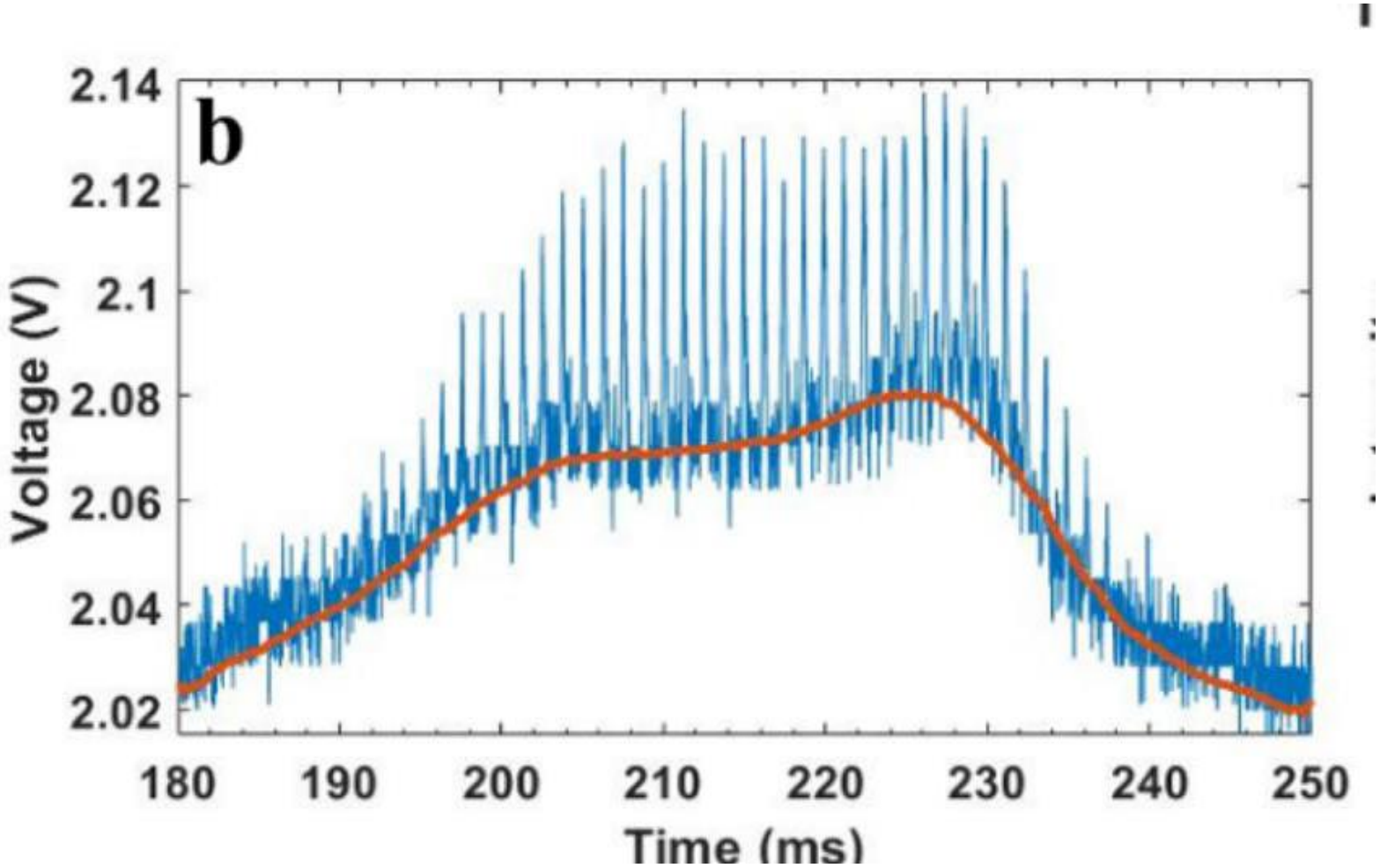
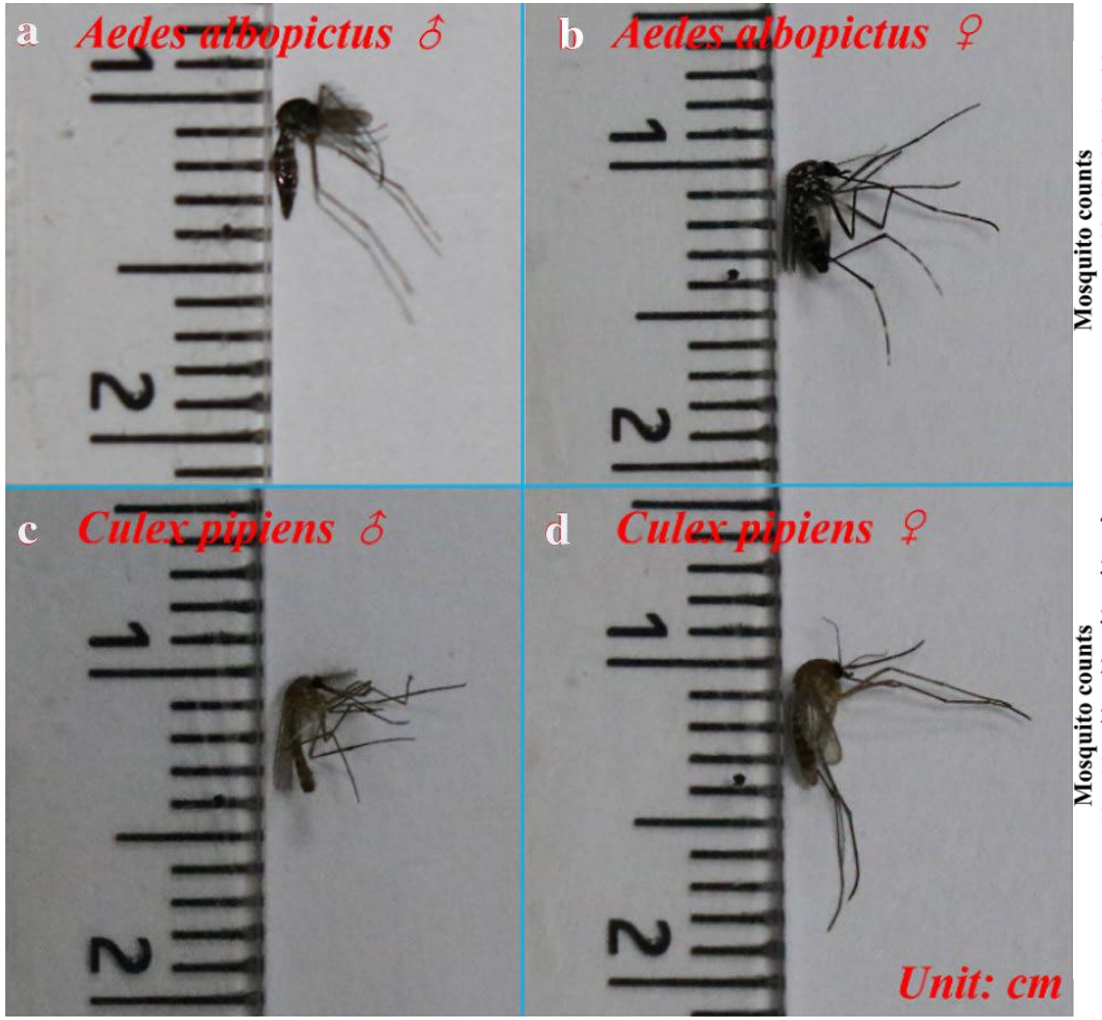
Received: 11 May 2019 / Accepted: 29 November 2019 / Published online: 22 January 2020

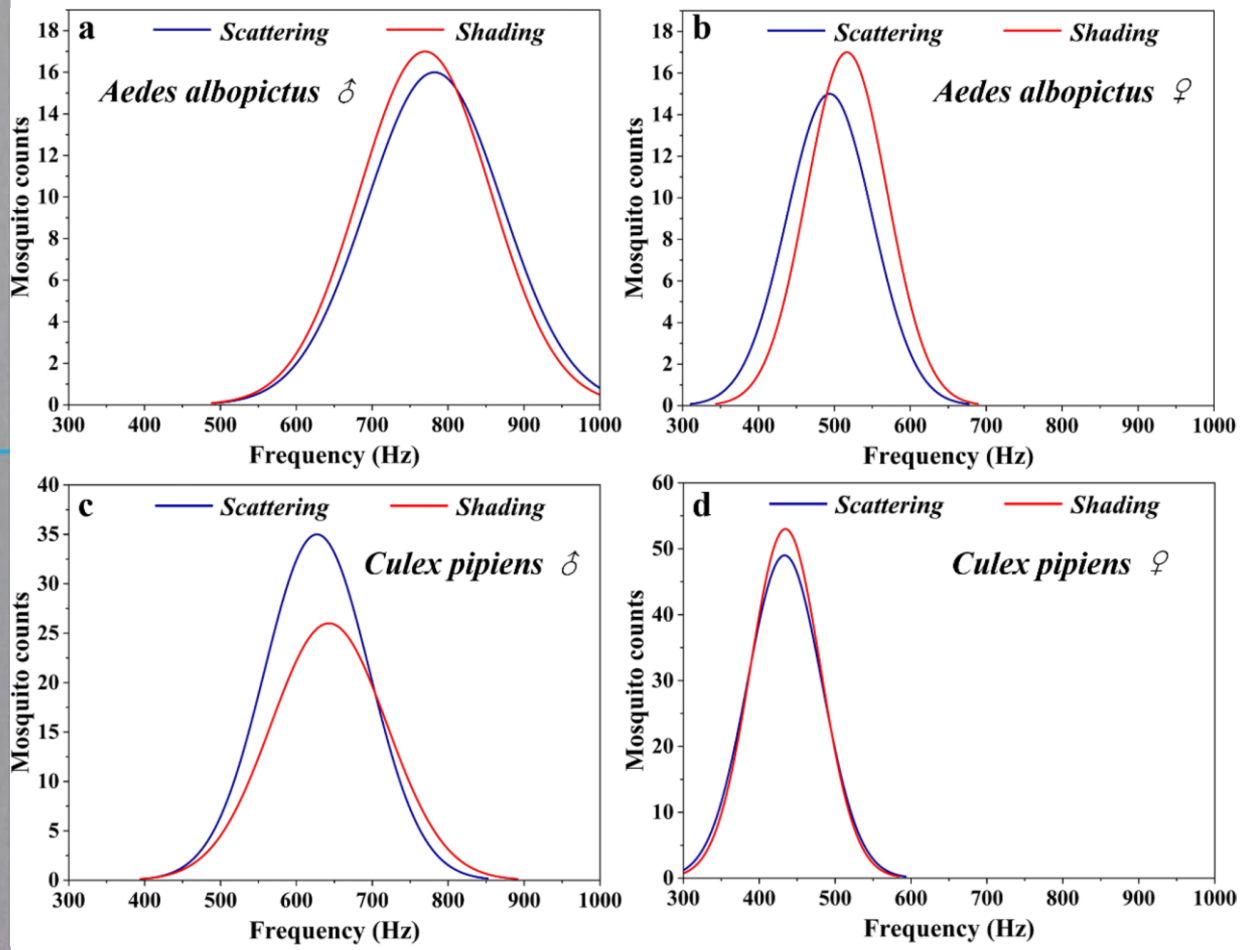
Abstract
Mosquitos, sometimes carrying deadly diseases such as malaria, zika, and dengue fever, cause much concern. To control mosquitos, it is important to effectively monitor their presence and behavioral trends. We have constructed two optical sens- ing systems for insects based on light attenuation and light backscattering, respectively. The systems, which were tested with the potentially dangerous *Aedes albopictus* and *Culex pipiens*, were able to extract the wing-beat frequency, when they passed impinging light, derived from light-emitting diodes. We could achieve distinction between the sexes of *A. albopictus* and *C. pipiens* based on the wing-beat frequency. Finally, we propose a statistical method suitable for the system to improve the accuracy of counting.

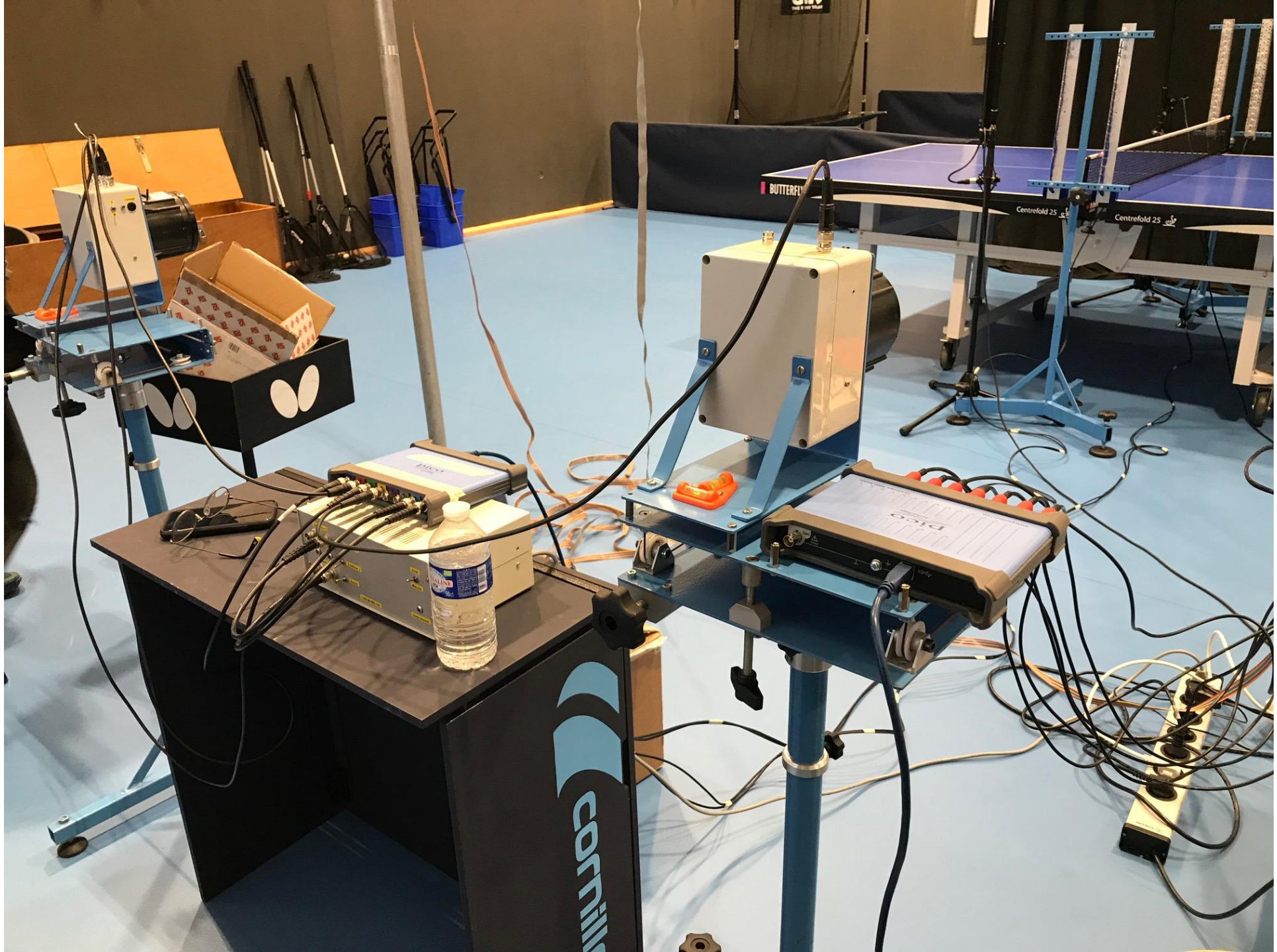
Le vol du moustique…



Dans la littérature…



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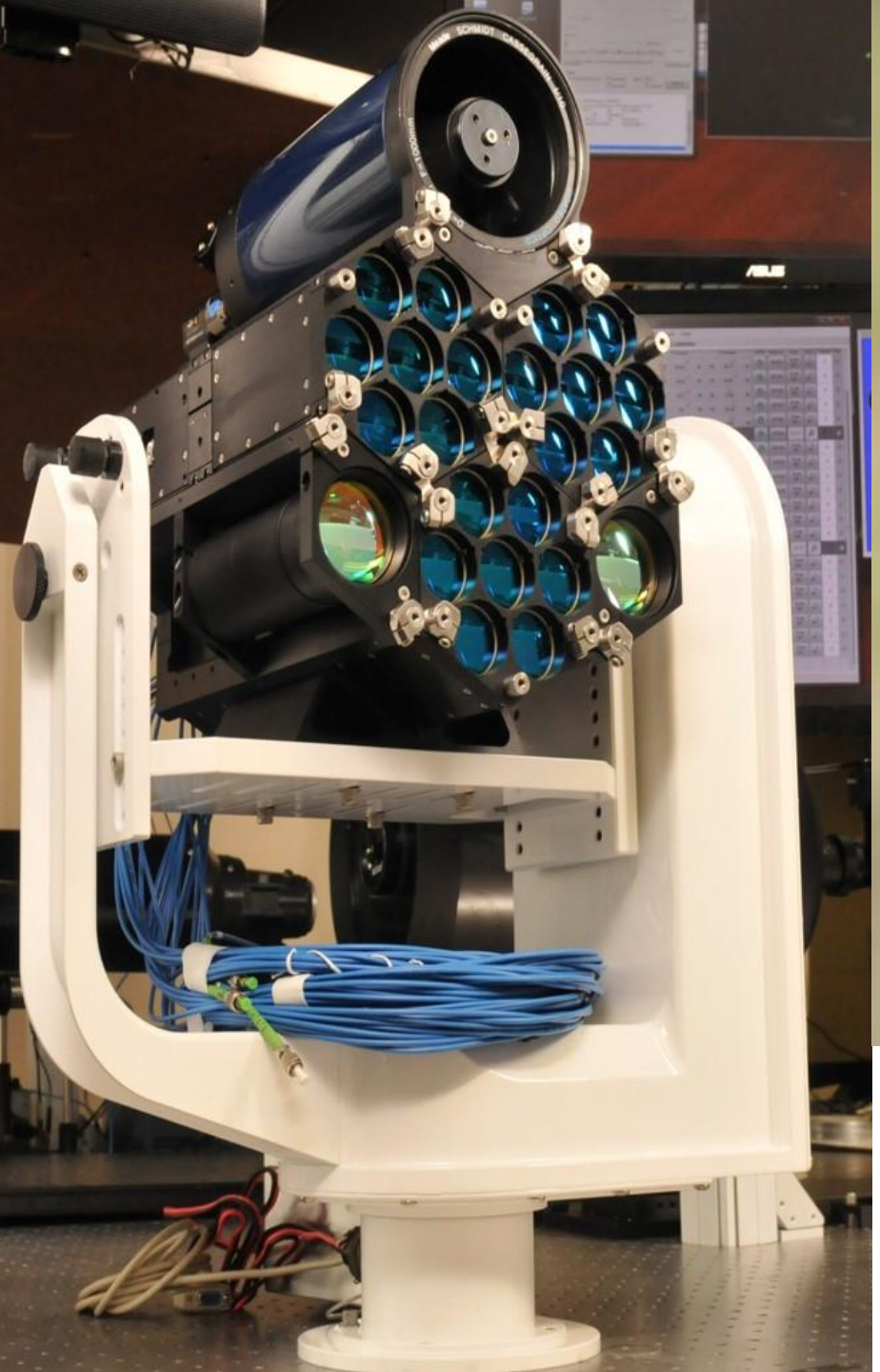
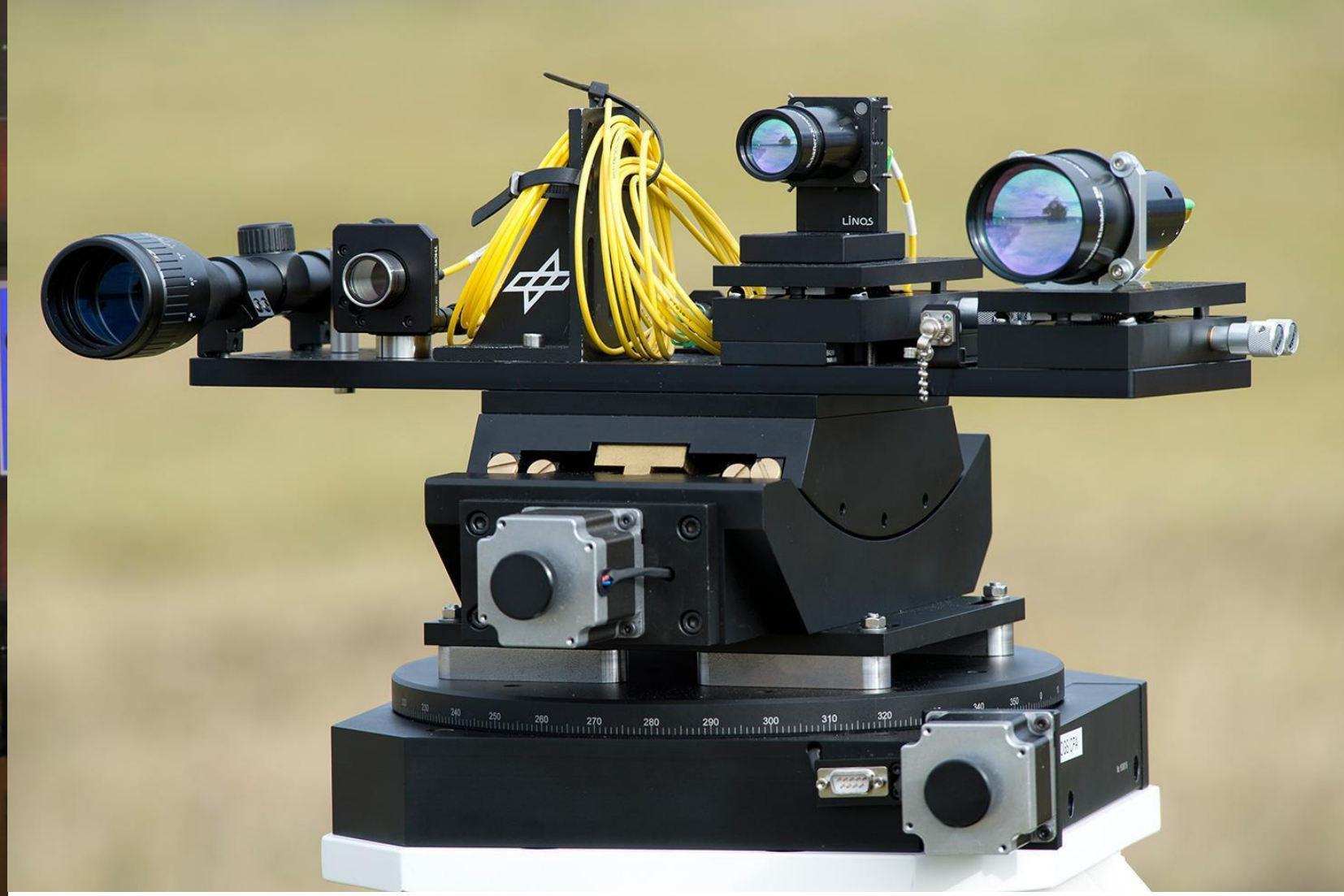
Centrefold 25
pico
pico
cornilleau





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