KICT Remote Sensing Technology

Fire Research Institute

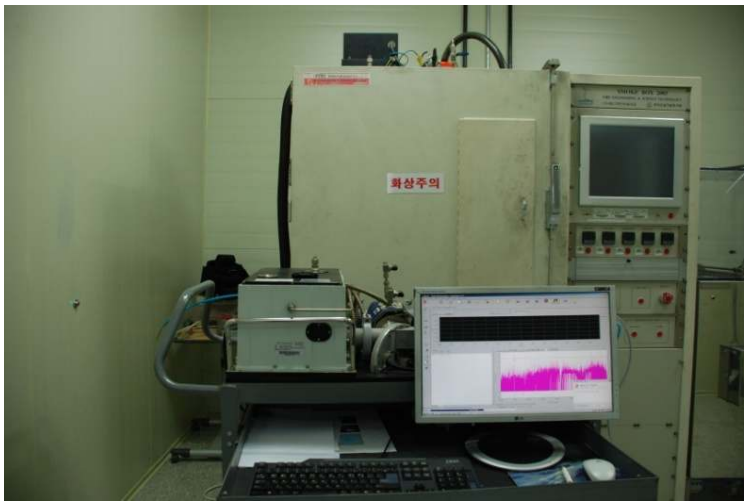
KICT 한국건설기술연구원

Korea Institute of Civil Engineering and Building Technology

Toxic Gas Analysis(Small scale to Large scale)

Fire Model : Cone Calorimeter

Fire Model : Smoke Density Chamber

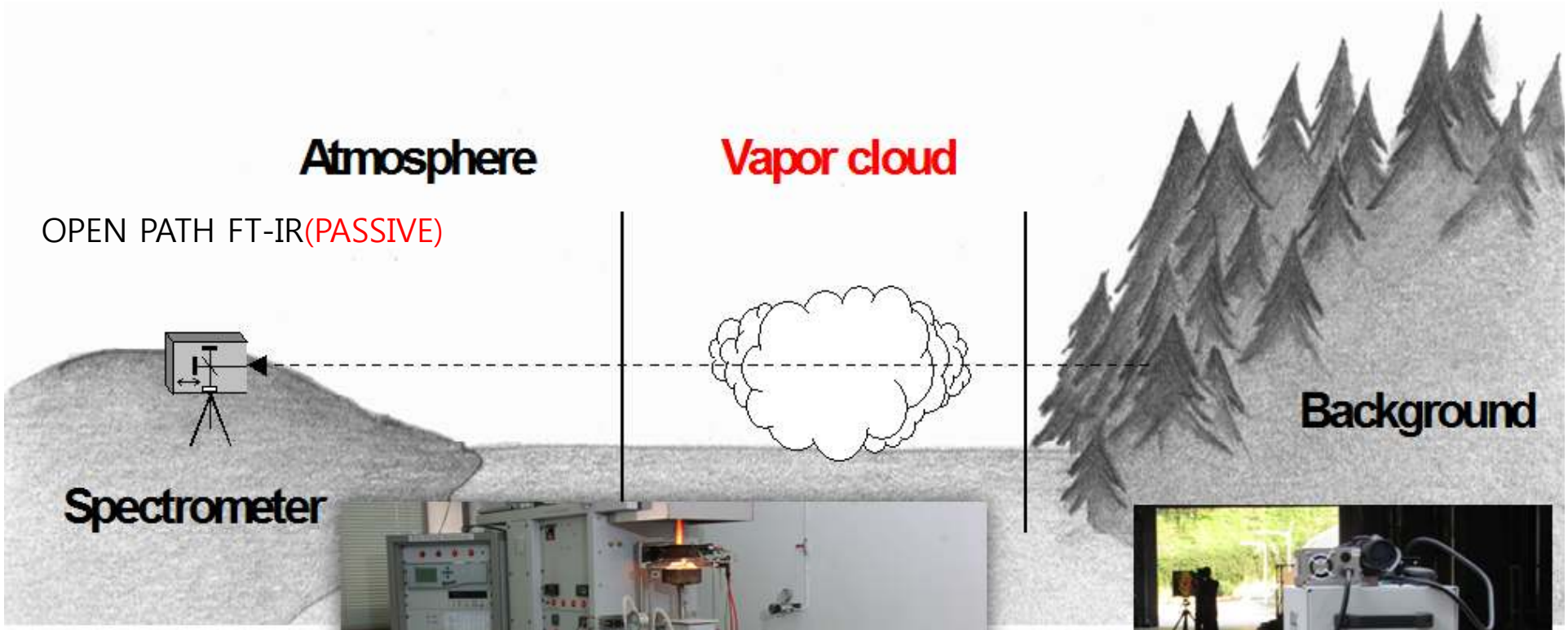


KICT TOXIC GAS ANALYSIS

- 2002 : Gas cells in FT-IR spectrometer
- Concentration units from PPM to percent
- 2007 : BS6853 Annex B2 test agency for Bureau Veritas France

OPEN PATH FT-IR : For Massive Fire

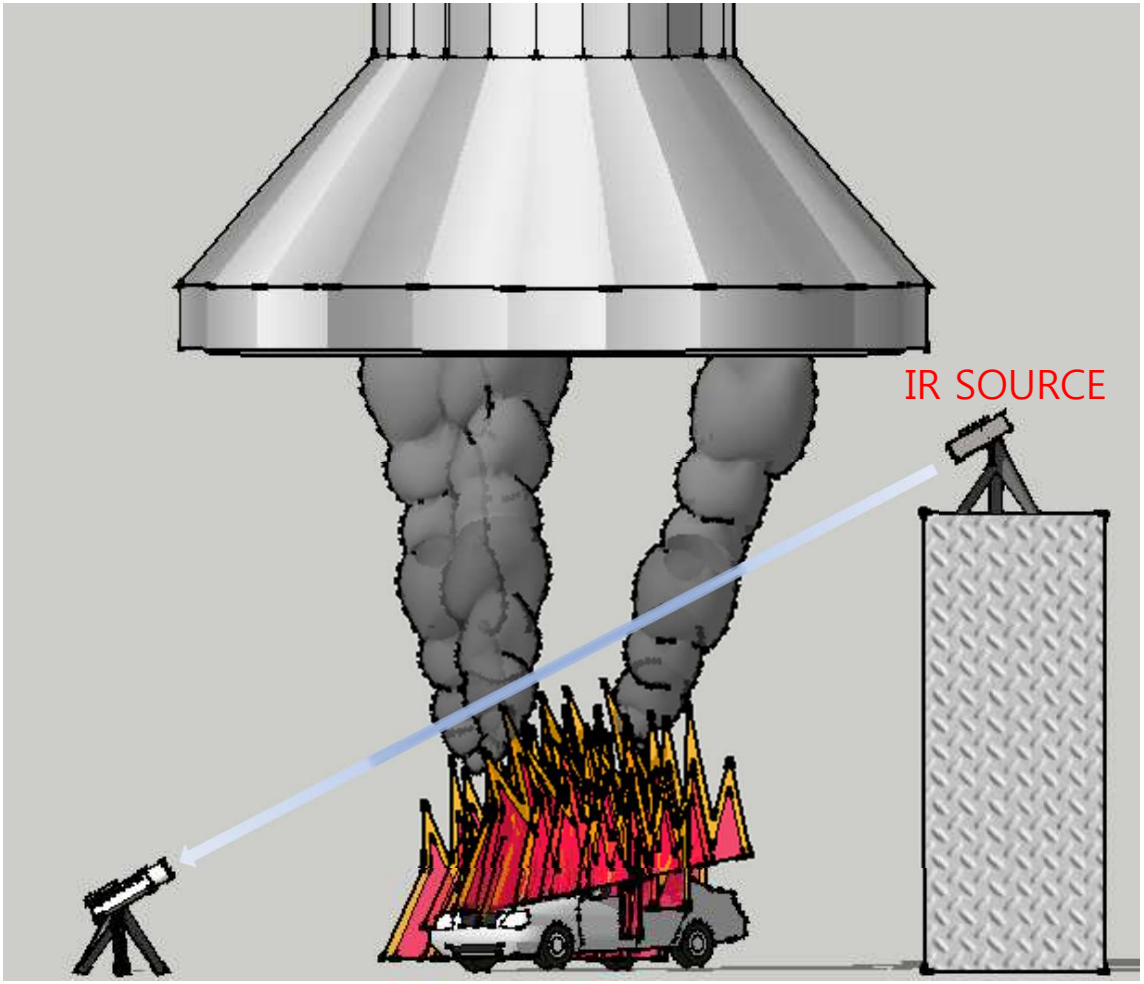
Toxic Gas Analysis(Large scale)



FT-IR(Lab)

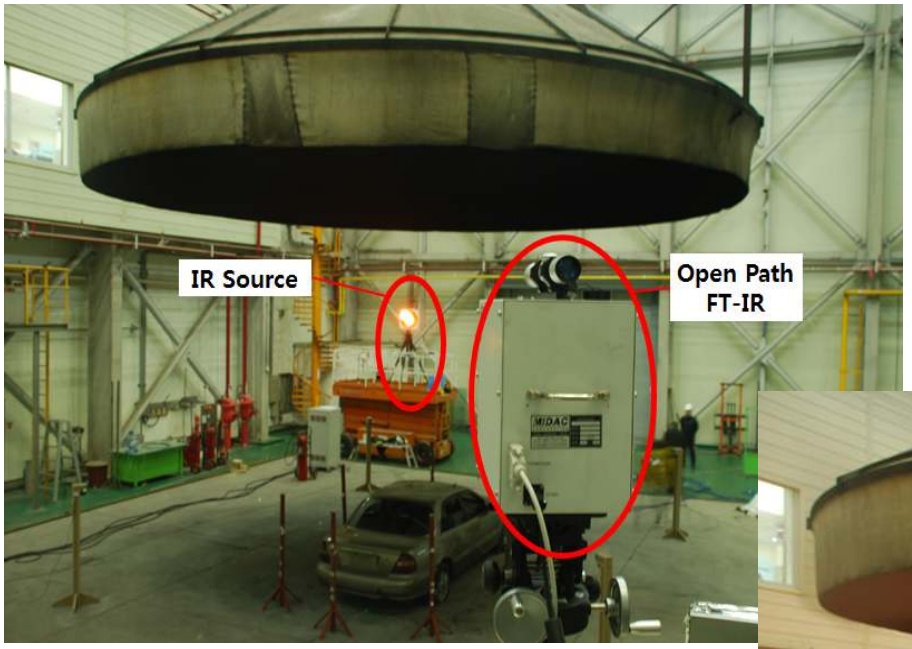
OPEN PATH FT-IR(ACTIVE)

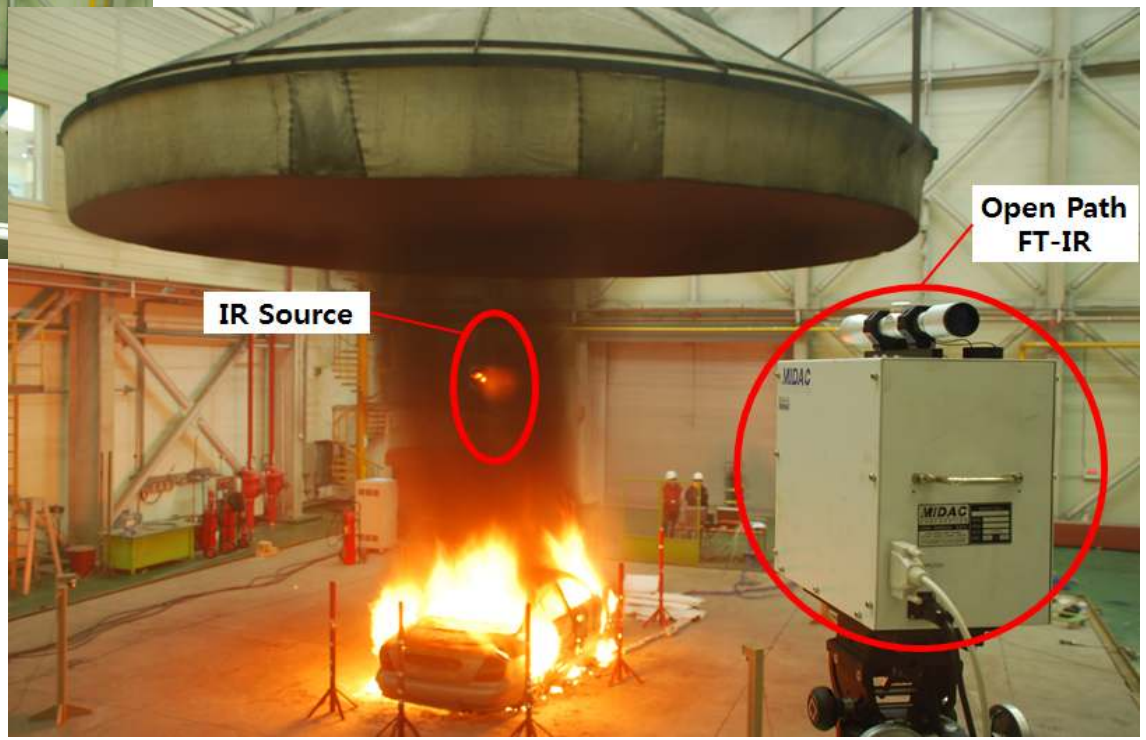
Open Path FT-IR(Active Mode)

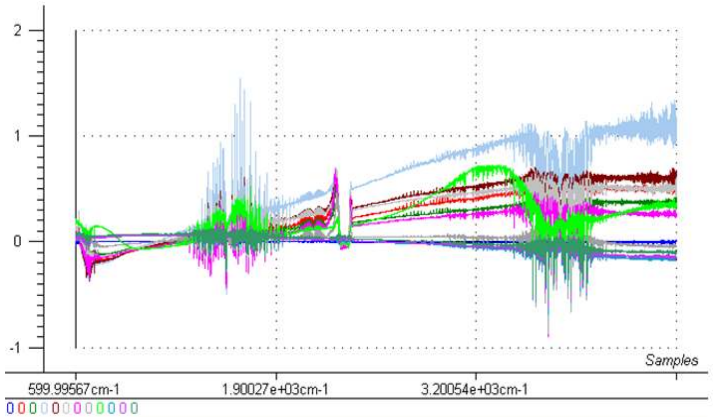


1. Various chemical species
2. Rapid Analysis
3. Real Time Analysis
4. For Large space
5. NO pre-treatment
6. No Contamination to Analyser
7. Easy to Operate
8. Easy Maintenance

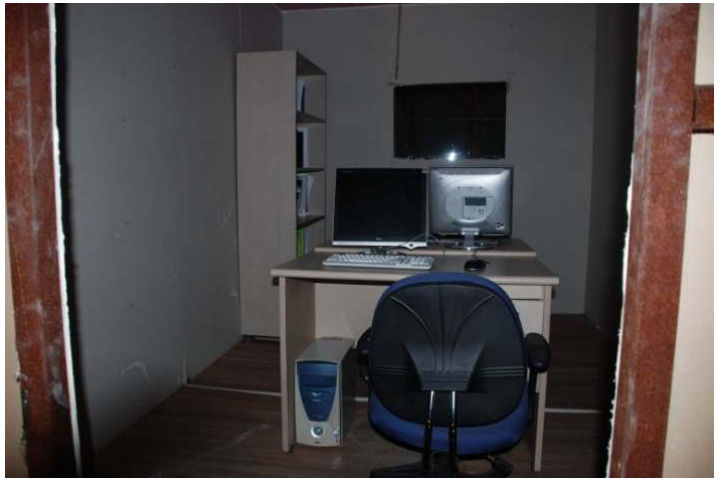
Large Scale Fire – Car Fire(Active)

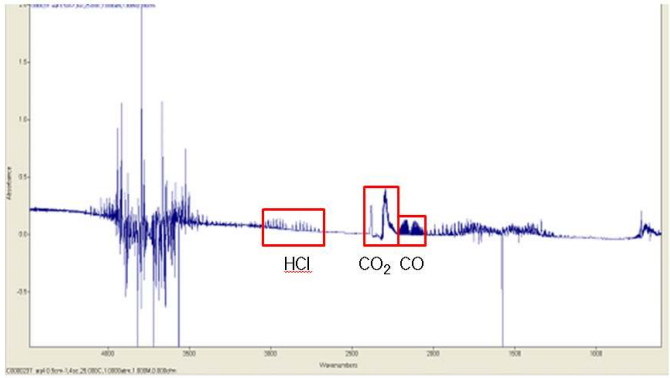






Large Scale Fire – Office Fire (Active)





Large Scale Fire – House Fire (Active)

Large Scale Fire – Apartment Fire (Passive)

Research Needs

In 2012, HF gas leakage Accident : Five people Died

Industry Expanding → Toxic Chemical use → Chemical Accident

Social Problem Solution Project

“A development of Chemical Accident Prevention & Survellance Technology”

(14 Institute, 22millon/3year)

Patent & Library D/B

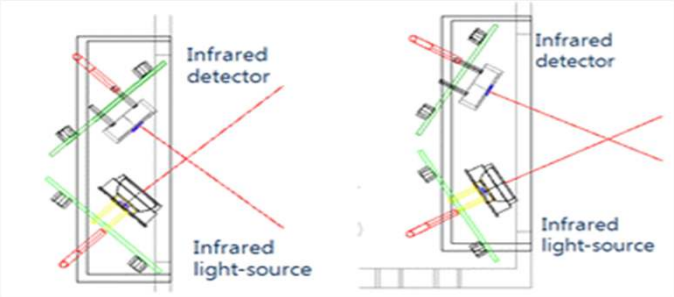
PATENT ANALYSIS
GAS LIBRARY DATA-BASE

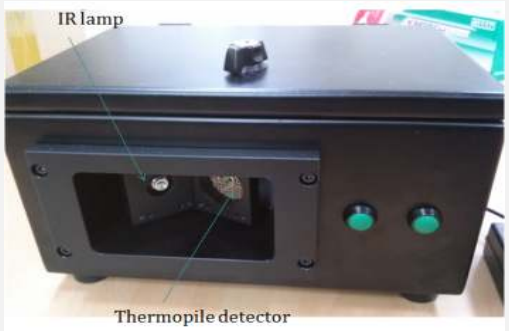
- **Hazardous gas detecting using FT-IR spectrometer**
  - Comparative analysis of Reference Chemical Wavelength and Measured Chemical Type (30 Types)
  - NO, NO_2, NF_6, SF_4, HCl, HF, CF_4, SF_6 etc.. (gas accident on Semiconductor process , 68 Conc. D/B setup)
  - For using NDIR sensor, unique absorption optical filter

Research key point

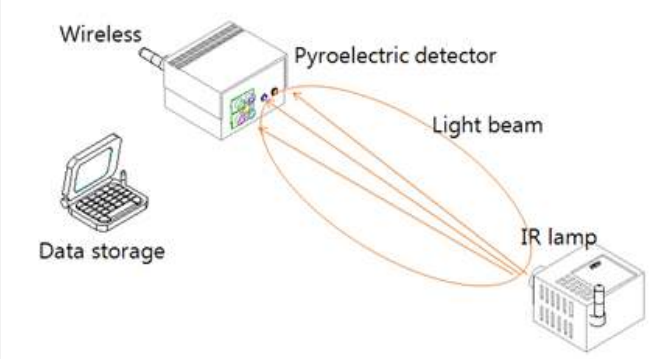
TOR & Transmission type Sensor(Open path Active)

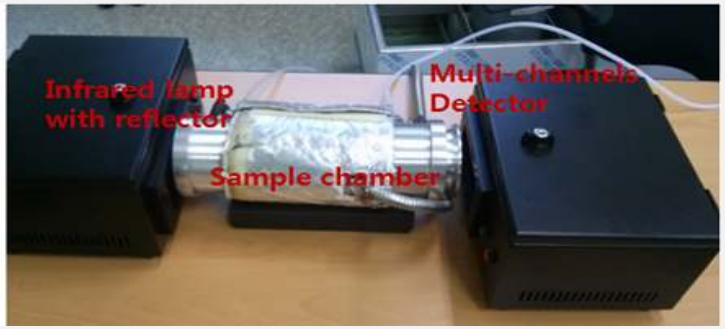
- TOR sensor that has a light source and a detector in one device (For Drone)





- Transmission–type sensor that has a light source and a detector separately

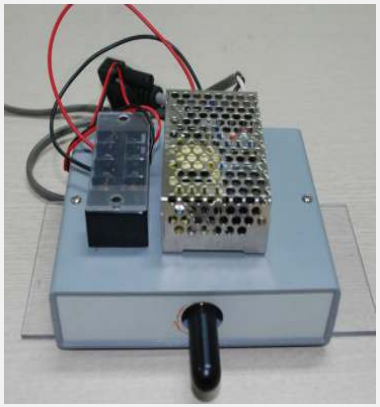




Research key point

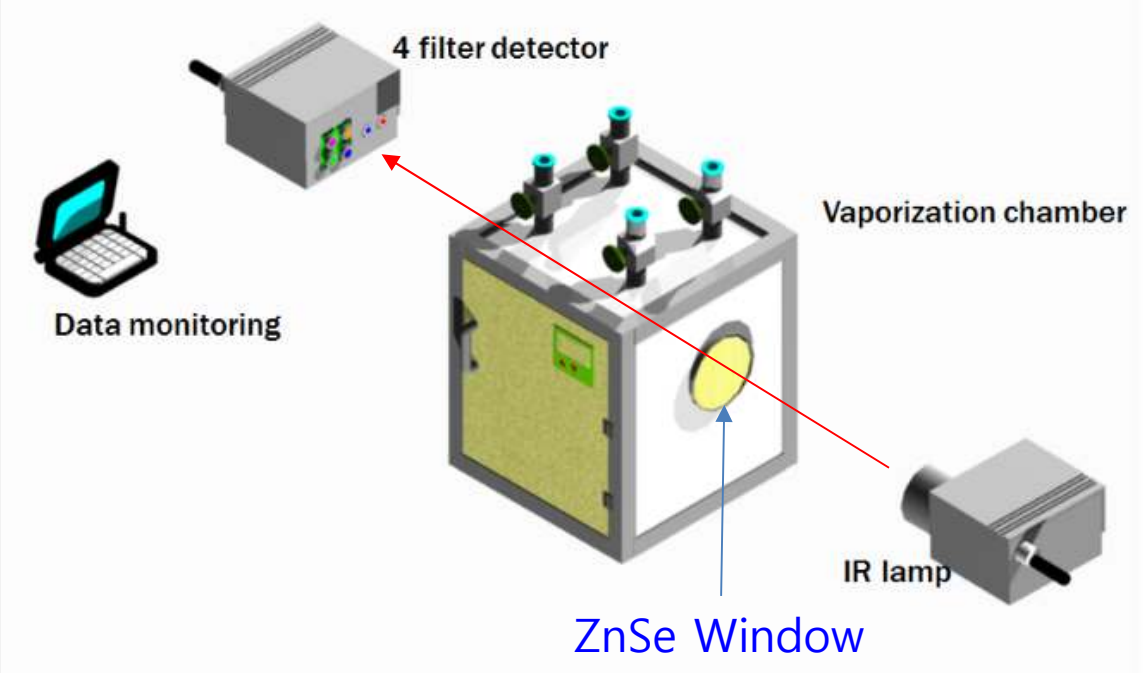
SOFTWARE

Computer monitoring S/W



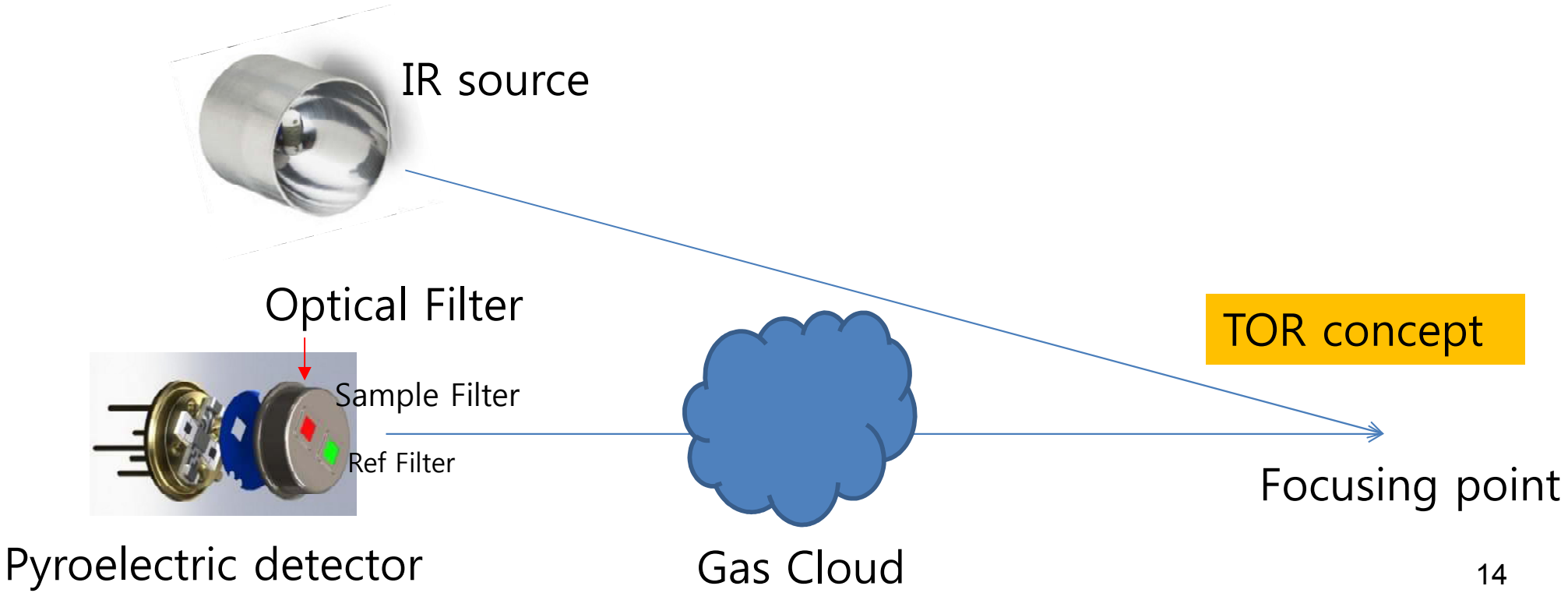
Research key point

ZnSe window Chamber for Sensor Calibration



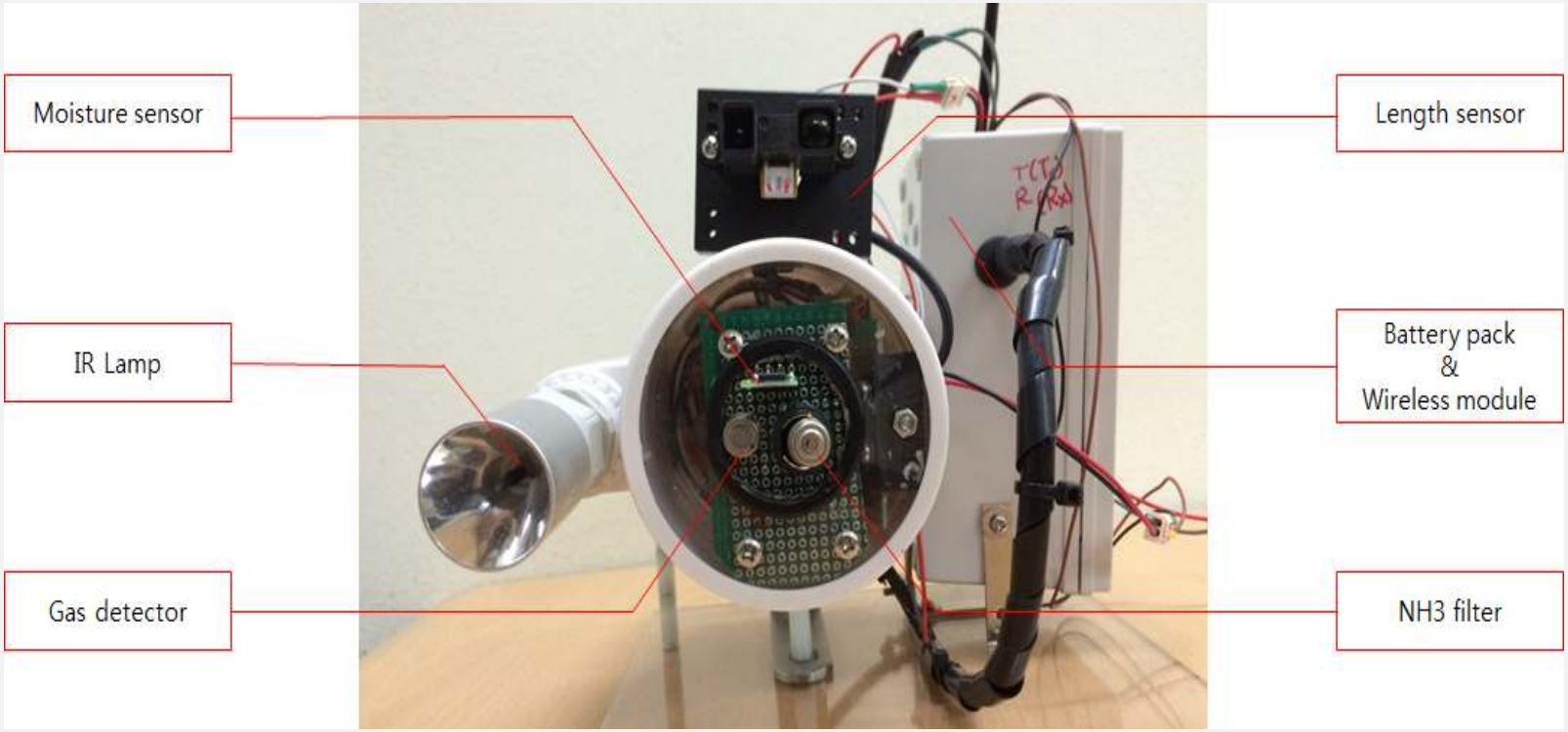
Thermal/Optical Reflectance (TOR)

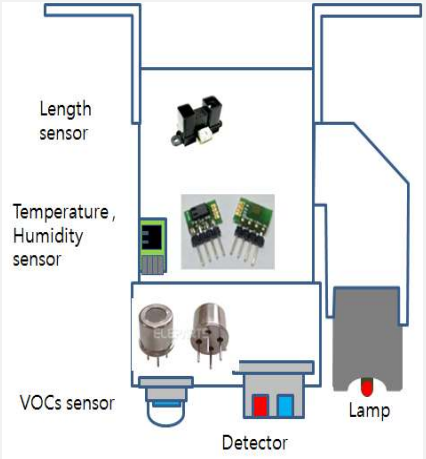
Open path gas analyzer with Optical Filter with Thermal/Optical Reflectance (TOR)



Research key point

Optical & electric amplification – long distance gas detect system – Drone

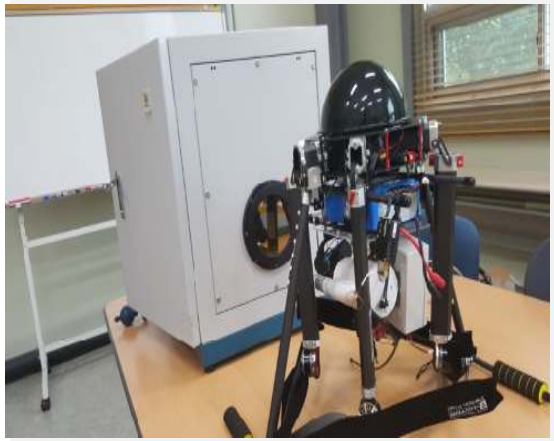




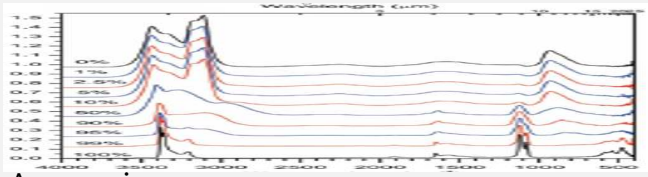
Research key point

Calibration for Drone Sensor

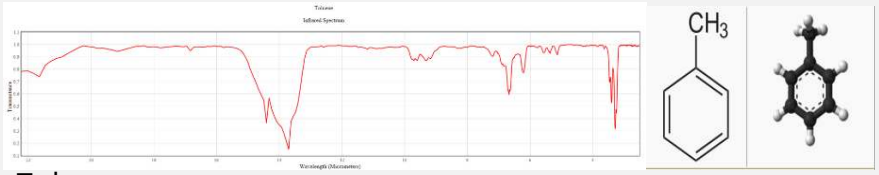
Vaporization chamber and heating



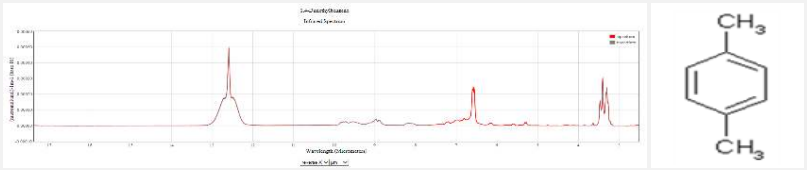
- Gas: Ammonia, Toluene, Xylene, Acetic acid
- Sample Process : Boiling Method (Constant speed)
- Detecting Method: RF commination, real-time monitoring



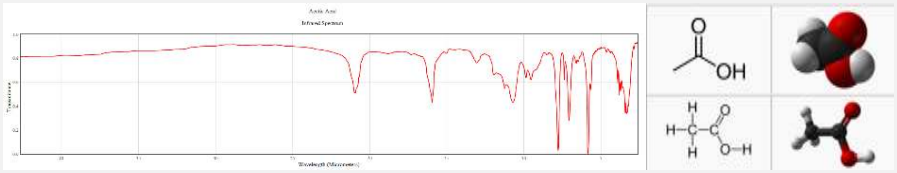
Ammonia



Toluene



Xylene



Acetic acid

Research key point

Confirm the linearity of production system

PLSR Calibration

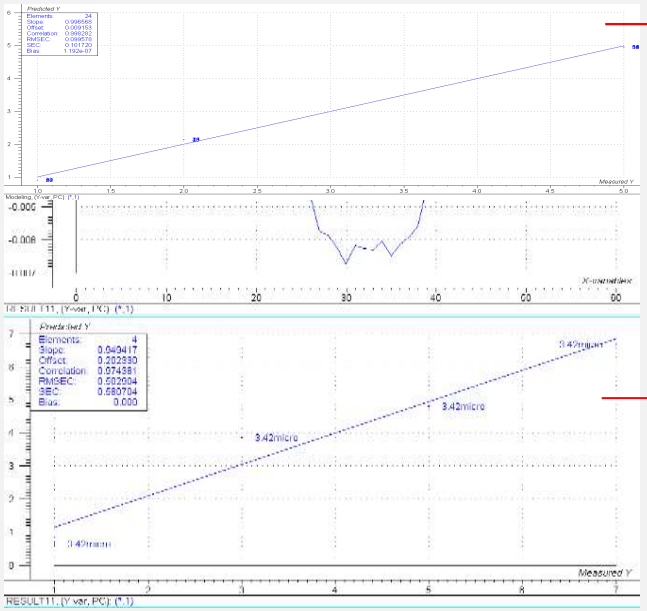
Chemical Reference Values

Spectroscopic Data

Calibration Modeling by Multivariate Calibration

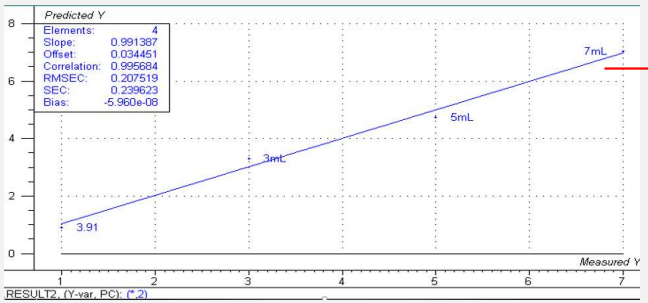
Unknown samples

Chemical Properties



Ammonia

Correlation : 0.99

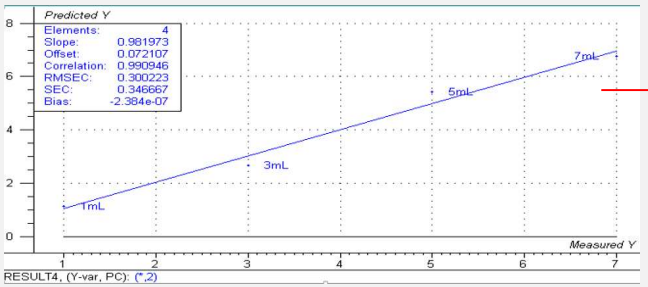


Xylene

Correlation : 0.99

Toluene

Correlation : 0.97



Acetic acid

Correlation : 0.99

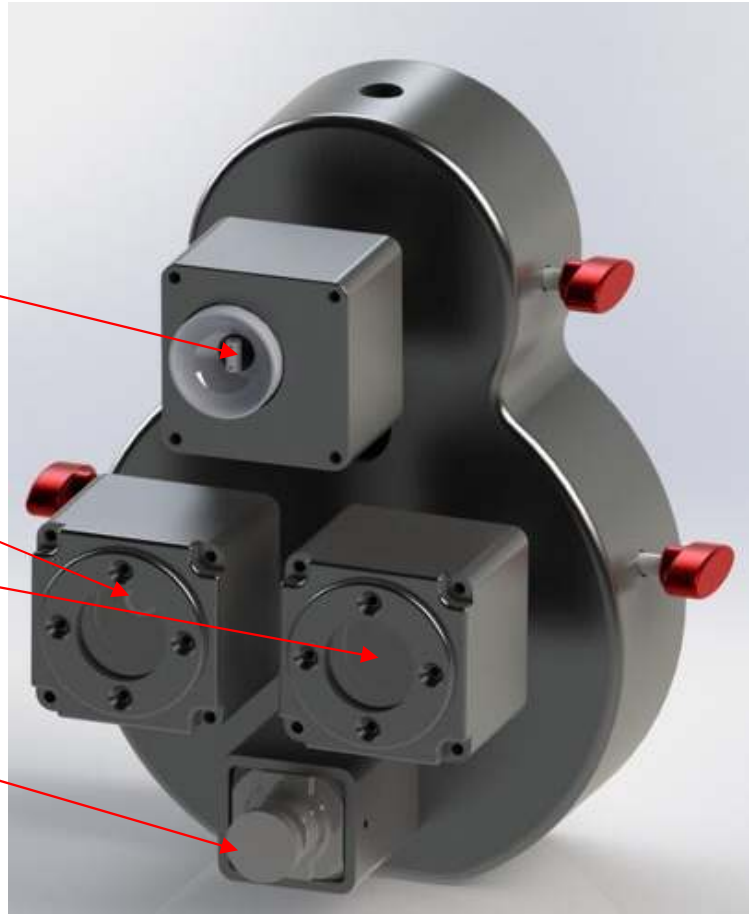
TOR Sensor for Drone

IR source

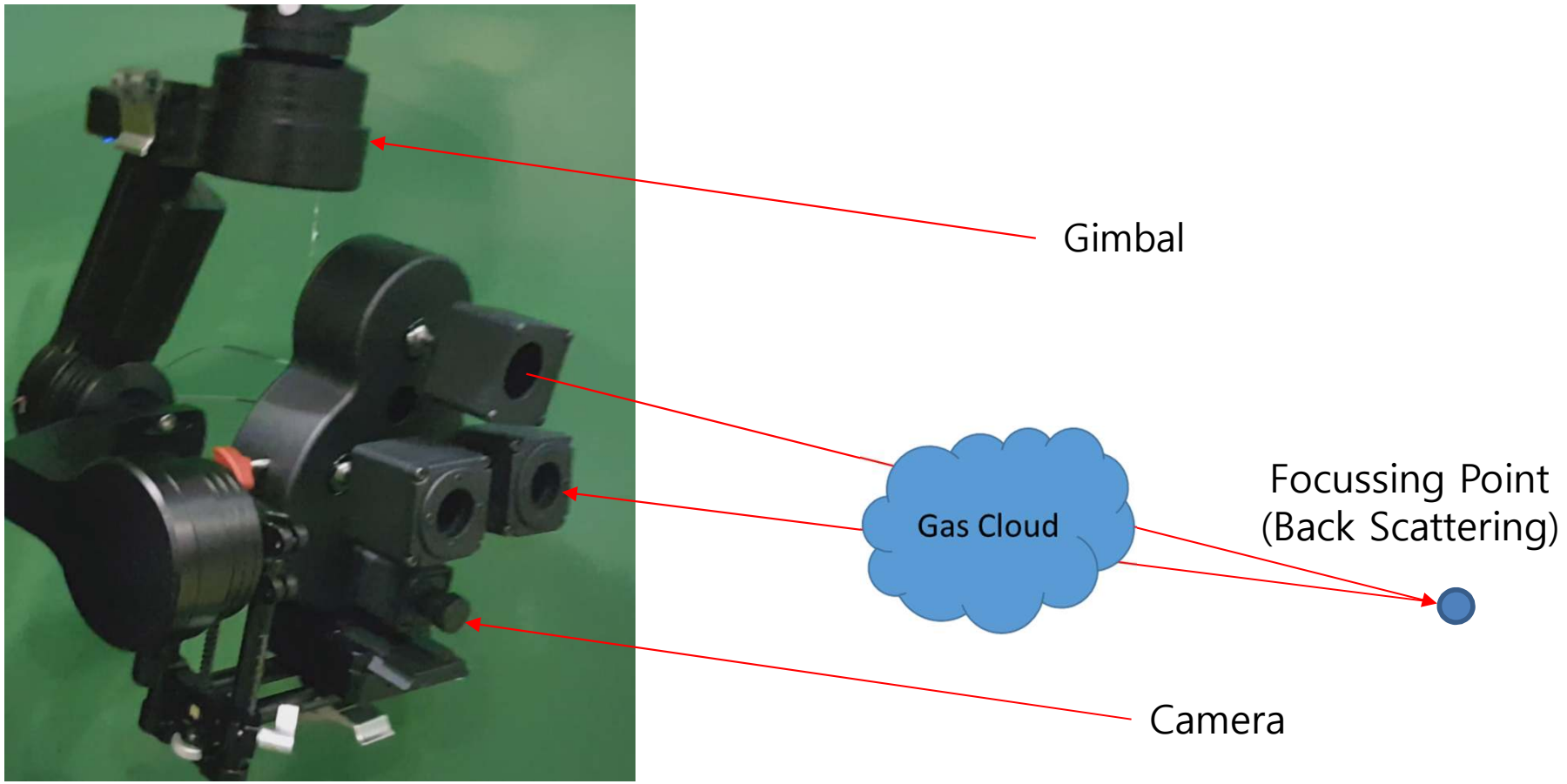
TOR sensor

Interference Correction

Camera



TOR Sensor for Drone

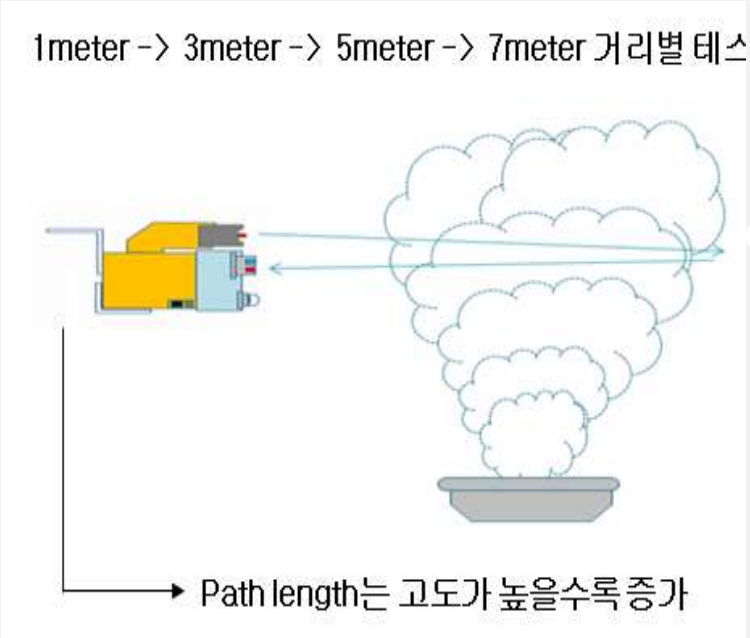


TOR Sensor for Drone

Gimbal
&
TOR
sensor

TOR Sensor : Drone Test – Ammonia detect

Confirm the linearity of production system

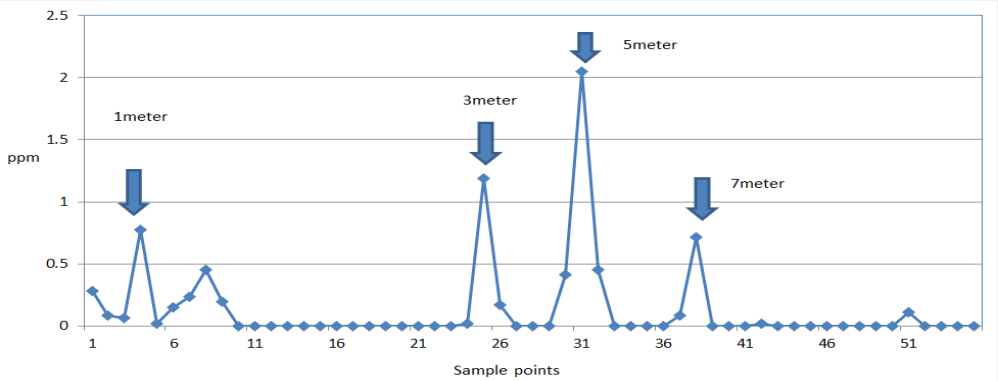


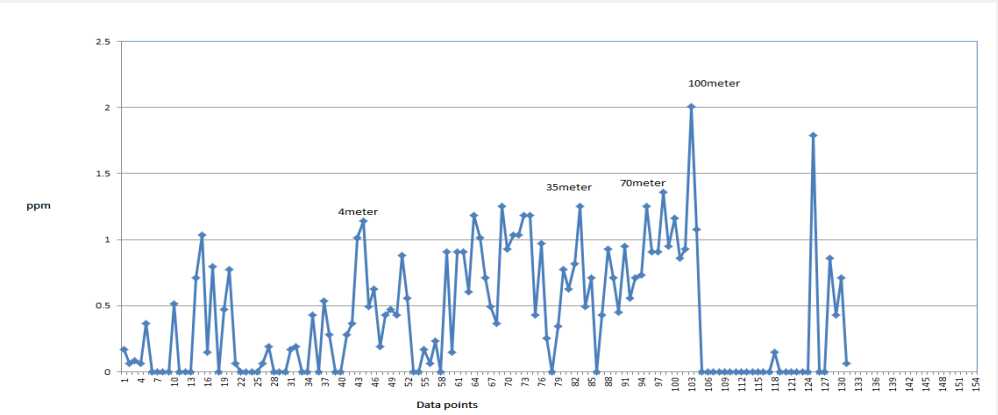
TOR Sensor : Drone Test – Ammonia detect

Confirm the linearity of production system

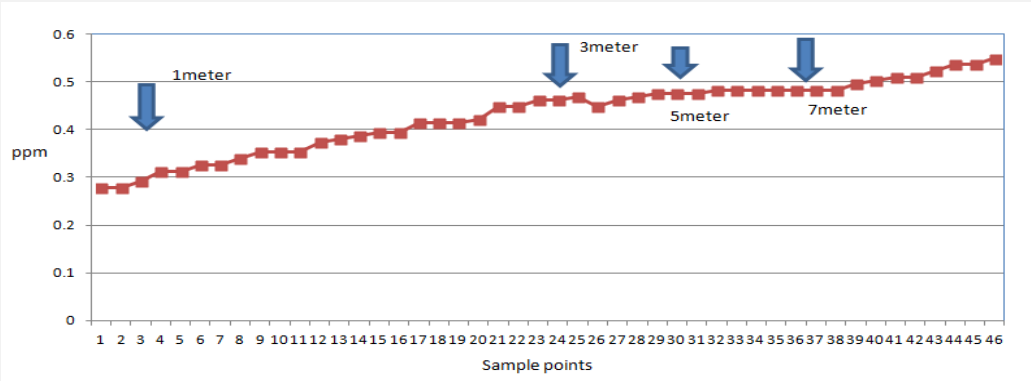
Calibration on pathlength

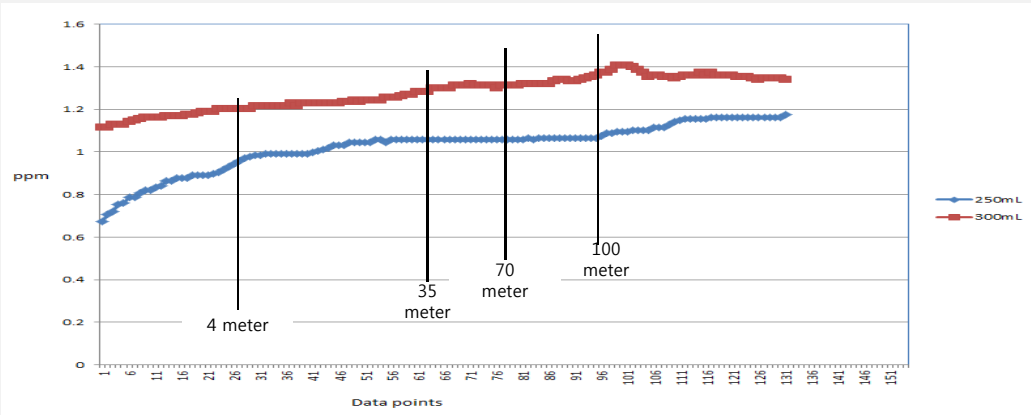
Test result of NDIR Data





Test result of VOCs Sensor Data





Transmission-type sensor System

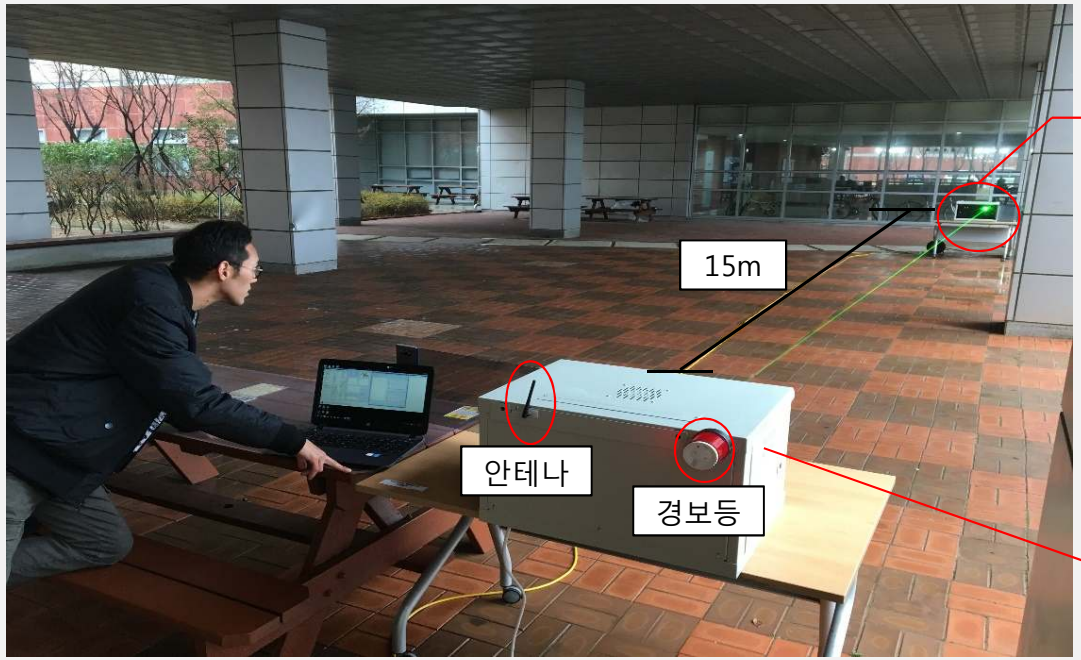
TEST-BED

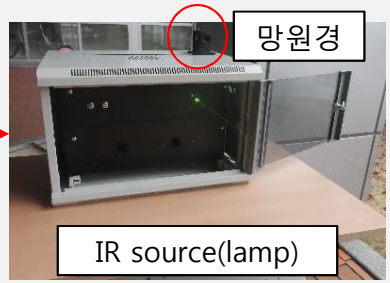
15~30M

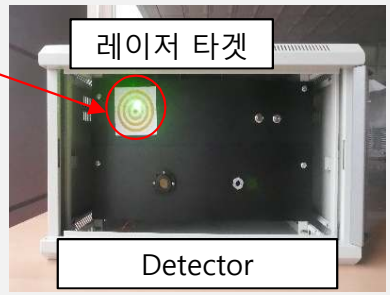
Transmission-type sensor System

TEST-BED

15M







Application field

TOR Type

Marine

Plant

Chemical Accident / Terror

Environmental Monitoring

Thank you for your kind attention !

KICT-FIRE 화재안전연구소 (화성)
Fire Investigation, Research, testing and Education