Plume

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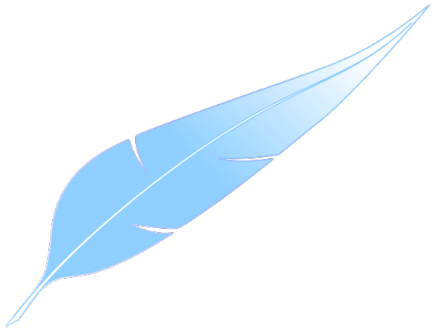
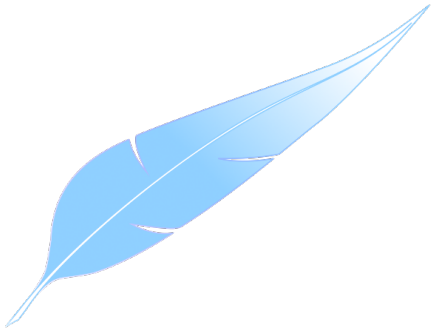


Plume is Localization Using Magnetic Emitters



Pourquoi ?

Pourquoi ?

Motion tracking

Pourquoi ?

Motion tracking

Asservissement

Pourquoi ?

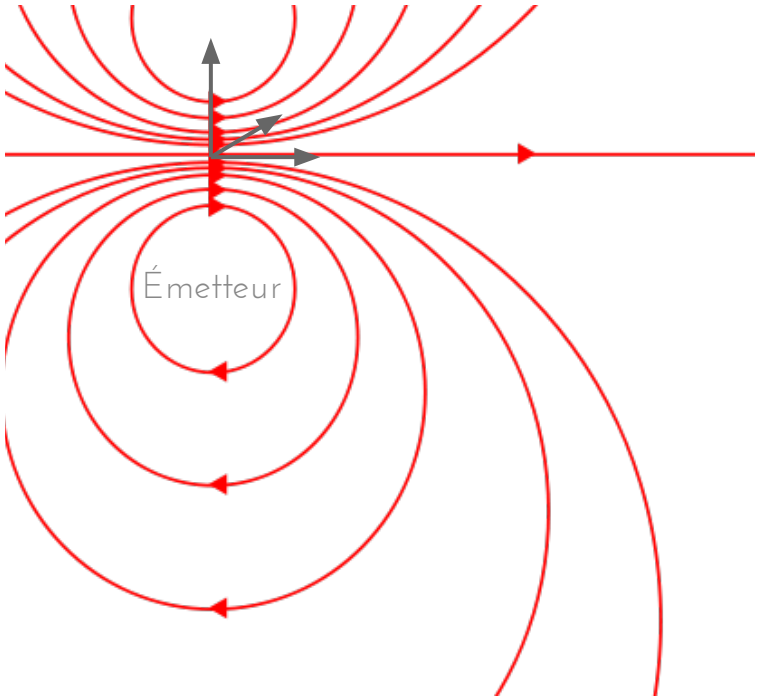
Motion tracking

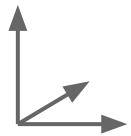
Asservissement

Localisation
en intérieur

Le projet

- Fonctionnement





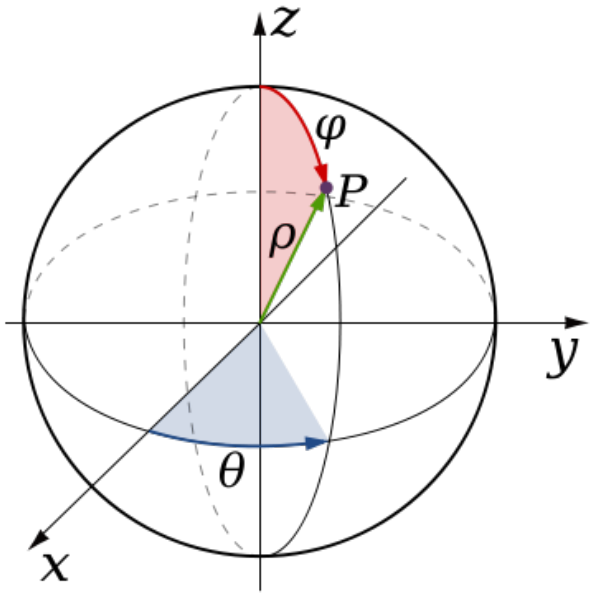
Récepteur

9 mesures de tension

6 degrés de liberté

En équations

L'émission

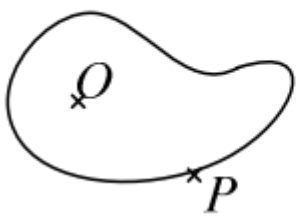


$$\vec{B^{(x)}} = \begin{pmatrix} B_r^{(x)} \\ B_\theta^{(x)} \\ B_\phi^{(x)} \end{pmatrix} = \begin{pmatrix} B_{x'}^{(x)} \\ B_{y'}^{(x)} \\ B_{z'}^{(x)} \end{pmatrix}$$

$$\vec{B^{(y)}} = \begin{pmatrix} B_r^{(y)} \\ B_\theta^{(y)} \\ B_\phi^{(y)} \end{pmatrix} = \begin{pmatrix} B_{x'}^{(y)} \\ B_{y'}^{(y)} \\ B_{z'}^{(y)} \end{pmatrix}$$

$$\vec{B^{(z)}} = \begin{pmatrix} B_r^{(z)} \\ B_\theta^{(z)} \\ B_\phi^{(z)} \end{pmatrix} = \begin{pmatrix} B_{x'}^{(z)} \\ B_{y'}^{(z)} \\ B_{z'}^{(z)} \end{pmatrix}$$

En équations



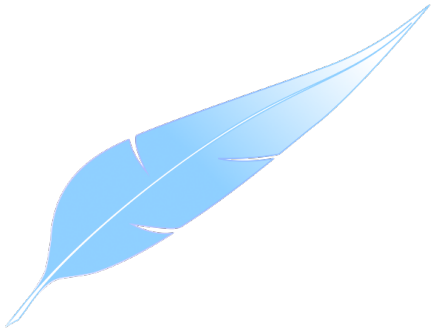
$$\overrightarrow{A}(M) = \frac{\mu_0}{4\pi r} \iiint_{\mathcal{V}} \overrightarrow{j_P}\, \mathrm{d}\mathcal{V} + \frac{\mu_0}{4\pi r^2} \iiint_{\mathcal{V}} \overrightarrow{j_P}\, (\overrightarrow{u} \cdot \overrightarrow{r_P})\, \mathrm{d}\mathcal{V}$$

$$= \frac{\mu_0 I}{4\pi} \iint_S d\vec{S} \wedge \underbrace{\vec{\nabla}_p \frac{1}{r'}}_{= \frac{\vec{r}'}{r'^3} \approx \frac{\vec{r}}{r^3}} = \frac{\mu_0 I}{4\pi} \iint_S d\vec{S} \wedge \frac{\vec{r}}{r^3} = \frac{\mu_0 I}{4\pi} \left(\iint_S d\vec{S} \right) \wedge \frac{\vec{r}}{r^3}$$

En équations

$$\vec{B^{(z)}} = \begin{pmatrix} B_r^{(z)} \\ B_\theta^{(z)} \\ B_\phi^{(z)} \end{pmatrix} = \begin{pmatrix} \frac{\mu_0}{4\pi}\frac{2M^{(z)}cos(\theta)}{r^3} \\ \frac{\mu_0}{4\pi}\frac{M^{(z)}sin(\theta)}{r^3} \\ 0 \end{pmatrix} = \begin{pmatrix} \frac{2G^{(z)}cos(\theta)}{r^3} \\ \frac{G^{(z)}sin(\theta)}{r^3} \\ 0 \end{pmatrix}$$

$$\begin{aligned} \left|B^{(i)}\right|^2 &= \left(G^{(i)}\right)^2 \frac{1}{r^6}\left(sin(\theta)^2 + 4cos(\theta)^2\right) \\ &= \left(G^{(i)}\right)^2 \frac{1}{r^6}\left(1 + 3cos(\theta)^2\right) \\ &= \left(G^{(i)}\right)^2 \frac{1}{r^6}\left(1 + 3\left(\frac{\vec{OM}\cdot\vec{e_i}}{|\vec{OM}|}\right)^2\right) \end{aligned}$$

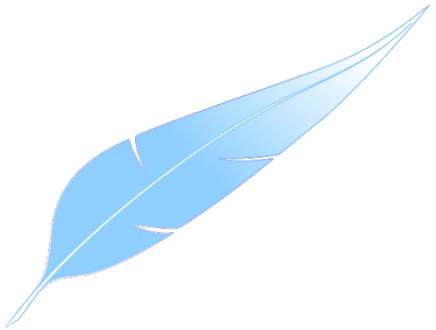


En équations

$$\left|B^{(x)}\right|^2 = \left(G^{(x)}\right)^2 \frac{1}{r^6}\left(1+3\frac{x^2}{r^2}\right)$$

$$\left|B^{(y)}\right|^2 = \left(G^{(y)}\right)^2 \frac{1}{r^6}\left(1+3\frac{y^2}{r^2}\right)$$

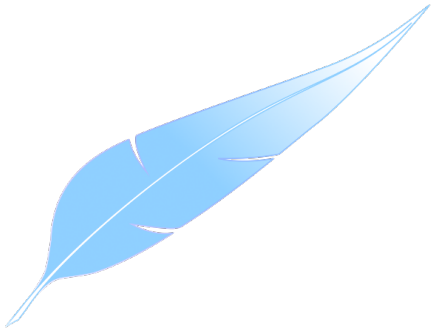
$$\left|B^{(z)}\right|^2 = \left(G^{(z)}\right)^2 \frac{1}{r^6}\left(1+3\frac{z^2}{r^2}\right)$$



En équations

$$\vec{V^{(i)}} = \begin{pmatrix} V_{x'}^{(i)} \\ V_{y'}^{(i)} \\ V_{z'}^{(i)} \end{pmatrix} = \begin{pmatrix} \frac{\partial \vec{B^{(i)}}}{\partial t} \cdot \vec{S_{x'}} \\ \frac{\partial \vec{B^{(i)}}}{\partial t} \cdot \vec{S_{y'}} \\ \frac{\partial \vec{B^{(i)}}}{\partial t} \cdot \vec{S_{z'}} \end{pmatrix}$$

$$= \begin{pmatrix} \vec{S_{x'}} \\ \vec{S_{y'}} \\ \vec{S_{z'}} \end{pmatrix} \cdot \frac{\partial \vec{B^{(i)}}}{\partial t} = \begin{pmatrix} \vec{S_{x'}} \\ \vec{S_{y'}} \\ \vec{S_{z'}} \end{pmatrix} \cdot j\omega^{(i)} \vec{B^{(i)}}$$



En équations

$$r = \sqrt[6]{\frac{6}{\frac{\left|B^{(x)}\right|^2}{\left(G^{(x)}\right)^2} + \frac{\left|B^{(y)}\right|^2}{\left(G^{(y)}\right)^2} + \frac{\left|B^{(z)}\right|^2}{\left(G^{(z)}\right)^2}}}$$

$$= \sqrt[6]{\frac{6}{\left|\frac{V^{(x)}_{x'}}{S_{x'}\omega^{(x)}G^{(x)}}\right|^2 + \left|\frac{V^{(x)}_{y'}}{S_{y'}\omega^{(x)}G^{(x)}}\right|^2 + \left|\frac{V^{(x)}_{z'}}{S_{z'}\omega^{(x)}G^{(x)}}\right|^2 + \left|\frac{V^{(y)}_{x'}}{S_{x'}\omega^{(y)}G^{(y)}}\right|^2 + \left|\frac{V^{(y)}_{y'}}{S_{y'}\omega^{(y)}G^{(y)}}\right|^2 + \left|\frac{V^{(y)}_{z'}}{S_{z'}\omega^{(y)}G^{(y)}}\right|^2 + \left|\frac{V^{(z)}_{x'}}{S_{x'}\omega^{(z)}G^{(z)}}\right|^2 + \left|\frac{V^{(z)}_{y'}}{S_{y'}\omega^{(z)}G^{(z)}}\right|^2}}$$

$$= \sqrt[6]{\frac{6}{\left|\left|\begin{pmatrix} G^{(x)} & 0 & 0 \\ 0 & G^{(y)} & 0 \\ 0 & 0 & G^{(z)} \end{pmatrix}^{-1} \cdot \begin{pmatrix} \omega^{(x)} & 0 & 0 \\ 0 & \omega^{(y)} & 0 \\ 0 & 0 & \omega^{(z)} \end{pmatrix}^{-1} \cdot \begin{pmatrix} V^{(x)}_{x'} & V^{(y)}_{x'} & V^{(z)}_{x'} \\ V^{(x)}_{y'} & V^{(y)}_{y'} & V^{(z)}_{y'} \\ V^{(x)}_{z'} & V^{(y)}_{z'} & V^{(z)}_{z'} \end{pmatrix} \cdot \begin{pmatrix} S_{x'} & 0 & 0 \\ 0 & S_{y'} & 0 \\ 0 & 0 & S_{z'} \end{pmatrix}^{-1}\right|\right|^2}}$$

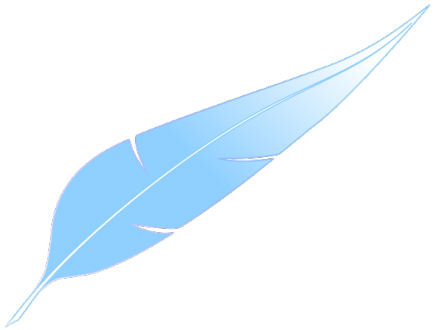
$$= \sqrt[6]{\frac{6}{||\mathbf{G}\cdot\mathbf{\Omega}\cdot\mathbf{V}\cdot\mathbf{S}||^2}}$$

En équations

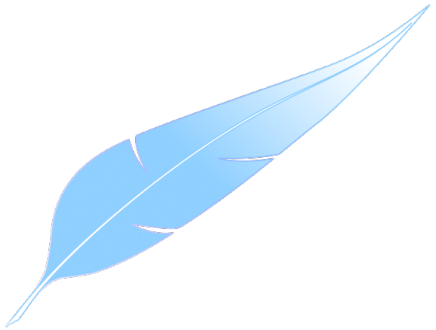
$$x = \sqrt{\frac{r^2}{3}\left(\frac{\left|B^{(x)}\right|^2 r^6}{\left(\frac{\mu_0 M^{(x)}}{4\pi}\right)^2} - 1\right)}$$

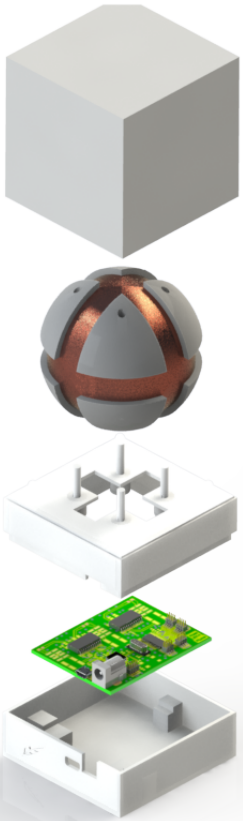
$$y = \sqrt{\frac{r^2}{3}\left(\frac{\left|B^{(y)}\right|^2 r^6}{\left(\frac{\mu_0 M^{(y)}}{4\pi}\right)^2} - 1\right)}$$

$$z = \sqrt{\frac{r^2}{3}\left(\frac{\left|B^{(z)}\right|^2 r^6}{\left(\frac{\mu_0 M^{(z)}}{4\pi}\right)^2} - 1\right)}$$

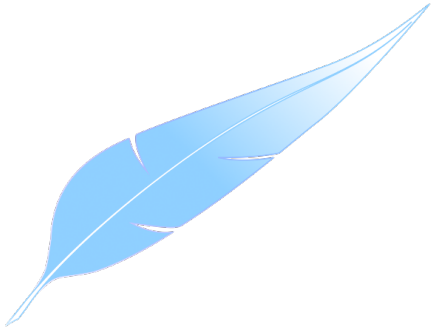


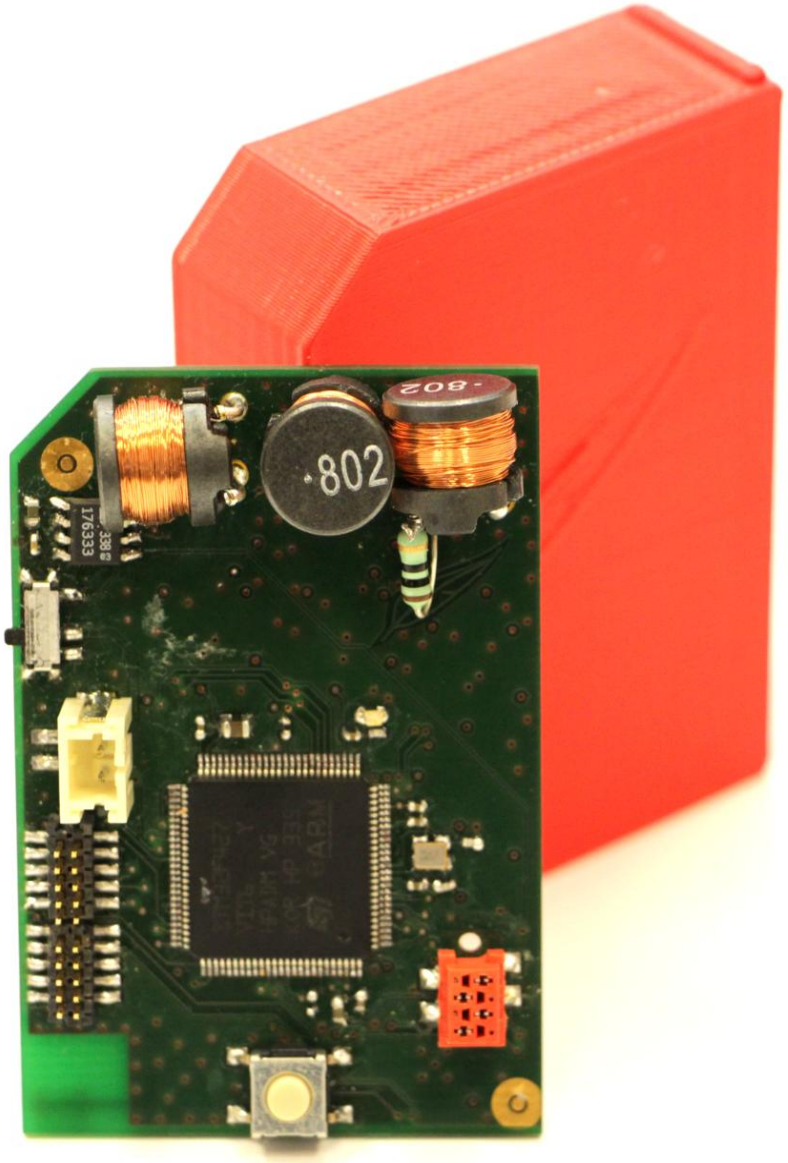
L'émetteur



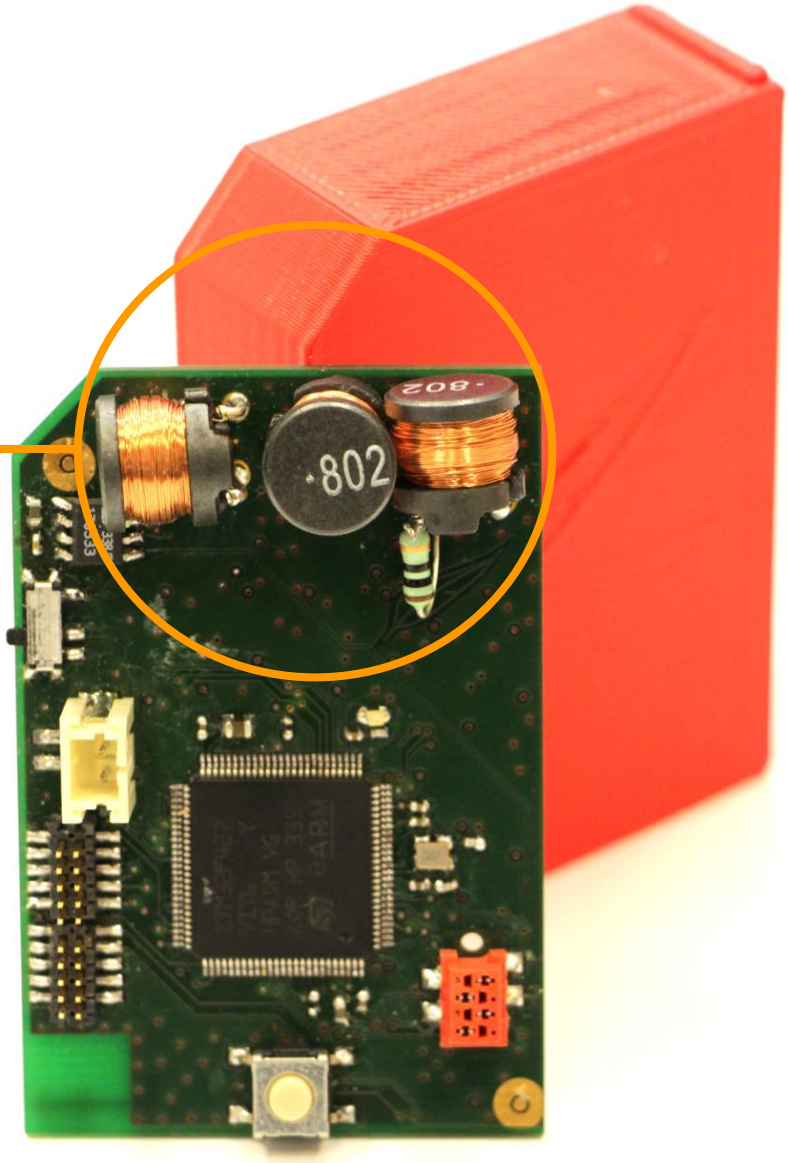


Les plumes

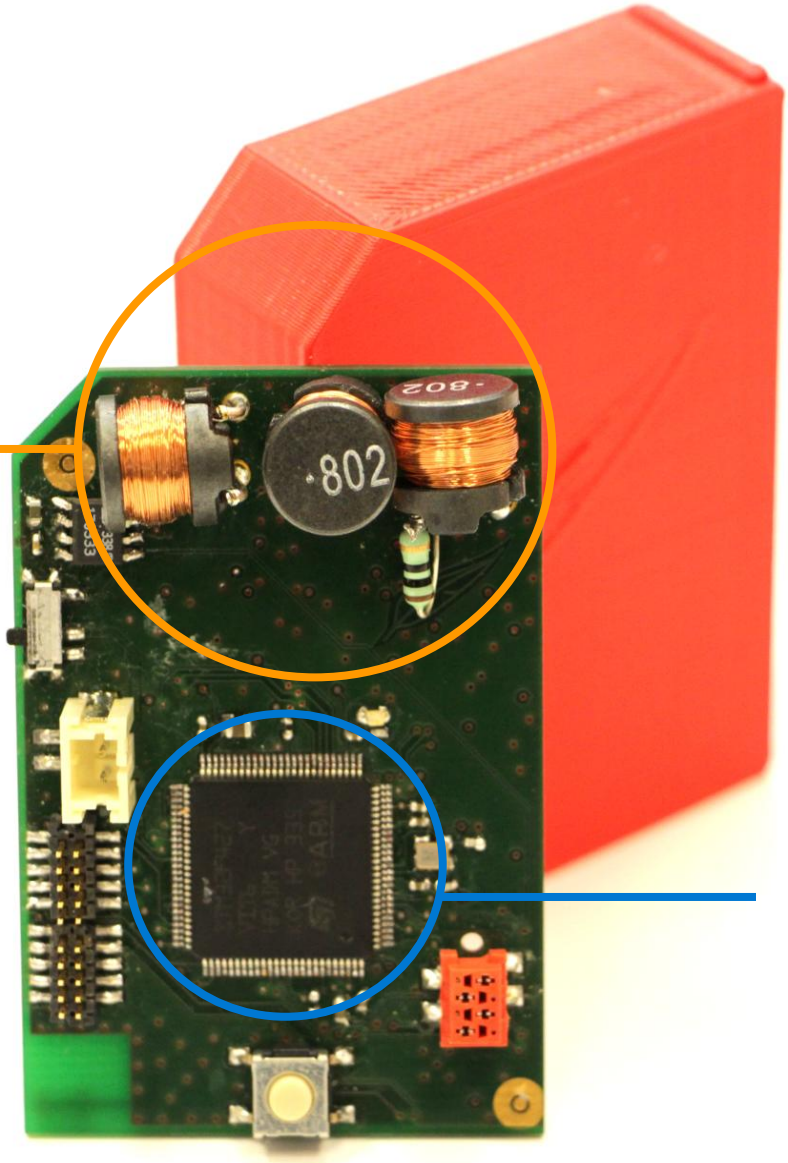



802

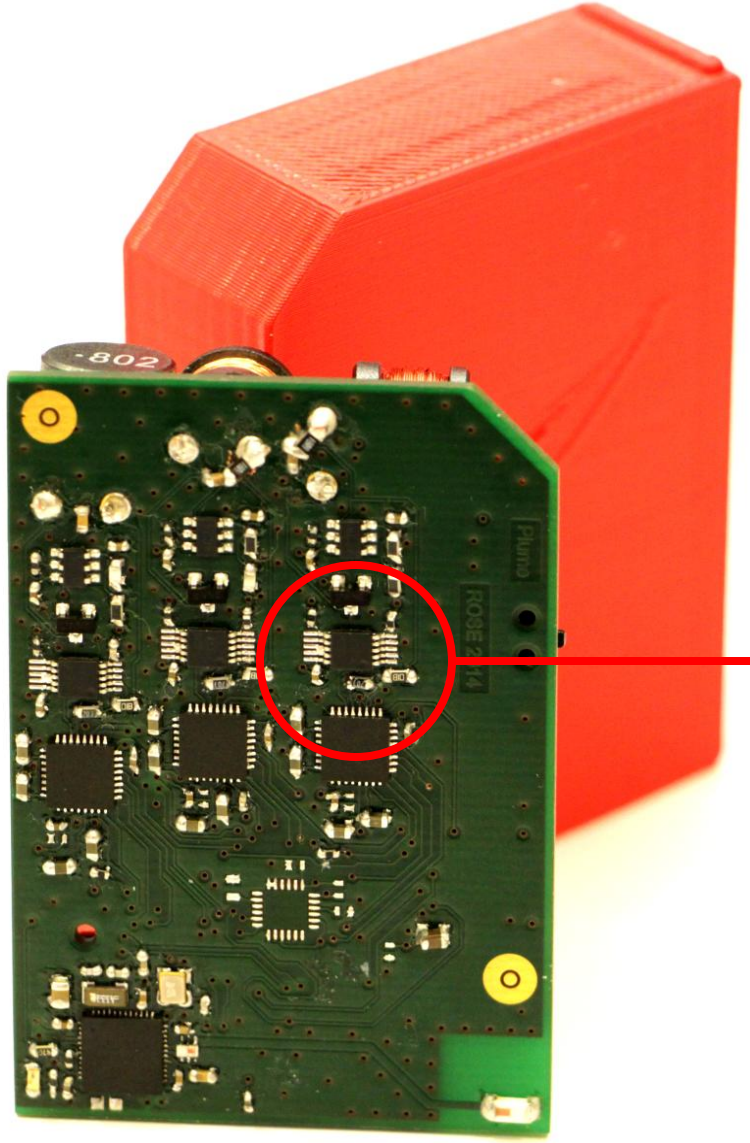
Bobines
réceptrices

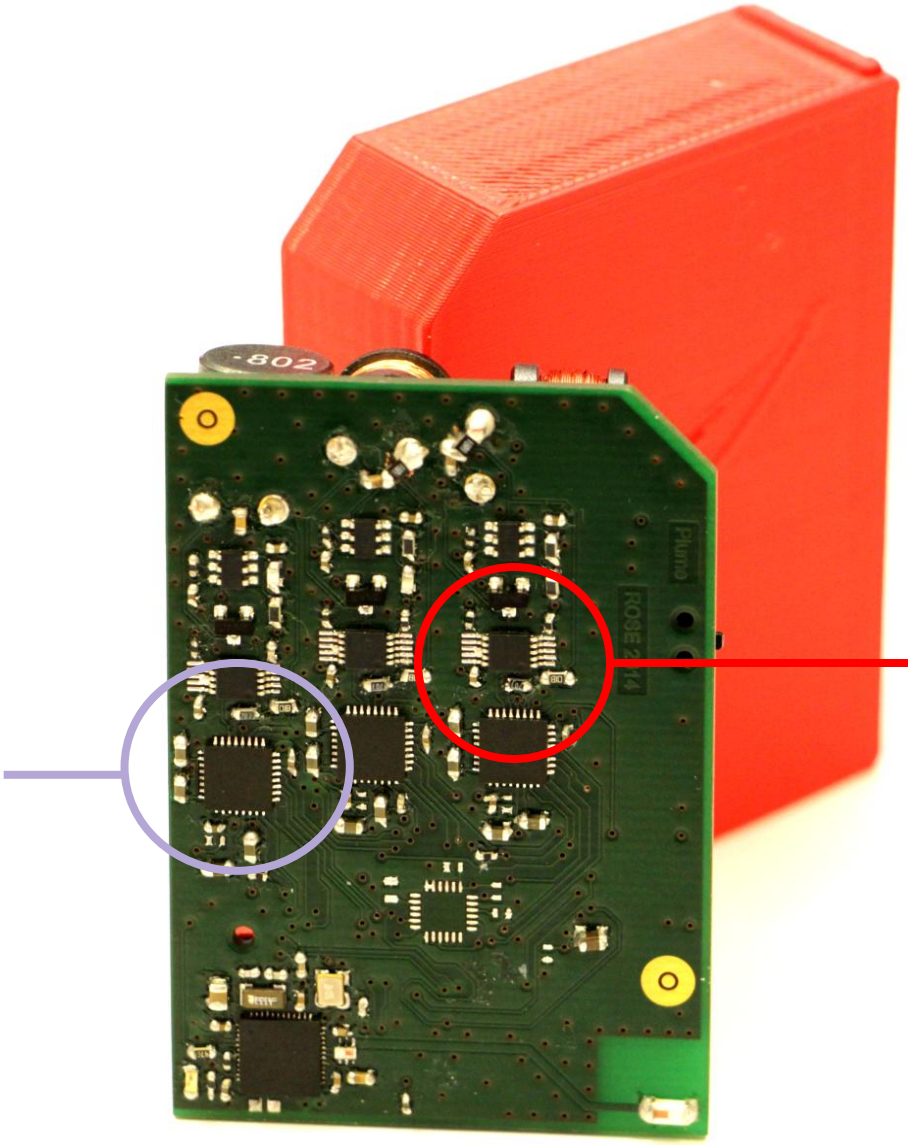


Bobines
réceptrices



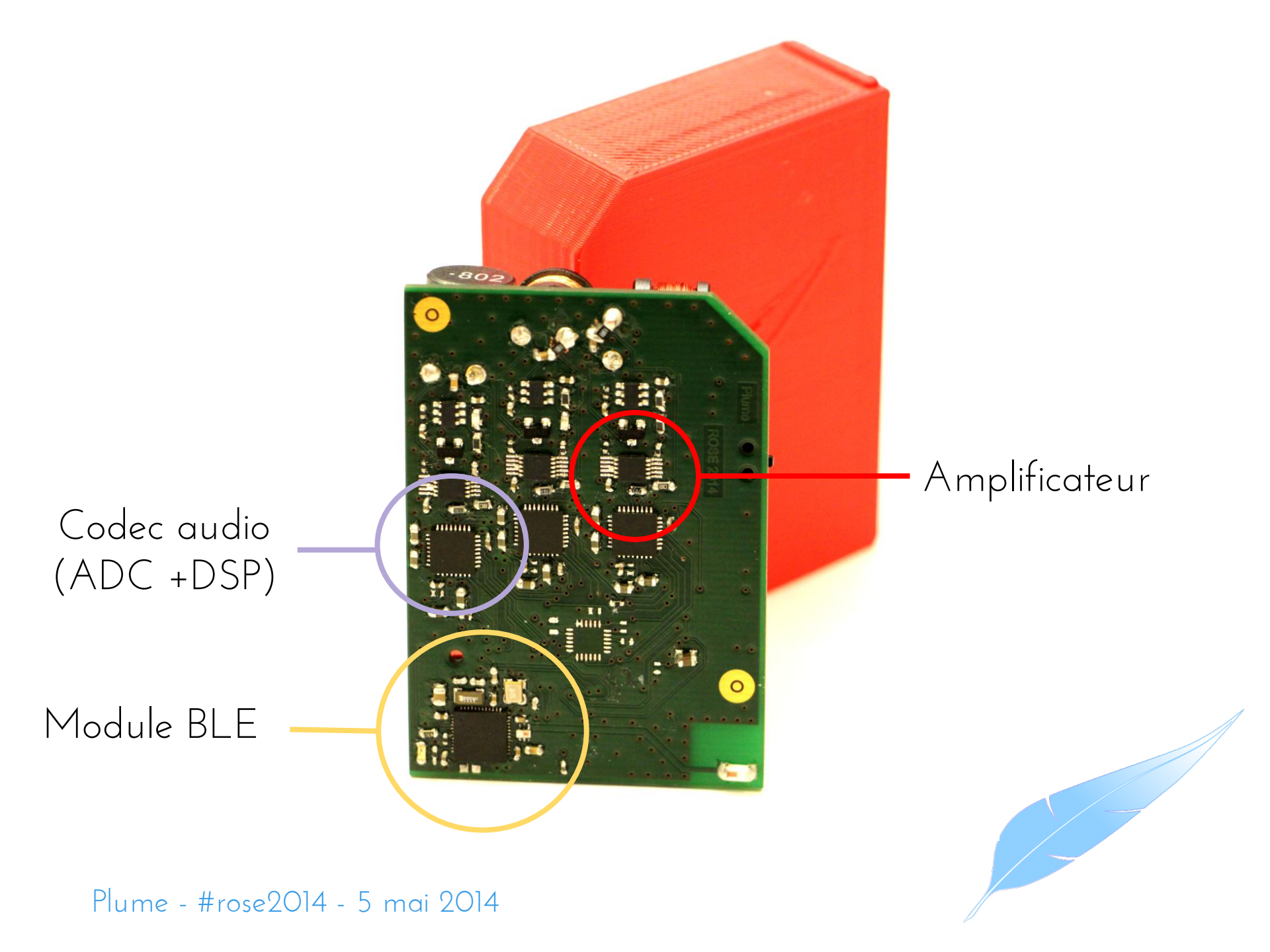
Micro-contrôleur

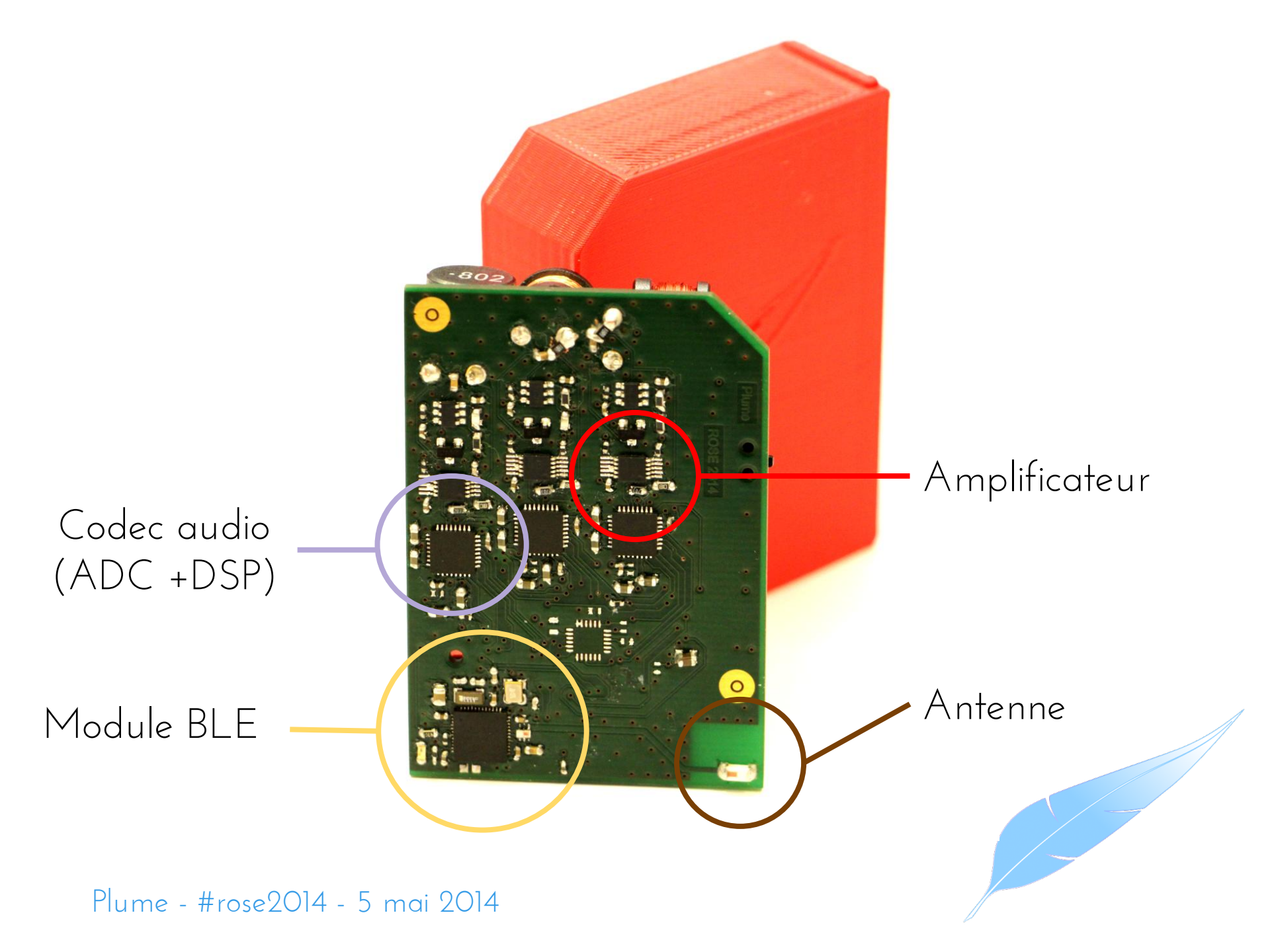

Amplificateur



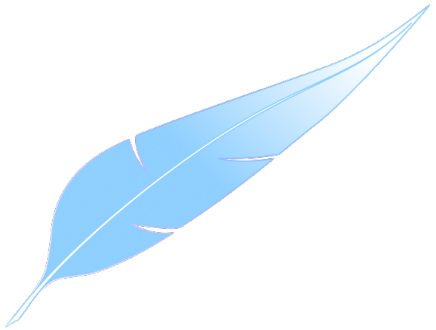
Codec audio
(ADC + DSP)

Amplificateur


Amplificateur
Codec audio
(ADC +DSP)
Module BLE

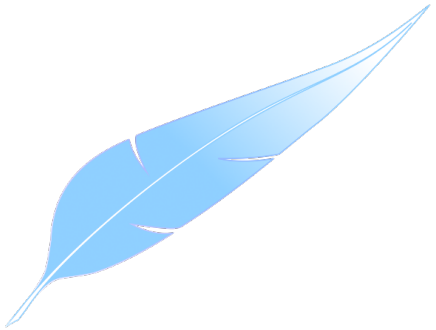

Amplificateur
Codec audio
(ADC +DSP)
Module BLE
Antenne

Plume c'est...



Plume c'est...

5 personnes

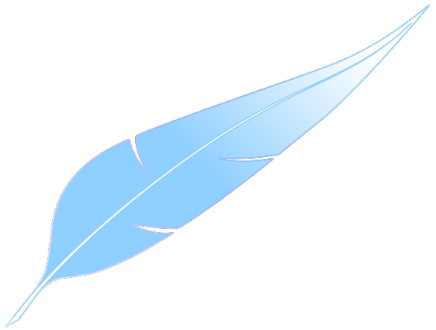


Plume c'est...

15 bobines

212 composants

5 personnes



Plume c'est...

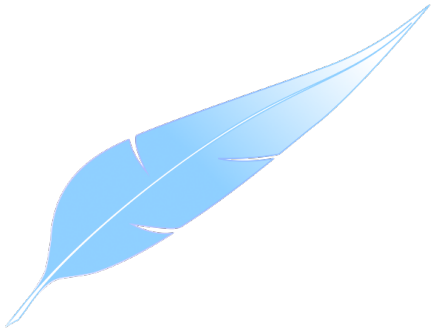
6 PCB

15 bobines

212 composants

5 personnes

2 professeurs



Plume c'est...

6 PCB

15 bobines

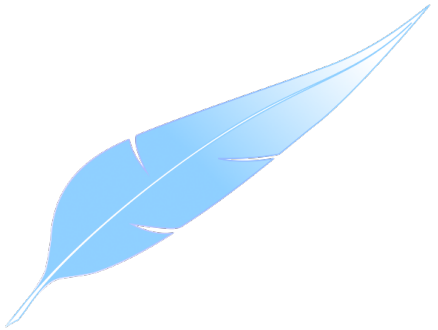
4 récepteurs

212 composants

5 personnes

41 jours

2 professeurs



Plume c'est...

6 PCB

15 bobines

4 leds

212 composants

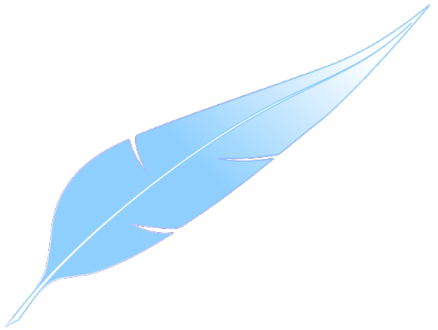
4 récepteurs

5 personnes

1 émetteur

41 jours

2 professeurs



Plume c'est...

6 PCB

15 bobines

1 imprimante 3D

1 train

4 leds

212 composants

4 récepteurs

5 personnes

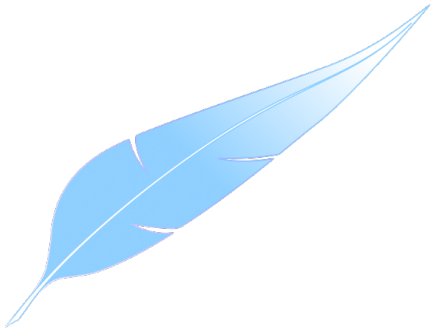
1 émetteur

41 jours

Des ballons

2 professeurs

Des drop's



Plume c'est...

6 PCB

1 bus SAI

15 bobines

1 imprimante 3D

1 train

4 leds

1 naissance

212 composants

4 récepteurs

5 personnes

42 branches

10 levers de soleil cumulés en A406

1 émetteur

41 jours

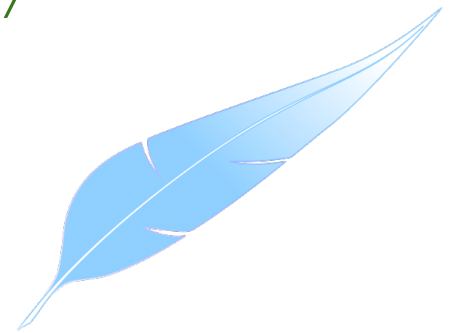
Des ballons

1 futur boys band

2 professeurs

Des drop's

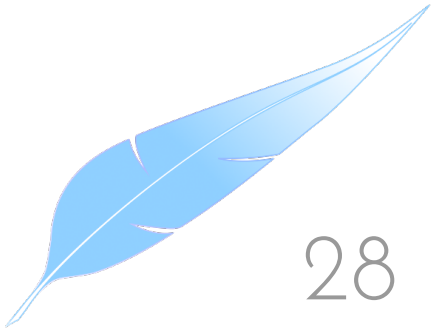
16000 équations (ou pas)



Joyeux anniversaire Alexis et Sam

•

10 ans



Merci pour votre attention

Merci Alexis et Sam