

TBI-FORENSIC SERVICES DIVISION PERFORMANCE VERIFICATION FORM

Instrument/Method to Verify:

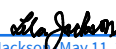
Nicolet iS20 FTIR (SN:BEP2310114) with Smart iTX attachment (SN:Y99963) - Inspector

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 Lela Jackson Title SA FS II Initials LJ

Completed: 
Lela Jackson (May 11, 2023 11:21 CDT)

Name _____ Title _____ Initials _____

Completed:

Name _____ Title _____ Initials _____

Completed:

Verification of final review:

Unit Supervisor: Rebecca Hernandez

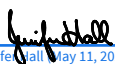
Section Manager: Melann Everett

Unit Supervisor: Brett Trotter

Section Manager:

Unit Supervisor:

Section Manager:

Regional Administrator: 
Jenifer Hall (May 11, 2023 11:12 CDT)

Regional Administrator:

Regional Administrator:

Quality Assurance Manager: 
Chad Johnson (May 11, 2023 12:27 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 (SN:BEP2310114) with Smart iTX attachment (SN: Y99963)
TBI FCU ID – INSPECTOR**

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Forensic Chemistry Performance Verification

Nicolet iS20 FTIR (SN:BEP2310114) with Smart iTX diamond attachment (SN: Y99963)
TBI FCU ID – Inspector

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 Avatar 380, 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.

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
- The ability to use the smart iTX accessory as a primary ATR accessory for future FTIR acquisitions and for serving as a potential back-up in the event of an attachment failure

Forensic Chemistry Performance Verification

Nicolet iS20 FTIR (SN:BEP2310114) with Smart iTX diamond attachment (SN: Y99963)
TBI FCU ID – Inspector

2. Components and Experiment Setup:

Instrument Components

iS20 FTIR	
Source	Single point
Beam splitter	KBr
Laser Type	Solid-state Diode
Detector	DTGS KBr
Internal Verification Standard	Polystyrene/NG Glass wheel

Experiment parameters	
Scans	16
Resolution	4
Spectral Range	4000 – 600
Gain	Auto
Optical Velocity	0.4747
Aperture	150.00

Smart iTX (SN:Y99963) was used since this attachment had been in service recently.

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 subsequent to running of the certified reference standards.

All standards were run in their pure form – no extractions, washes, or other alterations were performed. If available, the same chemical lots utilized to create the FCU ATR spectral library were used. Prior to each standard run, the instrument's sampling area was cleaned, and a background spectrum was collected to ensure no cross-contamination occurred.

Forensic Chemistry Performance Verification

Nicolet iS20 FTIR (SN:BEP2310114) with Smart iTX diamond attachment (SN: Y99963)
TBI FCU ID – Inspector

4. Standards Used:

Standard	Source	Lot Number
Acetaminophen	Sigma-Aldrich	088K0040
Alprazolam	Upjohn	487RA
Caffeine	Eastman Kodak	355
Carisoprodol	Alltech	311 (label A)
Cocaine base	Merck	U7472
Cocaine HCl	Sigma-Aldrich	SLCF4870
Diazepam	Sigma	105F0451
Methamphetamine	K&K Labs	732A
3,4-MDMA	Cayman Chemical	0460656-7
Oxycodone	Sigma	128H1012

5. Results and Conclusions

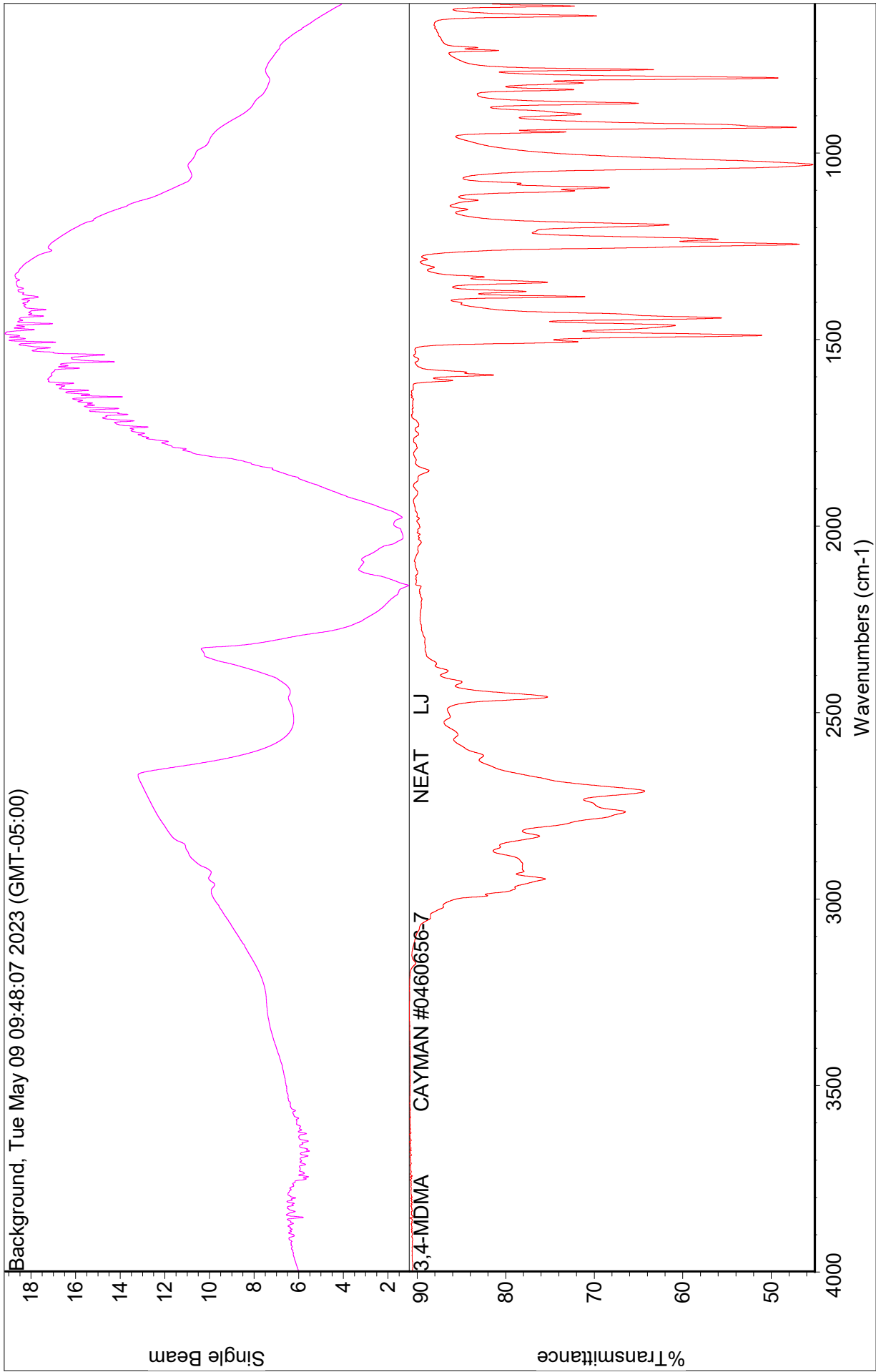
Spectra for the ten standards generated by Inspector were compared to library standard spectra. Results from Inspector using the smart iTX attachment were consistent with the library standard spectra and matched satisfactorily for identification.

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

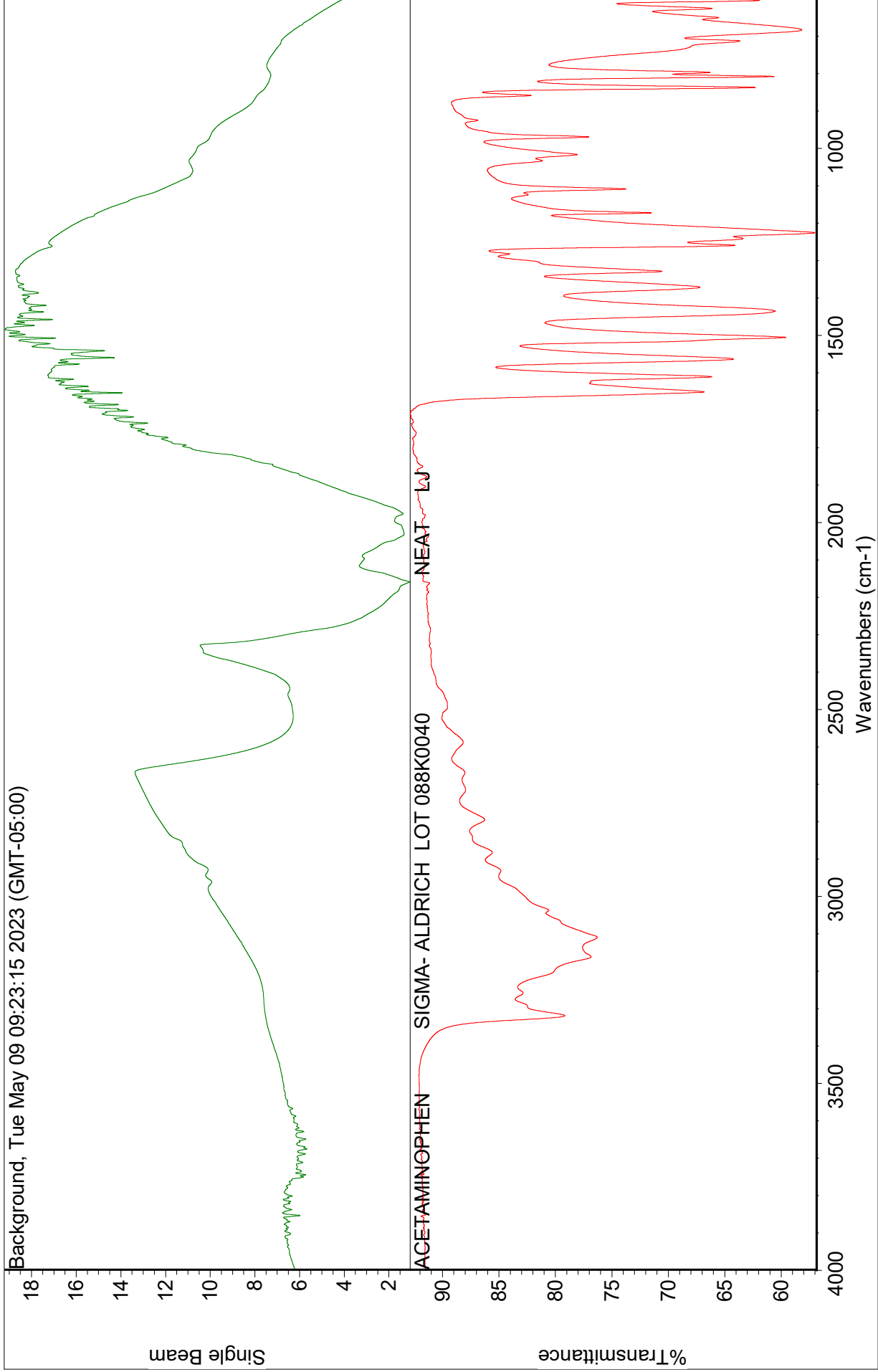
The ValPro Qualification reports outlined in the Procedure section as well as the current maintenance log are in Appendix B. The full factory validation performed is also included in this appendix.

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 labeling spectra as documented in the validation for the HAL9000 iS20 in service. Therefore, no additional training requirements will be needed for currently trained scientists.

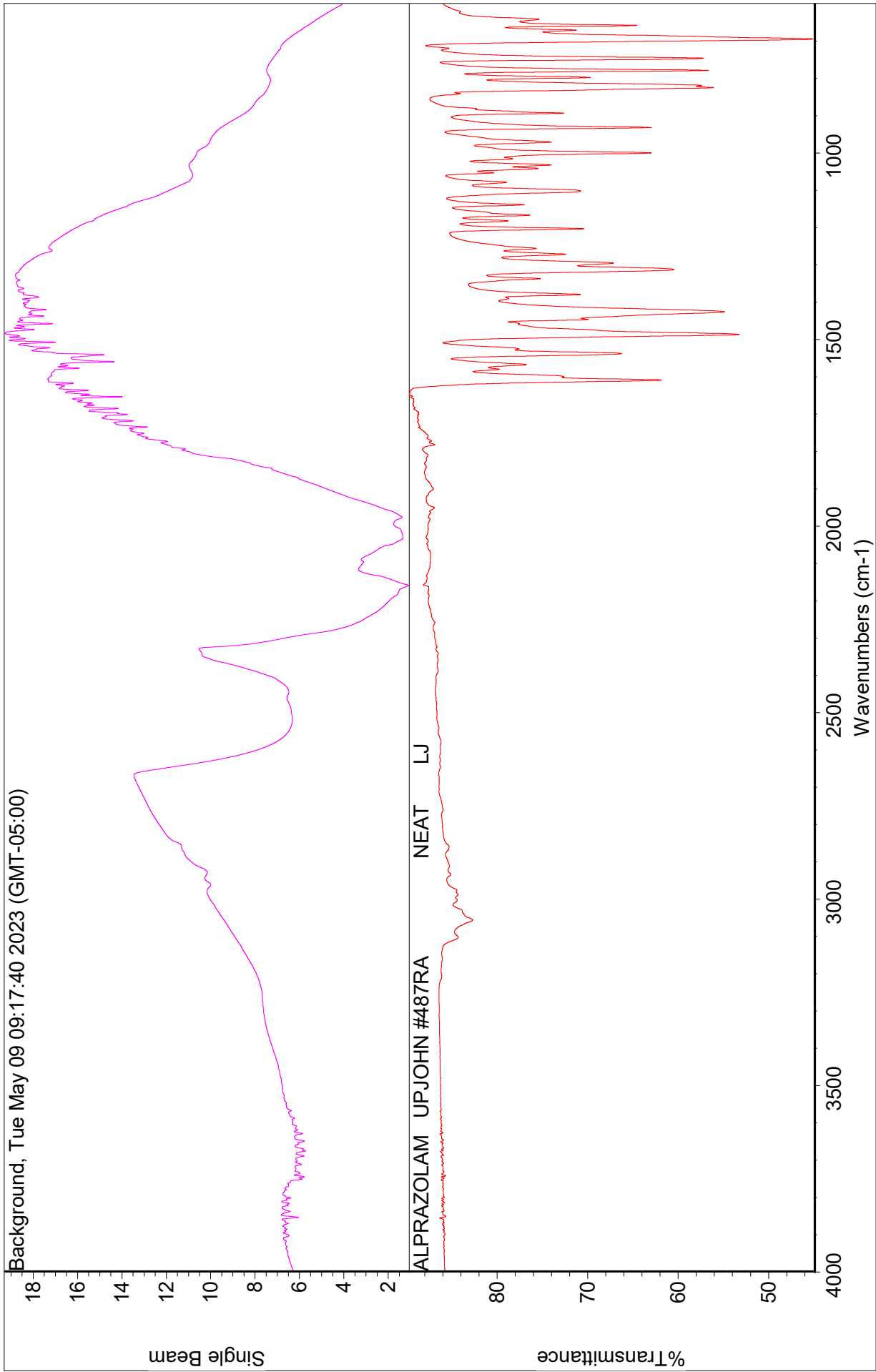


3,4-MDMA	CAYMAN #0460656-7	NEAT	LJ	INSPECTOR	Collection time: Tue May 09 09:50:11 2023 (GMT-05:00)	
					Detector: DTGS KBr	Number of sample scans: 16
					Beamsplitter: KBr	Number of background scans: 16
					Source: IR	Resolution: 4.000
					Sample gain: 4.0	
					Optical velocity: 0.4747	
					Aperture: 150.00	



ACETAMINOPHEN	SIGMA- ALDRICH LOT 088K0040	NEAT	LJ	Number of sample scans: 16
				Number of background scans: 16
				Resolution: 4.000
				Detector: DTGS KBr
				Sample gain: 4.0
				Beamsplitter: KBr
				Optical velocity: 0.4747
				Source: IR
				Aperture: 150.00

Collection time: Tue May 09 09:25:49 2023 (GMT-05:00) INSPECTOR



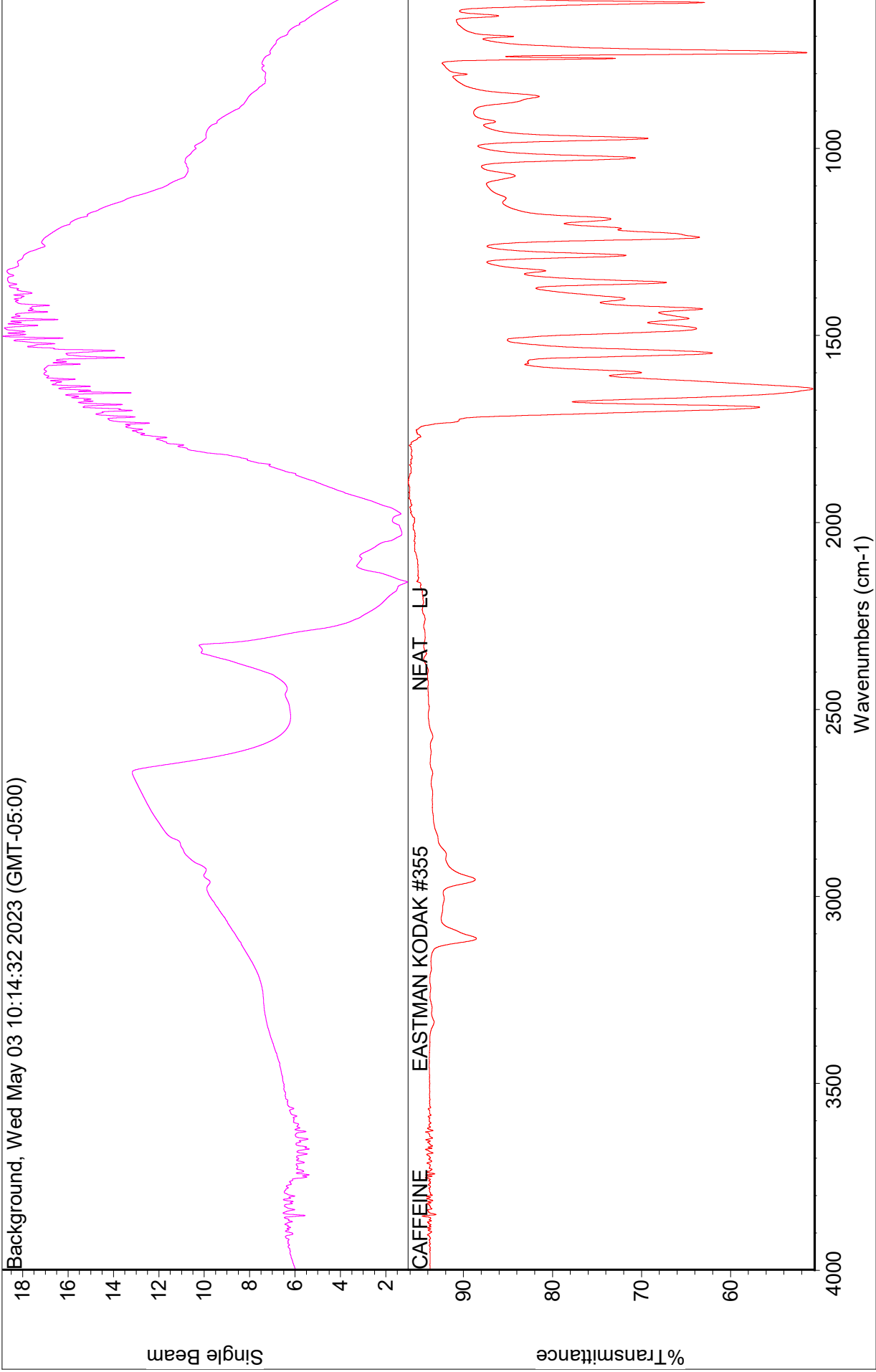
ALPRAZOLAM UPJOHN #487RA NEAT LJ

Collection time: Tue May 09 09:20:37 2023 (GMT-05:00) INSPECTOR

Detector: DTGS KBr Sample gain: 4.0
Beamsplitter: KBr Optical velocity: 0.4747
Source: IR Aperture: 150.00

Number of sample scans: 16
Number of background scans: 16
Resolution: 4.000

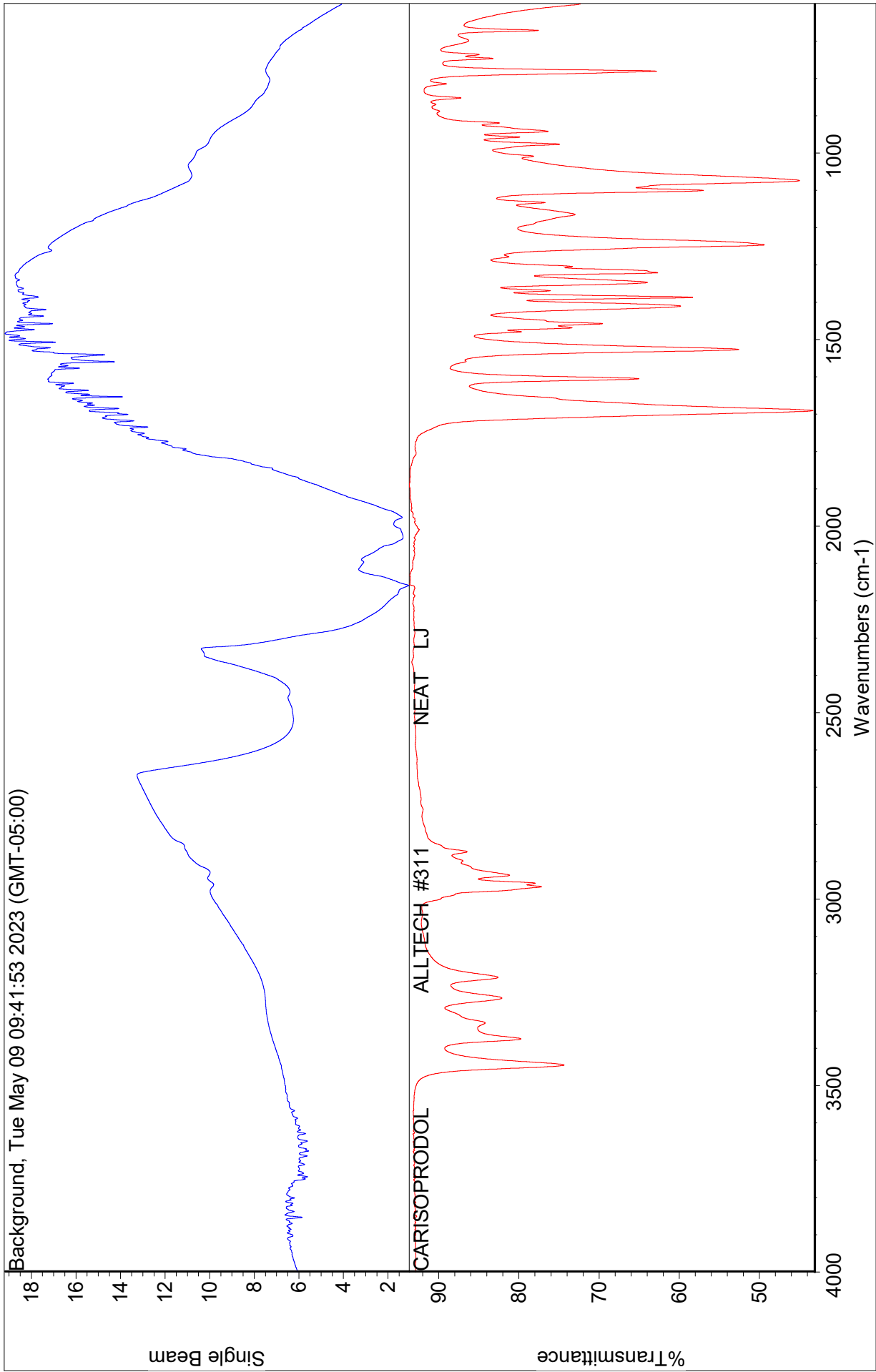
Background, Wed May 03 10:14:32 2023 (GMT-05:00)



CAFFEINE	EASTMAN KODAK #355	NEAT	LJ	Number of sample scans: 16
				Number of background scans: 16
				Resolution: 4.000
				Detector: DTGS KBr
				Sample gain: 4.0
				Beamsplitter: KBr
				Optical velocity: 0.4747
				Source: IR
				Aperture: 150.00

Collection time: Wed May 03 10:16:32 2023 (GMT-05:00)

INSPECTOR

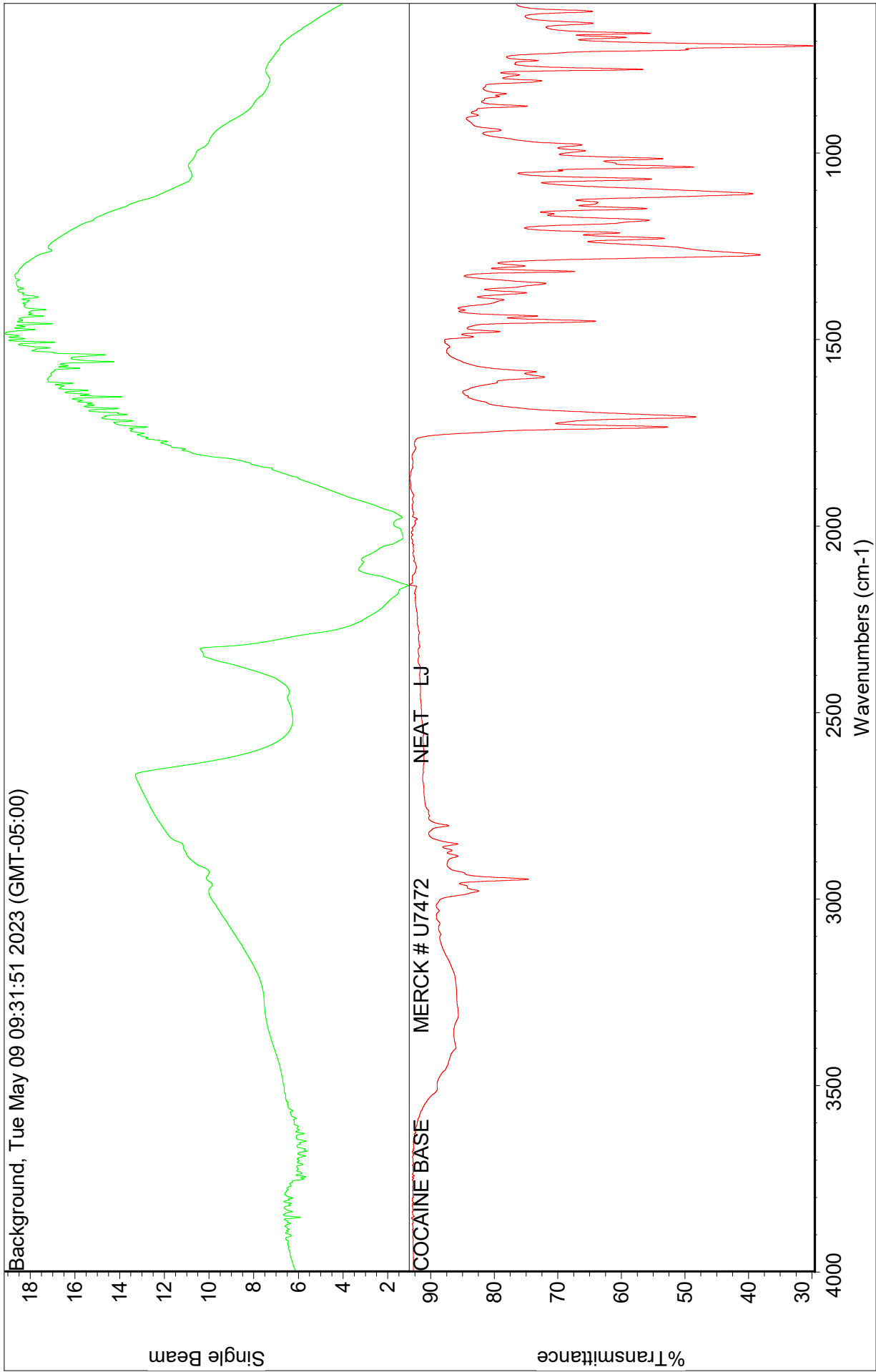


CARISOPRODOL ALLTECH #311 NEAT LJ

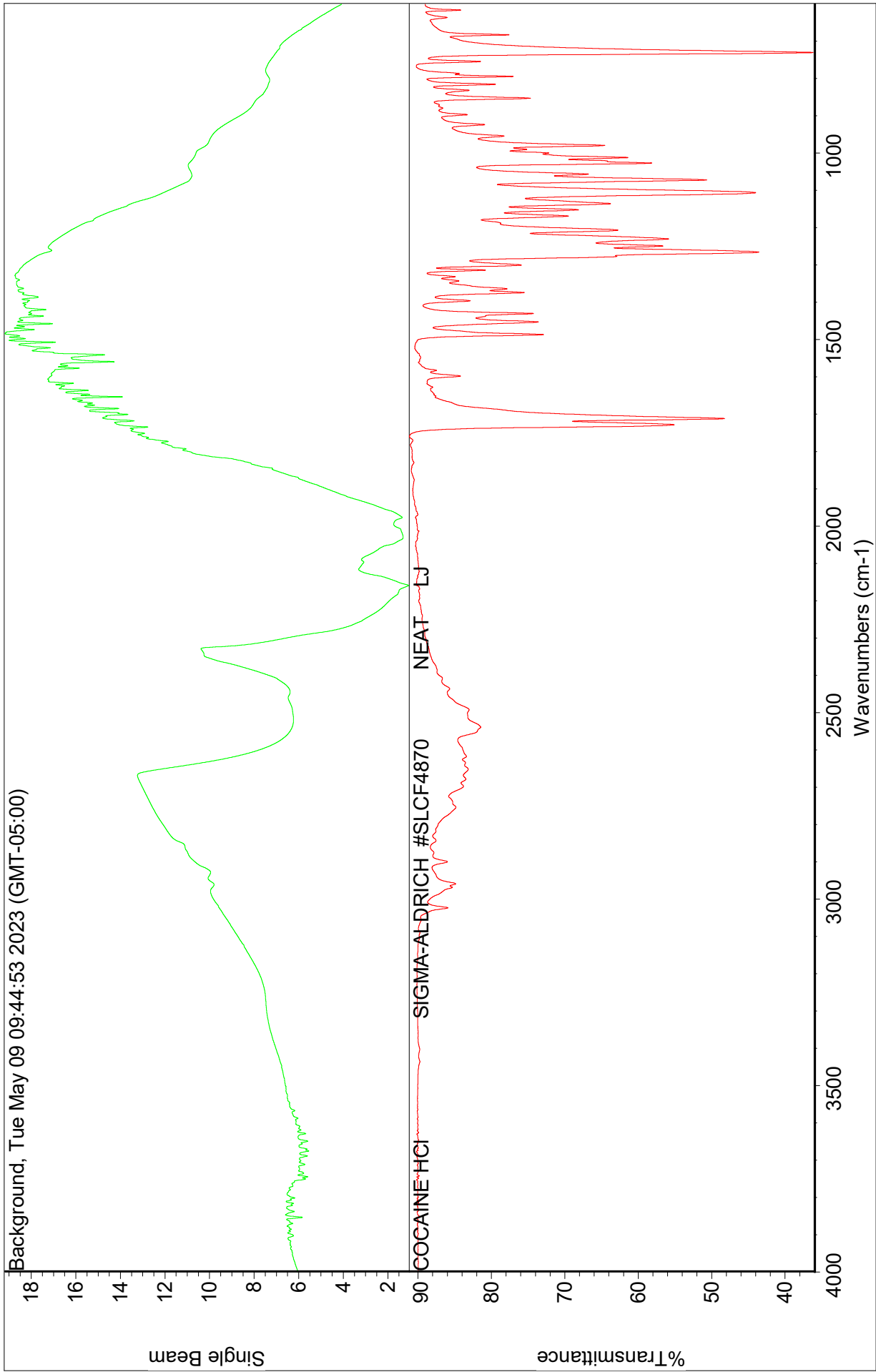
Detector: DTGS KBr Number of sample scans: 16
Beamsplitter: KBr Number of background scans: 16
Source: IR Resolution: 4.000
Sample gain: 4.0
Optical velocity: 0.4747
Aperture: 150.00

Collection time: Tue May 09 09:43:50 2023 (GMT-05:00)

INSPECTOR

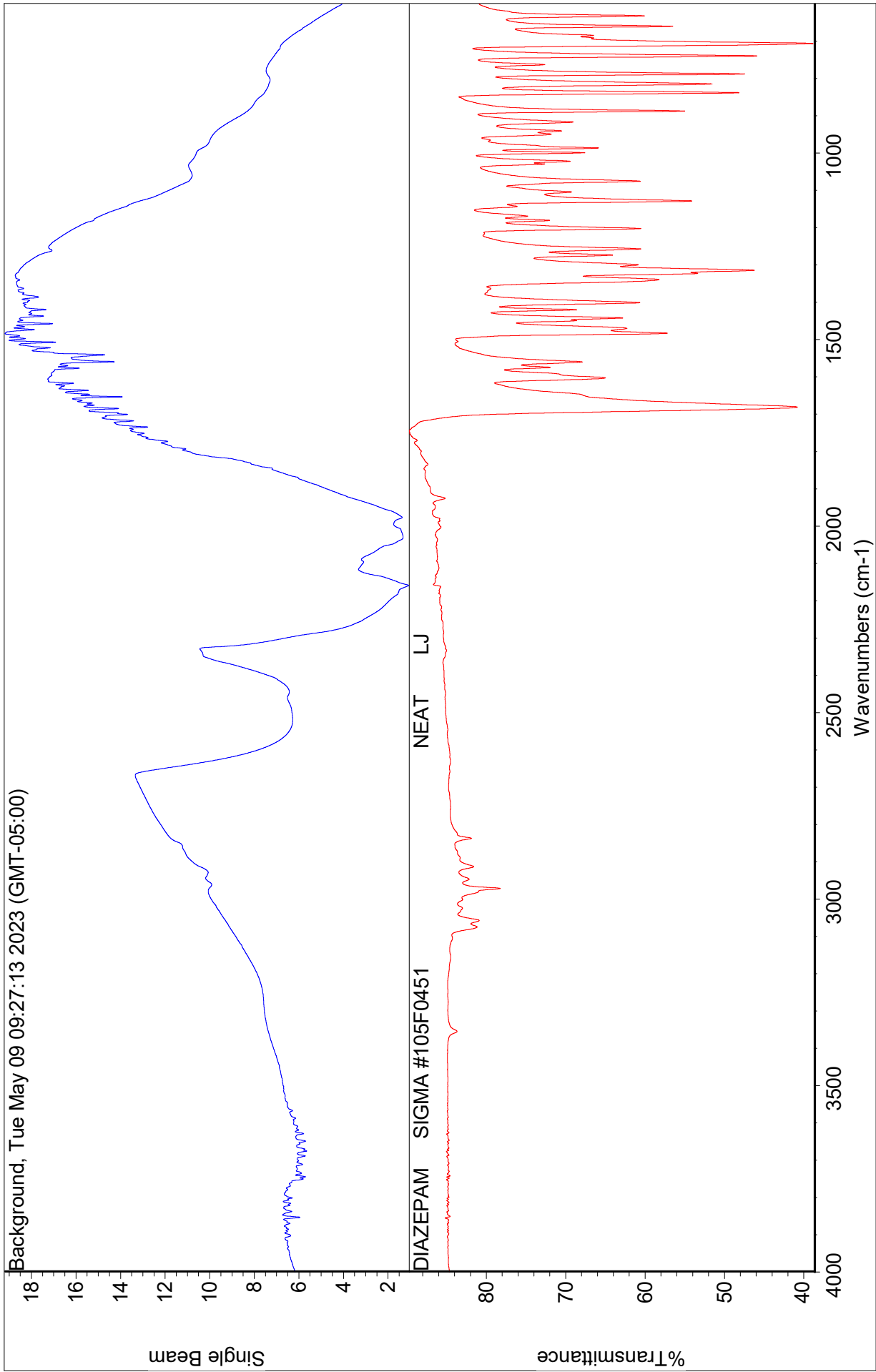


COCAINE BASE	MERCK # U7472	NEAT	LJ	INSPECTOR	Collection time: Tue May 09 09:34:38 2023 (GMT-05:00)	
					Detector: DTGS KBr	Number of sample scans: 16
					Beamsplitter: KBr	Number of background scans: 16
					Source: IR	Resolution: 4.000
					Sample gain: 4.0	
					Optical velocity: 0.4747	
					Aperture: 150.00	



COCAINE HCl	SIGMA-ALDRICH #SLCF4870	NEAT	LJ	Number of sample scans: 16
				Number of background scans: 16
				Resolution: 4.000
				Detector: DTGS KBr
				Sample gain: 4.0
				Beamsplitter: KBr
				Optical velocity: 0.4747
				Source: IR
				Aperture: 150.00

Collection time: Tue May 09 09:47:05 2023 (GMT-05:00) INSPECTOR



DIAZEPAM SIGMA #105F0451

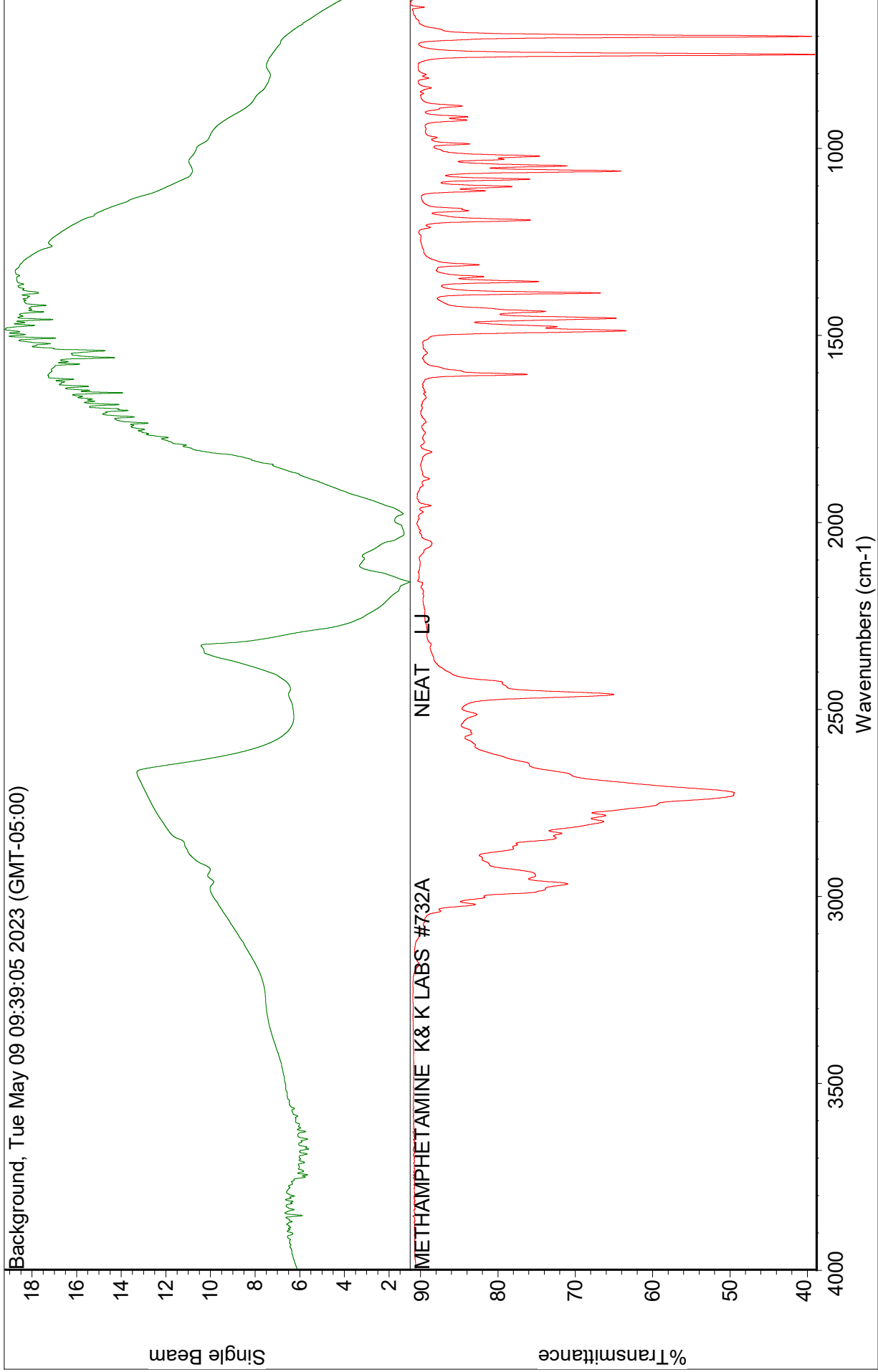
NEAT LJ

INSPECTOR

Collection time: Tue May 09 09:29:30 2023 (GMT-05:00)

Detector: DTGS KBr
Beamsplitter: KBr
Source: IR

Number of sample scans: 16
Number of background scans: 16
Resolution: 4.000
Sample gain: 4.0
Optical velocity: 0.4747
Aperture: 150.00



METHAMPHETAMINE K&K LABS #732A

INSPECTOR

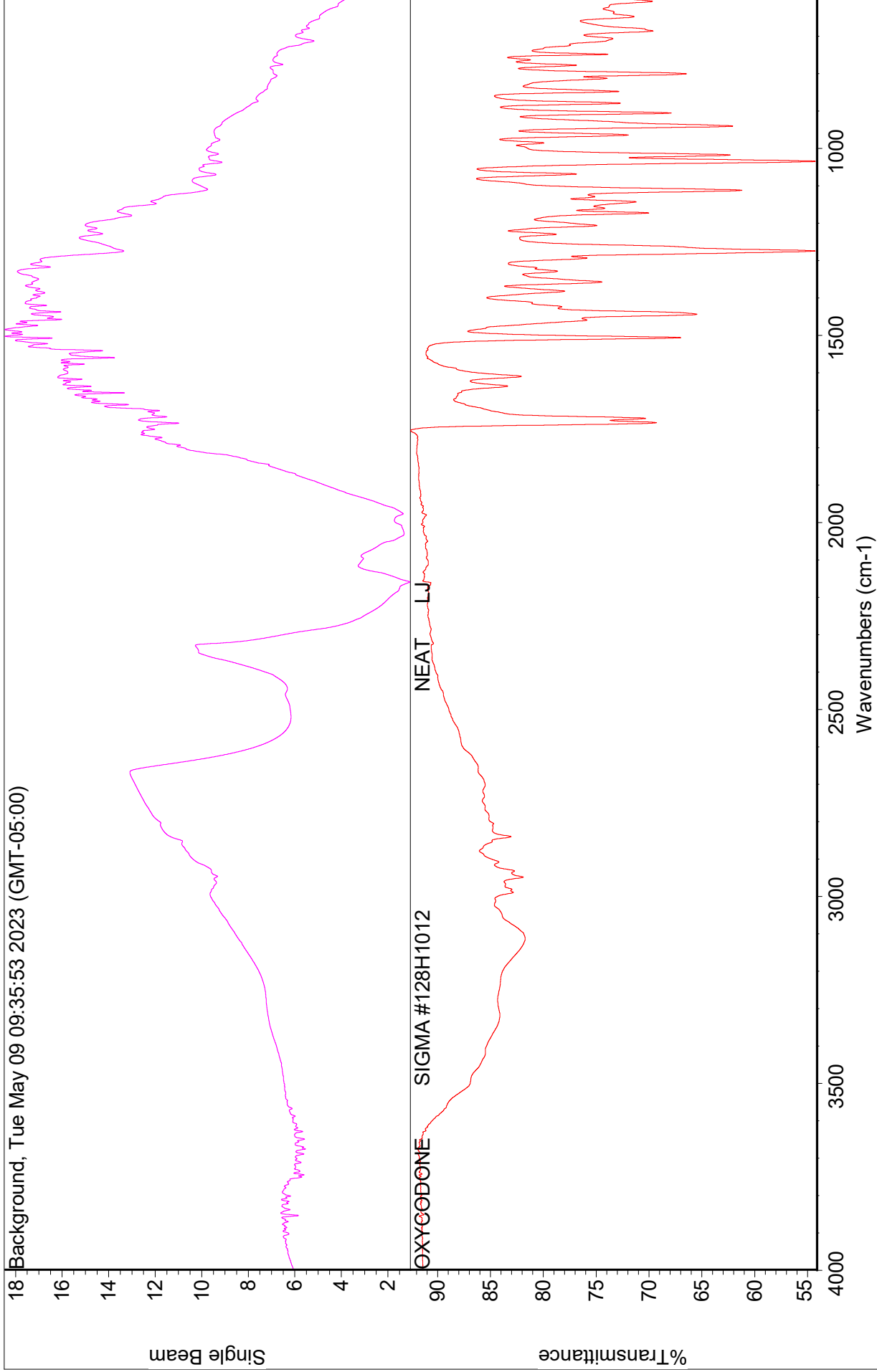
Collection time: Tue May 09 09:40:53 2023 (GMT-05:00)

Detector: DTGS KBr
Beamsplitter: KBr
Source: IR

NEAT LJ

Number of sample scans: 16
Number of background scans: 16
Resolution: 4.000
Sample gain: 4.0
Optical velocity: 0.4747
Aperture: 150.00

Background, Tue May 09 09:35:53 2023 (GMT-05:00)



OXYCODONE SIGMA #128H1012

NEAT LJ

Detector: DTGS KBr
Beamsplitter: KBr
Source: IR
Number of sample scans: 16
Number of background scans: 16
Resolution: 4.000
Sample gain: 4.0
Optical velocity: 0.4747
Aperture: 150.00

Collection time: Tue May 09 09:37:53 2023 (GMT-05:00)

INSPECTOR

ATR Maintenance Log

Instrument ID

INSPECTOR

[illegible]

Other Maintenance

[illegible]

ValPro Qualification Report

Qualification test: Nicolet iS20 system KBr - PV

Operator: Inspector

Date: Wednesday, May 3, 2023 7:44:03 AM (GMT-05:00)

Instrument: Nicolet iS20 Serial number: BEP2310114

Filename: Nicolet iS20 system KBr - PV_20230503_074403.spg

Test description	High limit	Low limit	Measured	Result
Energy ratio				
Energy ratio 4000 / 2000	1.00	0.20	0.34	Pass ✓
Energy ratio 2000 / 1000	4.00	0.80	1.58	Pass ✓
Noise level				
P-P noise 4050 - 3950 (%T)	0.25	0.00	0.08	Pass ✓
P-P noise 2050 - 1950 (%T)	0.221	0.00	0.093	Pass ✓
P-P noise 1050 - 950 (%T)	0.10	0.00	0.03	Pass ✓
P-P noise 550 - 450 (%T)	1.50	0.00	0.74	Pass ✓
RMS noise 4050 - 3950	0.05	0.00	0.01	Pass ✓
RMS noise 2050 - 1950	0.039	0.00	0.019	Pass ✓
RMS noise 1050 - 950	0.014	0.00	0.006	Pass ✓
RMS noise 550 - 450	0.30	0.00	0.13	Pass ✓
Detector linearity				
Slope	1.10	0.90	1.03	Pass ✓
Intercept (%T)	1.00	-1.00	0.07	Pass ✓

Performed by:  Title: _____ Date: 5/3/23

Approved by: _____ Title: _____ Date: _____

Comments: _____

Digital comment(s):

No digital comments found.

ValPro Qualification Report

Qualification test: Nicolet iS20 system KBr - USP

Operator: Inspector

Date: Wednesday, May 3, 2023 7:56:15 AM (GMT-05:00)

Instrument: Nicolet iS20 Serial number: BEP2310114

Filename: Nicolet iS20 system KBr - USP_20230503_075615.spg

Test description	High limit	Low limit	Measured	Result
Wavenumber accuracy				
Peak at 3060.0 (cm-1)	3061.0	3059.0	3059.6	Pass ✓
Peak at 2849.5 (cm-1)	2850.5	2848.5	2849.4	Pass ✓
Peak at 1942.9 (cm-1)	1943.9	1941.9	1942.6	Pass ✓
Peak at 1601.2 (cm-1)	1602.2	1600.2	1601.1	Pass ✓
Peak at 1583.0 (cm-1)	1584.0	1582.0	1583.0	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: <u> <i>lg</i> </u>	Title: _____	Date: <u> 5/3/23 </u>
Approved by: _____	Title: _____	Date: _____
Comments: _____		

Digital comment(s):

No digital comments found.

ValPro Qualification Report**Qualification test: Smart iTX accessory - PHEUR****Operator: Inspector****Date: Wednesday, May 3, 2023 8:14:33 AM (GMT-05:00)****Instrument: Nicolet iS20 Serial number: BEP2310114****Accessory serial number: Y99963****Filename: Smart iTX accessory - PHEUR_20230503_081433.spg**

	Test description	High limit	Low limit	Measured	Result	
Wavenumber accuracy						
	Peak at 3059.7 (cm-1)	3060.7	3058.7	3058.7	Pass	✓
	Peak at 1601.0 (cm-1)	1602.0	1600.0	1600.5	Pass	✓
	Peak at 1027.7 (cm-1)	1028.7	1026.7	1027.5	Pass	✓
	Peak at 906.1(cm-1)	907.1	905.1	905.8	Pass	✓
Optical Resolution						
	FWHH at 1154 (cm-1)	10.00	5.00	8.36	Pass	✓
	FWHH at 907 (cm-1)	14.00	5.00	12.99	Pass	✓

Performed by: *Pf* Title: _____ Date: 5/3/23

Approved by: _____ Title: _____ Date: _____

Comments: _____

Digital comment(s):

No digital comments found.

Background, Wed May 03 09:04:56 2023 (GMT-05:00)
2200-2100 = 0.010 PASS PERFORMANCE TEST

5/3/23

107.5

107.0

106.5

106.0

105.5

105.0

104.5

104.0

103.5

103.0

102.5

102.0

101.5

101.0

100.5

100.0

% Transmittance

4000

3500

3000

2500

2000

1500

1000

500

Wavenumbers (cm⁻¹)

Power Supply	Status	Current	Acceptable Range
+ 5 Volt	Pass ✓	4.99V	4.50V to 5.50V
+ 12 Volt	Pass ✓	11.91V	10.80V to 13.20V
- 12 Volt	Pass ✓	-12.05V	-13.20V to -10.80V
+3.3 Volt	Pass ✓	3.35V	3.00V to 3.60V

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Item	Status	Current	Acceptable Range
Laser Current	Pass ✓	0.21A	0.10A to 1.30A
Source Voltage	Pass ✓	10.43V	4.00V to 13.00V
Source Current	Pass ✓	1.91A	0.10A to 10.00A
Source Power		19.91W	
Temperature	Pass ✓	46.45C	0.50C to 70.00C

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