| LAUDO TÉCNICO | Data: 30/11/2023 | Película: Carbono Black 20% |
|---|---|---|
| Elaborado por: Vittor Andrade<br>Revisado por: Thaynnara Siqueira<br>Aprovado por: Hernane Fernandes | | **Lote: CB203212206** |

## Introdução

O presente relatório tem por objetivo apresentar o resultado dos testes feitos com as películas Bluetech Window Films®, bem como a análise e efetiva comprovação de suas características, sendo exemplos de avaliação o haze(embaçamento), percentual de luz visível transmitida, retenção de raios e infravermelhos ultravioleta, durabilidade, resistência (impactos mecânicos), entre outros.

## Normas técnicas

Todos os testes conduzidos pelo Departamento de Auditoria e Qualidade da Bluetech Window Films® são orientados segundo normas técnicas estabelecidas pela American Society for Testing and Materials (ASTM), Normas Nacionais da República Popular da China (GB) e pela The industry standard of the People's Republic of China (JGJ) seguindo rigorosos padrões de qualidade, a fim de constatar os atributos físicos de todas as películas comercializadas pela marca. Desta forma, as normas utilizadas nas aferições das amostras são:

- **TH-100: Norma ASTM D1003;**
- **CS-700: Norma ASTM D1003/D1044;**
- **GlasSpec-2500: Norma térmica JGJ/T151 e Norma ótica GB/T2680;**
- **Q-SUN XE-1: Norma ASTM D3424 - 01.**

## Maquinário

Para avaliação detalhada das películas, o laboratório de controle e qualidade da Bluetech Window Films® conta com os seguintes equipamentos:

- **CHN Spec modelo TH-100;**
- **CHN Spec modelo CS-700;**
- **GlasSpec-2500;**
- **Microscópio - Trinocular ótica finita acromático 1600x Mod. NO216T4 com Monitor. Lentes Plan 10/0.25, 4/0.10, 40/0.65, 100/1.25.**
- **Q-SUN modelo XE-1.**

# Índice

# Multiple test report

**Company name:** BLUETECH **Department:** AUDITORIA E QUALIDADE

**SMP name:** **test Title:** HAZE E TONALIDADE **Light:** D65

| Name | Test Mode | Haze | Total Tran | DT | DHaze | 400nm | 420nm | 410nm | 430nm |
|---|---|---|---|---|---|---|---|---|---|
| Target | ASTM | 0.00 | 100.00 | - | - | 0.00 | 0.00 | 0.00 | 0.00 |
| CB203212 206 - M1 | ASTM | 1.36 | 17.89 | -82.11 | 1.36 | 0.00 | 0.00 | 0.00 | 0.00 |
| CB203212 206 - M1 | ASTM | 1.41 | 17.97 | -82.03 | 1.41 | 0.00 | 0.00 | 0.00 | 0.00 |
| CB203212 206 - M1 | ASTM | 1.39 | 18.23 | -81.77 | 1.39 | 0.00 | 0.00 | 0.00 | 0.00 |
| CB203212 206 - M1 | ASTM | 1.37 | 18.38 | -81.62 | 1.37 | 0.00 | 0.00 | 0.00 | 0.00 |
| CB203212 206 - M1 | ASTM | 1.39 | 18.22 | -81.78 | 1.39 | 0.00 | 0.00 | 0.00 | 0.00 |
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| Remark: | | | | | | | | | |

Tester: check:VITTOR A. Data:

# HAZE E TONALIDADE

Default 1024.st5



corp: BLUETECH Department: AUDITORIA E QUALIDADE tester:VITTOR A.

| Standard | Light | Standard | Haze | Total Tran | DT | DHaze | 400nm | 420nm | 410nm | 430 |
|---|---|---|---|---|---|---|---|---|---|---|
| Target | D65 | ASTM | 0.00 | 100.00 | - | - | 0.00 | 0.00 | 0.00 | 0. |

| Sample | Light | Standard | Haze | Total Tran | DT | DHaze | 400nm | 420nm | 410nm | 430 |
|---|---|---|---|---|---|---|---|---|---|---|
| CB203212206 - M1 | D65 | ASTM | 1.36 | 17.89 | -82.11 | 1.36 | 0.00 | 0.00 | 0.00 | 0. |
| CB203212206 - M1 | D65 | ASTM | 1.41 | 17.97 | -82.03 | 1.41 | 0.00 | 0.00 | 0.00 | 0. |
| CB203212206 - M1 | D65 | ASTM | 1.39 | 18.23 | -81.77 | 1.39 | 0.00 | 0.00 | 0.00 | 0. |
| CB203212206 - M1 | D65 | ASTM | 1.37 | 18.38 | -81.62 | 1.37 | 0.00 | 0.00 | 0.00 | 0. |
| CB203212206 - M1 | D65 | ASTM | 1.39 | 18.22 | -81.78 | 1.39 | 0.00 | 0.00 | 0.00 | 0. |

# Multiple test report

**Company name:** BLUETECH **Department:** AUDITORIA E QUALIDADE

**SMP name:** **test Title:** HAZE E TONALIDADE **light /angle:** D65/2°

| Name | Test Mode | Haze | Total Tran | DT | DHaze | 400nm | 420nm | 410nm | 430nm |
|---|---|---|---|---|---|---|---|---|---|
| Target | ASTM | 0.00 | 100.00 | - | - | 98.87 | 99.85 | 100.16 | 100.90 |
| CB203212 206 - M1 | ASTM | 1.74 | 18.15 | -81.85 | 1.74 | 19.23 | 18.83 | 19.15 | 18.89 |
| CB203212 206 - M1 | ASTM | 1.55 | 18.28 | -81.72 | 1.55 | 19.66 | 19.20 | 19.01 | 19.01 |
| CB203212 206 - M1 | ASTM | 1.61 | 18.37 | -81.63 | 1.61 | 18.88 | 19.33 | 19.93 | 19.07 |
| CB203212 206 - M1 | ASTM | 1.65 | 18.61 | -81.39 | 1.65 | 19.21 | 19.09 | 18.79 | 19.39 |
| CB203212 206 - M1 | ASTM | 1.65 | 18.46 | -81.54 | 1.65 | 19.67 | 19.14 | 19.08 | 19.60 |
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| Remark: | | | | | | | | | |

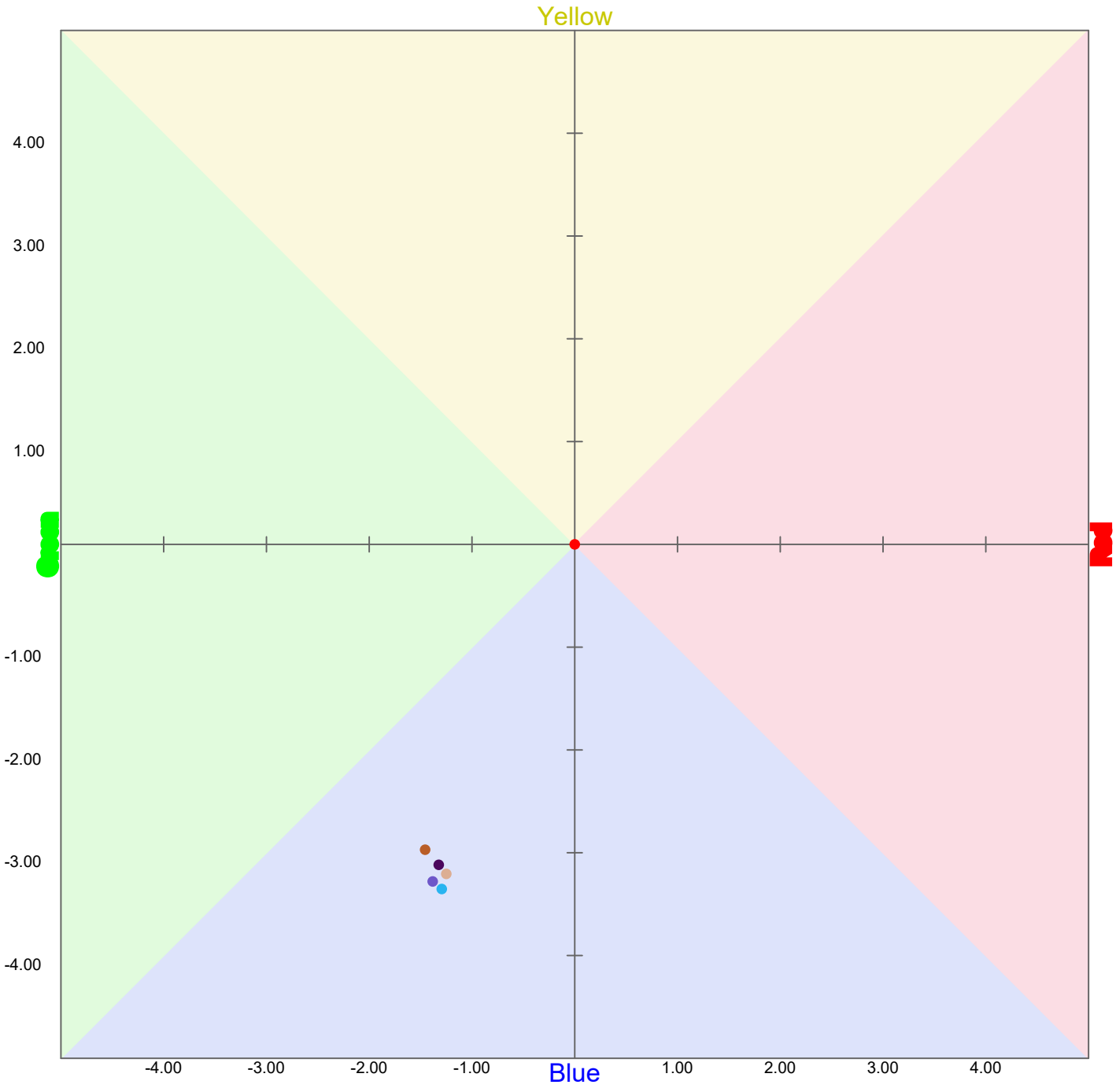
Tester: check:VITTOR A. Data:

# HAZE E TONALIDADE

Default 1024.st5



corp: BLUETECH Department: AUDITORIA E QUALIDADE tester:VITTOR A.

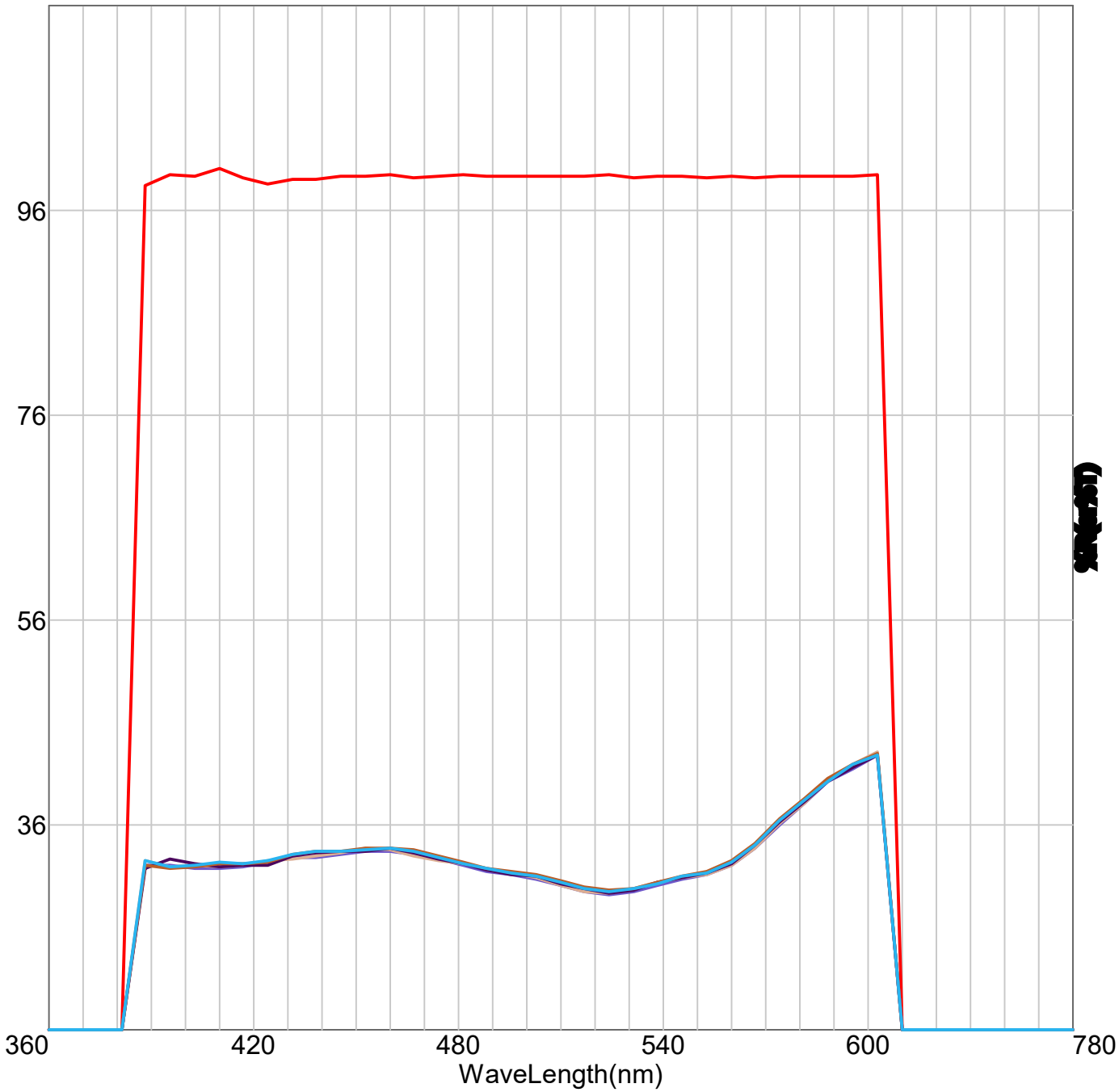


# HAZE E TONALIDADE

Default 1024.st5



corp: BLUETECH Department: AUDITORIA E QUALIDADE tester:VITTOR A.

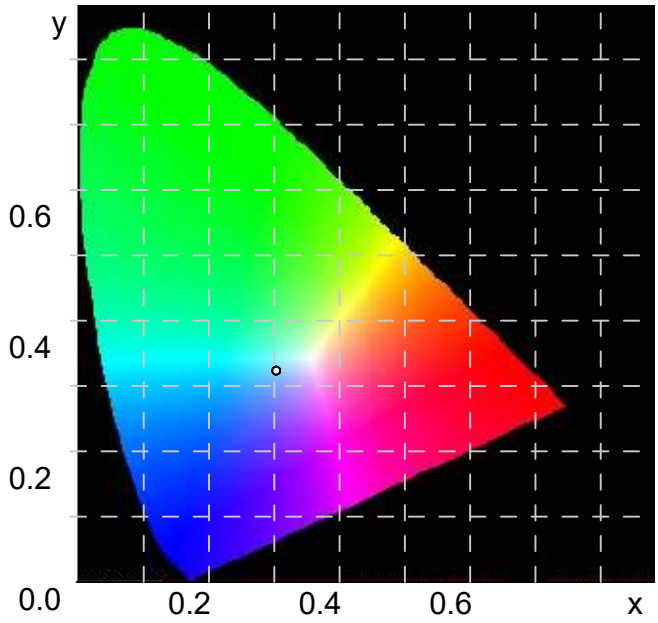


# HAZE E TONALIDADE

Default 1024.st5



corp: BLUETECH Department: AUDITORIA E QUALIDADE tester:VITTOR A.



# HAZE E TONALIDADE

Default 1024.st5



corp: BLUETECH Department: AUDITORIA E QUALIDADE tester:VITTOR A.

| Standard | Light | Standard | Haze | Total Tran | DT | DHaze | 400nm | 420nm | 410nm | 430 |
|---|---|---|---|---|---|---|---|---|---|---|
| Target | D65/2° | ASTM | 0.00 | 100.00 | - | - | 98.87 | 99.85 | 100.16 | 100 |

| Sample | Light | Standard | Haze | Total Tran | DT | DHaze | 400nm | 420nm | 410nm | 430 |
|---|---|---|---|---|---|---|---|---|---|---|
| CB203212206 - M1 | D65/2° | ASTM | 1.74 | 18.15 | -81.85 | 1.74 | 19.23 | 18.83 | 19.15 | 18 |
| CB203212206 - M1 | D65/2° | ASTM | 1.55 | 18.28 | -81.72 | 1.55 | 19.66 | 19.20 | 19.01 | 19 |
| CB203212206 - M1 | D65/2° | ASTM | 1.61 | 18.37 | -81.63 | 1.61 | 18.88 | 19.33 | 19.93 | 19 |
| CB203212206 - M1 | D65/2° | ASTM | 1.65 | 18.61 | -81.39 | 1.65 | 19.21 | 19.09 | 18.79 | 19 |
| CB203212206 - M1 | D65/2° | ASTM | 1.65 | 18.46 | -81.54 | 1.65 | 19.67 | 19.14 | 19.08 | 19 |

# GlasSpec2500 Optical and Thermal Parameters Measuring Instrument Test Report

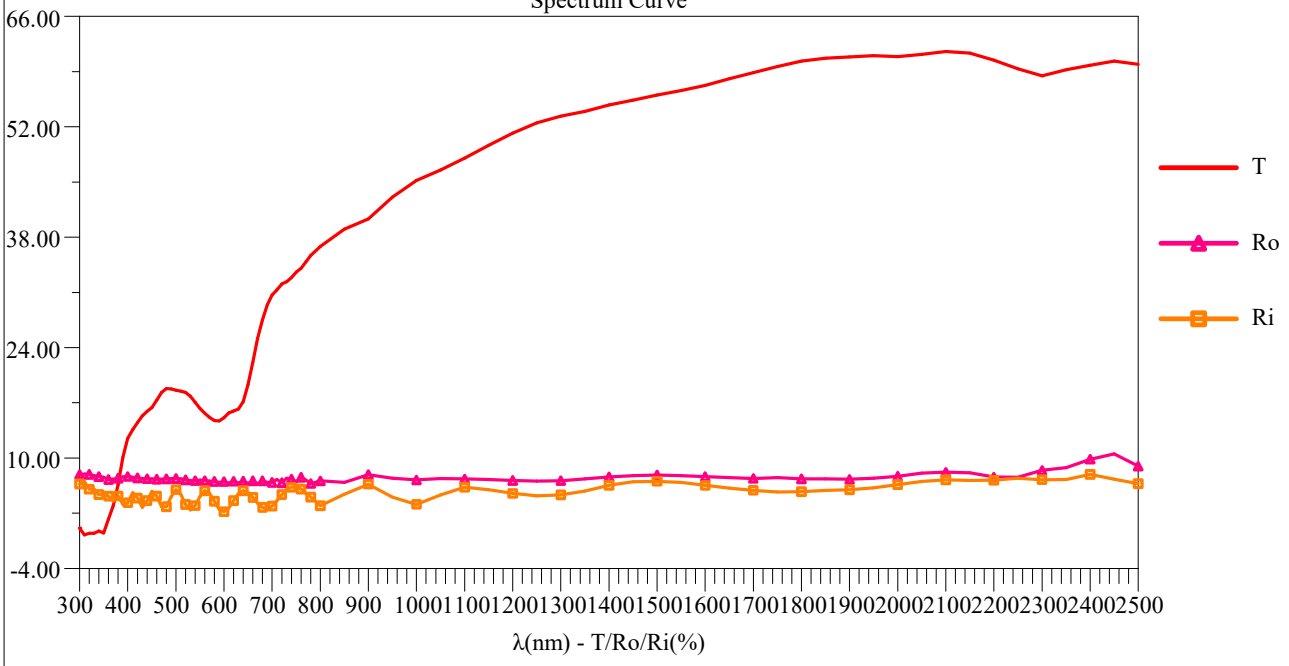
Instrument: GlasSpec2500 Thermal standard: JGJ/T 151 Date: 2023-09-08 Test No.:_____

CIE: D65/2° Optical standard: GB/T 2680 Time: 14:26:36 Environment:_____

Structure: 0.0(1#Low-E，0.880)

| No. | Content | Results |
|---|---|---|
| 1 | UV transmittance τuv | 0.022 |
| 2 | Visible light transmittance τv | 0.166 |
| 3 | Visible light reflectance ρv | 0.071 |
| 4 | Inside visible light reflectance ρv.i | 0.046 |
| 5 | Solar direct transmittance τe | 0.314 |
| 6 | Solar direct reflectance ρe | 0.073 |
| 7 | Inside solar direct reflectance ρe.i | 0.052 |
| 8 | Solar direct absorptance ae | 0.613 |
| 9 | Solar infrared direct transmittance τIR | 0.477 |
| 10 | Solar infrared direct reflectance ρIR | 0.073 |
| 11 | Total solar energy transmittance g | 0.469 |
| 12 | Shading coefficient SC | 0.540 |
| 13 | Total solar infrared heat transmittance gIR | 0.590 |
| 14 | Visible light to total solar energy transmittance LSG | 0.35 |
| 15 | Thermal transmittance K(W/(m^2·K)) | 5.39 |

Spectrum Curve



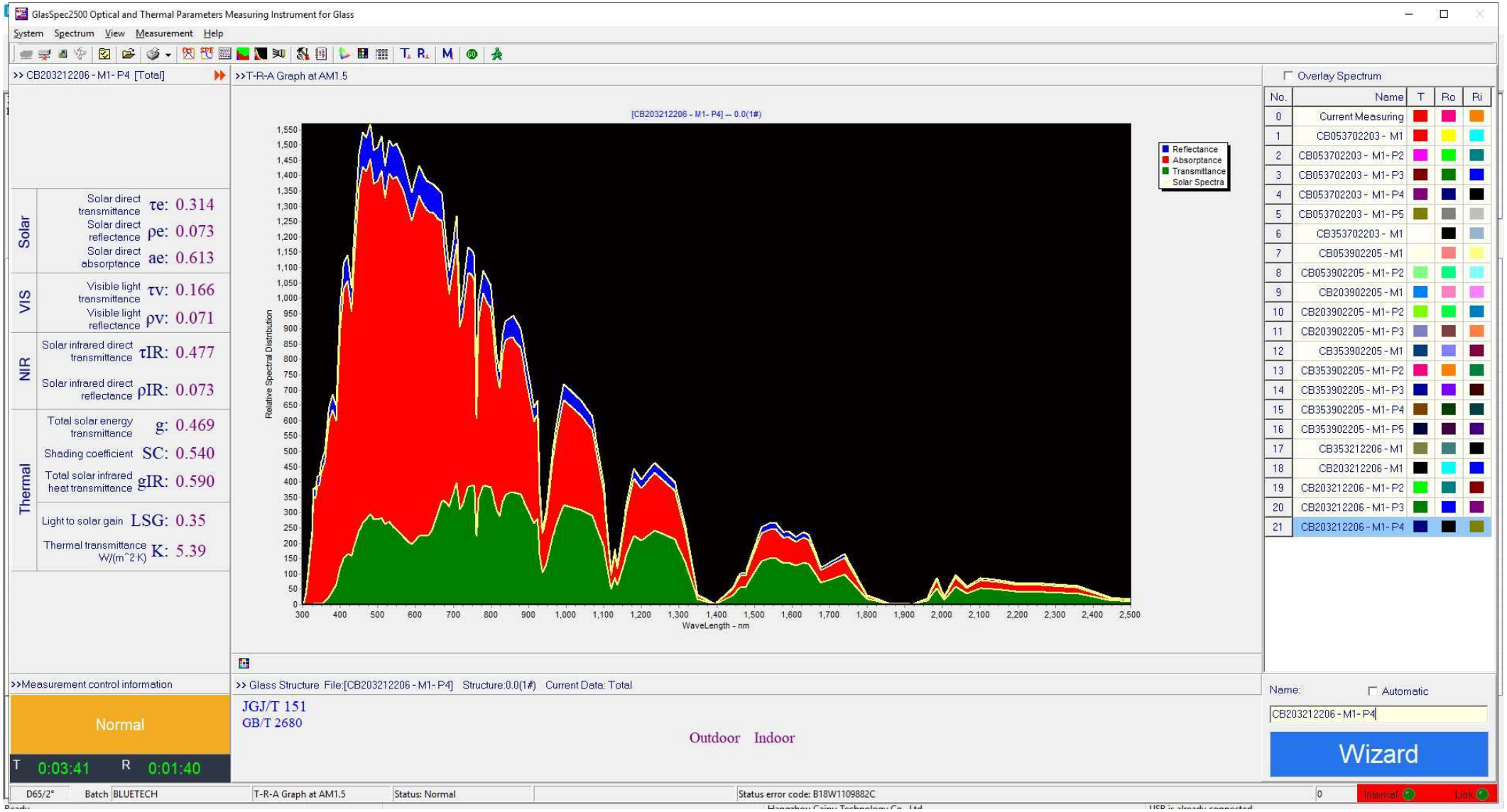

Notes:

1. K is calculated according to the winter condition of JGJ/T 151
2. g/gIR is calculated according to the summer condition of JGJ/T 151
3. The optical parameters are calculated according to standard GB/T 2680, SC = g/0.87
4. The spectral curve is plotted at spectral intervals in standard GB/T 2680

Tester:_____ Verification:_____

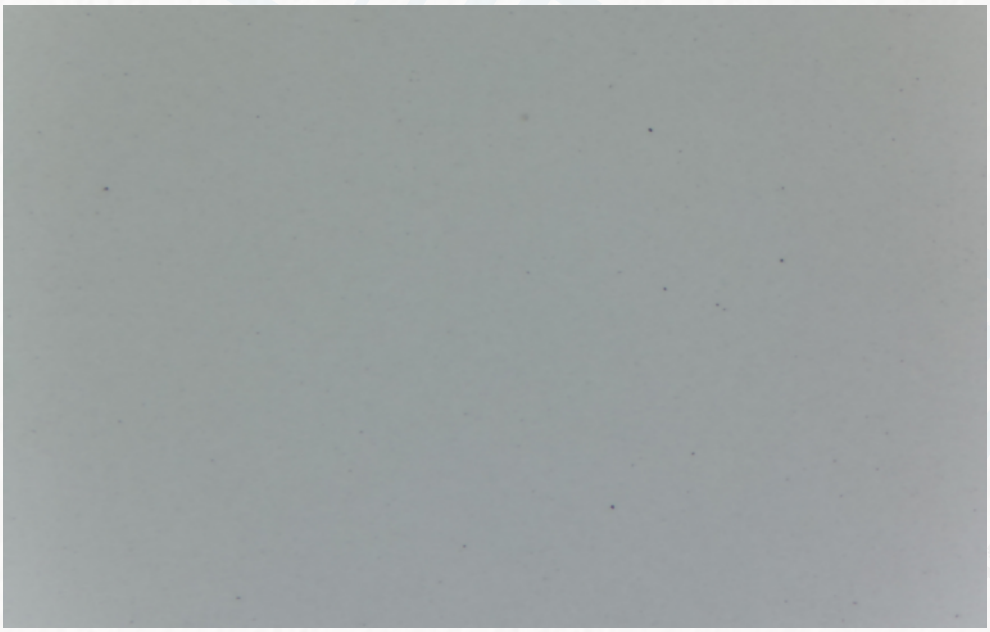
[Sample Name] D:\DataSet\GlasSpec2500\BLUETECH\CB203212206 - M1- P4.smt

*Aoptek Scientific*


GlasSpec2500 Optical and Thermal Parameters Measuring Instrument for Glass
System Spectrum View Measurement Help
>> CB203212206 - M1- P4 [Total]
>>T-R-A Graph at AM1.5
[CB203212206 - M1- P4] -- 0.0(1#)
Reflectance
Absorptance
Transmittance
Solar Spectra
Relative Spectral Distribution
WaveLength - nm
Overlay Spectrum
No. Name T Ro Ri
0 Current Measuring
1 CB053702203 - M1
2 CB053702203 - M1- P2
3 CB053702203 - M1- P3
4 CB053702203 - M1- P4
5 CB053702203 - M1- P5
6 CB353702203 - M1
7 CB053902205 - M1
8 CB053902205 - M1- P2
9 CB203902205 - M1
10 CB203902205 - M1- P2
11 CB203902205 - M1- P3
12 CB353902205 - M1
13 CB353902205 - M1- P2
14 CB353902205 - M1- P3
15 CB353902205 - M1- P4
16 CB353902205 - M1- P5
17 CB353212206 - M1
18 CB203212206 - M1
19 CB203212206 - M1- P2
20 CB203212206 - M1- P3
21 CB203212206 - M1- P4
Solar
Solar direct transmittance τe: 0.314
Solar direct reflectance ρe: 0.073
Solar direct absorptance ae: 0.613
VIS
Visible light transmittance τv: 0.166
Visible light reflectance ρv: 0.071
NIR
Solar infrared direct transmittance τIR: 0.477
Solar infrared direct reflectance ρIR: 0.073
Thermal
Total solar energy transmittance g: 0.469
Shading coefficient SC: 0.540
Total solar infrared heat transmittance gIR: 0.590
Light to solar gain LSG: 0.35
Thermal transmittance W/(m^2·K) K: 5.39
>>Measurement control information
Normal
T 0:03:41 R 0:01:40
>> Glass Structure File:[CB203212206 - M1- P4] Structure:0.0(1#) Current Data: Total
JGJ/T 151
GB/T 2680
Outdoor Indoor
Name: Automatic
CB203212206 - M1- P4
Wizard
D65/2° Batch BLUETECH T-R-A Graph at AM1.5 Status: Normal Status error code: B18W1109882C 0 Internal Link

**CB203212206 - SAMPLE - LENTE PLAN 10/0.25**

**CB203212206 - SAMPLE - LENTE PLAN 4/0.10**



**Assinatura do responsável**

Vittor Andrade

**Vittor Andrade**
Auditor de Qualidade