TBI-FORENSIC SERVICES DIVISION
PERFORMANCE VERIFICATION FORM

Instrument/Method to Verify:

Nicolet iS20 FTIR with Smart iTX (ATR) accessory (S/N BEP2310108) "GROGU"

Check the appropriate box: New Validation ☐ Modification ☐ Performance Check ☑

Laboratory: NCL ☐ KCL ☐ JCL ☑ Unit: Forensic Chemistry

Based on training and competency, the following analyst(s) are authorized by the Technical Leader to participate in this study:

Name Carter DePew Title SA/FS Initials CLD

Completed: Carter L. DePew Digitally signed by Carter DePew Date: 2023.05.04 07:55:11 -05'00'

Name _____ Title _____ Initials _____

Completed:

Name _____ Title _____ Initials _____

Completed:

Verification of final review:

Unit Supervisor: Bethany P McBride Digitally signed by Bethany P McBride Date: 2023.05.04 09:52:18 -05'00' Section Manager: Mark Dunlap (May 8, 2023 11:29 CDT)

Unit Supervisor: Section Manager:

Unit Supervisor: Section Manager:

Regional Administrator: Donna C. Nelson Donna Nelson (May 8, 2023 12:47 CDT)

Regional Administrator:

Regional Administrator:

Quality Assurance Manager: Chad Johnson (May 8, 2023 13:46 CDT)

By signing below, I have verified this study meets all requirements and I deem this procedure/ instrument fit for the intended use:

Technical Leader: Brett Trotter

All information must be submitted to the Quality Assurance Manager prior to the implementation of the procedure/instrument. If applicable, include training plan and competency testing schedule.

Forensic Chemistry Performance Verification

Nicolet iS20 FTIR with Smart iTX (ATR) accessory
(S/N BEP2310108) TBI FCU ID - GROGU

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Forensic Chemistry Performance Verification

Nicolet iS20 FTIR with Smart iTX (ATR) accessory

(S/N BEP2310108) TBI FCU ID - GROGU

1. Purpose:

Each Fourier-transform infrared (FTIR) spectrometer acquired by the TBI FCU must demonstrate that it will accurately reproduce spectra previously obtained within the laboratory. The TBI FCU currently uses Attenuated Total Reflectance (ATR) attachments since this technique is efficient and does not destroy the sample during analysis.

Although properly maintained instruments all adhere to the theories of FTIR, unique factors may exist within each system that can generate slightly different spectra between different instruments.

This instrument differs from the previous models of FTIR spectrometers (Nicolet iS10) used in the laboratory in that it uses a solid-state diode laser instead of the traditional Helium/Neon laser to track the position of the moving mirror in the interferometer.

The Smart iTX ATR attachment also differs from its predecessor (Smart iTR) because it uses a monolithic diamond crystal that provides the benefits of traditional diamond crystal without the need for ZnSe lenses.

This performance verification will assess the following:

- The spectrometer's ability to generate accurate spectra of certified reference standards compared to previously run laboratory standard spectra using the Smart iTX accessory

2. Components and Experiment Setup:

Instrument Components	
iS20 FTIR	**Smart iTX accessory**
Source: Single point	Crystal plate type Monolithic Diamond
Beam splitter: KBr/Ge coated	Verification Standard Polystyrene “lollipop”
Laser Type: Solid-state Diode	
Detector: DTGS KBr	
Internal Verification: Polystyrene/NG Glass Standard Wheel	

Experiment parameters	
Scans	16
Resolution	4
Spectral Range	4000 – 600 (iTX)
Gain	Auto
Optical Velocity	0.4747
Aperture	Medium resolution

3. Procedure:

Ten certified reference standards were tested on this instrument using the Smart iTX attachment. Several of these standards were selected because they are frequently encountered in case work. Both salt forms of cocaine were tested to determine if salt forms could be determined. Non-controlled substances were also tested to determine if the spectrometer could detect possible adulterants.

Prior to running these standards, the routine monthly maintenance as outlined in TBI SOP was performed to ensure the instrument was operating according to acceptable standards. Additionally, laser alignment is recommended every two months by the manufacturer since a slight drift in output is possible. In this performance check, the laser verification was performed before the standards were acquired.

All standards were run in their pure form — no extractions, washes, or other alterations were performed. Prior to each standard run, the instrument's sampling area was cleaned, and a background spectrum was collected to ensure no cross-contamination occurred.

4. Standards Used:

Standard	Source	Lot Number
Aspirin	Alltech	531
Carisoprodol	Grace	392
Clonazepam	Alltech	150
Cocaine base	Sigma	90K1947
Cocaine HCl	USP	R067U0
Diazepam	Alltech	0102
Methamphetamine	Sigma	057K0666
3,4 MDA HCl	Alltech	454
Oxycodone	Alltech	520
Pseudoephedrine HCl	Fluka	1342219/12307008

5. Results and Conclusions:

Results from GROGU using the iTX accessory were consistent with both sets of spectra and matched satisfactorily for identification.

The ValPro Qualification reports outlined in the Procedure section as well as the current maintenance log are in Appendix A.

All data generated for the iS20 using the iTX attachment can be found in Appendix B.

The laser monitoring requirement will be incorporated into the monthly maintenance to ensure the laser is verified regularly.

In summary, this instrument has demonstrated satisfactory results for use within the TBI FCU. The operation is the same as the unit's other ATRs with a few minor software differences for instrument performance checks. Therefore, no additional training requirements will be needed for currently trained scientists. Please refer to additional documents for the instructions for these differences.

Training for monthly maintenance requirements will be conducted according to the user manual for the iS10 and iS20 instruments located in ensur.

ATR Maintenance Log

Instrument ID: Grogu

Date	Initials	Laser Frequency (iS20)	Alignment - Max	ValPro Wavenumber Accuracy	ValPro Output, Noise, and Linearity	Performance Tests Noise Value	Performance Voltage	Smart iT Accessory (if equipped)
4/28/23	EZ	11674.783	7.41	Pass	Pass	0.006	Pass	Pass
5/1/23	EZ	11674.783	7.28	Pass	Pass	0.004	Pass	Pass

Other Maintenance

Date	Description

EZ

CD

ValPro Qualification Report

Qualification test: Nicolet iS20 system KBr - PV
Operator: OMNICAdmin
Date: Friday, April 28, 2023 9:14:19 AM (GMT-05:00)
Instrument: Nicolet iS20 Serial number: BEP2310108
Filename: Nicolet iS20 system KBr - PV_20230428_091419.spg

Test description	High limit	Low limit	Measured	Result
Energy ratio				
Energy ratio 4000 / 2000	1.00	0.20	0.43	Pass
Energy ratio 2000 / 1000	4.00	0.80	1.51	Pass
Noise level				
P-P noise 4050 - 3950 (%T)	0.25	0.00	0.01	Pass
P-P noise 2050 - 1950 (%T)	0.221	0.00	0.007	Pass
P-P noise 1050 - 950 (%T)	0.10	0.00	0.03	Pass
P-P noise 550 - 450 (%T)	1.50	0.00	0.50	Pass
RMS noise 4050 - 3950	0.05	0.00	0.00	Pass
RMS noise 2050 - 1950	0.039	0.00	0.002	Pass
RMS noise 1050 - 950	0.014	0.00	0.007	Pass
RMS noise 550 - 450	0.30	0.00	0.09	Pass
Detector linearity				
Slope	1.10	0.90	1.02	Pass
Intercept (%T)	1.00	-1.00	0.05	Pass

Performed by: Emily Adams Title: SA/FS Date: 04/28/23

Approved by: Carter L. DePew Title: SA/FS Date: 04/28/23

Comments: _____

Digital comment(s):
No digital comments found.

EA

CLD

ValPro Qualification Report

Qualification test: Nicolet iS20 system KBr - USP
Operator: OMNICAdmin
Date: Friday, April 28, 2023 9:21:43 AM (GMT-05:00)
Instrument: Nicolet iS20 Serial number: BEP2310108
Filename: Nicolet iS20 system KBr - USP_20230428_092143.spg

Test description	High limit	Low limit	Measured	Result
Wavenumber accuracy				
Peak at 3060.0 (cm-1)	3061.0	3059.0	3059.5	Pass
Peak at 2849.5 (cm-1)	2850.5	2848.5	2849.3	Pass
Peak at 1942.9 (cm-1)	1943.9	1941.9	1942.3	Pass
Peak at 1601.2 (cm-1)	1602.2	1600.2	1601.0	Pass
Peak at 1583.0 (cm-1)	1584.0	1582.0	1582.9	Pass
Peak at 1154.5 (cm-1)	1155.5	1153.5	1154.5	Pass
Peak at 1028.3 (cm-1)	1029.3	1027.3	1028.4	Pass

Performed by: Emily Adams Title: SA/FS Date: 04/28/23

Approved by: Carter L. DePew Title: SA/FS Date: 04/28/23

Comments: _____

Digital comment(s):
No digital comments found.

EL

CLD


Fri Apr 28 09:27:12 2023 (GMT-05:00)
100.4
100.2
100.0
99.8
99.6
99.4
99.2
99.0
98.8
98.6
98.4
98.2
98.0
%Transmittance
4000
3500
3000
2500
2000
1500
1000
500
Wavenumbers (cm-1)

E1

Power Supply	Status	Current	Acceptable Range
+ 5 Volt	Pass	4.97V	4.50V to 5.50V
+ 12 Volt	Pass	11.89V	10.80V to 13.20V
- 12 Volt	Pass	-11.92V	-13.20V to -10.80V
+3.3 Volt	Pass	3.35V	3.00V to 3.60V

Print View More Return

EL

CWD

ValPro Qualification Report

Qualification test: Smart iTX accessory - PHEUR
Operator: OMNICAdmin
Date: Friday, April 28, 2023 9:30:49 AM (GMT-05:00)
Instrument: Nicolet iS20 Serial number: BEP2310108
Accessory serial number: Z100823
Filename: Smart iTX accessory - PHEUR_20230428_093049.spg

Test description	High limit	Low limit	Measured	Result
Wavenumber accuracy				
Peak at 3059.7 (cm-1)	3060.7	3058.7	3059.2	Pass
Peak at 1601.0 (cm-1)	1602.0	1600.0	1600.8	Pass
Peak at 1027.7 (cm-1)	1028.7	1026.7	1027.6	Pass
Peak at 906.1(cm-1)	907.1	905.1	906.1	Pass
Optical Resolution				
FWHH at 1154 (cm-1)	10.00	5.00	8.47	Pass
FWHH at 907 (cm-1)	14.00	5.00	13.19	Pass

Performed by: Emily Adam Title: SA/FS Date: 04/28/23

Approved by: Carter L. DePew Title: SA/FS Date: 04/28/23

Comments: _____

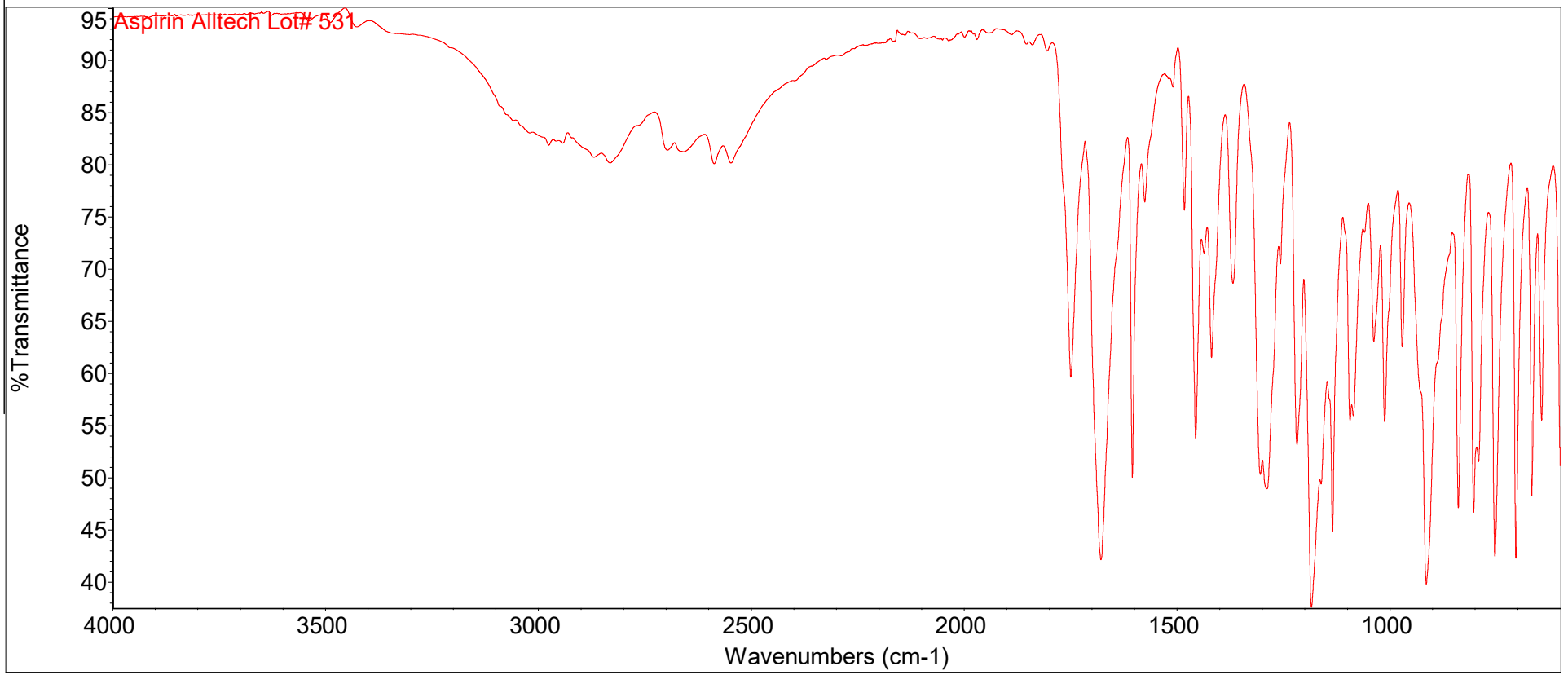
Digital comment(s):
No digital comments found.

EL

CD

Collection time: Mon May 01 14:52:49 2023 (GMT-05:00)

Aspirin Alltech Lot# 531



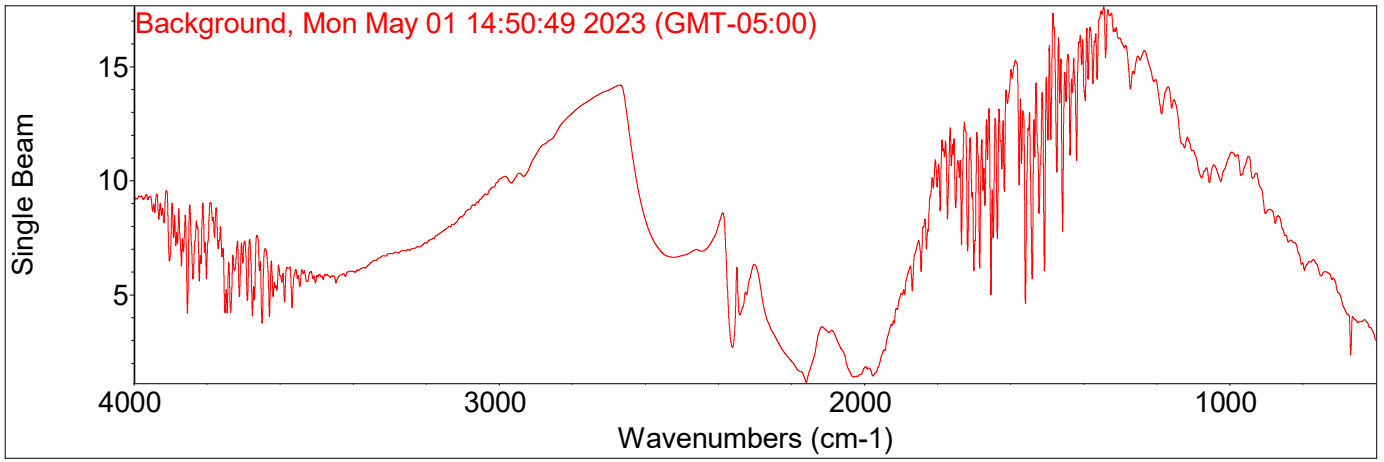
Collection time: Mon May 01 14:51:18 2023 (GMT-05:00)

Background

Number of sample scans: 16
Number of background scans: 0
Resolution: 4.000
Sample gain: 4.0
Optical velocity: 0.4747
Aperture: 80.00

Detector: DTGS KBr
Beamsplitter: KBr
Source: IR

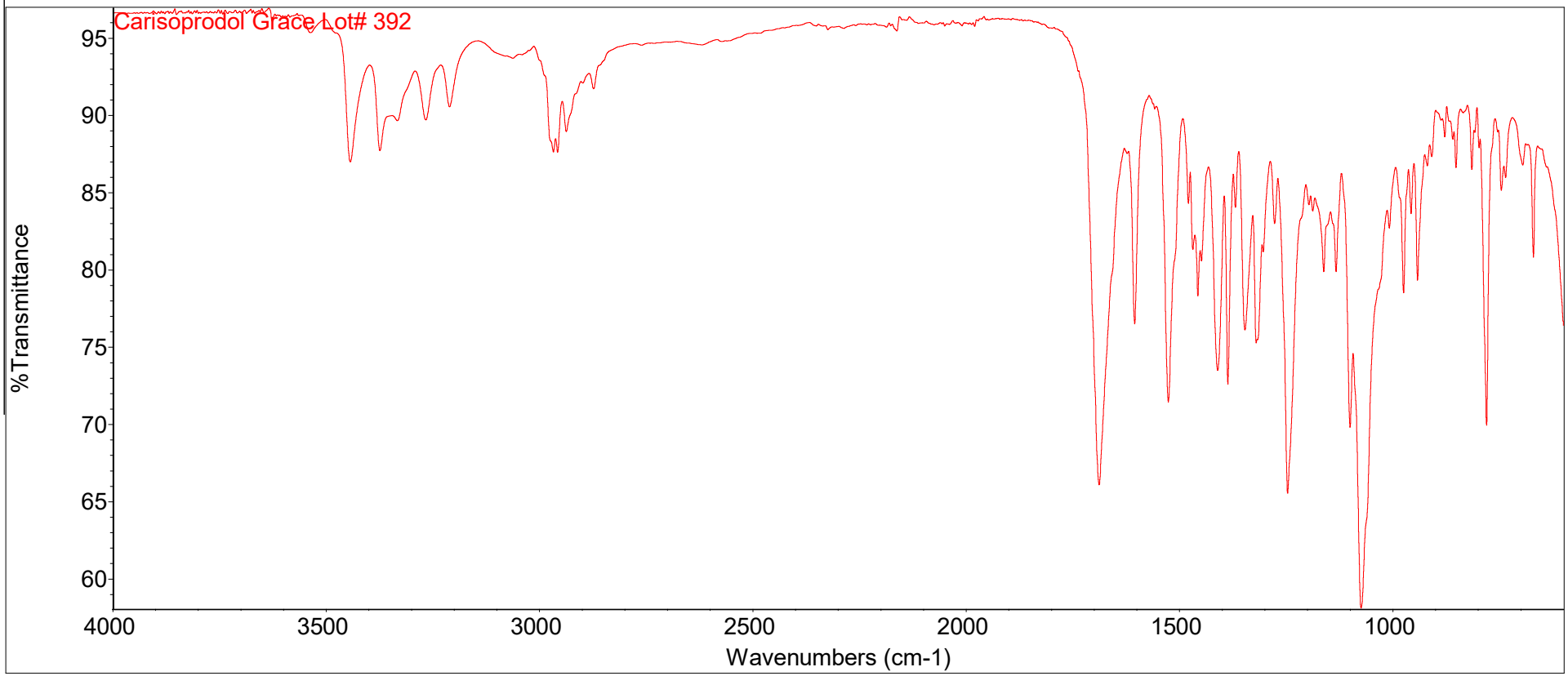
Instrument Name: GROGU



E1 CD

Collection time: Mon May 01 14:44:11 2023 (GMT-05:00)

Carisoprodol Grace Lot# 392



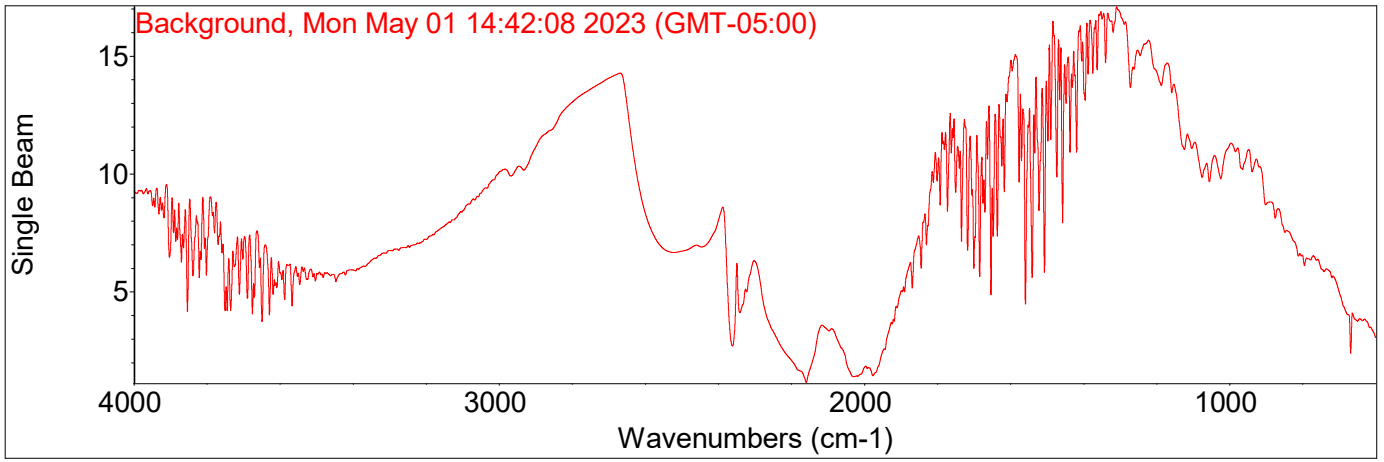
Collection time: Mon May 01 14:42:37 2023 (GMT-05:00)

Background

Number of sample scans: 16
Number of background scans: 0
Resolution: 4.000
Sample gain: 4.0
Optical velocity: 0.4747
Aperture: 80.00

Detector: DTGS KBr
Beamsplitter: KBr
Source: IR

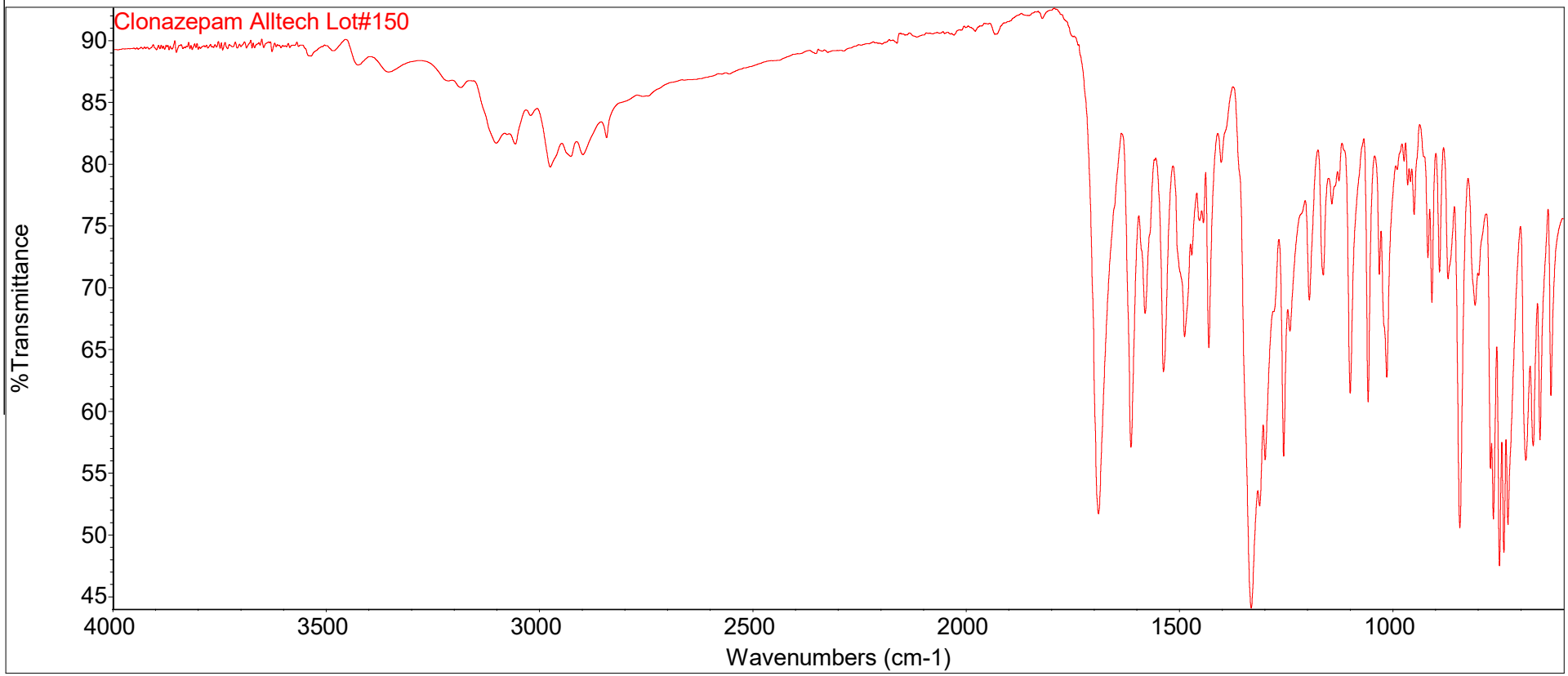
Instrument Name: GROGU



E1 CD

Collection time: Mon May 01 14:56:00 2023 (GMT-05:00)

Clonazepam Alltech Lot# 150



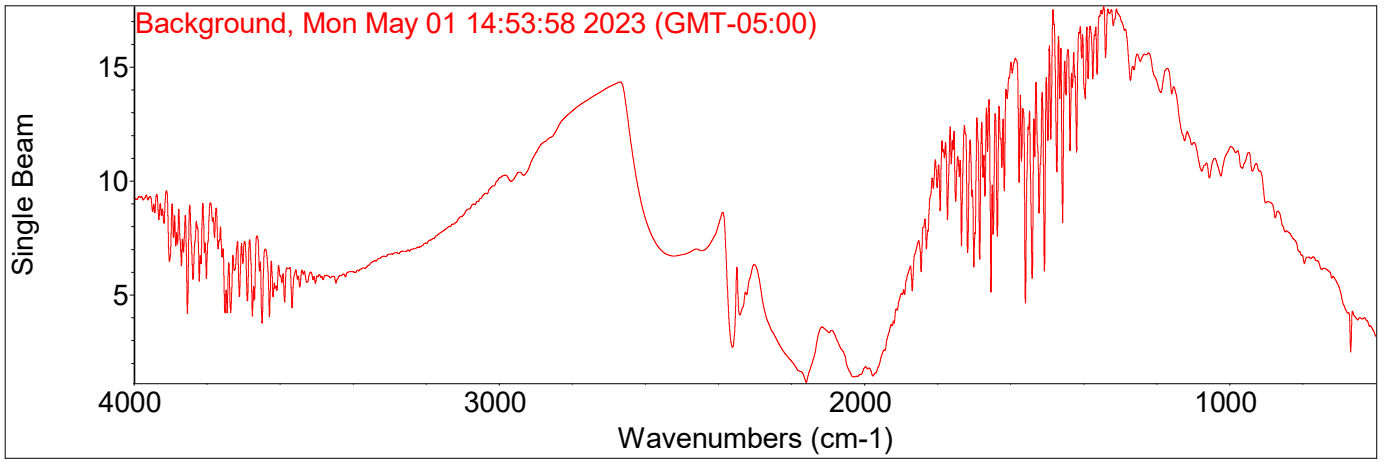
Collection time: Mon May 01 14:54:26 2023 (GMT-05:00)

Background

Number of sample scans: 16
Number of background scans: 0
Resolution: 4.000
Sample gain: 4.0
Optical velocity: 0.4747
Aperture: 80.00

Detector: DTGS KBr
Beamsplitter: KBr
Source: IR

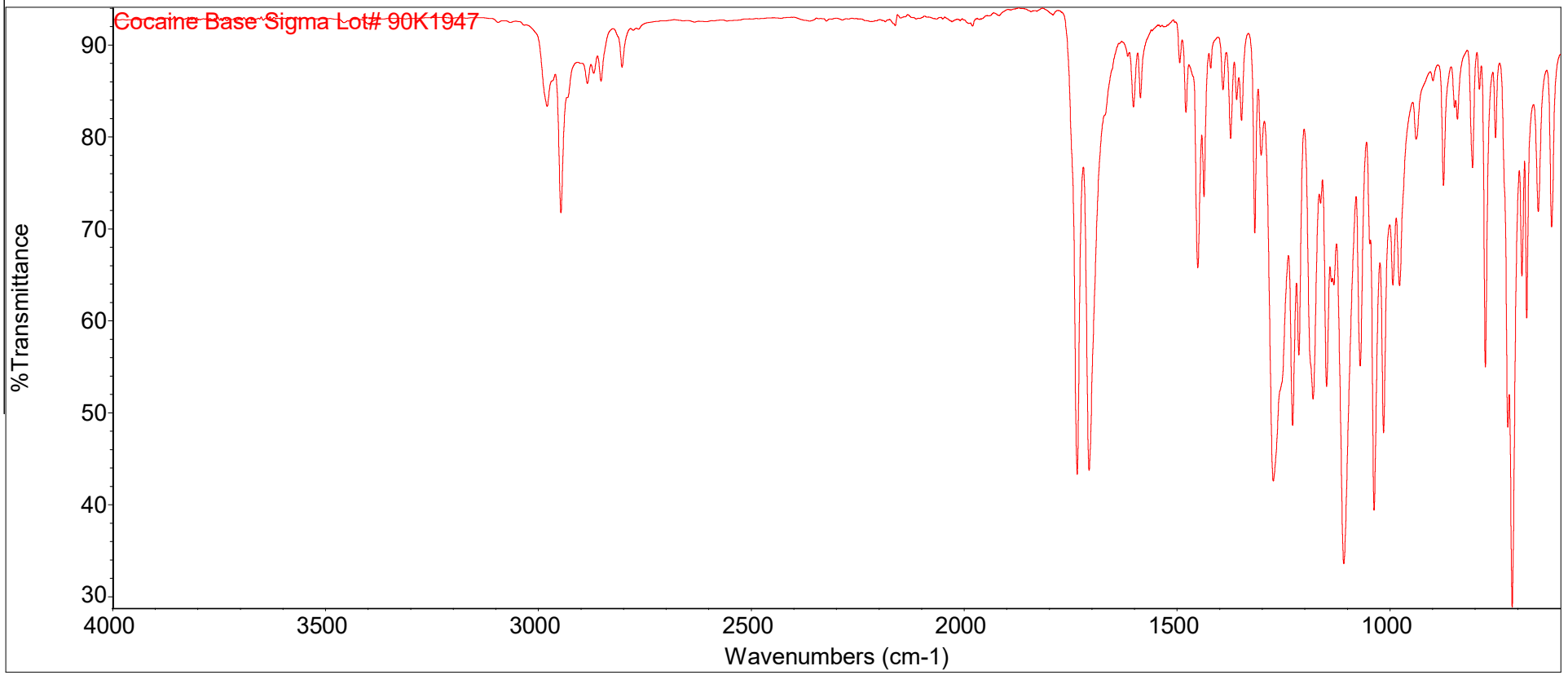
Instrument Name: GROGU



E1 CD

Collection time: Mon May 01 14:25:02 2023 (GMT-05:00)

Cocaine Base Sigma Lot# 90K1947



Collection time: Mon May 01 14:23:40 2023 (GMT-05:00)

Background

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Number of background scans: 0
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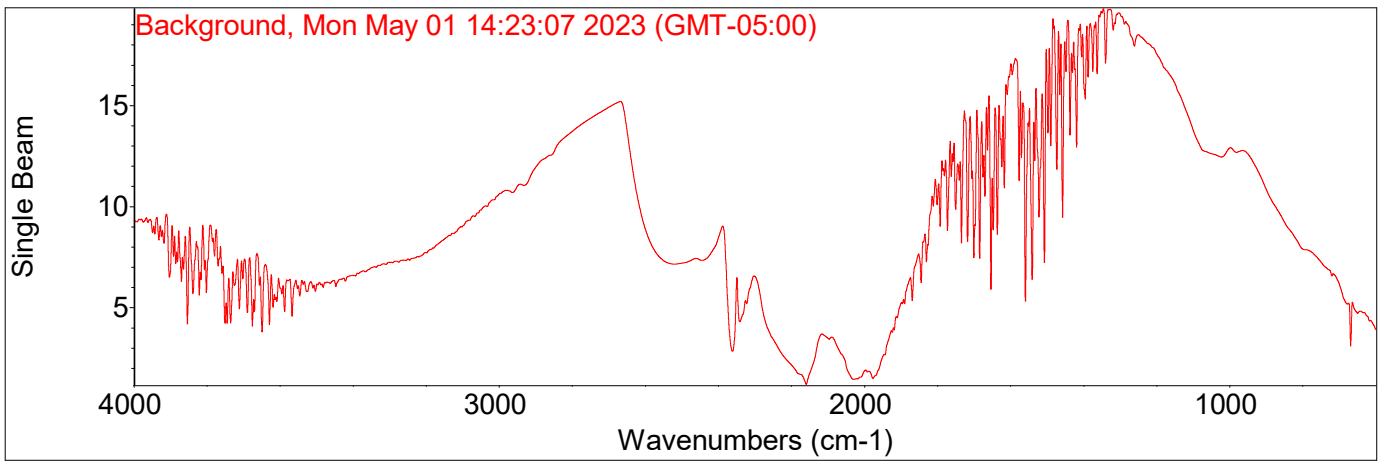
Sample gain: 4.0
Optical velocity: 0.4747
Aperture: 80.00

Detector: DTGS KBr
Beamsplitter: KBr
Source: IR

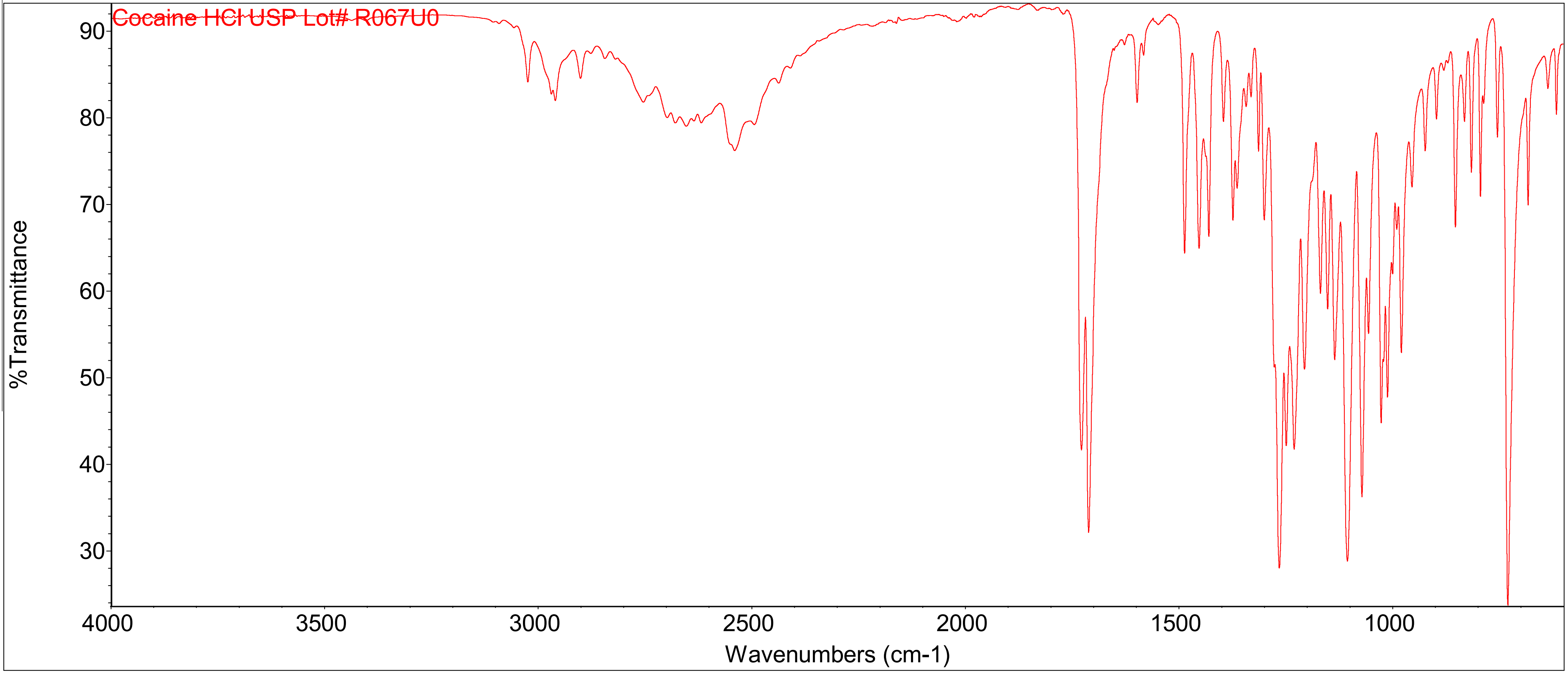
Instrument Name: GROGU



EL CLD

Collection time: Mon May 01 14:32:45 2023 (GMT-05:00)

Cocaine HCl USP Lot# R067U0



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Background

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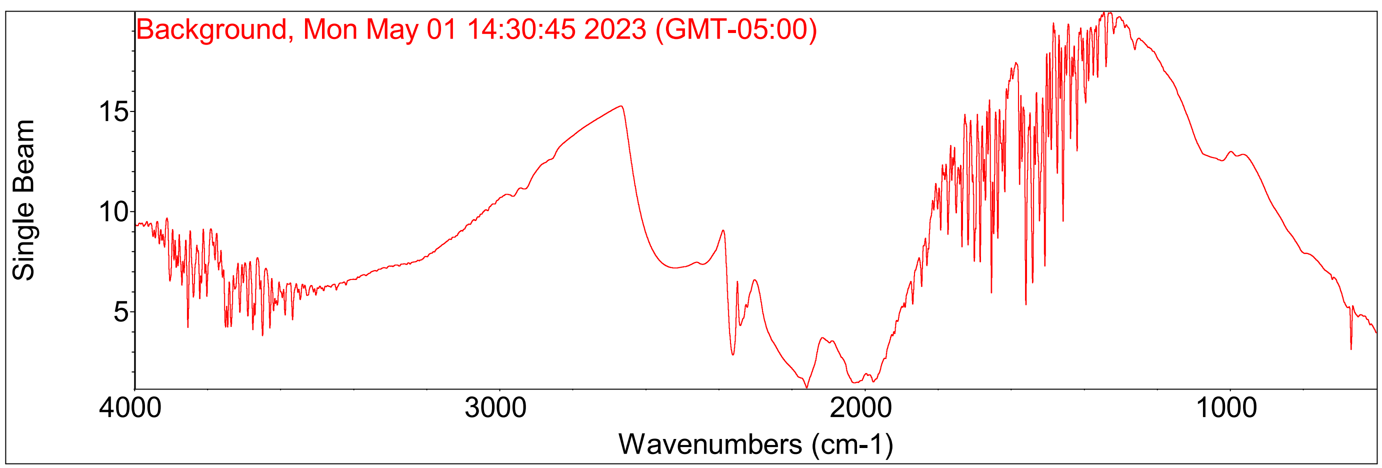
Number of background scans: 0
Resolution: 4.000
Sample gain: 4.0
Optical velocity: 0.4747
Aperture: 80.00

Detector: DTGS KBr
Beamsplitter: KBr
Source: IR

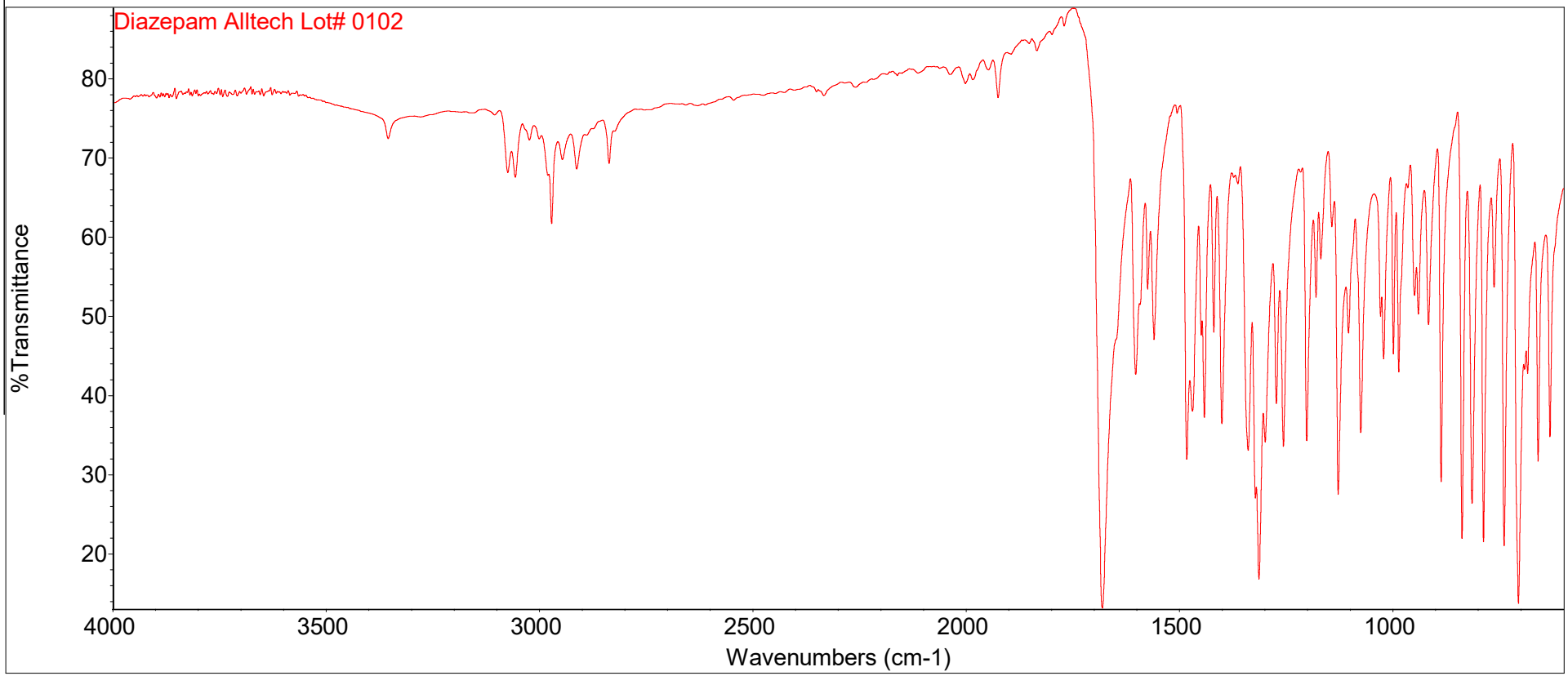
Instrument Name: GROGU



EL CUD

Collection time: Mon May 01 15:09:52 2023 (GMT-05:00)

Diazepam Alltech Lot# 0102



Collection time: Mon May 01 15:08:21 2023 (GMT-05:00)

Background

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Number of background scans: 0
Resolution: 4.000
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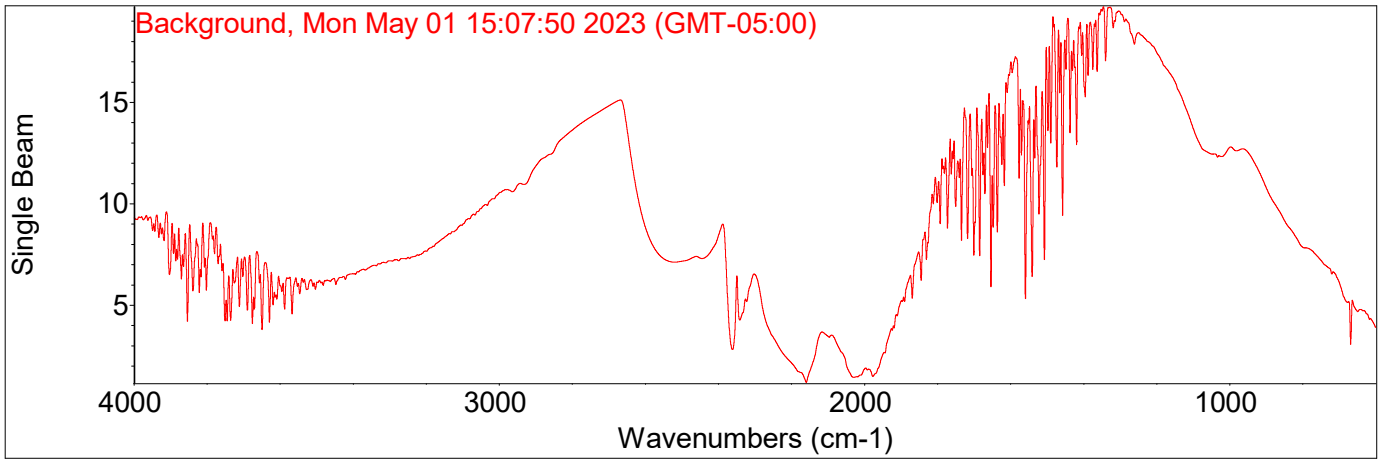
Aperture: 80.00

Detector: DTGS KBr
Beamsplitter: KBr
Source: IR

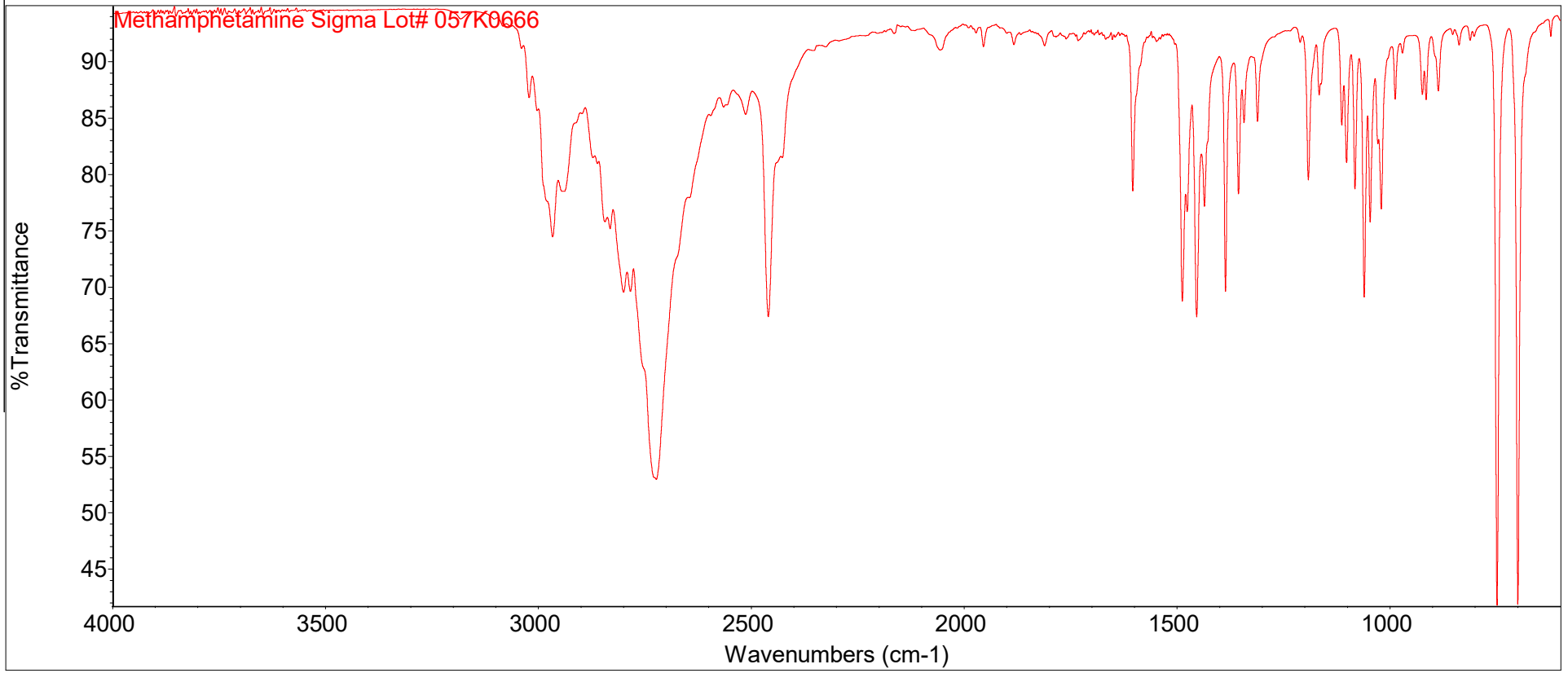
Instrument Name: GROGU



EL CLD

Collection time: Mon May 01 14:29:08 2023 (GMT-05:00)

Methamphetamine Sigma Lot# 057K0666



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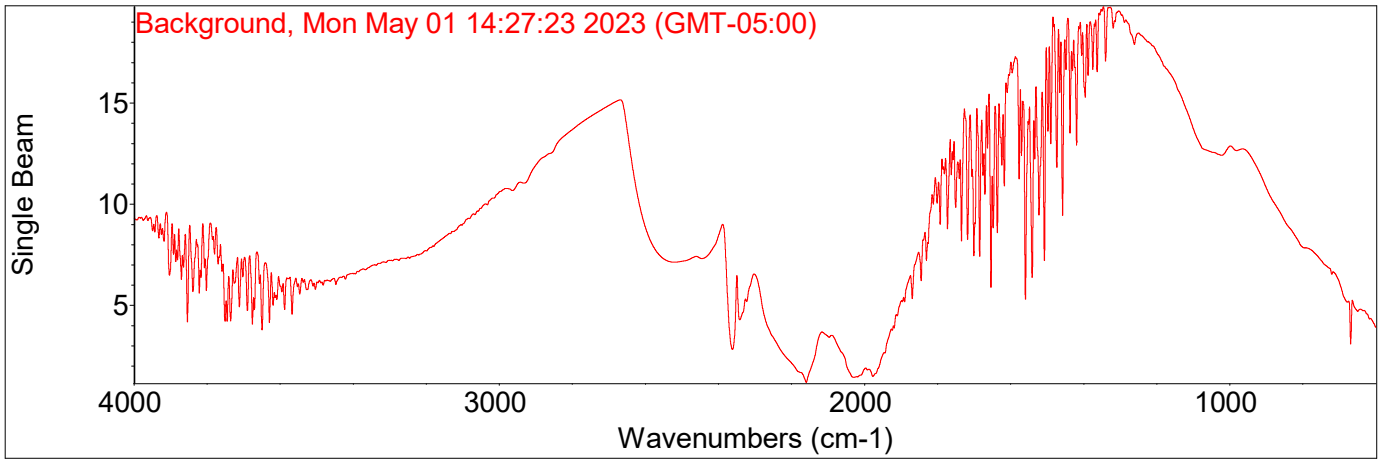
Background

Number of sample scans: 16
Number of background scans: 0
Resolution: 4.000
Sample gain: 4.0
Optical velocity: 0.4747
Aperture: 80.00

Detector: DTGS KBr
Beamsplitter: KBr
Source: IR

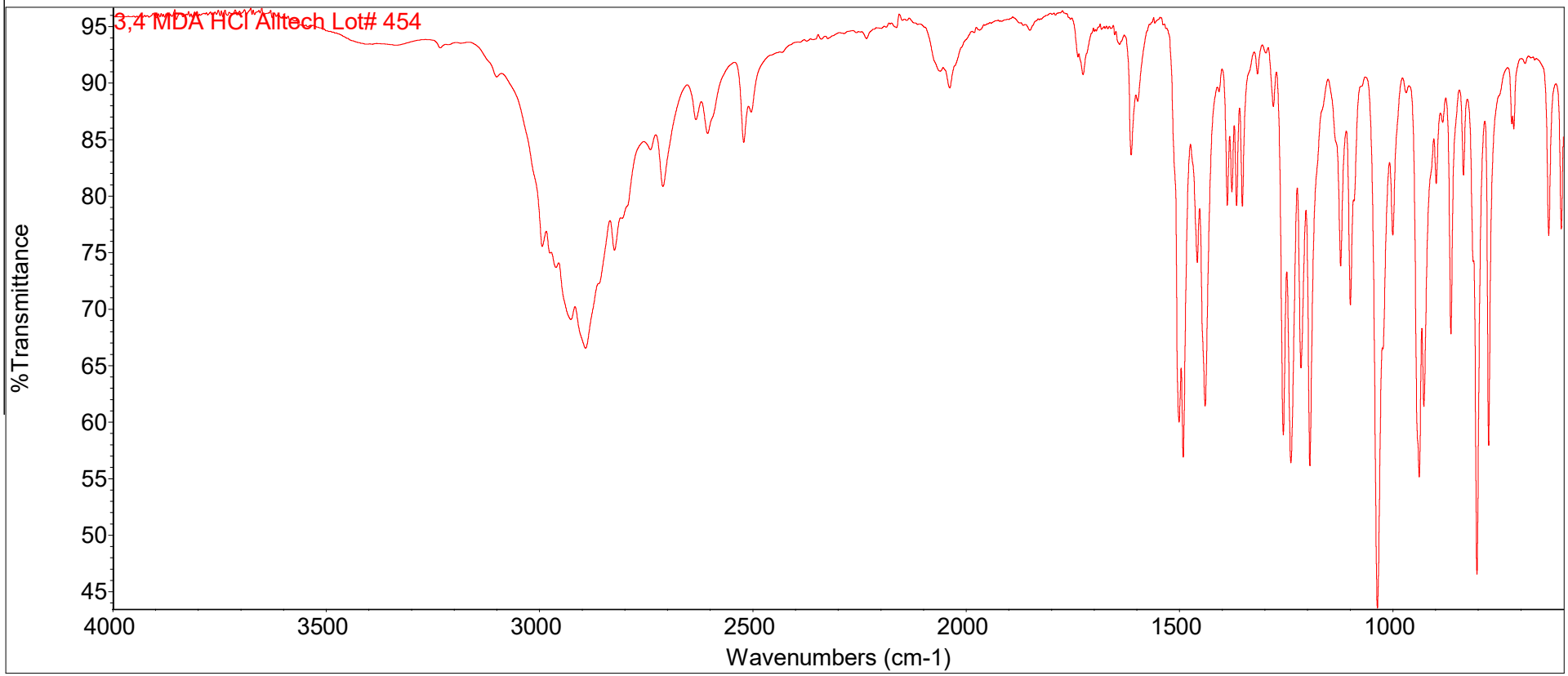
Instrument Name: GROGU



EL CLD

Collection time: Tue May 02 07:39:58 2023 (GMT-05:00)

3,4 Methylenedioxyamphetamine (MDA) HCl Alltech Lot# 45



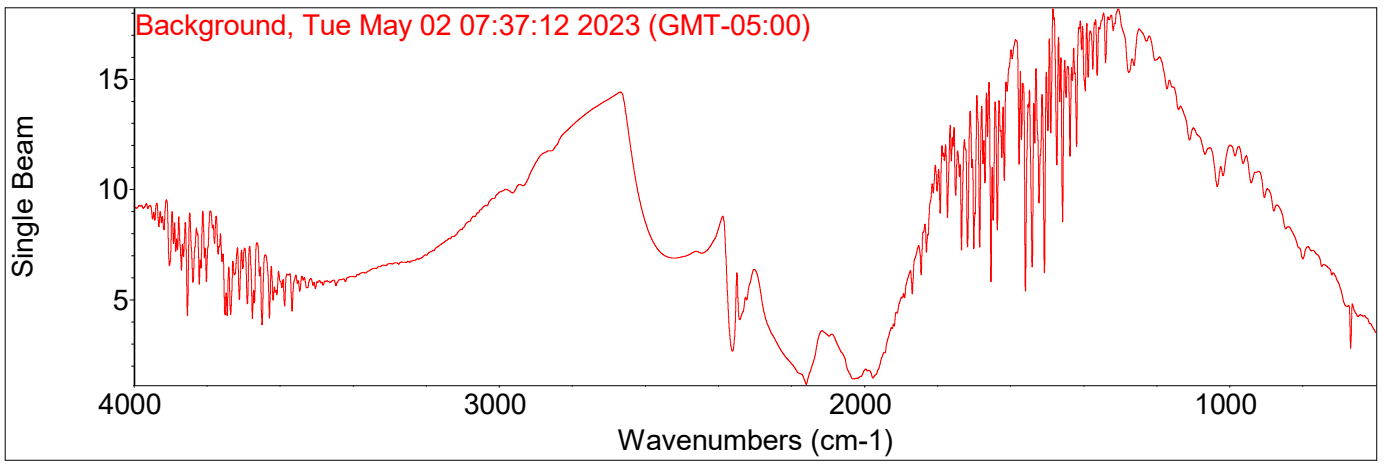
Number of sample scans: 16
Number of background scans: 0
Resolution: 4.000
Sample gain: 4.0
Optical velocity: 0.4747
Aperture: 80.00

Detector: DTGS KBr
Beamsplitter: KBr
Source: IR

Instrument Name: GROGU

Collection time: Tue May 02 07:37:42 2023 (GMT-05:00)

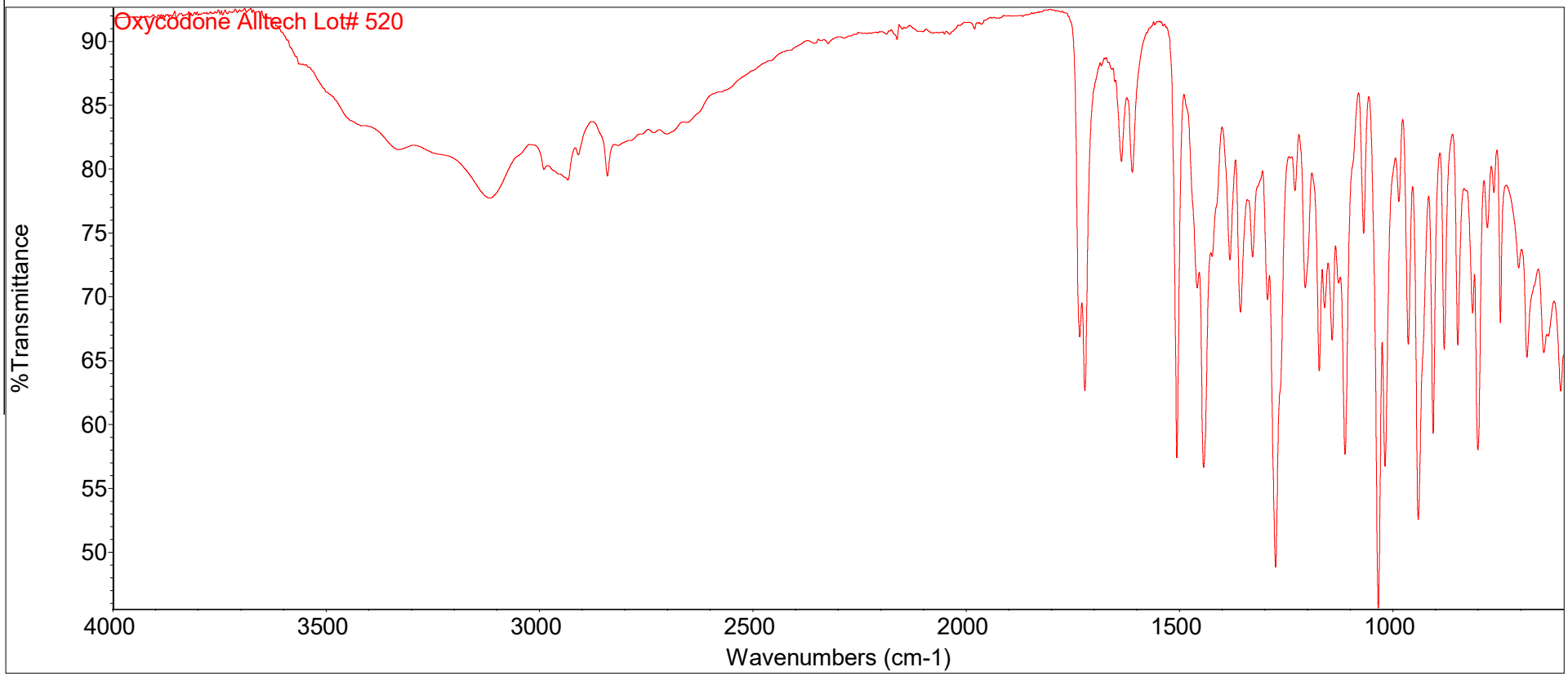
Background



E1 CD

Collection time: Tue May 02 07:09:00 2023 (GMT-05:00)

Oxycodone HCl Alltech Lot# 520



Collection time: Tue May 02 07:06:40 2023 (GMT-05:00)

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Number of background scans: 0
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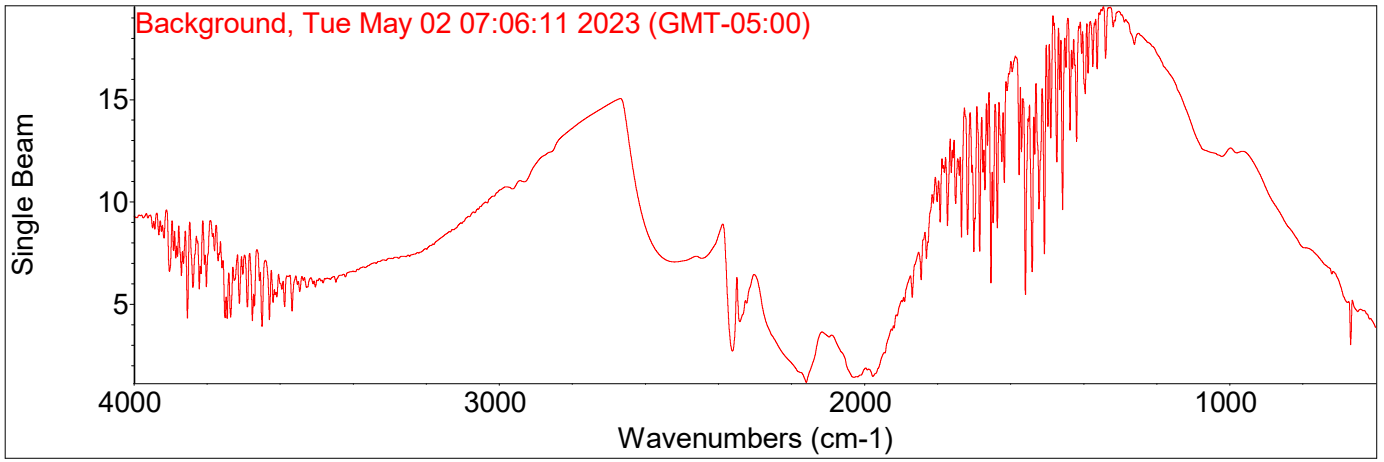
Detector: DTGS KBr
Beamsplitter: KBr
Source: IR

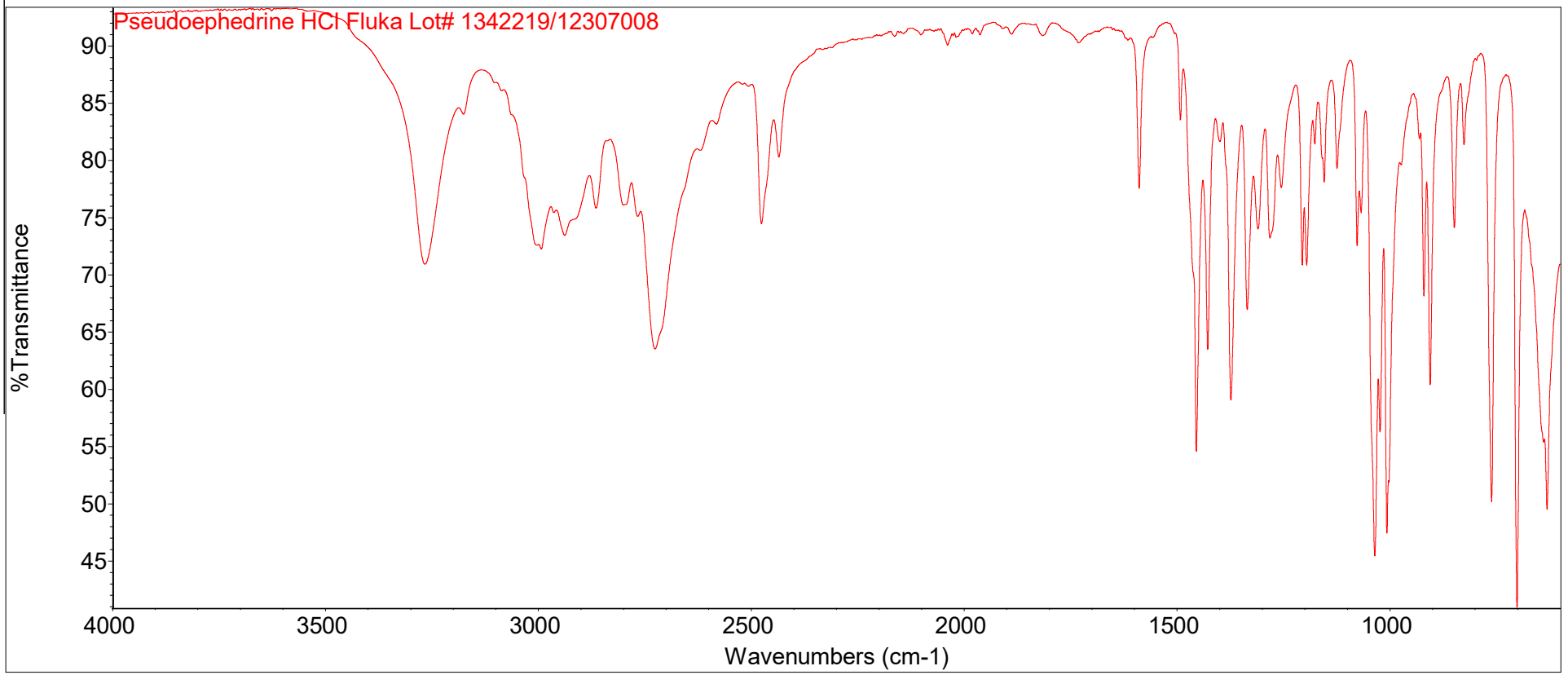
Instrument Name: GROGU



E1 CD

Collection time: Mon May 01 15:05:51 2023 (GMT-05:00)

Pseudoephedrine HCl Fluka Lot# 1342219/12307008



Collection time: Mon May 01 15:04:17 2023 (GMT-05:00)

Background

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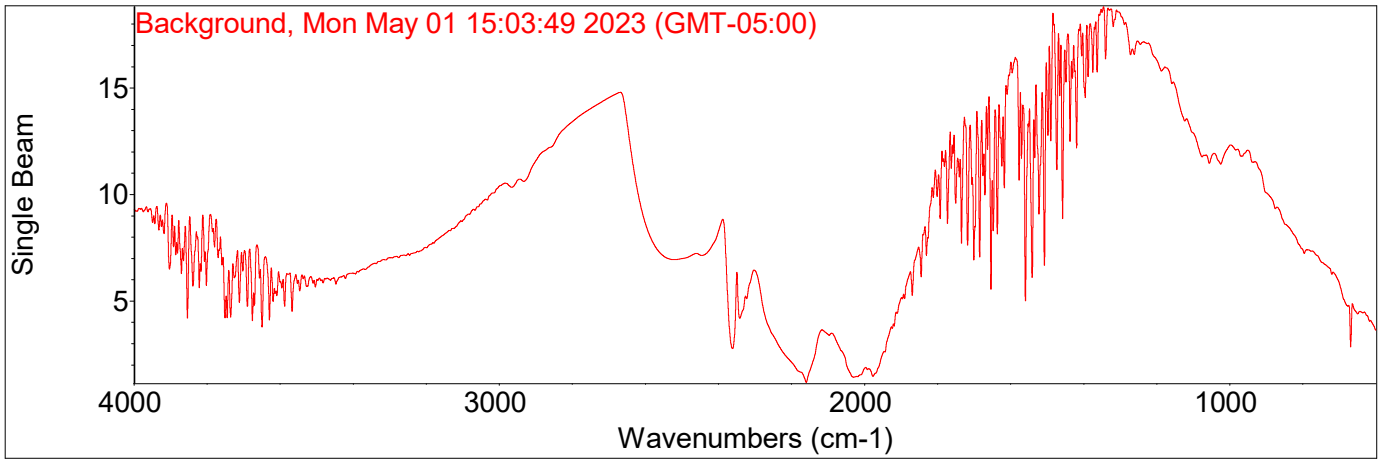
Number of background scans: 0
Resolution: 4.000
Sample gain: 4.0
Optical velocity: 0.4747
Aperture: 80.00

Detector: DTGS KBr
Beamsplitter: KBr
Source: IR

Instrument Name: GROGU



EL CLD