Illinois State Police Micro/Trace Evidence Collection

Adrienne Bickel

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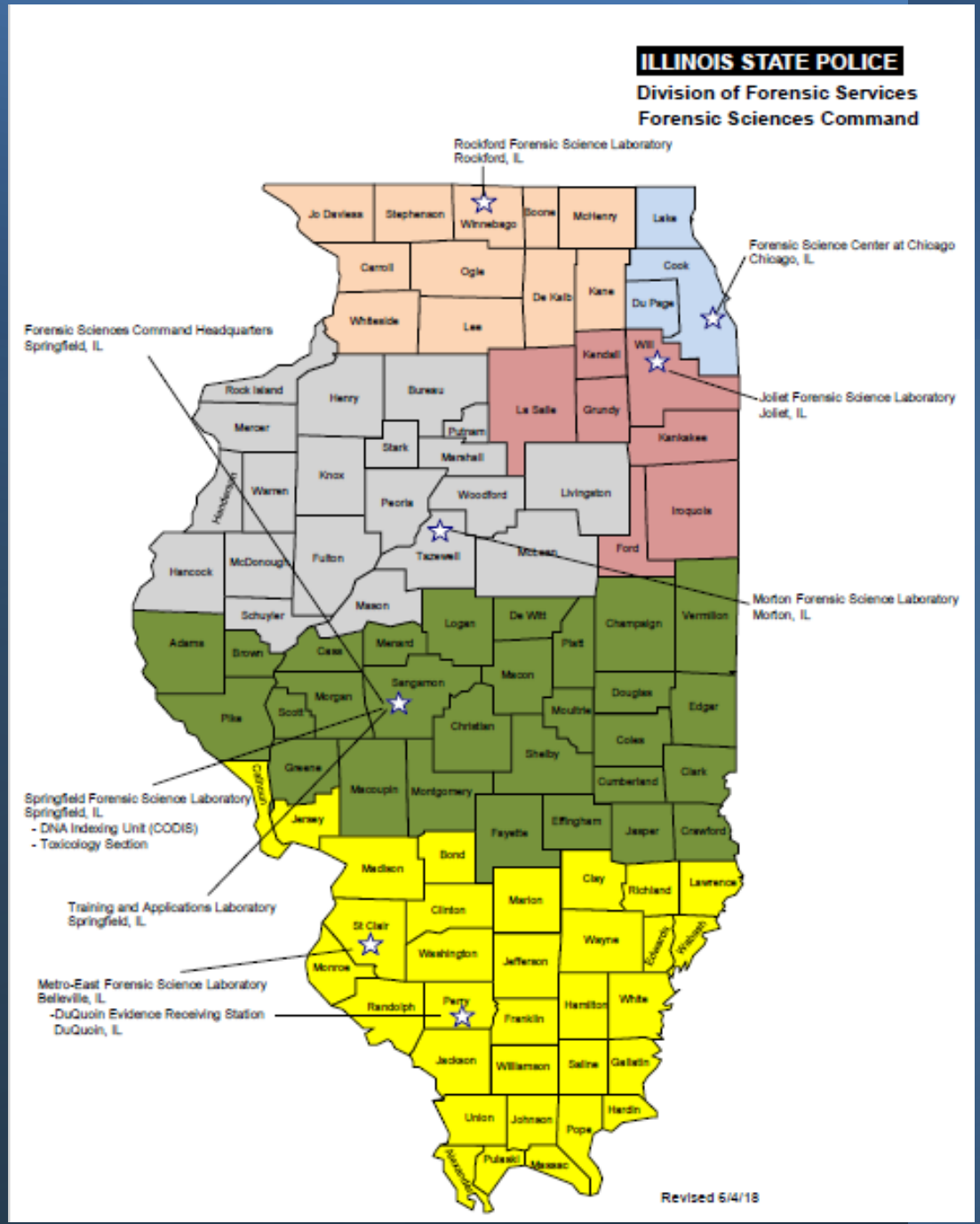
Introduction

- Adrienne Bickel
  - Illinois State Police
    - Micro/Trace Analyst
    - Command Advisory Board Chair
    - Quality Review Coordinator – Fire Debris, Paint
    - Fire Debris Training Coordinator
    - University of Illinois at Chicago Adjunct Instructor
      - Fire Debris
      - Explosives
      - Paint
      - Physical Match

- Forensic Science Center at Chicago (FSC-C)
- 1941 West Roosevelt Road
- (312) 433-8000 (phone)
- (312) 433-8041 (Trace section fax)

Organization

- Forensic Sciences Command under the Illinois State Police (ISP)
- ISP has about 300 forensic scientists making it one of the largest forensic laboratory systems in the world
  - Currently 7 forensics labs along with R&D lab
    - Chicago (FSC-C), Joliet, Rockford, Morton, Springfield, Fairview Heights, Decatur (Bio/DNA only)


ILLINOIS STATE POLICE
Division of Forensic Services
Forensic Sciences Command
Rockford Forensic Science Laboratory
Rockford, IL
Forensic Science Center at Chicago
Chicago, IL
Forensic Sciences Command Headquarters
Springfield, IL
Joliet Forensic Science Laboratory
Joliet, IL
Morton Forensic Science Laboratory
Morton, IL
Springfield Forensic Science Laboratory
Springfield, IL
- DNA Indexing Unit (CODIS)
- Toxicology Section
Training and Applications Laboratory
Springfield, IL
Metro-East Forensic Science Laboratory
Belleville, IL
-DuQuoin Evidence Receiving Station
DuQuoin, IL
Jo Daviess
Stephenson
Winnebago
Boone
McHenry
Lake
Carroll
Ogle
De Kalb
Kane
Cook
Du Page
Whiteside
Lee
Kendall
Will
Rock Island
Henry
Bureau
La Salle
Grundy
Mercer
Putnam
Kankakee
Stark
Marshall
Knox
Warren
Peoria
Woodford
Livingston
Iroquois
Henderson
Tazewell
McLean
Ford
Hancock
McDonough
Fulton
Mason
Schuyler
Logan
De Witt
Champaign
Vermilion
Adams
Brown
Cass
Menard
Piatt
Macon
Sangamon
Douglas
Edgar
Pike
Scott
Morgan
Moultrie
Christian
Shelby
Coles
Calhoun
Greene
Macoupin
Montgomery
Cumberland
Clark
Jersey
Fayette
Effingham
Jasper
Crawford
Madison
Bond
Clay
Richland
Lawrence
Clinton
Marion
St Clair
Wayne
Edwards
Wabash
Monroe
Washington
Jefferson
Randolph
Perry
Franklin
Hamilton
White
Jackson
Williamson
Saline
Gallatin
Union
Johnson
Pope
Hardin
Alexander
Pulaski
Massac
Revised 5/4/18

ISP Forensic Services

- Biology/DNA
- Firearms/Toolmarks
- Latent Prints
- Drug Chemistry
- Toxicology
- Microscopy/Trace

*Chicago is ISP's only full-service laboratory

Forensic Sciences Command Qualifications

- ISO/IEC 17025 certified
  - ISO is International Organization for Standardization
  - IEC is International Electrotechnical Commission
  - Been certified since 2005 (second laboratory system in the US to be ISO certified)
- ANSI-ASQ National Accreditation Board/FQS
- Recertify every 4 years
- Certificate #FT-0240

Any analysis conducted is accredited under the laboratory's ISO/IEC 17025 accreditation issued by ANSI-ASQ National Accreditation Board (ANAB). Refer to certificate #AT-1697 and associated Scope of Accreditation.

Training and Testing

- Every ISP forensic scientist trained internally by experienced ISP forensic analyst
  - Training for fire debris about ten months
    - Involves lectures, tours, exercises, written and practical tests, mock trial, and supervised casework
- Annual proficiency testing by an external agency
  - Must pass to be qualified for casework

Quality Control

- Case files reviewed by qualified fire debris examiner before report issued
- Three cases a month a reviewed by the section group supervisor
- Each discipline has a Quality Review Coordinator (QRC)
  - Each year five files are reviewed by the QRC for fire debris
  - Each year two cases completely reanalyzed by the QRC

How Evidence is Tracked and Moved

- Evidence is received at the FSC-C Evidence Control Center (ECC)
- ISP changed the evidence receiving computer system in December 2018
  - Went from CALMS to LIMS - Laboratory Information Management Systems
  - Agency must have a signed agreement and access to the LIMS system to submit evidence

How Evidence is Moved and Tracked

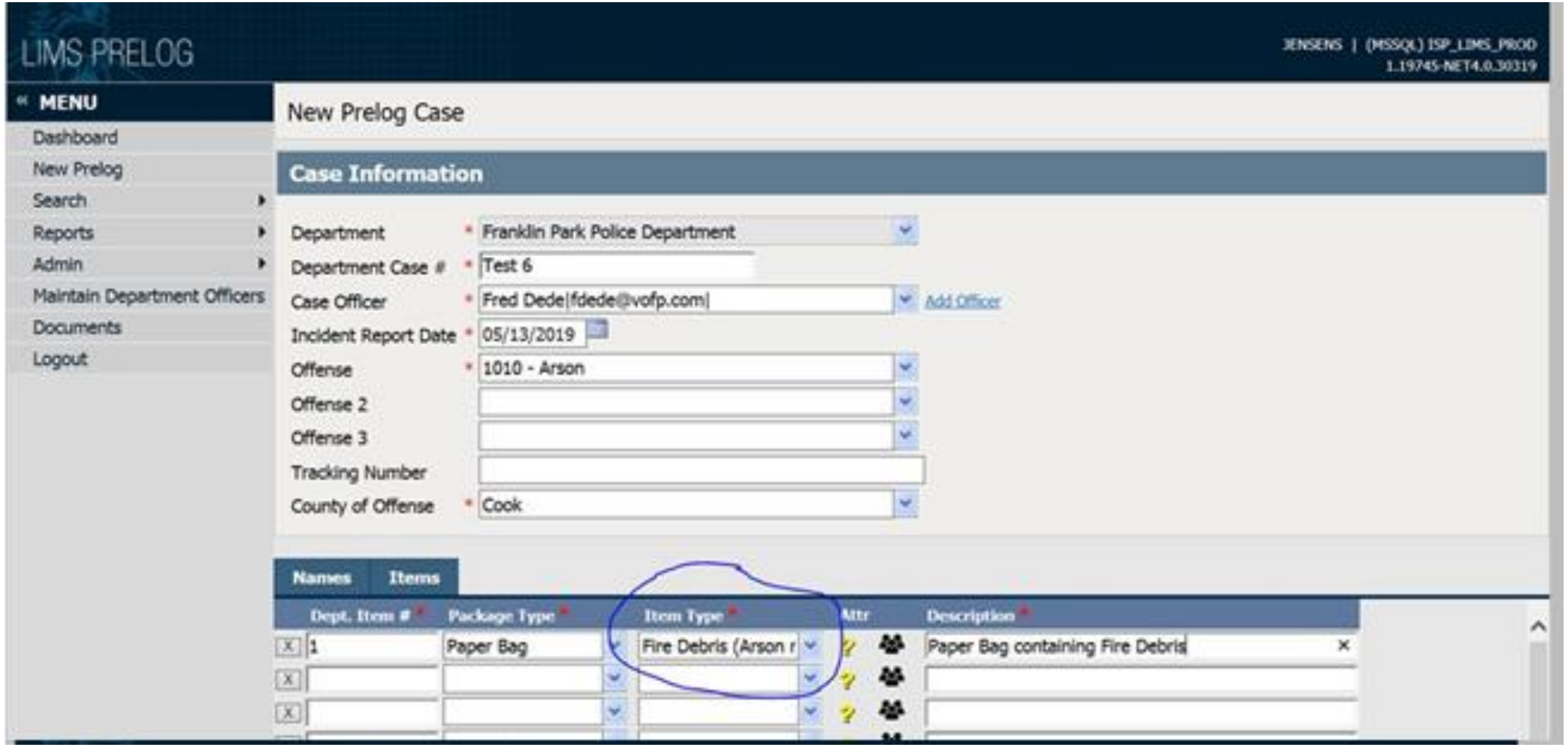
*Contact Pete Anzalone (312) 779-8285 if any problems with PreLog

All cases MUST be entered into PreLog **PRIOR** to coming to the lab

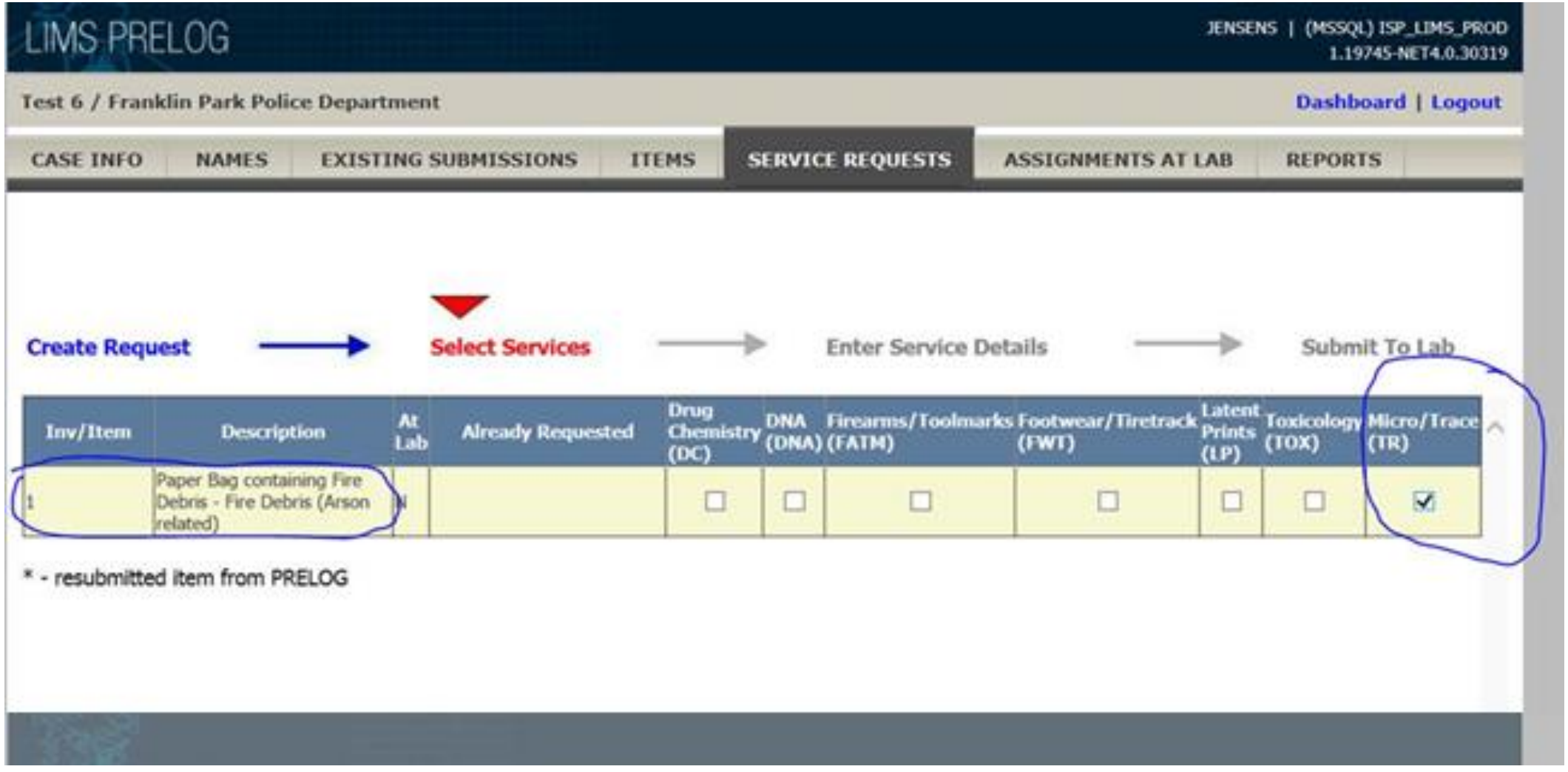
Evidence signed in by evidence technicians

Assigned laboratory case # by LIMS and gets a barcode

LIMS – What you need to know
Required Information (Item Type)

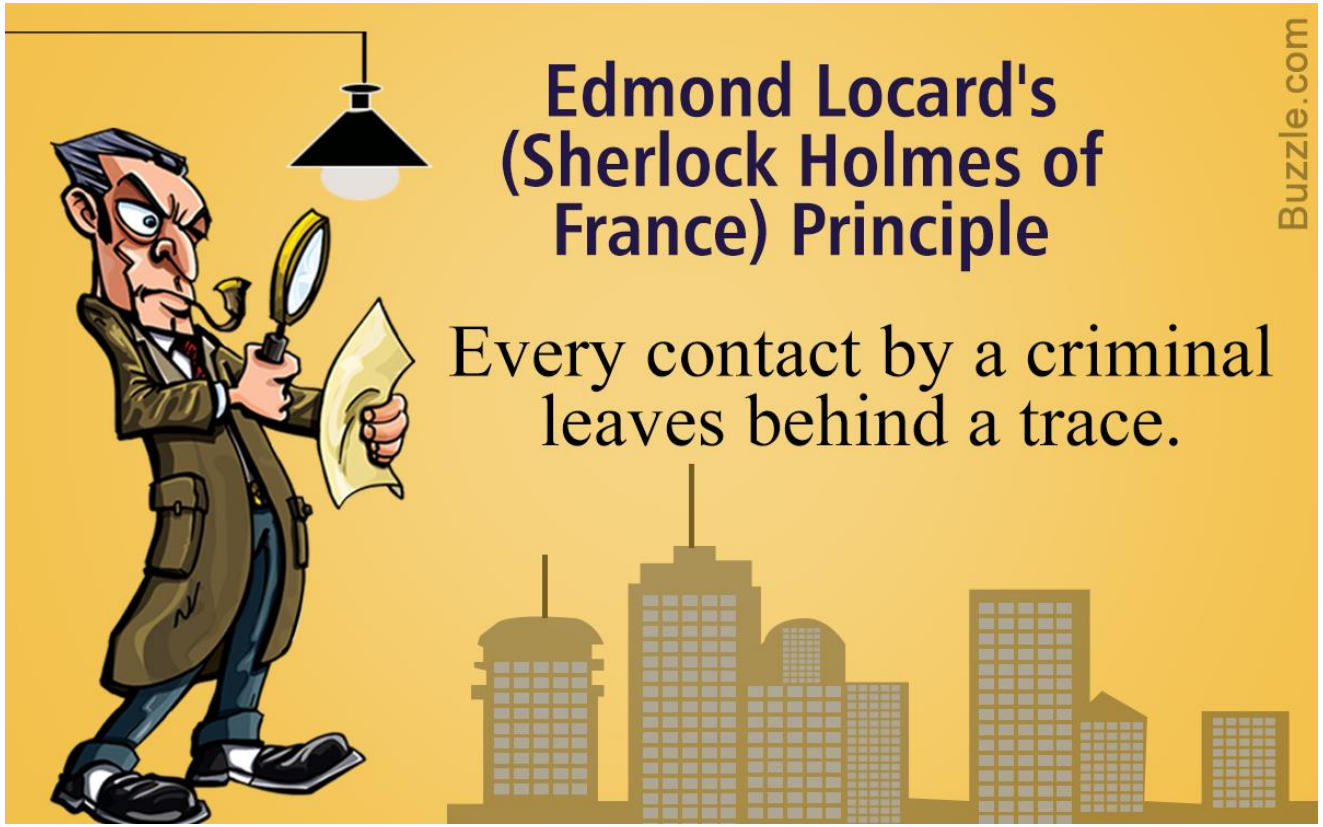


LIMS – What you need to know
Required Information (Correct Section)



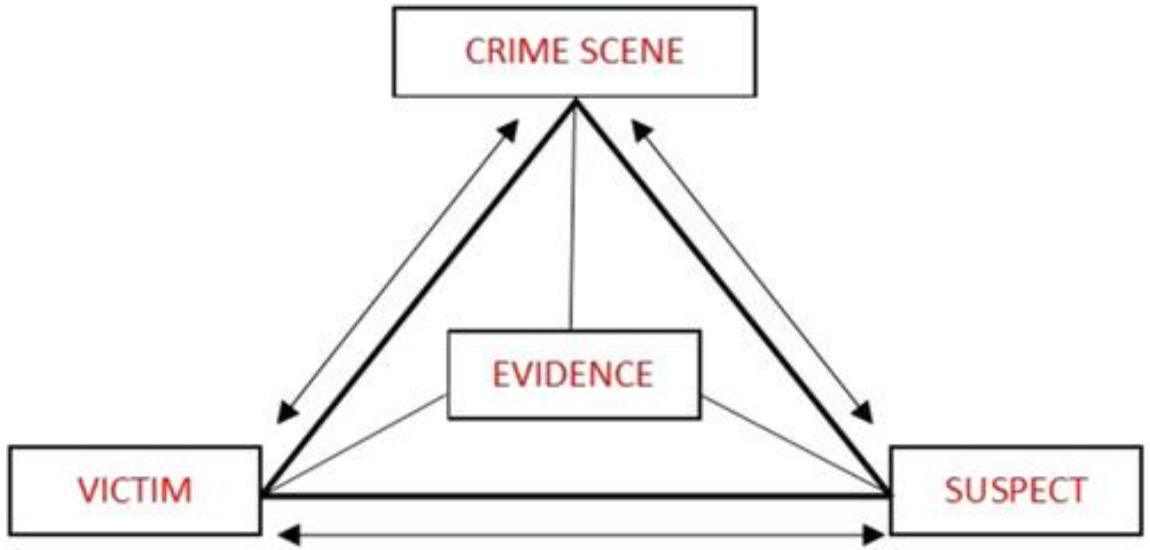
What is Micro/Trace?

- The analysis of trace materials that can be transferred during the transmission of a crime
  - Analyzed both by physical and chemical properties
- Based upon Locard's Exchange Principle
  - **"Every contact leaves a trace"**



Linkage Diagram

- Trace evidence can be used to link people or objects to places, other people or other objects
- Often serves as a starting point, or lead, for a particular line of investigation.
- Trace evidence helps to put together pieces of the investigative puzzle.
- Often circumstantial evidence



Current Micro/Trace Disciplines

- Microscopy
  - Hair Identification
  - Fiber analysis
- Paints and Polymers
  - Paint Data Query
- Physical Match
- Primer Gunshot Residue
- Fire Debris

Current Micro/Trace Statewide Distribution

- Total of nine Micro/Trace examiners statewide
  - Eight in Chicago and one in Fairview Heights
    - Seven fire debris analysts
- Chicago has the only full-service Micro/Trace section
  - Fairview Heights only does fire debris analysis and physical match
- Micro/Trace evidence can be received at all labs
- ISP recently discontinued glass comparisons, explosives analysis, unknown analysis, and hair comparisons

Current Micro/Trace Turnaround Time

- Typical turnaround time for all Micro/Trace disciplines is currently 160 days
- Priority can be given for court dates and rush cases
  - These are approved by the Micro/Trace supervisor:
    - **Hasnain Hamayat (312) 779-8407**

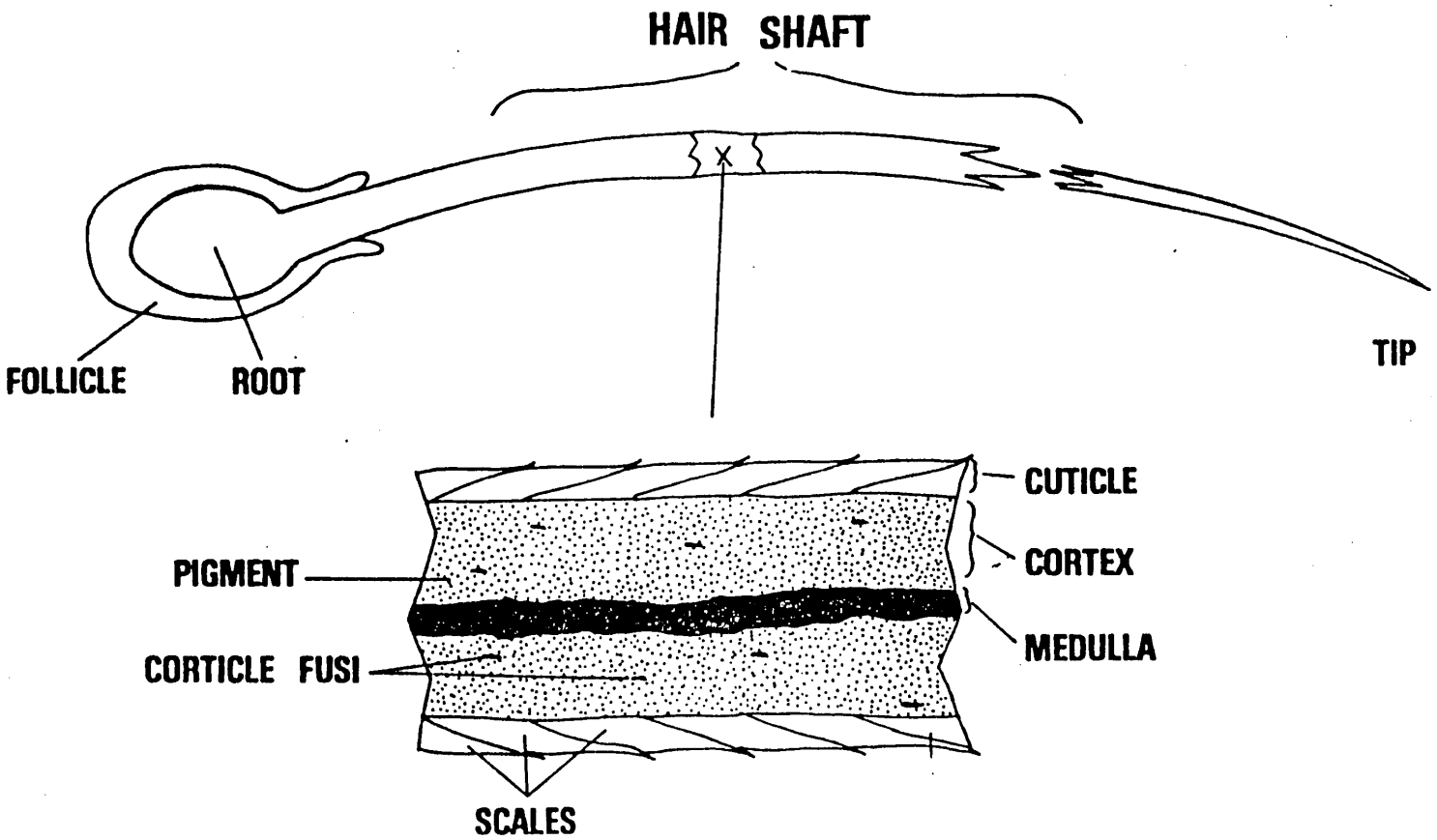
Microscopy

Hairs and Fibers

Microscopy Evidence
Hair Analysis

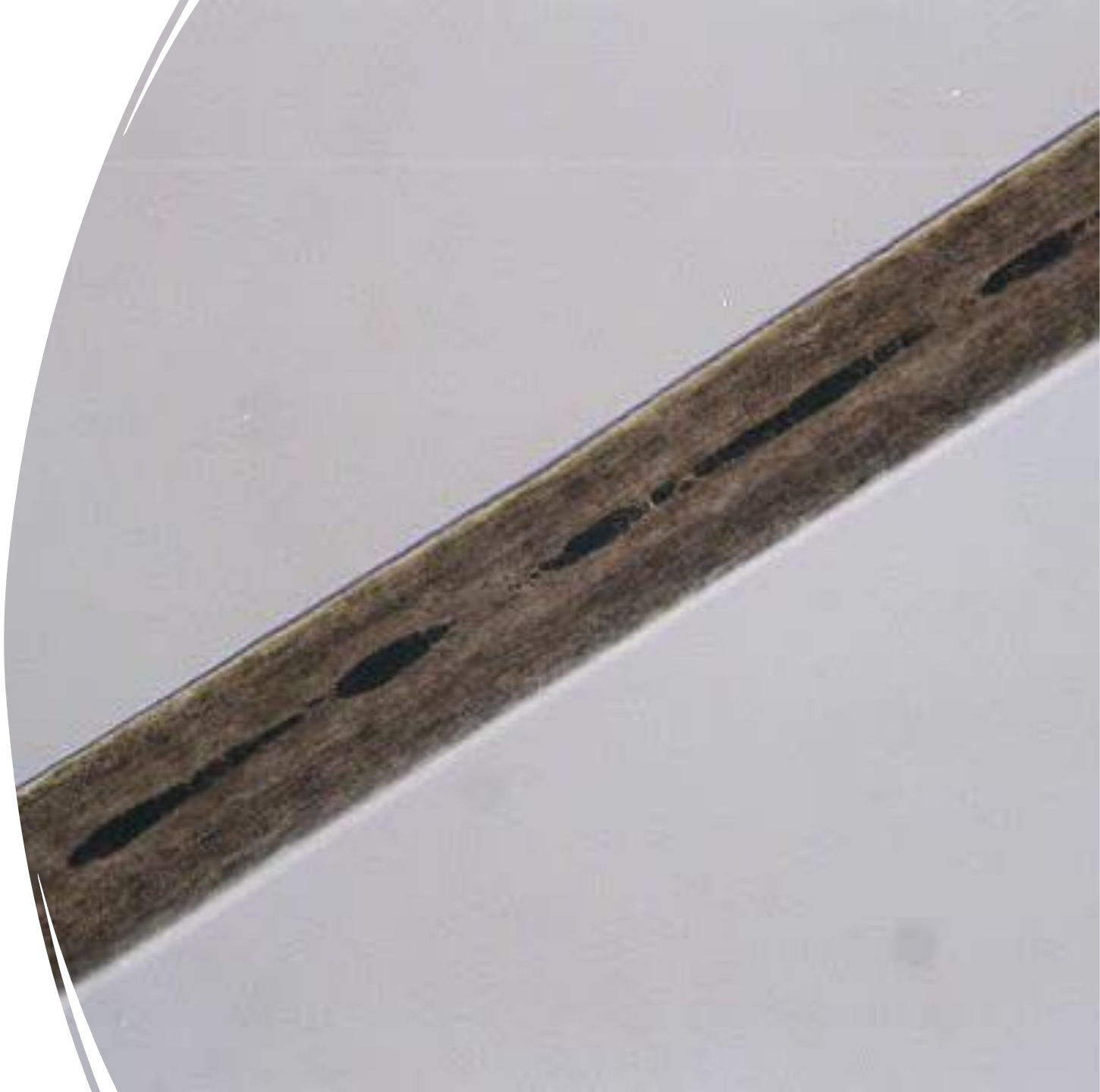
- Hair identification
  - Is it a hair
  - Human vs animal
- Importance of hair evidence
  - Easily transferred during crime
  - Durable
  - May yield information
    - Contains genetic material

Hair Structure



Forensic Uses Human Hair

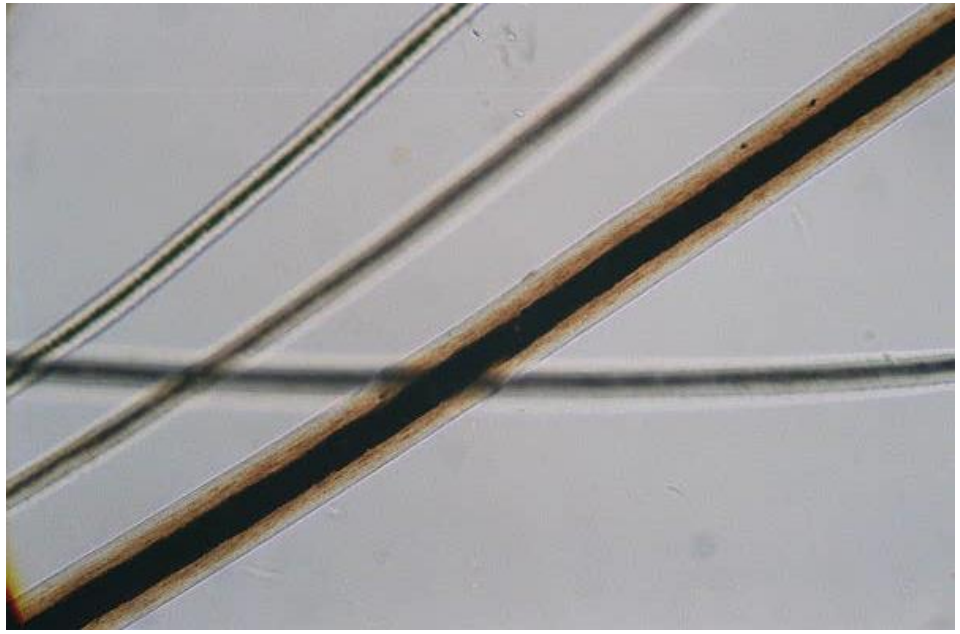
- Human hair
  - Small, flattened cuticle
  - Amorphous medulla
  - Medullary index < 1/3
    - $\frac{\text{Width of medulla}}{\text{Overall width of hair}}$
  - Uniform in color
    - No banding
    - Pigment evenly distributed

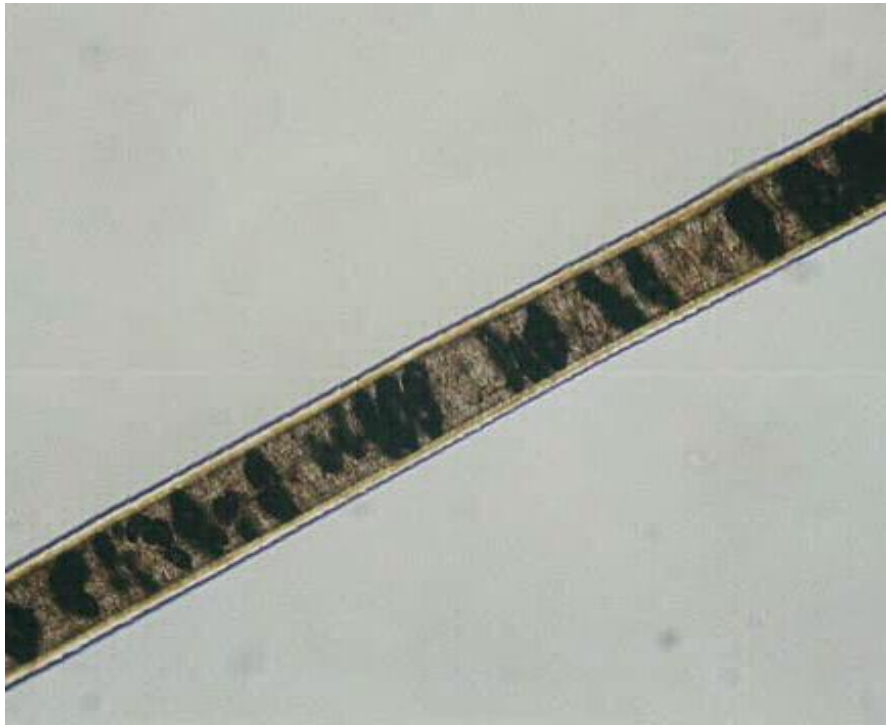


Forensic Uses Animal Hair

- Canis familiaris-Dogs
  - Medulla
    - Continuous
    - Amorphous
    - Index less than 2/3

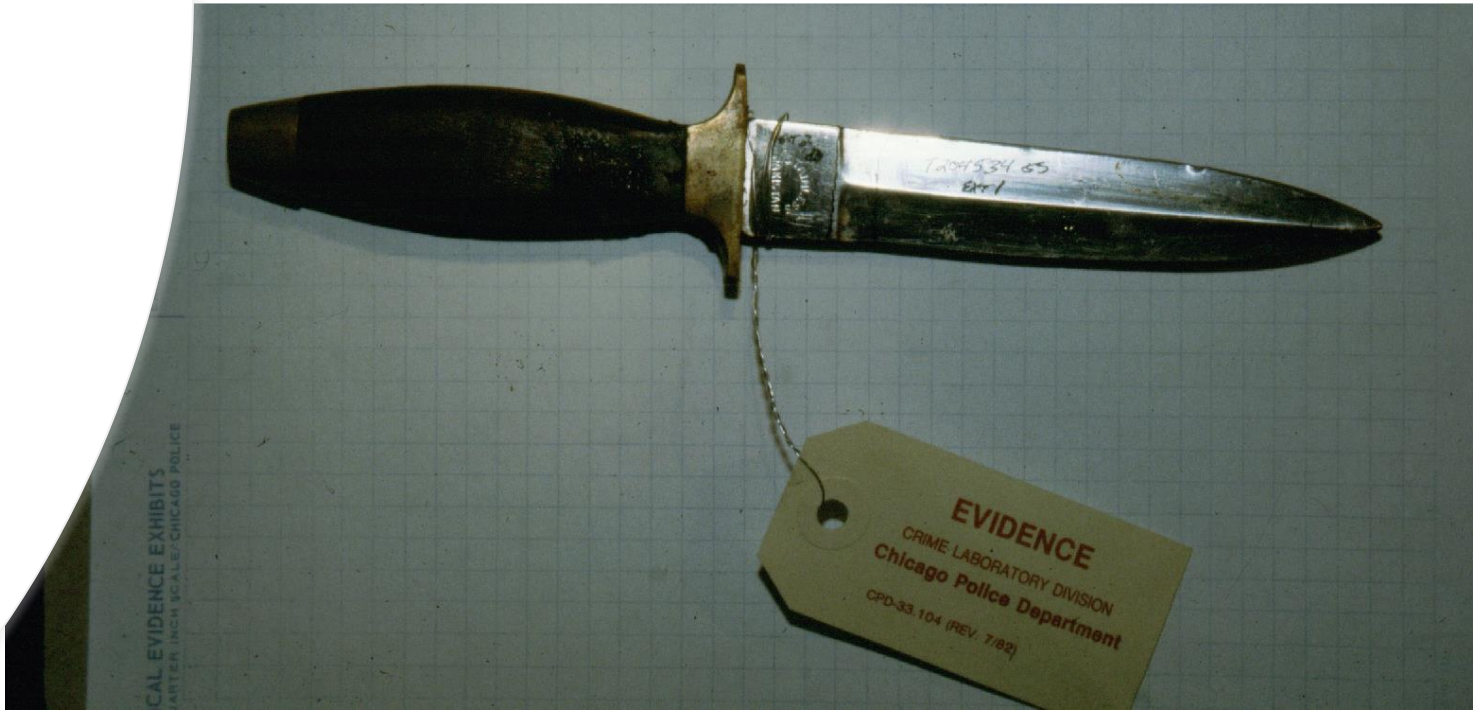
- Felis domesticus-Cats
  - Medulla
    - Uniserial ladder
    - Index more than 2/3





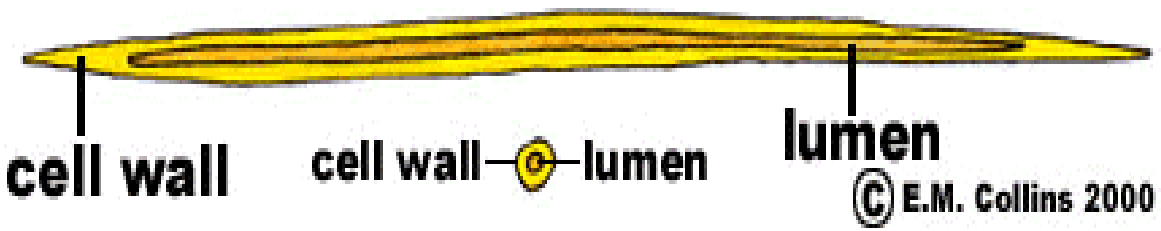
Fiber Analysis

- Transfer depends on fiber types
- Damaged garments shed fibers freely
- May yield information
  - Typical use as carpet, rope, clothing
- Most commonly a comparison analysis – known vs questioned
- Fiber types can be identified without standards if requested at time of submission



Natural Fibers

- Common examples: cotton, wool, silk
- Cotton
  - Ribbon-like
  - Twisted
  - Flattened tubes
  - Shorter

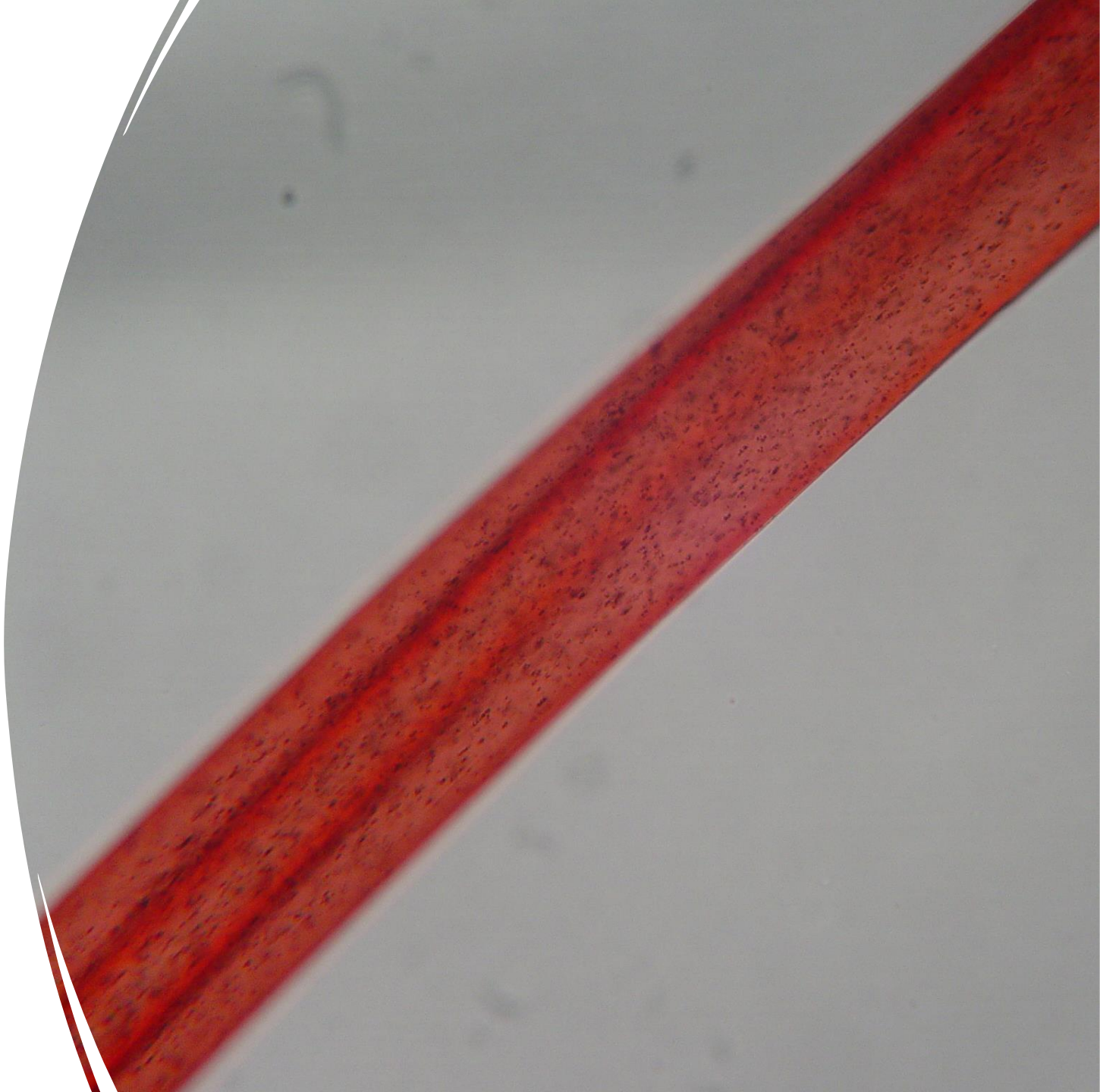


Synthetic Fibers

- Extrusion
  - Viscous liquid or chemical through tiny holes of spinneret
  - Can be long continuous strands
  - Common examples: nylon, polyester, acrylic, spandex, rayon

Synthetic Fibers

- Nylon carpet fiber
  - Trilobal shaped



Microscopy Analysis

- Physical Analysis/Comparison
  - Stereoscope
  - Polarized Light Microscopy
- Chemical Analysis/Comparison (Fibers only)
  - Microspectrophotometry
  - Fourier Transform Infrared Spectroscopy (FTIR)

Possible Conclusions for Fiber Analysis

- The type of fiber found is identified, i.e., “Item 1 is comprised of red nylon fibers.”
- Comparisons:
  - If visual and chemical analysis are similar in both the question and standard, then the questioned fibers could have originated from the same source as the standard.
  - If a significant difference is seen in any analysis, then no association could be made between the questioned fiber and the standard
  - If white cotton fibers are found the results of a fiber comparison will be inconclusive
    - Similarities were observed; however, because the fibers are commonly found in our environment and have little or no comparative value, complete comparison is precluded.

Fire Scenarios Microscopy Evidence

- Stolen vehicle
  - Driver’s seat may contain hairs from the suspect or fibers from the suspects clothing
- Forced entry into a building
  - Broken glass may contain hairs or fibers from the suspect

Collecting Hairs and Fibers

- Submit full item whenever possible
- Taping
  - Scotch Brand H-180 Industrial Grade Hand Dispenser (or similar)
  - Tape the object and fold tape onto itself, fibers and hairs are removed from tape for analysis
    - Seal in envelope
- Picking
- Scraping
- No vacuuming
- Always submit fibers from a standard, or known source, for comparison to the questioned fibers

Packing Hairs and Fibers

- Packaging
  - Paper folds
  - Envelopes
  - Small plastic containers
  - *Make sure all openings are sealed with tape*

Paint and Polymer Analysis

What is paint?

- A material, which when applied as a liquid to a surface, forms a solid film for the purpose of decoration and/or protection.
- Contains a binder, solvent, additives, and pigment.

Paint as Evidence

- Many items encountered in day-to-day life contain paint
  - Houses, roads, signs, fire hydrants, vehicles, boats, tools, picture frames, artwork, furniture, fingernail polish, etc.
  - Many different types of paint with different chemical make ups exist depending on end use

Paint as Evidence

- Associate an individual, item, or vehicle with a crime scene
- Usually involves physical and chemical comparison analyses between a standard paint and a questioned paint
  - Standard paint – paint recovered from known origin, i.e., suspect's 1968 red Ford Mustang, victim's front door jam, crowbar recovered from suspect's house
  - Questioned paint – paint of unknown origin, i.e., paint chips recovered from hit-and-run crime scene, paint chips recovered from victim's clothing, paint smear recovered from victim's door jam
- Ultimate purpose – determine if the questioned paint could have come from the same source as the known paint

Paint as Evidence

- Hit-and-runs
  - Evidence can be vehicle parts, victim's clothing, paint chips, paint from fire hydrant or signposts
  - Paint Data Query (PDQ) – make, model, year
    - No suspect hit-and-runs
- Burglary
  - Evidence can be paint transferred from a door jam or windowsill, can be paint standards from crowbars or other tools
- Can really be found in any type of case
  - Homicide, drug related, sexual assault, DUI, arson

Ryland End-Use 2

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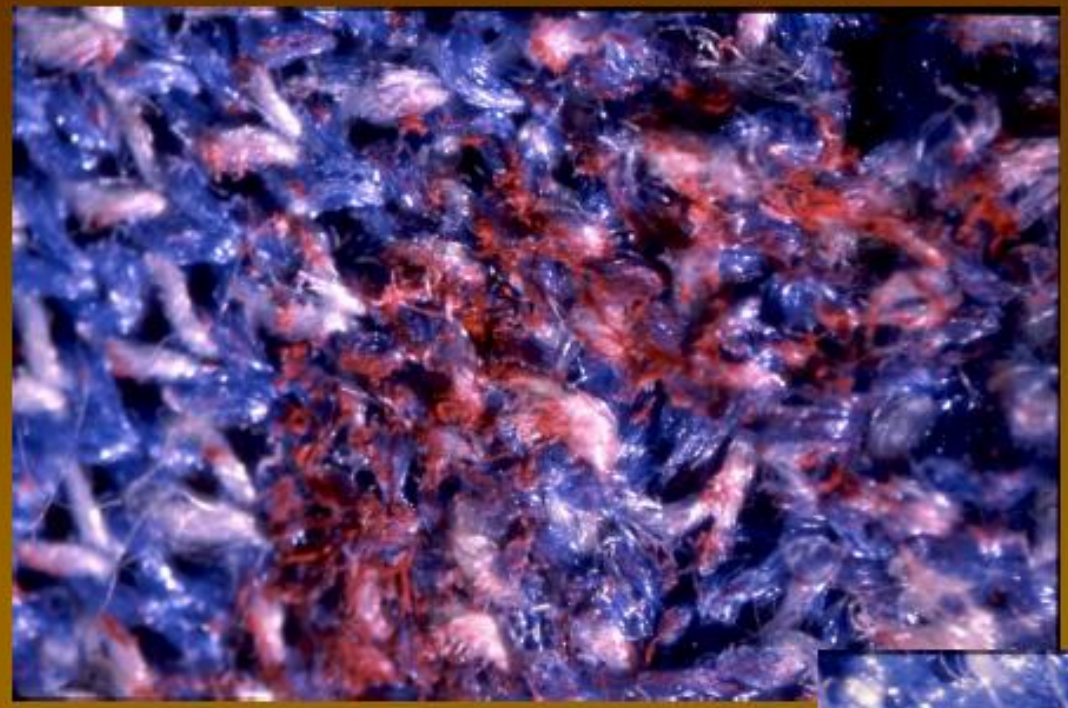
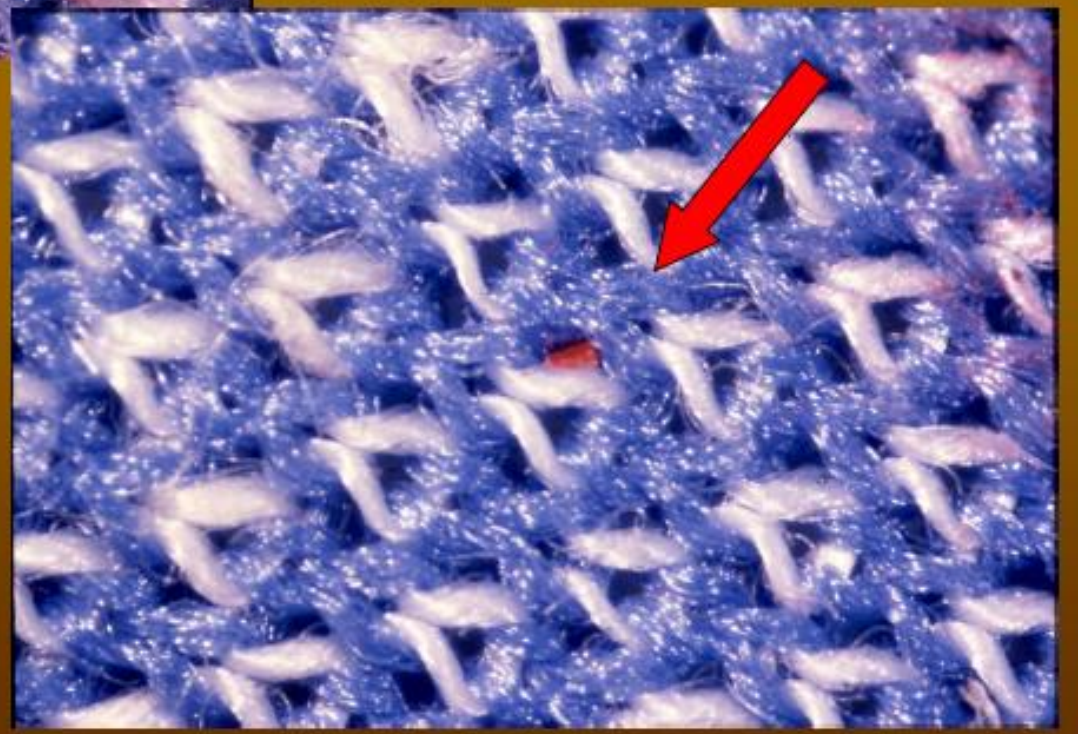


SMEARS

LOOSE
DEBRIS
CHIPS



Common Types of Paint

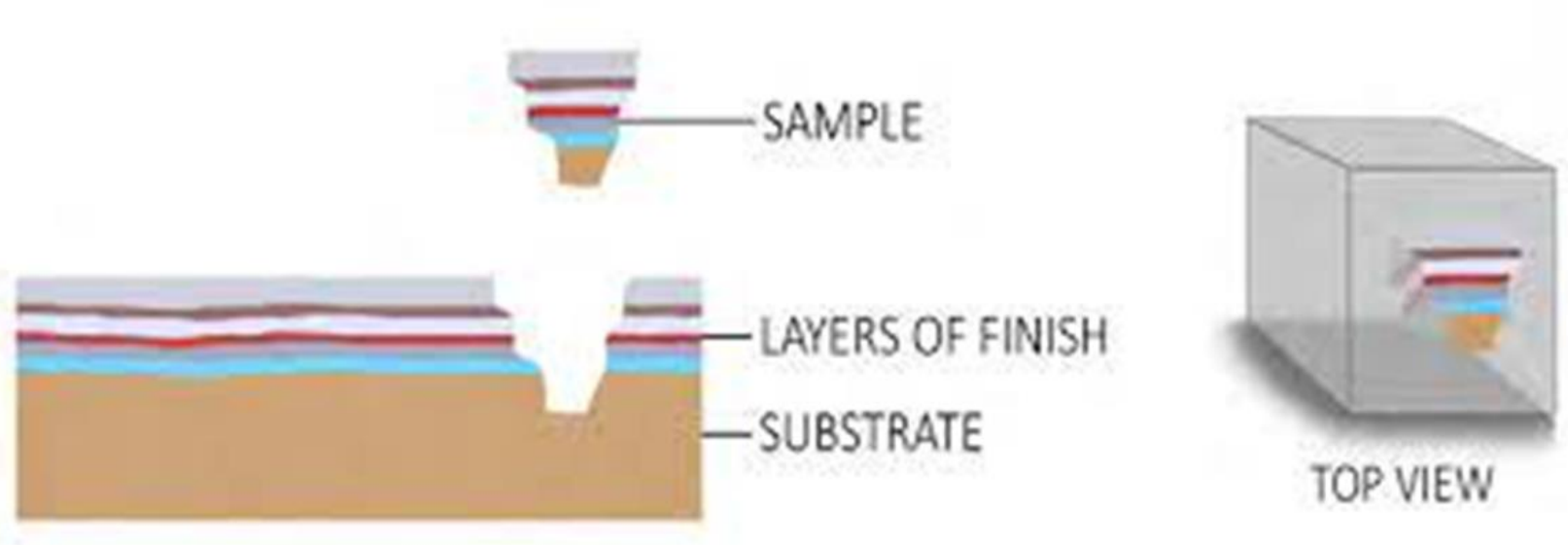
- Architectural
- Tool
- Automotive
- Bicycle
- Road
- Marine
- Plane

Architectural Paint

- May be any number of layers – had a case of paint chips with 17 different paint layers
- Layers can very uneven
- Can be from any structure
  - Typically, metal, wood, or drywall substrate

Architectural Paint

- Every layer could have different chemistry
  - Very important to collect all paint layers (i.e., collect down to substrate)
- Each layer analyzed separately



Tool Paint

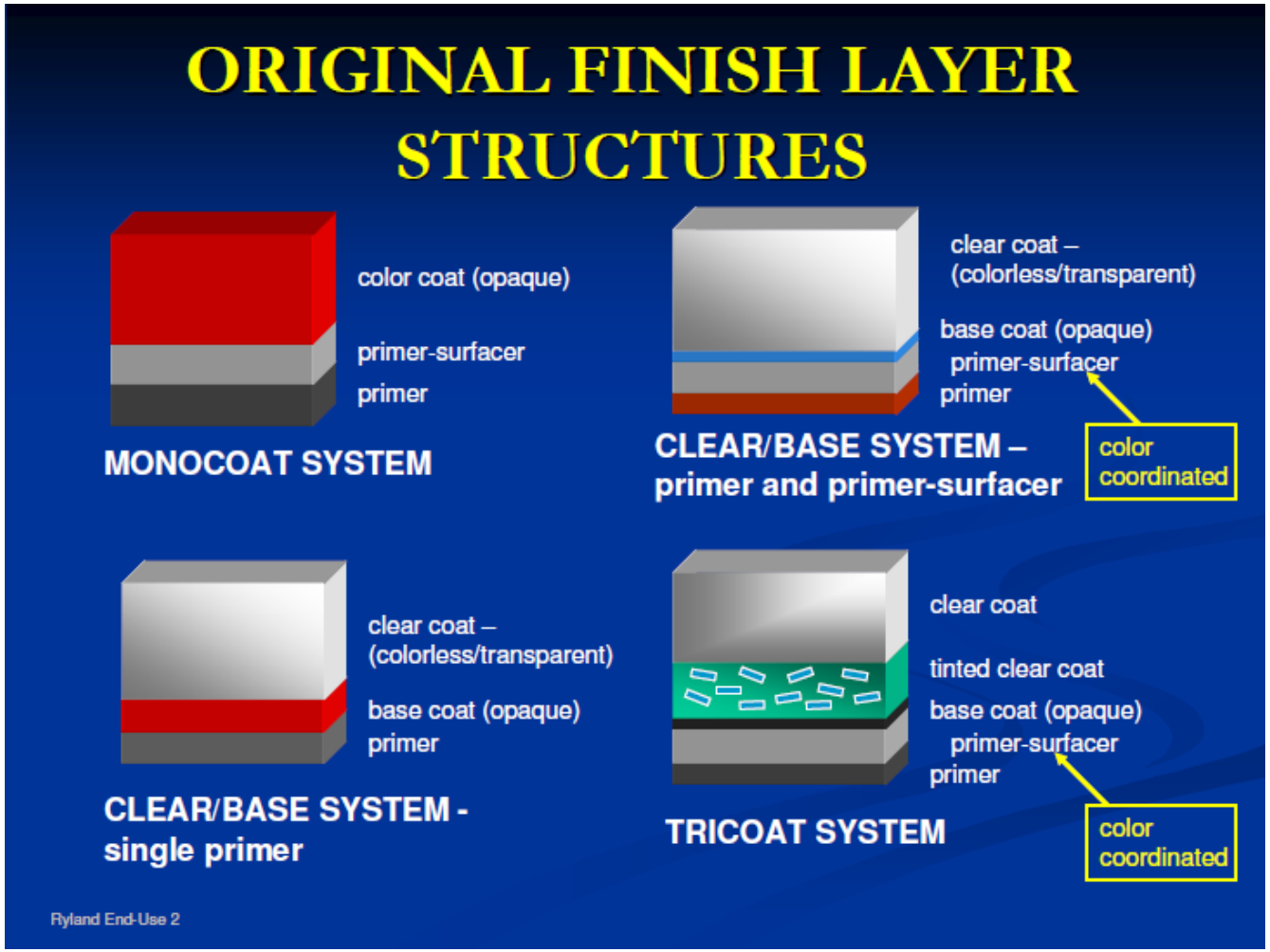
- Usually from burglary tools
- Usually painted 1 layer by manufacturer
- Can have multiple transfers
- Usually transfer from building onto tool or from tool onto building
- Submit the entire tool

Automotive Paint

- Three most likely scenarios:
  - Collisions between 2 vehicles
  - Collisions between a vehicle and another object (i.e., building, fire hydrant, bicycle)
  - Collision between a vehicle and a person
- In all scenarios paint evidence can be left behind as a transfer, smear or broken off paint chip
  - Transfer – occurs when one or more layers of an automotive paint are physically removed from the original vehicle and deposited on a different surface

Automotive Paint

- Typically, 3-4 layers
  - Clearcoat – unpigmented layer improves gloss, durability, and appearance
  - Basecoat – color coat, creates visual affects (pearl luster, metallic look)
    - Usually similar to clear coat except pigments
  - Primer surfacer – smooths out and hides seams or imperfections
    - Different pigments, additives, binder
  - Ecoat/primer – applied to steel body of car, provides corrosion resistance usually pigmented grey
- Layers typically uniform thickness throughout



Automotive Paint

- Different parts of car painted differently
  - Especially different substrates, i.e., metal vs. plastic vs fiberglass
  - Bumpers commonly painted at different plant than the metal body frame of vehicle
  - Therefore, very important to collect standard sample from area closest to damaged area of vehicle and from every damaged substrate type
    - If paint from several areas of the same item are taken, place each in a separate container

Collection of Automotive Paint

- Collect paint standards with enough to cover the face of a dime.
- Chip the paint off, taking all layers. Scraping may not provide valuable layer information.
- Collect as much of the questioned paint as possible.
    - Cut portions including substrate is best (i.e., portion of bumper with the paint smear)

Paint Analysis

- Physical Comparisons
  - Stereoscope
  - Physical match
  - Polarized light microscopy
- Chemical comparisons
  - Microchemical tests
  - Scanning electron microscopy (SEM)
  - Pyrolysis gas chromatography/mass spectrometry (PyGC/MS)
  - Fourier transform infrared spectroscopy (FTIR)
- *Highlighted tests are required for full analysis*

Report Wording

- If visual and chemical are similar in both question and standard, then the question sample could have originated from the same source as standard
- If significant difference seen in any analysis (visual or chemical) – the question paint did not originate from same source as standard
- Inconclusive – not able to reach a conclusion based upon the results
  - Insufficient quality/quantity
  - Slight variation in physical or chemical properties

Paint Data Query (PDQ)

- Purpose of analysis
  - Used to determine possible make, model, year of questioned vehicle paint when no suspect vehicle has been located
- Basis for analysis
  - Automobile manufacturers tend to use specific combinations of pigments, extenders, and binders in each of the paint layers used.
  - Using this information in a searchable database form allows for the forensic scientist to make a conclusion on possible suspect vehicle

Paint Data Query (PDQ)

- Database maintained by RCMP
  - FTIR spectra of paint layers from vehicles
  - Contains automotive paint samples from all over the world
  - Can be paint from victim's clothing, from vehicle parts left at scene, from paint smears left on objects such as fire hydrants
- Currently, contains chemistry of over 70,000 layers of automotive paint

PDQ Analysis

- Test results:
  - 2000 Jeep Grand Cherokee manufactured at the Jefferson North plant
  - 1991 to 1993 Geo Metro, Suzuki Swift, Pontiac Firefly, Geo Tracker, Suzuki Sidekick, Pontiac SunRunner produced at the Ingersoll plant

Collecting Paint Evidence

- Visible
  - Tweezers/finger
- Standard
  - Razor blade/scalpel
  - Thumbnail size with all layers
  - Substrate
- **No tape/fingerprint lifts**
- If hit and run victim, submit clothing
- Submit full item whenever possible
- Always collect standard from close proximity to damaged area (can be from vehicle, door jam, etc.)
- Always collect as much of the transfer paint as possible

Packaging Paint Evidence

- Paper folds
- Paper envelopes
- Metal containers
- Do NOT use plastic containers or bags for paint evidence due to static buildup
- *Make sure all openings are sealed with tape*

Physical Match

Physical Match

- Definition
  - A positive identification demonstrated by piecing together two or more fragments (broken or torn pieces) to prove they were at one time joined to form a single object.
  - Positive identification: the examination results are conclusive to the elimination of all other results
- Basis for Analysis
  - No two items are exactly the same
  - No two fractures are exactly the same
  - Therefore, the correlation between two objects that become separated due to varying forces produce a random fracturing process

Criteria for Physical Match

- Four Criteria:
  - Broken or separated
  - Capable of being physically or optically realigned
  - Fits together like a “lock-and-key”
    - Edge to edge “jigsaw puzzle”
    - Surface markings
  - Pieces are unique
    - Not-interchangeable with similar pieces elsewhere
    - Individual characteristics observed
- Look for class and individual characteristics

Class Characteristics

- Class Characteristics
  - Definition
    - Features associated with a group and never with a single source
  - Purposeful
  - Determined prior to manufacturing
  - Examples – brands, sizes, types – into groups
  - “Similar” conclusion, at best

Class Characteristics

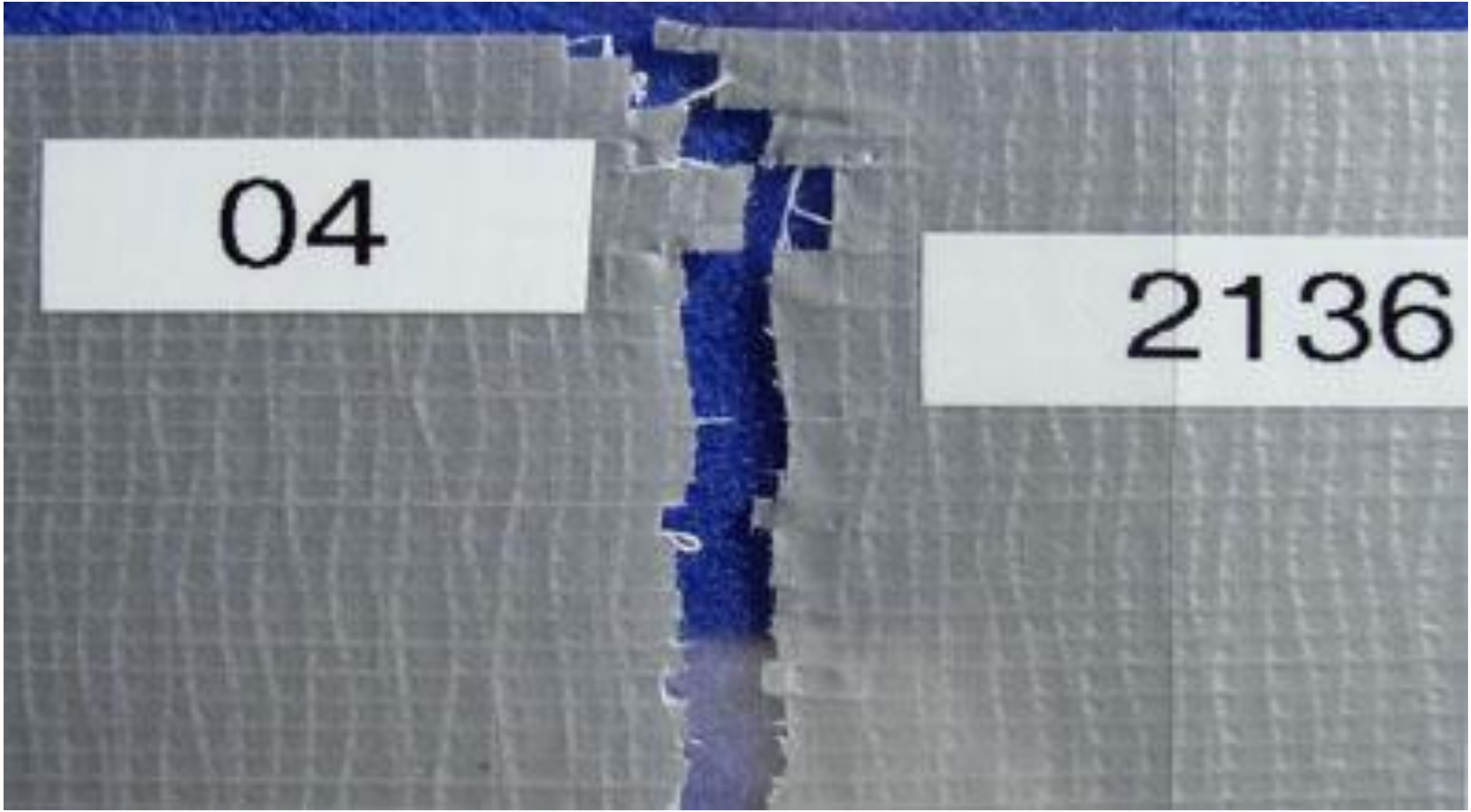
- Class characteristic examples
  - Shoes
    - “Nike” brand
    - Men’s size 10
    - Left shoe
    - Sneaker model
    - Sole-thread pattern
  - Paint
    - White
    - Acrylic lacquer
    - Contains kaolinite

Individual Characteristics

- Definition
  - Features of evidence associated with a unique source
- Accidental
- No repeating pattern
- Individual characteristic examples
  - Wear patterns on the bottom of shoes
  - Striation marks on paint chips or vehicle parts
  - Tear pattern on tape
- Required for positive identification

Types of Physical Matches

- 2 dimensional
  - Emphasis on the planar edge
  - Information may exist on interface
- 3 dimensional
  - All available surfaces
- Layered
  - “Mirrored” image
  - Requires a unique pattern at the interface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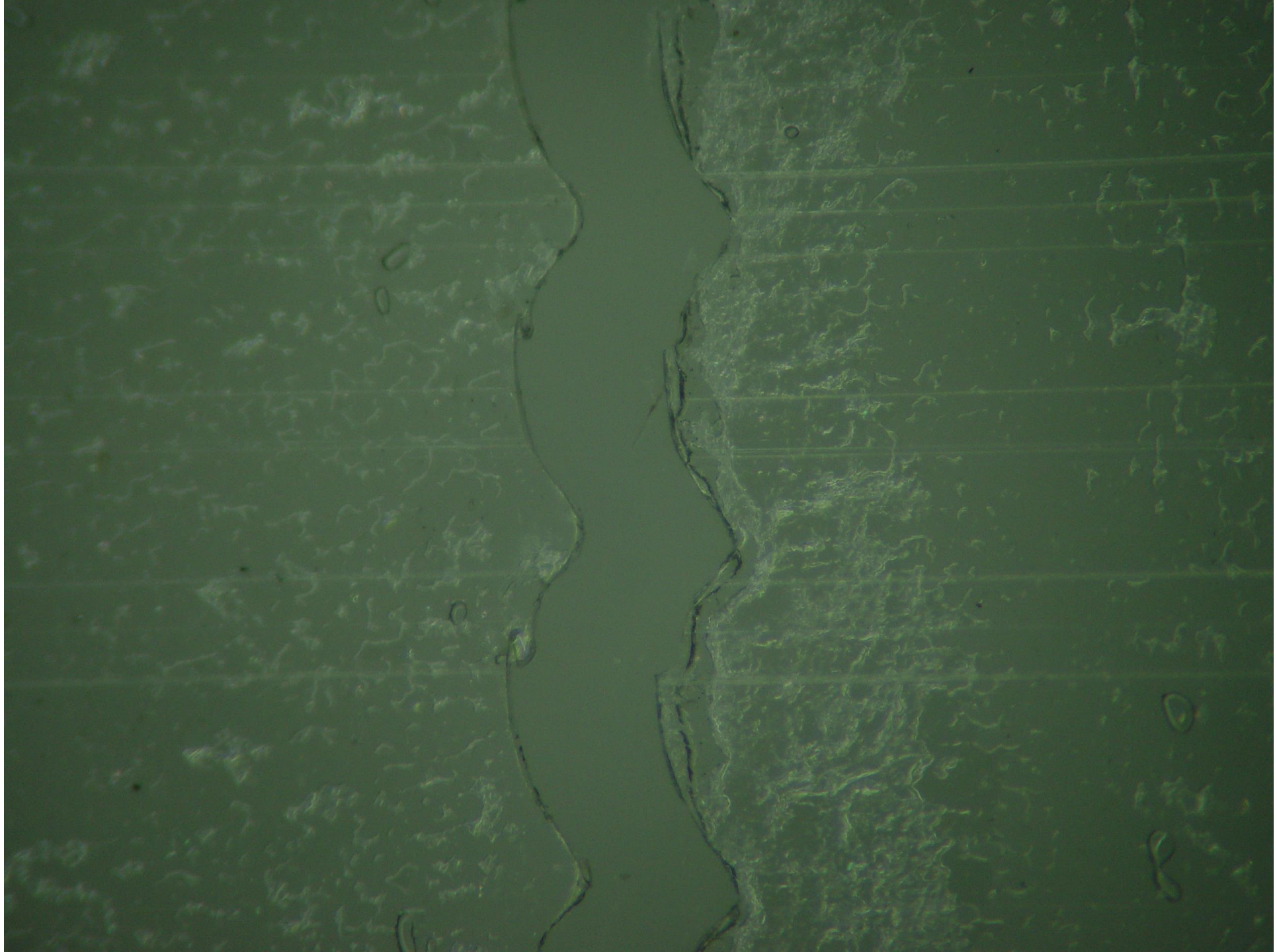
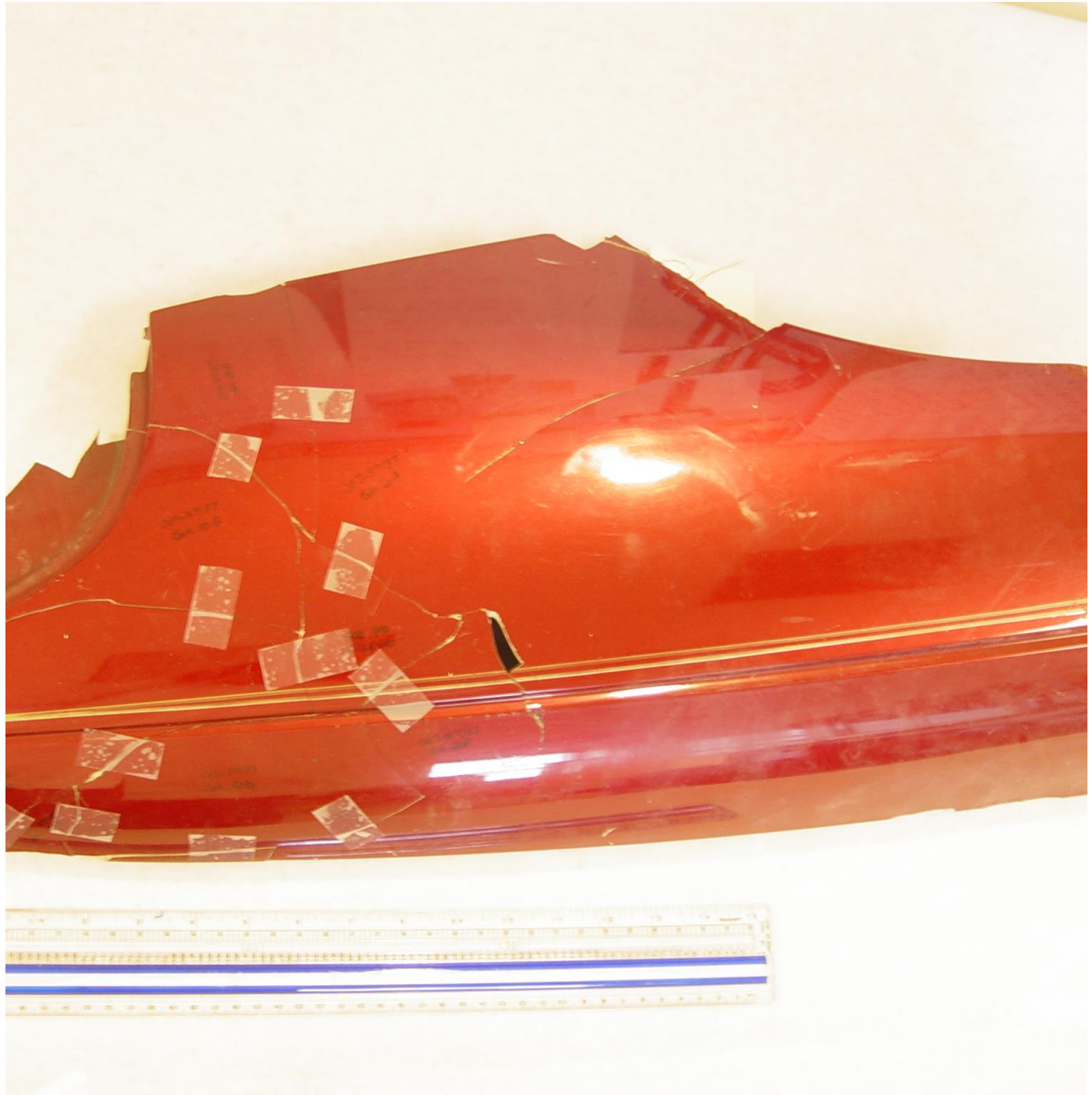
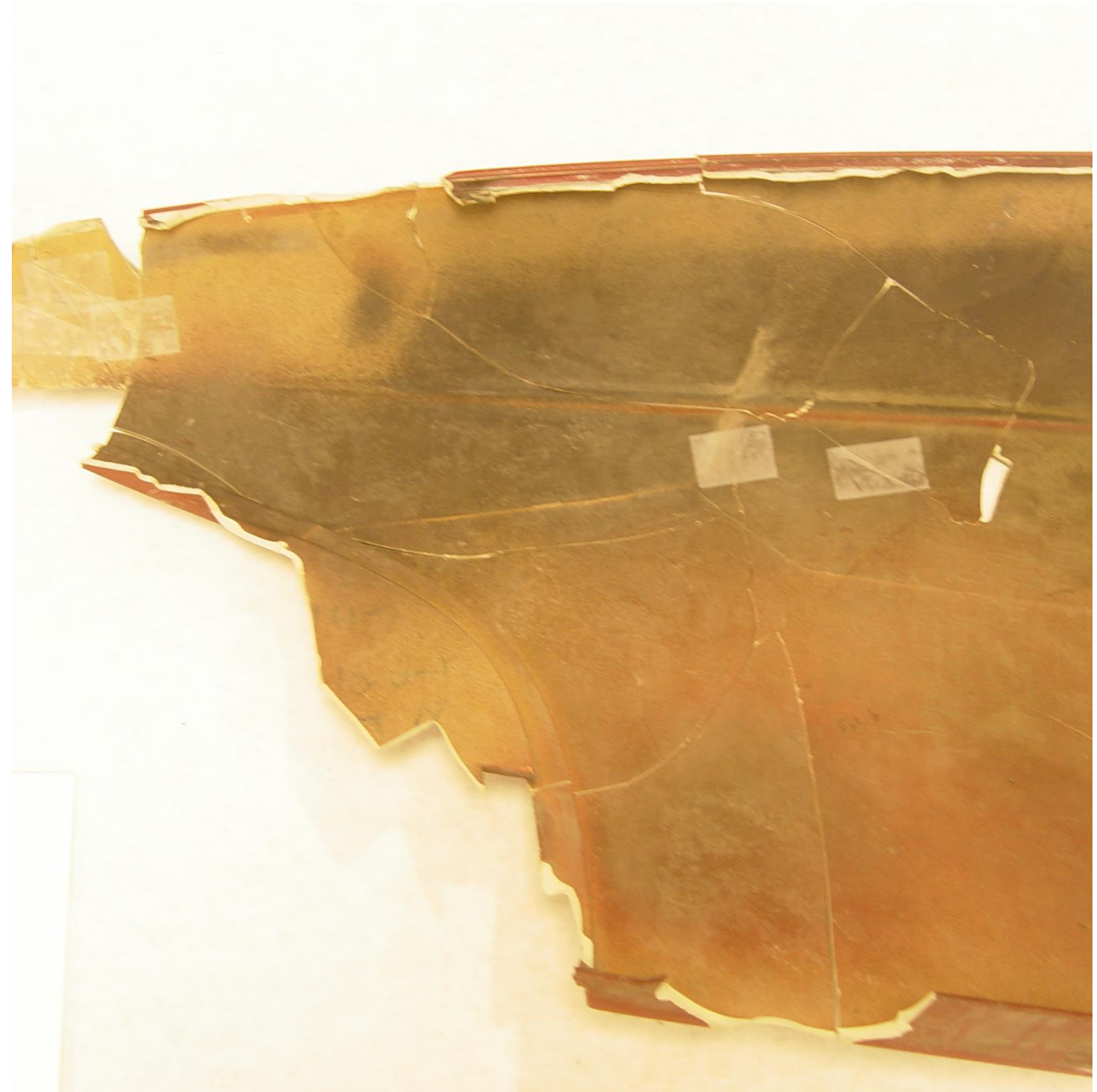
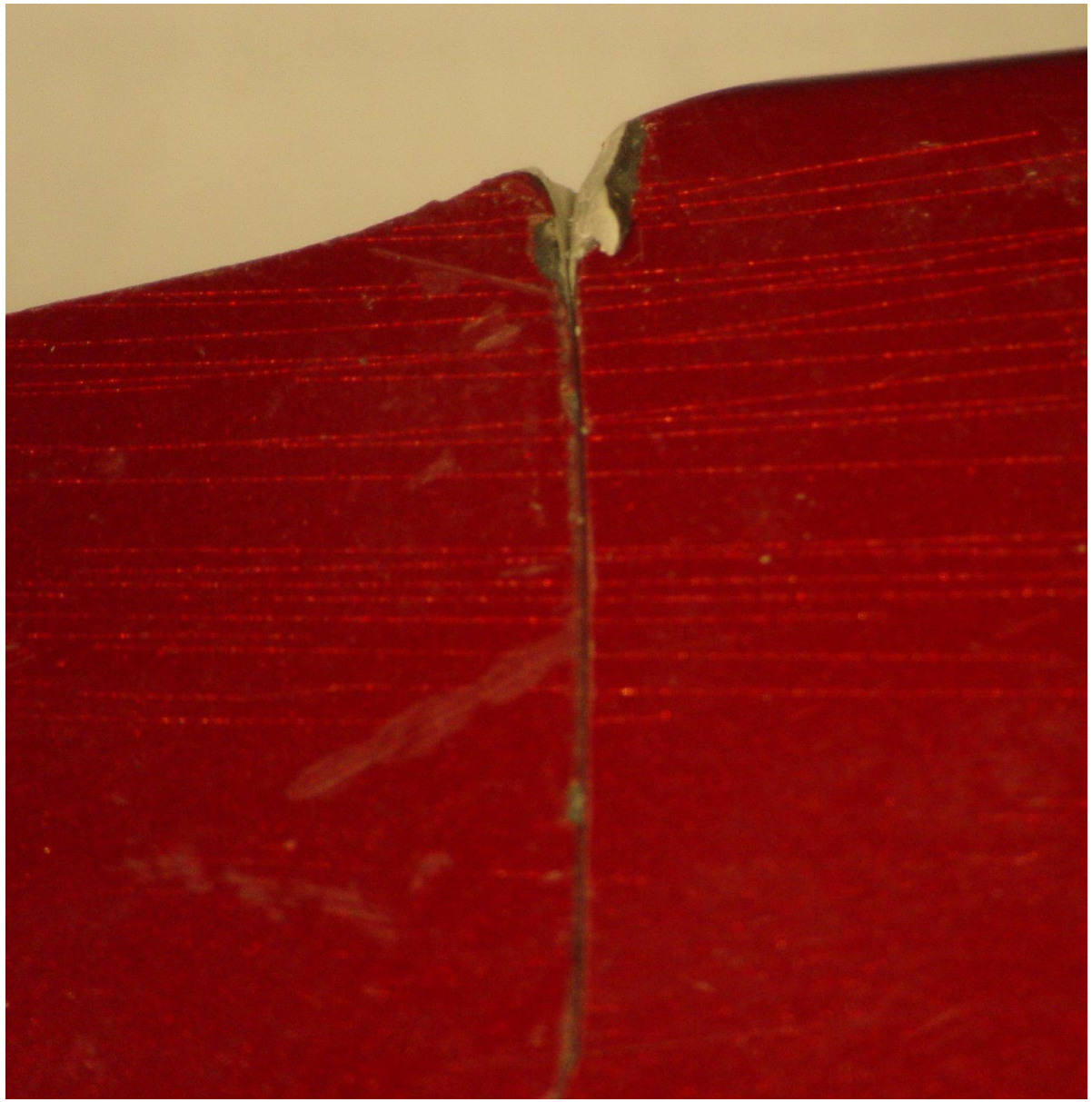


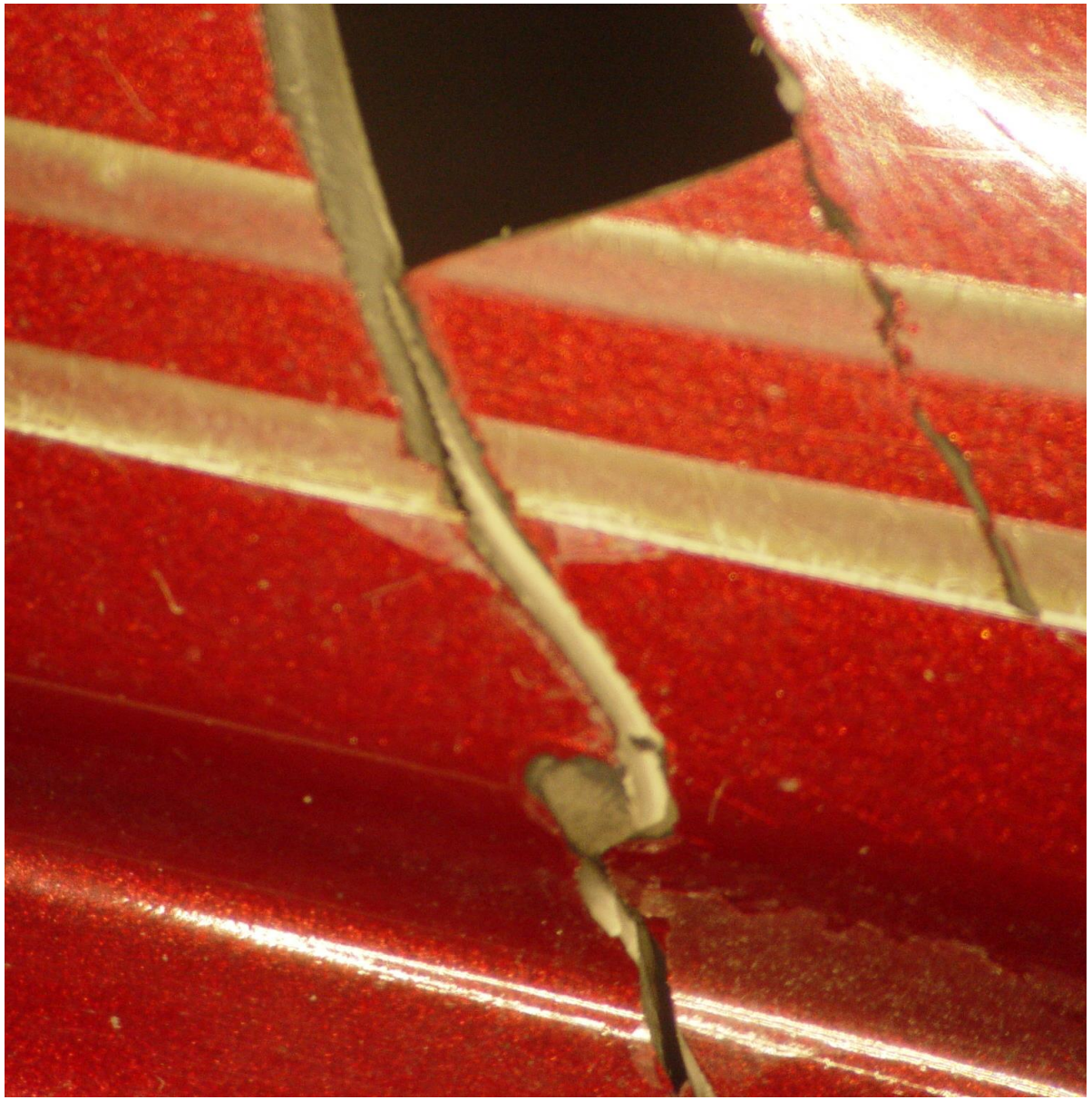
Pieces from Scene

Pieces from Suspect Vehicle









Item from the Scene

Item from suspect vehicle

Report Writing

- Results
  - Positive
    - Item 1 came from Item 2
    - At one time formed a single object
    - Were both part of the same source
  - Negative – eliminated by class or individual characteristics
    - Item 1 could not have come from Item 2.
    - Items 1 and 2 do not constitute a physical match and did not at one time form a single object.
    - Item 2 can be eliminated as the source of Item 1.

Report Writing

- Inconclusive
  - It cannot be determined whether Items 1 and 2 were at one time joined.
  - Similar class characteristics but no individual characteristics observed.
    - Although Items 1 and 2 are similar in class characteristics, they do not match any of the fracture lines, and therefore do not constitute a physical match.
  - Edges of one or both items distorted
    - A statement of what caused the problem may be used.
    - Although similarities were noted between Item 1 and Item 2 extensive distortion in the material precludes a definite conclusion.

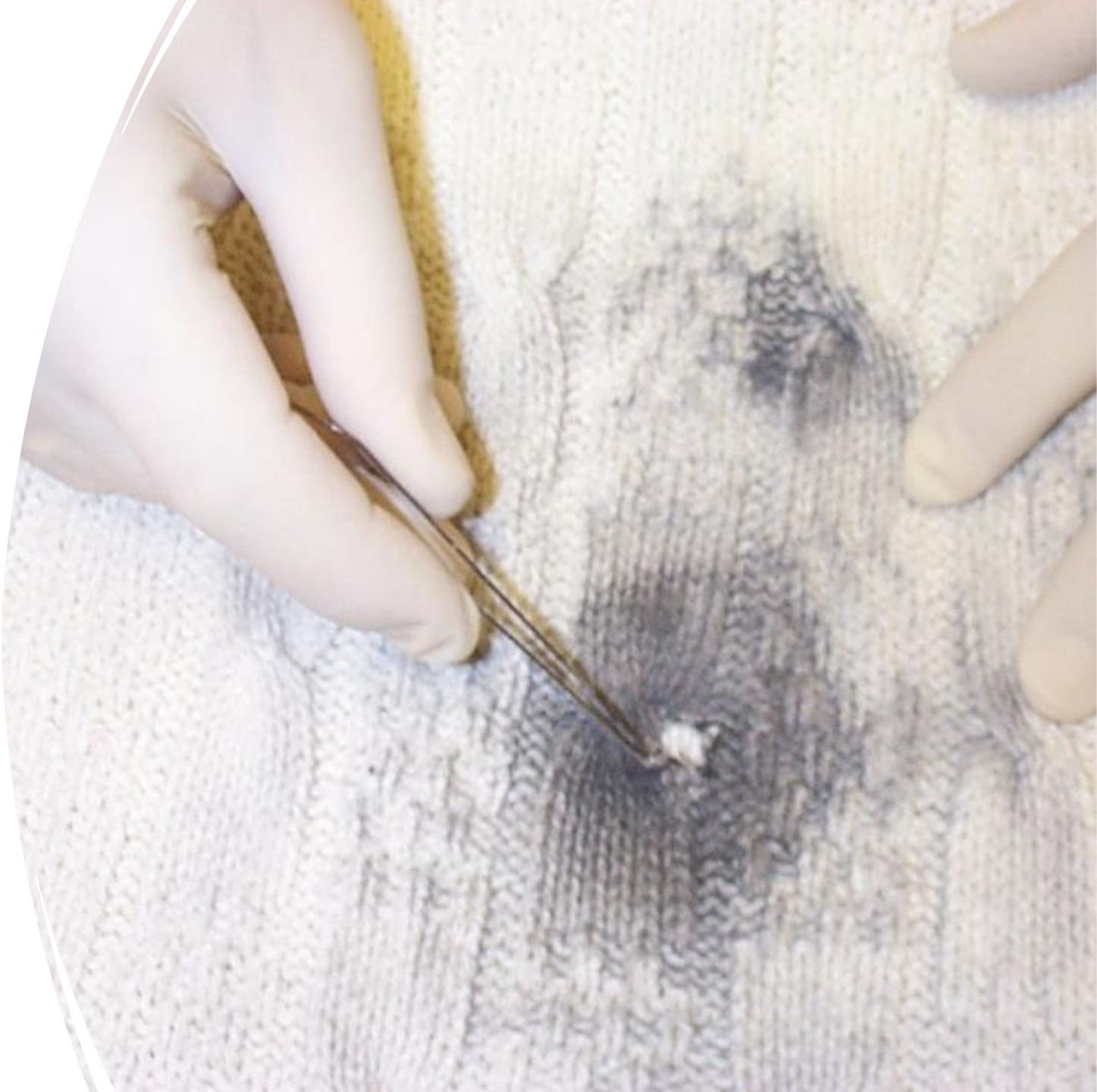
Collecting and Packaging Physical Match Evidence

- Collecting
  - Collect all broken pieces from scene
    - Can be packaged together if recovered from same area
  - Collect entire portion of broken standard
    - If item must be cut/torn, ensure original broken edge is secure and safe from damage
- Packaging
  - No restrictions as long as integrity of broken edge is maintained
  - If submitting pieces of torn tape, place tape between wax paper

Primer Gunshot Residue (PGSR) Analysis

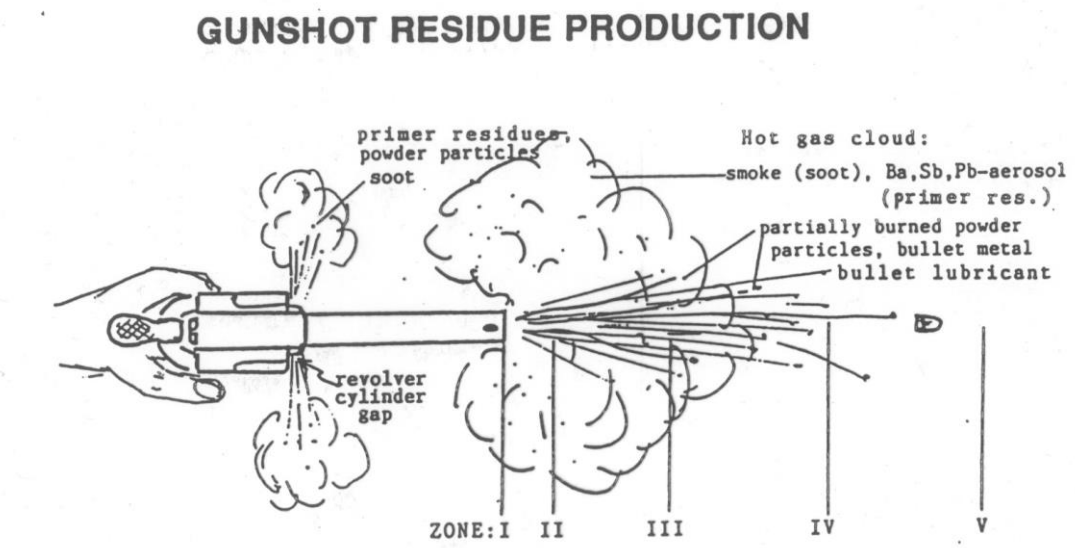
Gunshot Residue

- Bullet hole identification
  - May show directionality
- Distance determination
  - Distance from muzzle to garment
- Examined by Firearms Section



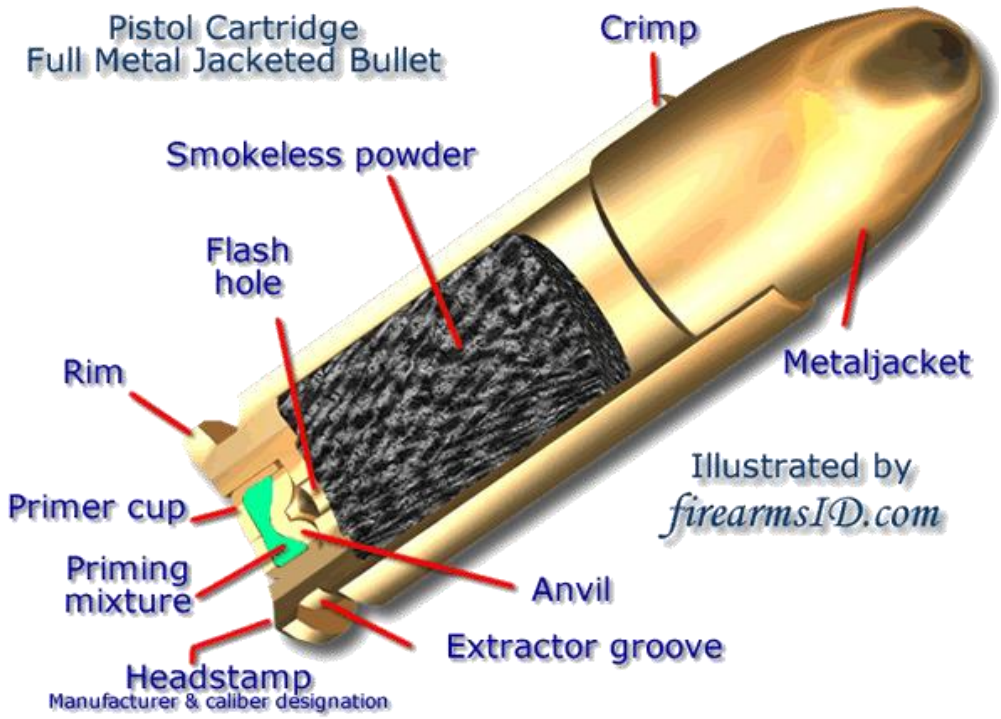
Gunshot Residue

- A generic term describing a number of materials emitted from a firearm when discharged
- Consists of materials from the primer, propellant, lubricant, bullet, bullet jacketing, cartridge case and firearm barrel.



Primer Gunshot Residue (PGSR)

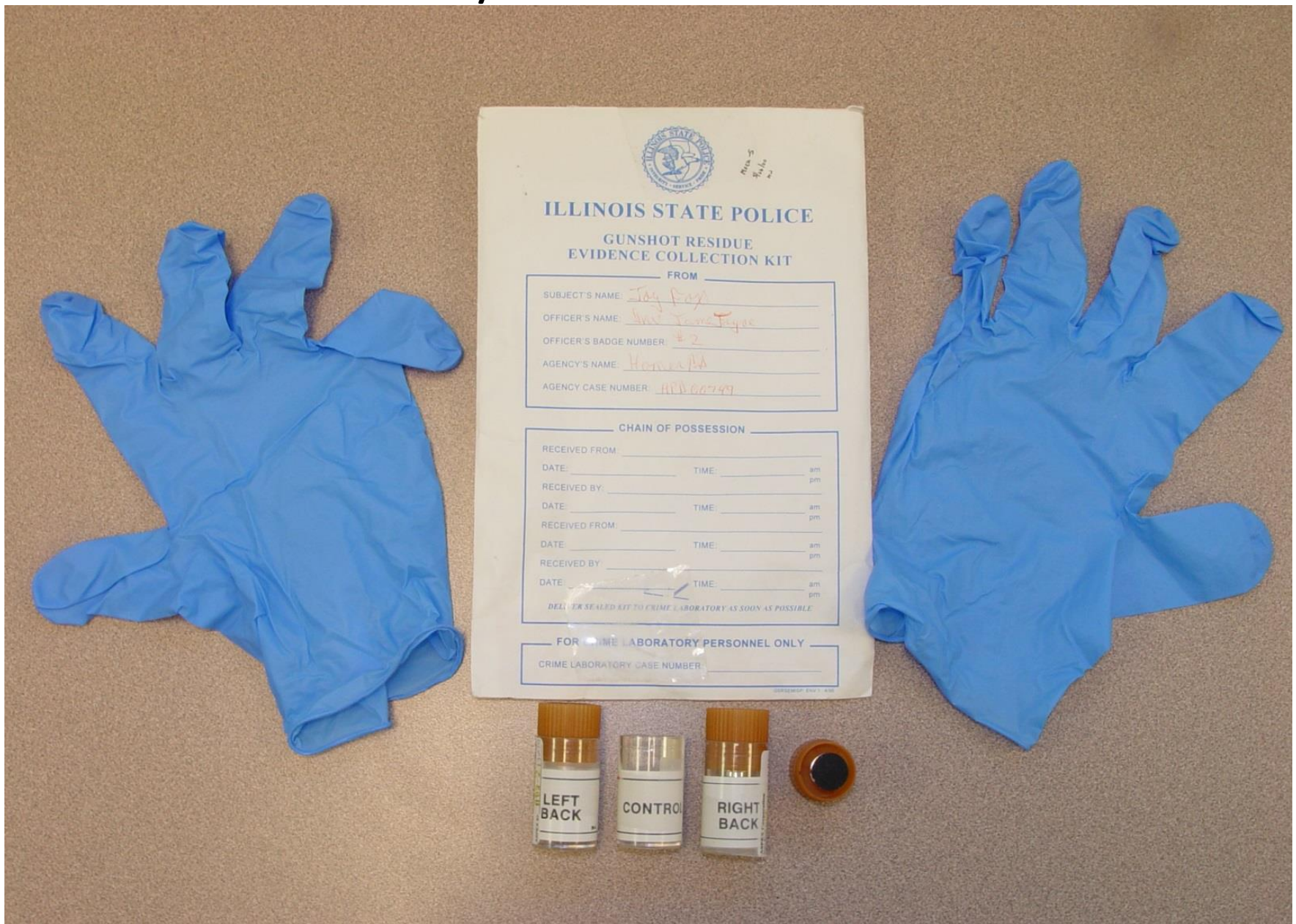
- Elements that are emitted from a weapon which originated in the primer of the ammunition. Not from gunpowder.
- Most ammunitions contain lead, barium, and antimony
  - Particles produced are easily transferred from one surface to another



How Long Does PGSR Stay on a Surface

- Live Subjects – 6 hrs.
- Deceased Subjects – Indeterminate unless subject is washed or sampling area is wiped
- Clothing – Indeterminate unless item is washed
- No matter the surface, washing permanently removes particles
- Rule of Thumb
  - > Time period between incident and collection > Loss of Particles
  - > Activity > Loss of Particles

SEM/GSR Collection Kit



Kit Order Information

Tritech Forensics

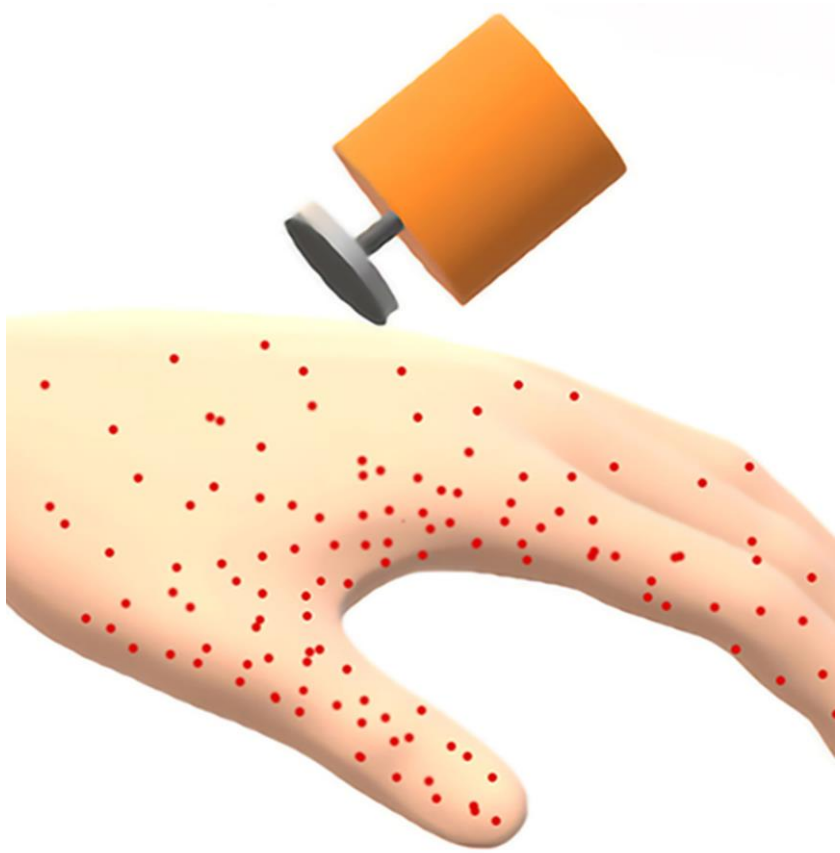
1-800-438-7884

Catalog # GSR-SEM/ISP

tritechforensics.com

Collecting Gunshot Residue

- Kits
  - Must use stubs for SEM instrument
    - ISP does not have the ability to analyze any other type of kit
  - Possible suspects
  - Vehicle
  - Clothing
  - Consider area closest to shooting incident
    - Hands
    - Clothing
    - Different parts of body
      - Face – Closest Part to Rifle, Shotguns
- Clothing
    - Package each item separately

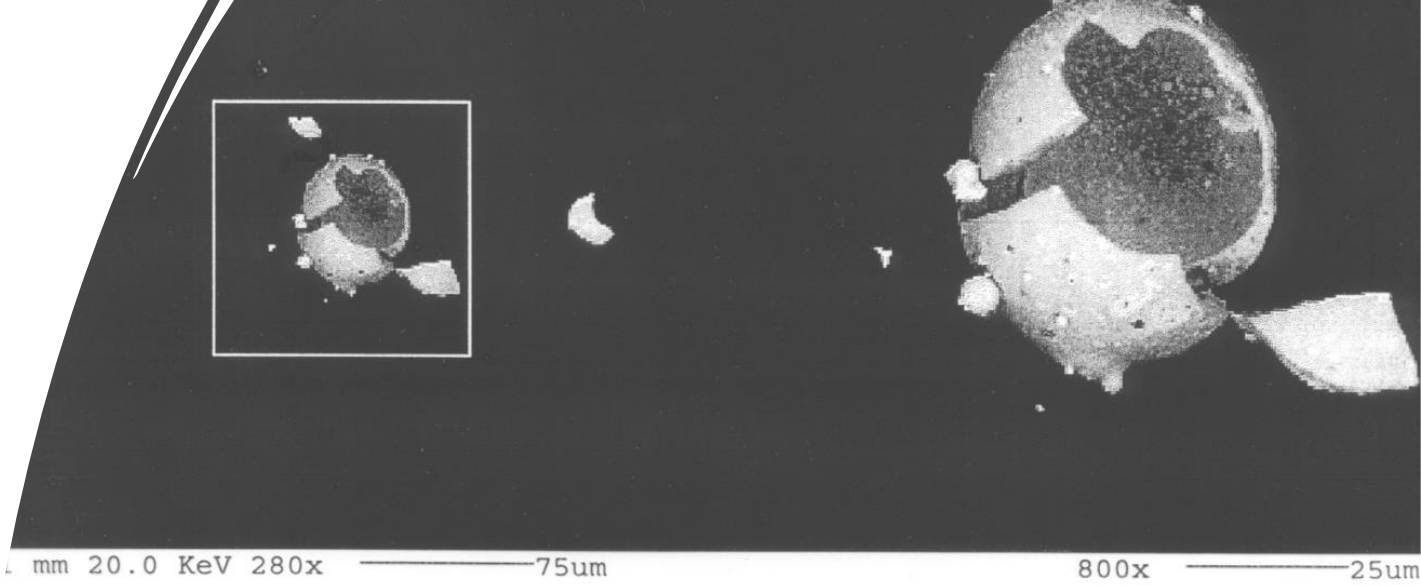


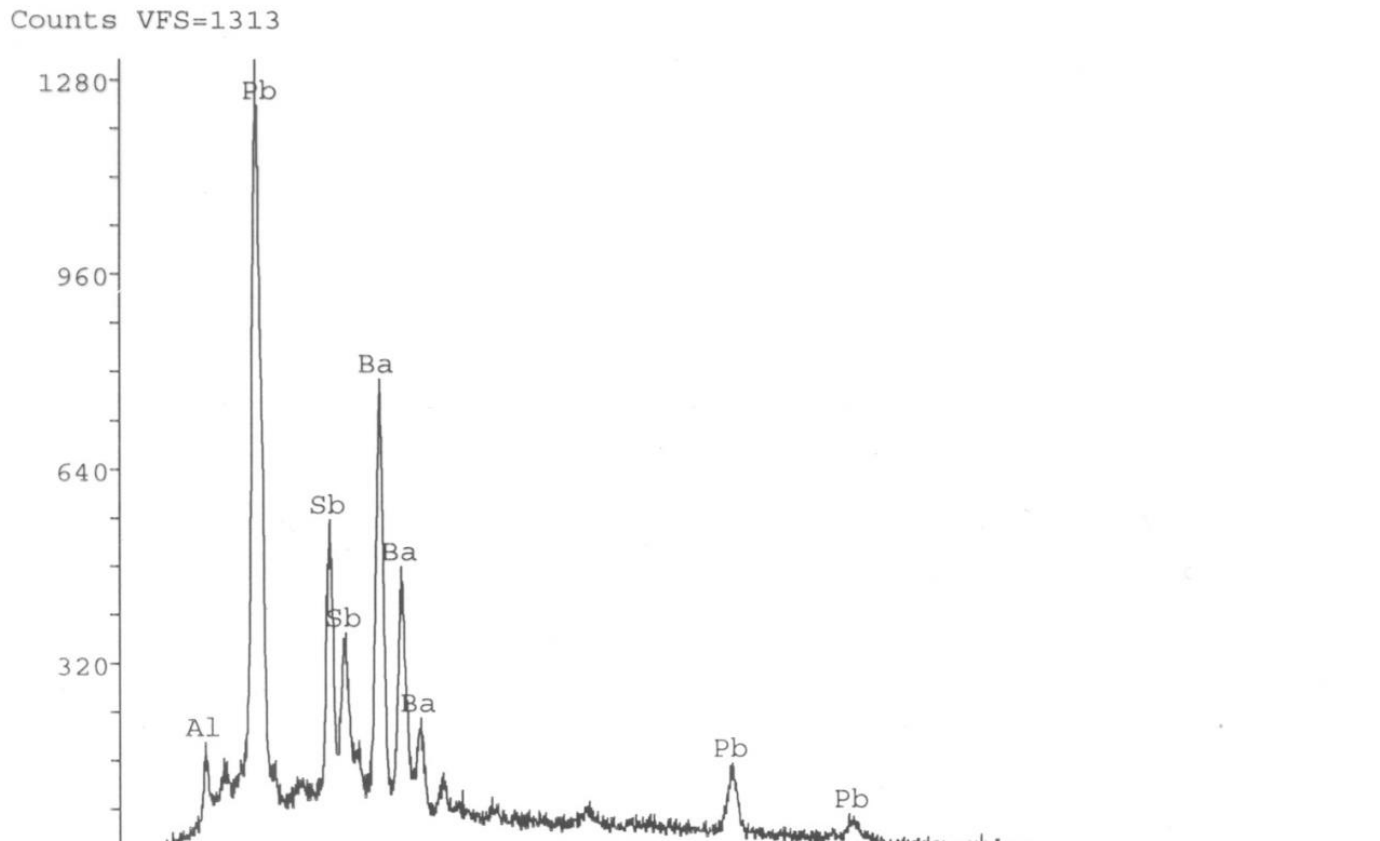
Collecting Gunshot Residue

- Collect samples ASAP
- Fill out form as completely as possible
- 3 Samples Recovered (2 Areas & 1 Control)
  - Control - vial is opened and exposed to the environment where PGSR samples are recovered
    - Prevents the possibility of creating a false positive
- Dab the collection area identified until adhesive is no longer tacky or area is sufficiently sampled
  - 4 X 4 in^2 sampling area
- Clean work area in between samples
- Reseal kit with stubs and form only
- Do not put evidence tape on stubs

PGSR Particle Identification
Scanning Electron Microscope

- Composition
  - Antimony, Barium, and Lead
    - PbBaSb
- Morphology
  - Slightly rounded
  - Molten in appearance
  - May contain nodules
  - Surface contains bright spots
  - Agglomerate of many small particles
  - May have multiple layers of colors, compositions and textures





Limitations

- Cannot identify one person as the shooter
    - Discharge
    - Contact
    - Environment
- Cannot answer whether homicide or suicide
  - Cannot differentiate between shooter vs. being shot
- Cannot determine ammunition type
- Cannot determine when particles were deposited for clothing
- Particles lost after 6 hrs. in most cases with activity

Key Collecting and Packaging Takeaways

- Microscopy (hairs and fibers) – can be taped and packaged in any type of material just ensure all edges and corners are properly sealed
- Paint and polymers – cannot be taped or packaged in plastic, best in paper envelopes
- Physical match – can be packaged in any type of material if all broken edges are protected for analysis
- Primer Gunshot Residue – use adhesive stubs that can be analyzed by scanning electron microscope instrument (SEM)

FIRE DEBRIS ANALYSIS

What is Fire Debris Analysis?

- Science related to the examination of fire debris samples to detect and identify ignitable liquids or ignitable liquid residues (ILR's)

Ignitable Liquids

- Any liquid or the liquid phase of any material that can fuel a fire (i.e., starting a fire or spreading a fire)
  - **Highly volatile liquid**
  - Some ignitable liquids emit sufficient vapor at room temperature for ignition (i.e., gasoline) and others must be heated prior to igniting (i.e., diesel fuel)
- Derived from crude oil or are produced synthetically
  - Composed of organic molecules (primarily hydrocarbons)
  - Are products with specific boiling ranges and burning characteristics
  - Examples: gasoline, diesel fuel, kerosene, charcoal lighter fluid, turpentine

Fire Debris Packaging

- Super Important!!
  - Can cause damage or loss of evidence if done improperly!

ATF Study - Contamination

- Goal of study: to understand the potential for cross-contamination resulting from improper evidence packaging
  - Common types of improper containers were studied (i.e., cardboard boxes, plastic bags, paper bags) along with the duration of the improper packaging
  - Proper, vapor-tight containers also checked (i.e., nylon bags, metal cans)
- Results
  - Cross-contamination can happen in as little as an hour
    - ***Evidence must be packaged properly in vapor-tight container from the start***

Evidence Packaging Requirements

- Collection and packaging of evidence varies according to section and discipline but a properly packaged container for fire debris satisfies the following criteria:
  - **Provides an airtight seal retaining the volatile accelerant in the collected sample**
  - Avoids contamination between samples
  - Resistant to damage, breakage, puncture, or cutting
  - Provides a proper chain of custody for the collected material
  - Readily available
  - Inexpensive
  - Easy to transport and store
  - Easy to seal and unseal
  - Clean – no hydrocarbon or chemical residue

Fire Debris Containers

- Metal cans with friction fit lids
  - The most recommended container for debris (non-liquid samples)
  - Advantages: they are robust and unbreakable and meet the criteria for an evidence container
  - Disadvantages: they can rust with wet debris and are difficult to use with very large pieces or oddly shaped pieces of evidence
  - ISP buys cans from Berlin Packaging https://www.berlinpackaging.com/

Fire Debris Containers

- Metal cans (cont.)
  - We can analyze in cans from ½ pint to five gallons
  - Cans are available with or without liners
    - Linings will retard the rusting of the metal can but some have trace levels of ignitable liquids which can produce interferences for the laboratory.
    - *Regardless of what type of can you choose, you can send the lab a sample can for testing along with data such as manufacturer, lot number, and type of lining to ensure there is no contamination from the lining or any part of the container*

Fire Debris Containers

- Glass vial and jars – best for liquid samples
  - The major disadvantage is that they can break
    - To help prevent this, pad the inside a metal can with paper towels
  - Screw cap lids with Teflon liners are the best

Fire Debris Containers

- Plastic or paper bags - will **not** be analyzed
  - Will be reported out as “Improperly packaged”
  - Cans and vials are impermeable to vapors, paper and plastic are not

What to Collect at the Fire Scene

- Liquid
- Solid samples
  - Clothing
    - Victim's
    - Suspect's
  - Debris
  - Containers
  - Comparison and Control Samples
- *Do not include plastic gloves used to collect debris

Collection of Liquid Samples

- Liquid samples include any suspected accelerant found in containers or bottles at or near the fire scene.
- One fluid ounce of liquid is more than sufficient for laboratory analyses.
- Remove liquid with clean disposable pipette or syringe if necessary.
- Place liquid sample into small glass vial if possible
  - Ignitable liquids are corrosive – most can rust a metal can
- Secure all vial caps with adhesive tape to prevent loosening.

Collection of Liquid Samples

- Clean cotton gauze “swabs” can be used to collect liquids if only residue present
  - Place swabs in sealed can
  - ATF gauze study – ink from packaging can leach onto gauze in hot environment causing a false positive
  - Submit clean unused gauze in second can for control
- For Unlawful Use of Weapon charge, provide at least ¼ ounce of liquid for analysis
  - The weight of liquid, a measurement of uncertainty in the weight, and the identity of the liquid are reported.

Collection of Solid Samples

- Debris
  - Unused metal paint cans are the best containers readily available for the packaging of fire debris
  - If lid is firmly in place, the container is essentially vapor-tight.
  - Fill can ½ to ⅔ full (maximum)
    - Don’t shove the evidence into the can
    - When searching for residue of ignitable liquids at the fire scene, look for absorbent (porous) materials which will retain liquids more readily such as:
      - Carpet & Padding
      - Wood
      - Linens/Drapes
      - Paper
      - Soil
      - Concrete
      - Do not collect heavily charred (ashy) material

Collection of Solid Samples

- Debris (cont.)
  - List on evidence if soil or garbage present so we can analyze sooner or make sure we store it in the freezer
- Clothing
  - It is important to obtain the clothing from the suspect or victim as soon as possible.
    - Potential ignitable liquids evaporate away quickly
  - Please clearly mark any potential biohazard
- “EMPTY” containers of ignitable liquids
  - Ex. Original manufacturer’s packaging with lid

How to Package Containers with Latent Prints or DNA Requests

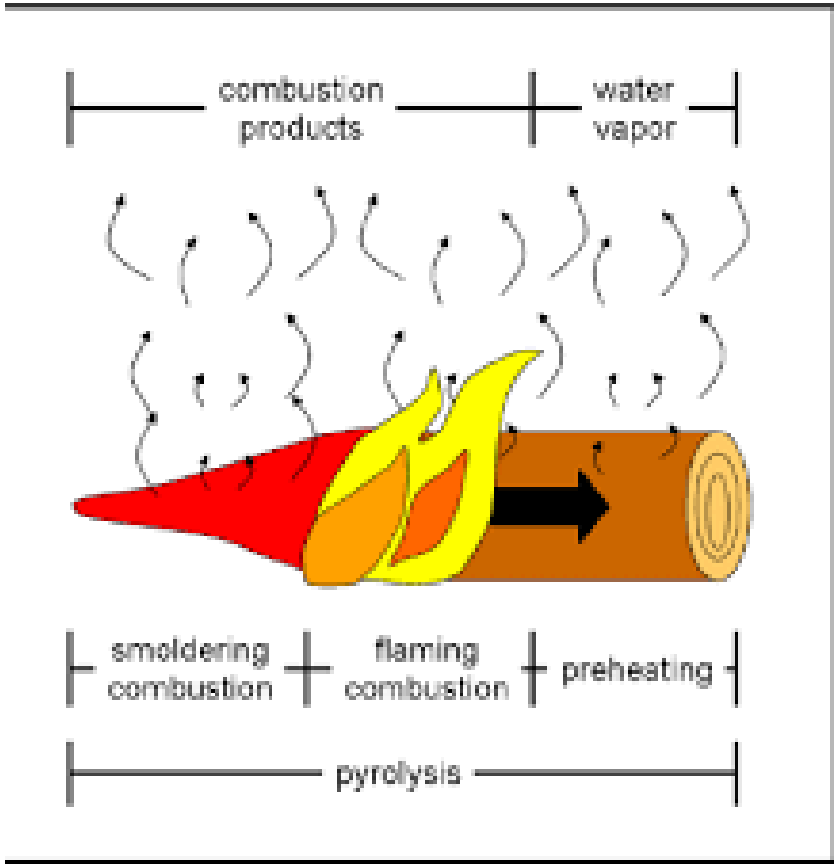
- DNA and Latent Prints can be damaged by strong ignitable liquid vapors in an airtight environment
  - Caution must be taken when packaging this type of evidence
- Container with liquid
  - Package the liquid in a glass vial and submit to Micro/Trace
  - Package the container in a paper bag or cardboard box and submit to DNA and/or Latent Prints
- Containers without liquid but still has original top intact – can be submitted in either metal can, paper bag, or cardboard box and all the sections can analyze

How to Package Containers with Latent Prints or DNA Requests

- Containers with wick
  - Package wick in metal can and submit to Trace
  - Package container in paper bag or cardboard box and submit to DNA and/or Latent Prints
- Open containers with no wick or liquid
  - For ignitable liquid analysis it must be submitted in metal can
  - However, ignitable liquids may damage prints and DNA, therefore, a decision must be made

Comparison Samples

- Materials collected at a fire scene that will be analyzed to ascertain if any interferences are present in the material.
- Comparisons can be submitted for each different debris substrate.
  - Pyrolysis products occur when a material is exposed to heat in the absence of sufficient oxygen to burn. The material will decompose, often releasing smaller compounds (such as hydrocarbons) which are more volatile than the original substrate



Comparison Samples

- Should be unburned material from the fire scene identical to the suspect sample but free of ignitable liquids.
  - Examples of substrates include carpeting, tile, vinyl siding, wood, liquid, etc.

Control Sample

- A control sample is a “fresh” sample, usually purchased by investigator.
  - Example would be a brand of shoes like those worn by the suspect, purchased from the store, and submitted as evidence

Shoes

- It has been reported that shoes, especially athletic shoes produced in Pacific Rim countries, may contain inherent ignitable liquids.
- These primarily come from the adhesives and glues used to manufacture the shoe.
- Other sources may be from the manufacturing process:
  - Solvents used to clean the molds
  - Solvents used in finishing
- Common interferences – toluene, xylenes, and distillates

Shoes

- Package each shoe separately
- Don’t package shoes with any other evidence
- All reports that have a positive finding for shoes that were extracted with heat will have a disclaimer at the bottom unless a control shoe is submitted:
  - “Footwear may contain petroleum products because of the manufacturing process. Submission of an identical new shoe as a control sample may result in a more definitive finding.”

ATF Study
Cleaning Scene Tools

- Goal: Based on previous research, questions raised concerning use of Dawn soap for decontamination
  - Determine if Dawn is still effective for cleaning fire scene equipment
- Method: spiked different tools with ignitable liquid, cleaned tools with Dawn soap, dried overnight, analyzed
- Results:
  - **Found Dawn soap was ineffective**
  - Tested several different types of cleaners
  - Best cleaner turned out to be Simple Green
  - Suggested cleaning procedure
    - Rinse tool with strong stream of water
    - Scrub entire tool for 30 sec in 1/3 solution of Simple Green/water
    - Rinse tool completely with water
    - Let dry

Common Sampling Errors

- Not enough sample collected
- Too few samples collected
- Too much sample forced into the container
- Sampling outside of the ignitable liquid pour pattern
- Sample not relevant to the scene
- No comparison samples submitted
- Ineffective preservation
  - Wrong type of container
  - Too long between fire and packaging

Micro/Trace Evidence Collection App!!!

Go MOBILE for FREE with the Trace Evidence Collection App!

New Demonstration Videos Included!
Download the Updated App Now!

GET IT ON Google Play

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Trace Evidence Collection App

- Assists crime scene teams with the recognition, collection and preservation of trace evidence
- What it includes:
  - Searchable platform accessible from anywhere
    - Searchable based on type of crime scene or type of trace evidence
    - Arson and Fire debris are included
  - The *Trace Materials Crime Scene Investigation Guide* – contains info on types of trace evidence commonly encountered by crime scene investigators
  - Range of images and videos to provide further detail and instruction to the user for evidence collection techniques
- Maintained by Organization of Scientific Area Committees (OSAC)

Role of the Fire Debris Analyst

What can a fire debris analyst do?

- Determine if an ignitable liquid is present
  - Can be from debris from a fire scene, a liquid from a gas can, or clothes from the victim or suspect
- Identify the type of ignitable liquid
- Give likely examples from that type to assist the investigator in the determination of arson

What can a fire debris analyst NOT do?

- Determine if a fire is arson
- Make any conclusion about how a fire started
- Identify brands, additives, gas stations, or any kind of source such as a specific container
- Determine when and how the ignitable liquid was deposited

Analysis of Liquid Samples and Containers

Liquid samples

Test to see if liquid is flammable by trying to light a small amount in pipet

- If flammable – inject directly into instrument
- If not flammable – solvent extraction

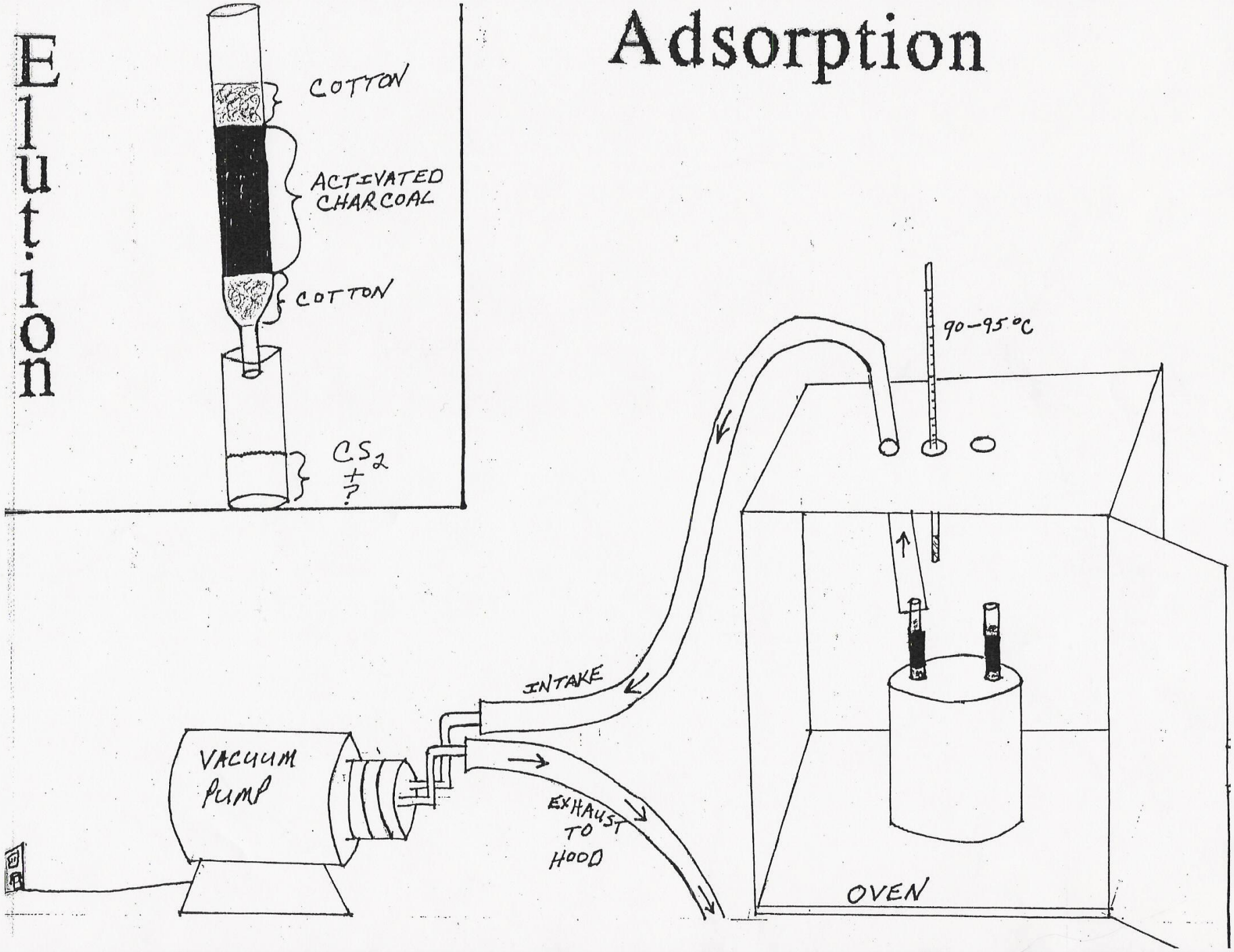
Empty containers

Solvent rinse inside of bottles with carbon disulfide to extract ignitable liquids

Analysis of Debris Samples

- Any potential ignitable liquids must be extracted from the debris
- Active Charcoal Elution (ACE) - uses heat and vacuum to volatilize material inside sample and then adsorption and subsequent solvent elution to collect and analyze the volatilized material
  - Provides a representative sample
  - Quick
  - Very sensitive
    - Capable of isolating ignitable liquid quantities smaller than 0.1 µL from a sample
  - Most common extraction method used at ISP

Adsorption


Elution
COTTON
ACTIVATED CHARCOAL
COTTON
CS_2 + ?
90–95 °C
INTAKE
VACUUM PUMP
EXHAUST TO HOOD
OVEN

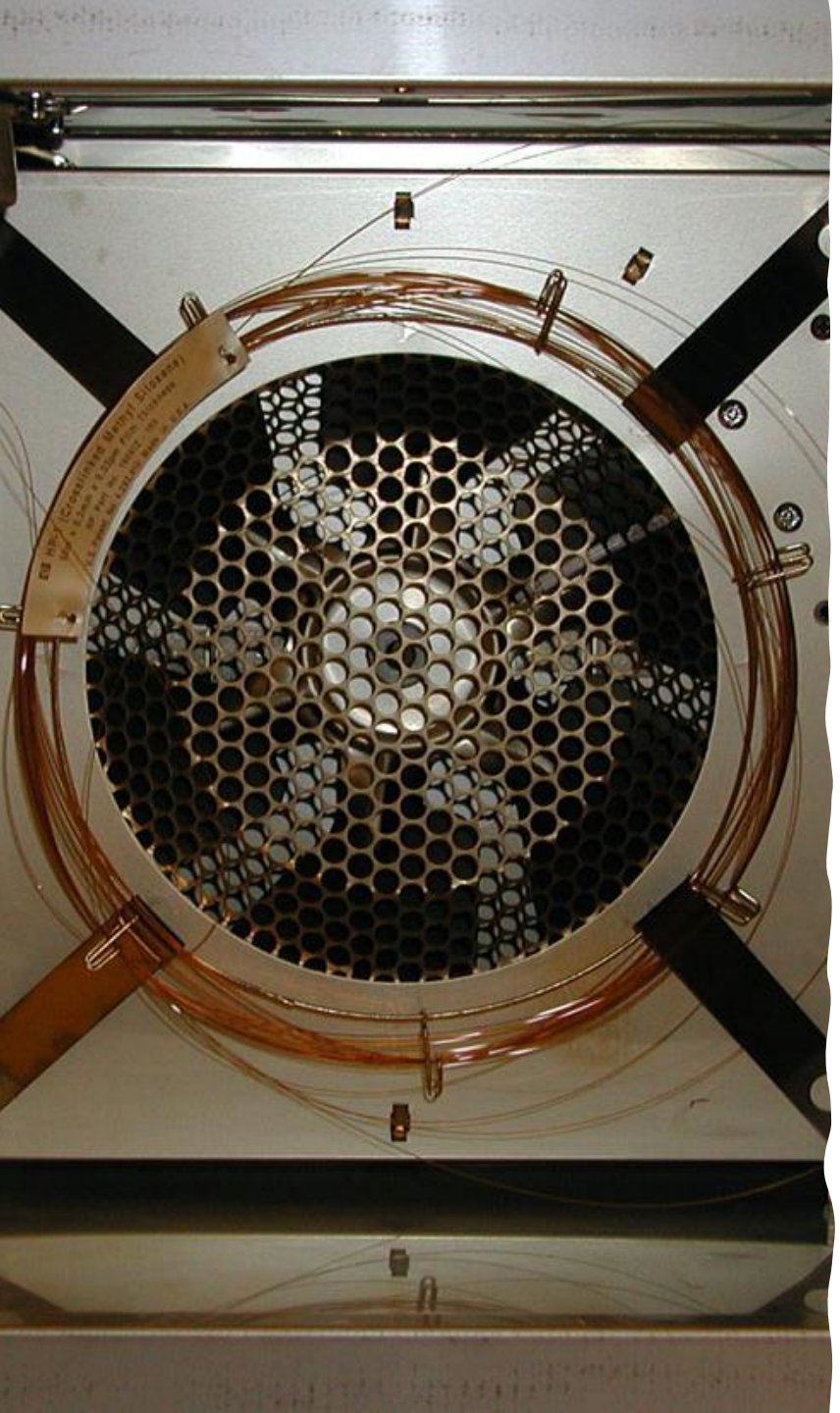
Analysis of Debris Samples

- ACE detects all ignitable liquid classifications including gasoline, MPD's, and HPD's but is not good at detecting alcohols or light oxygenate products such as acetone or isopropyl alcohol
  - We analyze for alcohols and light oxygenate products only if specifically requested
- For Latent Prints or DNA request, debris is analyzed by Passive Charcoal Elution (PCE) at room temperature

Instrumentation Used

Gas Chromatograph/

Mass Spectrometer

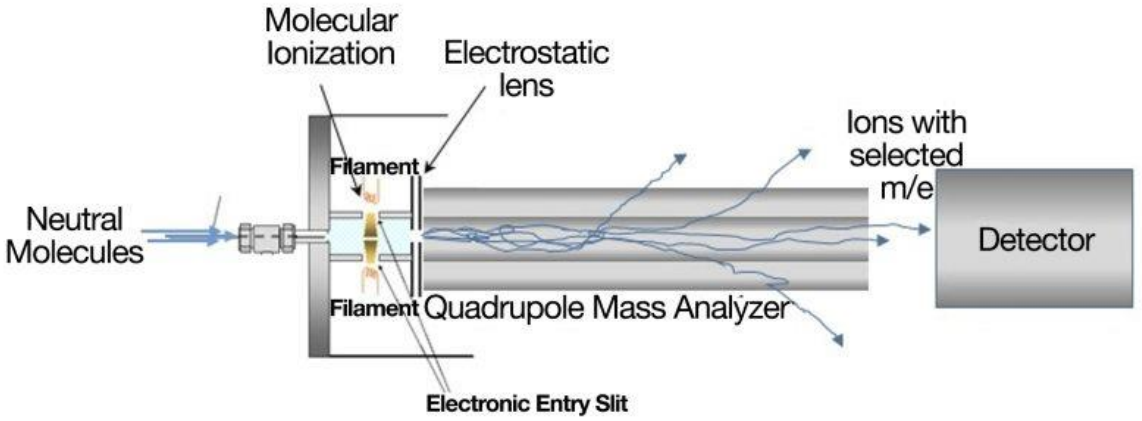


Instrumental Analysis

- **A Gas Chromatograph** (GC) is used to separate components of an ignitable liquid.
  - Hundreds of compounds can be found in a sample of gasoline.
- The GC uses a column to separate mixtures based upon physical and chemical properties.
- Liquid sample or extracts are injected, heated into a vapor, then swept through the column by a carrier gas. While going through the column the sample is separated into its individual components.

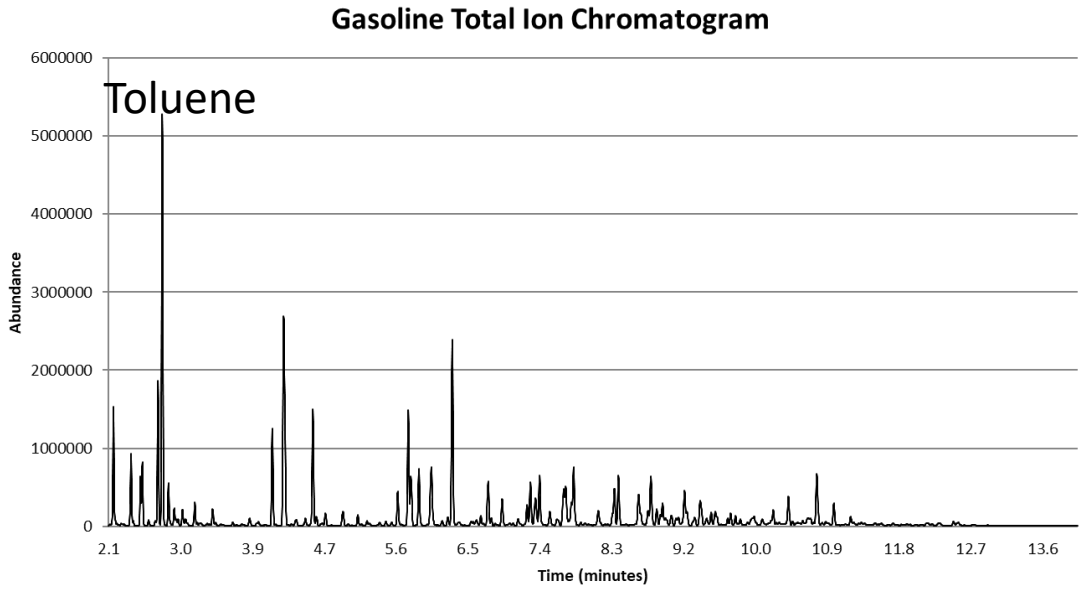
Instrumental Analysis

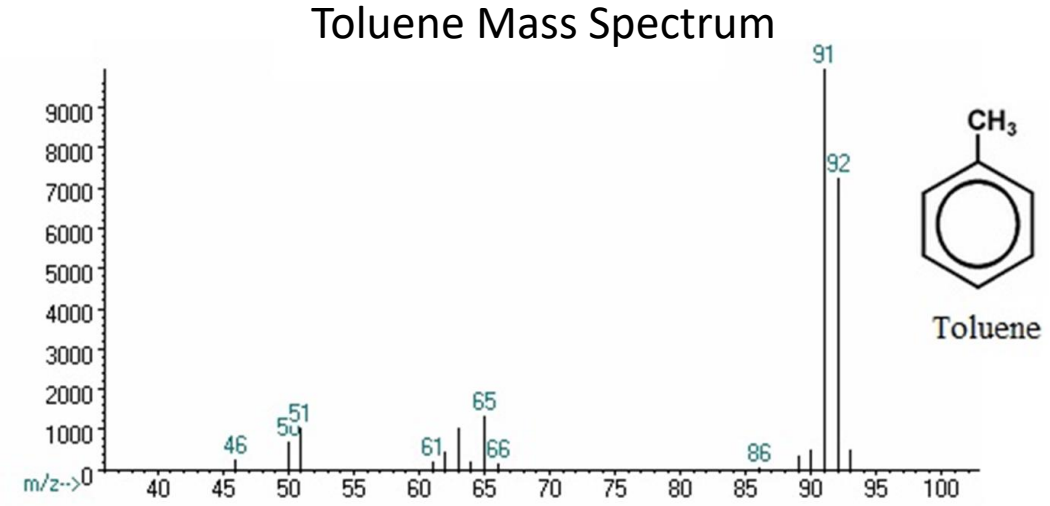
- Mass Spectrometer (MS)
  - The eluting compound is bombarded with electrons and broken into fragments.
  - A magnet separates the fragments based upon their mass; each fragment is counted, and an electrical signal is generated.



Instrumental Analysis

- A Total Ion Chromatogram (TIC) is produced.
  - Each peak represents a separated component of the original mixture.
  - Each peak contains a mass spectrum which is the fragmentation pattern of that separated component from the mixture.





Classification of Ignitable Liquids

- Fire debris analyst can describe the sample based on chemical composition and boiling point range but not on its commercial use
  - One ignitable liquid of a given chemical composition may be marketed as many different end-use products
    - Marketing practices dictates that a product must meet certain specifications, not have a specific chemical composition
      - Ex. A paint thinner, cleaning solvent and charcoal lighter fluid may have the exact same chemical composition

Classification of Ignitable Liquids

- Most commercially available ignitable liquids consist of a complex mixture of chemical compounds
  - Chromatograms give a distinctive pattern of peaks which can identify the class of the ignitable liquid
  - The chromatogram of the sample is compared to chromatograms of known ignitable liquids run under the same conditions of analysis.
    - Must be good similarity in chromatogram patterns to identify the class of the ignitable
  - Data is kept in case file along with function checks of the instrument

Classification of Ignitable Liquids

- Current Classification System from American Society of Testing and Materials (ASTM) E1618-19
  - Petroleum Distillates
  - Gasoline
  - Isoparaffinic Products
  - Oxygenate Solvents
  - Normal Alkane Products
  - Naphthenic/Paraffinic Products
  - Aromatic Products
  - Miscellaneous
    - At ISP this includes Terpenes, Unidentified Petroleum Product, Unidentified Petroleum Distillate, mixtures, and more.
- All classes except for gasoline can be further divided into “light”, “medium”, and “heavy” depending on the carbon range of the sample
  - “Light” – C_4-C_9
  - “Medium” – C_8-C_{13}
  - “Heavy” – C_9-C_{20+}

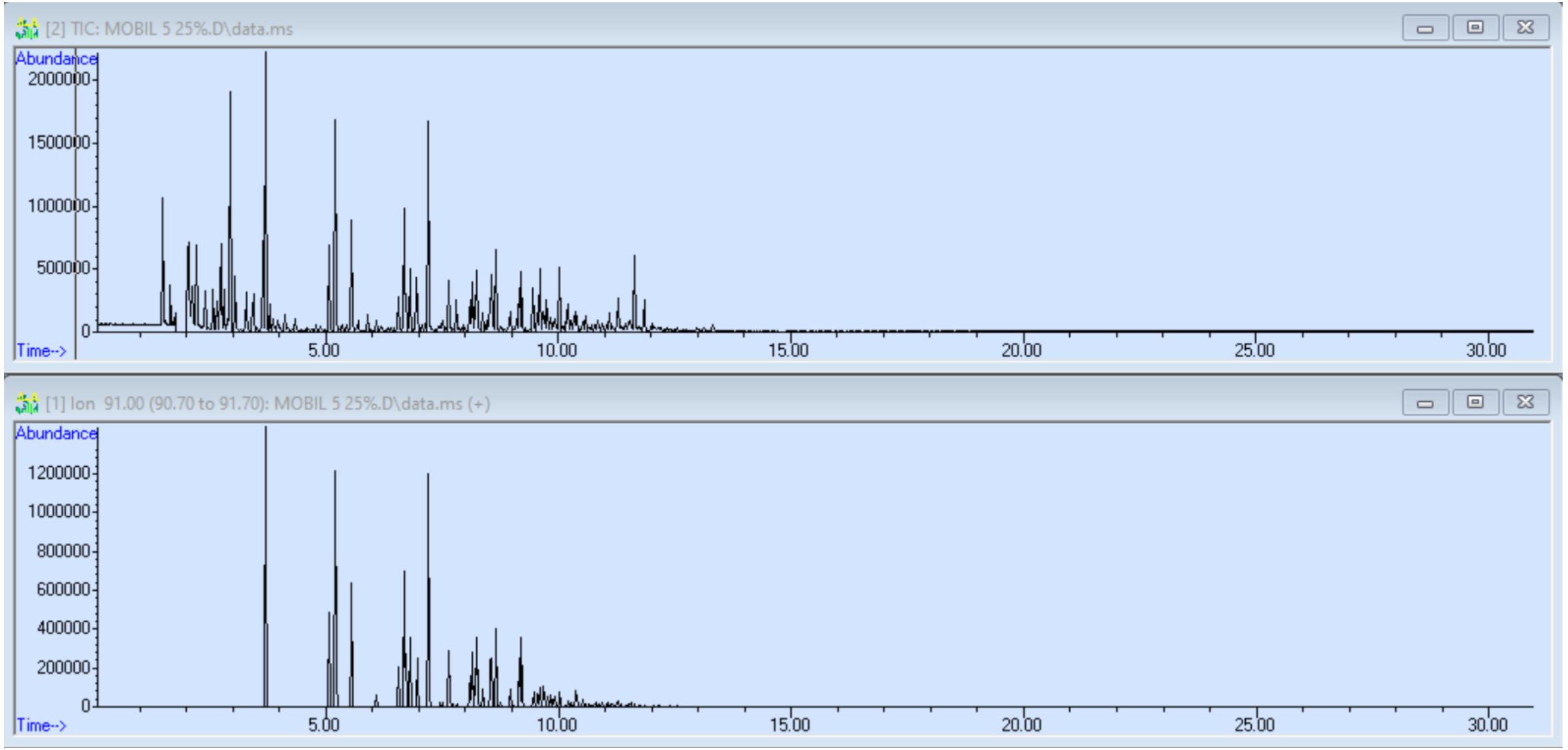
Classification of Ignitable Liquids

- Primarily based on pattern recognition and pattern comparison in the TIC and Extracted Ion Profiles (EIP'S)
  - EIP's are generated by separating out peaks with certain mass fragments
- Review the minimum requirements for each class
- In what boiling range are the peaks present (light, medium, or heavy)?
  - Look at the n-alkane carbon numbers
- What is the width of the range the peaks are in (narrow or wide)?
- Are any distinguishing features present, i.e., 5 peak group for gasoline, Gaussian shape for a distillate?
- What are the ratios of the extracted ion profiles to each other (aromatic/alkane = 10/1)?

Classification of Ignitable Liquids
General Fragments/Extracted Ion Profiles of Interest

- Aromatics
  - 91 – C1 Benzene
  - 105 – C2 Benzene
  - 119 – C3 Benzene
  - 133 – C4 Benzene
- Alkanes
  - 57 – n-Alkanes (C_4H_9)
  - 71 – n-Alkanes (C_5H_{11})
  - 85 – n-Alkanes (C_6H_{13})
  - 99 – n-Alkanes (C_7H_{15})
- Naphthalene
  - 128 – Naphthalene
  - 142 – C1 Naphthalene
  - 156 – C2 Naphthalene
- Indanes
  - 117 - Indane
  - 131 – C1 Indane
  - 145 – C2 Indane
  - 159 – C3 Indane

Classification of Ignitable Liquids
Total Ion Chromatogram (TIC) vs. Extracted Ion Profile (EI)



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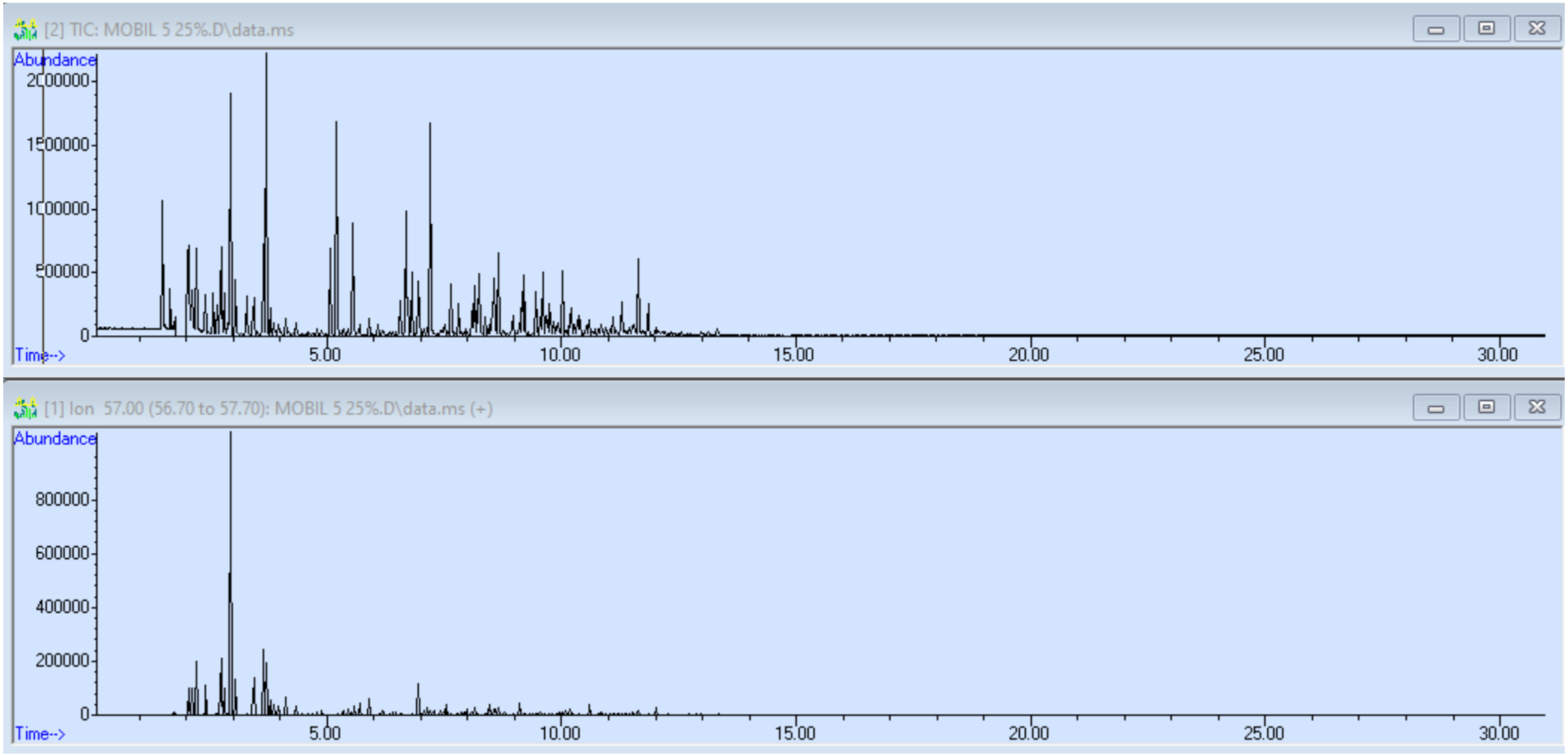

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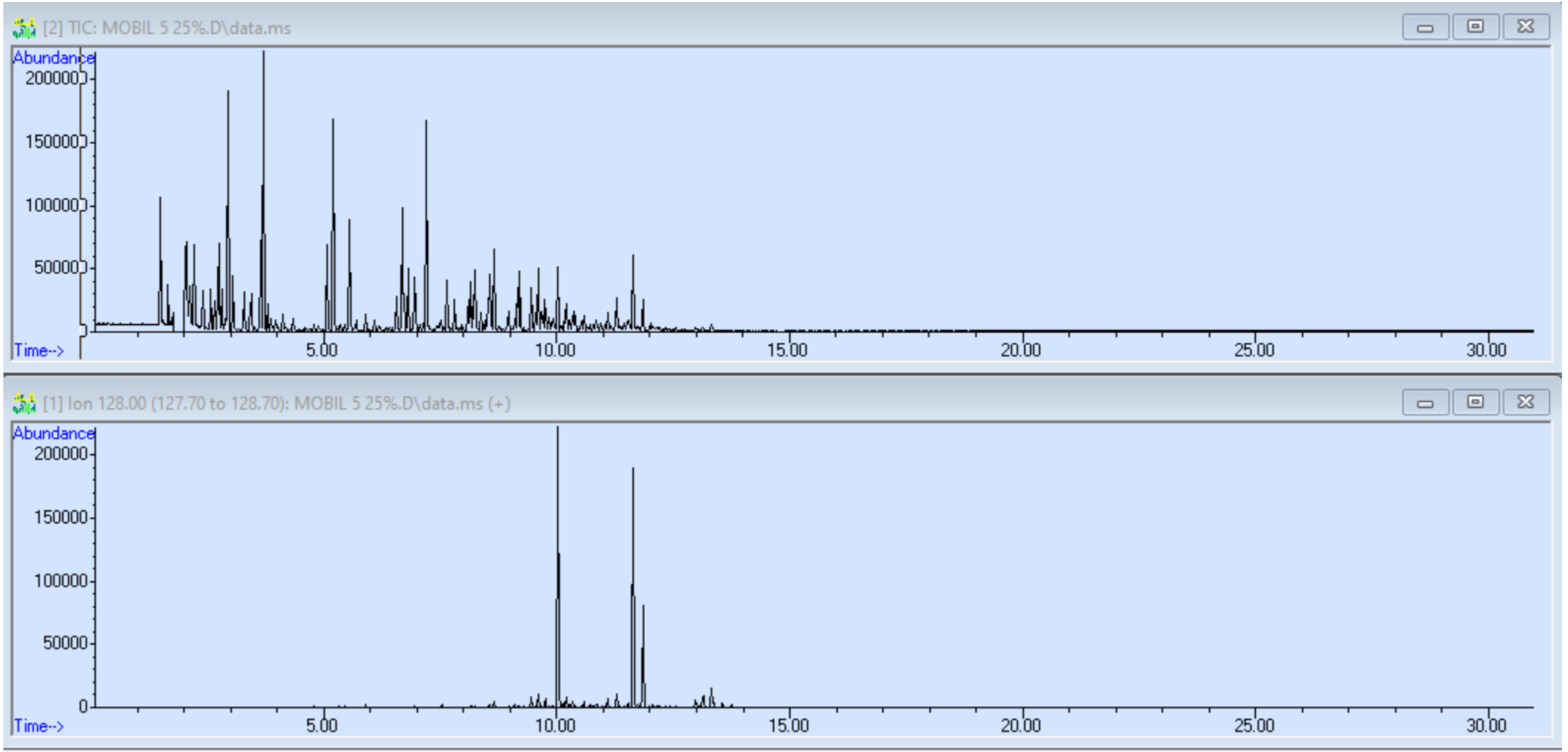

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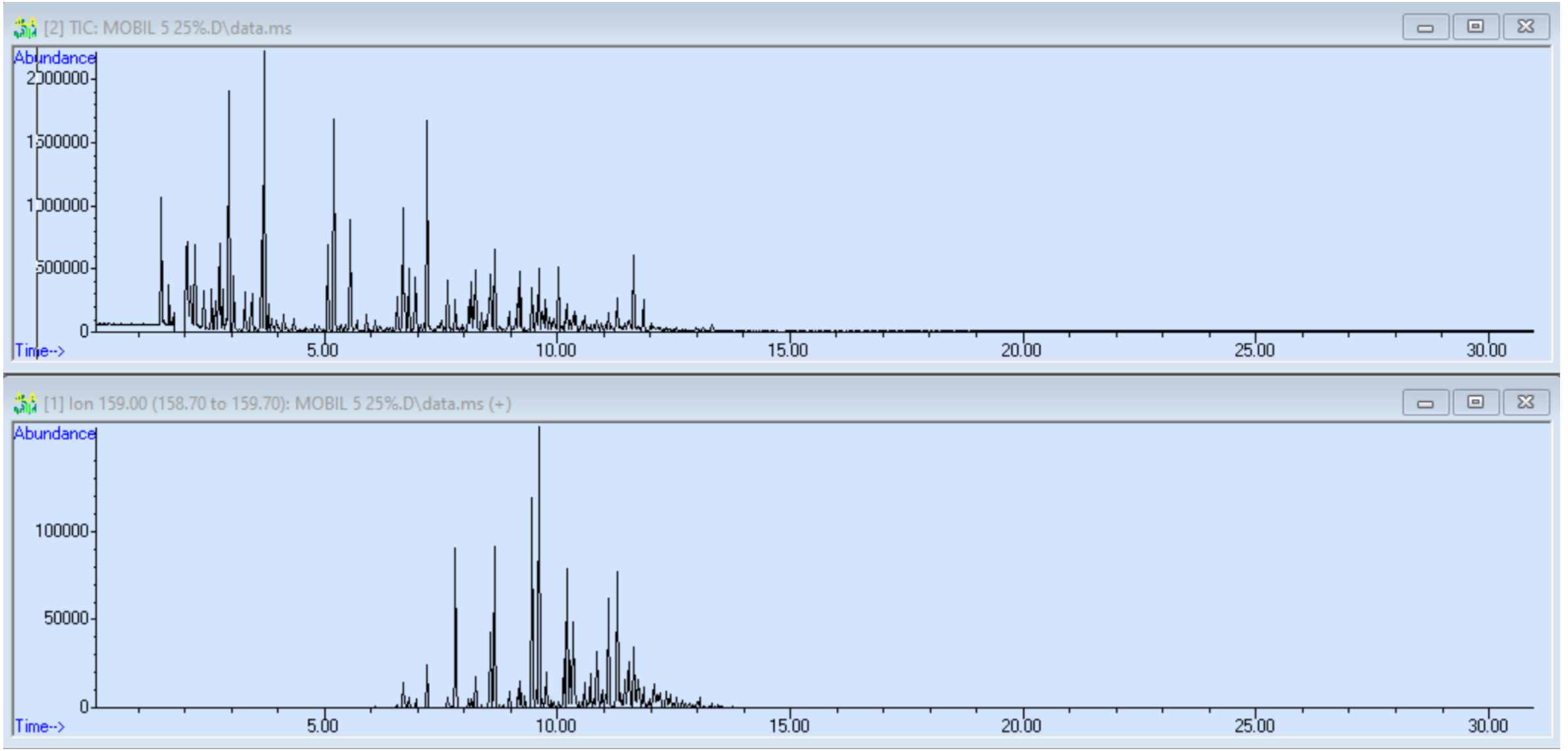
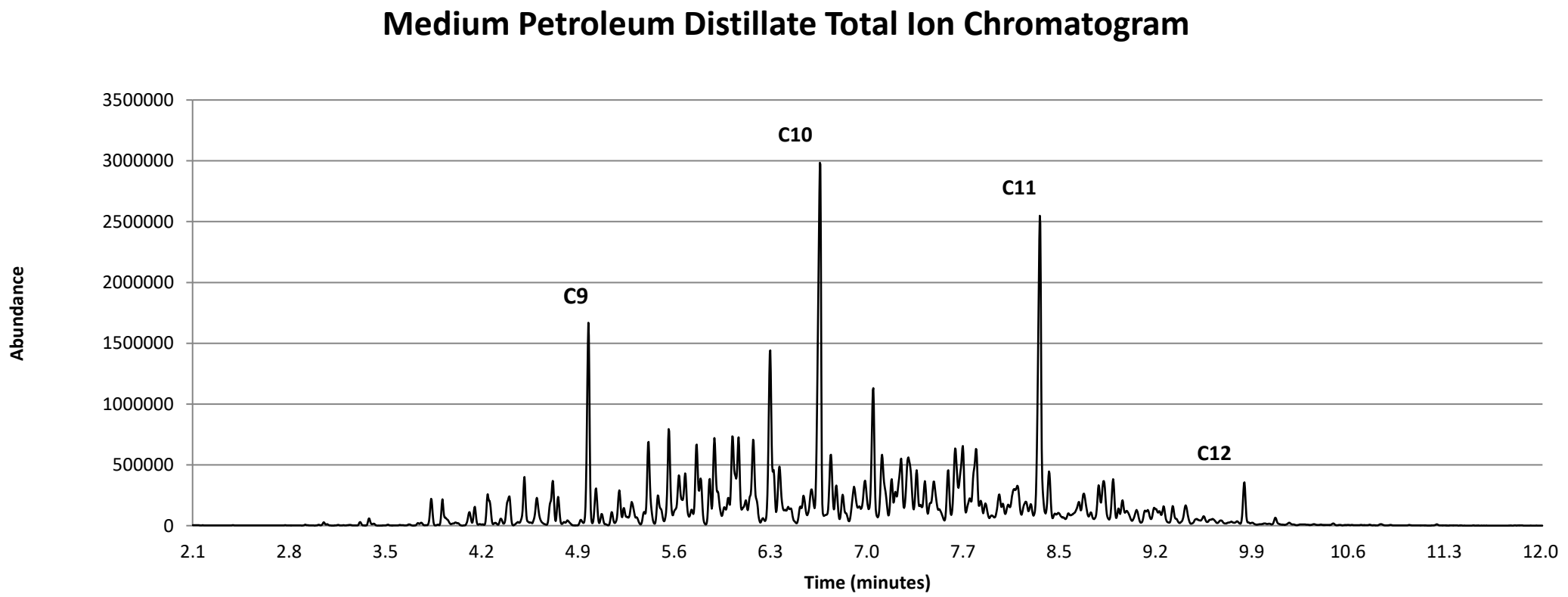
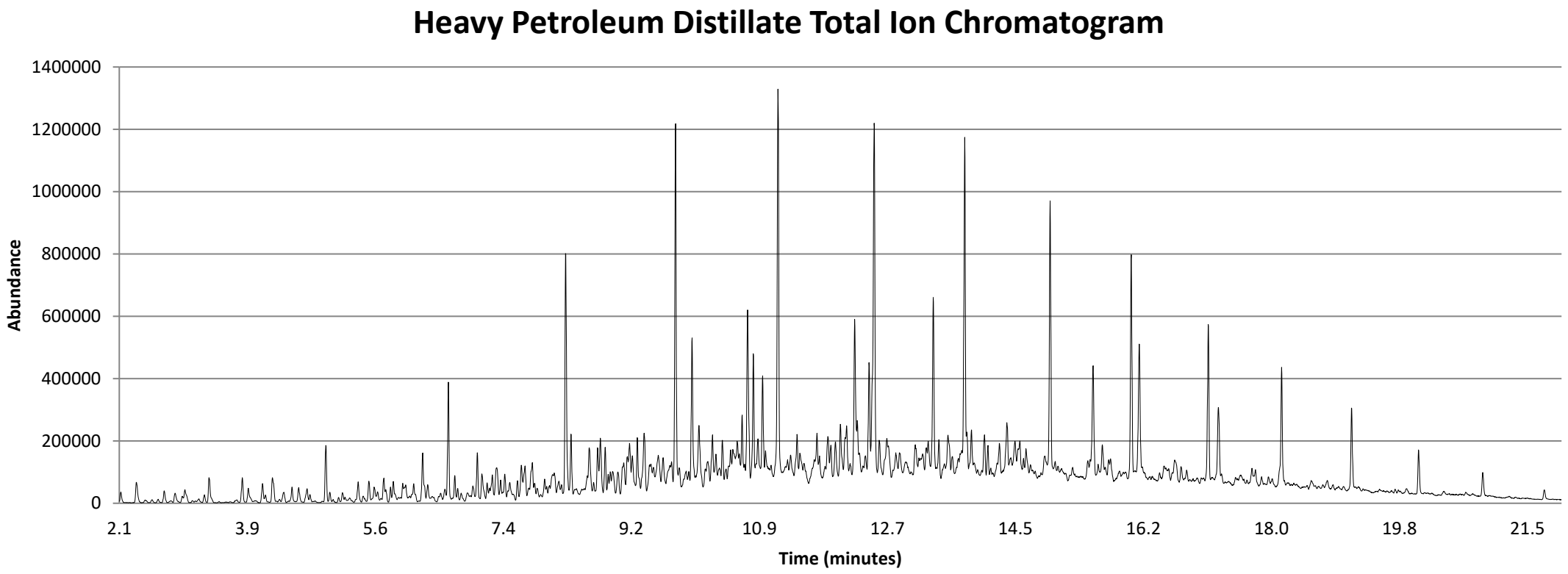
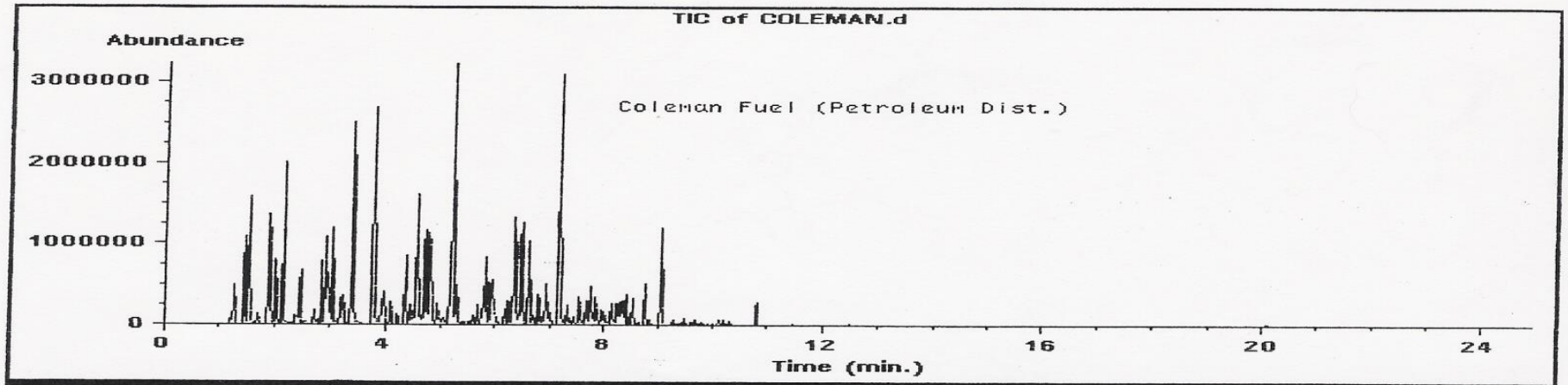


Classification of Ignitable Liquids



Classification of Ignitable Liquids




TIC of COLEMAN.d
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1000000
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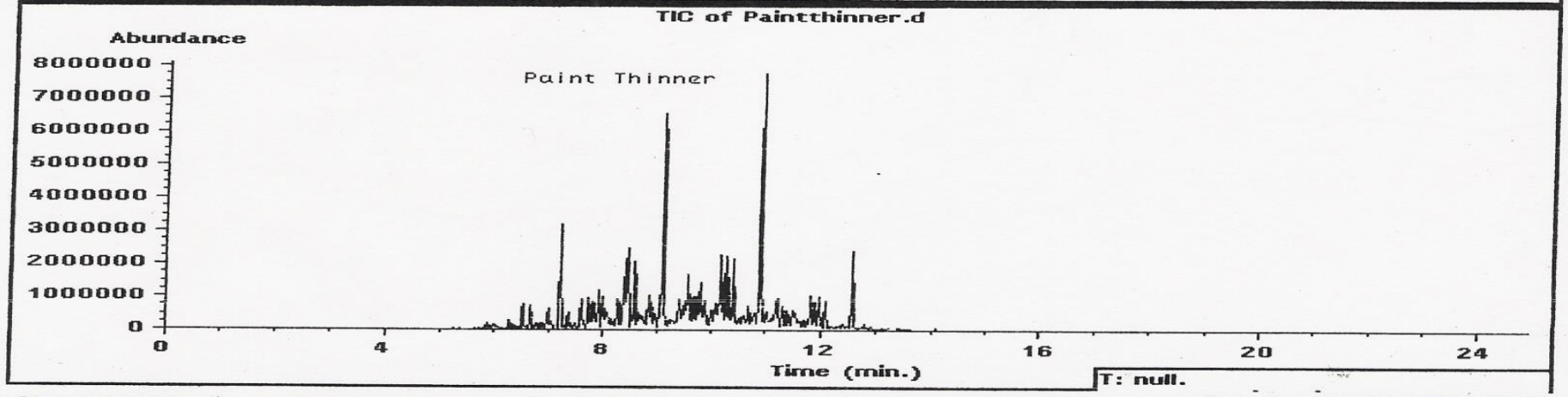
Coleman Fuel (Petroleum Dist.)
0
4
8
12
16
20
24
Time (min.)


TIC of Paintthinner.d
Abundance
8000000
7000000
6000000
5000000
4000000
3000000
2000000
1000000
0
Paint Thinner
0
4
8
12
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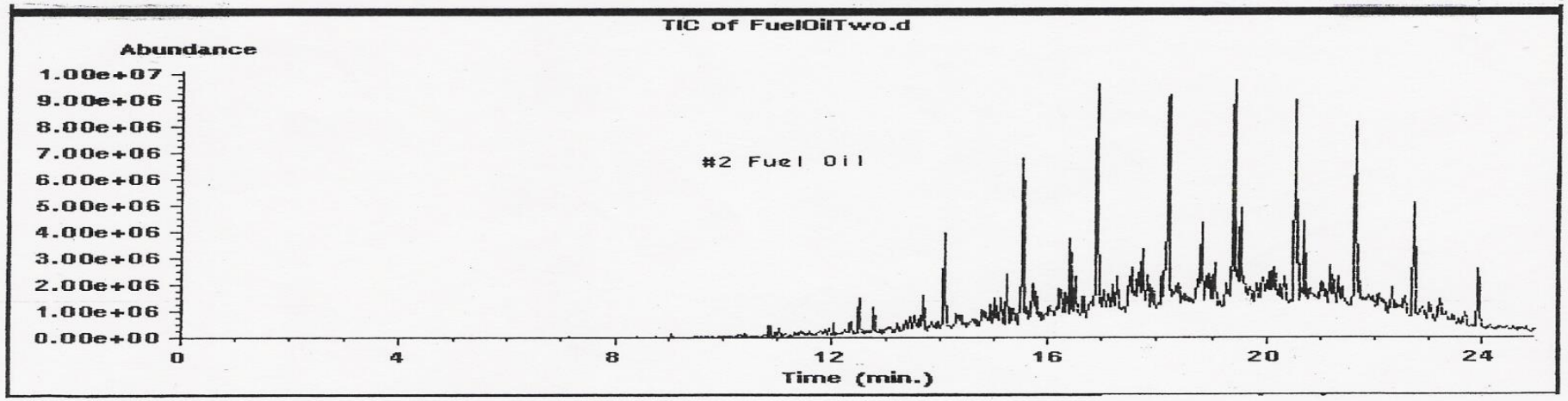
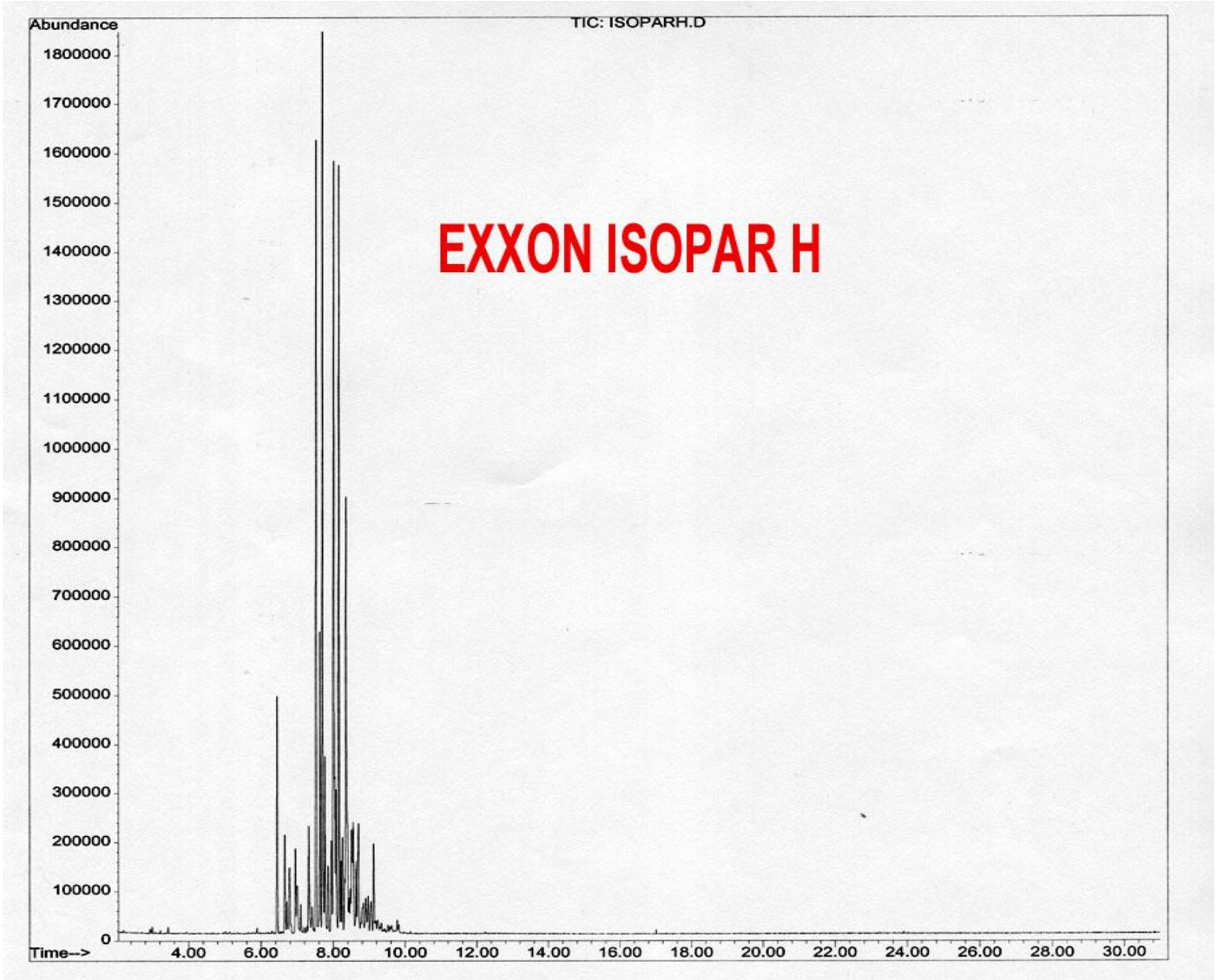
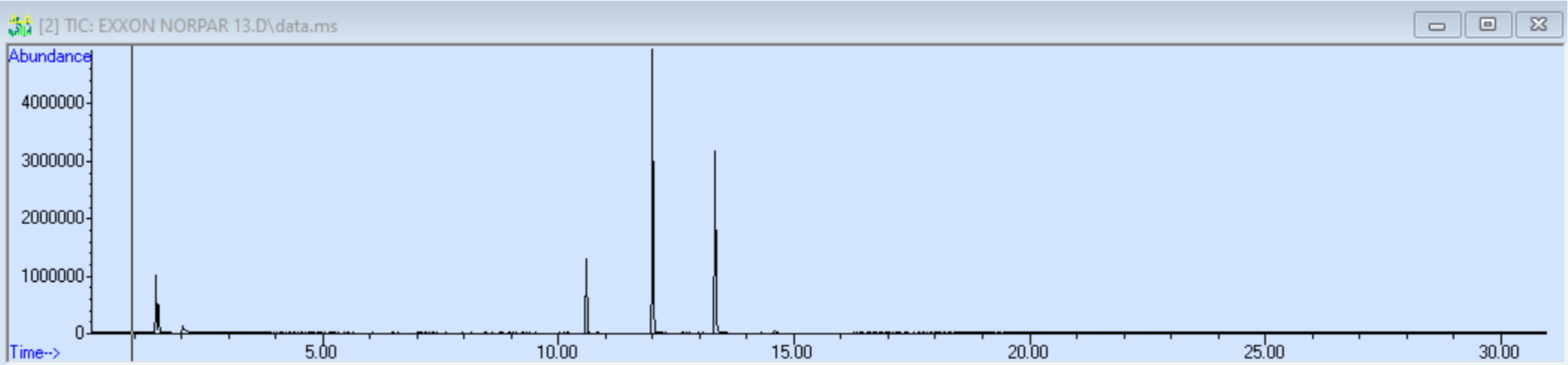
Time (min.)
T: null.

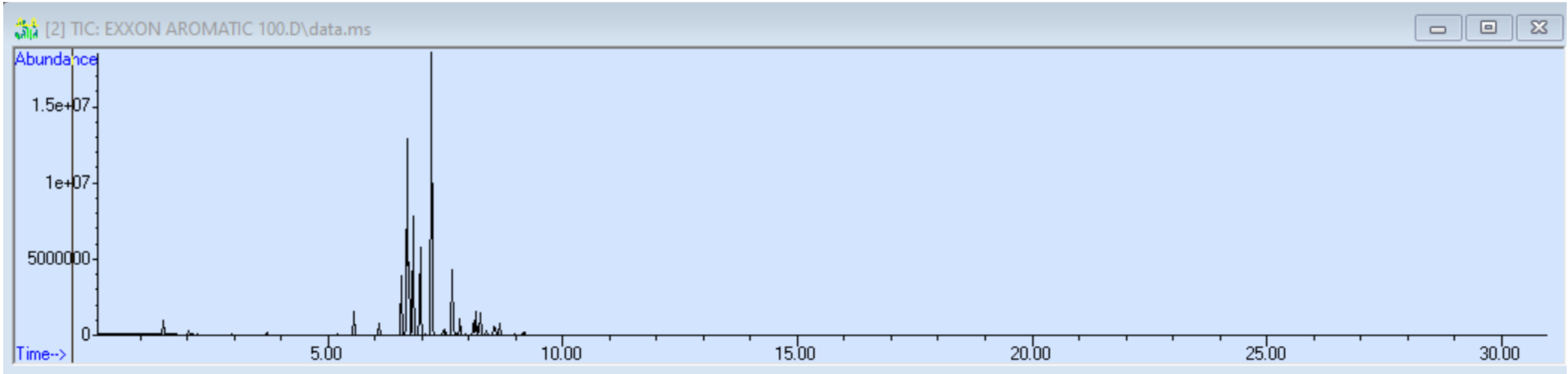

TIC of FuelOilTwo.d
Abundance
1.00e+07
9.00e+06
8.00e+06
7.00e+06
6.00e+06
5.00e+06
4.00e+06
3.00e+06
2.00e+06
1.00e+06
0.00e+00
#2 Fuel Oil
0
4
8
12
16
20
24
Time (min.)


TIC: ISOPARH.D
Abundance
1800000
1700000
1600000
1500000
1400000
1300000
1200000
1100000
1000000
900000
800000
700000
600000
500000
400000
300000
200000
100000
0
Time-->
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
22.00
24.00
26.00
28.00
30.00
EXXON ISOPAR H

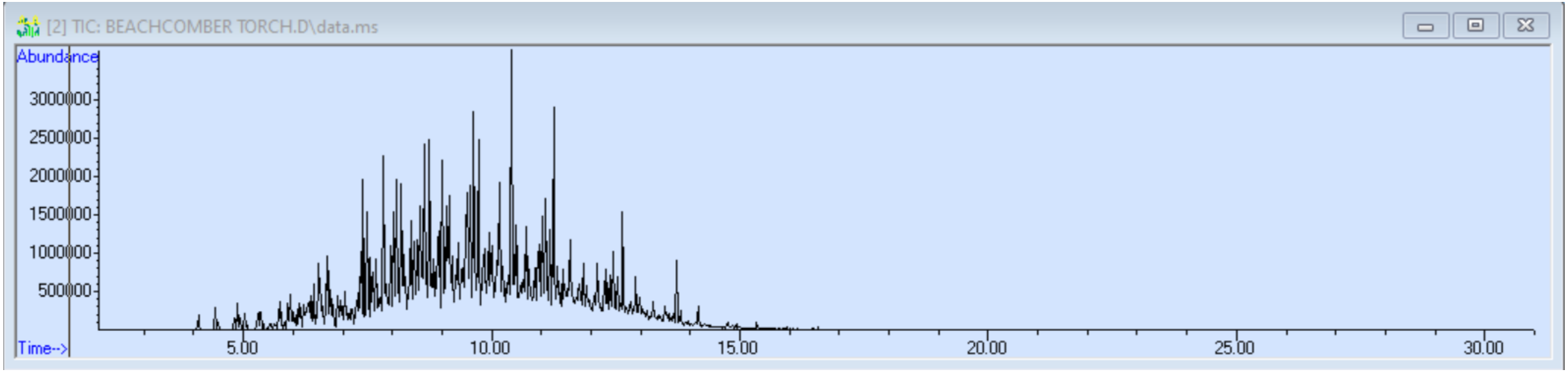
Classification of Ignitable Liquids
N-alkane Product



Classification of Ignitable Liquids
Aromatic Product



Classification of Ignitable Liquids Naphthenic/Paraffinic Product



Classification of Ignitable Liquids Examples of Each Classification

- Gasoline – all brands and grades of automotive gasoline
- Light Petroleum Distillates (LPD) – petroleum ethers, pocket lighter fluids, camp fuels, specialty solvents, some brands of charcoal starters
- Medium Petroleum Distillates (MPD) – some brands of charcoal starters, paint thinners, dry cleaning solvents, torch fuels
- Heavy Petroleum Distillates (HPD) – fuel oil, diesel fuel, lamp oils, Jet fuel, insect sprays, charcoal starters

Classification of Ignitable Liquids Examples of Each Classification

- Isoparaffinic products – charcoal starters, aviation fuels, solvents for lamp oils, insecticides and polishes, camp fuels
- Oxygenated solvents – alcohols, ketones
- Normal alkanes – specialty products formulated from normal alkanes, lamp oils, solvents for insecticides and polishes
- Naphthenic-Paraffinic products – charcoal starters, lamp oils, insecticide sprays
- Aromatic products – solvents for paints and plastics, carriers for pesticides and printing inks

Classification of Ignitable Liquids

- Miscellaneous/Everything Else
  - There are many ignitable liquids and commercially available products containing an ignitable liquid (solvent) as an ingredient, but the compositions do not neatly fall into on of the other more defined classes or can fall into more than one of these. What do we report these as?
    - Single compounds
    - Mixtures
    - Turpentine
    - Unidentified Petroleum Product
      - Some mixtures, highly degraded samples, specialty solvents

Classification of Ignitable Liquids

- Single Compounds or Simple Mixtures
  - Are reported based upon identification of the compounds rather than classification
    - Example – If isopropyl alcohol and acetone peaks are observed in the chromatogram then “Isopropyl alcohol and acetone” are reported, not “Oxygenated Solvent”
- Mixtures
  - Some ignitable liquids are a mixture from the manufacturer
    - Example – Parade lighter fluid – manufactured as a mixture of an Isoparaffinic Product and MPD
    - E85 gasoline – gasoline but 85% of the volume is ethanol

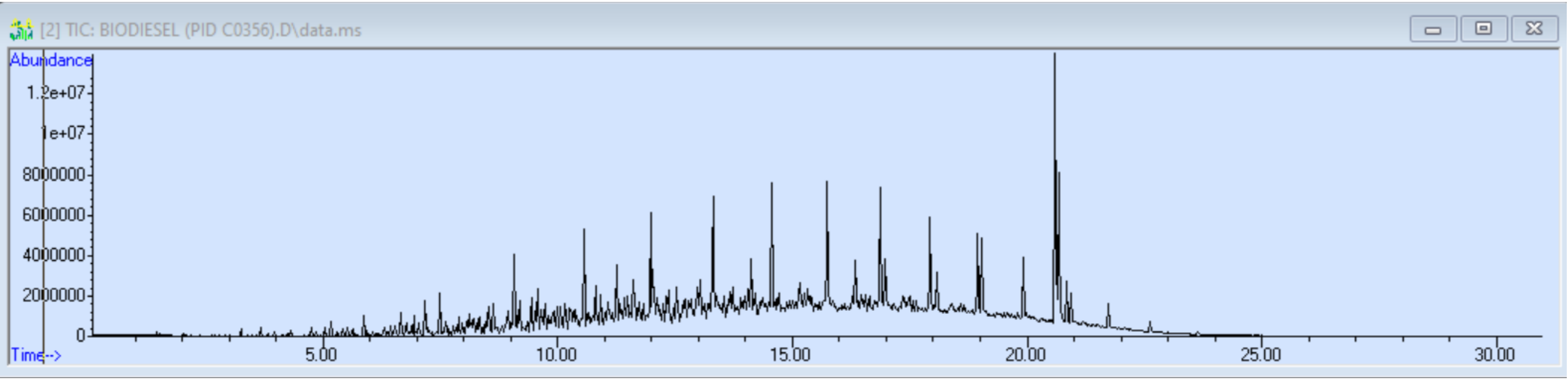
Classification of Ignitable Liquids

- Mixtures (cont.)
  - However, we have no way of knowing if the mixture is manufactured that way or if the suspect mixed two different chemicals together (i.e., acetone and lighter fluid), therefore, we use the following disclaimer whenever reporting out a mixture:
    - "Without a control sample, it is not possible to determine if the above listed components in the findings for Item ___ constitute one product or a mixture of products."

Classification of Ignitable Liquids

- Mixtures (cont.)
  - Biodiesel the exception
    - Mixture of diesel fuel and fatty acid methyl esters (FAME's) from soybeans in Illinois
    - Current report wording: "A heavy petroleum distillate (HPD) and fatty acid methyl esters (FAME's) were identified. This combination is indicative of a biodiesel product. Biodiesel products are ignitable liquids."
    - Trends - Several states are now requiring a small amount of FAME's to be added to all diesel fuels to make more ecofriendly

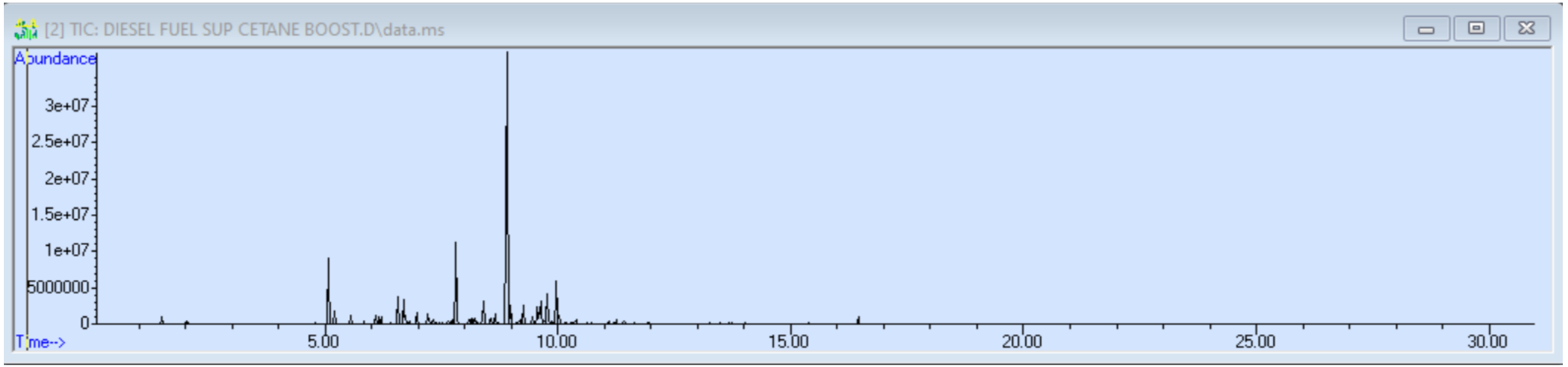
Classification of Ignitable Liquids
Biodiesel Fuel



Classification of Ignitable Liquids

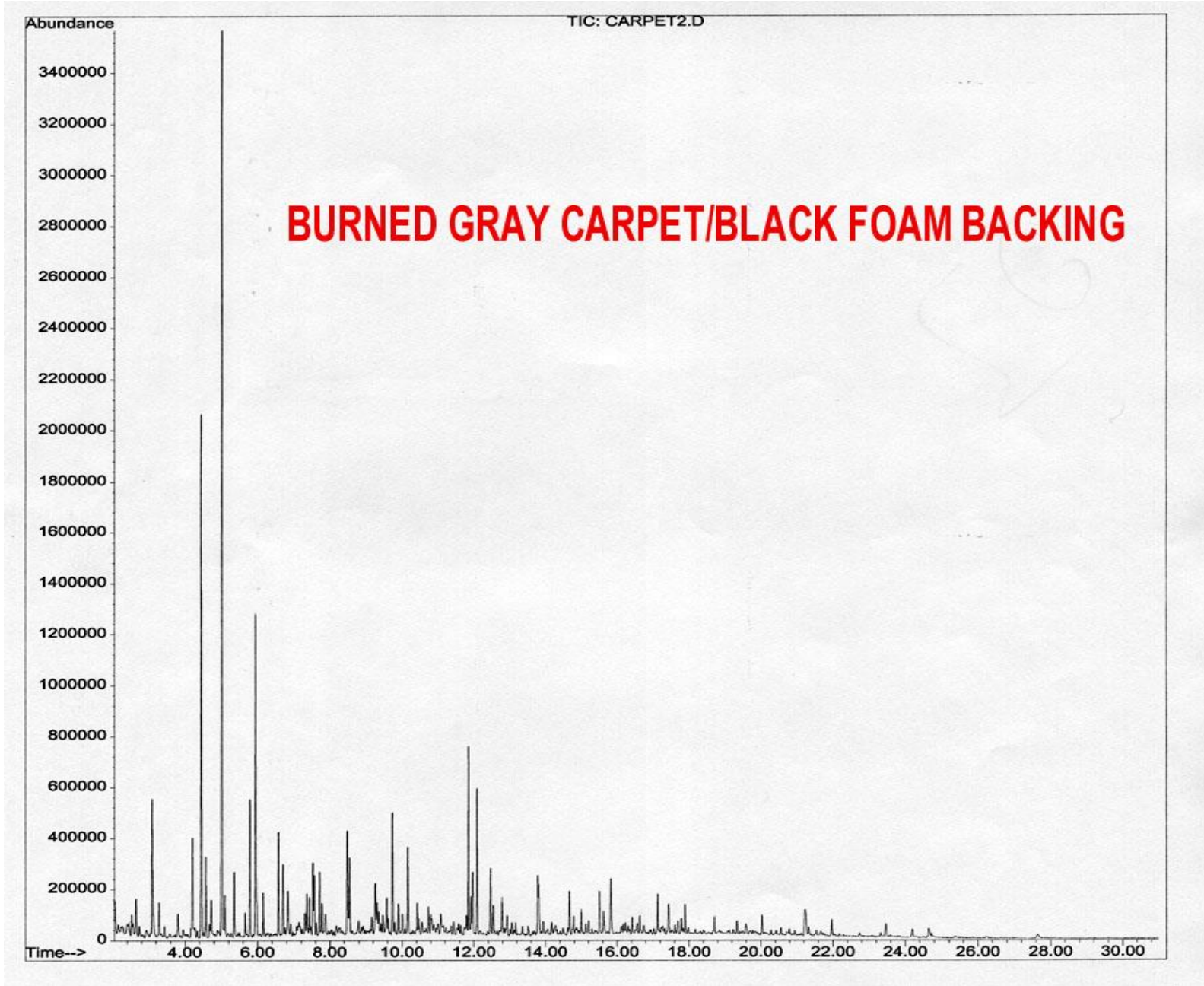
- Not every ignitable liquid falls neatly into a classification
  - Therefore, the need for a miscellaneous category (i.e., “Unidentified Petroleum Product”)
  - Some examples
    - Power Service Diesel fuel supplement + cetane boost
    - Antifreeze – contains ethylene glycol
    - Octane boosters
    - Fuel stabilizers

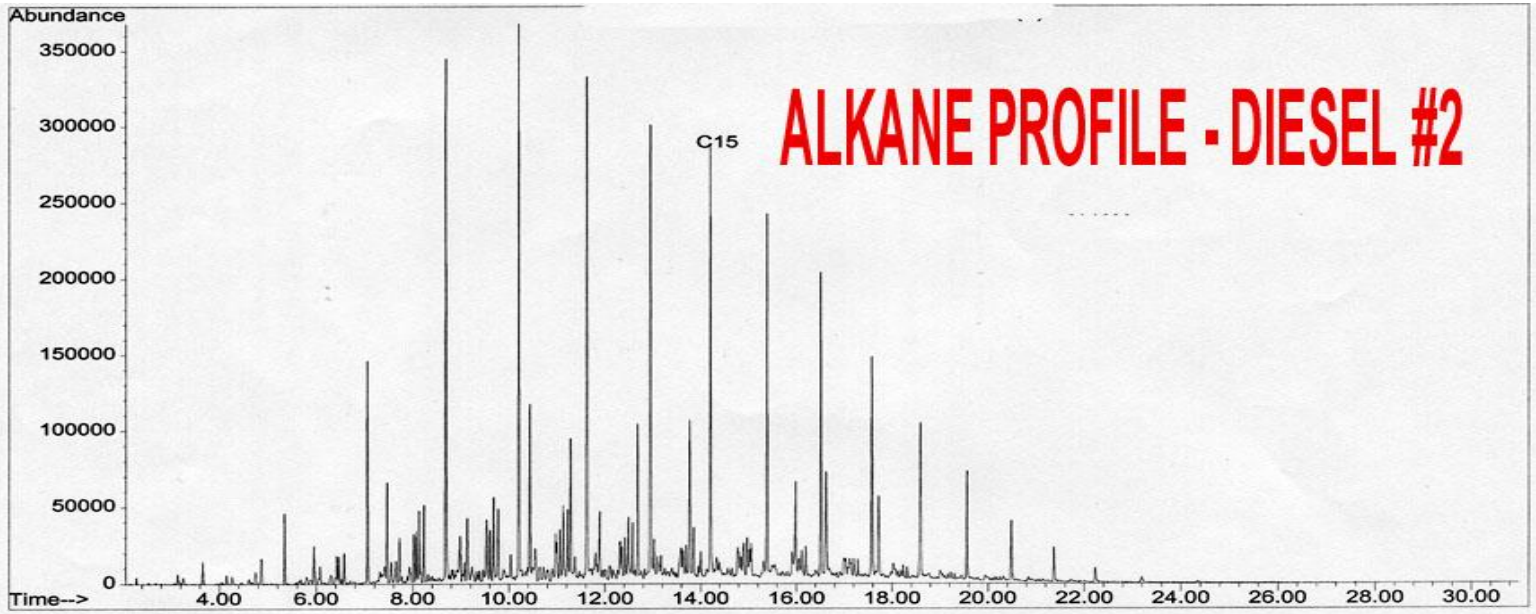
Classification of Ignitable Liquids
Diesel Fuel Supplement

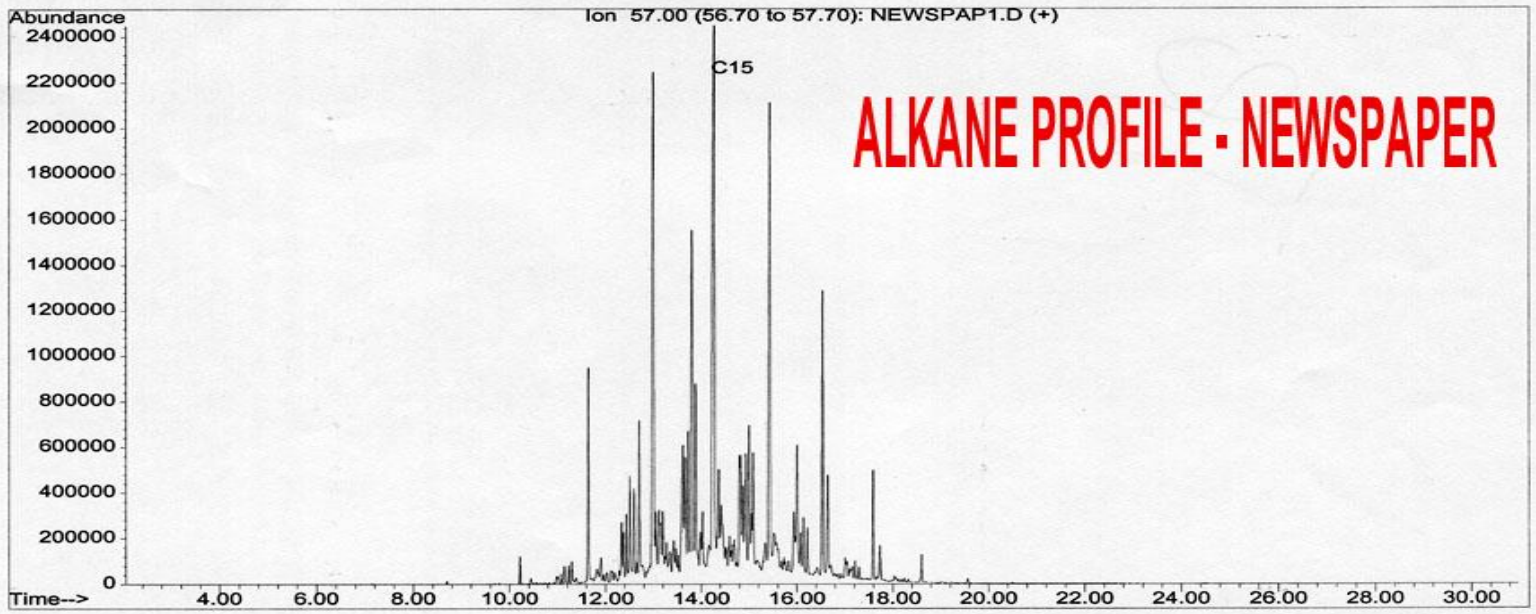


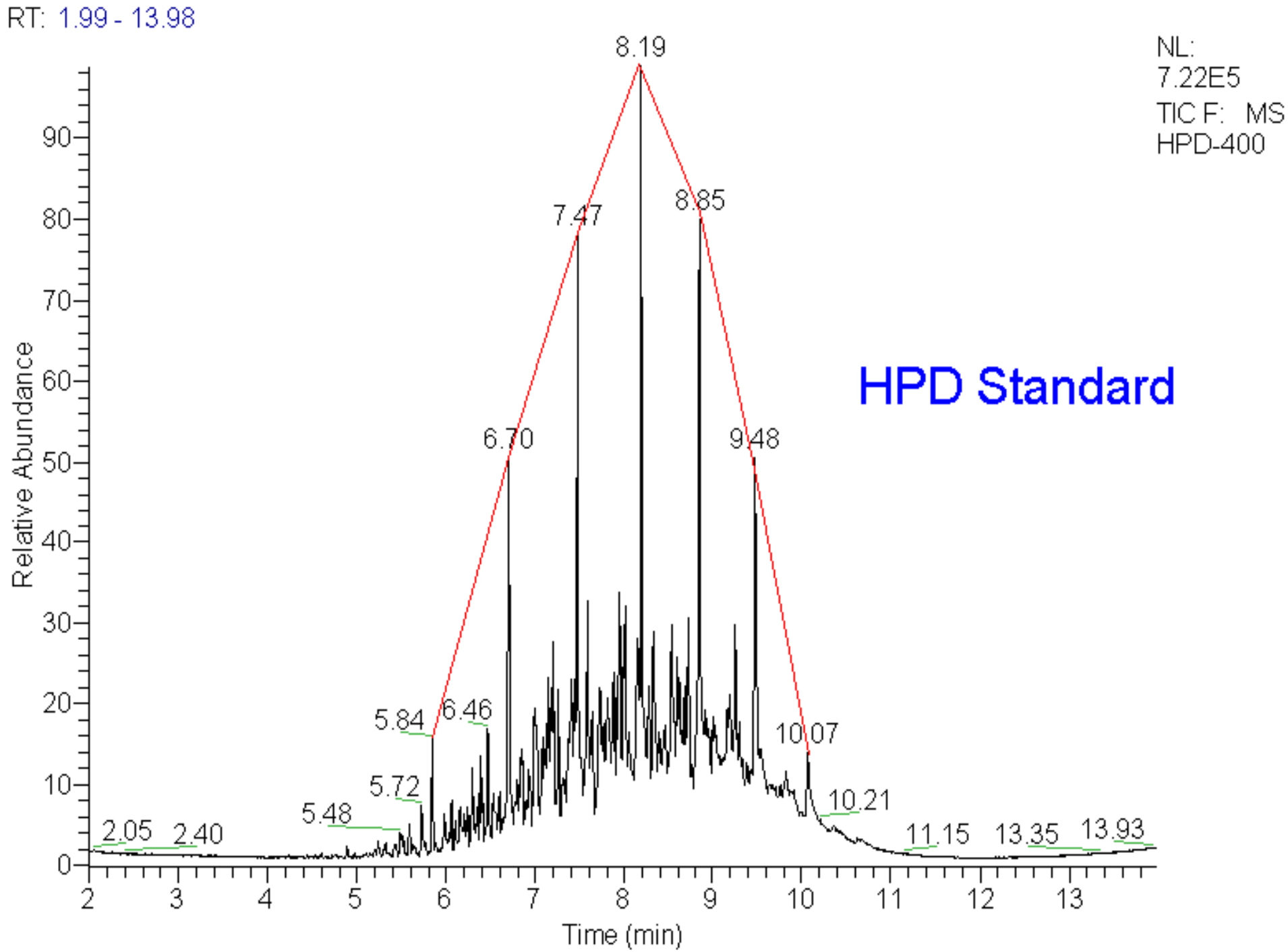
Classification of Ignitable Liquids

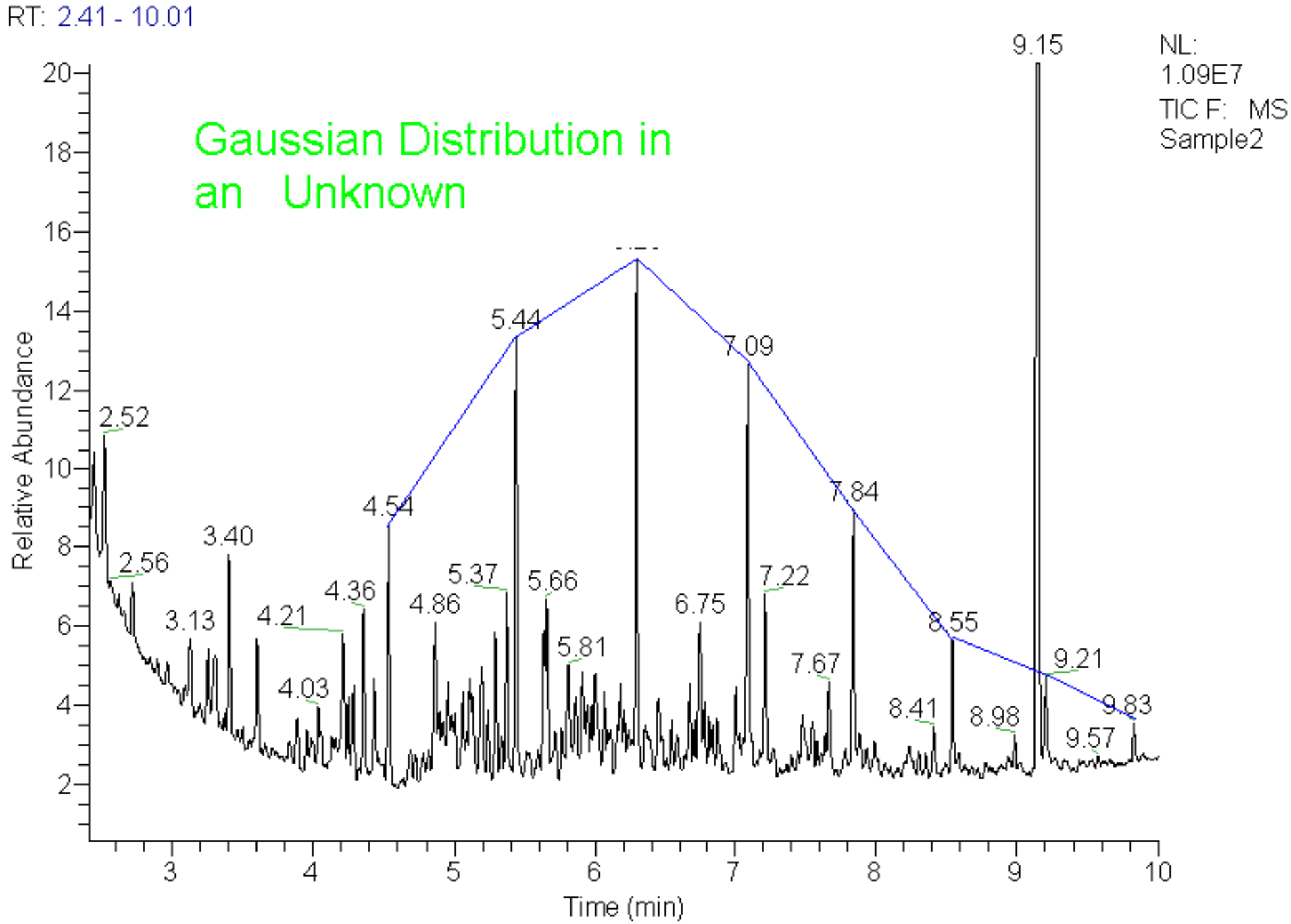
- Complications may arise from substrate interference
  - Terpenes often seen in debris containing soft wood - probably from wood and not a turpentine
    - If terpenes are reported a disclaimer will be added to the report
      - "Terpenes are found in turpentines as well as naturally occurring in some types of wood."
  - Printed material such as newspaper may show HPD in ink
  - Some corrugated cardboards show HPD
  - Some vinyl tiles show isoparaffinic product
  - Some plastics may show what seems like a distillate but do not have a complete pattern

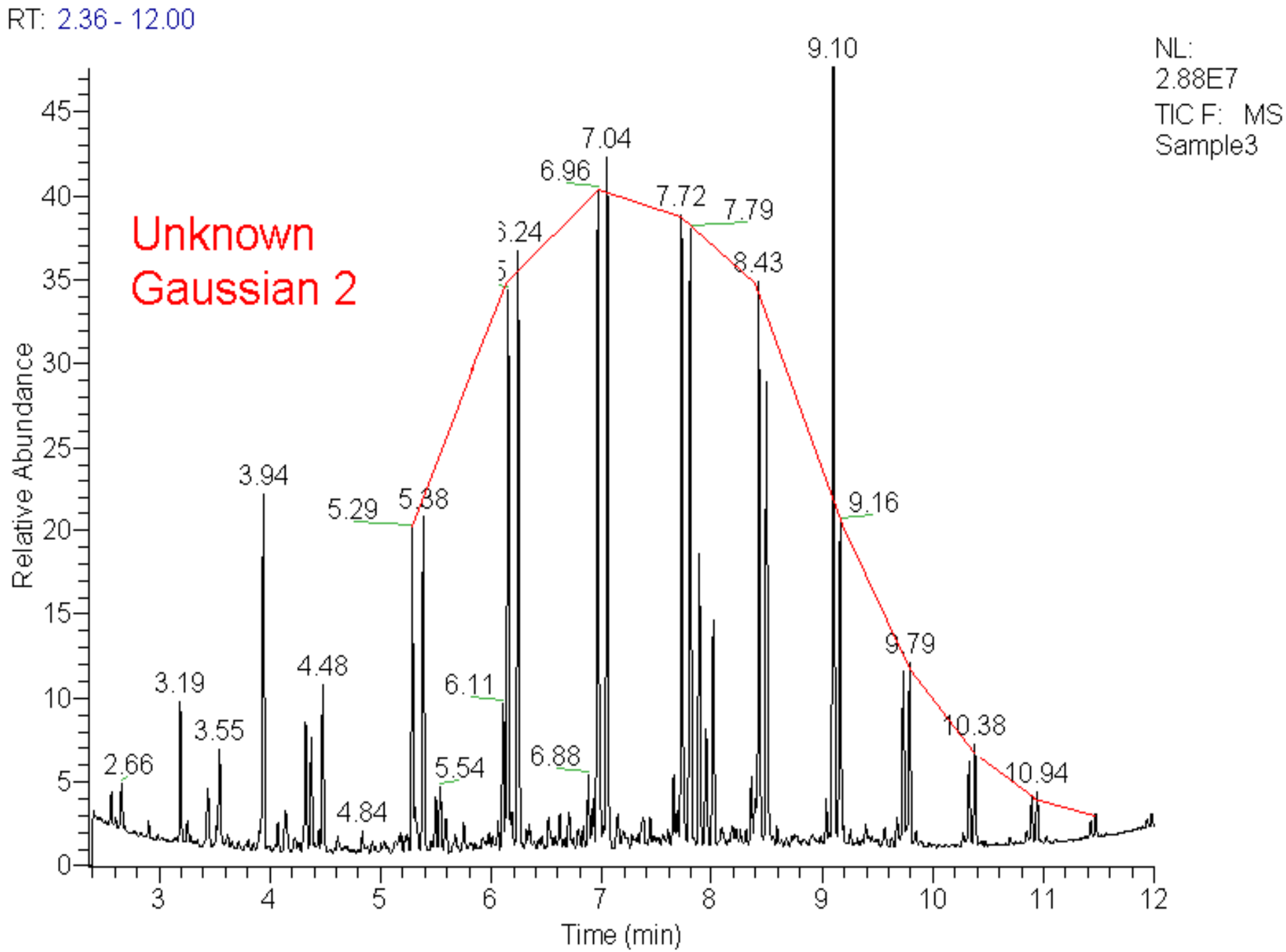

TIC: CARPET2.D
Abundance
3400000
3200000
3000000
2800000
2600000
2400000
2200000
2000000
1800000
1600000
1400000
1200000
1000000
800000
600000
400000
200000
0
Time-->
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
22.00
24.00
26.00
28.00
30.00
BURNED GRAY CARPET/BLACK FOAM BACKING


Abundance
350000
300000
250000
200000
150000
100000
50000
0
Time-->
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
22.00
24.00
26.00
28.00
30.00
C15
ALKANE PROFILE - DIESEL #2


Abundance
Ion 57.00 (56.70 to 57.70): NEWSPAP1.D (+)
2400000
2200000
2000000
1800000
1600000
1400000
1200000
1000000
800000
600000
400000
200000
0
Time-->
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
22.00
24.00
26.00
28.00
30.00
C15
ALKANE PROFILE - NEWSPAPER

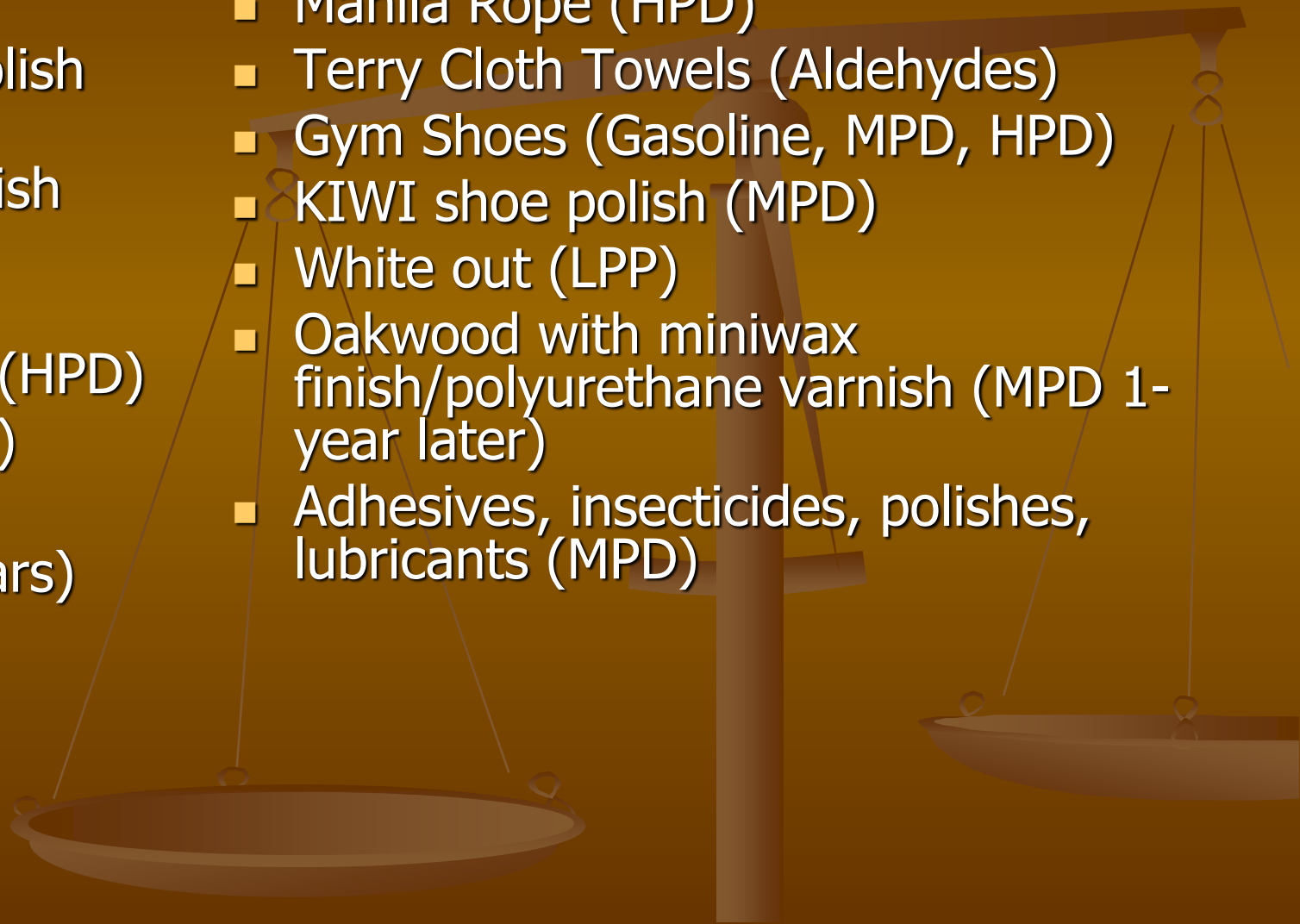

RT: 1.99 - 13.98
NL:
7.22E5
TIC F: MS
HPD-400
HPD Standard
Relative Abundance
Time (min)
8.19
7.47
8.85
6.70
9.48
5.84
6.46
10.07
5.72
10.21
5.48
2.05
2.40
11.15
13.35
13.93


RT: 2.41 - 10.01
Gaussian Distribution in
an Unknown
NL:
1.09E7
TIC F: MS
Sample2
Relative Abundance
Time (min)
2.52
2.56
3.13
3.40
4.03
4.21
4.36
4.54
4.86
5.37
5.44
5.66
5.81
6.75
7.09
7.22
7.67
7.84
8.41
8.55
8.98
9.15
9.21
9.57
9.83


RT: 2.36 - 12.00
NL:
2.88E7
TIC F: MS
Sample3
Unknown
Gaussian 2
Relative Abundance
Time (min)
9.10
7.04
6.96
7.72
7.79
8.43
3.24
3.94
5.29
5.38
9.16
9.79
10.38
10.94
4.48
3.19
6.11
3.55
2.66
5.54
6.88
4.84
0
5
10
15
20
25
30
35
40
45
3
4
5
6
7
8
9
10
11
12

Petroleum Laced Products

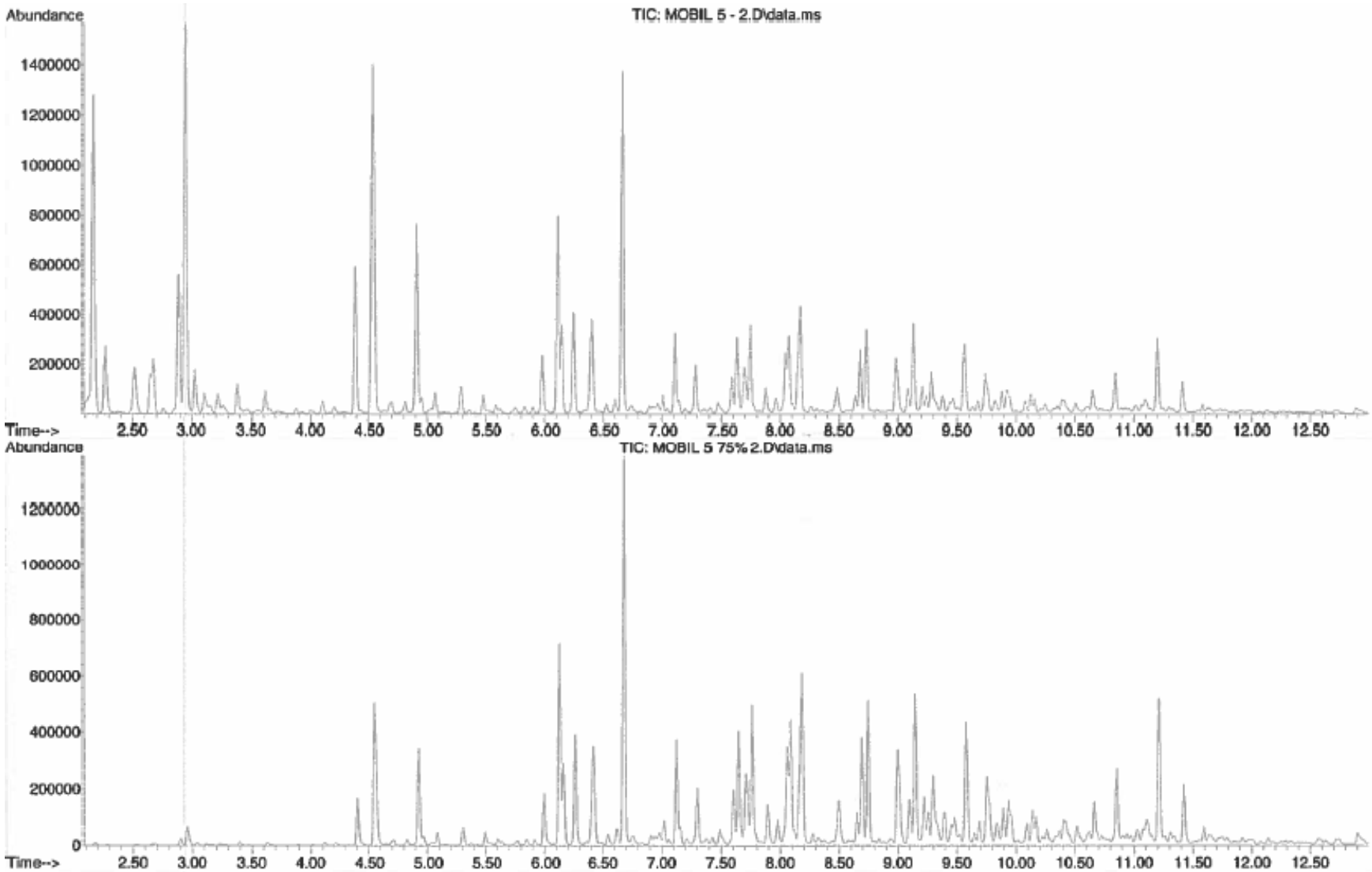
- Raid (HPD)
- Lemon Oil Liquid Furniture Polish (HPD)
- Homer Formby's Tung Oil Finish (MPD)
- WD40 (MPD)
- Paper Products: Newspapers (HPD)
- Carbonless Forms (N-Alkanes)
- Zip-lock bags (MPD)
- Mini Grip Storage Bags (Isopars)
- Manila Rope (HPD)
- Terry Cloth Towels (Aldehydes)
- Gym Shoes (Gasoline, MPD, HPD)
- KIWI shoe polish (MPD)
- White out (LPP)
- Oakwood with miniwax finish/polyurethane varnish (MPD 1-year later)
- Adhesives, insecticides, polishes, lubricants (MPD)



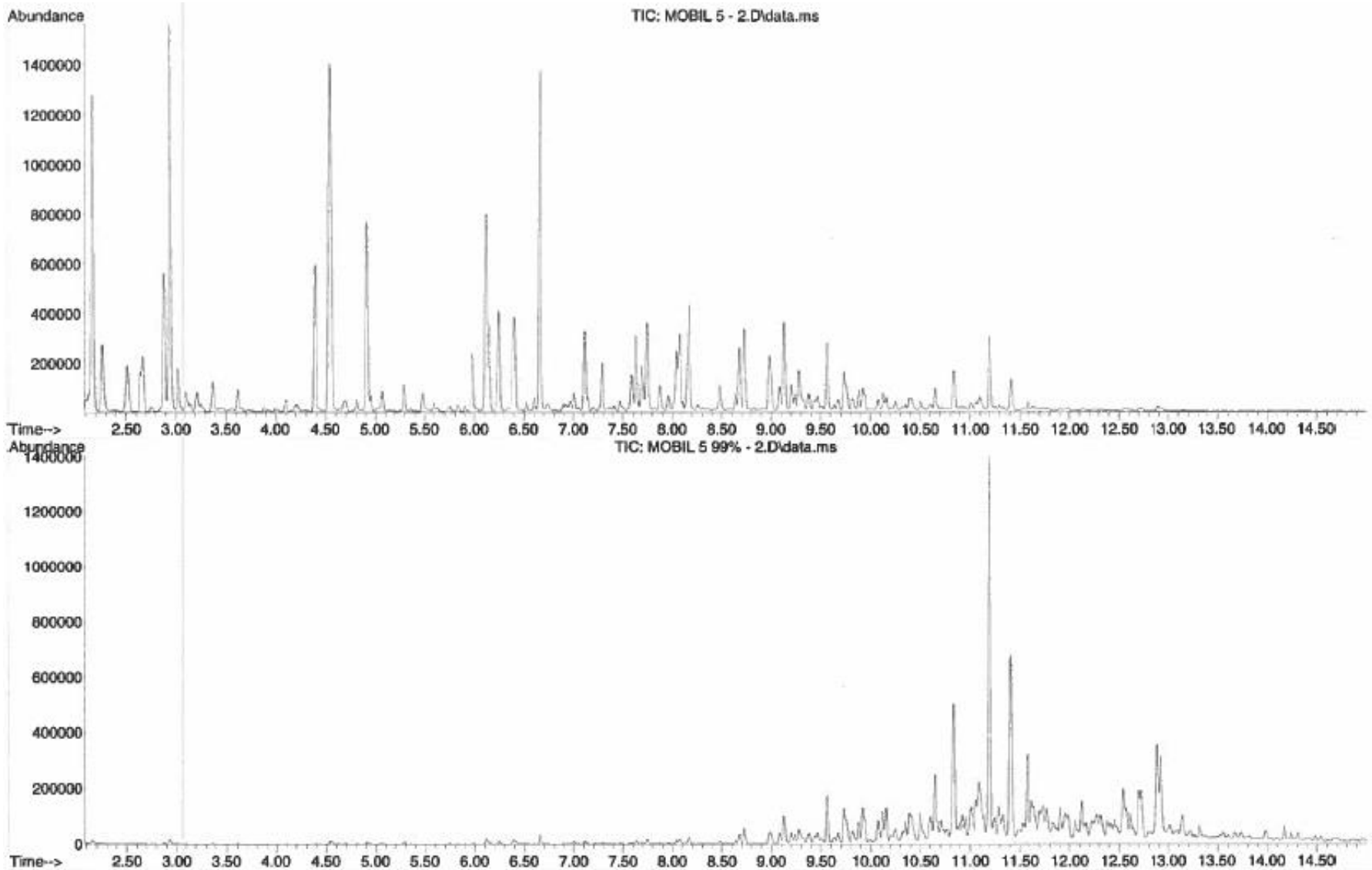
Classification of Ignitable Liquids

- Complications may arise from environment
  - Debris often shows evaporated ignitable liquid
    - FSC-C has an extensive ignitable liquids library which includes neat ignitable liquids along with several stages of evaporation from every possible classification for comparison

Gasoline Weathering ~75%



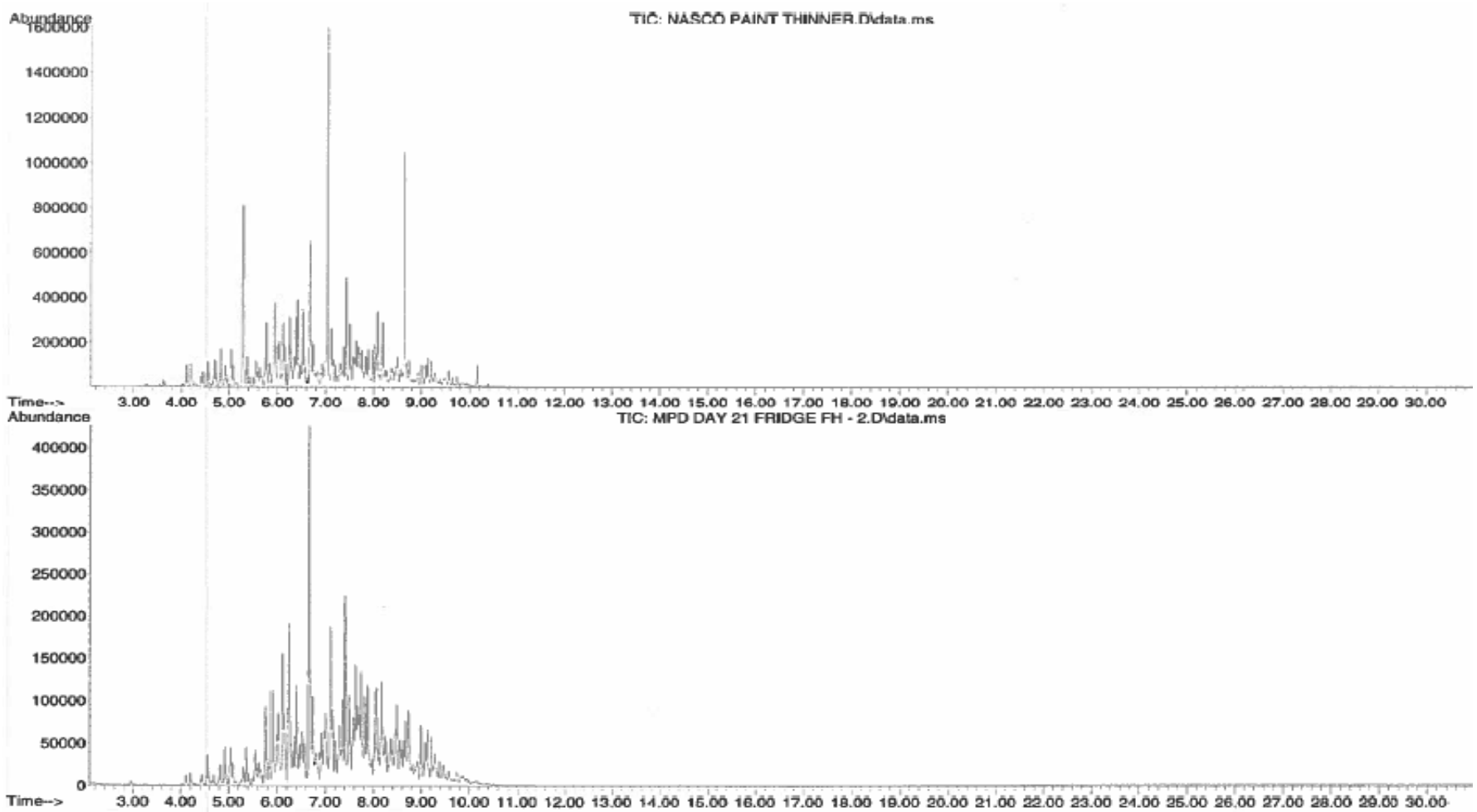
Gasoline Weathering ~99%



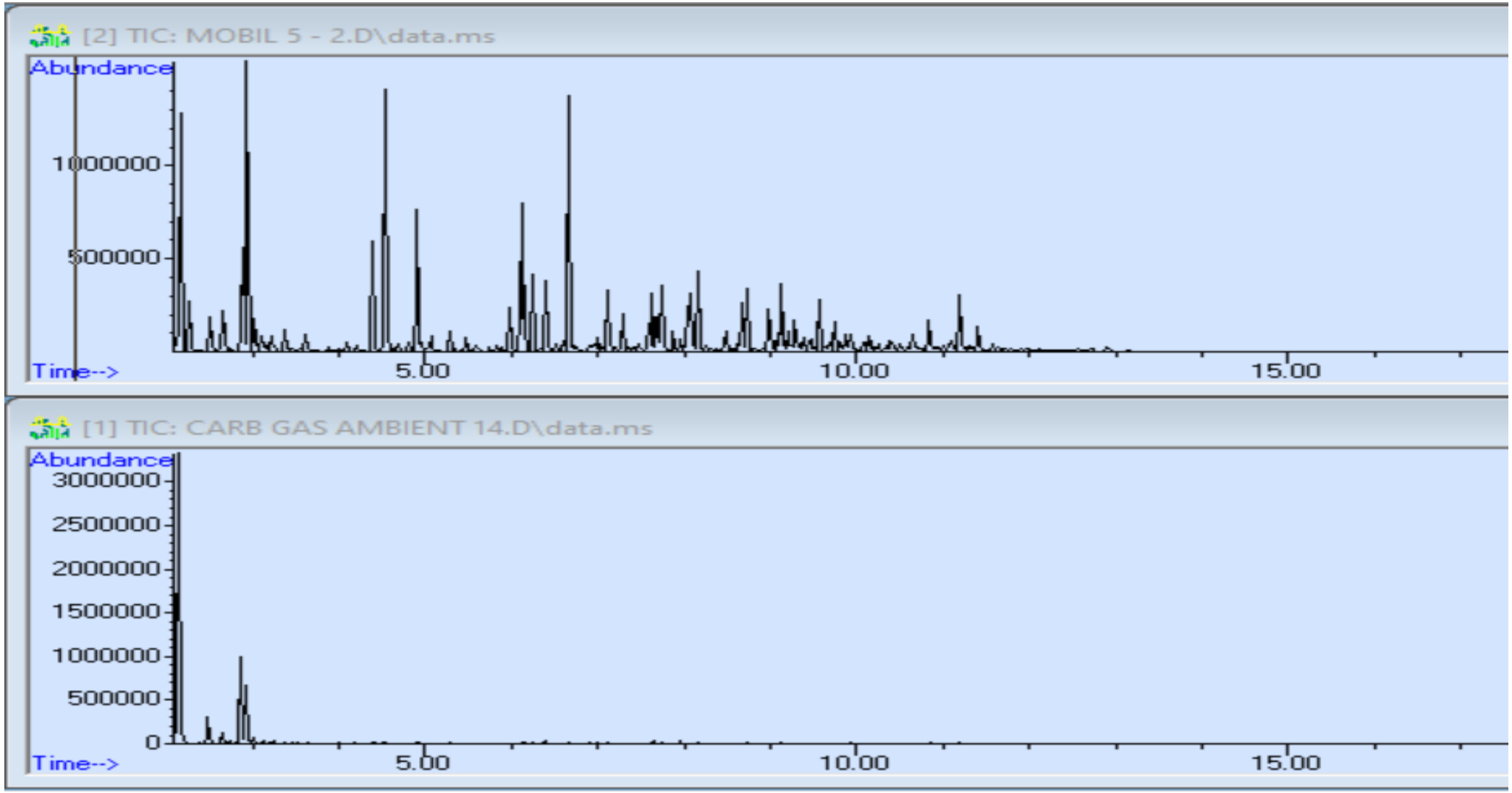
Classification of Ignitable Liquids

- Complications may arise from environment (cont.)
  - Debris may show degradation due to bacteria
    - Usually seen in debris containing soil or garbage
    - FSC-C has done degradation studies on gasoline, MPD's and HPD's
    - These are reported as degraded gasoline, MPD, etc.
    - Important to collect sample at scene and get them to the crime lab as soon as possible to minimize these effects (all our items containing debris are stored in a freezer inside our vault)

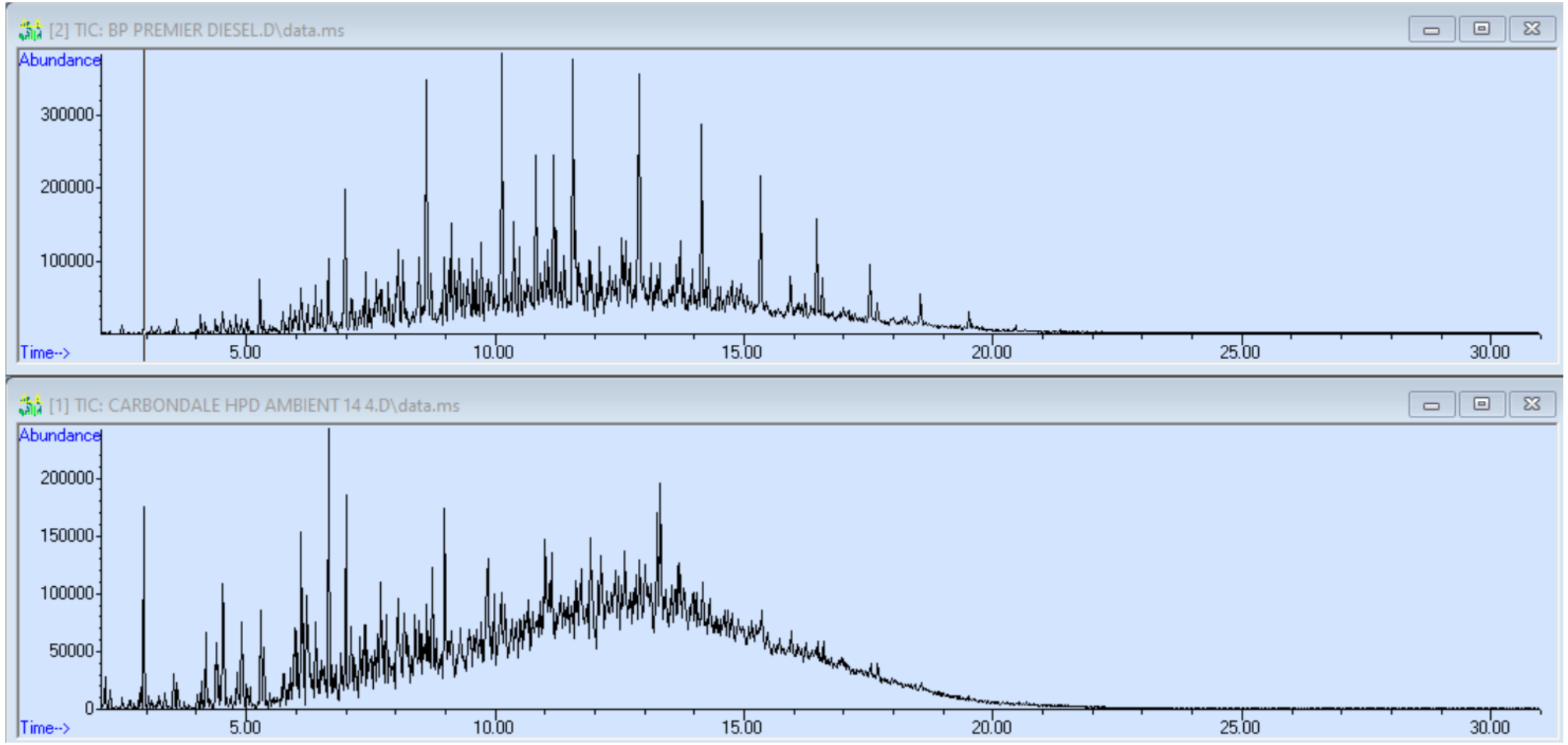
Classification of Ignitable Liquids
(MPD Degradation – 21 days Freezer)



Classification of Ignitable Liquids (Gasoline Degradation – 14 days)



Classification of Ignitable Liquids (HPD Degradation – 14 days)



Some Reasons for Negative or Inconclusive Findings

- May be only fragmentary patterns or too weak to tell conclusively
- Patterns may look very much like flammable liquid but ratios off or something else present or missing
- No ignitable liquids present or ignitable liquid consumed by high temperatures in a fire
- Improper packaging
- Lack of instrument sensitivity
- Limited accelerant reference standards
- Pyrolysis/substrate product interference
- Degradation

Illinois State Police
Division of Forensic Services
Forensic Science Center at Chicago
1941 West Roosevelt Road
Chicago, Illinois 60608-1229
(312) 433-8000 (Voice) * (800) 255-3323 (TDD)

LABORATORY REPORT
Trace

GREGORY GRANADON 20240
BOMB AND ARSON DIVISION
BOMB AND ARSON SECTION
3340 WEST FILLMORE
CHICAGO IL 60624

DFS Case #: C18-017810
Report #: 2
Report Date: 05/09/2019

Agency Case #: JB385627
Offense(s): Battery
Offense Category(s): Battery
Victim(s): Stephanie Smith
Suspect(s):

Item(s) Submitted:

LAB ITEM #	AGENCY ITEM #	DESCRIPTION
1	14237624-9089938	1-VIAL OF LIQUID FROM GAS CAN

Results:

ITEM #	DESCRIPTION	FINDINGS
1	Liquid	Gasoline

Any analysis conducted is accredited under the laboratory's ISO/IEC 17025 accreditation issued by ANSI-ASQ National Accreditation Board (ANAB). Refer to certificate #AT-1697 and associated Scope of Accreditation.

Respectfully submitted,

Adrienne M. Bickel

Ignitable Liquid Analysis

- When finished with analysis, we seal evidence and return to agency
- Report is generated and the agency can access it in LIMS
- We are always available for questions

Fire Debris Cases

- Worked over 2000 fire debris cases
  - Never hear outcome unless I go to court
  - Have only testified 7 times for fire debris
- People vs. James Roberts
  - Accused of attempted murder
  - Poured isopropyl alcohol on his wife's head and set her on fire in a grocery store parking lot
  - Items submitted:
    - Partially charred dark brown wig – no ignitable liquids were found
    - Partially charred bra – isopropyl alcohol
  - Found guilty of 9 felony counts – aggravated battery causing great bodily harm with a flammable substance, aggravated domestic battery, aggravated battery – great bodily harm
    - Received 18 years

Fire Debris Cases

- People Vs. Ocheil Keys
  - Accused of first-degree murder, concealment of homicidal death, and dismembering a human body
  - Accused of shooting girlfriend in the head, moving body to a fire pit in the backyard of an abandoned house and setting the body on fire.
    - Came back to the fire pit the next day to find that the rain had put the fire out and animals were eating the body.
    - He cut up the body, put the pieces in a garbage bag and put the garbage bag in the back seat of mother vehicle where it was found by police
  - In the fire pit, bones and clothing were found.
  - Items submitted for analysis:
    - Fire debris from burn pit – degraded gasoline
    - Black fabric from burn pit – no ignitable liquids were found
    - Burned plastic from burn pit - gasoline
    - Burned carpet from burn pit – degraded gasoline
  - Found guilty of all counts and sentenced to 96 years in prison

Questions?


PEOPLE
QUALITY
INTEGRITY
TRAINING
INNOVATION
LEADERSHIP
KNOWLEDGE THROUGH EXCELLENCE IN FORENSIC SCIENCE
ILLINOIS STATE POLICE