

FT-IR self-user training

SEON HYE SON

UNIST Central Research Facilities (UCRF)
Ulsan National Institute of Science and Technology (UNIST)

Search condition

Reservation date: 2015.01.01 ~ 2015.08.04

Reservation
 Input result
 Completed
 All

1st classification: 2nd classification: Equipment name:

Equipment booking list

Select	Status	Sortation	Equipment name	Chief of research	Reservation date	Reservation time	Fee	1st classification	2nd classification name	Application date	Free_Test	Free_Longterm	Memo
<input type="checkbox"/>	Reservation	Self	AFM-Raman	김영기	2015.07.24	14:00~15:00	0.00	UMAL - 기기분석실	Surface Analysis	2015.07.17 11:08	<input type="checkbox"/>	<input type="checkbox"/>	<input type="button" value="Memo"/>
<input type="checkbox"/>	Reservation	Self	Confocal Raman	김영기	2015.07.24	14:00~15:00	0.00	UMAL - 기기분석실	Surface Analysis	2015.07.17 11:07	<input type="checkbox"/>	<input type="checkbox"/>	<input type="button" value="Memo"/>
<input type="checkbox"/>	Reservation	Self	FT-IR	김영기	2015.07.23	13:30~17:00	0.00	UMAL - 기기분석실	Spectroscopic Analys	2015.07.17 11:05	<input type="checkbox"/>	<input type="checkbox"/>	<input type="button" value="Memo"/>
<input type="checkbox"/>	Reservation	Self	Confocal Raman	김영기	2015.07.22	13:00~14:00	0.00	UMAL - 기기분석실	Surface Analysis	2015.07.20 11:20	<input type="checkbox"/>	<input type="checkbox"/>	<input type="button" value="Memo"/>
<input type="checkbox"/>	Reservation	Self	Fluorometer	김영기	2015.07.20	14:00~14:30	0.00	UMAL - 기기분석실	Spectroscopic Analysis	2015.07.17 11:03	<input type="checkbox"/>	<input type="checkbox"/>	<input type="button" value="Memo"/>
<input type="checkbox"/>	Reservation	Self	Fluorometer	김영기	2015.07.20	13:30~14:00	0.00	UMAL - 기기분석실	Spectroscopic Analysis	2015.07.16 16:55	<input type="checkbox"/>	<input type="checkbox"/>	<input type="button" value="Memo"/>
<input type="checkbox"/>	Reservation	Self	FT-IR	김영기	2015.07.17	16:00~17:00	0.00	UMAL - 기기분석실	Spectroscopic Analys	2015.07.17 18:00	<input type="checkbox"/>	<input type="checkbox"/>	<input type="button" value="Memo"/>

3)

1)

2)

Application

Select equipment

Client ID: shson35@unist.ac.kr / 30678 / 손선혜

Subscriber: 30678 손선혜

1st classification: UMAL - 기기분석실 2nd classification: Surface Analysis 3rd classification: Confocal Raman

project information

Chief of research: 김영기

Reservation control information

Reservation time unit	daily maximum reservation time	Reservation open timing	Cancelable timing	Fee
30 분	3.0 시간	5 일전	2 시간전	0.5 Hour 12,500 원

유의사항01 Laser power on/off
유의사항02 Keep clean lens to avoid contamination

Time/date	07/20(M)	07/21(T)	07/22(W)	07/23(T)	07/24(F)	07/25(S)	07/26(S)	07/27(M)	07/28(T)	07/29(W)	07/30(T)	07/31(F)	08/01(S)	08/02(S)	08/03(M)
09:00-09:30	✓	✓													
09:30-10:00	✓	✓													
10:00-10:30	✓	✓													
10:30-11:00	✓	✓													
11:00-11:30	✓	✓													
11:30-12:00	✓	✓													
12:00-12:30	✓	✓													
12:30-13:00															
13:00-13:30	✓	✓													
13:30-14:00	✓	✓													
14:00-14:30															
14:30-15:00															
15:00-15:30															
15:30-16:00	✓	✓													
16:00-16:30	✓	✓													
16:30-17:00	✓	✓													

1) Select the classification and equipment

2) Select the time you want on white box.

Yellow box : my reservation

Red box : others reservation

3) Click application

Equipment reservation

Search condition

Reservation date: 2015.01.01 ~ 2015.08.04

Reservation Input result Completed All

1st classification: UMAL - 기기분석실

2nd classification: Surface Analysis

Equipment name: Confocal Raman

Equipment booking list

Select	Status	Sortation	Equipment name	Chief of research	Reservation date	Reservation time	Fee	1st classification	2nd classification name
<input checked="" type="checkbox"/>	Reservation	Self	Confocal Raman	김영기	2015.07.24	14:00~15:00	0.00	UMAL - 기기분석실	Surface Analysis
<input type="checkbox"/>	Reservation	Self	Confocal Raman	김영기	2015.07.22	13:00~14:00	0.00	UMAL - 기기분석실	Surface Analysis

- 1) Select the reservation.
- 2) Click the 'reservation cancel'.

Equipment reservation



Search condition

Inquiry

Reservation date: 2015.01.01 ~ 2015.08.04
 Reservation Input result Completed All

1st classification: UMAL - 기기분석실 2nd classification: Surface Analysis Equipment name: Confocal Raman

Equipment booking list

Application Reservation cancel **Input result**

Select	Status	Sortation	Equipment name	Chief of research	Reservation date	Reservation time	Fee	1st classification	2nd classification name	Application date	Free_Test	Free_Longterm	Memo
<input checked="" type="checkbox"/>	Reservation	Self	Confocal Raman	김영기	2015.07.24	14:00~15:00	0.00	UMAL - 기기분석실	Surface Analysis	2015.07.17 11:07	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	Reservation	Self	Confocal Raman	김영기	2015.07.22	13:00~14:00	0.00	UMAL - 기기분석실	Surface Analysis	2015.07.20 11:20	<input type="checkbox"/>	<input type="checkbox"/>	

- 1) Select the reservation.
- 2) Click the 'Input result'.
- 3) Check the information and click 'save'

Equipment reservation

Save Close

Search condition

Inquiry

Reservation date: 2015.07.24 Application date: 2015.07.17

1st classification: UMA

Reservation information

Reservation number: 2015001217 Reservation date: 2015.07.24 Client authorization: Self : shson35@unist.ac.kr 손선희

Application date: 2015.07.17 Reservation time: 14:00~15:00 Rate: 50 Equipment name: Confocal Raman

Project information

Chief of research	Chief of research	Detail project number	detailed item	Executable amount		
20032	김영기			0	0	0

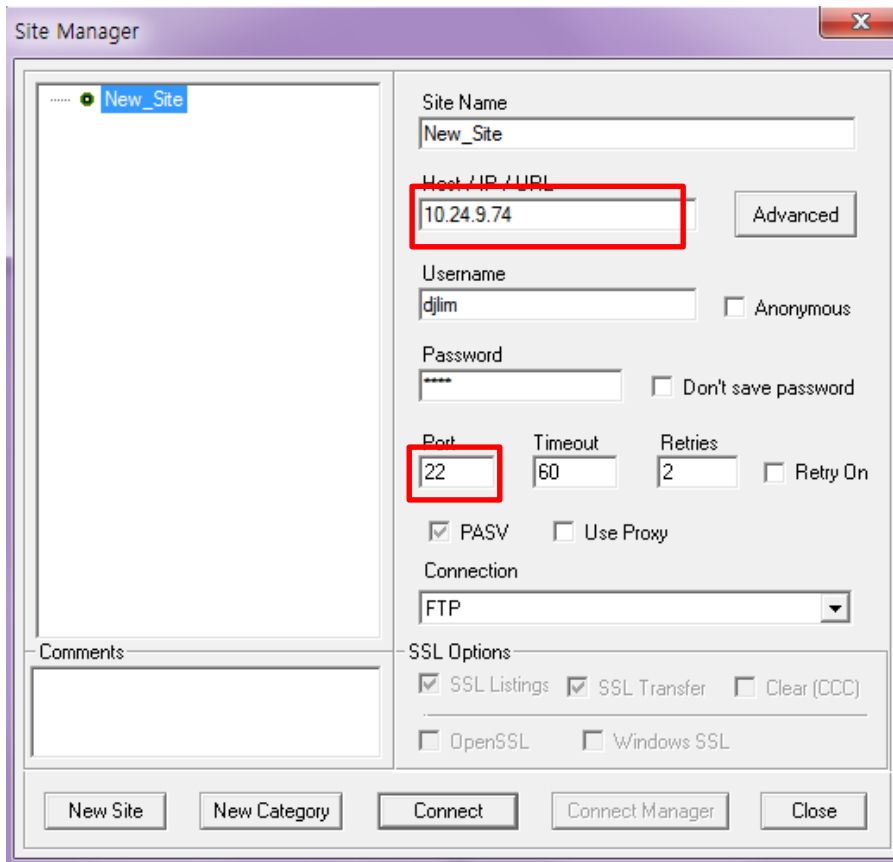
Fee

Cost	Unit quantity	Unit	unit amount	discount applying	Option applying	Amount	Fee	Rate	Amount
기본공정료	0.5	H	12,500	<input checked="" type="checkbox"/>		1.0	25,000	50	12,500
합계							25,000		12,500

Process condition

equipment status (problem and repair)

My PC



Site Manager

New_Site

Site Name
New_Site

Host / IP / URL
10.24.9.74

Advanced

Username
djlim Anonymous

Password
**** Don't save password

Port
22

Timeout
60

Retries
2 Retry On

PASV Use Proxy

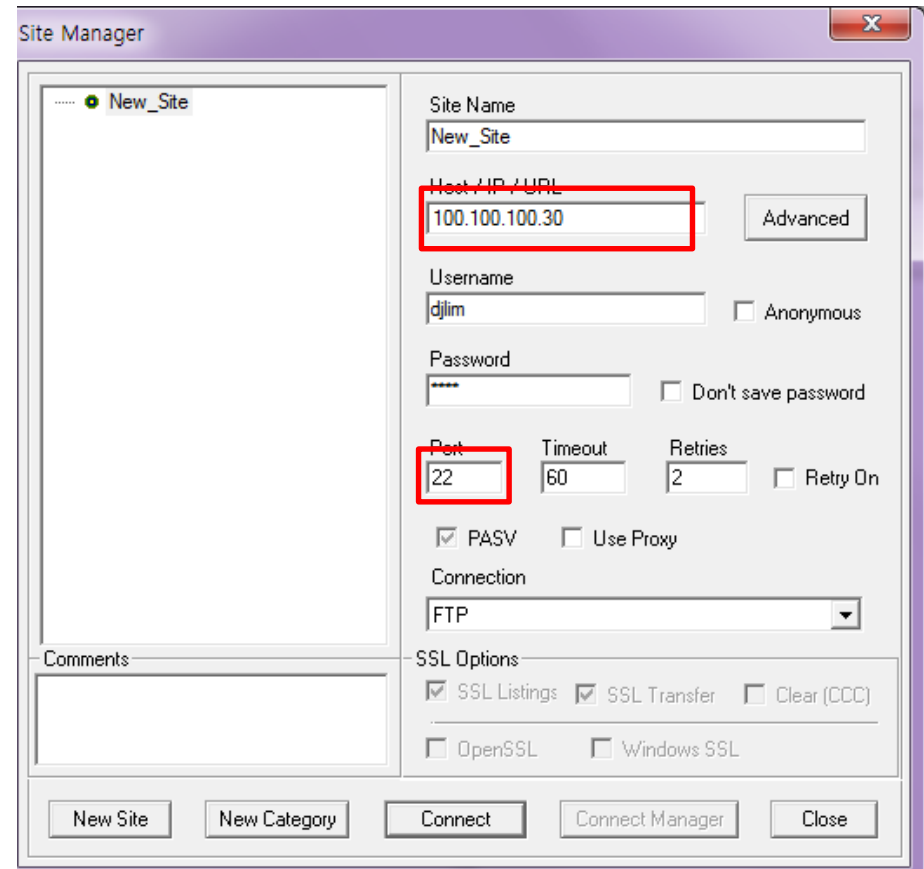
Connection
FTP

SSL Options
 SSL Listings SSL Transfer Clear (CCC)
 OpenSSL Windows SSL

Comments

New Site New Category Connect Connect Manager Close

UCRF PC



Site Manager

New_Site

Site Name
New_Site

Host / IP / URL
100.100.100.30

Advanced

Username
djlim Anonymous

Password
**** Don't save password

Port
22

Timeout
60

Retries
2 Retry On

PASV Use Proxy

Connection
FTP

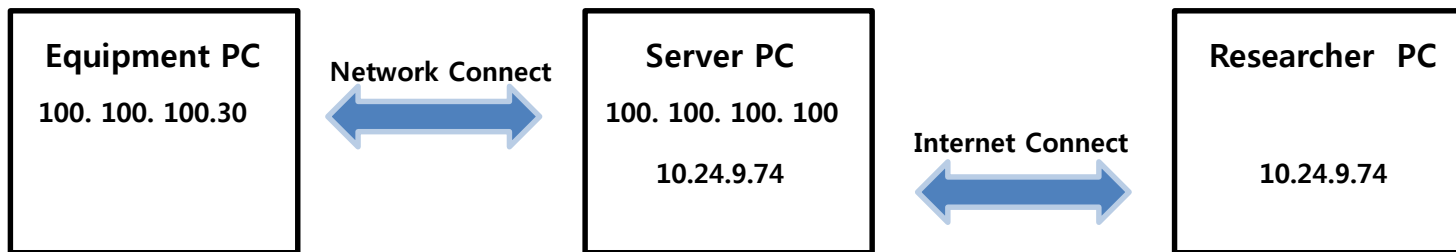
SSL Options
 SSL Listings SSL Transfer Clear (CCC)
 OpenSSL Windows SSL

Comments

New Site New Category Connect Connect Manager Close

Common ID : djlim
Common PW : 0254
Port : 22

Data upload and download



Core FTP LE - 10.24.9.42:22

File View Sites Manage Help

250 CWD command successful. "." is current folder.
 PWD
 257 "." is current directory.
 PASV
 227 Entering Passive Mode (10,24,9,42,146,187).
 LIST
 Connect socket #1020 to 10.24.9.42, port 37563...
 150 Opening data conn
 226 File sent ok
 Transferred 4,523 byte:

Analysis PC or My PC

Server PC

Filename	Size	Date
..		09/13/13 09:07
Fax		08/13/13 11:28
Malvern Instruments		09/19/12 10:43
SAP		10/03/13 17:24
Scanned Documents		08/13/13 11:28
경남은행		08/07/13 15:49
Self 교육.xlsx	14 KB	09/26/12 17:59
XRF_data_보정.xls	112 KB	12/27/12 13:22
거래내역조회_2009_출력.pdf	45 KB	08/07/13 16:13
동위원소상기동률계산_박지혜.xlsx	32 KB	04/26/13 18:00

Filename	Size	Date
<>		
..		
Company		10/04/13 11:...
Labs		10/06/13 20:...
Program		09/02/13 12:...
toengineer		01/30/13 10:...
touser		10/04/13 15:...
UCRF		10/02/13 17:...
UCRF 로그북관리		10/01/13 14:...
AFM 스캐너수리 요구내역.xlsx	0	04/27/13 15:...

Article 1 (Purpose)

This guideline is intended to provide detailed requirements for operating the Central Research Facilities at Ulsan National Institute of Science and Technology (UNIST) (hereinafter referred to as “UCRF”) in accordance with Article 10, Operational Regulations of Central Research Facilities at UNIST.

Article 2 (Scope)

This guideline shall apply to faculty, graduate students, undergraduate students and researchers at UNIST, as well as external clients, who request services from UCRF, and equipment managers.

Article 3 (Definitions)

Terms used in this guideline shall be defined as follows:

“Autonomous use” means that UNIST faculty members or students use UCRF's equipment without any help from the equipment manager.

“Autonomous user” refers to users who have qualifications for the “autonomous use” of the equipment in paragraph 1 above, according to procedures set by UCRF.

“Request for analysis and processing” is a request to the equipment manager to perform a series of analyses and processes, so autonomous users can use UCRF's common equipment to obtain the results of a test analysis or process.

Article 4 (Access Management)

- ① If any personnel want authorized access to laboratories with restricted access, they must fill out an application form and receive approval from the supervising professor and Center manager to register their ID.
- ② If any personnel needs to access laboratories for equipment maintenance and repair, they must be accompanied by a competent manager or have the manager's approval to gain access to the labs.
- ③ For laboratories that require safety training for personnel with access, approval for access will be withheld until they complete prior training, as specified for each laboratory.

Article 5 (Requests for Analysis and Processing)

- ① If a client requests for analysis and processing that can be supported by UCRF, the client should discuss with the equipment manager beforehand.
- ② A client who requests analysis and processing shall cooperate with the equipment manager in identifying the necessary information needed to maintain the normal operations and safety of equipment or facilities.
- ③ Analysis and processing services will be available to clients on a first-come-first-serve basis. In any special circumstances such as equipment inspection and repair is needed, requests for such services may be reserved or cancelled at the equipment manager's discretion.

- ④ If there are no special requests from the client, each manager may discard any specimens that are seven days or older after the results-notice date, and may also discard the outcome or results data produced by the analysis and processing service three months from the day of said notice or later.

Article 6 (Qualifications for Autonomous Use)

- ① Authorized persons who qualify for autonomous use shall be limited to graduate students, researchers, professors and authorized undergraduate students (with the supervising professor's approval) at UNIST.
- ② Qualifications for autonomous use shall be granted to any persons who satisfy the requirements specified by each laboratory (e.g. safety training, equipment user training, evaluation, etc.).
- ③ A list of autonomous users shall be updated every 6 months and shall be published on the UCRF homepage.
- ④ An autonomous user's qualifications may be cancelled if the equipment manager deems it necessary, or if the user does not frequently use the equipment (less than the minimum limit of 10 times in the last 6 months). In such cases, users may discuss with the manager and go through a re-orientation process to be qualified for autonomous use again.

Article 7 (Responsibility of Autonomous Users)

- ① Autonomous users should follow the instructions for using the equipment as they learned during the orientation. If there is something significant to report, they must discuss with a competent manager and help operate and maintain the safety of the research equipment facilities.
- ② Autonomous users will be liable for any accidents, equipment damage, failure and loss incurred as a result of their negligence when using the equipment.
- ③ Equipment reservations should be made a day (24 hours) prior to when they need to use the equipment, and may be cancelled no later than 12 hours before the booked start time. If a user wants to cancel their reservation, they must inform the equipment manager via phone or e-mail during regular work hours (weekdays: 09:00 - 18:00) or via e-mail during off-hours.
- ④ Any reservations that are made less than 24 hours in advance may be cancelled before the booked start time. If users want to cancel their reservation, they must inform the equipment manager via phone or e-mail during regular work hours (weekdays: 09:00 - 18:00) or via e-mail during off-hours.
- ⑤ After using the equipment at night or during the equipment manager's off-hours, authorized users should make sure the laboratory is put back in order, the lights are turned OFF, and the entrance door is properly locked before leaving.

Article 8 (Restrictions for Autonomous Use)

- ① For the convenience of other users, a comfortable research environment, and to promote proper use of the equipment, UCRF may sanction users.
- ② Sanction criteria from the above paragraph 1 shall follow "Table 1. Penalty Points and Sanction Criteria for Users of Common Equipment."

Article 9 (Billing for Test Analysis Fees)

- ① Clients or autonomous users will receive bills for test analysis fees in the following month after the analysis and processing has ended, and may only pay for these bills to UCRF's bank accounts.
- ② Clients or autonomous users shall follow the specified procedures to pay bills charged under the standards of test analysis fees in accordance with Article 8, "Operational Regulations of Central Research Facilities at UNIST."
- ③ The standards of test analysis fees, as stipulated in Article 7, Operational Regulations of Central Research Facilities at UNIST, may be provided to clients or users before request or use.
- ④ If this is their first request or first time using the equipment, clients and users should submit copies of their business license and their bank book to UCRF's administrative offices.
- ⑤ When there is any change to the business license, they shall inform the administrative manager of the change and send a copy of the new business license to the manager.
- ⑥ Bills for test analysis fees shall be issued by UCRF's administrative office, and clients or users shall pay the bill to UCRF no later than 1 month after the bill is sent to them. If the payment is overdue, UCRF may stop supporting services for users and laboratories in arrears.
- ⑦ If more time is required for analysis and process due to negligence on the part of clients, additional test analysis fees may be charged.

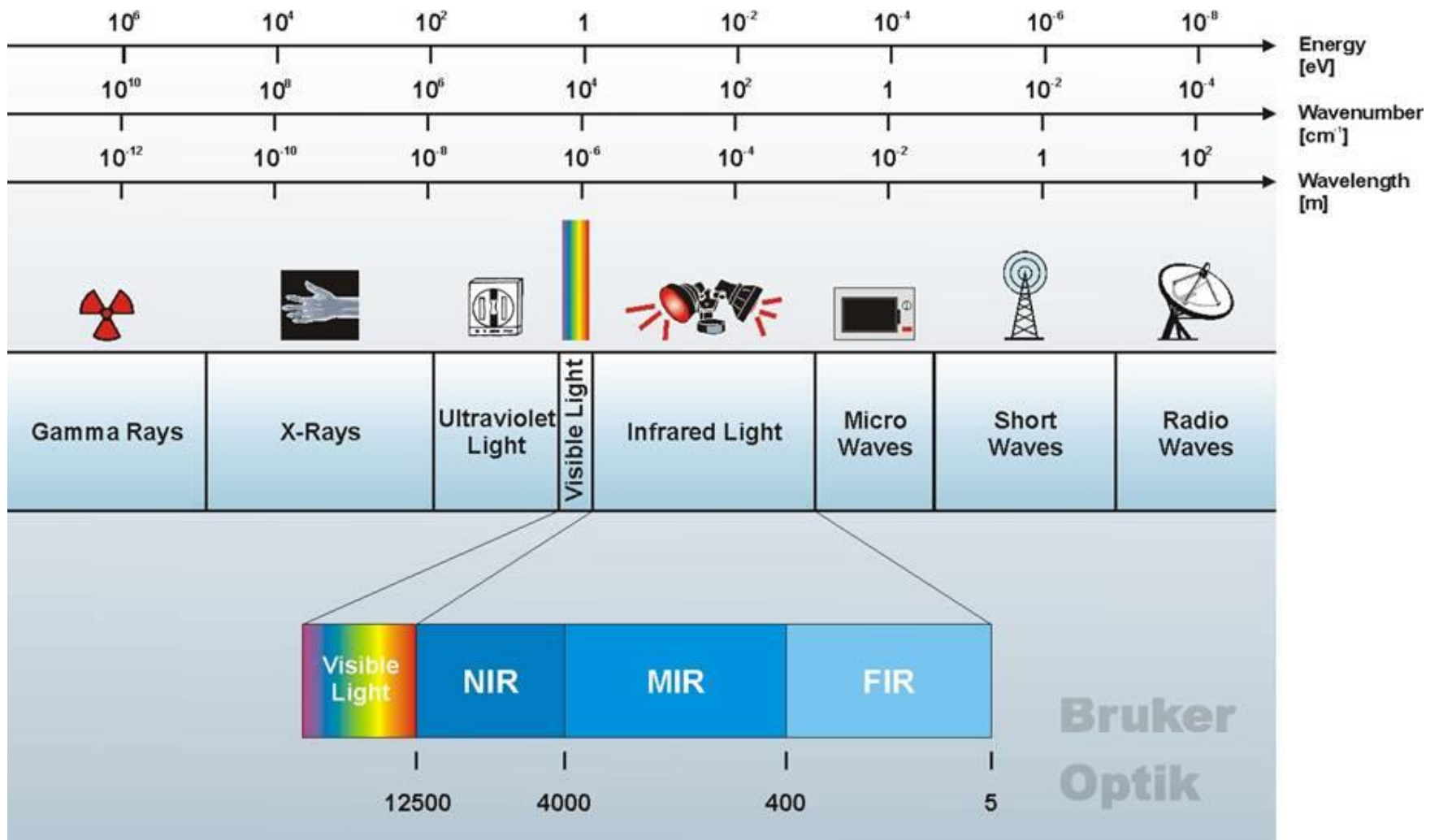
Penalty Points and Sanction Criteria

	Behaviors subject to penalty points	Penalty pts
[Eligibility to use equipment]		
1	Unauthorized use of equipment without permission	5
2	Use of equipment without a reservation	3
3	Someone other than the equipment lessee used the equipment	3
[Reservations for using equipment]		
4	Reserved and used equipment outside of permitted hours	1
5	Use of equipment beyond the time reserved without making another reservation beforehand for extra time	1
6	Failed to use the equipment during the reserved time and did not cancel reservation in advance	3
7	Cancelling reservations for equipment after the cancellation deadline, under Article 7, Guideline for the Operation of the UNIST Central Research Facilities (UCRF)	1
8	Use of any equipment without giving a prior notice to the equipment manager, after making a reservation	1
[Careless behaviors]		
9	Using functions on the equipment that are not permitted	3
10	Failure to promptly notify the manager of any errors or failures detected during use	3
11	Negligence that resulted in damages or failure to the equipment	5
12	Negligence that resulted in loss or damage to an equipment component or part	5
13	Failure to record in the equipment usage log after using any equipment, or misrepresentation or partial representation of the facts	1
14	Failure to provide specimen information required by the equipment manager to ensure normal operations and safety of equipment or facilities, thus resulting in damage or failure to the equipment	3
[Careless behaviors]		
15		3
16	Using functions on the equipment that are not permitted	5
17	Failure to promptly notify the manager of any errors or failures detected during use	5

Penalty Points and Sanction Criteria

Classification	Penalty pts.	Follow-up actions
(Individual users of equipment)		
Sum up penalty points imposed to individuals	≥ 5 points	Equipment manager will notify user(s) and their supervising professor by email of their penalty points total, and shall post the details of their penalty points on the bulletin board of the equipment room. Users with penalty points 8 points or higher may not use the relevant equipment for 3 months.
	≥ 8 points	Equipment manager will notify user(s) and their supervising professor by email that the user(s) may not use the relevant equipment for 3 months until they complete the re-orientation course; will also forward an official notice to their supervising professor; and will post details of their penalty points on the bulletin board of the equipment room.
(User's laboratory)		
Sum up penalty points imposed on the students in the laboratory for the same equipment in the same laboratory	≥ 12 points	Equipment manager will notify the user(s) and their supervising professor by email that user(s) with penalty points 15 points or higher may not use the relevant equipment in the laboratory for 3 months.
	≥ 15 points	Equipment manager will email the supervising professor to inform that the user(s) may not use the relevant equipment in the laboratory for 3 months; will also forward an official notice to their supervising professor; and will post the details of their penalty points on the bulletin board of the equipment room.
Sum up penalty points imposed on the students in the laboratory for all UCRF equipment in the same laboratory	≥ 20 points	UCRF will notify students and their supervising professor by email that the user(s) with 25 penalty points or higher may not use any UCRF equipment in the laboratory for 1 month.
	≥ 25 points	UCRF will notify students and their supervising professor by email that user(s) may not use any UCRF equipment in the laboratory for 1 month; will also forward official notice to their supervising professor; and will post details of their penalty points on the bulletin board of UCRF.

Electromagnetic Radiation



Spectral ranges

NIR : 15000 – 4000 cm^{-1}

- **Overtone**s and combination vibrations
- low absorption coefficient \Leftrightarrow high sample concentrations
- Advantage : Quartz is transparent \rightarrow fiber optics, in glass vials
- Source : tungsten lamp
- Optical material : Quartz
- Detector : Ge, InGaAs

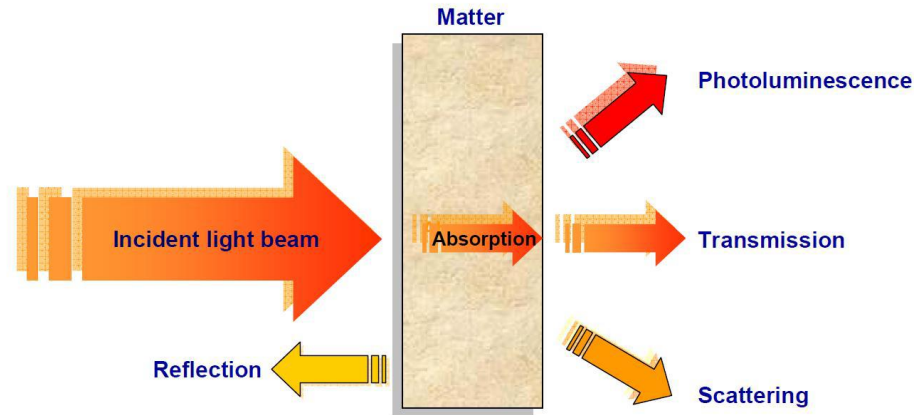
MIR : 4000 – 400 cm^{-1}

- Fundamental molecular vibrations : **stretch and deformation vibrations**
- high absorption coefficient \Leftrightarrow low sample concentrations
- Source : Globar
- Optical material : KBr, ZnSe
- Detector : DTGS, MCT

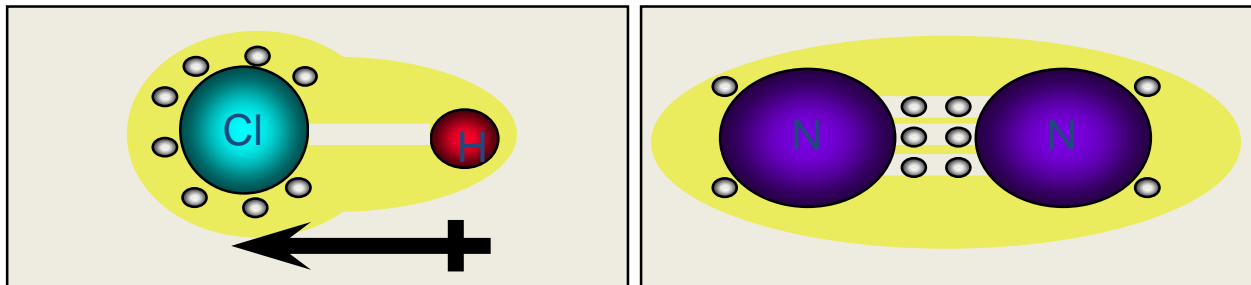
FIR : 400 – 5 cm^{-1}

- **backbone vibration of large molecules**, molecules with heavy atoms
- low absorption coefficient, strong water vapor absorption \rightarrow vacuum spectrometer
- Source : Globar, Hg lamp
- Optical material : PE, CsI
- Detector : DTGS, Bolometer

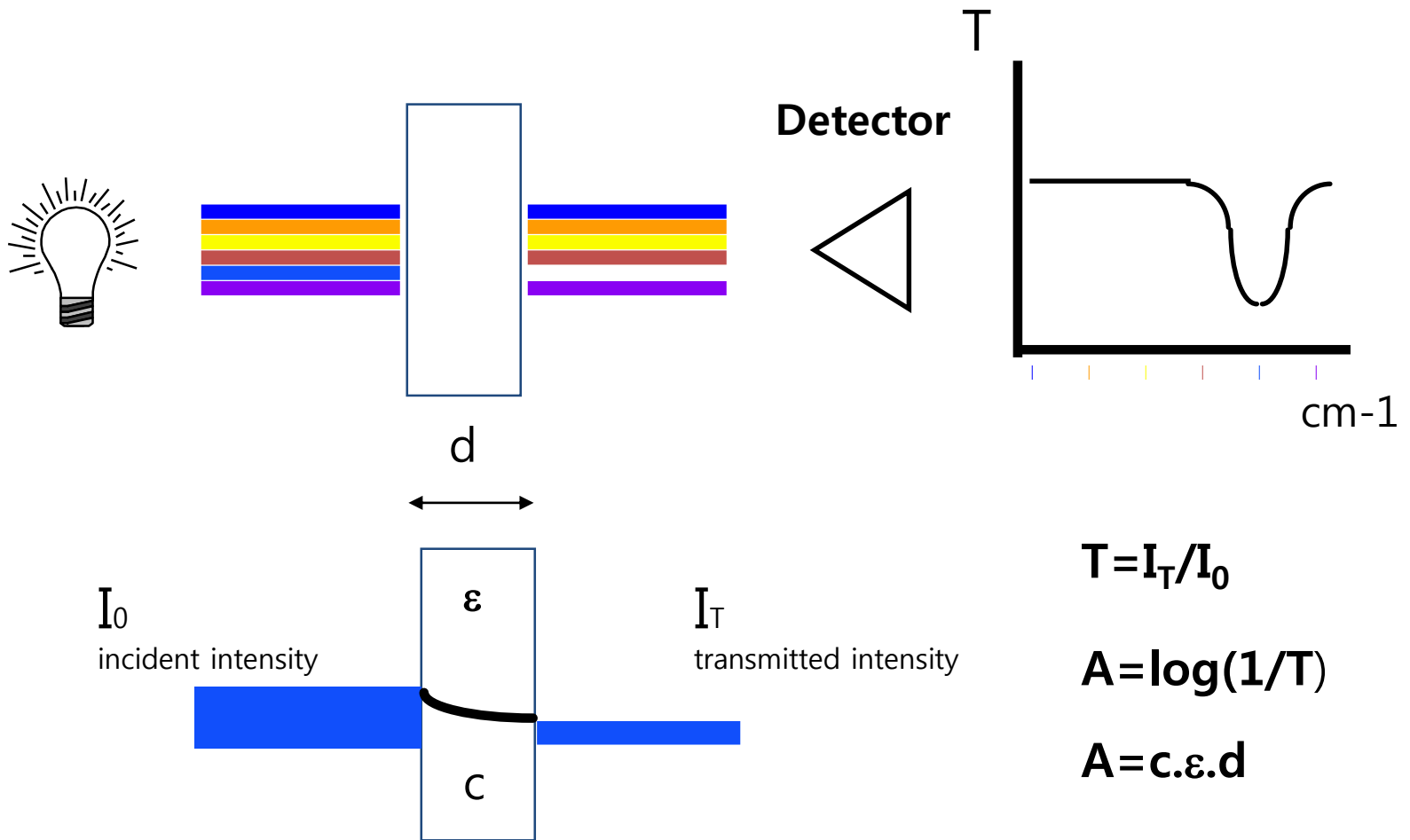
The absorption of Infra-red Light



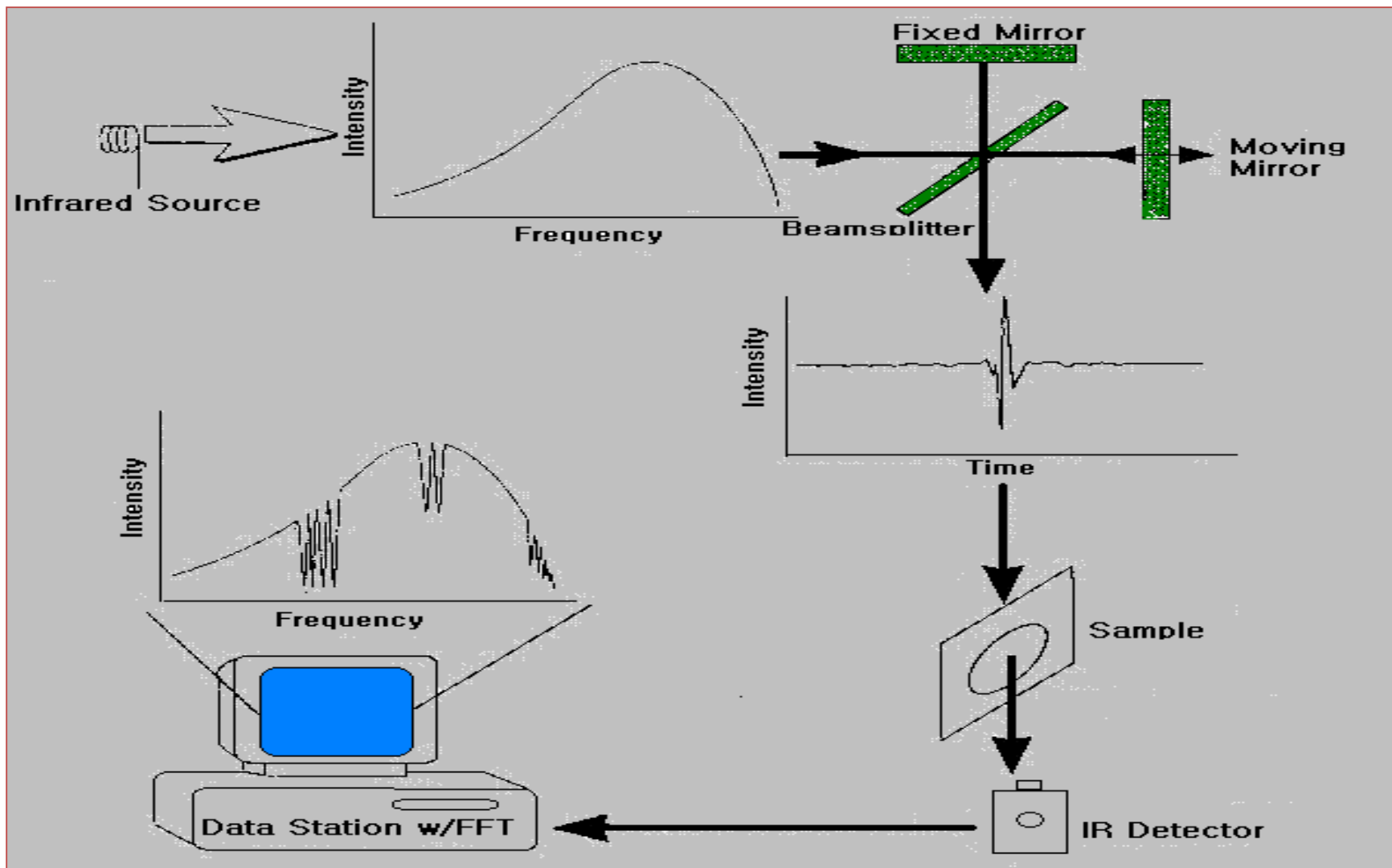
- Infrared light can only be absorbed by a molecule if the dipole moment of the specific group of atoms changes during the vibration.
- The greater the change in dipole moment, the stronger the corresponding IR absorption band will be.



Principles of Spectroscopy

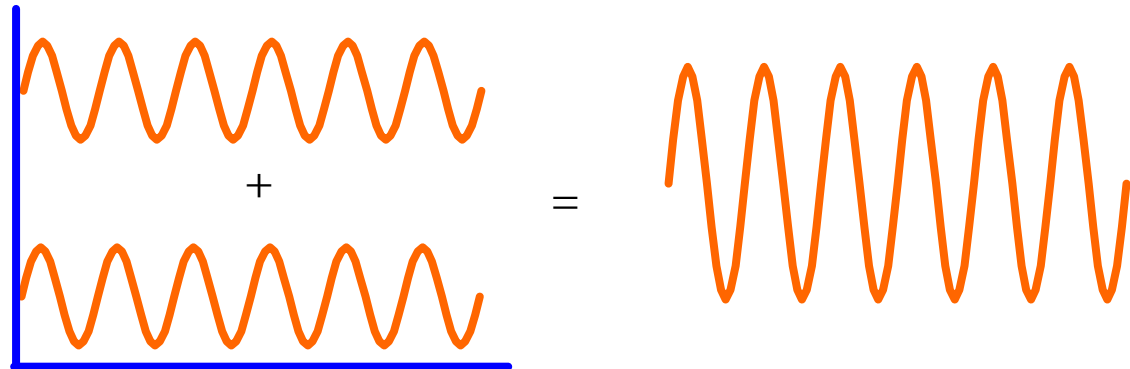


Schematic of FT-IR

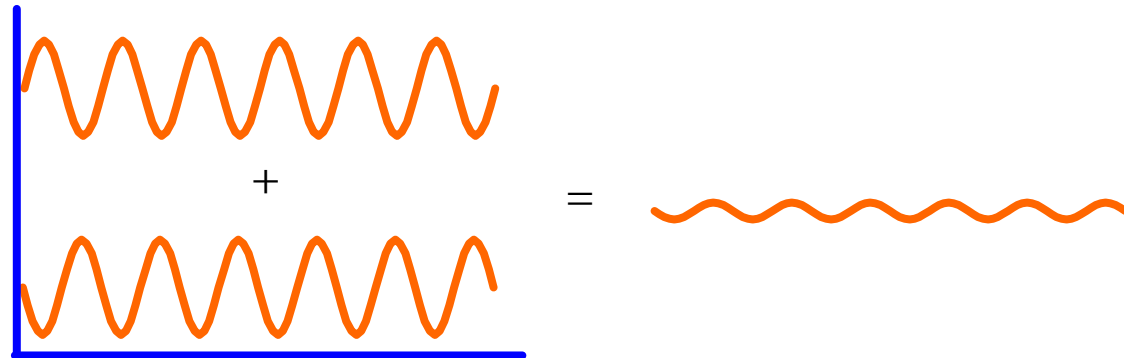


Wave Interaction (Interference)

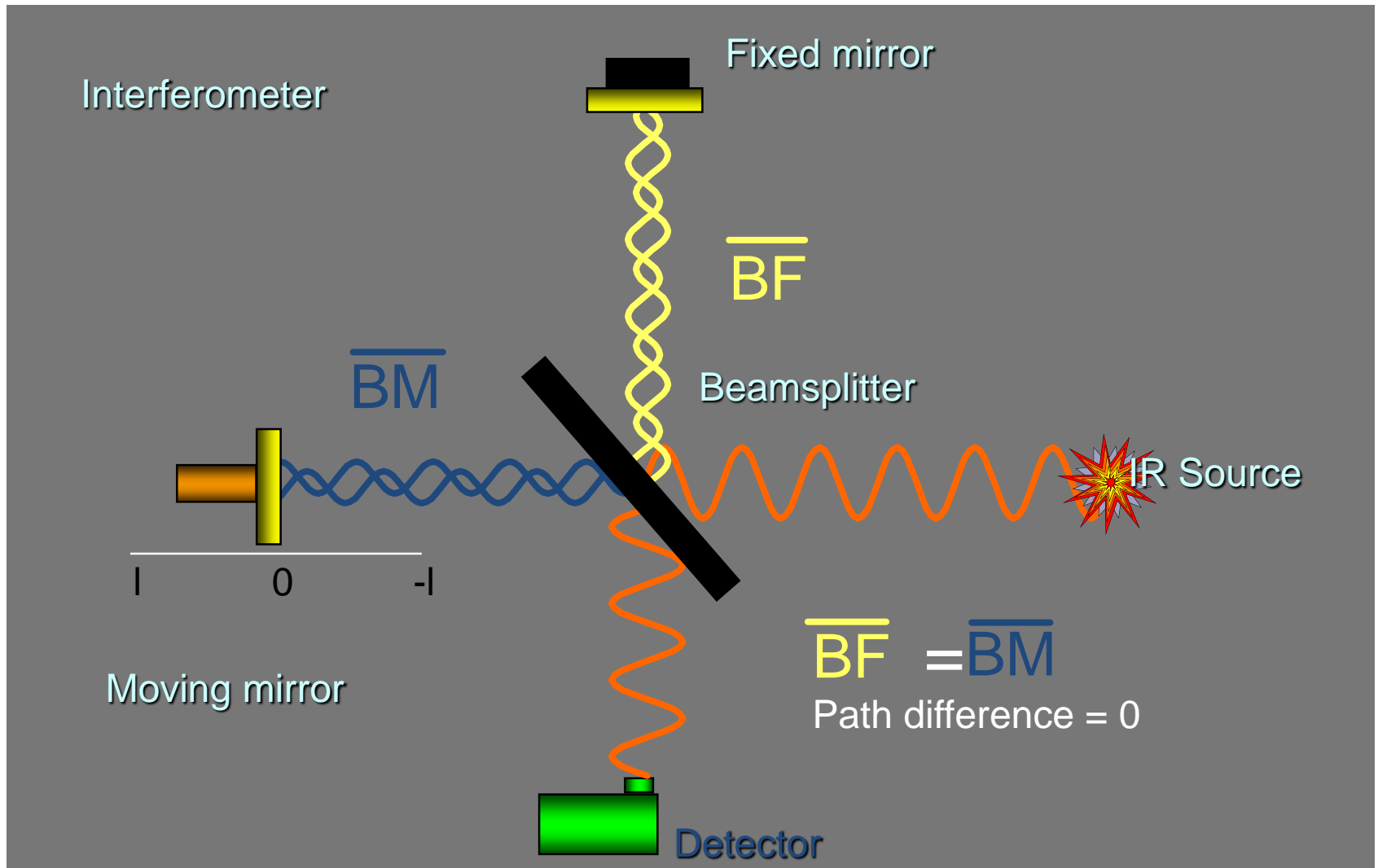
- In-phase
 - *Constructive interference*



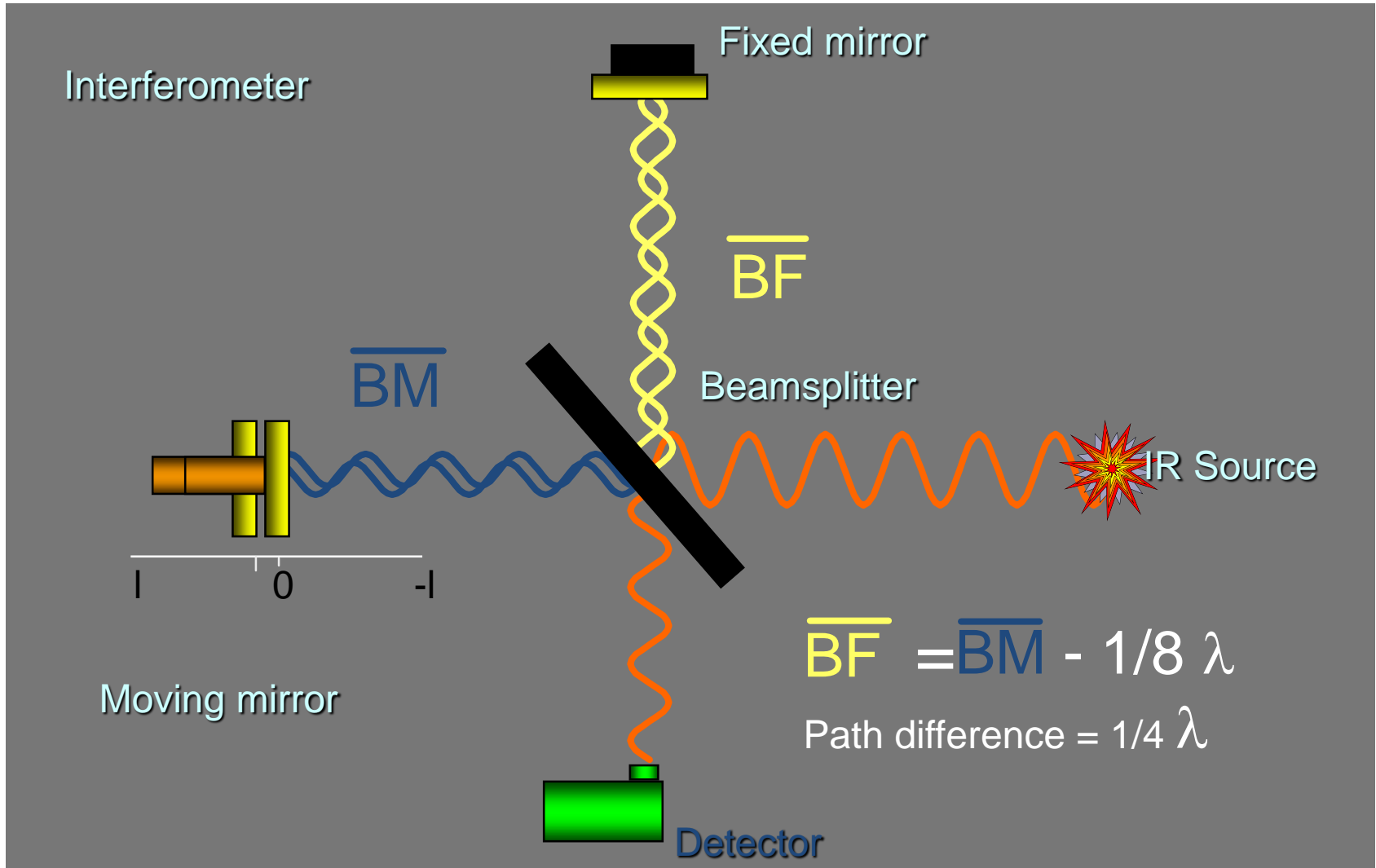
- Out-of-phase
 - *Destructive interference*



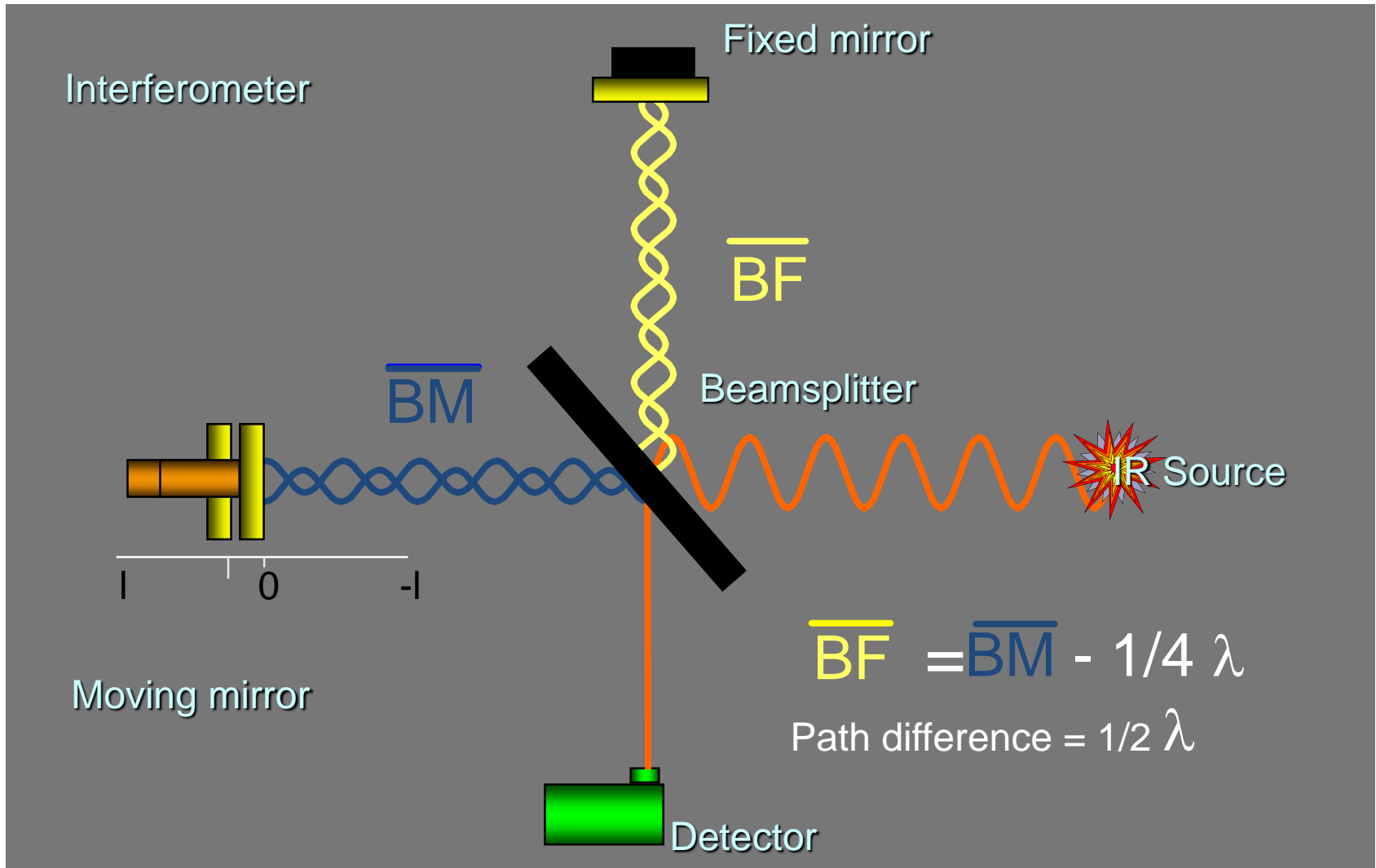
Michelson Interferometer



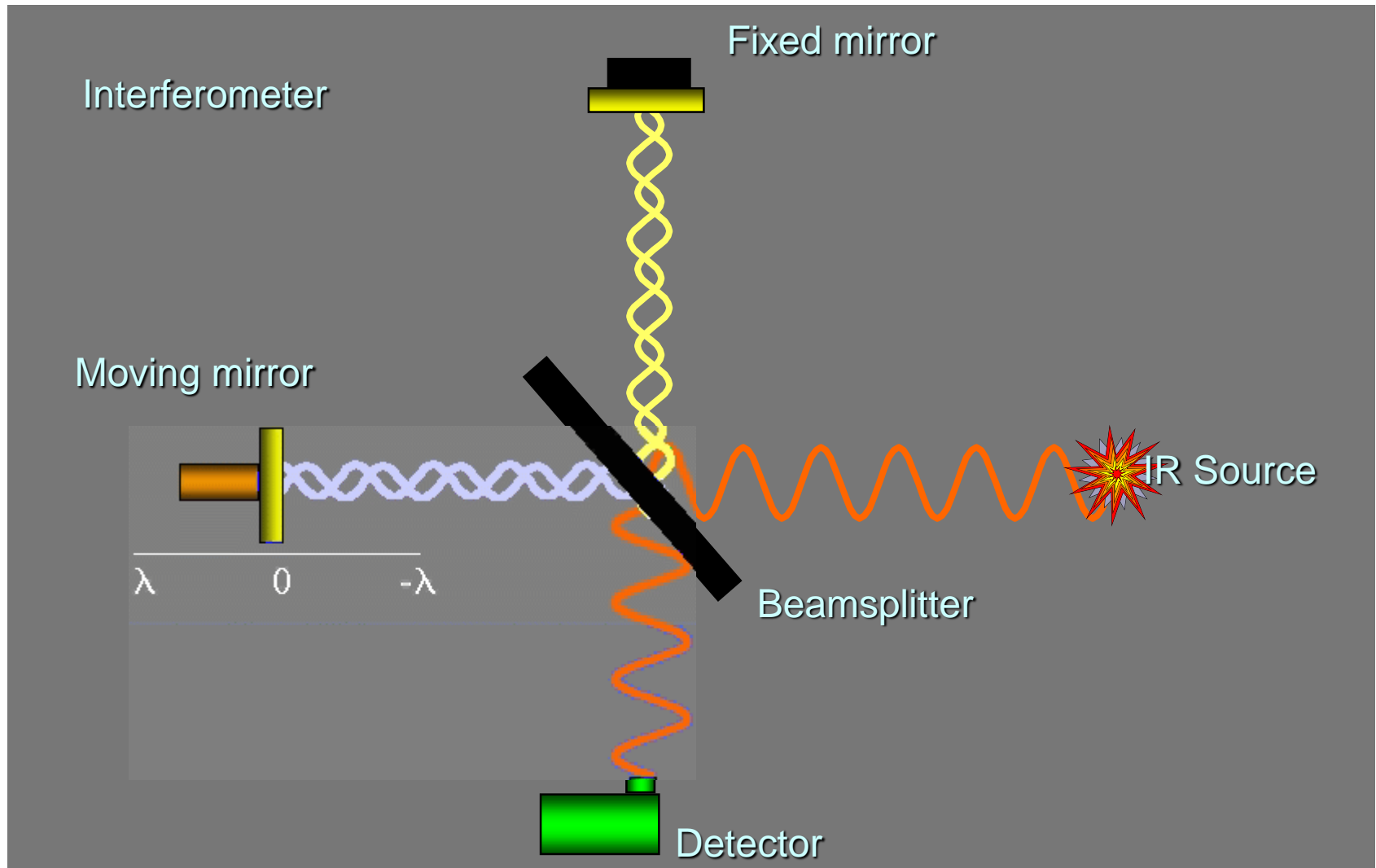
Michelson Interferometer



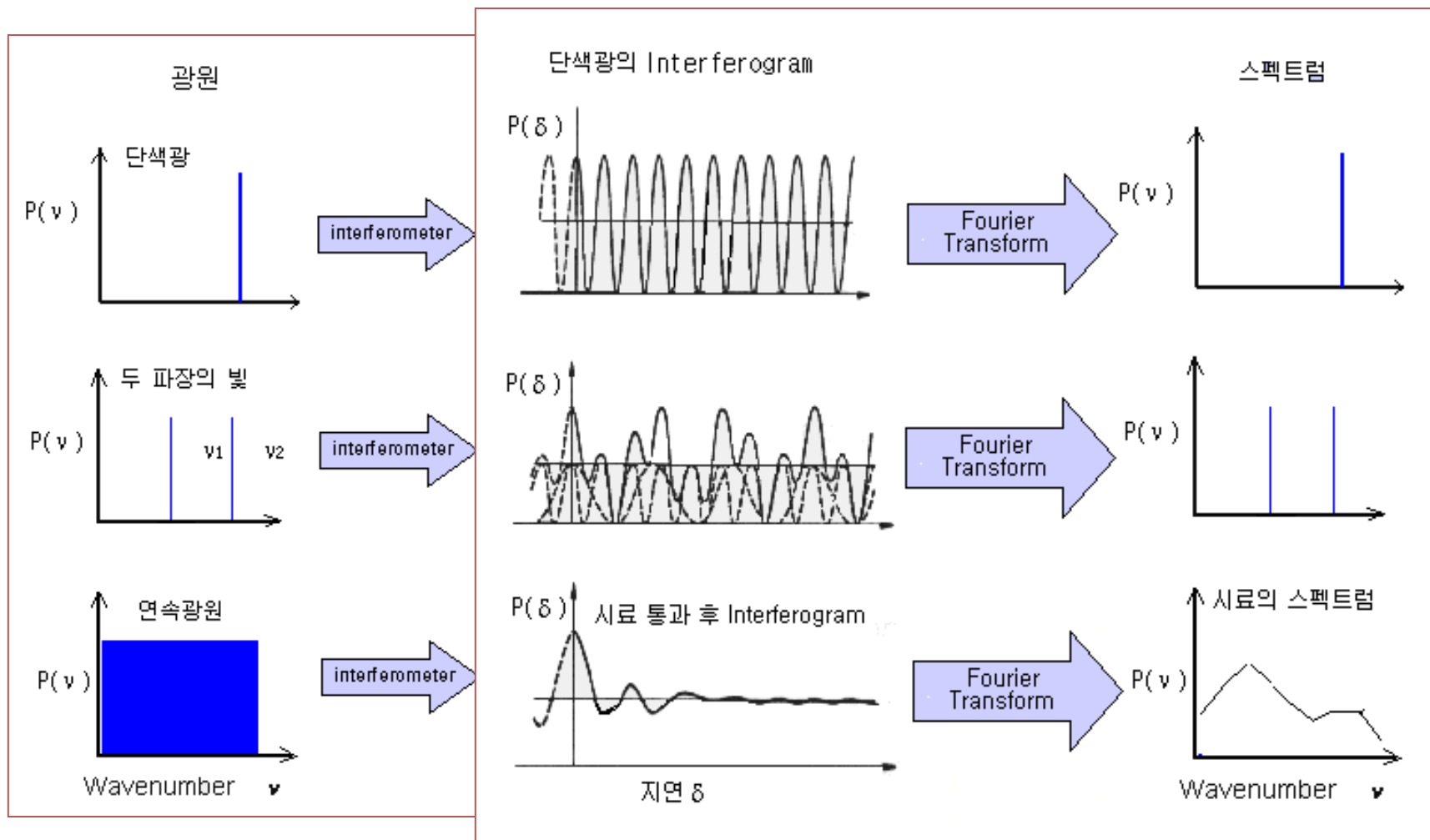
Michelson Interferometer



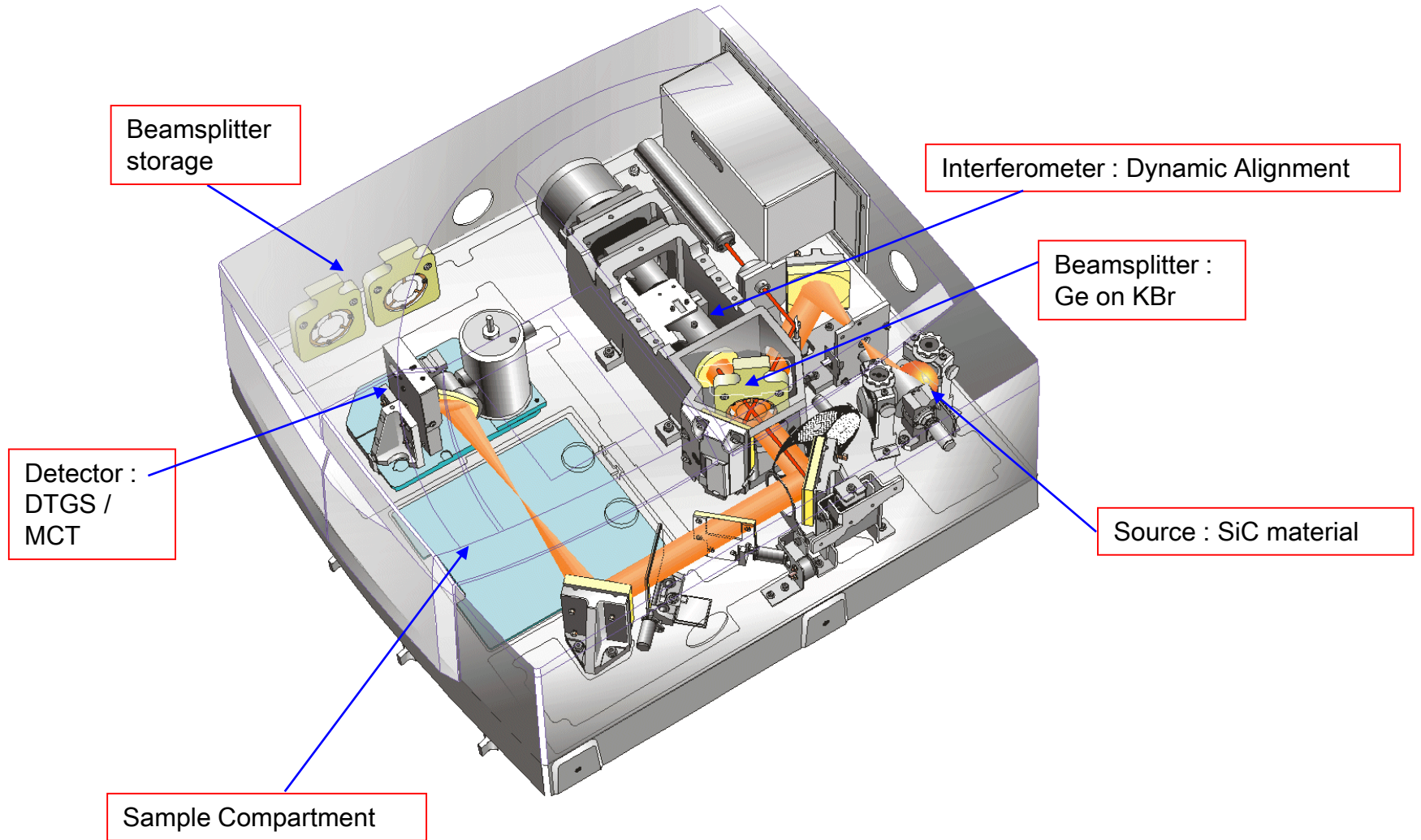
Michelson Interferometer



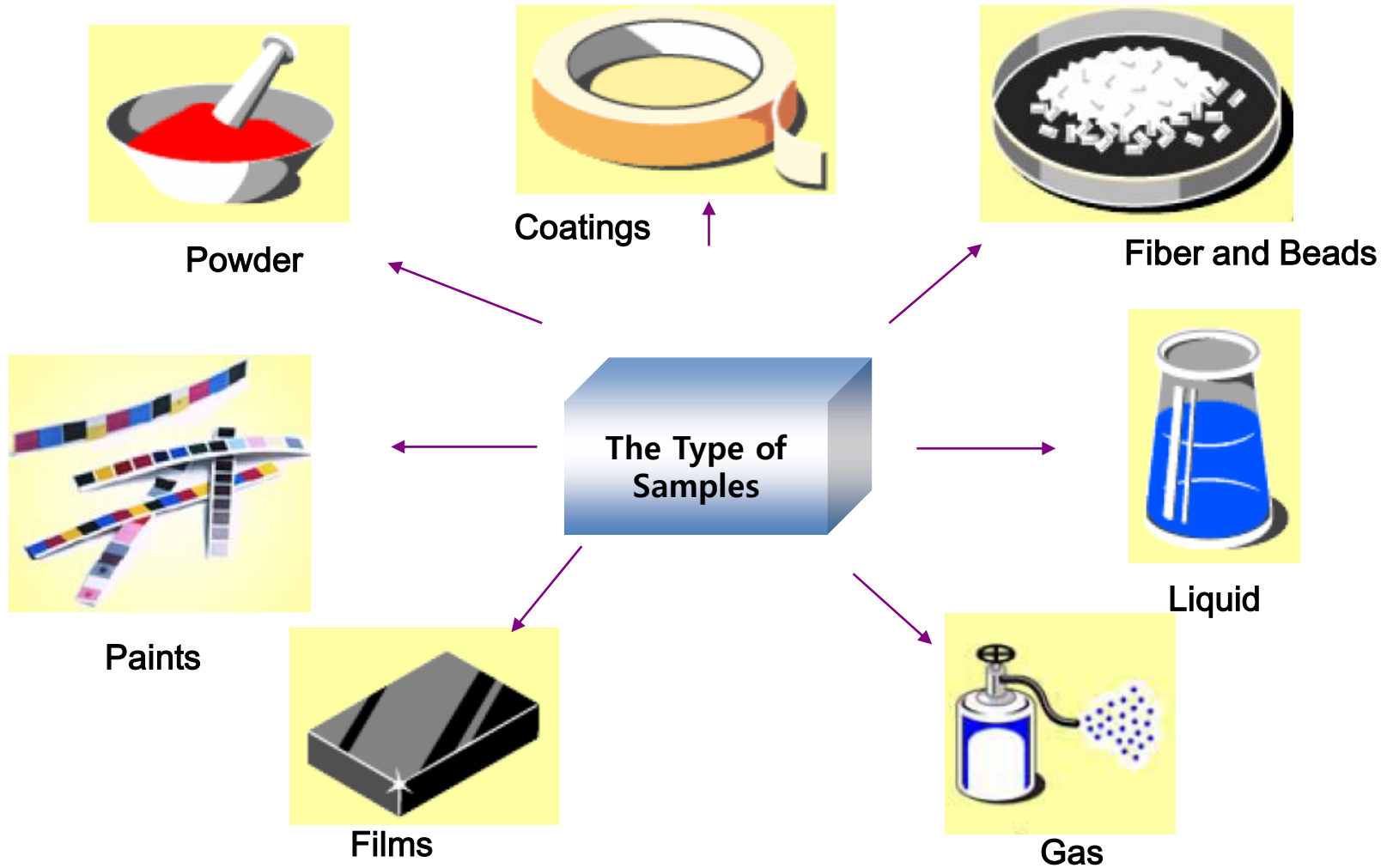
Conversion to Spectrum

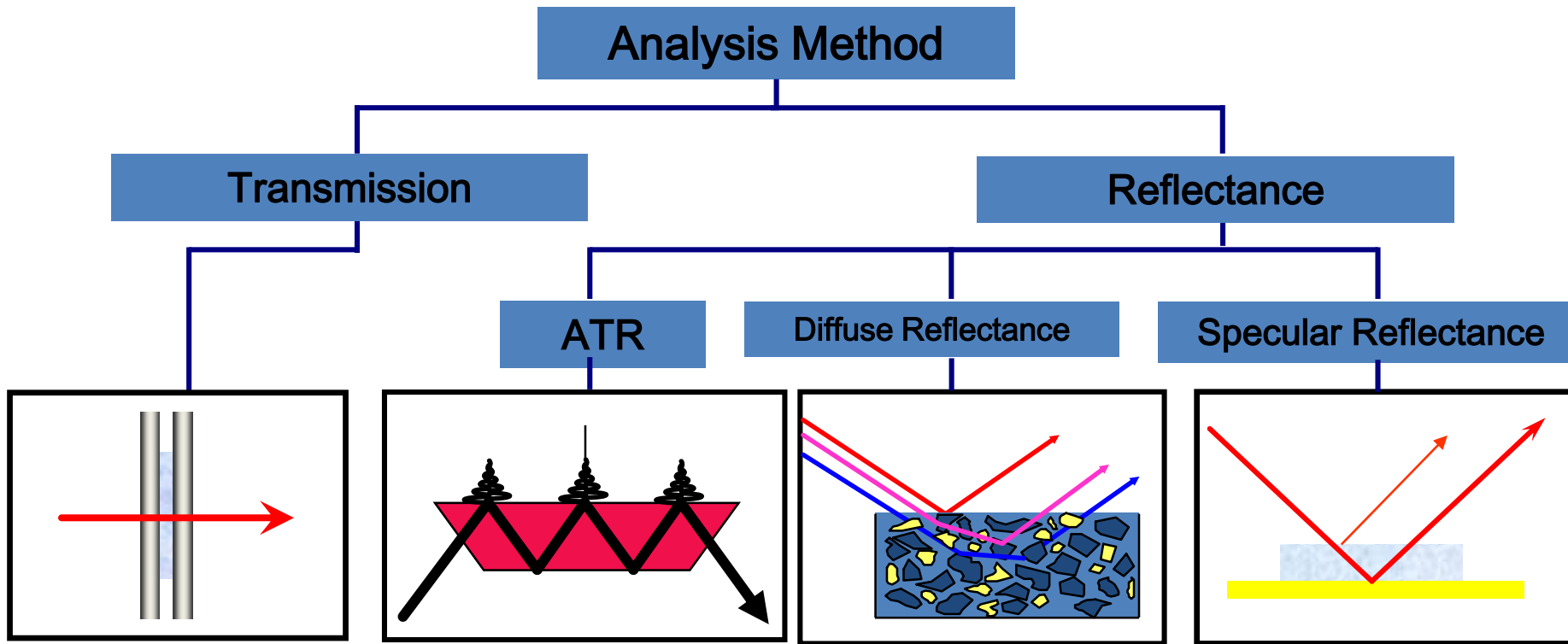


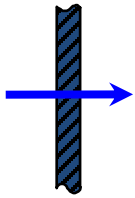
670 FT-IR Systems



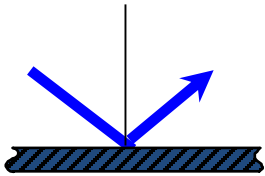
The Type of Samples







$I^{\circ}=0^{\circ}$



$I^{\circ}=R^{\circ}$

Transmission

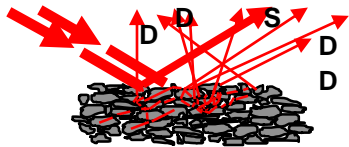
(Powder, Drugs-KBr pellet/Films, Coatings, Paints-film holder/Liquid-window cell)

Absolute reference measurement

Sample preparation can be difficult and time consuming

Specular Reflectance

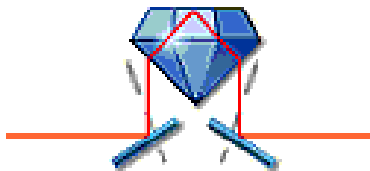
Sample must have a back reflective layer or must be on a mirror
(layer thickness = single molecule)



Diffuse Reflectance

Solids and powders, diluted in a matrix of KBr or KCl

Analysis of non-reflective materials



ATR (Attenuated Total Reflectance)

(Powder, Drugs, Films, Coatings, Paints, Liquid, Rubber)

The infrared beam is focused into a crystal

Creating an evanescent wave about 1 – 2 microns deep

No sample preparation

Transmission by KBr Pellet : Powder, Drugs, Film

1. Grind sample together with the KBr for several minutes until fully mixed using an agate mortar and pestle.
2. Assemble the Die set and add the mixture into the die. Put the die into the press.
(8 ton, Hold time 1min. Release time 1min.)

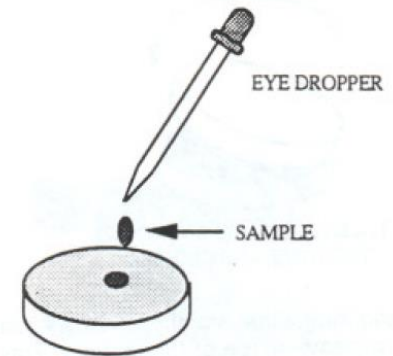
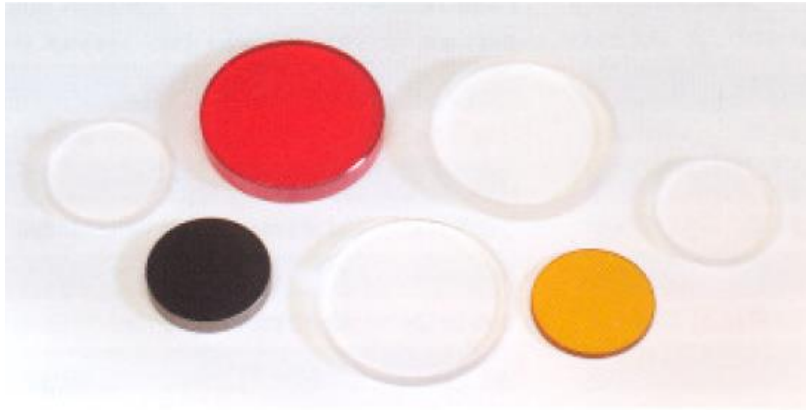


▼ Mounting a Pellet Sample



Transmission using window materials (Liquid sample)

Step 1. Choice the window material



Step 2. Place a small amount of sample onto the window using the eye dropper or spatula.

Step 3. Once enough sample is deposited on the window, place the other infrared window on top of the sample.

Step 4. Twist the windows together in opposite directions to get rid of air bubbles and to decrease the pathlength.

APPLY PRESSURE AND
TWIST TOP WINDOW



APPLY PRESSURE AND
TWIST BOTTOM WINDOW

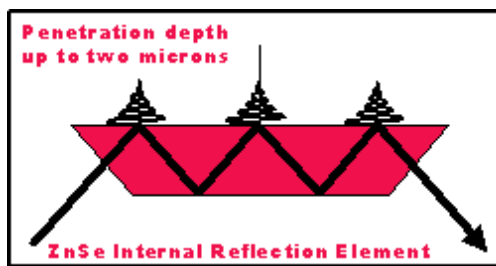
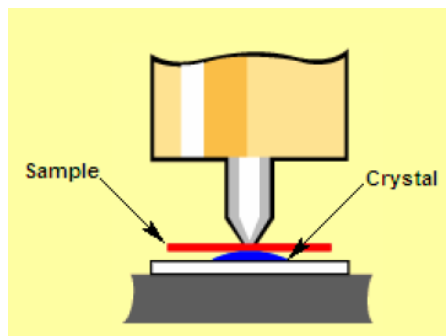
Transmission using window materials (Liquid sample)

Material	Water Sol. (g/100g H ₂ O) @25 °C	Max. Useful Temp. In Air (°C)	Density g/cm ³	pH Range	Cleaning Agents	Solvents Which Attack Material	Hardness (Knoop#)
AgCl	0.00015	200	6.47	N/A	acetone, CH ₂ Cl ₂	complexing agents*	9.5
Al ₂ O ₃ (Sapphire)	insol.	1700	4.00	1 – 14	alcohol, acetone, H ₂ O	acids, alkalies	1370
AMTIR	insol.	300	4.40	1 – 9	alcohol, acetone, H ₂ O	alkalies	170
BaF ₂	0.17	500	4.83	5 – 8	acetone, alcohol	NH ₄ ⁺ + salts, acids	82
CaF ₂	0.0013	900	3.18	1 – 9	acetone, alcohol	NH ₄ ⁺ + salts, acids	158
CdTe	insol.	300	6.2	1 – 9	alcohol, acetone	acids, HNO ₃	56
CsI	44.4	200	4.50	N/A	anhydrous solvents	lower alcohols "wet" solvents	20
Diamond	insol.	750	3.51	1 – 14	alcohol, acetone	K ₂ Cr ₂ O ₇ , conc. H ₂ SO ₄	7000
Ge	insol.	270	5.32	1 – 14	alcohol, acetone, H ₂ O	H ₂ SO ₄ , aqua regia	550
KBr	53.5	300	2.75	N/A	anhydrous solvents	lower alcohols "wet" solvents	7
KRS-5	0.05	200	7.37	5 – 8	MEK	complexing agents*	40
NaCl	35.7	400	2.17	N/A	anhydrous solvents	lower alcohols "wet" solvents	15
Si	insol.	300	2.33	1 – 12	alcohol, acetone, H ₂ O	HF, HNO ₃	1150
SiO ₂ (Quartz)	insol.	1200	2.65	1 – 14	alcohol, acetone, H ₂ O	HF, some hot acids and bases	820
ZnS	0.00069	300	4.08	5 – 12	acetone, alcohol	acids	178
ZnSe	insol.	300	5.27	5 – 9	alcohol, acetone, H ₂ O	acids, strong alkalies	137

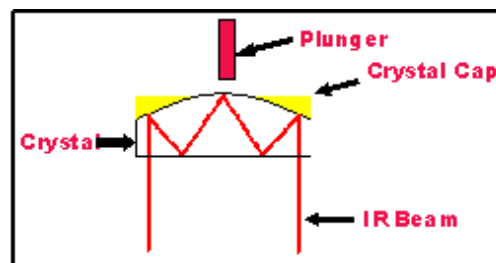
*typical complexing agents include ammonium salts & materials such as EDTA.

ATR Accessories

- Main Frame
- Crystal
(ZnSe, Diamond, Ge, Si)
- High Pressure Clamp








Multi-bounce ATR



Single-bounce ATR



Sampling Accessories - ATR

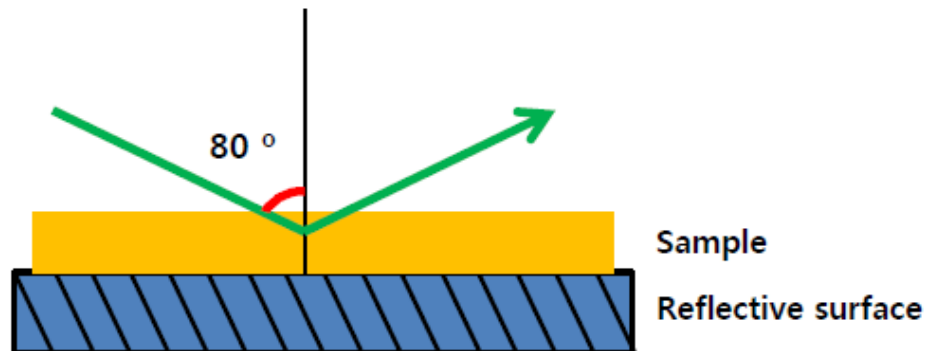
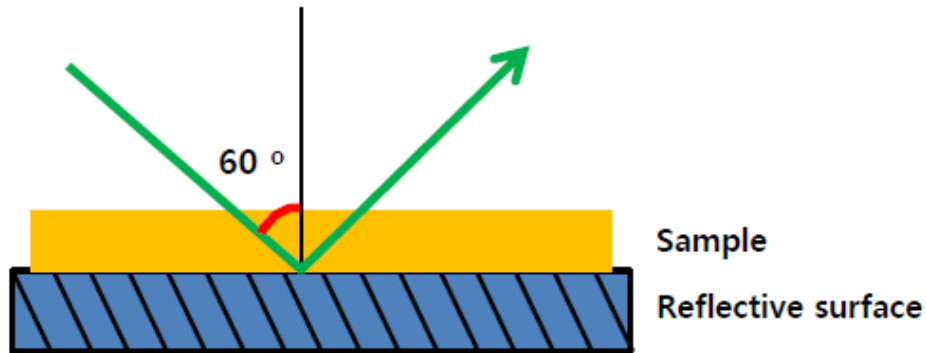
Material	ATR Spectral Range (cm ⁻¹)	Refractive Index	Depth of Penetration (μ) (at 45° & 1000 cm ⁻¹)	Uses
Germanium	5,500 - 675	4	 0.66	Good for most samples, especially strong absorbing samples, such as dark polymers
Silicon	8,900 - 1,500 & 360-120	3.4	 0.85	Resistant to basic solutions
AMTIR	11,000 - 725	2.5	 1.77	Very resistant to acidic solutions
ZnSe	15,000 - 650	2.4	 2.01	General use
Diamond	25,000 - 100	2.4	 2.01	Good for most samples. Extremely caustic or hard samples

Specular Reflectance

Thin films on reflective surfaces : Au, Ag, Al great

Polarization dependent : Polarized light improves s/n of results

Grazing angle improves interaction with sample



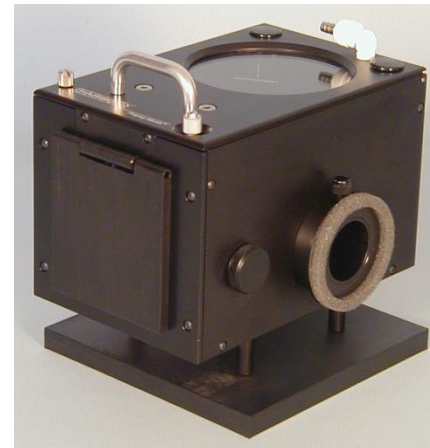
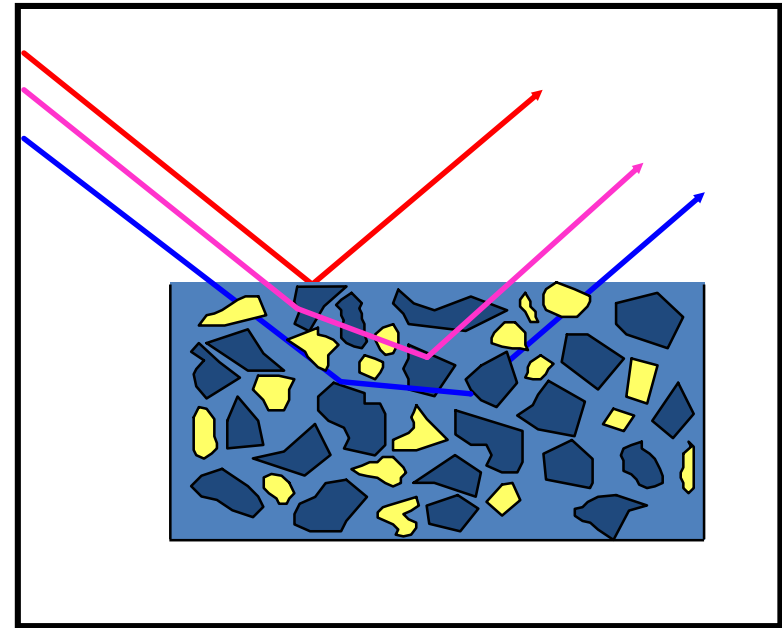
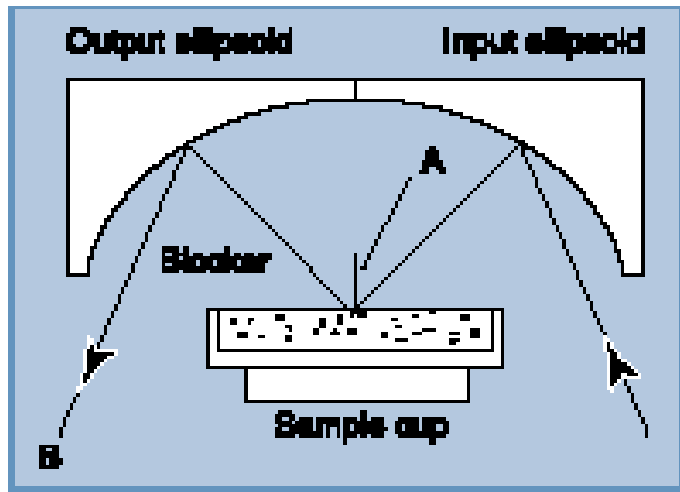
Seagull

Diffuse Reflectance (DRIFTS)

Preferred choice for dilute powders

Analysis of non-reflective materials

Minimal sample preparation

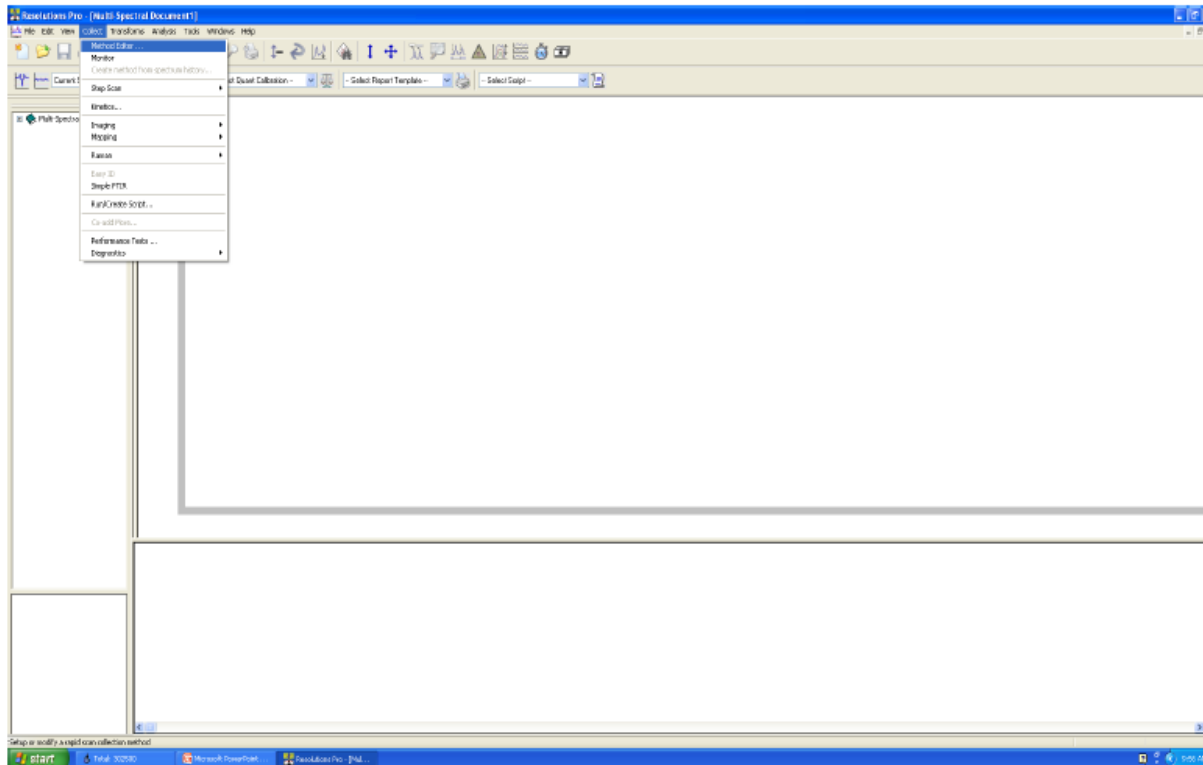


Praying Mantis

1. Agilent Resolution Pro. STATR



2. Collect ⇒ Method Editor



3. Method List ⇒ select method_ATR

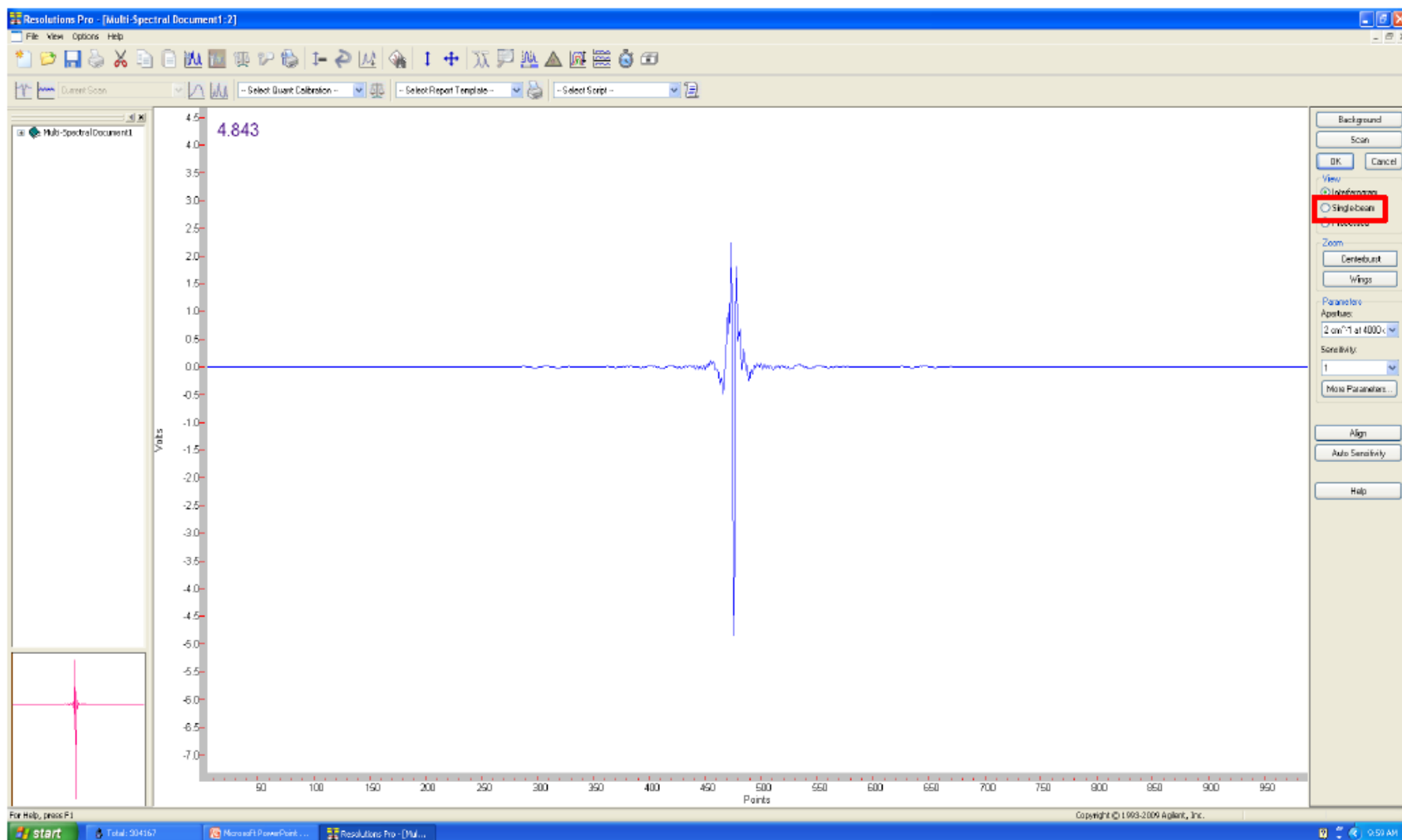
4. Signal Monitor click

The screenshot displays the 'Method Editor' window for the file 'C:\Program Files\Warian\Resolutions\Sample Data\methode\WCT.clm'. The interface is divided into several sections:

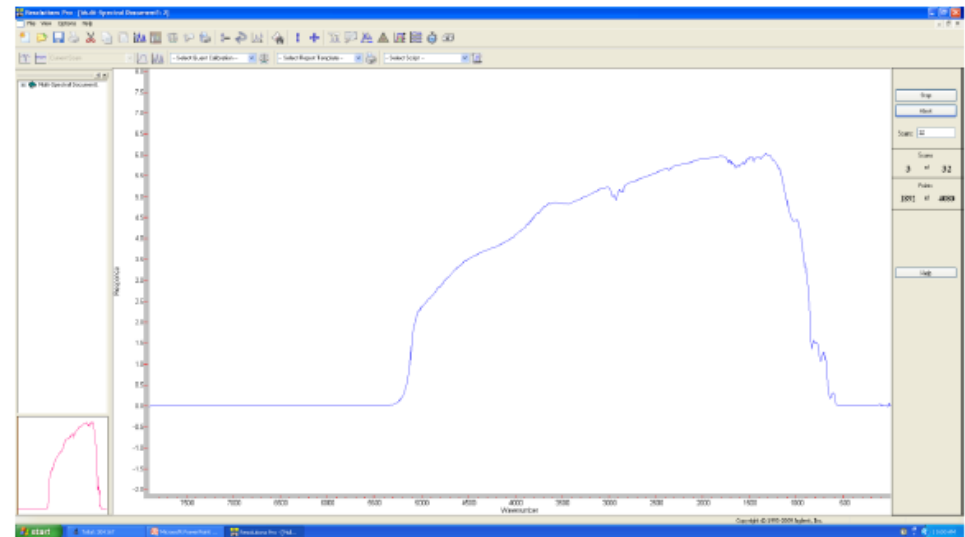
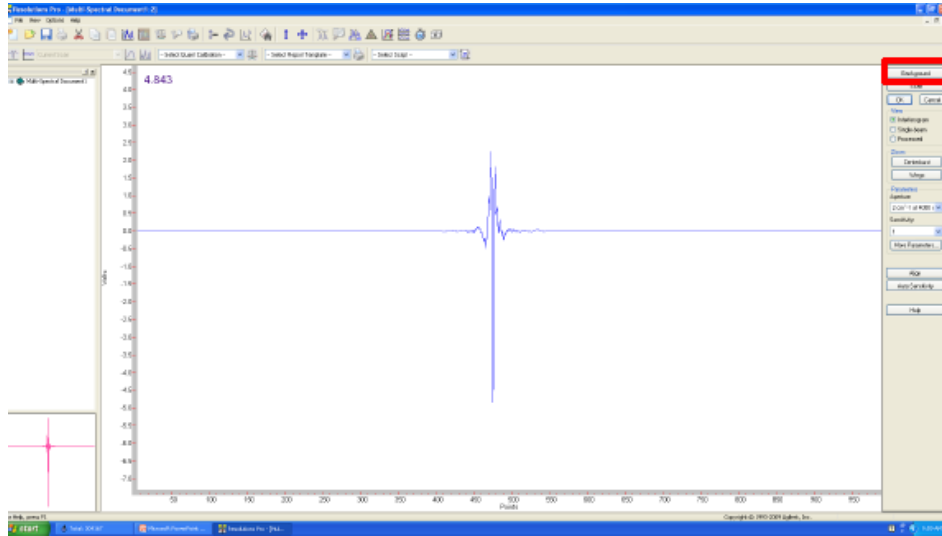
- Contents:** A tree view on the left showing the method's structure, including 'Method Summary', 'Common Settings', 'Notes', 'Background Scan', 'Slow Kinetics', and 'Advanced Settings Summary'.
- Method List:** A tree view below 'Contents' showing a folder 'methode (3)' containing an 'ATR' method, which is highlighted with a red box. Other folders include 'Standard Method - reflectar', 'Advanced Methods (3)', and 'Microscope (3)'.
- Common Settings:** A central panel with a blue header and a help icon. It contains:
 - Scan Settings:** Fields for 'Number of scans' (32), 'Spectrum name' (sample/background), 'Resolution (cm-1)' (4), 'Scan type' (Absorbance), and 'Scan range (cm-1)' (4000 to 650). A 'Usable range' of 6000 ... 450 is also shown.
 - Spectrometer Configuration:** Fields for 'Method accessory' and 'Installed accessory', each with a 'Set to Installed' or 'Options' button.
- Right Panel:** A vertical stack of buttons: 'Scan', 'Background', 'Signal Monitor' (highlighted with a red box and a red '4' next to it), 'Microscope', 'OK', 'Help', and 'Restore Defaults'.

5. Check the Inteferogram

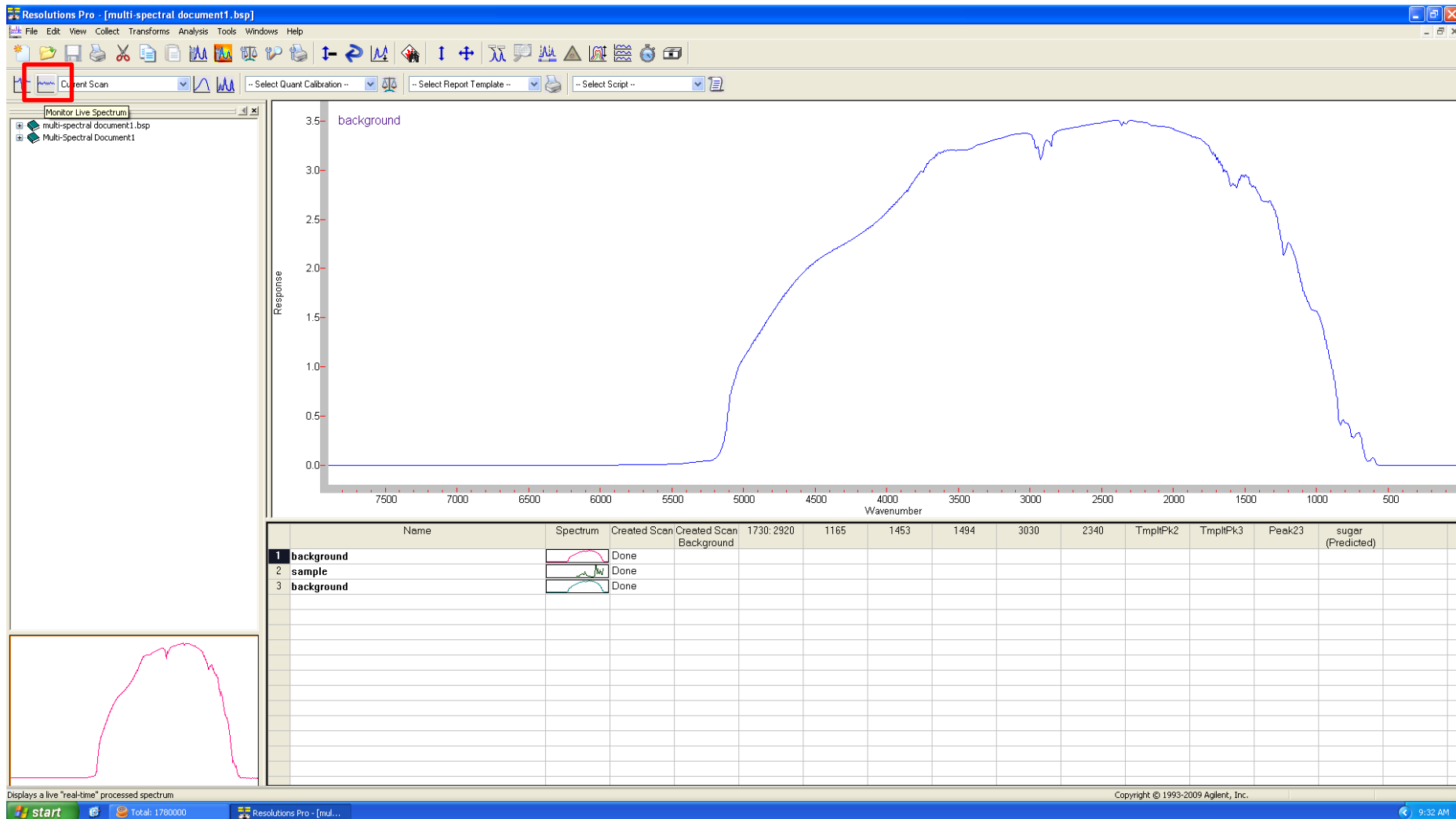
6. Click **Singlebeam** – Check background condition



7. Click **Background** ⇒ Save .bsp file






8. Sample loading ⇒ Monitor live spectrum click



The screenshot shows the Resolutions Pro software interface. The main window displays a "Monitor Live Spectrum" plot with the following characteristics:

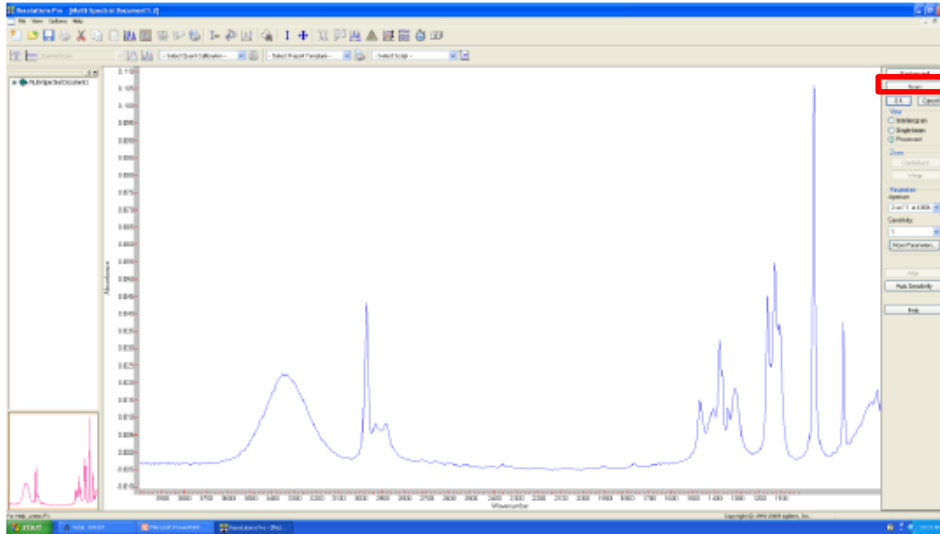
- Y-axis:** Labeled "Response", ranging from 0.0 to 3.5.
- X-axis:** Labeled "Wavenumber", ranging from 7500 to 500.
- Plot:** A blue line representing the spectrum, showing a broad peak centered around 3000-3500 cm⁻¹. The word "background" is written in purple at the top left of the plot area.

Below the plot is a table with the following data:

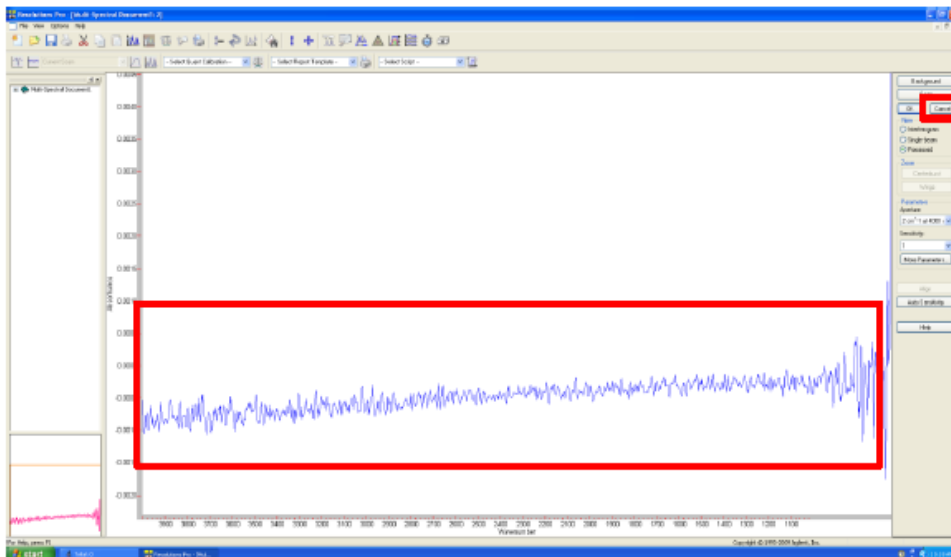
	Name	Spectrum	Created Scan	Created Scan	1730: 2920	1165	1453	1494	3030	2340	TmplPk2	TmplPk3	Peak23	sugar (Predicted)
1	background		Done	Background										
2	sample		Done											
3	background		Done											

At the bottom left, there is a smaller inset plot showing a red spectrum. At the bottom of the window, a status bar reads "Displays a live 'real-time' processed spectrum" and "Copyright © 1993-2009 Agilent, Inc." The Windows taskbar at the very bottom shows the time as 9:32 AM.

9. Scan click

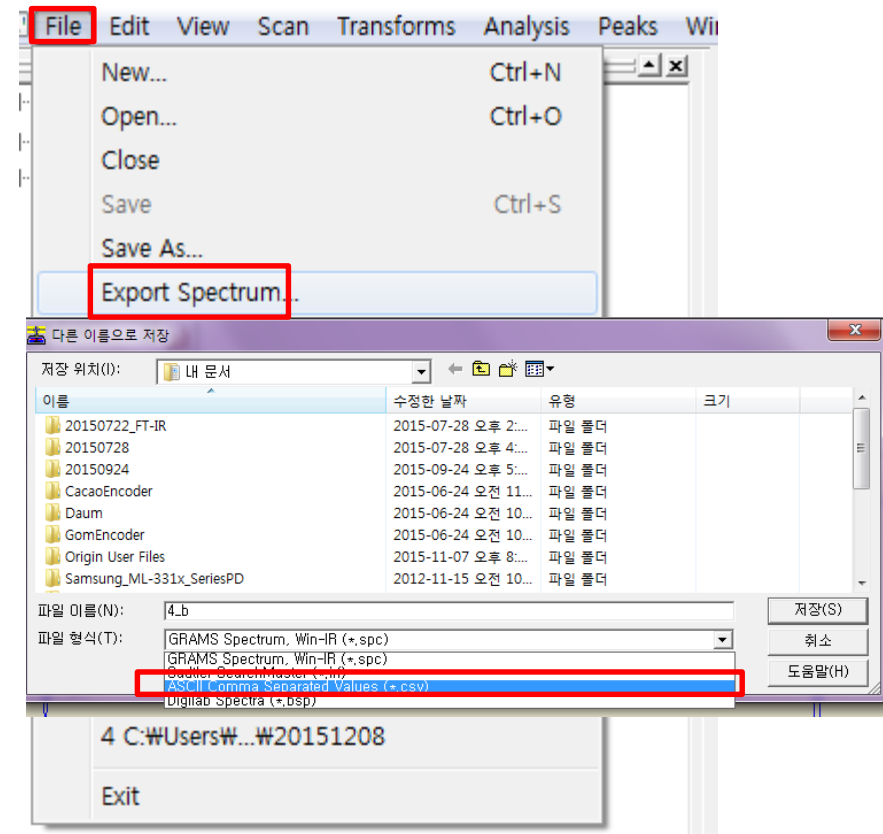
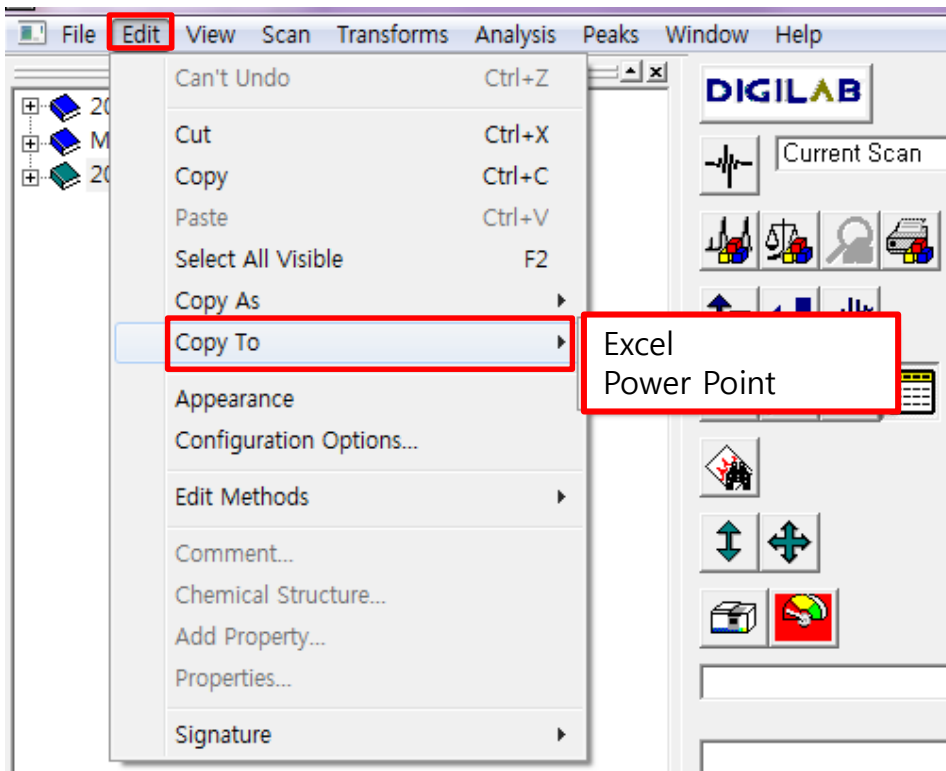


10. ATR cleaning \Rightarrow Monitor live spectrum \Rightarrow If there is no peak \Rightarrow Cancel click



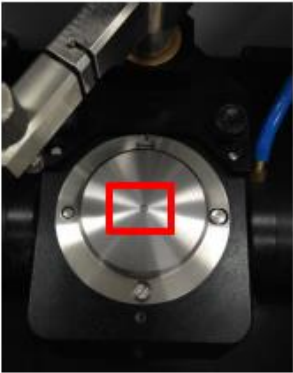
11. Export spectrum

- 1) Select data – Edit – Copy to
- 2) Select data - File – Export Spectrum – .csv file

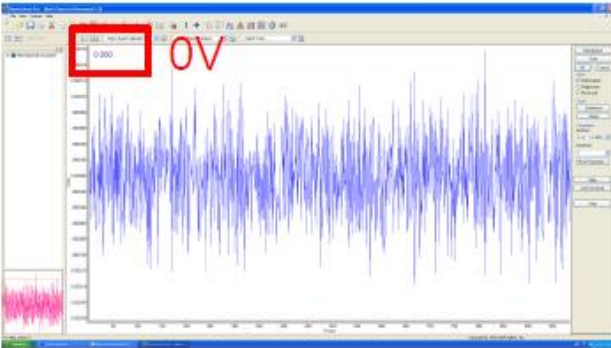


Cautions

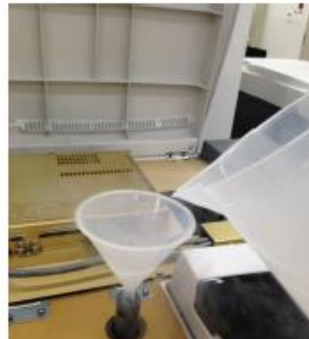
1. ATR crystal cleansing



2. Fill up the MTC detector with liquid nitrogen



After close program, fill up!



		Main body		Microscope
		ATR	ACC	
UNIST students	Client(70%)	21,000/hr	31,500/hr	42,000/hr
	Self-user(50%)	15,000/hr	22,500/hr	30,000/hr

True Café using time	Charging time
0.1~0.5 hr	0.5 hr
0.6~1.0 hr	1.0 hr
1.1~1.5 hr	1.5 hr
1.6~2.0 hr	2.0 hr
...	...