LABORATOIRES Dubernet œnologie

CONSEIL EN VINIFICATION - ELEVAGE ET TRAVAIL DU VIN - ANALYSE
ANALYSE FINE - MICROBIOLOGIE DU VIN - AUDIT - EXPERTISE

# SENTIA Free SO2 analyser

Universal Biosensors

# Dossier de validation

2 Novembre 2021

# SOMMAIRE

# 1 Presentation of the method and intended use

Universal Biosensors Pty is an Australian listed company called. Sentia is a hand-held device that measures key compounds such as free sulphur in post fermentation red and white wine. Sentia offers significant advantages over other analysis products in the market: speed, portability (e.g. test at the barrel), ease of use, automatic calibration, and no use of reagents.

The Sentia Wine Analyzer is currently distributed in Australia, New Zealand, North America, Chile and South Africa.

The Sentia system uses square wave voltammetry which is utilised to measure electrical current as a function of voltage rather than time. When wine is added to the strip, it dissolves the dried down reagents on the strip. The dried down compounds automatically adjust the pH of the wine sample so that the hydrogen sulphite is converted to sulphur dioxide. This becomes directly reduced at the electrode when the square waveform is applied. The data obtained is analysed to generate “differential current vs voltage” data which contains a specific peak that correlates to the concentration of free $SO_2$ in the wine sample.

Universal biosensor has asked Laboratoires Dubernet, France, to carry out a validation study of the SENTIA system for the analysis of free SO2

# 2 Expected performance

| **Paramètre** | Free SO2 |
|---|---|
| **Paramétrages de la méthode** | Type de détection….<br><br>Electrochimie |

| **Type de matrices à analyser :** | **Vins rouges**<br>**Vins blancs** |
|---|---|
| Performances requises: | |
| **Exigences des clients :** | **LQ : 5 mg/L**<br><br>**Sr – r : 1,5 mg/L 4,5 mg/L** |
| **Données Bibliographiques :** | |
| **Données réglementaires :** | |
| **Autre :** | |

| Itinéraire de validation | Commentaires |
|---|---|
| **Plans d'expérience**<br><br>**1/ Total error profile**<br><br>6 samples ran 5 times with replicates<br>Range 2 to 50 ppm, distributed equally<br><br>The experiment is performed one time for white/rosé calibration and one time for red wines calibration.<br><br>This total error profile is designed to test the LOQ value at the same time. The target values are defined on an average of 2 Franz Paul determinations.<br><br>**2/ Comparison to Franz Paul method and automated colorimetric method**<br><br>30 samples ran in replicates on SENTIA system, and once on Franz Paul method, and automated method.<br><br>Regression for comparison.<br><br>The experiment is performed one time for white/rosé calibration and one time for red wines calibration.<br><br>Theses experiments design are described into the OENO SCMA 418/2003 OIV resolution. | |

# 3 Presentation of the plans of experiment and the calculations carried out

## 3.1 Accuracy profile

### 3.1.1 Plan of experiment

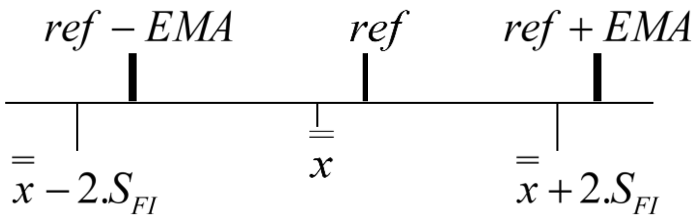
Prepare or choose $q \geq 3$ reference materials covering the scope of the method in terms of concentration for a given matrix.
Analyze each material in $n \geq 5$ series under conditions of intermediate fidelity and in the material stability time for the matrix under consideration. If the material is unstable carry out several preparations.
For each reference material and in each series, perform $p = 2$ repetitions under repeatability conditions.

### 3.1.2 Accuracy calculations

Pour chaque matériau de référence correspond à une niveau de concentration donné pour lequel on peut définir un $EMA_{exactitude}$ donné.

| | Matériau 1 | … | Matériau *i* | … | Matériau *q* |
|---|---|---|---|---|---|
| Valeur de référence | $Ref_1$ | … | $Ref_i$ | … | $Ref_p$ |
| EMA | $EMA_1$ | … | $EMA_i$ | … | $EMA_p$ |
| EMA% | $EMA\%_1 = \frac{EMA_1}{ref_1}$ | … | $EMA\%_i = \frac{EMA_i}{ref_i}$ | … | $EMA\%_q = \frac{EMA_q}{ref_q}$ |
| Nombre de séries | $n_1$ | … | $n_i$ | … | $n_q$ |
| Nombre de répétitions par série | $p_1$ | … | $p_i$ | … | $p_q$ |
| Moyenne générale de chaque matériau | $\bar{\bar{x}}_1 = \frac{\sum_{j=1}^{n_1} \frac{\sum_{i=1}^{p_1} x_{ji}}{p_1}}{n_1}$ | … | $\bar{\bar{x}}_i = \frac{\sum_{j=1}^{n_i} \frac{\sum_{i=1}^{p_i} x_{ji}}{p_i}}{n_i}$ | … | $\bar{\bar{x}}_q = \frac{\sum_{j=1}^{n_q} \frac{\sum_{i=1}^{p_q} x_{ji}}{p_q}}{n_q}$ |
| Ecart relatif | $b\%_1 = \frac{\bar{\bar{x}}_1 - ref_1}{ref_1}.100$ | … | $b\%_i = \frac{\bar{\bar{x}}_i - ref_i}{ref_i}.100$ | … | $b\%_q = \frac{\bar{\bar{x}}_q - ref_q}{ref_q}.100$ |
| Écart-type de fidélité intermédiaire | $s_{FI_1}$ | … | $s_{FI_i}$ | … | $s_{FI_q}$ |
| CV de fidélité intermédiaire en % | $CV(\%)_1 = 2.\frac{s_{FI_1}}{\bar{\bar{x}}_1}.100$ | … | $CV(\%)_i = 2.\frac{s_{FI_i}}{\bar{\bar{x}}_i}.100$ | … | $CV(\%)_q = 2.\frac{s_{FI_q}}{\bar{\bar{x}}_q}.100$ |

The verification of accuracy is done at each concentration level represented by the $q$ materials studied, comparing the interval produced by the intermediate fidelity around the measured mean value, to the interval of the $EMA_{accuracy}$around the reference value of the material. Accuracy is accepted if the first interval falls within the second.




This is reflected in the verification of the following inequalities:

accuracy is verified if:

$$\bar{\bar{x}} + 2.S_{FI} \leq ref + EMA$$

$$et$$

$$\bar{\bar{x}} - 2.S_{FI} \geq ref - EMA$$

These quantities can just as well be expressed as a coefficient of variation:

Accuracy is accepted if:

$$b(\%) + CV(\%) \leq EMA(\%)$$

$$et$$

$$b(\%) - CV(\%) \geq -EMA(\%)$$

If the accuracy of the method is verified on the reference materials then the accuracy of the method is verified on the validation domain. Graphical formatting of the results is performed.

## 3.2 Calculation of intralaboratory repeatability

**Répétabilité**

Either:

$w_j = x_{j1} - x_{j2}$, the difference between the two repetitions of the $j^{eme}$ reply.

Alors,

$$s_r = \sqrt{\frac{\sum_{j=1}^{n} w_j^2}{2n}}$$

The repeatability standard deviation is expressed as $s_r$, and repeatability r = 2,8.$s_r$.

## 3.3 Comparison of the usual method with the OIV reference method

### 3.3.1 Basic protocol and calculations

In each range level, accuracy will be determined from a series of ***60*** test materials with analyte concentration values covering the range level under consideration.

Each test material will be duplicated by both methods under repeatability conditions.

The average values $Mx_i$ of the 2 measurements $x_i$ and $x'_i$ made by the usual method and the average values $My_i$ of the 2 measurements $y_i$ and $y'_i$ made by the reference method will be calculated, then the difference $d_i$ between the values $Mx_i$ and $My_i$.

The results of the experiment can be recorded in the following table:

| **Matériau d'essai** | ***x*** : Méthode usuelle | | ***y*** : Méthode de référence | | Moyennes | | Différence |
|---|---|---|---|---|---|---|---|
| | **Rep1** | **Rep2** | **Rep1** | **Rep2** | ***x*** | ***y*** | ***d*** |
| *1* | $x_1$ | $x'_1$ | $y_1$ | $y'_1$ | $Mx_1$ | $My_1$ | $d_1 = Mx_1 - My_1$ |
| … | … | … | … | … | … | … | … |
| *i* | $x_i$ | $x'_i$ | $y_i$ | $y'_i$ | $Mx_i$ | $My_i$ | $d_i = Mxi - My_i$ |
| … | … | … | … | … | … | … | … |
| *n* | $x_n$ | $x'_n$ | $y_n$ | $y'_n$ | $Mx_n$ | $My_n$ | $d_n = Mx_n - My_n$ |

Les calculs suivants seront mis en oeuvre

- La moyenne des résultats de la méthode usuelle $M_x$

$$M_x = \frac{1}{n}\sum_{i=1}^{n} Mx_i$$

- La moyenne des résultats de la méthode de référence $M_y$

$$M_y = \frac{1}{n}\sum_{i=1}^{n} My_i$$

**- Calculer la moyenne des différences** $M_d$

$$M_d = \sum_{i=1}^{n} \frac{d_i}{n} = Mx - My$$

- Calculer l'écart type des différences $S_d$

$$S_d = \sqrt{\frac{\sum_{i=1}^{n}(d_i - M_d)^2}{n-1}}$$

- Calculer le $Z_{score}$

$$Z_{score} = \frac{|M_d|}{S_d}$$

**Interprétation**

- If $Z_{score}$ is **less than** or equal to 2.0, it can be concluded that the accuracy of one method in relation to the other is satisfactory, in the level of range considered, with a risk of error $\alpha = 5\%$.

- If $Z_{score}$ is **greater than** 2.0, it can be concluded that the usual method is not fair compared to the reference method, in the range level considered, with a risk of error α = 5%.

# 4 Results

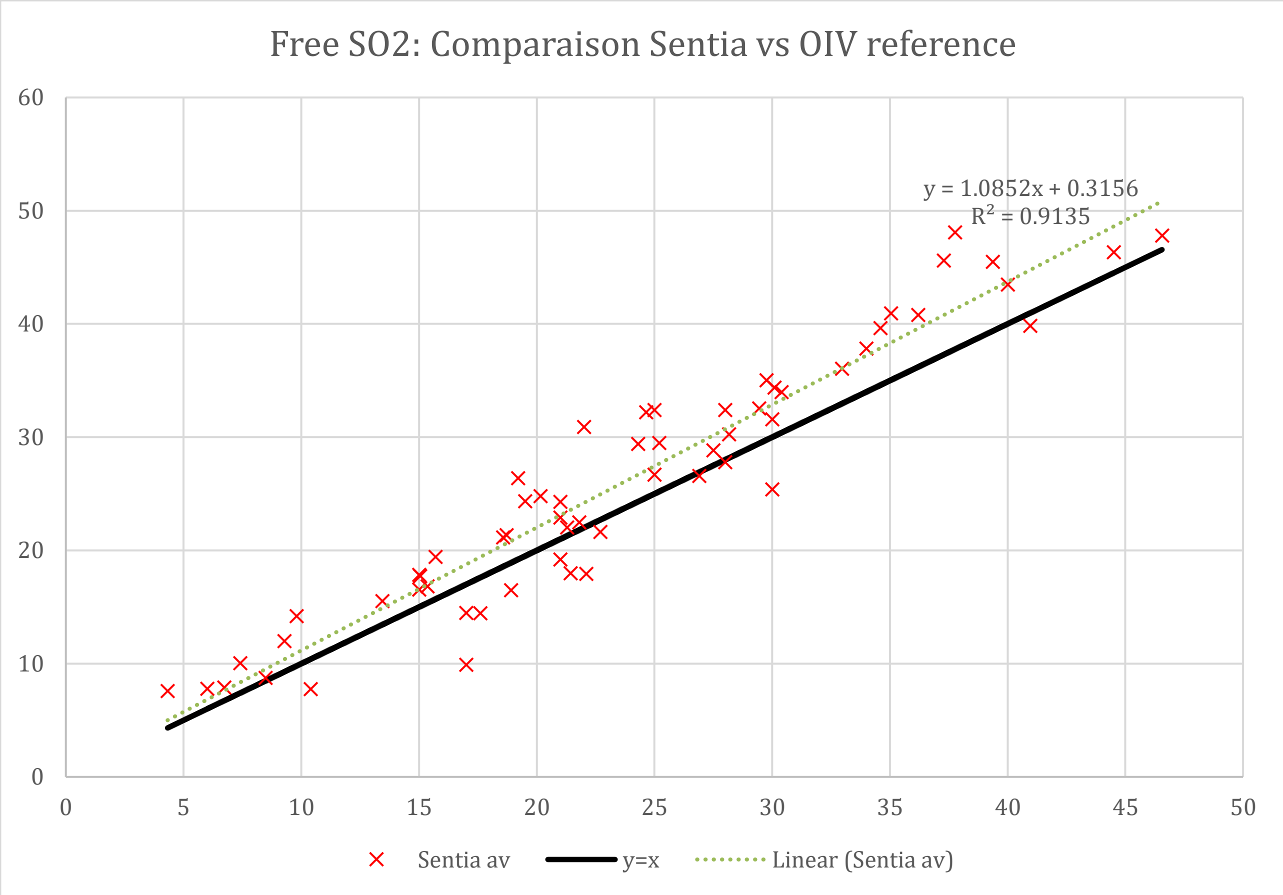
## 4.1 Raw results

Results in mg/L

| n° | ID ech | Color | Date | Franz Paul (OIV) | Sentia 1 | Sentia 2 | Sentia av | Sequential |
|---|---|---|---|---|---|---|---|---|
| 1 | BL170921-1 | white | 17/9/21 | 34 | 38,2 | 37,5 | 37,85 | 37,8 |
| 2 | BL170921-2 | white | 17/9/21 | 21 | 23,4 | 22,4 | 22,9 | 23 |
| 3 | BL170921-3 | white | 17/9/21 | 40 | 44 | 43 | 43,5 | 42,8 |
| 4 | RS170921-4 | white | 17/9/21 | 15 | 16,5 | 16,6 | 16,55 | 18,2 |
| 5 | RS170921-5 | white | 17/9/21 | 28 | 30,3 | 25,3 | 27,8 | 27,5 |
| 6 | RS170921-11 | white | 17/9/21 | 25 | 27 | 26,4 | 26,7 | 30,6 |
| 7 | BL170921-12 | white | 17/9/21 | 21 | 19,4 | 19 | 19,2 | 24,1 |
| 9 | BL230921-29 | white | 23/9/21 | 9,28 | 12 | 12 | 12 | 15 |
| 10 | RS230921-32 | white | 23/9/21 | 30,1 | 34,4 | 34,4 | 34,4 | 32 |
| 11 | BL230921-33 | white | 23/9/21 | 24,64 | 33,9 | 30,5 | 32,2 | 31 |
| 12 | RS230921-34 | white | 23/9/21 | 28,16 | 31,3 | 29,2 | 30,25 | 29 |
| 14 | RS230921-36 | white | 23/9/21 | 21 | 23,3 | 25,3 | 24,3 | 27 |
| 16 | BL230921-38 | white | 23/9/21 | 22 | 29,9 | 31,9 | 30,9 | 27 |
| 17 | BL230921-39 | white | 23/9/21 | 6,72 | 7,6 | 8,2 | 7,9 | 11 |
| 18 | BL230921-40 | white | 23/9/21 | 39,36 | 42,8 | 48,2 | 45,5 | 43 |
| 19 | BL2709-21-43 | white | 27/9/21 | 44,5 | 46,6 | 46,1 | 46,35 | 50,3 |
| 20 | BL2709-21-44 | white | 27/9/21 | 27,5 | 29,7 | 28 | 28,85 | 29,6 |
| 21 | BL2709-21-45 | white | 27/9/21 | 24,3 | 31,6 | 27,2 | 29,4 | 28,8 |
| 22 | BL2709-21-46 | white | 27/9/21 | 17,6 | 16,3 | 12,6 | 14,45 | 21,2 |
| 23 | BL2709-21-47 | white | 27/9/21 | 22,7 | 22,2 | 21,1 | 21,65 | 19,7 |
| 24 | BL2709-21-48 | white | 27/9/21 | 21,8 | 22,6 | 22,4 | 22,5 | 27 |
| 26 | PE-BL061021-2 | white | 6/10/21 | 15,36 | 17 | 16,7 | 16,85 | 24,7 |
| 27 | PE-BL061021-3 | white | 6/10/21 | 21,28 | 23,4 | 20,7 | 22,05 | 28,5 |
| 28 | PE-BL061021-4 | white | 6/10/21 | 30,4 | 30,5 | 37,5 | 34 | 40,2 |
| 29 | PE-RS061021-5 | Rose | 6/10/21 | 4,32 | 7,6 | 7,6 | 7,6 | 7,3 |
| 30 | PE-RS061021-6 | Rose | 6/10/21 | 40,96 | 43 | 36,7 | 39,85 | 42,3 |
| 31 | BL111021-1 | White | 11/10/21 | 15,04 | 17,9 | 17,6 | 17,75 | 15,9 |
| 32 | RS111021-2 | Rose | 11/10/21 | 32,96 | 36,2 | 35,9 | 36,05 | 34,6 |
| 33 | BL111021-3 | White | 11/10/21 | 46,56 | 46,8 | 48,8 | 47,8 | 47,6 |
| 34 | BL111021-11 | White | 11/10/21 | 21,44 | 18,5 | 17,5 | 18 | 16,8 |
| 35 | RG070921-1 | Red | 7/9/21 | 36,2 | 39,7 | 41,9 | 40,8 | 39,6 |
| 36 | RG070921-2 | Red | 7/9/21 | 26,9 | 27,4 | 25,8 | 26,6 | 31,8 |
| 37 | RG070921-3 | Red | 7/9/21 | 17 | 9,6 | 10,2 | 9,9 | 17,4 |
| 38 | RG070921-4 | Red | 7/9/21 | 18,9 | 16,2 | 16,8 | 16,5 | 23,2 |
| 39 | RG070921-5 | Red | 7/9/21 | 22,1 | 17,2 | 18,7 | 17,95 | 26,1 |
| 41 | RG170921-7 | Red | 17/9/21 | 15 | 18,6 | 17,1 | 17,85 | 20,7 |
| 42 | RG170921-8 | Red | 17/9/21 | 6 | 8,8 | 6,8 | 7,8 | 12,5 |
| 43 | RG170921-9 | Red | 17/9/21 | 28 | 31,6 | 33,2 | 32,4 | 30,5 |
| 44 | RG170921-10 | Red | 17/9/21 | 17 | 15,7 | 13,3 | 14,5 | 18,4 |
| 45 | RG170921-13 | Red | 17/9/21 | 30 | 31,4 | 31,8 | 31,6 | 31,6 |
| 46 | RG170921-14 | Red | 17/9/21 | 30 | 25,6 | 25,2 | 25,4 | 29 |
| 50 | RG220921-25 | Red | 22/9/21 | 25 | 32,4 | 32,4 | 32,4 | 33,9 |
| 51 | RG230921-25 | Red | 23/9/21 | 7,4 | 9,6 | 10,5 | 10,05 | 14,2 |
| 52 | RG230921-26 | Red | 23/9/21 | 15,7 | 20 | 18,9 | 19,45 | 22,7 |
| 53 | RG230921-27 | Red | 23/9/21 | 25,2 | 28,3 | 30,7 | 29,5 | 28,1 |
| 54 | RG230921-28 | Red | 23/9/21 | 19,2 | 23,4 | 29,4 | 26,4 | 25,5 |
| 55 | RG230921-30 | Red | 23/9/21 | 19,5 | 26,1 | 22,6 | 24,35 | 24,8 |
| 56 | RG230921-31 | Red | 23/9/21 | 9,8 | 14,8 | 13,6 | 14,2 | 14,8 |
| 57 | RG270921-41 | Red | 27/9/21 | 34,6 | 39,1 | 40,2 | 39,65 | 39,1 |
| 58 | RG270921-42 | Red | 27/9/21 | 10,4 | 8,1 | 7,4 | 7,75 | 13,2 |
| 59 | RG111021-4 | Red | 11/10/21 | 18,72 | 21 | 21,7 | 21,35 | 20,8 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 60 | RG111021-5 | Red | 11/10/21 | 35,04 | 41 | 40,9 | 40,95 | 38,4 |
| 61 | RG111021-9 | Red | 11/10/21 | 8,48 | 8,7 | 8,8 | 8,75 | 11,6 |
| 62 | RG111021-10 | Red | 11/10/21 | 18,56 | 21,4 | 20,9 | 21,15 | 20,9 |
| 63 | RG111021-12 | Red | 11/10/21 | 37,76 | 49 | 47,2 | 48,1 | 34,7 |
| 64 | RG111021-13 | Red | 11/10/21 | 29,76 | 35,7 | 34,4 | 35,05 | 30 |
| 65 | RG121021-1 | Red | 12/10/21 | 37,28 | 44,4 | 46,8 | 45,6 | 39,3 |
| 66 | RG121021-2 | Red | 12/10/21 | 13,44 | 16,1 | 15 | 15,55 | 14,4 |
| 67 | RG121021-3 | Red | 12/10/21 | 29,44 | 31,6 | 33,5 | 32,55 | 31,4 |
| 68 | RG121021-4 | Red | 12/10/21 | 20,16 | 24,6 | 25 | 24,8 | 24,4 |

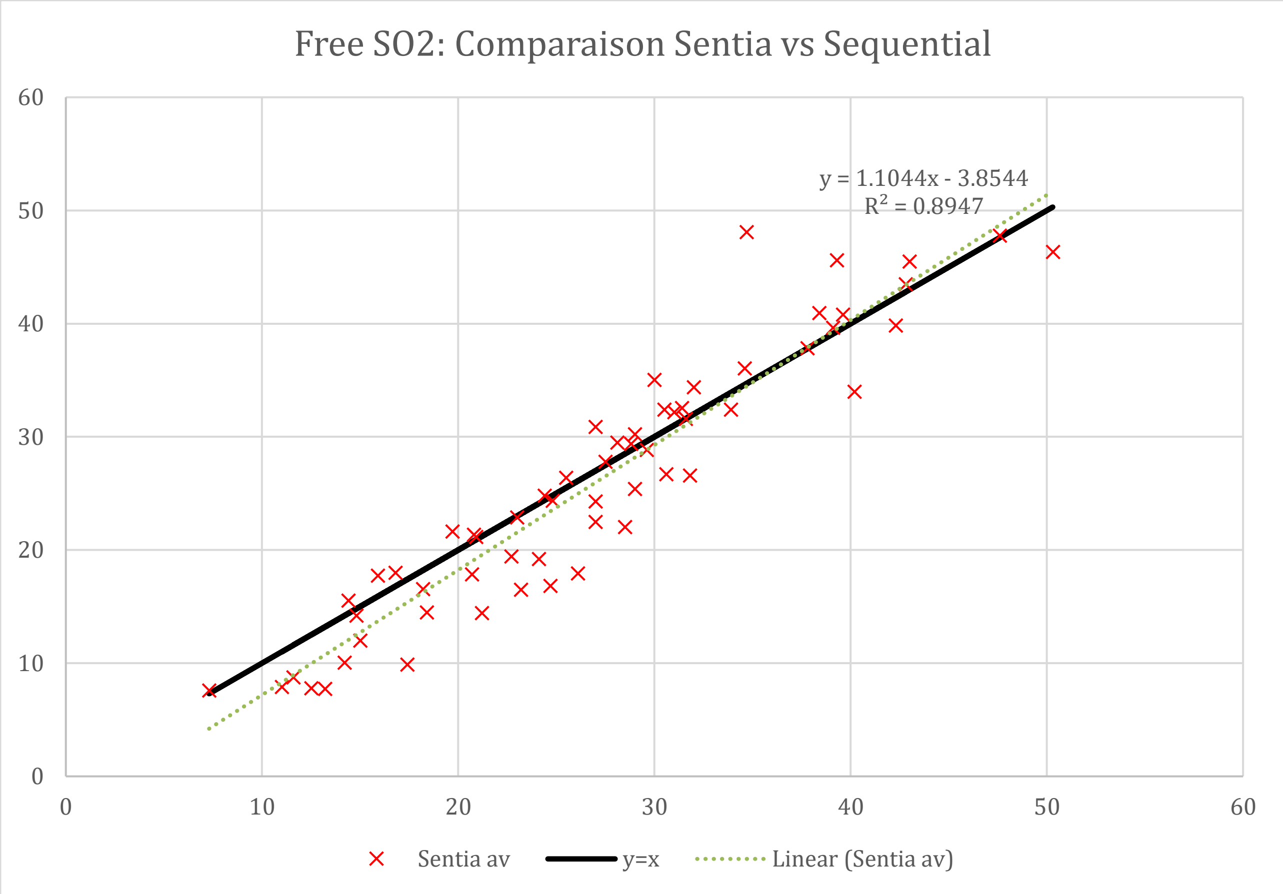
## 4.2 Comparison Sentia vs OIV reference method




N= 60 samples of regular white and red wines
Md (écart moyen) = 2,32 mg/L
Sd (Écart type écart moyen) = 3, 43 mg/L
Z_Score = 0,67

Conclusion: the differences are statistically insignificant

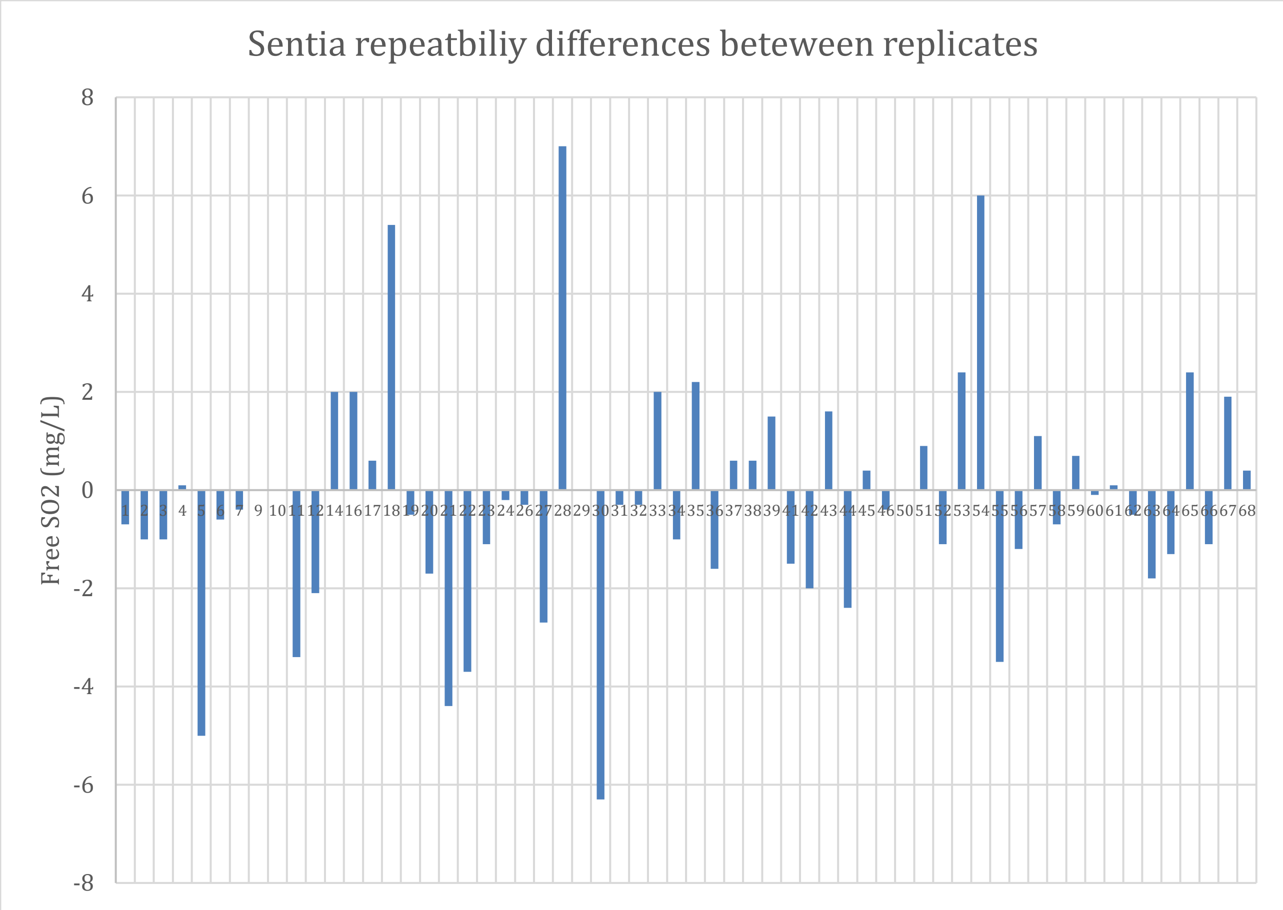
## 4.3 Comparison Sentia vs colorimetric automated accredited method




N= 60 samples of regular white and red wines
Md (écart moyen) = -1,04 mg/L
Sd (Écart type écart moyen) = 3,81 mg/L
Z_Score = - 0,27

Conclusion: the differences are statistically insignificant

## 4.4 Repeatability




Repetability Standard error
Sr = 1,63 mg/L
Repeatbility
R : 4,47 mg/L

## 4.5 <u>Accuracy Profile</u>

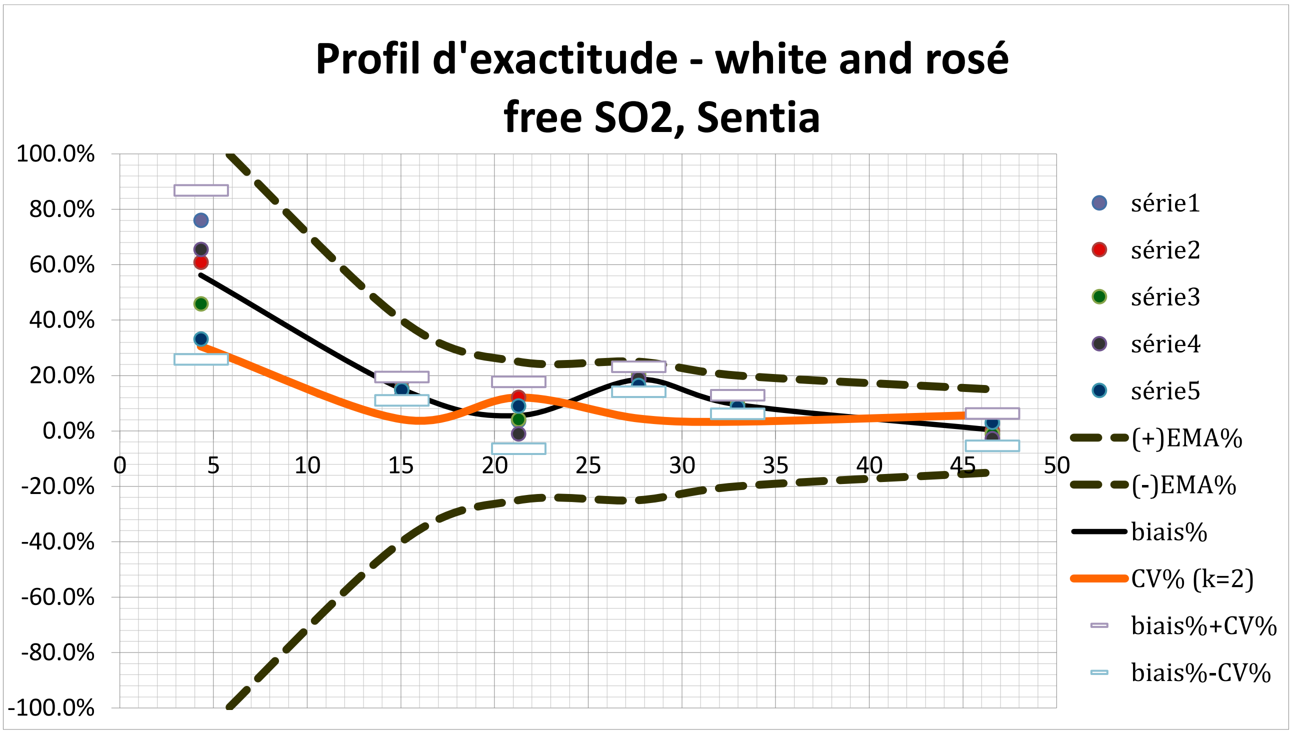
### 4.5.1 White and rosé

Reference value is assigned by OIV reference method

| | | | | | |
|---|---|---|---|---|---|
| FQ7-0-5_B | **Méthode** | SENTIA | **opérateurs** | série1 | FG |
| | **Paramètre** | SO2 libre | | série2 | FG |
| | **Date** | 06/10/2021 au 11/10/2021 | | série3 | FG |
| | | | | série4 | FG |
| | | | | série5 | FG |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | RS061021-5 | | BL111021-1 | | BL061021-3 | | BL071021-1 | | RS111021-2 | | BL111021-3 | |
| | **Matériau 1** | | **Matériau 2** | | **Matériau 3** | | **Matériau 4** | | **Matériau 5** | | **Matériau 6** | |
| **Nature du matériau** | VIN ROSE | | VIN BLANC | | VIN BLANC | | Vin BLANC | | VIN BLANC | | VIN ROSE | |
| **Valeur de référence** | 4,32 | | 15,04 | | 21,28 | | 27,68 | | 32,96 | | 46,56 | |
| **EMA%** | 110 % | | 40 % | | 25 % | | 25 % | | 20 % | | 15 % | |
| | **Matériau 7** | | **Matériau 2** | | **Matériau 3** | | **Matériau 4** | | **Matériau 4** | | **Matériau 6** | |
| | rep1 | rep2 | rep1 | rep2 | rep1 | rep2 | rep1 | rep2 | rep1 | rep2 | rep1 | rep2 |
| Série1 | 7,60 | 7,60 | 17,90 | 17,60 | 23,40 | 20,70 | 32,70 | 33,00 | 36,20 | 35,90 | 46,80 | 48,80 |
| Série2 | 6,70 | 7,20 | 16,90 | 17,80 | 24,00 | 23,70 | 33,00 | 32,60 | 37,00 | 36,60 | 45,60 | 47,60 |
| Série3 | 5,30 | 7,30 | 17,30 | 17,30 | 23,30 | 21,00 | 33,70 | 32,90 | 35,90 | 36,40 | 45,35 | 46,70 |
| Série4 | 7,30 | 7,00 | 17,10 | 16,80 | 21,20 | 20,90 | 34,20 | 31,60 | 35,60 | 35,60 | 44,90 | 45,60 |
| Série5 | 4,50 | 7,00 | 17,30 | 17,20 | 22,90 | 23,50 | 32,30 | 32,10 | 35,00 | 36,60 | 48,10 | 47,90 |
| Moy | 6,75 | | 17,32 | | 22,46 | | 32,81 | | 36,08 | | 46,735 | |
| | **Matériau 1** | | **Matériau 2** | | **Matériau 3** | | **Matériau 4** | | **Matériau 5** | | **Matériau 6** | |
| Série1 | 75,9% | 75,9% | 19,0% | 17,0% | 10,0% | -2,7% | 18,1% | 19,2% | 9,8% | 8,9% | 0,5% | 4,8% |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Série2 | 55,1% | 66,7% | 12,4% | 18,4% | 12,8% | 11,4% | 19,2% | 17,8% | 12,3% | 11,0% | -2,1% | 2,2% |
| Série3 | 22,7% | 69,0% | 15,0% | 15,0% | 9,5% | -1,3% | 21,7% | 18,9% | 8,9% | 10,4% | -2,6% | 0,3% |
| Série4 | 69,0% | 62,0% | 13,7% | 11,7% | -0,4% | -1,8% | 23,6% | 14,2% | 8,0% | 8,0% | -3,6% | -2,1% |
| Série5 | 4,2% | 62,0% | 15,0% | 14,4% | 7,6% | 10,4% | 16,7% | 16,0% | 6,2% | 11,0% | 3,3% | 2,9% |
| **Fidélité** | **Matériau 1** | | **Matériau 2** | | **Matériau 3** | | **Matériau 4** | | **Matériau 5** | | **Matériau 6** | |
| Sr | 1,02908 | | 0,31623 | | 1,14543 | | 0,87693 | | 0,55317 | | 1,01747 | |
| r | 2,88142 | | 0,88544 | | 3,20719 | | 2,45539 | | 1,54888 | | 2,84892 | |
| *Sx* | *0,72887* | | *0,28636* | | *1,08766* | | *0,39433* | | *0,45634* | | *1,16855* | |
| *SFI* | 1,02993 | | 0,36332 | | 1,35610 | | 0,73485 | | 0,60104 | | 1,37227 | |
| CV% (k=2) | 30,52 % | | 4,20 % | | 12,08 % | | 4,48 % | | 3,33 % | | 5,87 % | |

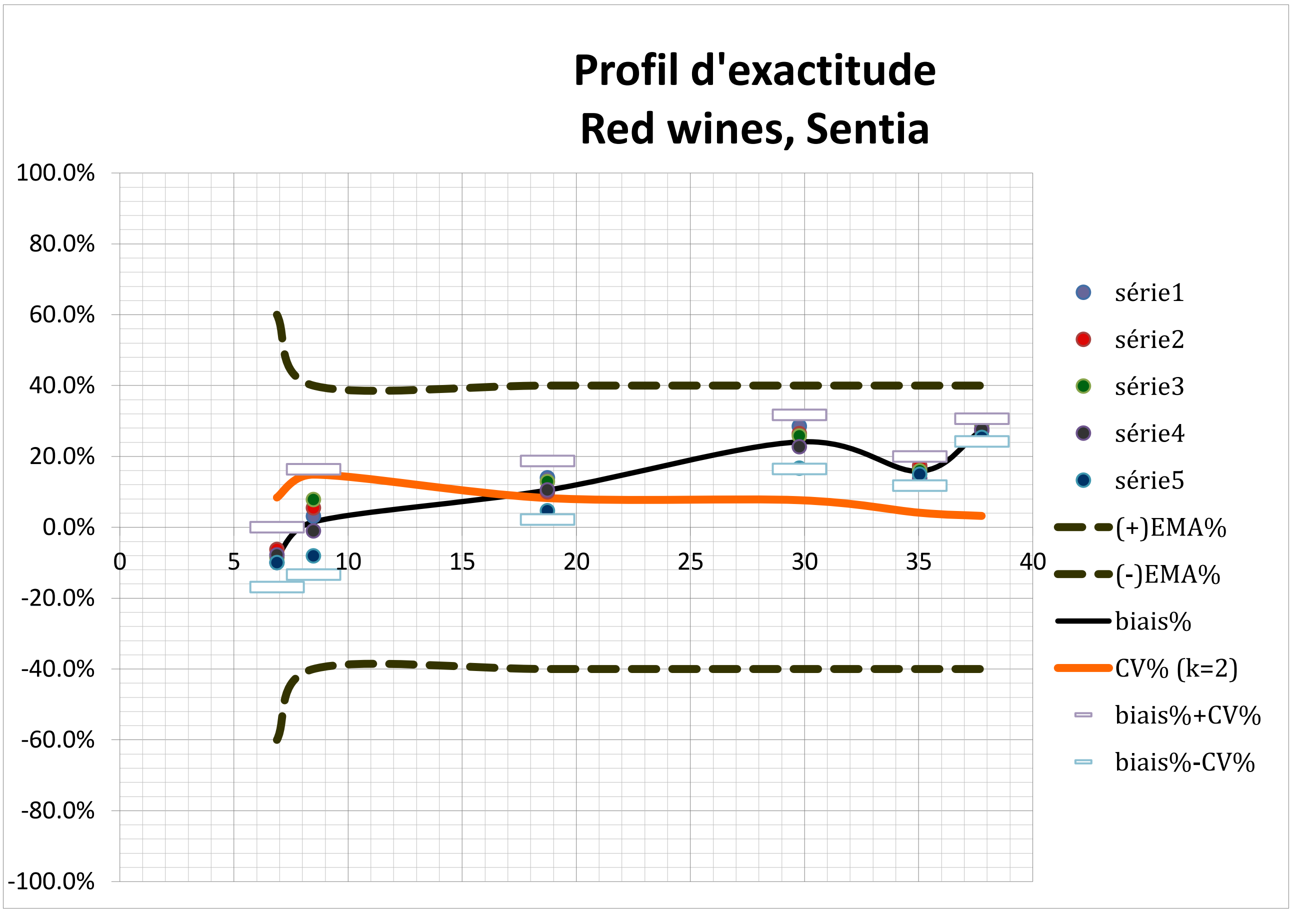



## 4.5.2 Red wines

Reference value is assigned by OIV reference method

| | | | | |
|---|---|---|---|---|
| **Méthode** | SENTIA | **opérateurs** | série1 | FG |
| **Paramètre** | SO2 libre | | série2 | FG |
| **Date** | 07/10/21 | | série3 | FG |
| | | | série4 | FG |
| | | | série5 | FG |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | RG071021-2 | | RG111021-9 | | RG11021-4 | | RG071021-3 | | RG111021-5 | | RG111021-12 | |
| | **Matériau 1** | | **Matériau 2** | | **Matériau 3** | | **Matériau 4** | | **Matériau 5** | | **Matériau 6** | |
| | vin rouge | | vin rouge | | vin rouge | | vin rouge | | vin rouge | | vin rouge | |
| | 6,88 | | 8,48 | | 18,72 | | 29,76 | | 35,04 | | 37,76 | |
| | 60 % | | 40 % | | 40 % | | 40 % | | 40 % | | 40 % | |
| | **Matériau 1** | | **Matériau 7** | | **Matériau 2** | | **Matériau 4** | | **Matériau 4** | | **Matériau 4** | |
| date | rep1 | rep2 | rep1 | rep2 | rep1 | rep2 | rep1 | rep2 | rep1 | rep2 | rep1 | rep2 |
| 07/10/21 | 6,10 | 6,30 | 8,70 | 8,80 | 21,00 | 21,70 | 38,50 | 38,00 | 41,00 | 40,90 | 49,00 | 47,20 |
| 07/10/21 | 6,40 | 6,50 | 9,10 | 8,80 | 21,00 | 20,20 | 38,00 | 37,30 | 41,70 | 40,60 | 48,90 | 47,50 |
| 07/10/21 | 6,40 | 6,20 | 9,20 | 9,10 | 21,40 | 20,90 | 38,10 | 36,80 | 41,60 | 39,70 | 48,00 | 49,40 |
| 07/10/21 | 6,50 | 6,20 | 8,90 | 7,90 | 20,70 | 20,70 | 36,70 | 36,40 | 40,90 | 38,90 | 48,20 | 48,20 |
| 07/10/21 | 5,70 | 6,70 | 8,40 | 7,20 | 18,60 | 20,60 | 34,50 | 35,00 | 40,40 | 40,20 | 47,50 | 47,20 |
| | 6,3 | | 8,61 | | 20,68 | | 36,93 | | 40,59 | | 48,11 | |
| | **Matériau 1** | | **Matériau 2** | | **Matériau 3** | | **Matériau 4** | | **Matériau 5** | | **Matériau 6** | |
| | -11,3% | -8,4% | 2,6% | 3,8% | 12,2% | 15,9% | 29,4% | 27,7% | 17,0% | 16,7% | 29,8% | 25,0% |
| | -7,0% | -5,5% | 7,3% | 3,8% | 12,2% | 7,9% | 27,7% | 25,3% | 19,0% | 15,9% | 29,5% | 25,8% |
| | -7,0% | -9,9% | 8,5% | 7,3% | 14,3% | 11,6% | 28,0% | 23,7% | 18,7% | 13,3% | 27,1% | 30,8% |
| | -5,5% | -9,9% | 5,0% | -6,8% | 10,6% | 10,6% | 23,3% | 22,3% | 16,7% | 11,0% | 27,6% | 27,6% |
| | -17,2% | -2,6% | -0,9% | -15,1% | -0,6% | 10,0% | 15,9% | 17,6% | 15,3% | 14,7% | 25,8% | 25,0% |
| | **Matériau 1** | | **Matériau 2** | | **Matériau 3** | | **Matériau 4** | | **Matériau 5** | | **Matériau 6** | |
| | 0,34351 | | 0,50498 | | 0,73348 | | 0,52631 | | 0,94181 | | 0,85147 | |
| | 0,96183 | | 1,41393 | | 2,05376 | | 1,47366 | | 2,63706 | | 2,38411 | |
| | *0,10607* | | *0,53080* | | *0,67879* | | *1,36272* | | *0,50175* | | *0,48528* | |
| | 0,26505 | | 0,63973 | | 0,85425 | | 1,41262 | | 0,83382 | | 0,77330 | |
| | 8,41 % | | 14,86 % | | 8,26 % | | 7,65 % | | 4,11 % | | 3,21 % | |




## 5 Comments on results

The comparison with the OIV reference method shows compliant results on the SENTIA system, both for white, rosé and red wines. Very diverse wines were used, some of which were very rich in polyphenols. We can therefore see the robustness of the method.

The slight bias between the SENTIA system and the OIV reference method is also related to the use of the new version of the reference method, the results of which are significantly lower than the "classical" version of the reference method, before its revision by the OIV. This same type of bias is also observed with the usual colorimetric method. It should therefore not be considered as a major defect.

The repeatability of the method is correct. A little worse than the repeatability of the reference method. The user experience seems to be decisive in the quality of this repeatability. In particular, the test taking of the sample is an essential critical point to be well defined and controlled.

## 6 Conclusions

In view of the experiments conducted, the quality of the results of the determination of free SO2 in wines by the SENTIA system seems to us to be very good. Very comparable to the OIV reference method, or to the usual ISO 17025 accredited method, the SENTIA system clearly shows an extremely interesting new way of analysis of free $SO_2$.

Montredon des Corbières, le 2 novembre 2021

**Laboratoires Dubernet**
Technical Director:
Matthieu Dubernet