NIR-M-R11 Product Introduction

2025/12/3

Responsibility Innovation Superiority Entrepreneurship

Contents

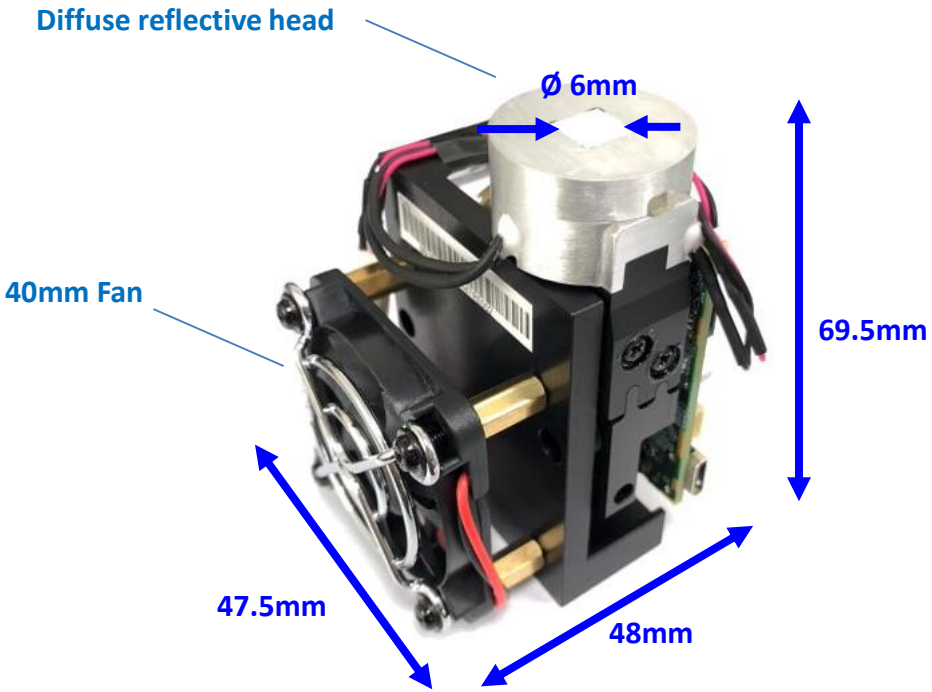
Specification

- Wavelength range: 1350~2150nm
- Signal-to-Noise Ratio (SNR): 3,000:1 @ 2000nm
- Optical Resolution: Typ. 12nm
- Wavelength Accuracy: Typ. ±1 nm
- Detector: 1mm extended InGaAs (Uncooled)
- Slit Size: 1.8mm * 0.025mm
- Scan Capability: Linear (Column) / Hadamard / Slew Scan
- Illumination Source: three 0.7W tungsten filament lamps
- Scan window: Ø6mm with square cover glass
- Measurement mode: Diffuse reflective mode
- Communication Interface: Micro USB / UART / Bluetooth Low Energy (optional)
- Sensors: Humidity and temperature sensor
- Power requirement: Min. 1.2 A (DC 5 V), high-power USB hub is preferred
- Fan: 40x40x10mm, 5V /6000RPM / 0.15m^3/min.
- Battery type: One rechargeable 18650 battery can be installed but is not included.
- Operating battery life: 500+ scans in preset scan configuration, using 18650 battery with 2600mAh capacity.
- Battery charge time: 2600mAh capacity 18650 battery, fully charged in 5 hours.
- Dimensions: 69.5mm * 48mm * 47.5mm
- Weight: < 120g
- Accessory: USB Standard-A to Micro-B cable (1m), ISC's accessory is preferred.

What's inside the box

- **NIR-M-R11 module (x1): for diffuse reflective measurement**
- **USB cable (x1): for powering the module**

Appearance & Interface



Appearance & Interface

18650 Battery

Protection Circuit Modules witch NTC
(Negative Temperature Coefficient Thermistor)

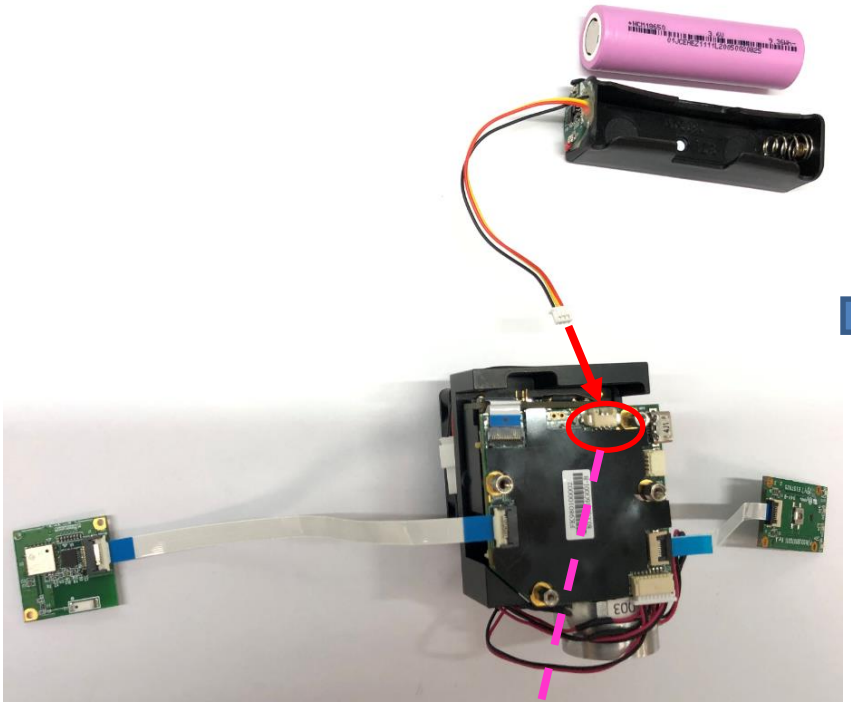
USB connector

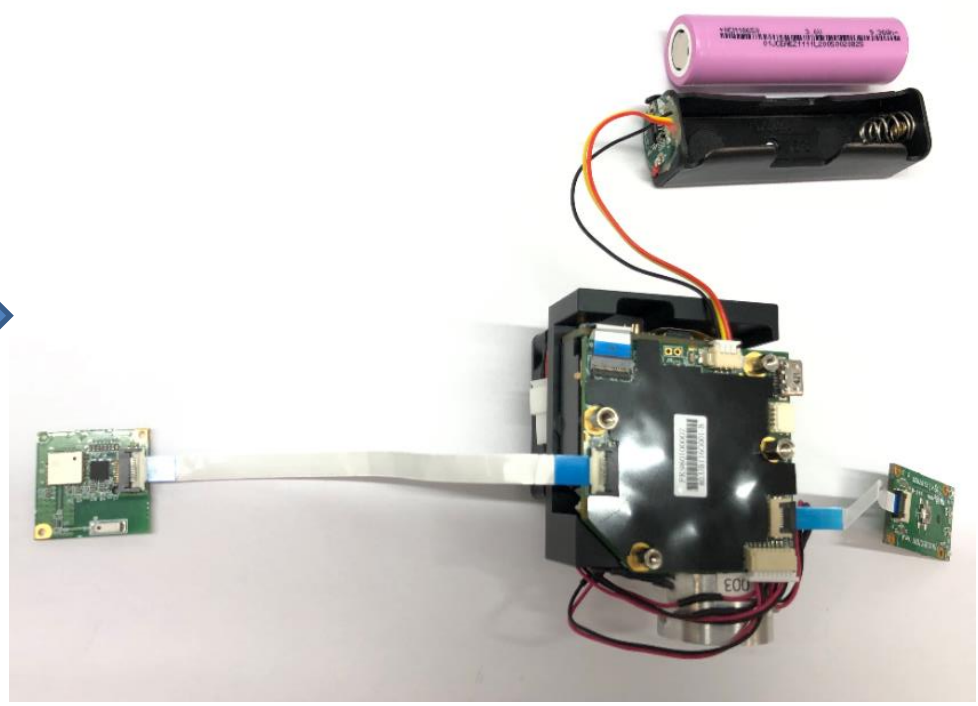
UART connector

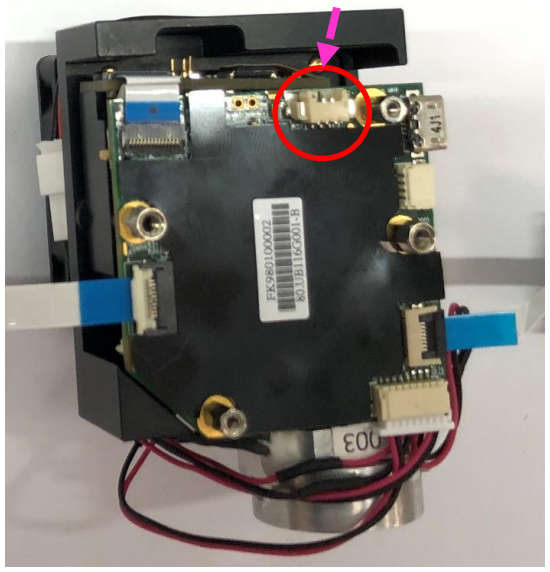
BLE Board

OP board

Appearance & Interface







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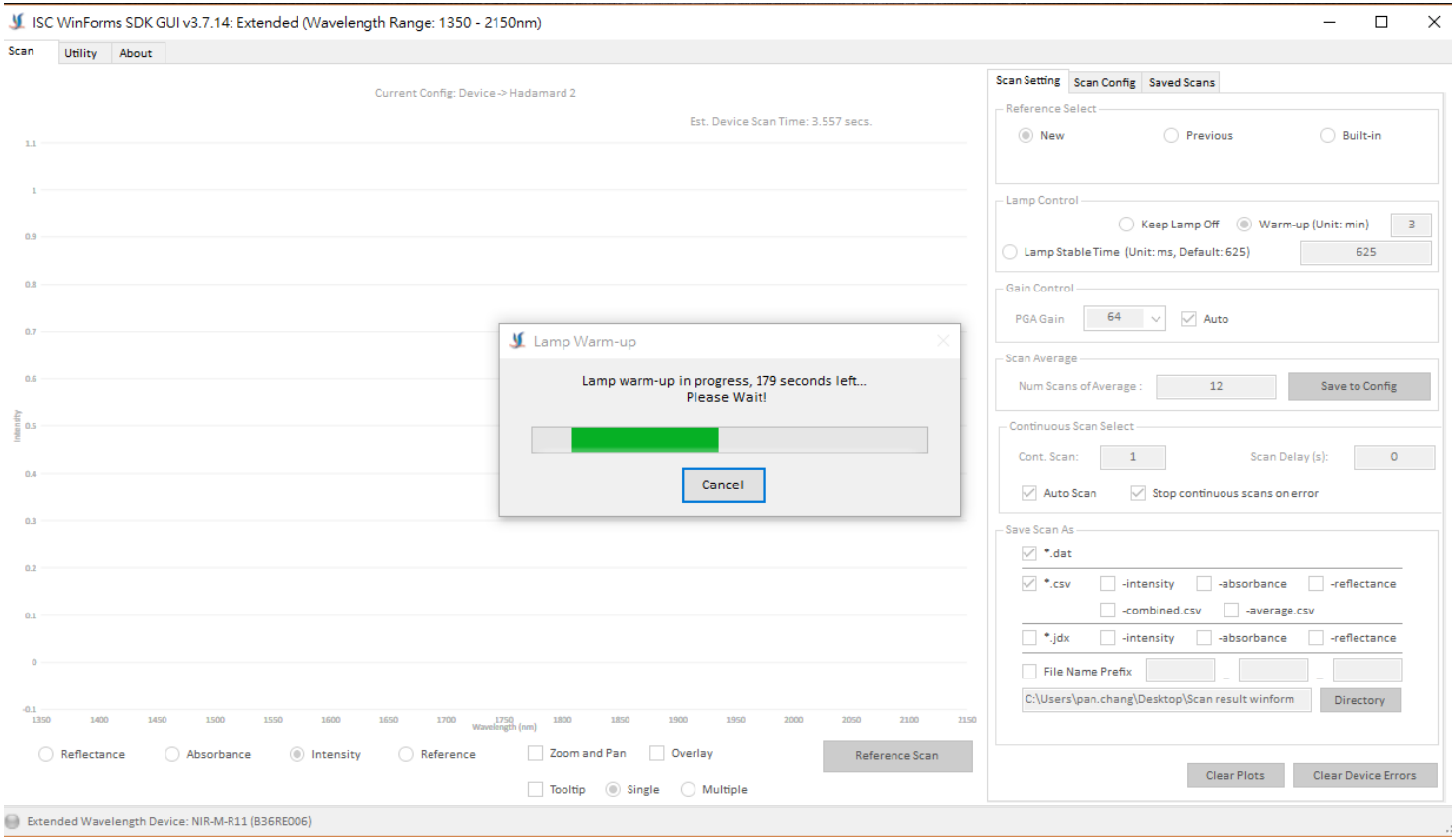
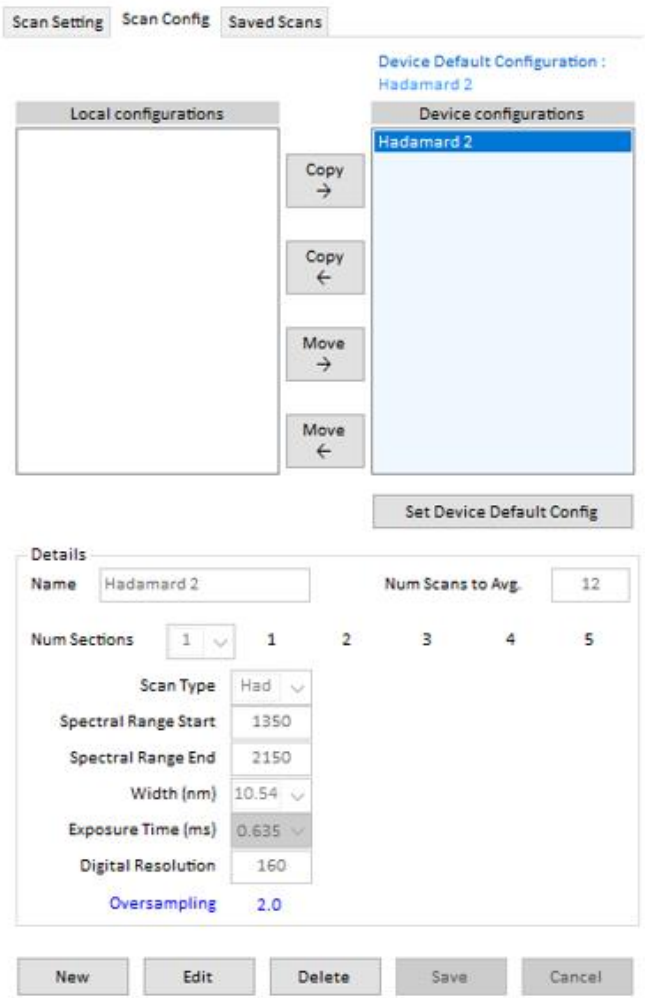
Quick Start Guide

Perform a scan job

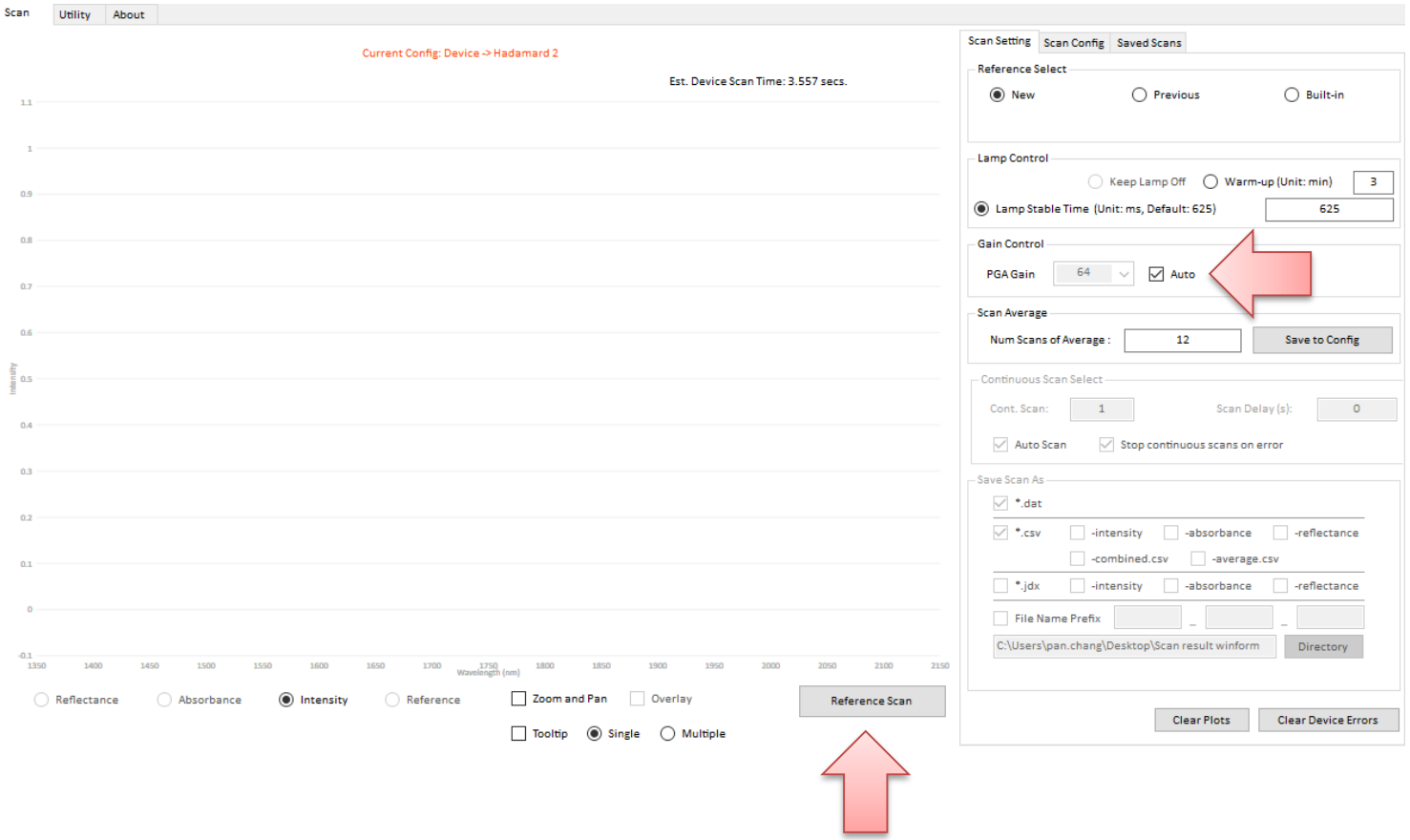
- Reference material: **SRS99 or equivalent**
- Sample material: **HDPE cap**
- Software: **ISC WinForms GUI**
- Please connect the NIRScan device to the PC. After launching the WinForms GUI, please check "**Warm-up**" to start the lamp warm-up process for at least 3 minutes.

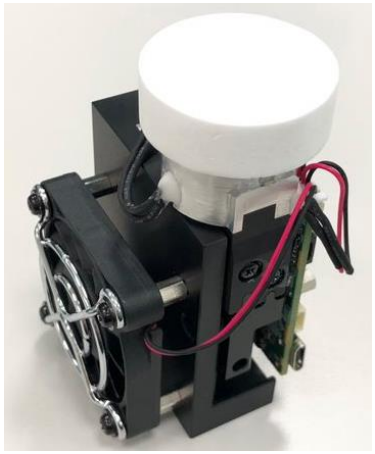


- Scan Configuration: select **device default configuration “Hadamard 2”**

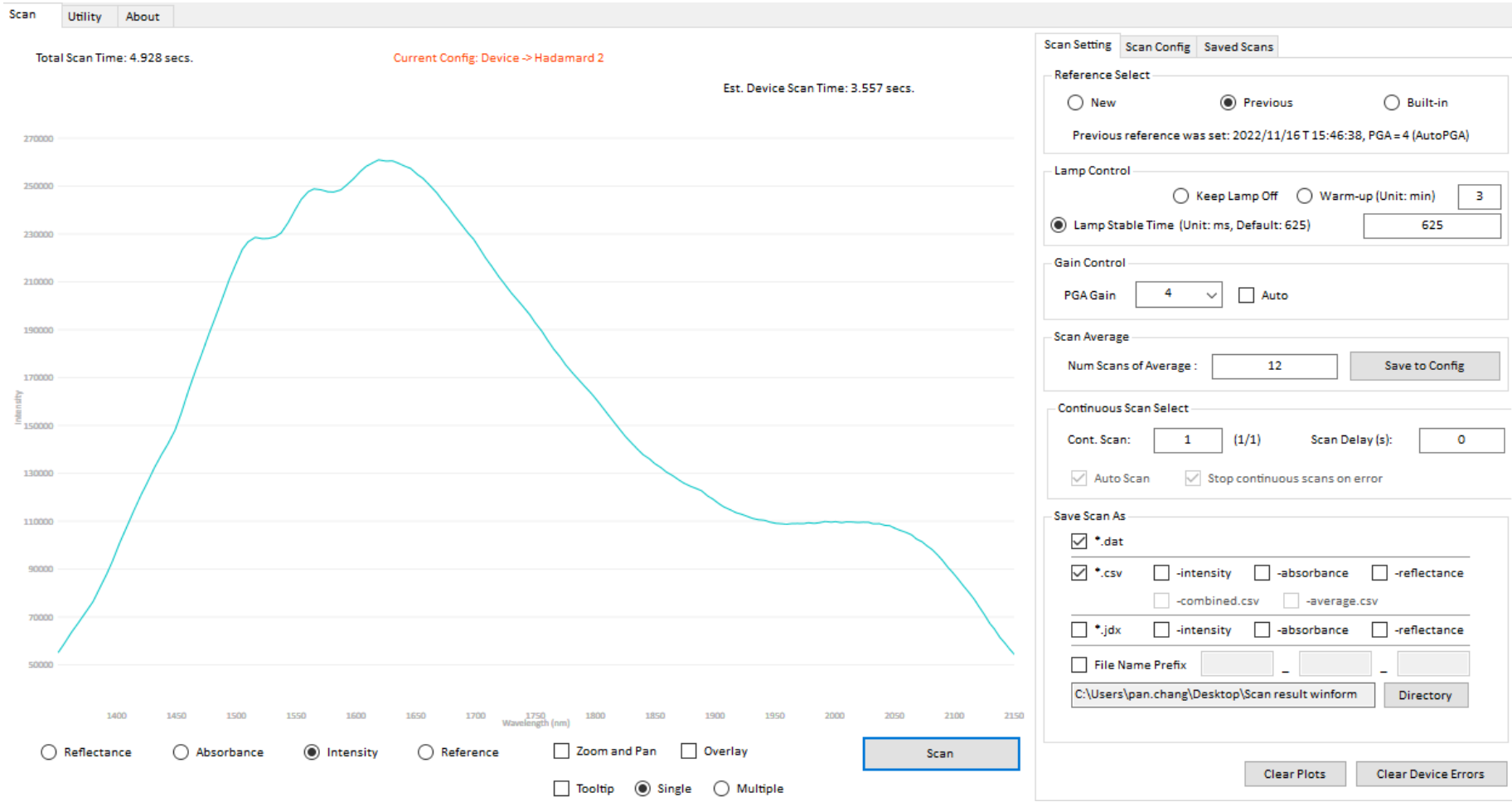


- Select **Auto PGA**.
- Please scan an **SRS99** to capture a new reference signal.

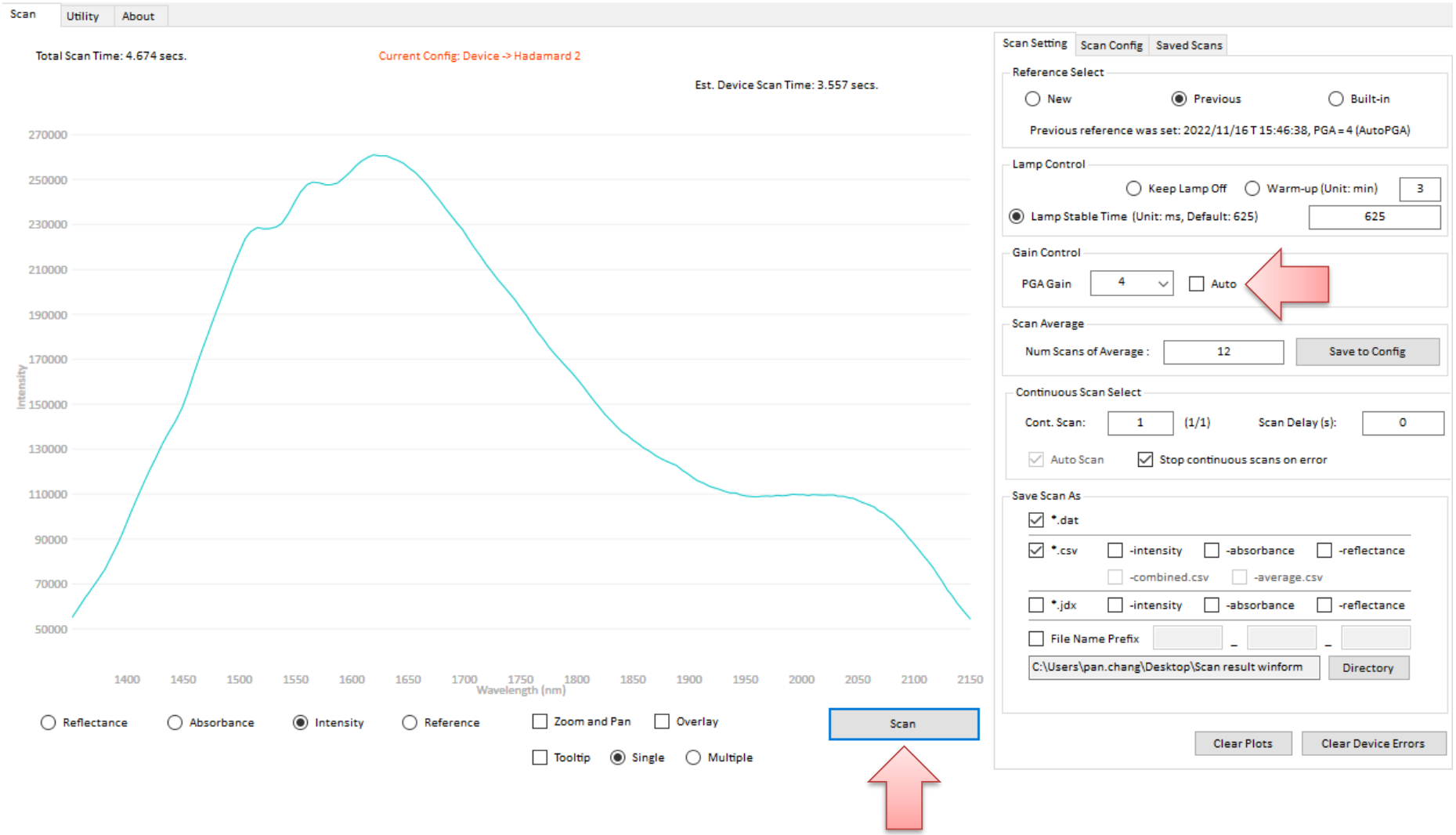




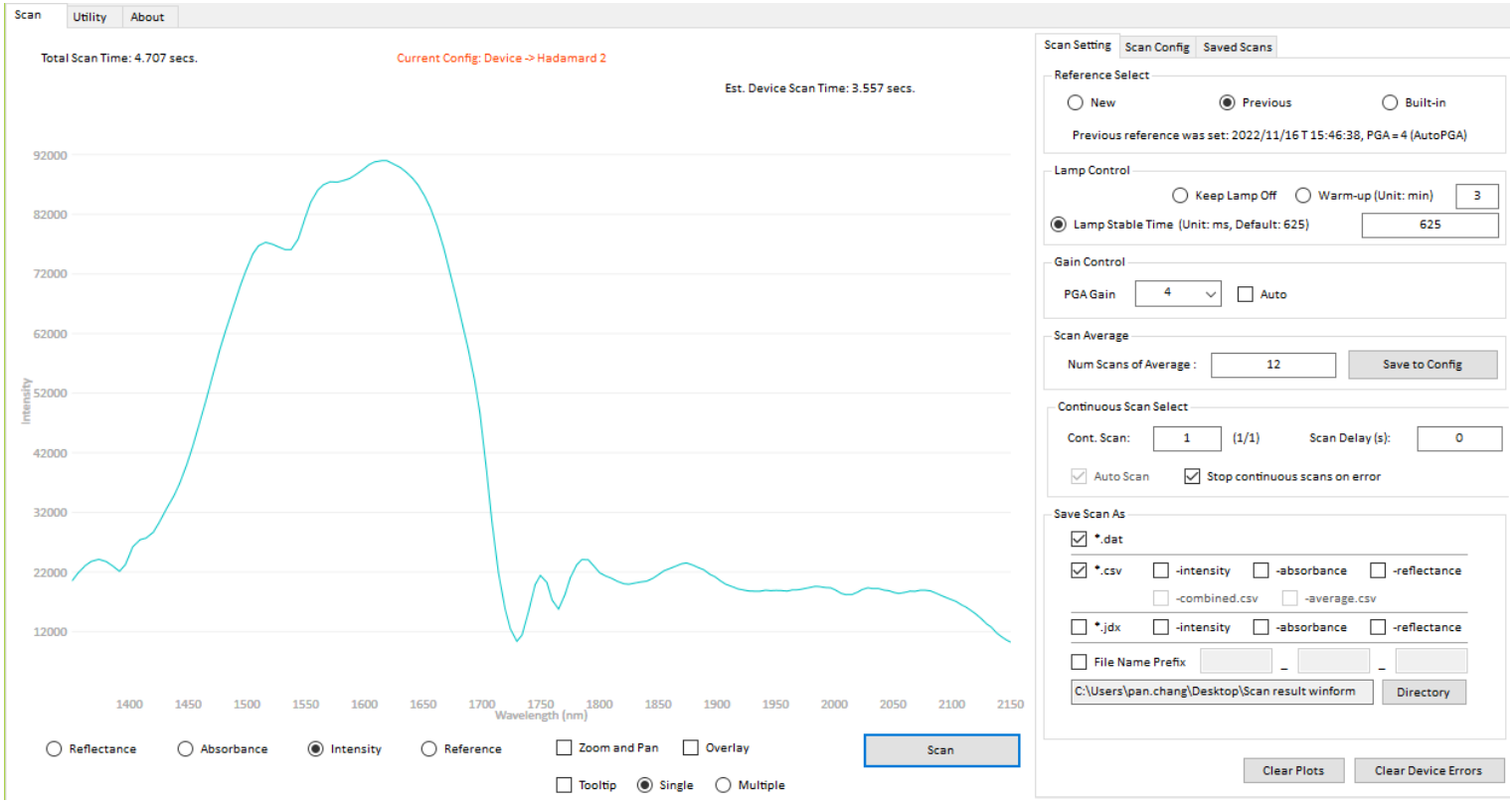
- A reference signal is captured and displayed as below. In this case, the software determines PGA=4 for this SRS99 in “Hadamard 2” configuration.



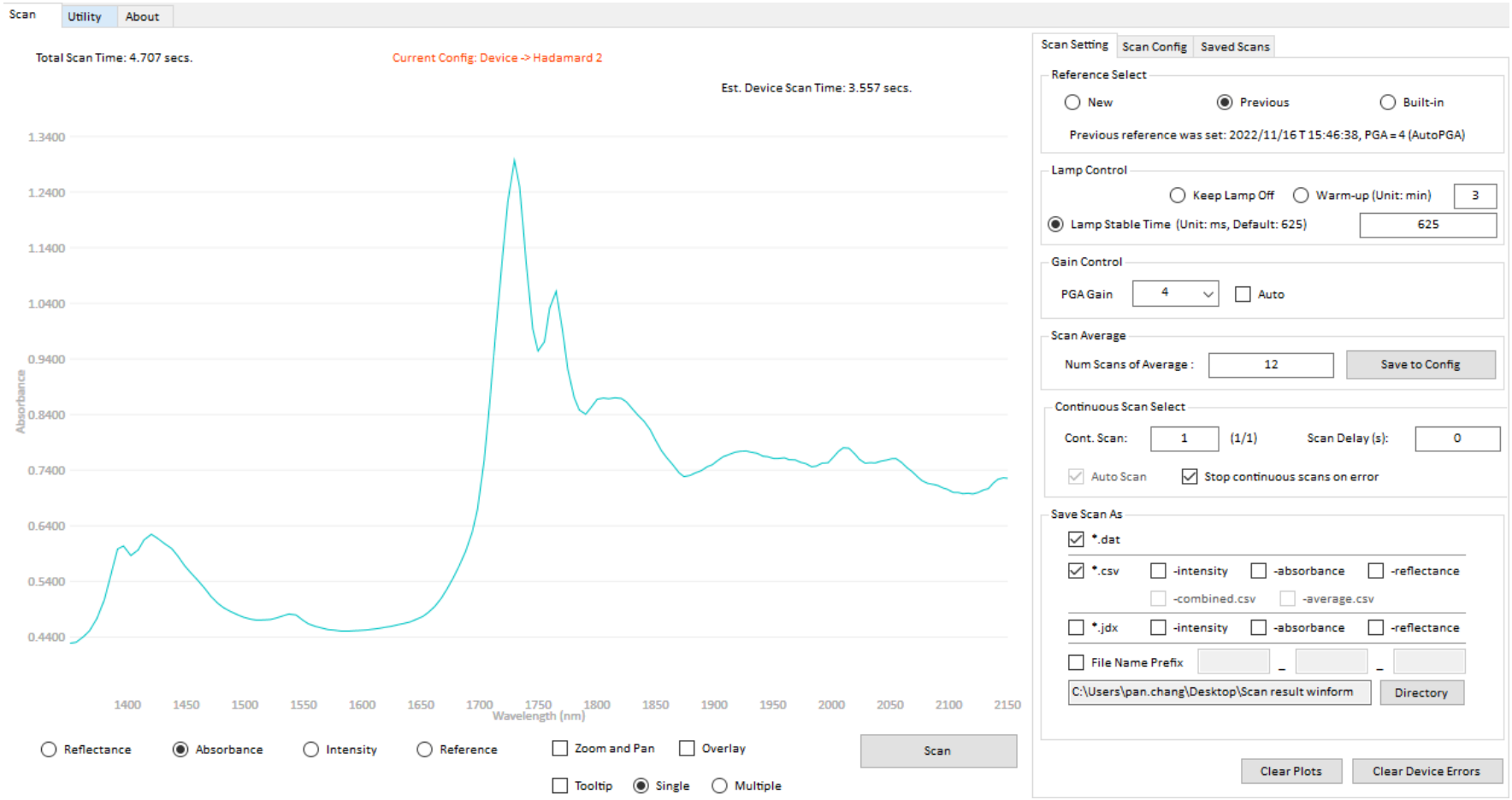
- To perform a sample signal scan, you can **fix the PGA to** 4. This will ensure both sample and reference signals with **same PGA gain**.



- Place the HDPE cap on the scan window, select "Previous" from "Reference Select" menu and click "Scan" to execute sample scan. The sample signal is captured and displayed as follows.

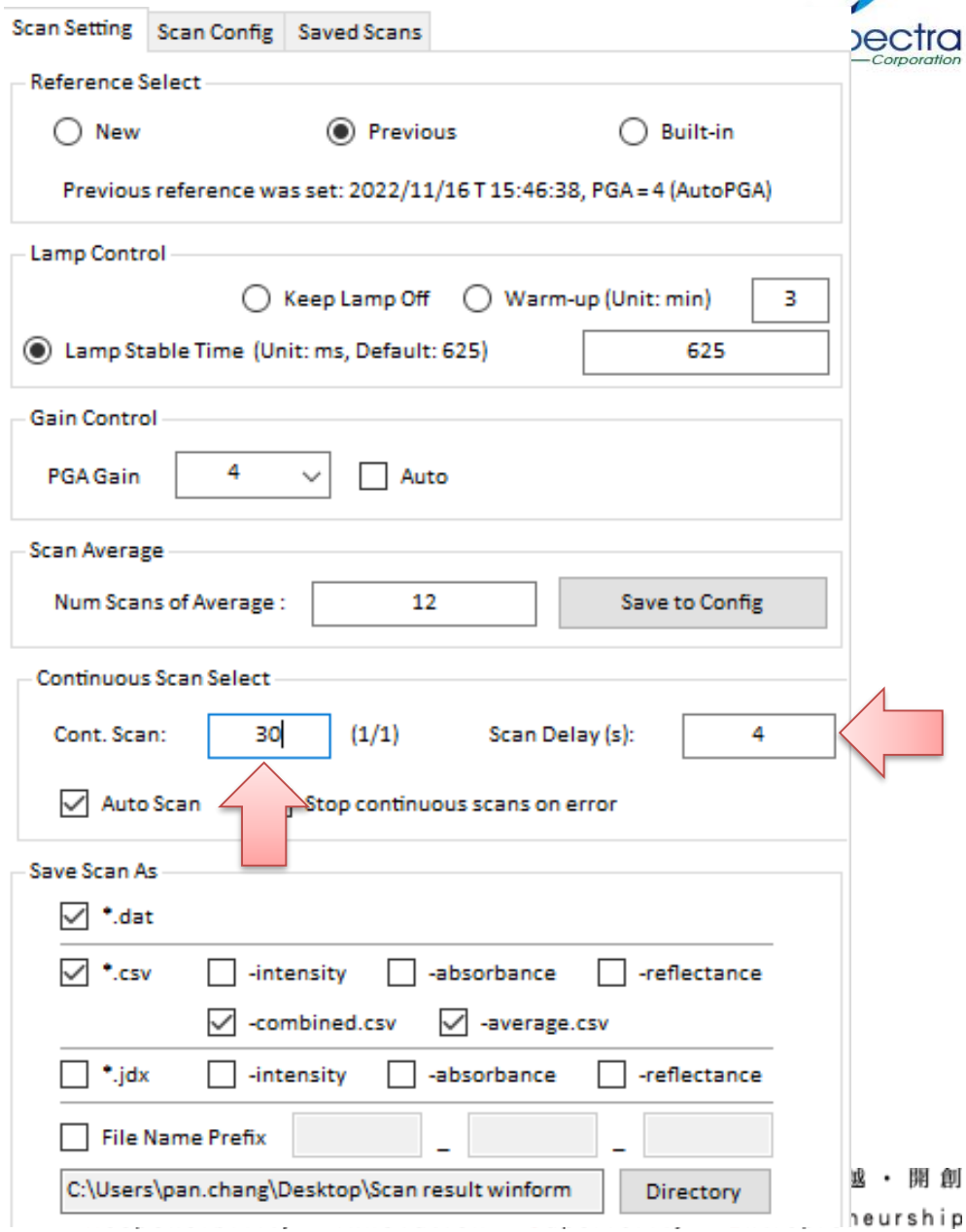


- The absorbance of this sample can be observed as below.



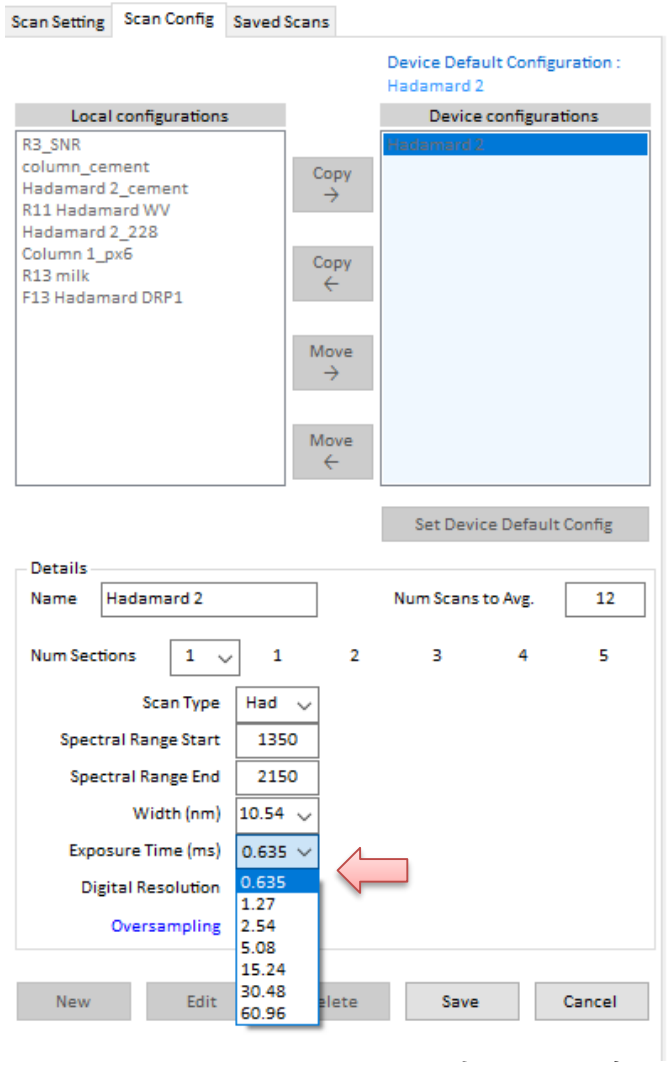
Continuous Scan

- If you plan to perform continuous scans without moving or changing the sample, remember to set the "scan delay" (for example, 4s or longer). By increasing the delay time, the sample can be prevented from heating for a long time. This can help you to get correct spectrum and better SNR.



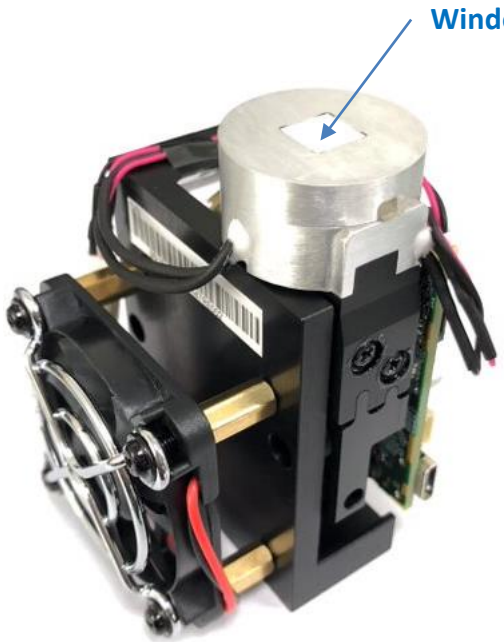
SNR Enhancement

- In **Hadamard mode**, you can also **increase the exposure time to improve SNR**.



Maintenance

- You can clean reflective head by air gun when you find that there are particles outside of the reflective head.
- The suggested distance between air gun and reflective head is at least 0.3m.
- Clean the window with a lint-free cleaning cloth very slightly moistened with **ethanol**.



Applications

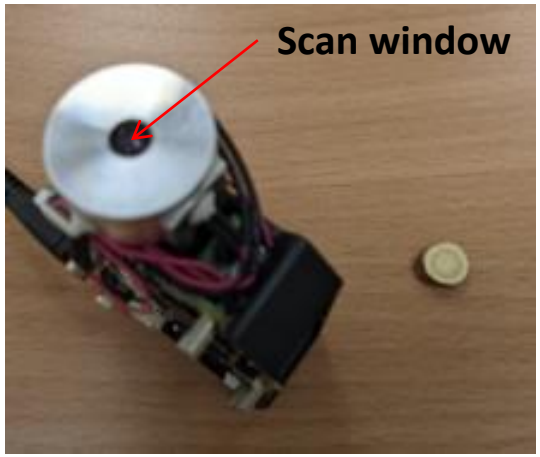
NIR-M-R11 can be used for the measurement of solid, powder and liquid. See the table below to learn how to choose your measurement mode.

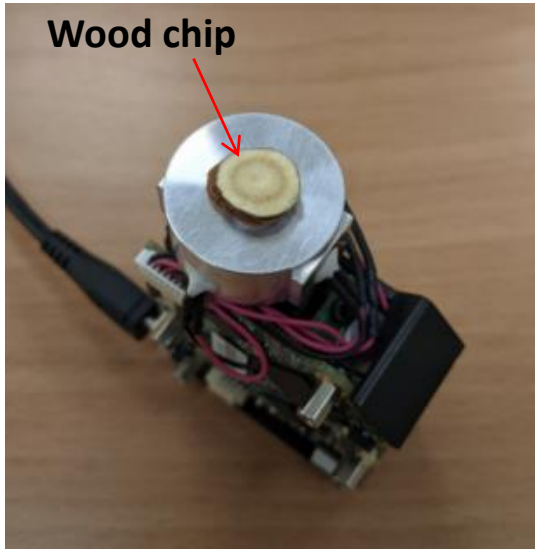
Solid / Powder	Liquid
• Diffuse reflective mode: Opaque solids and powders	• Transflective mode: Transparent liquid (e.g. wine) (need to add a reflector)
• Transflective mode: Transparent solid(need to add a reflector)	• Diffuse reflective mode: Slurry or opaque liquid (e.g. milk)

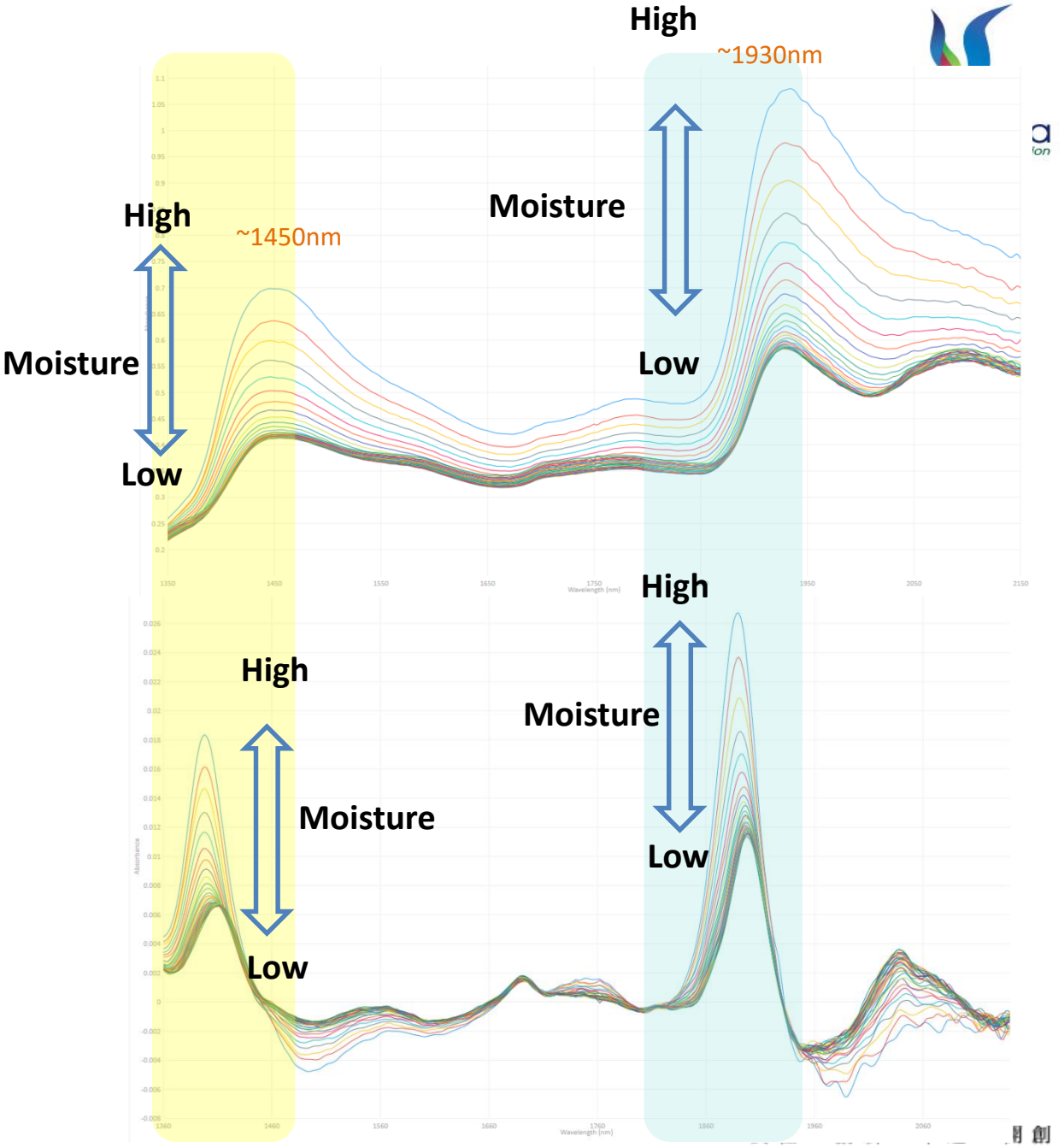
Here are some examples for your reference:

- **Wood**
- **Soil**
- **Tobacco Fragments**
- **Tobacco Powders**
- **Rock**
- **Plastic Resin**
- **Milk Powder**
- **Flour / Cheese Powder**
- **Textiles**
- **Milk Fat**

Wood


Scan window


Wood chip


High
~1930nm
Moisture
Low
High
~1450nm
Moisture
Low
High
Moisture
Low
High
Moisture
Low

Reference Material:

Estimation of moisture in wood chips by Near Infrared Spectroscopy

https://scielo.conicyt.cl/scielo.php?script=sci_arttext&pid=S0718-221X2020000300291

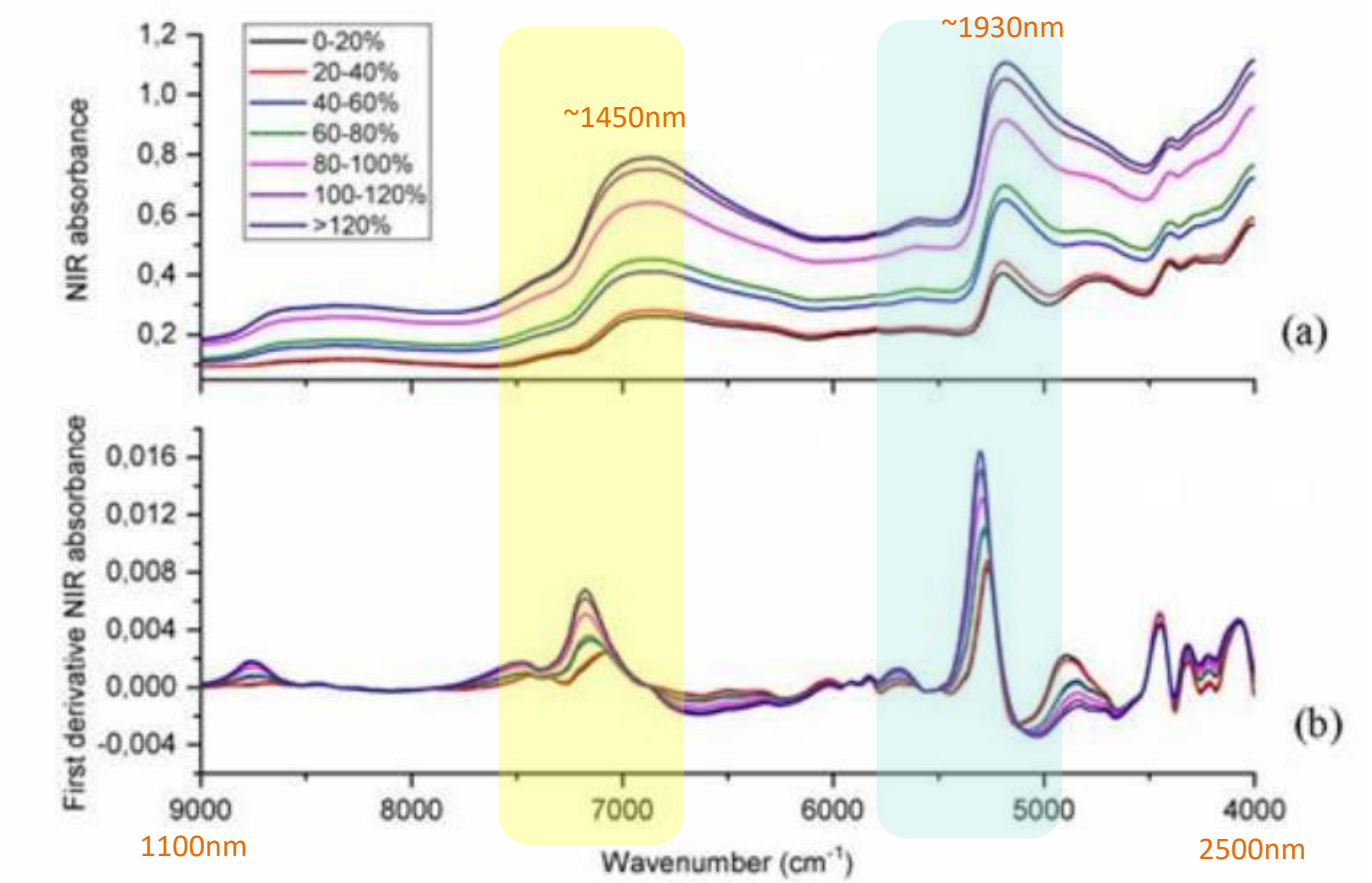
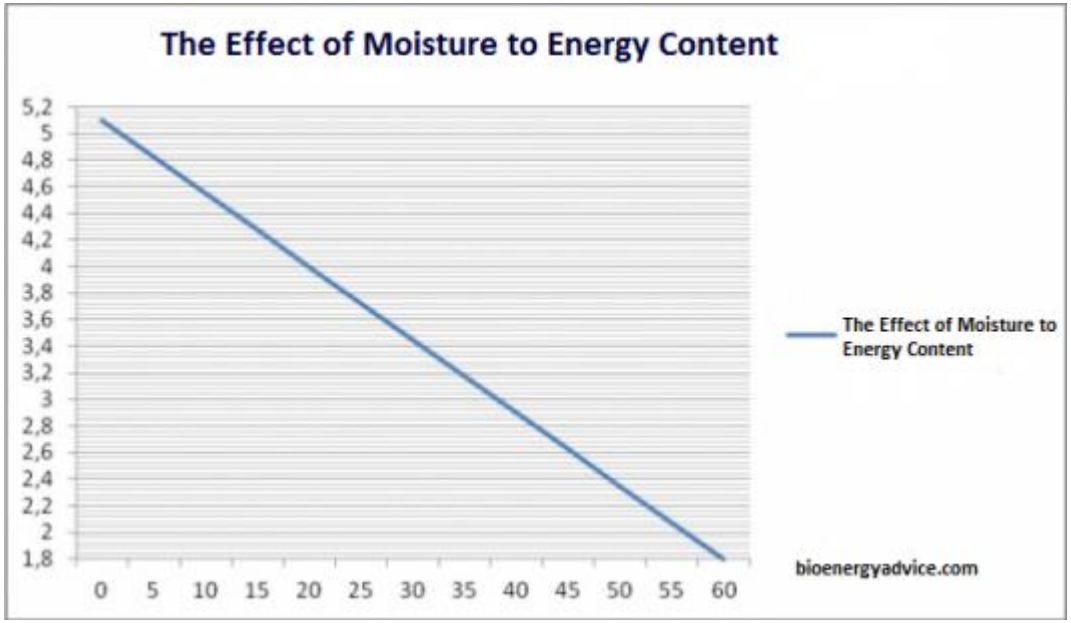


Figure 1: (a) Diffuse reflection spectra obtained with the original (untreated) data and (b) with the treatment of the first derivative.

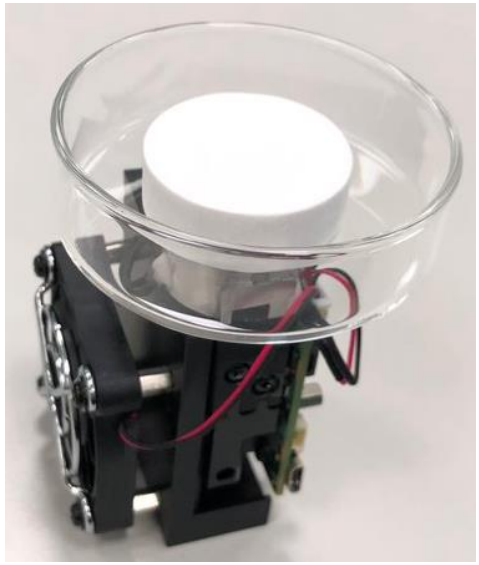
Reference Material:

http://www.bioenergyadvice.com/facts/moisture-content/

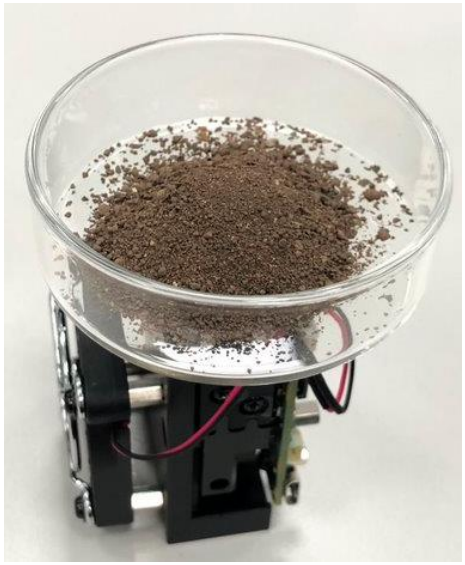
The vertical axis refers to wood's energy content in relation to weight (kWh/kg). The horizontal axis describes the moisture content percentage (%). Fresh tree has about 50–60 % water. Fire wood is classified as of high-quality when its moisture content is 15–16 % or less. Wood chip is of high-quality if its moisture content is 25–30 %. The table illustrates the effect moisture content has on energy content. Source: VTT.



Soil

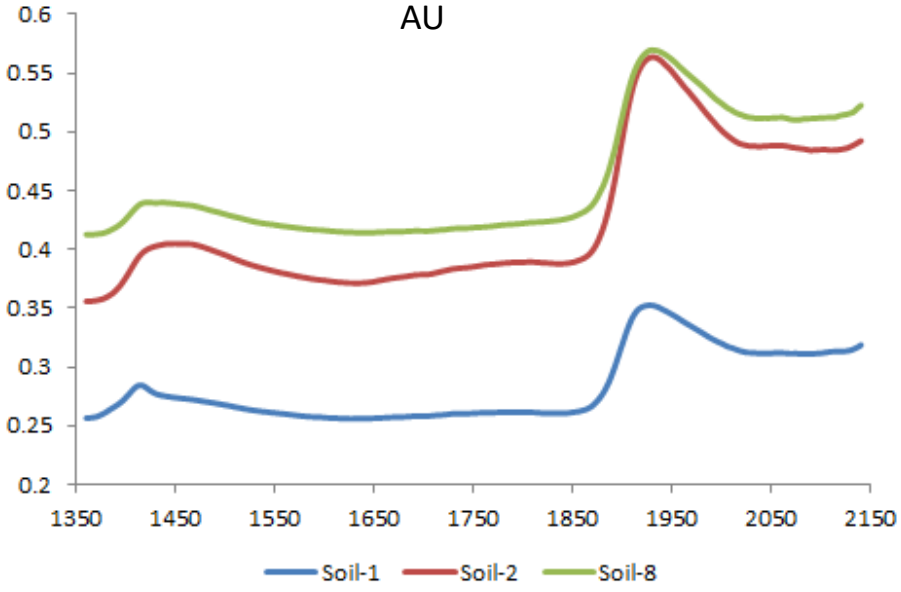


Reference scan

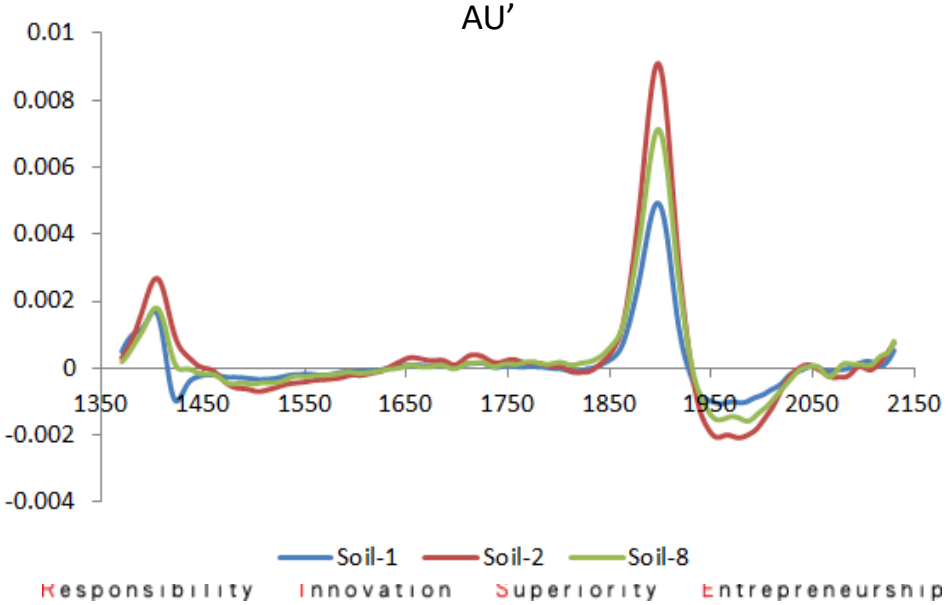


Sample scan

AU



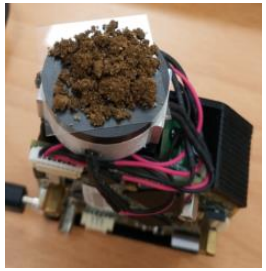
AU’

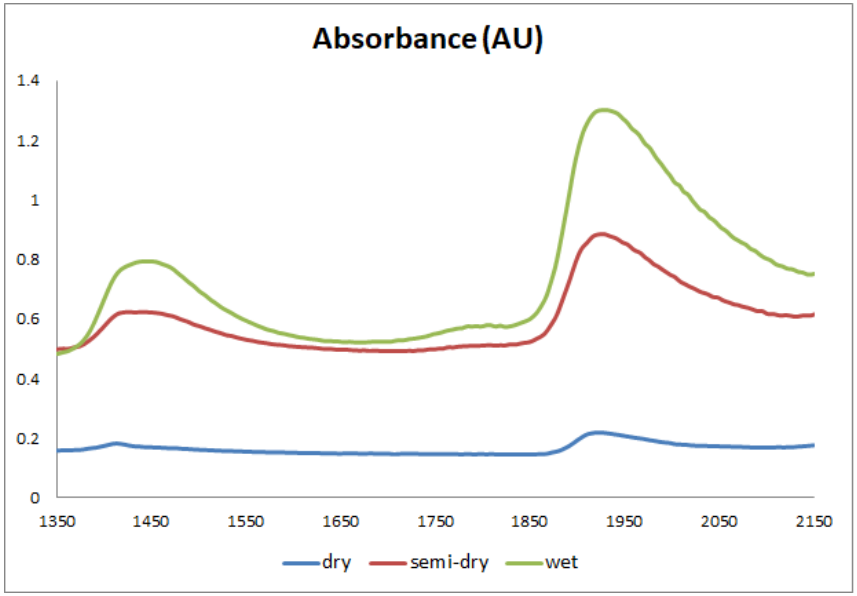


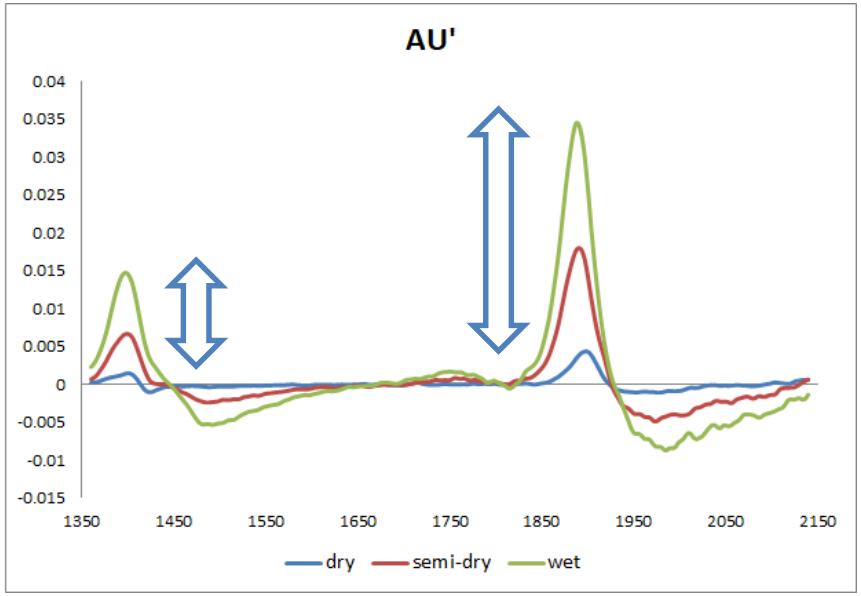
wet

semi-dry

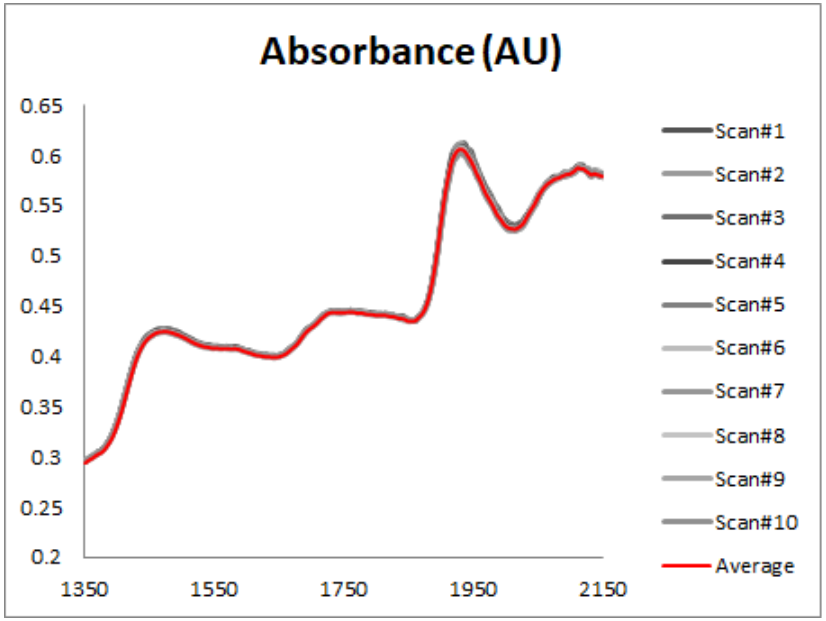
dry

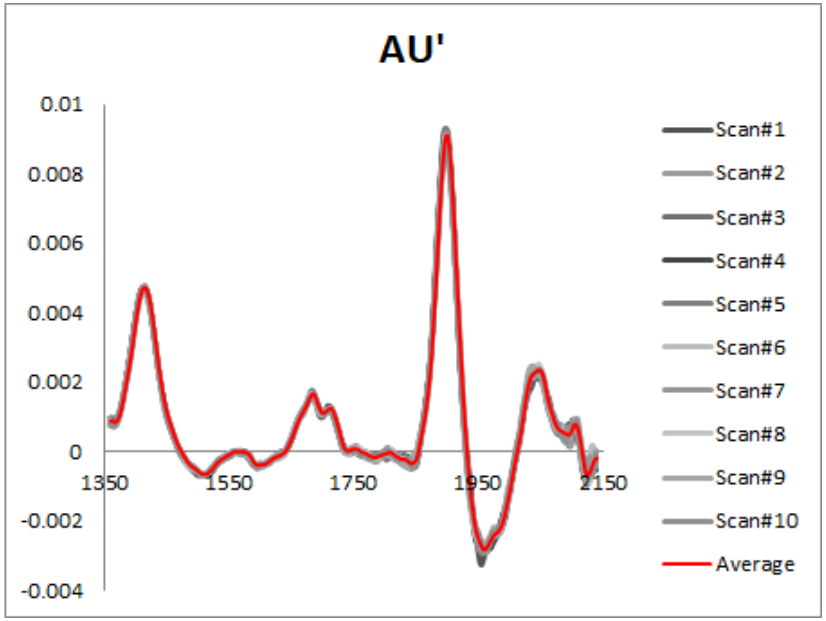






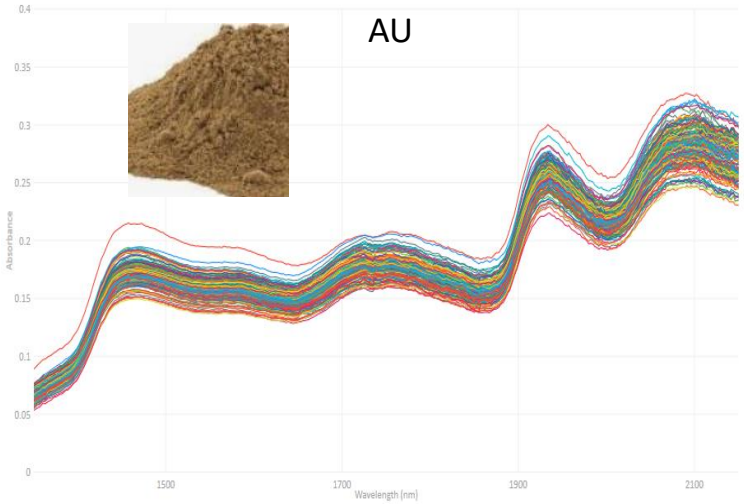
Tobacco Fragments

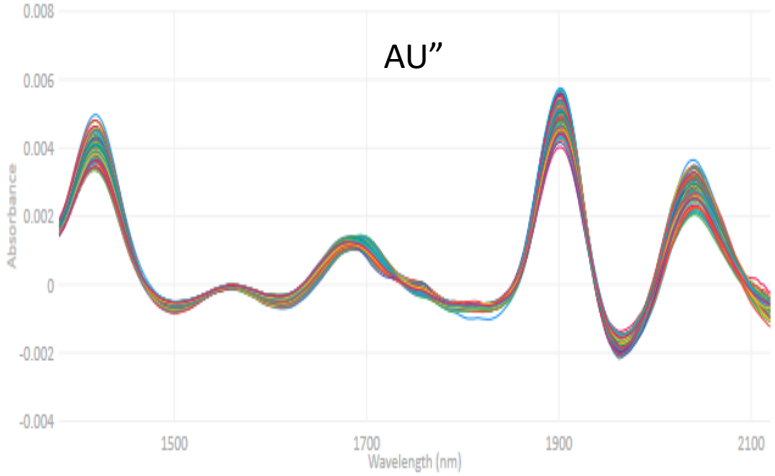

Absorbance (AU)
0.65
0.6
0.55
0.5
0.45
0.4
0.35
0.3
0.25
0.2
1350
1550
1750
1950
2150
Scan#1
Scan#2
Scan#3
Scan#4
Scan#5
Scan#6
Scan#7
Scan#8
Scan#9
Scan#10
Average


AU'
0.01
0.008
0.006
0.004
0.002
0
-0.002
-0.004
1350
1550
1750
1950
2150
Scan#1
Scan#2
Scan#3
Scan#4
Scan#5
Scan#6
Scan#7
Scan#8
Scan#9
Scan#10
Average

Tobacco Powders

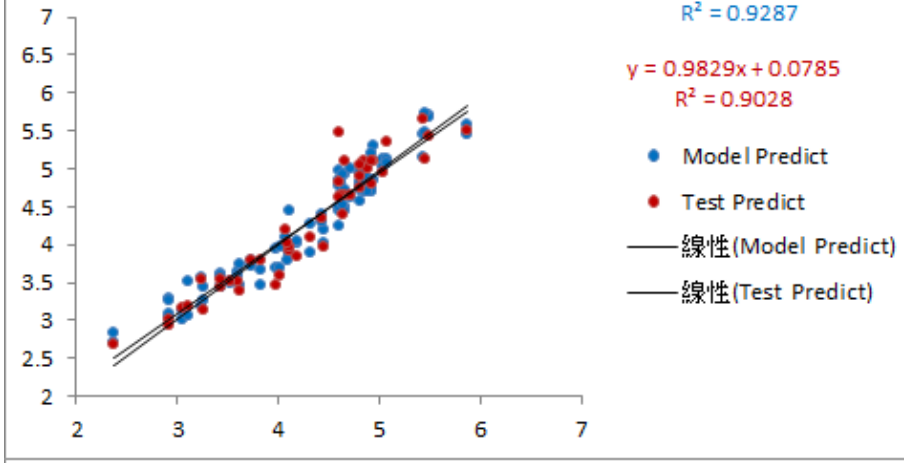
Index	Total_Sugars %	Reducing_Sugars %	Total_Nitrogen %	Nicotine %	Index	Total_Sugars %	Reducing_Sugars %	Total_Nitrogen %	Nicotine %
1	29.51	19.17	1.94	3.60	24	27.67	17.30	2.29	5.03
2	27.55	16.51	2.11	3.42	25	28.98	20.09	2.26	4.92
3	29.72	21.74	1.91	2.92	26	27.07	19.83	2.27	4.84
4	29.67	19.43	2.07	3.73	27	26.57	17.56	2.27	4.88
5	32.56	23.51	1.79	2.37	28	30.75	20.18	2.14	4.43
6	30.66	20.35	1.94	3.25	29	29.46	18.23	2.16	4.80
7	27.67	19.40	2.16	4.10	30	26.20	16.41	2.35	4.59
8	29.82	21.51	2.00	3.82	31	23.98	16.47	2.57	5.42
9	30.40	21.63	1.90	2.91	32	29.72	20.58	2.10	4.66
10	26.22	17.57	2.03	3.42	33	27.06	19.54	2.21	4.94
11	23.17	15.75	2.16	4.06	34	25.45	19.36	2.25	5.07
12	25.08	15.05	2.14	4.31	35	28.81	20.11	2.27	4.59
13	27.33	18.51	2.09	4.18	36	32.41	21.90	1.99	4.66
14	27.91	18.54	2.08	3.53	37	24.43	16.09	2.36	4.62
15	32.36	22.77	1.82	3.05	38	34.40	23.94	1.87	4.59
16	28.67	21.13	2.02	4.11	39	27.60	18.93	2.18	4.81
17	26.01	16.54	2.08	3.62	40	27.05	16.89	2.12	4.64
18	30.44	22.94	1.86	3.23	41	28.11	18.93	2.04	4.80
19	36.12	23.38	1.75	3.11	42	27.90	20.90	2.23	4.91
20	33.77	24.49	1.76	3.97	43	24.77	20.17	2.31	5.49
21	28.62	19.62	2.00	4.09	44	24.08	19.37	2.35	5.44
22	29.54	21.83	1.91	4.44	45	26.11	18.33	2.11	4.72
23	28.94	21.53	2.00	4.02	46	24.19	18.66	2.29	5.86



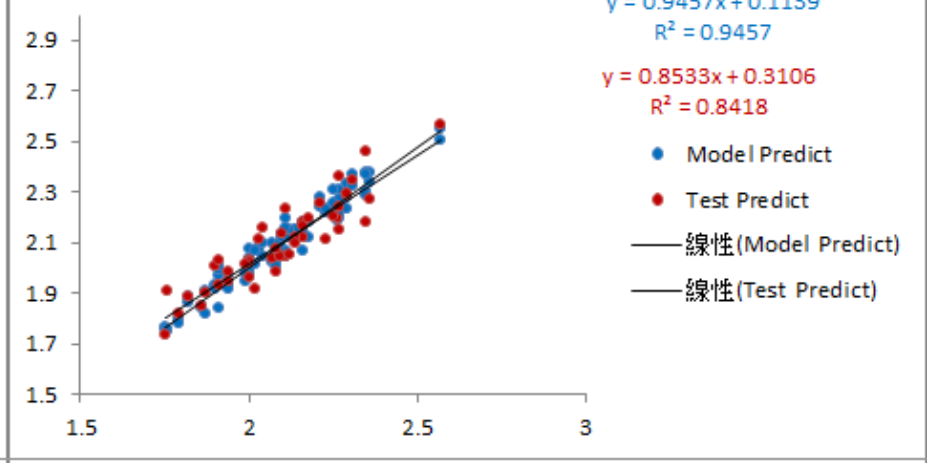


InnoSpectra Corporation

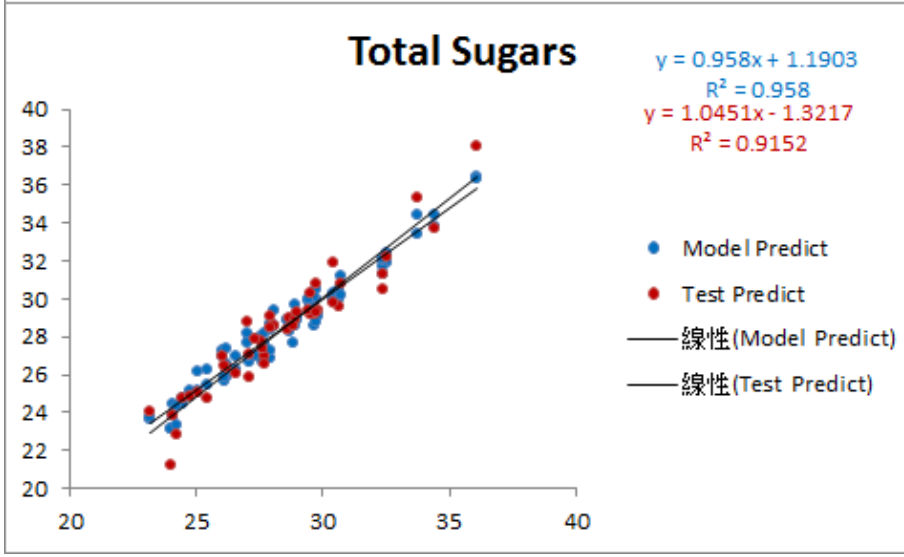
Nicotine



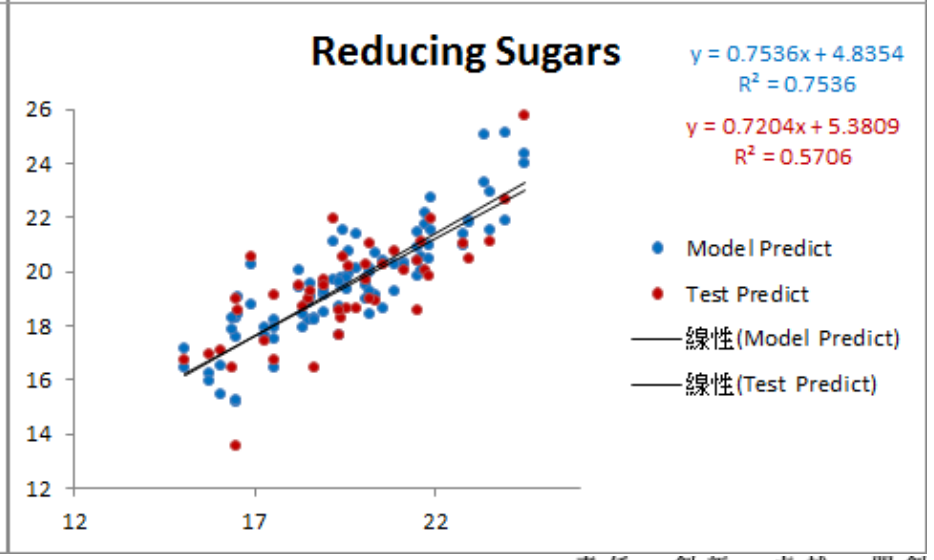
Total Nitrogen



Total Sugars

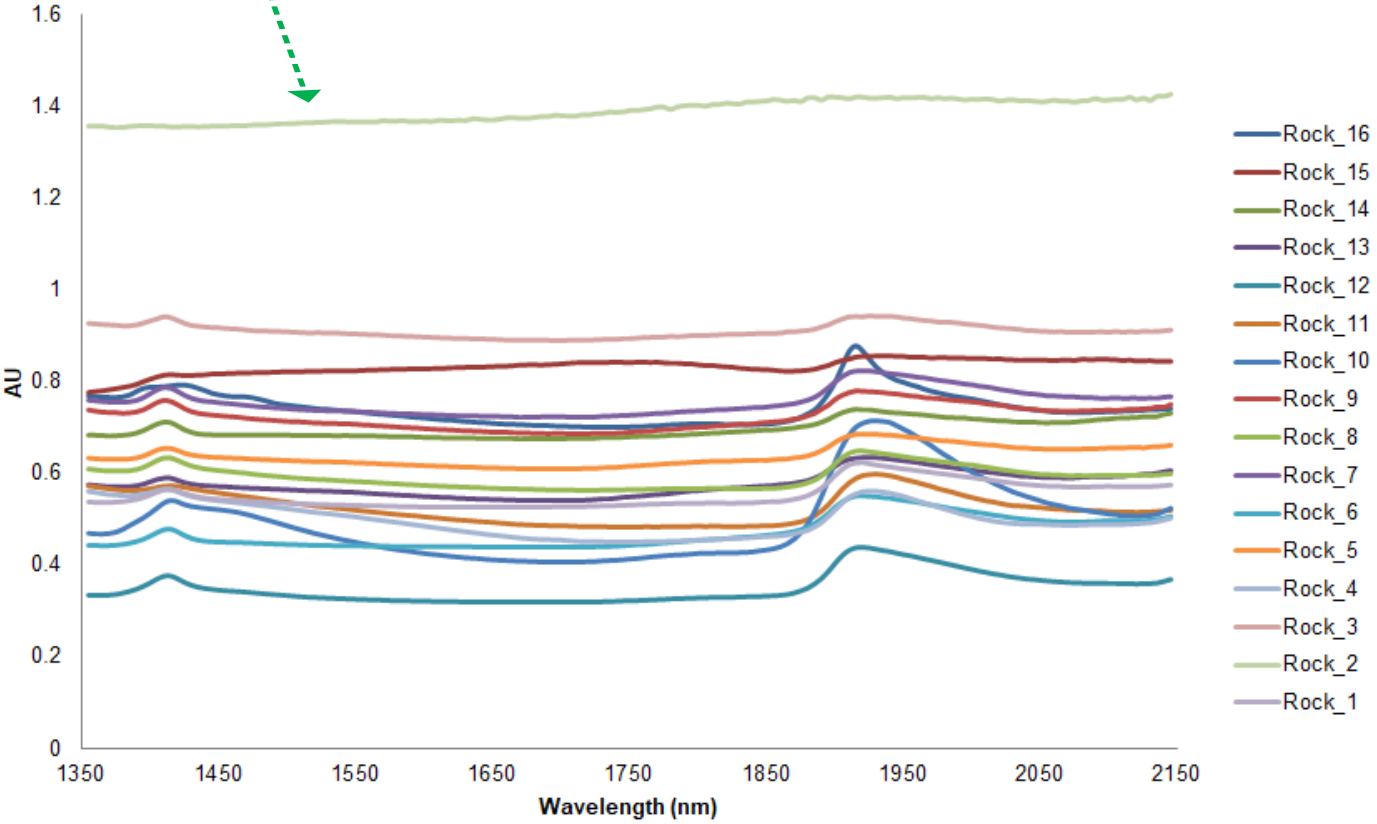


Reducing Sugars

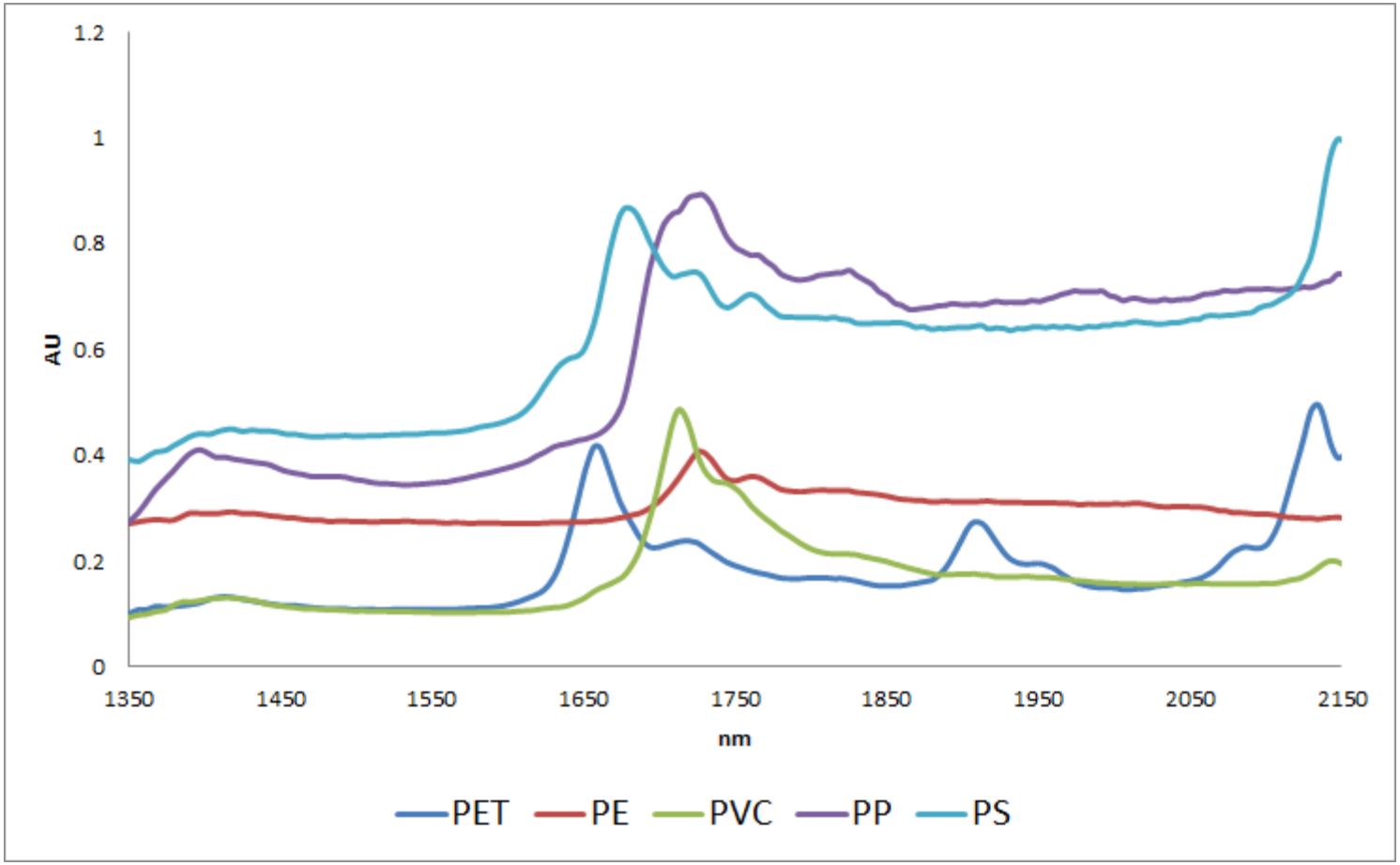


Rock

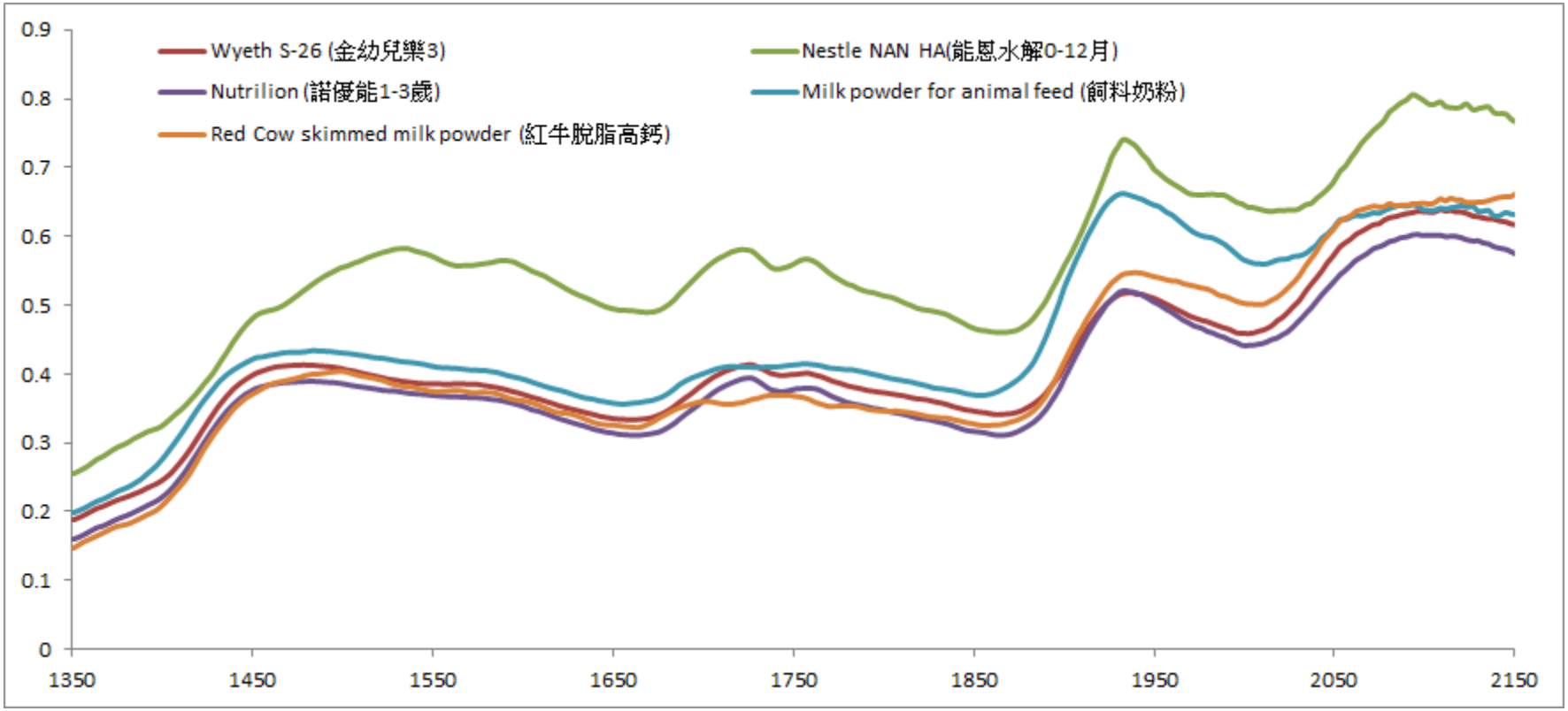
#2: carbon containing



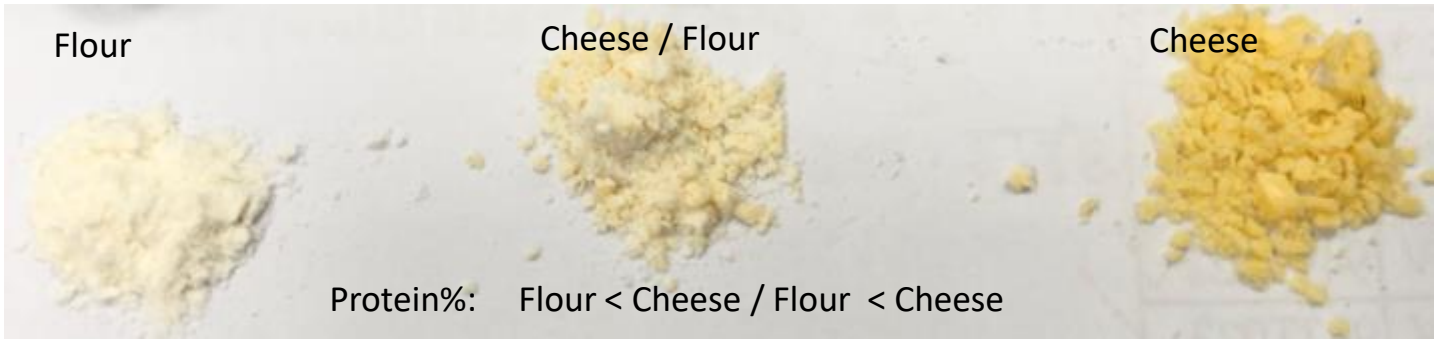
Plastic Resin

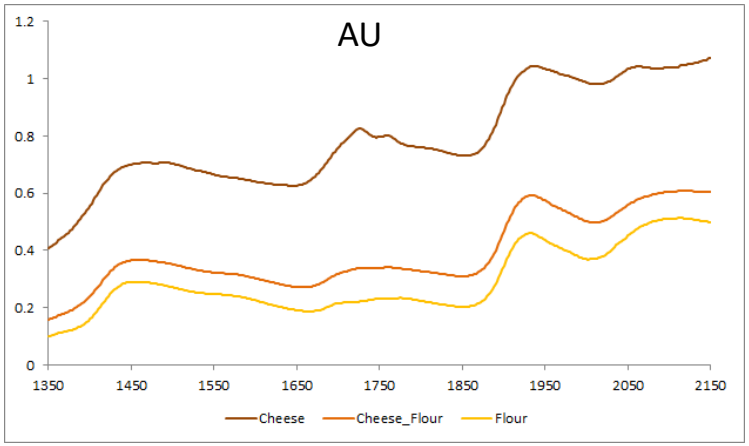

1.2
1
0.8
0.6
0.4
0.2
0
AU
1350
1450
1550
1650
1750
1850
1950
2050
2150
nm
PET
PE
PVC
PP
PS

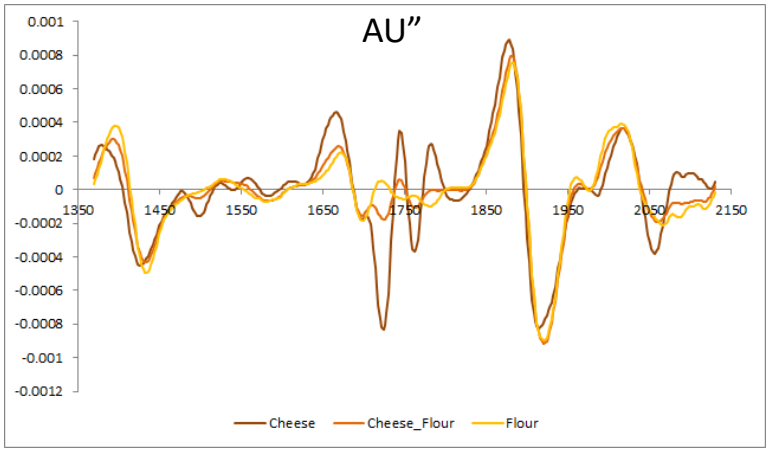
Milk Powder


Wyeth S-26 (金幼兒樂3)
Nestle NAN HA(能恩水解0-12月)
Nutrilion (諾優能1-3歲)
Milk powder for animal feed (飼料奶粉)
Red Cow skimmed milk powder (紅牛脫脂高鈣)
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1350
1450
1550
1650
1750
1850
1950
2050
2150

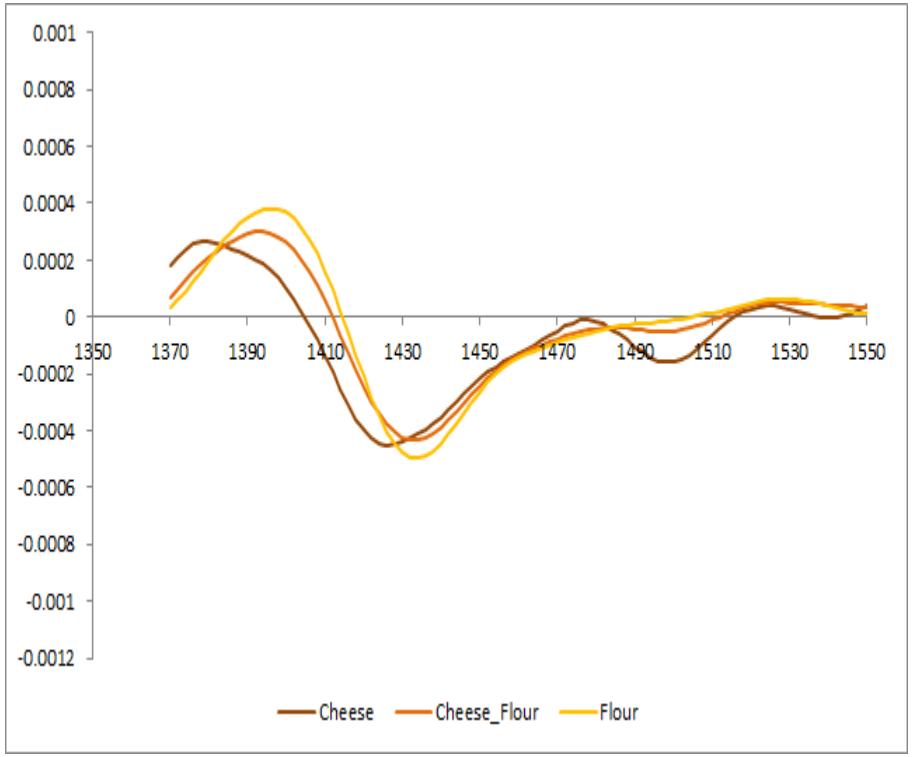
Flour / Cheese Powder

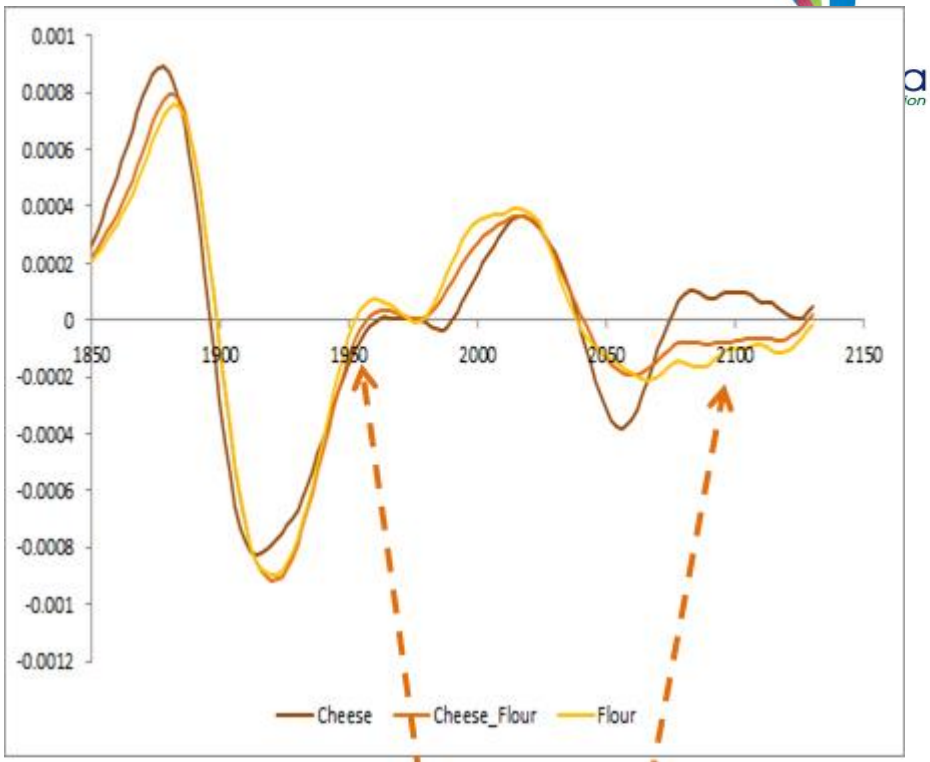

Flour
Cheese / Flour
Cheese
Protein%: Flour < Cheese / Flour < Cheese

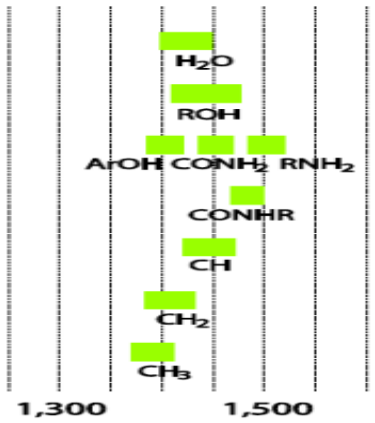

AU
1.2
1
0.8
0.6
0.4
0.2
0
1350
1450
1550
1650
1750
1850
1950
2050
2150
Cheese
Cheese_Flour
Flour

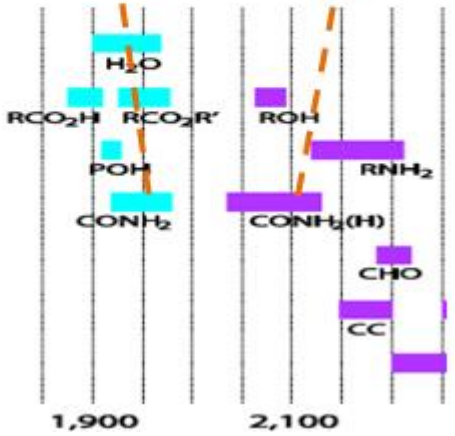

AU”
0.001
0.0008
0.0006
0.0004
0.0002
0
-0.0002
-0.0004
-0.0006
-0.0008
-0.001
-0.0012
1350
1450
1550
1650
1750
1850
1950
2050
2150
Cheese
Cheese_Flour
Flour

CONH2 & RNH2 Absorption





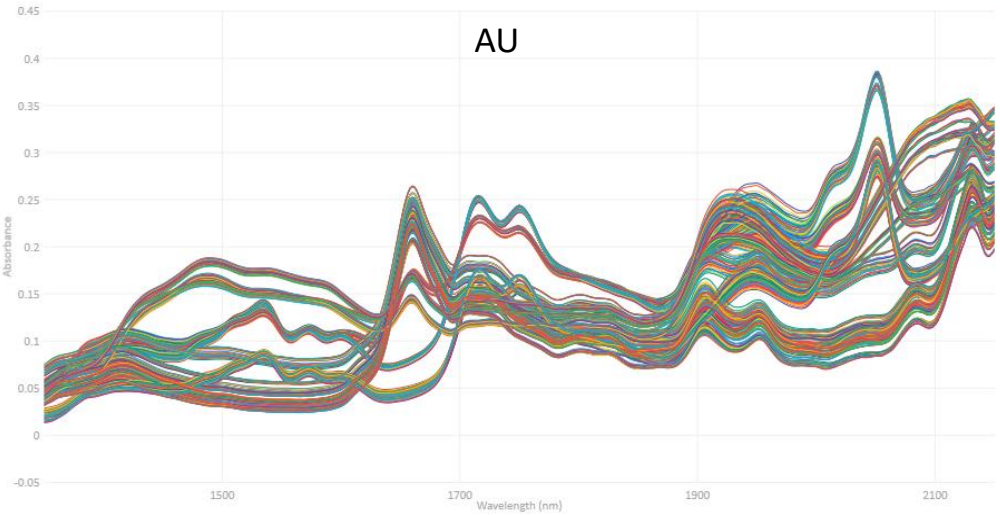


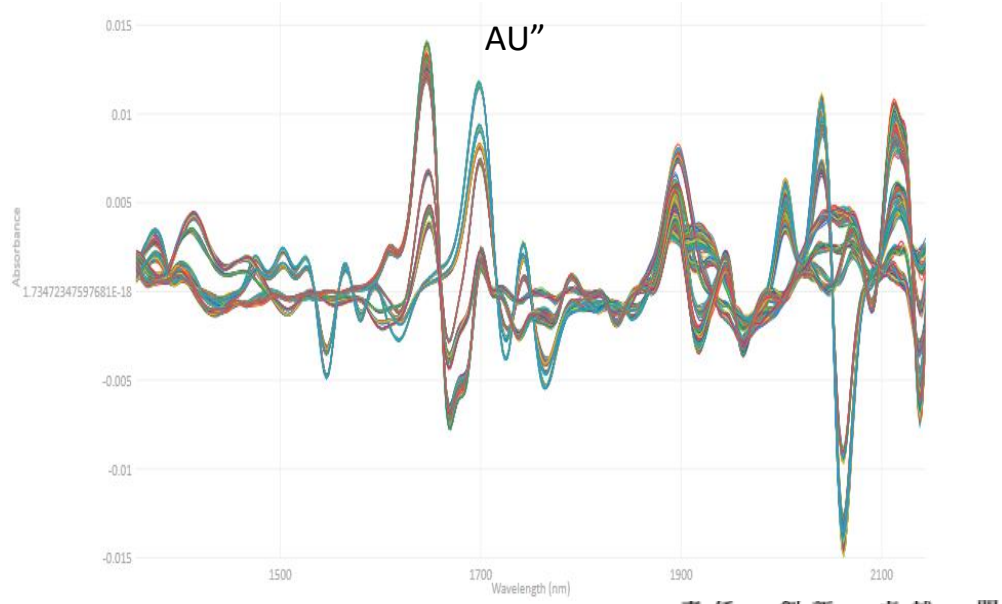


Textiles

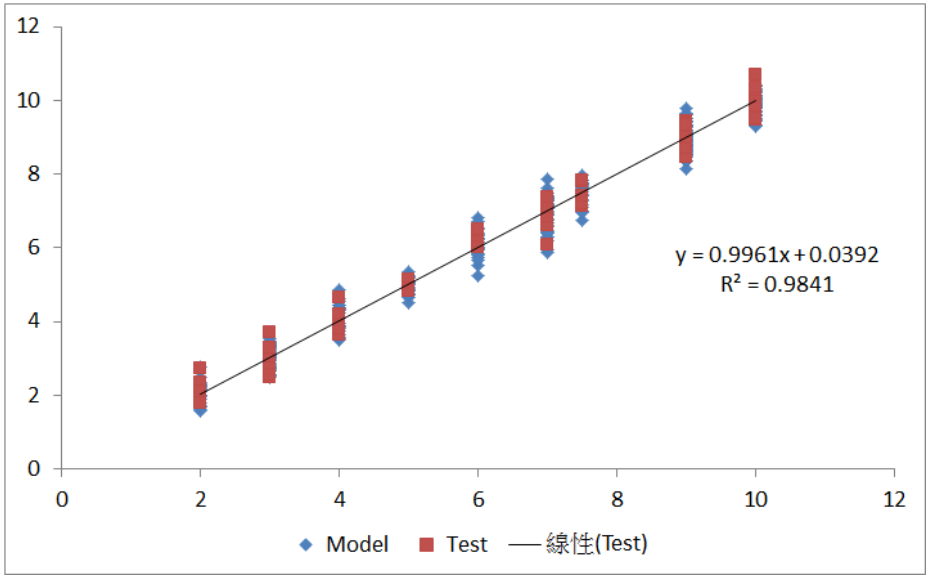
Prediction of Spandex Content in Blended Fabric

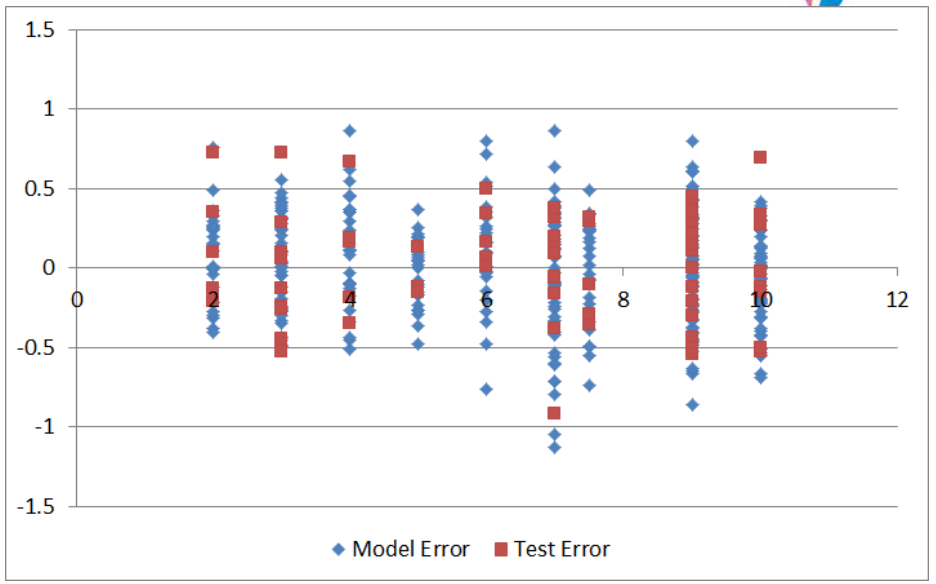
Index	Item No.	Spandex	Polyester	Nylon	N66	Cotton	Wool
1	NSP024819	7.0			93.0		
2	MPP01672	9.0	91.0				
3	XSSP01009	9.0	34.0	57.0			
4	XSSP030111	9.0	91.0				
5	NSP02123	2.0		98.0			
6	CSP027621	3.0	32.0			65.0	
7	XSSP02875	7.0	93.0				
8	XSSP00735	10.0	90.0				
9	MWP00731	7.5	86.0				6.5
10	XCSP005013	3.0	32.0			65.0	
11	CSY02872	5.0	33.0			62.0	
12	NSP0118141	10.0		90.0			
13	MPP04633	4.0	96.0				
14	MPP02061	6.0	94.0				





Prediction of Spandex Content in Blended Fabric





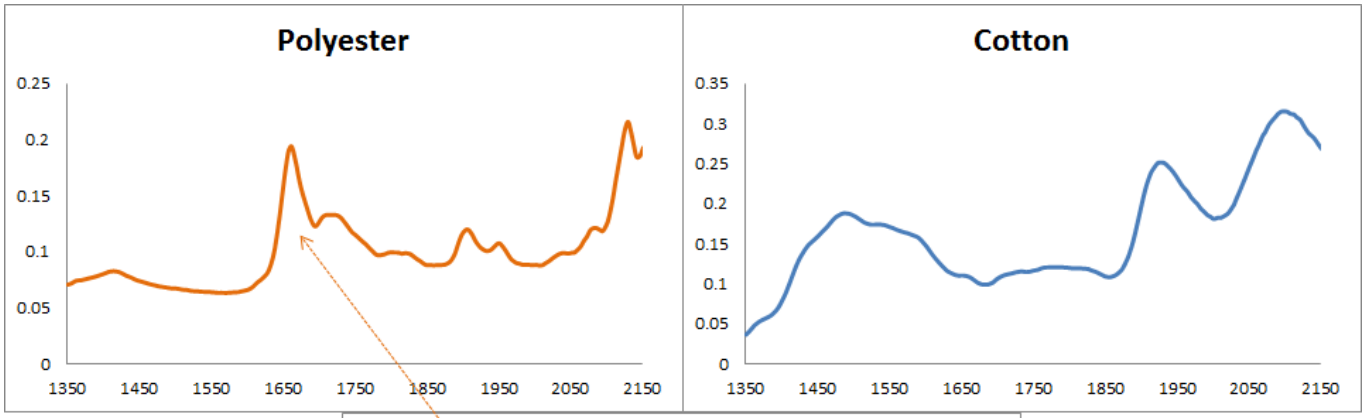
Condition:

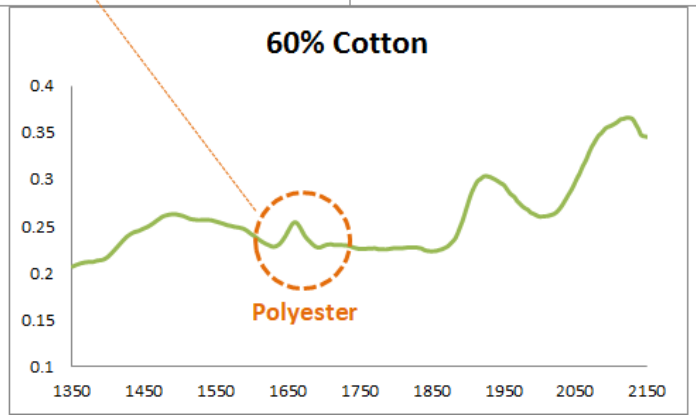
- 5 units NIR-M-R11
- 14 kinds of blended fabrics
- Spandex content : 2-10%

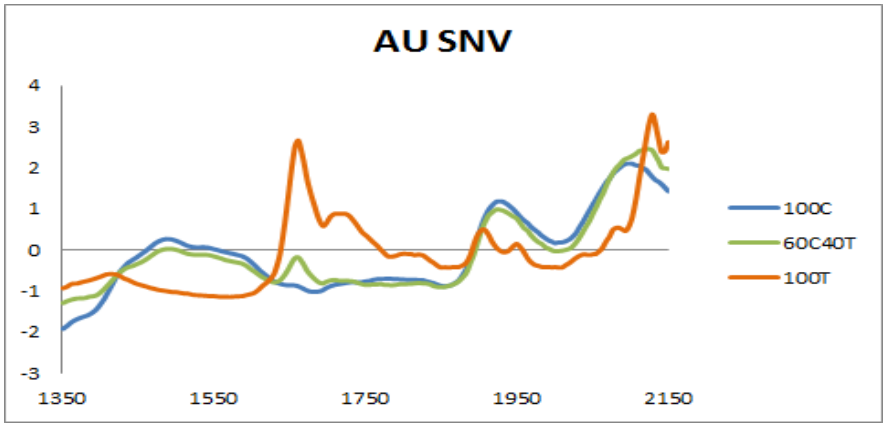
Result :

- $R^2 > 0.98$ with PLSR
- Average of RMSEC & RMSEP <0.4%

Blended Fabric



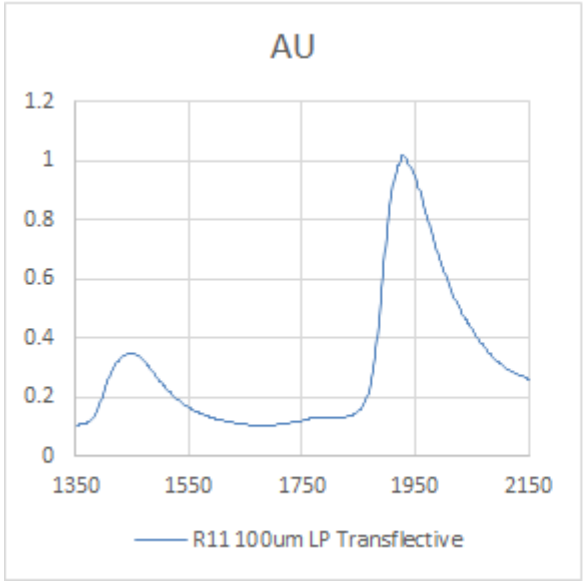


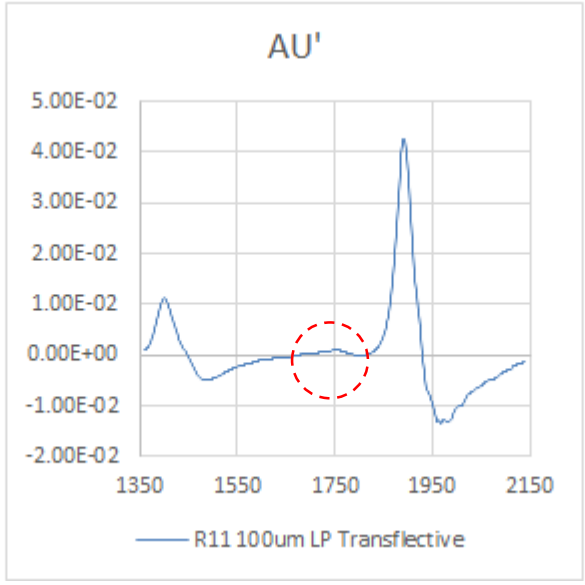


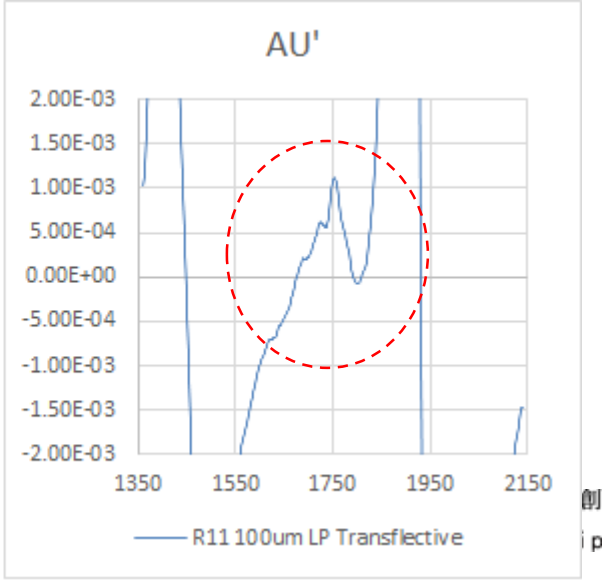
Milk Fat


logitech
1mm
100um
R11


Transflective
SRS99


AU
1.2
1
0.8
0.6
0.4
0.2
0
1350
1550
1750
1950
2150
R11 100um LP Transflective


AU'
5.00E-02
4.00E-02
3.00E-02
2.00E-02
1.00E-02
0.00E+00
-1.00E-02
-2.00E-02
1350
1550
1750
1950
2150
R11 100um LP Transflective


AU'
2.00E-03
1.50E-03
1.00E-03
5.00E-04
0.00E+00
-5.00E-04
-1.00E-03
-1.50E-03
-2.00E-03
1350
1550
1750
1950
2150
R11 100um LP Transflective

InnoSpectra Corporation

Thank You

責任・創新・卓越・開創

Responsibility Innovation Superiority Entrepreneurship