VALENVERAS

Powered by BÜCHI

Certificates

This document compiles the international quality and technical compliance certifications (such as ISO 9001, FCC, and CE) of the Valenveras Portable Lab. It also validates the use of FT-NIR technology for the instant analysis of cannabinoids and terpenes in dried cannabis flowers.

INDEX

SI-WARE SYSTEMS ISO9001 CERTIFICATE

ISO 9001 is an internationally recognized standard for Quality Management Systems (QMS). It outlines criteria for a QMS and is based on principles like customer focus, leadership, process approach, and continual improvement. Certification demonstrates a commitment to providing quality products and services, enhancing customer satisfaction, and continuous improvement.

EURO CERT

Certificate Number
00.12.1041

Date of Initial Validity of the Certificate from
23/01/2014
Date of the Validity of the current Certificate from
06/02/2023

The Certificate is valid until
05/02/2026

CERTIFICATE

EUROCERT S.A. certifies that the company

Si-Ware Systems

3, Khaled Ibn Al-Waleed Street, Heliopolis,Cairo, Egypt

implements a Quality Management System
according to the Standard:

EN ISO 9001:2015

for the following Scope of Certification:

SI-WARE SYSTEMS IS A FABLESS SEMICONDUCTOR COMPANY DESIGNING, DEVELOPING, DISTRIBUTING & SUPPORTING FT-NIR END-TO-END REAL TIME MATERIAL SENSING SPECTROSCOPY SOLUTIONS.

On behalf of EUROCERT S.A.,
Sifonios George
Director of International Markets

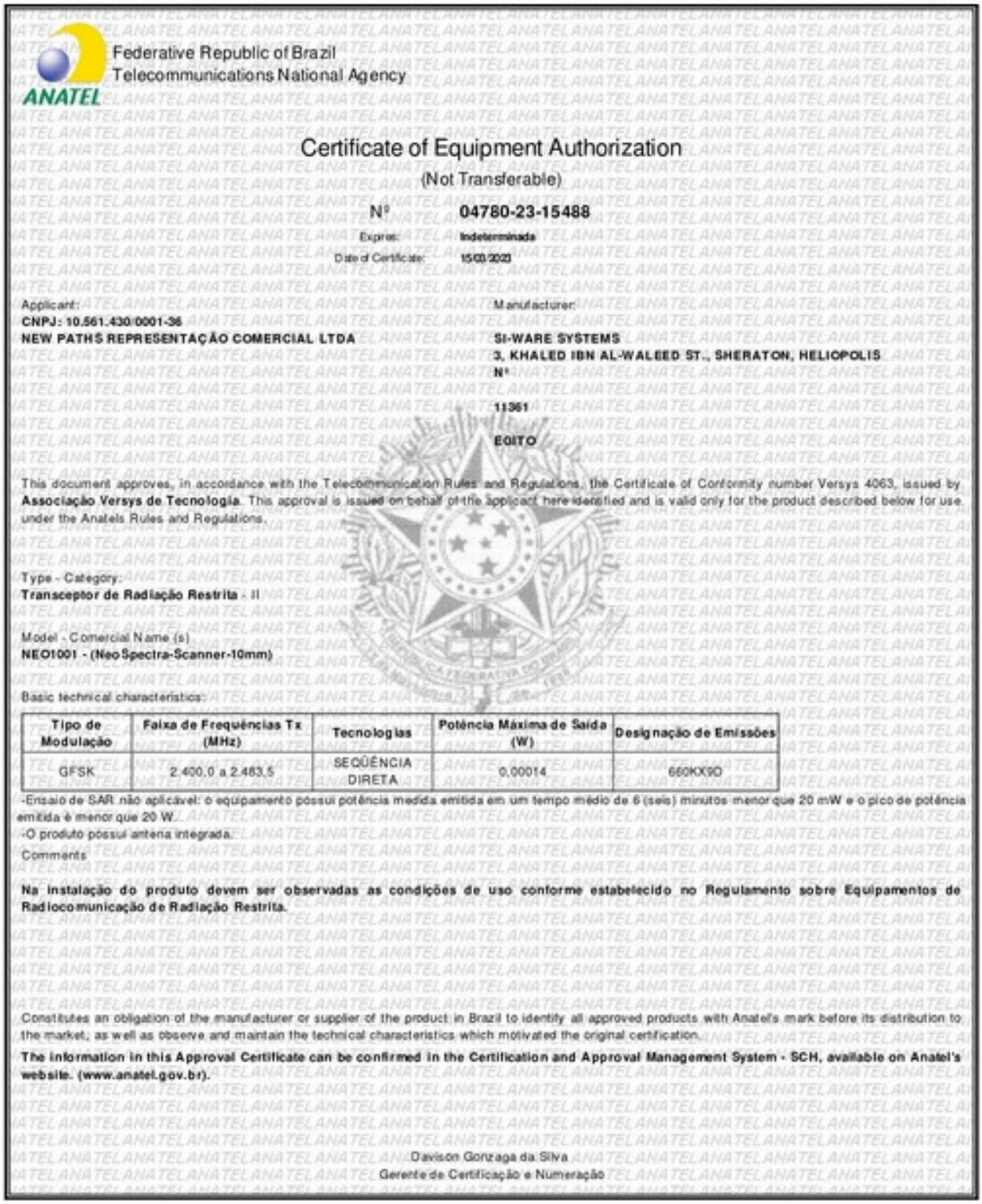
Lack of fulfillment of the conditions set out in the contract No.06.000058.23, makes this Certificate invalid.
The validity of this Certificate is subject to annual surveillance.
Check the validity of the Certificate with the QR code at right.

IAF

EUROCERT S.A. 89 Chlois & Lykoviseos str., 144 52, Metamorphosi - Greece
T +30 210 62.52.495, +30 210 62.53.927, F +30 210 62.03.018, M eurocert@otenet.gr

CERTIFICATE OF EQUIPMENT AUTHORIZATION

This device is approved by ANATEL with the certificate of Equipment Authorization 04780-23-15488.



Federative Republic of Brazil
Telecommunications National Agency

ANATEL

Certificate of Equipment Authorization

(Not Transferable)

Nº **04780-23-15488**

Expires: **Indeterminada**

Date of Certificate: **15/03/2023**

Applicant:
CNPJ: 10.561.430/0001-36
NEW PATHS REPRESENTAÇÃO COMERCIAL LTDA

Manufacturer:
SI-WARE SYSTEMS
3, KHALED IBN AL-WALEED ST., SHERATON, HELIOPOLIS
Nº
11361
EGITO

This document approves, in accordance with the Telecommunication Rules and Regulations, the Certificate of Conformity number Versys 4063, issued by **Associação Versys de Tecnologia**. This approval is issued on behalf of the applicant here identified and is valid only for the product described below for use under the Anatels Rules and Regulations.

Type - Category:
Transceptor de Radiação Restrita - II

Model - Comercial Name (s)
NEO1001 - (NeoSpectra-Scanner-10mm)

Basic technical characteristics:

Tipo de Modulação	Faixa de Frequências Tx (MHz)	Tecnologias	Potência Máxima de Saída (W)	Designação de Emissões
GFSK	2.400,0 a 2.483,5	SEQÜÊNCIA DIRETA	0,00014	660KX9D

-Ensaio de SAR não aplicável: o equipamento possui potência medida emitida em um tempo médio de 6 (seis) minutos menor que 20 mW e o pico de potência emitida é menor que 20 W.
-O produto possui antena integrada.

Comments

Na instalação do produto devem ser observadas as condições de uso conforme estabelecido no Regulamento sobre Equipamentos de Radiocomunicação de Radiação Restrita.

Constitutes an obligation of the manufacturer or supplier of the product in Brazil to identify all approved products with Anatel's mark before its distribution to the market, as well as observe and maintain the technical characteristics which motivated the original certification.

The information in this Approval Certificate can be confirmed in the Certification and Approval Management System - SCH, available on Anatel's website. (www.anatel.gov.br).

Davison Gonzaga da Silva
Gerente de Certificação e Numeração

GENERATION OF EQUIPMENT TYPE APPROVAL

This device has an Equipment Type Approval (ETA) from the Government of India, issued under O.M. No. ETA-WPC

सत्यमेव जयते

Government of India
Ministry of Communications
Department of Telecommunications
WPC Wing
Sanchar Bhawan, New Delhi-110001.

[Generation of Equipment Type Approval (ETA) through self-declaration issued under O.M. No. ETA-WPC /Policy/2018-19 dated 26 February, 2019].

THIS ETA IS ISSUED FOR A SINGLE MODEL WITH MODEL NAME NEO1001

Registration No: ETA-SD-20230201614 Date: 21-02-2023

I). Details of Applicant and Parameters of Equipment:

1.	Name & Address of the first Applicant. (Indian Manufacturer/ Authorised Indian representative for foreign manufacturer)	PAVONE TECHNOLOGIES, WZ-256 E/1, SECOND FLOOR, INDERPURI, Central Delhi,DELHI,110012
2.	Equipment category	Handheld Spectral Sensing Scanner
3.	Make	Si-Ware Systems,Egypt
4.	Model	NEO1001
5.	Frequency range(s) of Equipment	1. 2402-2480 MHz
6.	Max output power/Field strength/PSD	1. E.I.R.P. (dBm). 10.95

GENERATION OF EQUIPMENT TYPE APPROVAL

This device has an Equipment Type Approval (ETA) from the Government of India, issued under O.M. No. ETA-WPC

7.	Applicable Gazette Notification(s)	1. 45 (E) Dated 28-01-2005	
8.	RF Test Report details:-		
	Name&Address /Country of accredited laboratory issuing the RF test report	Accreditation Certificate Reference/Number	Test Report No. and Date
	CERPASS TECHNOLOGY CORPORATION TEST LABORATORY & No.10, Ln.2, Lianfu St., Luzhu Dist., Taoyuan City 33848, Taiwan (R.O.C.)	TAF 1439	22060122-TRCE02 & 12-12-2022

II). Terms and Conditions

(i). This certificate will not be valid in case any change in the above parameters and not conforming to the Gazette Notification mentioned in sl.no 7 above.
(ii). Use of such equipment has been exempted from licensing requirement vide Gazette Notification mentioned in sl. no. 7, on Non-interference,Non-protectionand sharing (non-exclusive) basis.
(iii). Use of such equipment in case not conforming to above notification will require a specific wireless operating license, as applicable from this Ministry.
(iv). Field units of WPC Wing reserve the right for sample check/audit carried out for the purpose of RF analysis/spectrum monitoring in view to avoid interference to other wireless users and ensure compliance of technical parameters mentioned in sl no. 5,6&7.
(v). This certificate is valid only for equipment which are exempted from import licensing requirements as per the Import Policy of DGFT and for import of such device, a self-declaration based, system generated (Saralsanchar) Import undertaking/ permission is required.
(vi). The applicant is liable for prosecution under Indian Law in case of any wrong declaration/ submission of ingenuine RF test report(s) for issue of ETA through Self-Declaration.

Note:
1. Once ETA through self-declaration is generated for a model, subsequently it may be utilized by other person(s) for import/usage purpose in India.

2. The importers of above model shall comply with other import related requirements, if any, with Customs.

This is Self-generated certificate. Hence, no signature is required. It may be downloaded/verified from the website https://saralsanchar.gov.in.

FCC SUPLLIER'S DECLARATION OF CONFORMITY

This device complies with Part15 of the FCC Rules. Operation is subject to the following two conditions: (1)This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.Supplier's Declaration of Conformity 47 CFR ? 2.1077Compliance Information Unique Identifier: NeoSpectraScanner-10mmResponsible Party ? U.S. Contact Information: Si-ware Inc., 101 Jefferson Drive, 1st. Floor, Menlo Park, CA 94025

Supplier's Declaration of Conformity

47 CFR § 2.1077 Compliance Information

Unique Identifier: NEO1001

Responsible Party – **U.S. Contact Information**

Si-Ware Systems, Inc.

101 Jefferson Drive, 1st. Floor,

Menlo Park, CA 94025

Nevine.mounib@si-ware.com

FCC Compliance Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Date: 12/27/2022

Name: Nevine Mounib

Function: Operations Manager

Signature: N. Mounib

RADIO EQUIPMENT TYPE DIRECTIVE 2014/53/EU7

Hereby, Si-Ware Systems, declares that the radio equipment type NeoSpectra Scanner-10 mm, is incompliance with Directive 2014/53/EU

NeoSpectra™ by Si-Ware

EU Declaration of Conformity

Hereby we, the undersigned:

Manufacturer:	Si-ware Systems
Address; city:	3, Khaled Ibn Al-Waleed St., Sheraton, Heliopolis, Cairo
Country:	Egypt
Telephone number:	+20 222 68 47 04
Authorized representative in Europe:	SI-WARE SYSTEMS
Address; city:	16 rue portalis, 75008, Paris
Country:	France
Contact:	Bassam.saadany@si-ware.com

Declare that this DoC is issued under our sole responsibility and that this product is:

Product description:	Handheld Spectral sensing scanner
Type Number:	NEO1001
Trademark:	NeoSpectra

Object of the declaration:

The object is in conformity with the relevant Union harmonization legislation:

☒	*Radio Equipment Directive – 2014/53/EU*			
☒	**Article 3.1(a)**	☒	**Article 3.2**	
	EN 62368-1:2014+A11:2017		EN 300 328 v.2.2.2. (2019-7)	
	EN 62311:2008			
☒	**Article 3.1(b)**		**EU Type examination:**	
	EN 301 489-1 V.2.2.3 (2019-11)		Notified Body:	Phoenix Testlab GmbH
	EN 301 489-17 V.3.2.2 (2019-12)		Notified Body Number:	0700
			Type examination Number:	22-211368 - 22-221368

☐	*Ecodesign Directive – 2009/125/EFC*		
☐	Regulation EC No. 1275/2008	☐	Regulation EC No. 278/2009
☐	Regulation EC No. 642/2009	☐	Regulation EC No. 617/2013

☒	*RoHS Directive – 2011/65/EU*		

☒	***Equipment Class 1***	☐	***Equipment class 2***		

Description of accessories and components, including software, which allow the radio equipment to operate as intended and covered by the DoC:

Accessories:	
Description:	Model Name:
Description 1	Model 1
Description 2	Model 2
Description 3	Model 3

RADIO EQUIPMENT TYPE DIRECTIVE 2014/53/EU7

Hereby, Si-Ware Systems, declares that the radio equipment type NeoSpectra Scanner-10 mm, is incompliance with Directive 2014/53/EU

NeoSpectra™ by Si-Ware

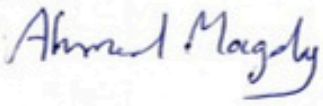
Software Description:	Version:
	FW 2206054218

Wireless Module:		
Description:	Module type:	Certificate number:
BLE Module	ESP32-WROOM-32D	B2006163

Signed for and on behalf of:

Place: Cairo place
Date: 02 Feb 2023 date

Name: Ahmed Magdy
Function: General Manager
Signature:



RADIO TRANSMISSION EQUIPMENT TYPE APPROVAL CERTIFICATE

This device is certified to conform to the provisions of the Radio Regulations of the People's Republic of China, with CMIIT ID 2023DJ9547.

无线电发射设备
Radio Transmission Equipment
型号核准证
Type Approval Certificate

埃及 Si-Ware Systems:

根据《中华人民共和国无线电管理
In accordance with the provisions on the Radio

条例》，经审查，下列无线电发射设备
Regulations of the People's Republic of China , the following

符合中华人民共和国无线电管理规定和
radio transmission equipment , after examination , conforms

技术标准，其核准代码为： CMIIT ID:2023DJ9547
to the provisions with its CMIIT ID:

中华人民共和国工业和信息化部
(发证机关)

有效期： 2025-12-31
Validity

Sealed by issuing authority
2023 年 06 月 21 日
Year Month Date

RADIO TRANSMISSION EQUIPMENT TYPE APPROVAL CERTIFICATE

This device is certified to conform to the provisions of the Radio Regulations of the People's Republic of China, with CMIIT ID 2023DJ9547.

编号：
Number 2023-9547

设备名称：蓝牙设备
Equipment Name

设备型号：NE01001
Equipment Type

主要功能：数据传输
Main Functions

调制方式：GFSK
Modulation Mode

主要技术参数及其指标值：
Main Technical Parameters

频率范围：2400-2483.5MHz
Frequency Range

频率容限：≤20ppm
Frequency Tolerance

发射功率：≤20dBm(EIRP)
Transmitting Power

占用带宽：≤2MHz
Occupied Bandwidth

杂散发射限值：≤-30dBm
Spurious Emission Limits

（核发单位章）
Sealed by issuing authority
2023 年 06 月 21 日
Year Month Date

BLUETOOTH

This device complies with the Bluetooth Launch Studio Terms of use under declaration ID D065301

Bluetooth

Project Details

Project Name	NeoSpectra Scanner NEO1001
Referenced Qualified Design(s)	164224 103832
Listing Date	2023-08-29
Declaration ID	D065301

Product Listing(s)

Name	Website	Category	Publish Date	Model Number	Description
NeoSpectra Scanner	https://www.si-ware.com/	Unique Products	8/29/2023 12:00:00 AM	NEO1001	Handheld spectral sensing scanner

Member Company	Si-ware Systems

Declaring Member Contact / Listing Contact Person

Name	Ahmed Saleh
Address	50 Tice Boulevard
City	Woodcliff Lake
State	New Jersey
Country	United States
Postal Code	07677

Complete the Project and Submit Product(s) for Qualification

By typing my name or other symbol of my signature into the "Signature" field below, I agree on behalf of Si-ware Systems ("Company") to Bluetooth Launch Studio Terms of Use, and I make the following representations and warranties personally and on behalf of Company. The following representations and warranties, together with all project information and the Bluetooth Launch Studio Terms of Use, are the Supplier Declaration of Conformity and Declaration of Compliance described in the Program Reference Document (PRD) and Declaration Process Document (DPD).

- ☑ I am authorized by Company to submit all of the information included in this project and all information is complete and accurate.
- ☑ Company does not, by its governing documents or other applicable law, require more than one signatory, a stamp or seal, or a witnessed signature to be legally bound.
- ☑ I agree on behalf of Company to contract in English and electronically, and adopt the characters and symbols input in the signature field below as my signature, with the same effect as an ink signature.
- ☑ The products included in this project are owned and distributed by Company under a Product name that identifies Company as the source of the Product. Company has the right to use and reference all Qualified Designs referenced in the project, and the products and referenced Qualified Designs comply with the version of the Bluetooth Specification identified in the project submission.
- ☑ The product(s) included in this project and the corresponding Qualified Designs comply with the Bluetooth Launch Studio Terms of Use.

If any of the foregoing is not correct or you do not agree, you must exit this form without signing.

Signature:

Ahmed Saleh

BLUETOOTH

This device complies with the Bluetooth Launch Studio Terms of use under declaration ID D065301

BLUETOOTH® LAUNCH STUDIO TERMS OF USE

Last Updated: November 15th, 2022.

These Bluetooth Launch Studio Terms of Use ("**Launch Studio Terms**") are a supplement to the Bluetooth SIG Website Terms of Use ("**WTOU**") and together the Launch Studio Terms and WTOU are a legal agreement (collectively the "**Bluetooth Terms**") between you and Bluetooth SIG, Inc., a Delaware corporation ("**Bluetooth SIG**") that governs your access to and use of the Bluetooth Launch Studio (the "**Launch Studio Tool**").

The Launch Studio Tool is a Service (as defined in the WTOU) offered by Bluetooth SIG. Terms used but not defined in these Launch Studio Terms have the meanings ascribed to them in the WTOU. In the event of a conflict between these Launch Studio Terms and the WTOU, these Launch Studio Terms will govern.

PLEASE READ THE BLUETOOTH TERMS CAREFULLY. BY ACCESSING OR USING THE LAUNCH STUDIO TOOL AND/OR CLICKING TO INDICATE THAT YOU AGREE TO THE LAUNCH STUDIO TERMS, YOU REPRESENT THAT YOU ARE AUTHORIZED TO BIND THE ENTITY UNDER WHOSE BLUETOOTH SIG MEMBERSHIP YOU OBTAINED A USER ACCOUNT AND THAT YOU AND THAT MEMBER AGREE TO BE BOUND BY THE BLUETOOTH TERMS. IF YOU ARE NOT AUTHORIZED OR DO NOT AGREE TO THE BLUETOOTH TERMS, DO NOT ACCESS OR USE THE LAUNCH STUDIO TOOL OR CLICK TO INDICATE THAT YOU AGREE TO THESE LAUNCH STUDIO TERMS.

1. MEMBERSHIP ACCOUNT REQUIREMENT.

To access and use the Launch Studio Tool, you must have an Account (as defined in the WTOU) issued under the membership account of a current Bluetooth SIG member and log into the Launch Studio Tool with that Account. You acknowledge and agree that when you access the Launch Studio Tool that you are doing so on behalf of the member your Account is associated with ("**Member**") and you represent and warrant that you are authorized by Member to access and use the Launch Studio Tool and provide Submissions (defined below) on Member's behalf.

2. BLUETOOTH QUALIFICATION PROCESS.

The "**Bluetooth Qualification Process**" is the process created by Bluetooth SIG for qualifying Products. The Launch Studio Tool is the Bluetooth SIG tool designed to implement the Bluetooth Qualification Process. A "**Product**" means a product that:

(a) if sold, is sold as a single item (consisting of software, firmware, drivers, applications, hardware, or a combination of some or all of the foregoing);

(b) contains one or more Portions; and

(c) if marketed, is marketed under a name and/or trademark that uniquely identifies Member as the source of the product. A "**Portion**" means hardware, software, or a combination of hardware and software that implements a Bluetooth Specification. If the hardware, software, or combination contains or consists of more than an implementation of the Bluetooth specification, the "Portion" is only the implementation of the Bluetooth Specification. "**Bluetooth Specification**" is defined in the Bylaws of Bluetooth SIG.

3. REPRESENTATIONS AND ACKNOWLEDGEMENTS.

(a) You represent and warrant that you have permission to submit to Bluetooth SIG all information and materials (including design information, product information, test reports, and test results) that you provide through the Launch Studio Tool ("**Submissions**") and that all Submissions are true, complete, and accurate.

(b) You represent and warrant that you and Member will comply with the SIG Member Terms (as defined in the WTOU).

(c) You represent and warrant that all Submissions that you make through the Launch Studio

BLUETOOTH

This device complies with the Bluetooth Launch Studio Terms of use under declaration ID D065301

Tool and all Products listed in your Submissions comply with the SIG Member Terms (as defined in the WTOU) and the Bluetooth Specification(s) referenced in your Submission.

(d) You represent and warrant that the products referenced in your Submissions that you submit to the Bluetooth Qualification Process via the Launch Studio Tool will only be Products that, if marketed or distributed, are done so by Member under a name or trademark that uniquely identifies Member as the source of the Product.

(e) You acknowledge and agree that a product is not a Bluetooth Product under the Bluetooth Trademark License Agreement and you and Member will not market or distribute any product that uses any Bluetooth® trademark on it or in connection with any related marketing, promotion, or advertising unless you or Member have been notified by Bluetooth SIG that it has completed the Bluetooth Qualification Process (e.g., via a confirmation screen or email from Bluetooth SIG expressly stating that that the Product has completed the Bluetooth Qualification Process).

4. FEES AND PAYMENT TERMS.

(a) Bluetooth SIG may charge you fees in connection with the Bluetooth Qualification Process including within the Launch Studio Tool and Submissions (e.g., declaration fees, etc.). The type and amount of fees may change at any time. You agree that Member will pay all fees required by Bluetooth SIG in accordance with the instructions provided within the Launch Studio Tool. Bluetooth SIG may accept credit card payments or, if offered within the Launch Studio Tool, may permit you to pay fees offline. If you choose to pay offline, you will pay the invoice issued to you by Bluetooth SIG, according to the terms stated in the invoice. If you provide credit card payment information, you agree that Bluetooth SIG or its third party payment processor may charge your credit card immediately. You acknowledge that, until Bluetooth SIG has processed your payment and received the funds: you and Member will not acquire any of the rights or benefits for those fees. All sales are final and all payments are nonrefundable.

(b) If you receive a discount on any fees based on your Member's level of membership and your Member's membership level changes (e.g., the Member moves from an associate to an adopter level), you will no longer be entitled to receive the discount and any fees owed and any outstanding invoices from Bluetooth SIG as of the date of the membership level change will be increased to reflect the amount owed without the discount. Further, if you prepaid any declaration fees and received a discount and you have not used the declaration fees as of the date of the membership level change, you may not use the declaration fees unless you pay the difference between the then-current standard fee and the discounted fee previously paid.

(c) Declaration Fees. When required by Bluetooth SIG, Member must pay a declaration fee prior to completion of the Bluetooth Qualification Process. To confirm payment of the declaration fee, Bluetooth SIG will issue a unique identification number ("Declaration ID"), which will be associated with your user account. Any declaration fees you pay are paid by you on behalf of Member regardless of the payment method or source of funds and proof of payment is evidenced by the issuance of a Declaration ID. If requested by Member, Bluetooth SIG may reassign, without notice to you, a Declaration ID from your user account to another user account under the Member's membership account. When required by Bluetooth SIG, Member must provide the Declaration ID in the Submission as proof of payment before completing the Bluetooth Qualification Process. All Declaration IDs not used in a Submission as proof of payment expire 12 months from the date of receipt of payment. No declaration fees will be refunded. All Declaration IDs not used in a Submission as proof of payment are nontransferable.

5. CONFIDENTIALITY OF SUBMISSIONS.

You and the Bluetooth SIG agree that Submissions are Confidential Information subject to the Bluetooth SIG Confidentiality Policy even if you do not label the Submission "Confidential." Notwithstanding anything in the Bluetooth SIG Confidentiality Policy and except as described in the following sentence, you agree that Bluetooth SIG will treat your Submissions as confidential, including by not making them available through the searchable database on Bluetooth SIG's web site until the date that you have selected as the "listing date" within the Launch Studio Tool when you click to submit your Submission. Bluetooth SIG further agrees that

(a) if, when you submit a Submission, the "publish date" in your Submission is after the listing date, the following information will be treated as Member Confidential Information and not included in the searchable database on Bluetooth SIG's web site until the "publish date":

BLUETOOTH

This device complies with the Bluetooth Launch Studio Terms of use under declaration ID D065301

product name, product number, category, subset ID (*if applicable*), publish date, and product description and

(b) the test plan and test evidence provided as part of your Submission will continue to be treated as Member Confidential Information for the period of time required under the Bluetooth SIG Confidentiality Policy regardless of any listing date or publish date in the Submission. To the extent that this Section conflicts with the Bluetooth SIG Confidentiality Policy, this Section supersedes the Bluetooth SIG Confidentiality Policy with respect to Bluetooth SIG's obligations of confidentiality of Submissions.

6. RECORD KEEPING AND AUDIT.

You agree to maintain a complete copy of your Submissions as well as all supporting information and documentation related to each Product you submit for qualification through the Launch Studio Tool ("**Records**") in order to document your compliance with the SIG Member Terms and Bluetooth Specifications. You agree that Bluetooth SIG may request copies of Records relating to or pertaining to your Submissions and all Products referenced therein and you will provide copies of Records and permit Bluetooth SIG and its representatives to audit, examine, and make copies of or extracts from all Records (in whatever form they may be kept, whether written, electronic, or other) in order to verify the truth, accuracy, and completeness of your Submissions as well as compliance with the SIG Member Terms and Bluetooth Specifications. Bluetooth SIG will be responsible for the cost of any audit, unless the audit reveals that any Submission is incomplete or inaccurate or that you, Member, any of your Submissions, or any Product fails to comply with the SIG Member Terms or Bluetooth Specifications, in which case Member will reimburse Bluetooth SIG for the costs of the audit within 30 days after receiving Bluetooth SIG's request for reimbursement.

7. ADDITIONAL DISCLAIMERS.

The Launch Studio Tool is not a record-keeping or storage tool. You are responsible for backing up all of Your Content (as defined in the WTOU) submitted to the Launch Studio Tool. In addition to the disclaimers in the WTOU, Bluetooth SIG does not guarantee that Your Content will not be removed, damaged, corrupted, or lost.

DATA SECURITY CERTIFICATE

Certificate of Registration

This is to certify that Information Security Management System of

SI-WARE

3, Khaled Ibn Al Waleed St. Sheraton Heliopolis, Cairo 11361, Egypt

is in accordance with the requirements of the following standard

ISO/IEC 27001:2013

(Information Security Management System)

SCOPE

FT-NIR END-TO-END REAL TIME MATERIAL SENSING SPECTROSCOPY LABORATORY - FREE SOLUTIONS PLANNING, DESIGN, DEVELOPMENT, SUPPORT, MONITORING, EVALUATION AND IMPROVEMENT.

(SOA Version - 1.0, Dated - Jan 2022)

Certificate Number : SCK/05/SIW/22/20/1503

To verify certificate, visit at :
www.sckcerts.com

Initial Registration Date : 20-Jun-2022
1st Surveillance Date : 20-May-2023
2nd Surveillance Date : 20-May-2024
Certificate Expiry Date : 19-Jun-2025

Issued by SCK Certifications Pvt. Ltd.

Director

IAS IAF ISO 27001

Accreditation Board : 3060, Saturn Street, Suite 100, Brea, California 92821-1732, USA

Uses of portable FT-NIR to determine cannabinoids and terpenes in dry-cured cannabis flowers

Marcal Plans1 ; Adham Hesham1 ; Ruben Valenzuela2

1. Si-Ware Inc. 101 Jefferson Drive, Menlo Park, CA, USA. 2. Valenveras, Camí Pla de la Torreta 1 BIS, Sant Andreu de Llavaneres, 08392, Barcelona, Spain

INTRODUCTION

The cannabis industry is growing exponentially worldwide. The crop can engage old and new farmers to adopt it as a novel crop. In that sense, there is a need for fast, on-site, accurate technology to provide the growers, distributions, and producers with a tool to manage the qualitycontrolof theirsitesandimprovecropoptimization.
NIR infrared hasshown thepotentialtobeused asatool topredictthe cannabinolscontentindry-curedflowershemp(1)andcannabis(2). Handheld portable devices provide good performance to predict quantitative levels of cannabinols in flowers (2). This has opened a lot of opportunities to implement this technology in the field and directly to the quality control; from the crop to the distributor to the medical dispensary. Increasing the traceability of the production and improving the transparency for the final user.

METHODOLOGY

A Total of 7000 samples were used to calibrate the cannabinols, and 4000 samples to calibrate the total terpenes. The reference analyses were done using ISO certified HPLC-PDA method for cannabinols and GC-FID for the total terpenes.

Partial Least Square regression (PLSR) was used to correlate the spectra obtained from NeoSpectraScanners (17 scanners (Si-Ware Inc., Menlo Park, CA, USA)) from 1350 –2550 nm with the reference analysis.

RESULTS

Models showed a good performance predicting THC, CBD, CBG, Total Terpenes, THC acid, and CBD acid with a low error of predictions.

	Low Concentration 0-3%				High Concentration 3-30%			
	RMSECVR2	2cv	RMSEP	Rp	RMSECVR	cv	RMSEP	Rp
CBD Total	0.19	0.80	0.16	0.91	1.60	0.89	1.70	0.91
THC Total	0.15	0.85	0.10	0.93	2.10	0.91	2.10	0.90
CBG Total	0.15	0.71	0.11	0.72				
Total Terpenes	0.20	0.70	0.30	0.65				
THC acid	0.16	0.84	0.11	0.91	2.20	0.90	2.20	0.89
CBD acid	0.20	0.79	0.18	0.90	1.65	0.88	1.75	0.90

PLS models for THC and CBD show good linearity between predicted levels and measured by HPLC-PDA levels of the cannabinoids.

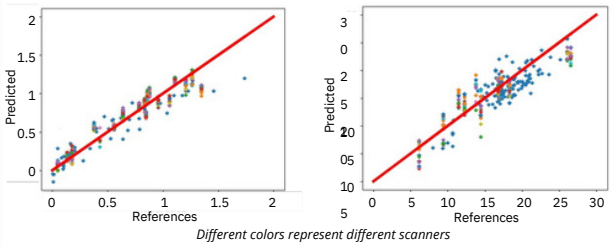
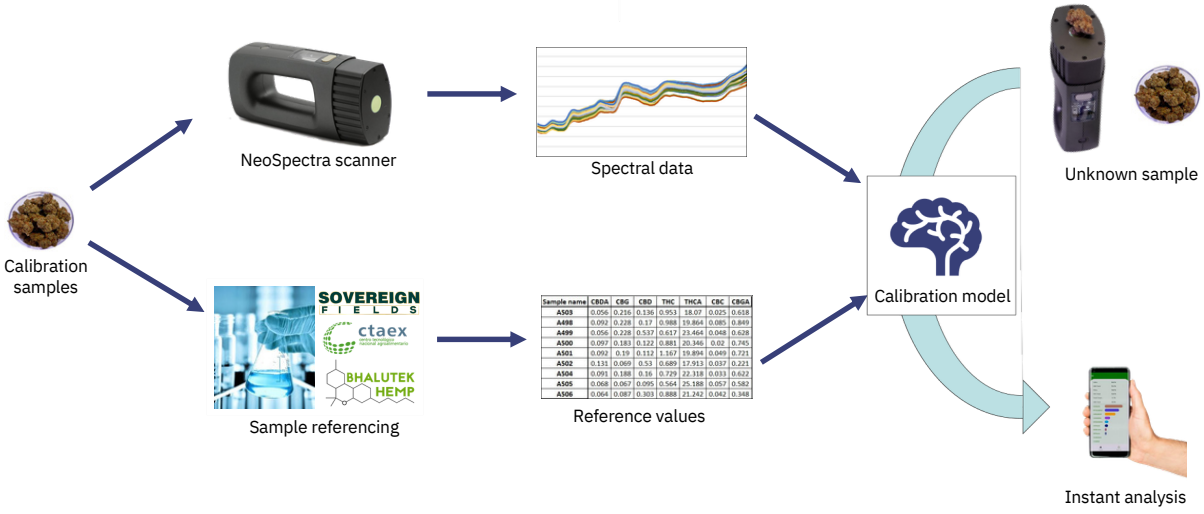


Fig 1. Predicted THC total vs the HPLC-PDA levels in the low range (left) and high range (right).



CONCLUSIONS

Si-Ware technology coupled with Valenveras as the expert in the cannabis sector, provides reliable and robust models. The current FT-NIR technology could be used as an alternative to the classical HPLC and GC analysis for in-situ analysis of the cannabis flowers. Moreover, besides the prediction of the cannabinols, total terpenes also can be predicted, giving the final user the tools to discriminate between high and low content of phenotypes.

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Badajoz, 29 May 2024

The cannabinoid analysis data used by the company Valenveras for the calibration of the NEOSPECTRA (SI-WARE) equipment were performed by HPLC-DAD techniques by the AOAC 2018.11 method of analysis. They have been performed by HPLC-DAD techniques by the method of analysis of the AOAC 2018.11. The PE-1938 method of analysis for cannabinoid quantification is accredited under the UNE-EN ISO/IEC 17025:2017 standard in different matrices and ranges (attached scope of accreditation).

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