A Preliminary Result on Characteristics of Temporal Column Abundances of CO2 and CH4 from the Ground-based FTS at Anmyeondo, Korea during 2015

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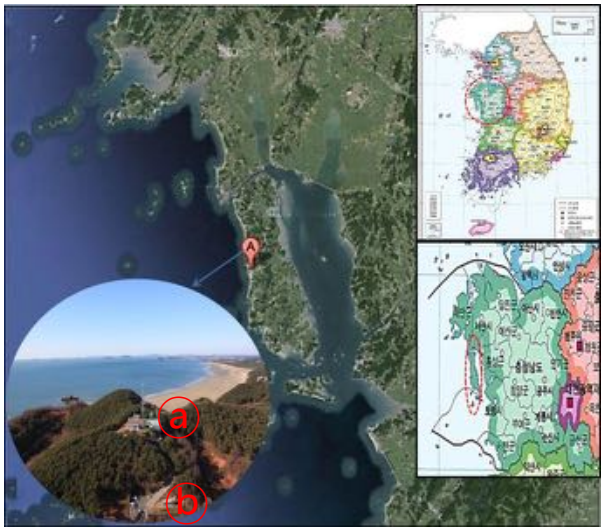
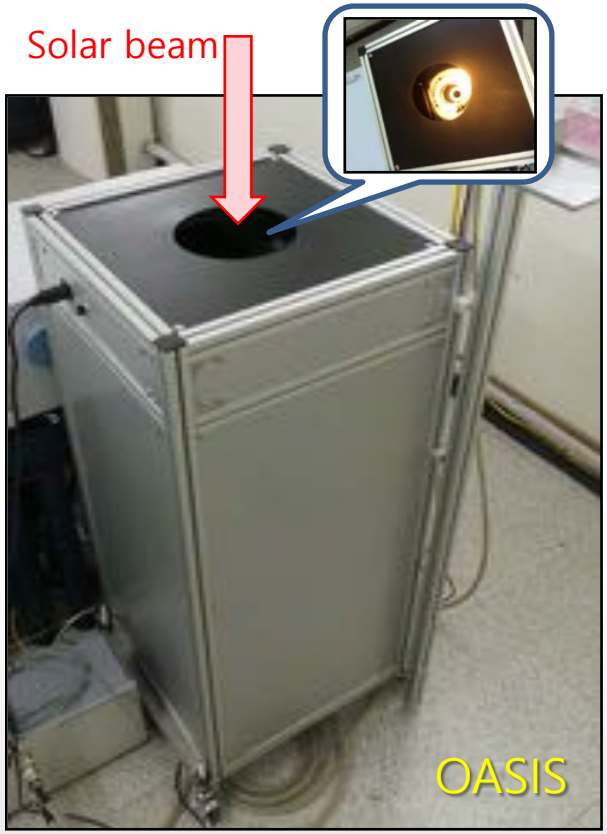
Site Description

- Anmyeondo is operational TCCON site located at mid-west Korea
- Lat/Lon/Alt: 36°32N / 126°19E / 30 ma└|
- A: WMO Regional GAW station
- B: FTS site
- IFS-125HR / A547N solar tracker / Camtracker
- InGaAs, Si diode / CaF2 / NIR source
- OASIS (Operational Automatic System for Intensity of Sunray)



Improvement of Spectral Measurement

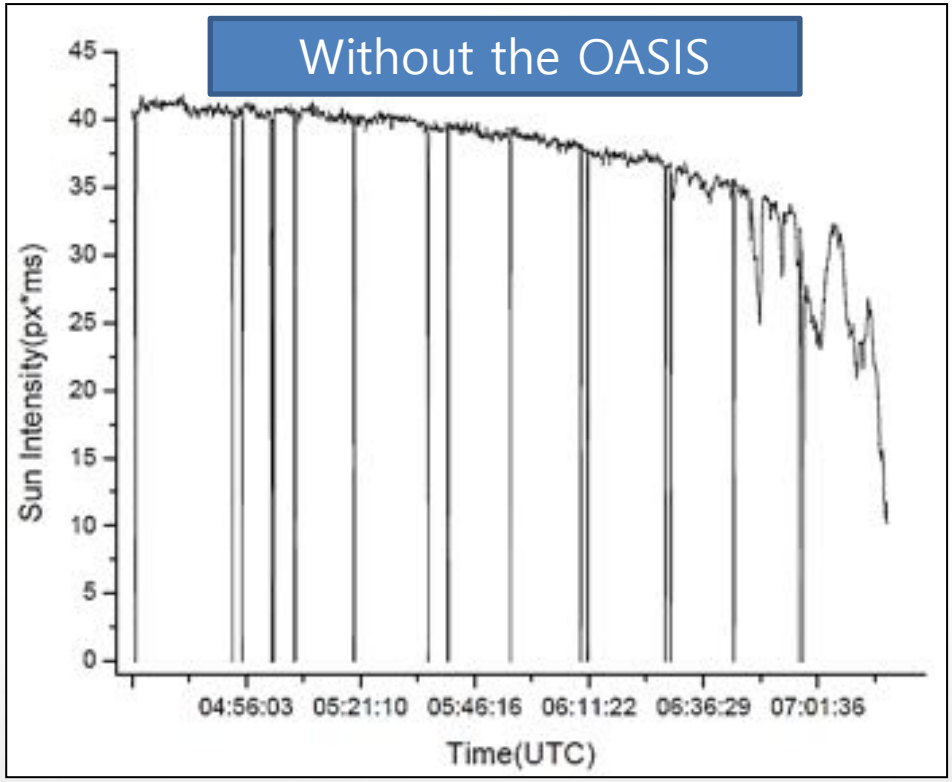
◈ Development of Operational Automatic System for Intensity of Sunray (OASIS)
- Photo-electronic sensor detects the number of photons in solar beam.
- Aperture controls the diameter of solar beam according to photons.
- A maximum solar energy can be given in the detection range of the FTS.

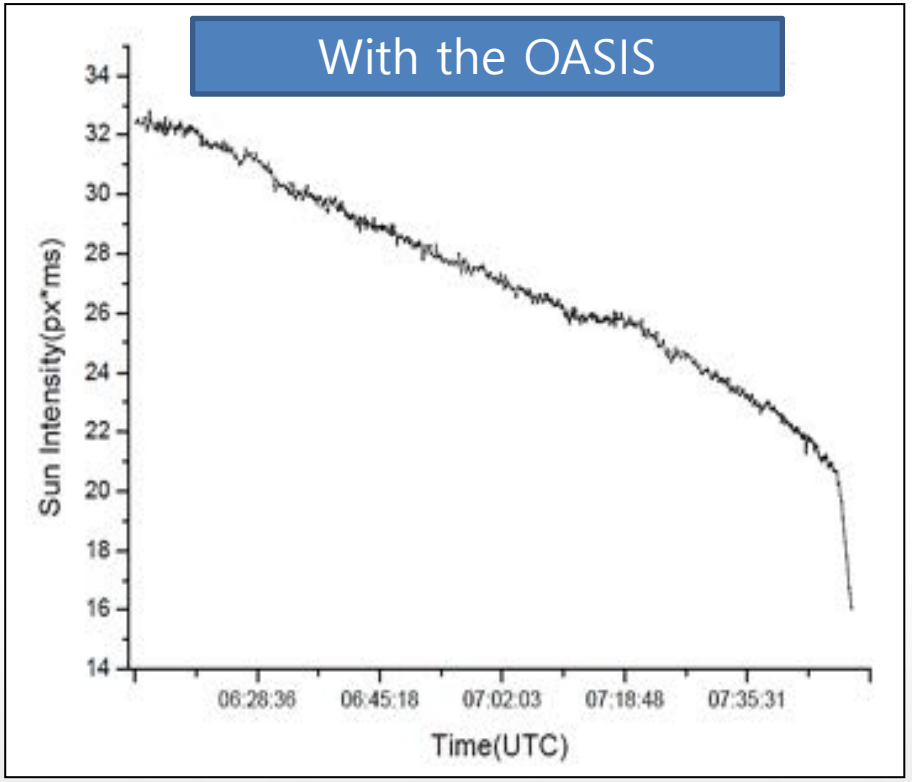


Aperture Control Unit

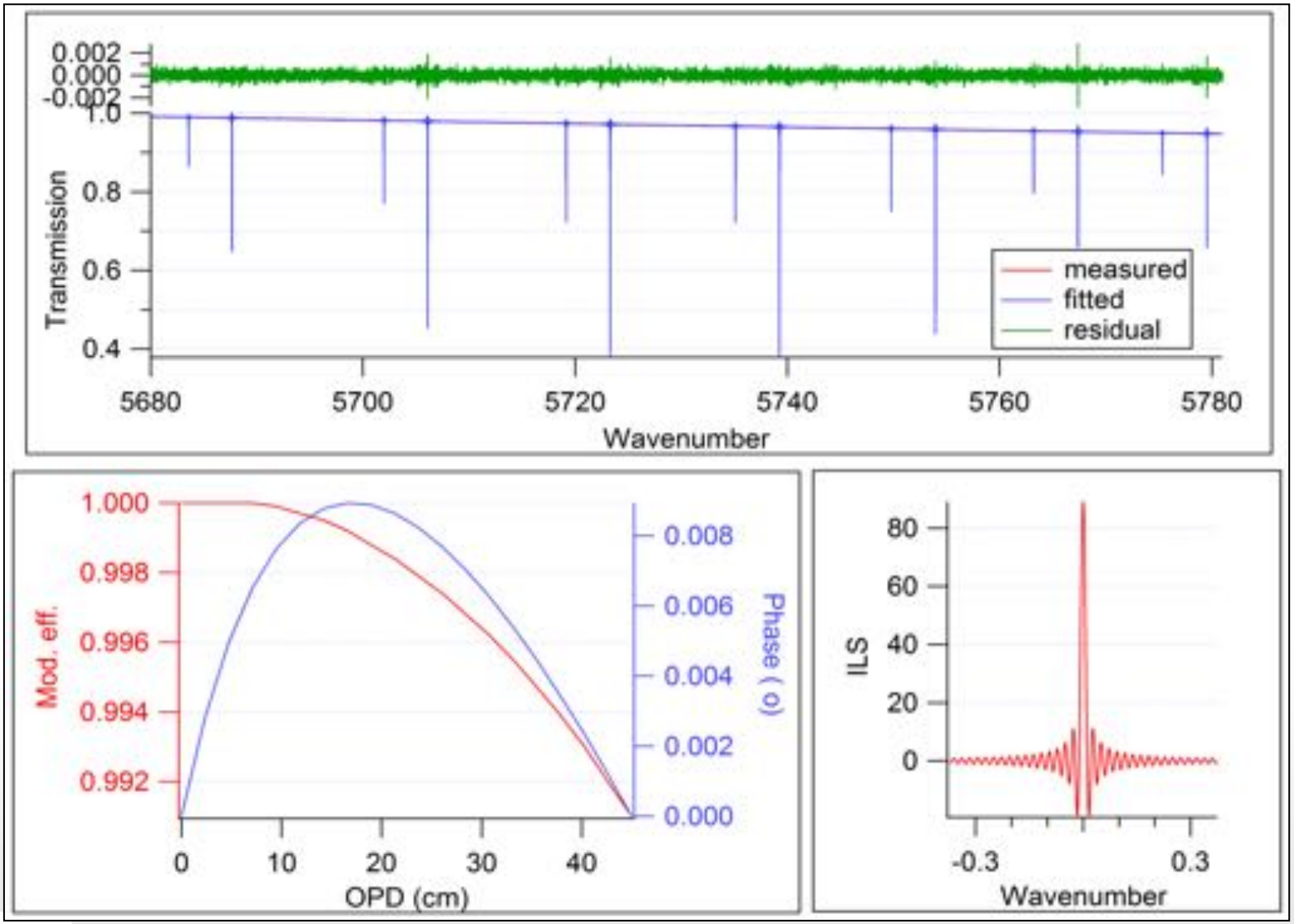
Sensor

OASIS Effect



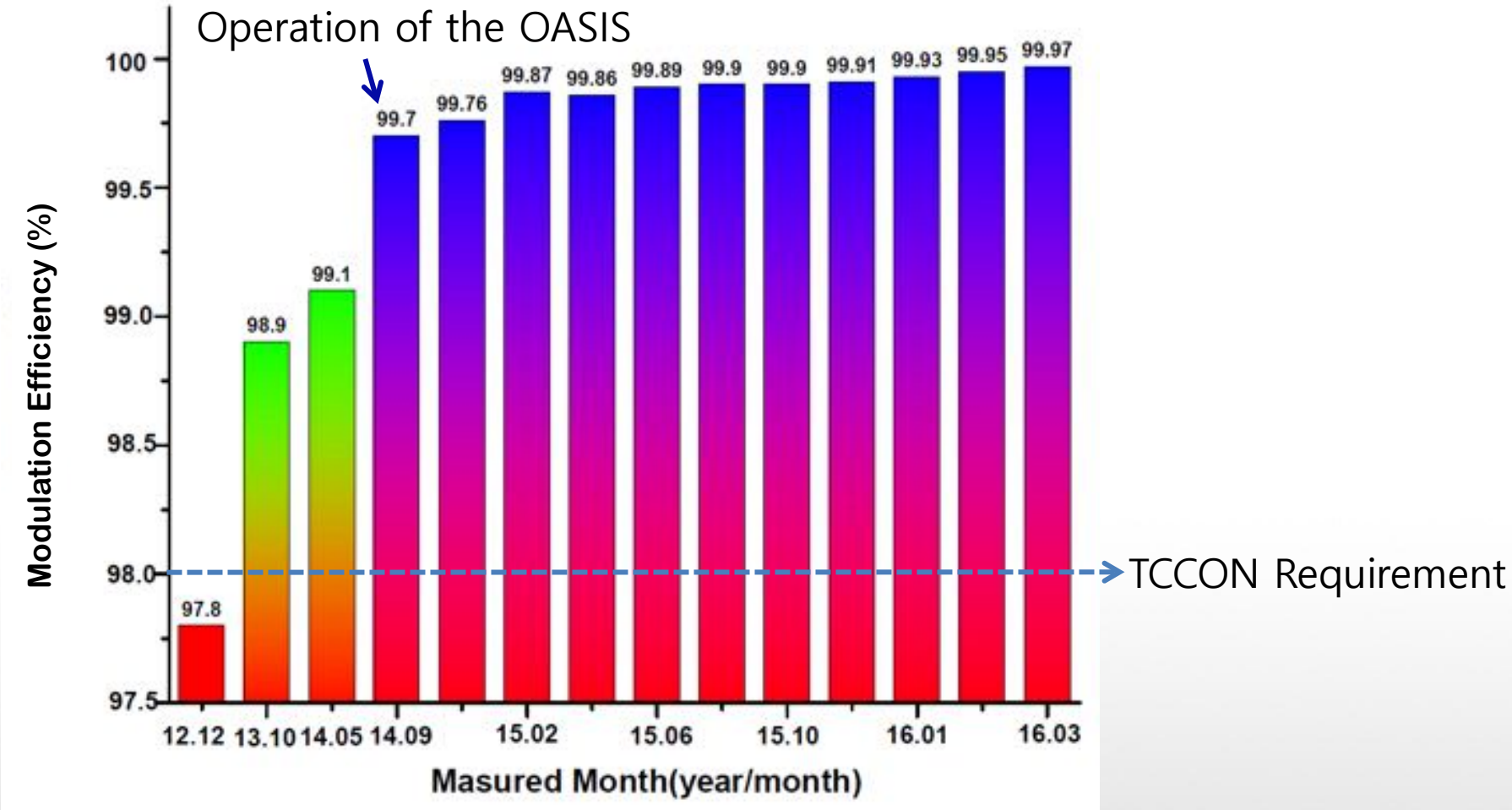


Accuracy of Measured Spectrum



Modulation Efficiency

◈ Monthly Modulation Efficiency (45 cm OPD)



Instrument Configurations

	FTS(IFS-125HR)	GOSAT-FTS	OCO-2 (grating)
Band	9000~16,000 cm^{-1} (Si Diode Detector)	12,900~13,200 cm^{-1} (Si Diode Detector)	12,953~13,210 cm^{-1} (HgCdTe Detector)
	3,800~12,800 cm^{-1} (InGaAs Detector)	5,800~6,400 cm^{-1} (InGaAs Detector)	6,172~6,289 cm^{-1} (HgCdTe Detector)
		4,800~5,200 cm^{-1} (InGaAs Detector)	4,807~4,901 cm^{-1} (HgCdTe Detector)
Spec. Res.	0.2 cm^{-1}	0.2 cm^{-1}	0.3 cm^{-1}
Time. Res.	Every 2~3 min.	Every 3 days	Every 16 days

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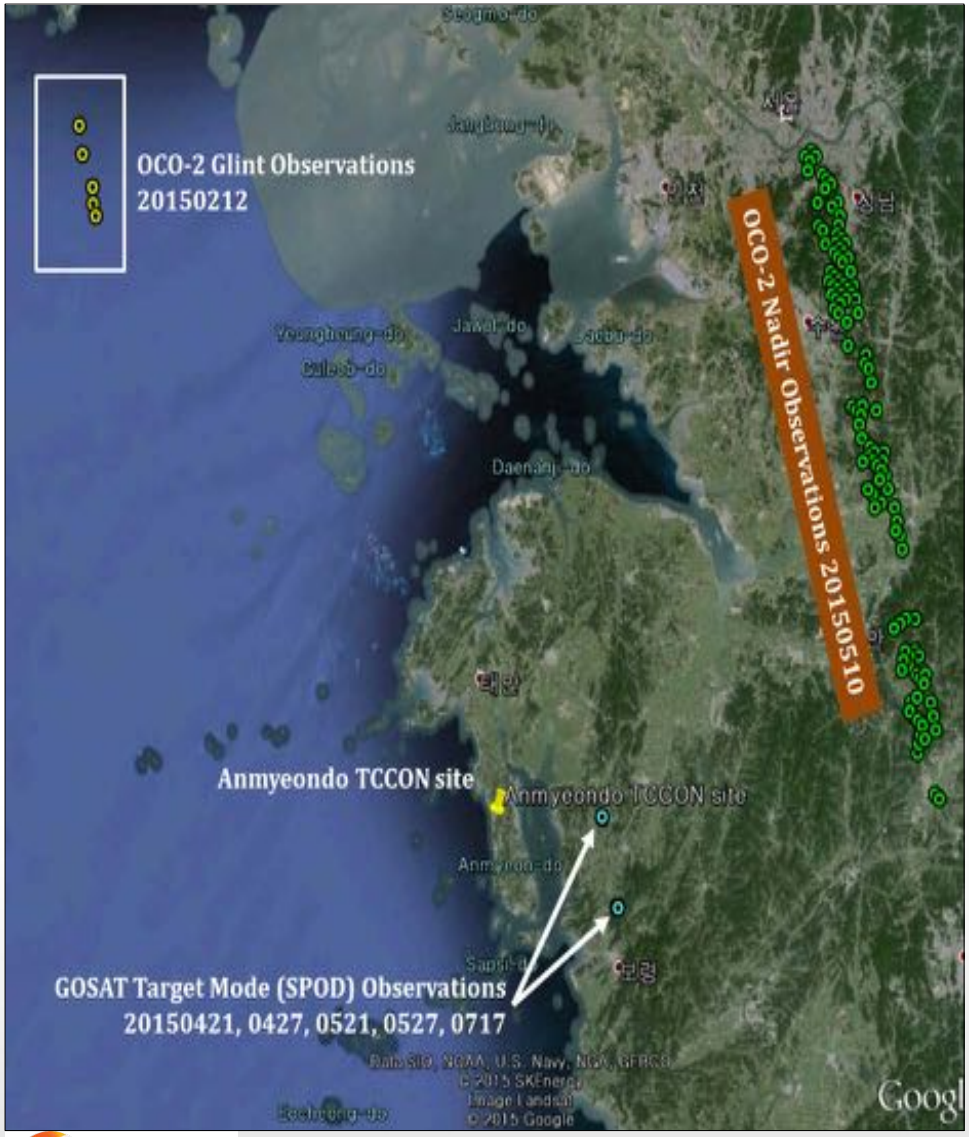
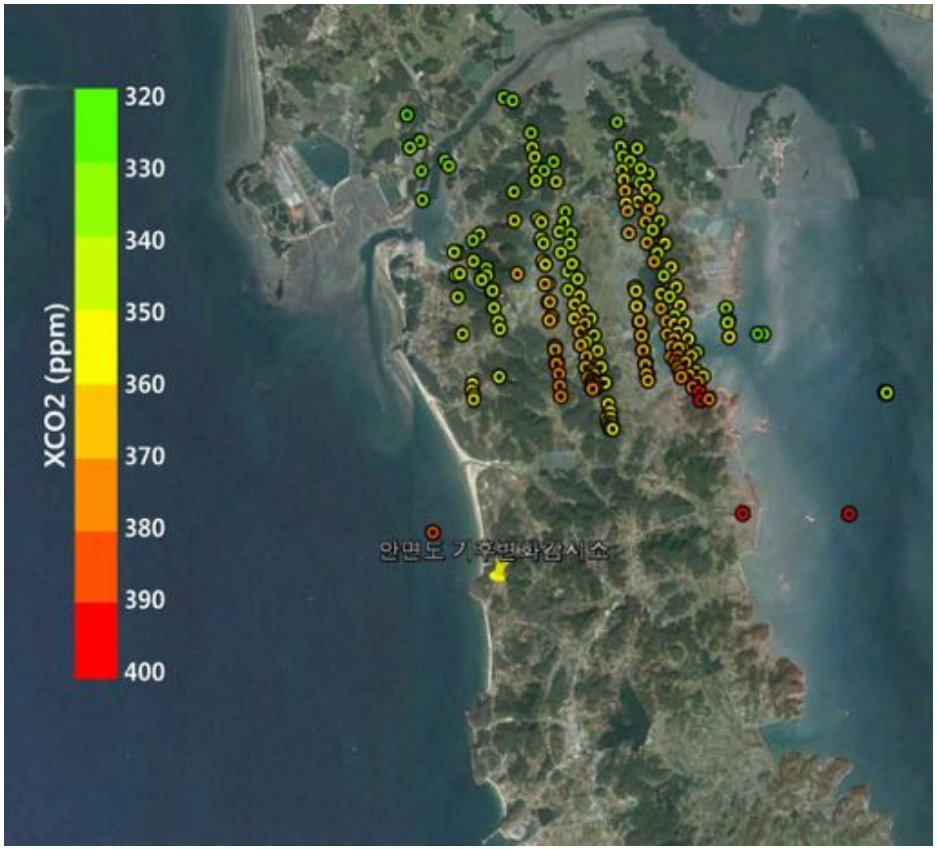

OCO-2 Glint Observations
20150212
OCO-2 Nadir Observations 20150510
Anmyeondo TCCON site
Anmyeondo TCCON site
GOSAT Target Mode (SPOD) Observations
20150421, 0427, 0521, 0527, 0717


XCO2 (ppm)
320
330
340
350
360
370
380
390
400

Data

◈ Insitu Observation Data

- Data/Period: Hourly-averaged CO2 & CH4 / 2015.1.~12.
- Site/Instrument: KGAWC / CRDS (Cavity Ring-Down Spectroscopy)

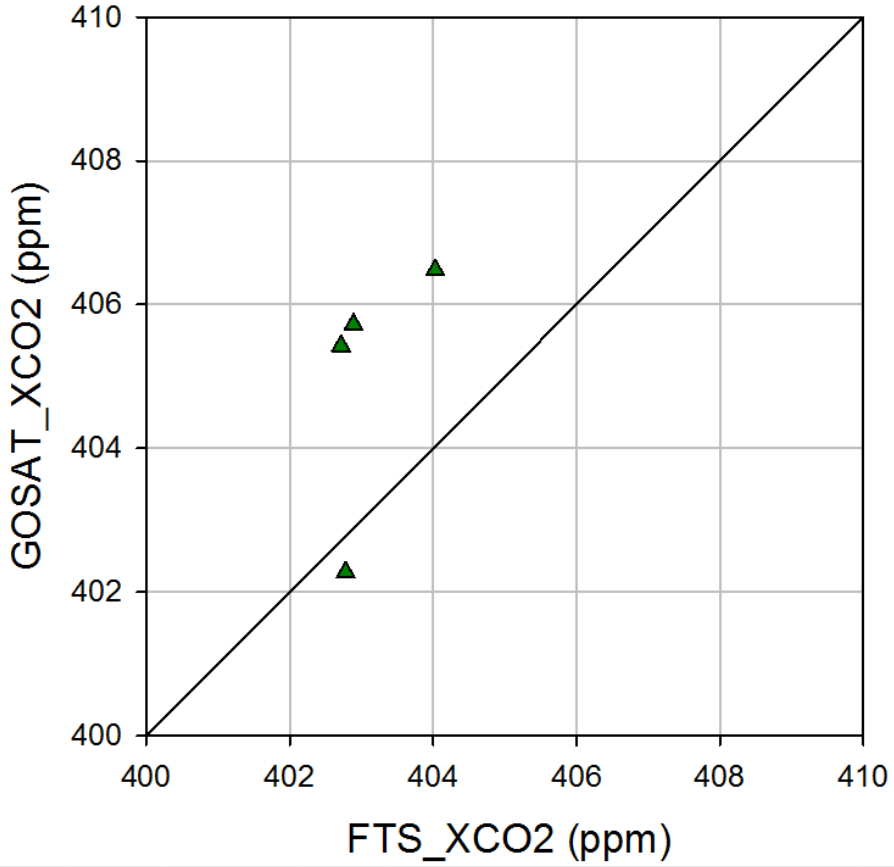
◈ Ground-based FT-IR Measurements & Retrievals

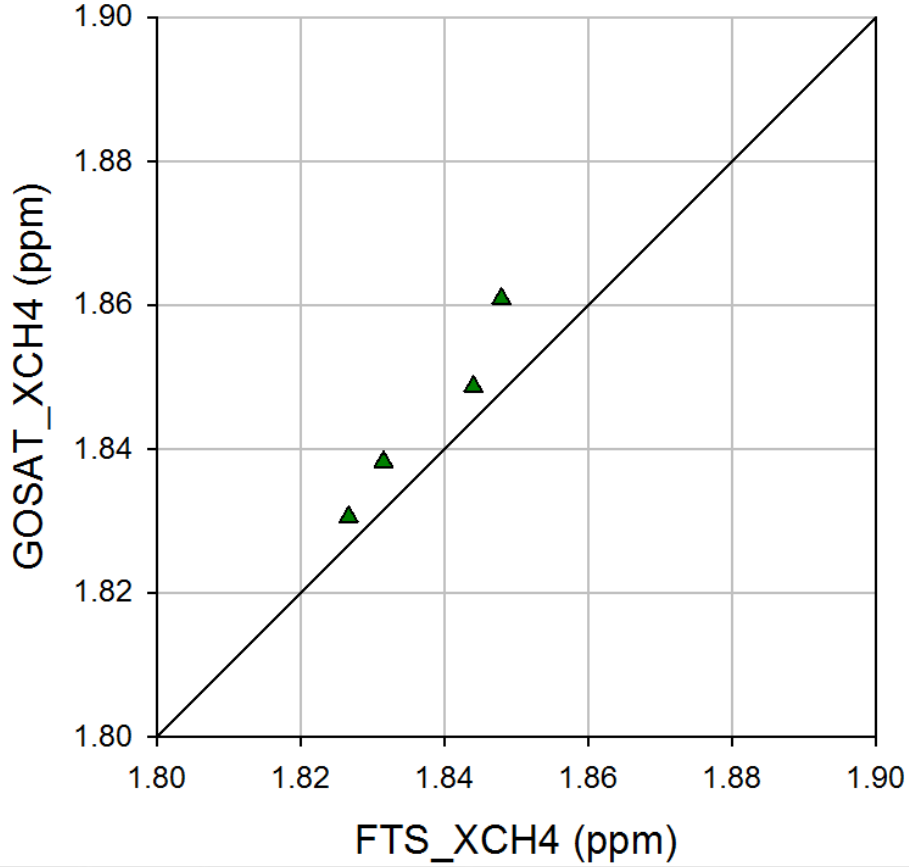
- Data/Period: Hourly-averaged XCO2 & XCH4 / 2015.2.~9.
- Site/Instrument: KGAWC / IFS-125HR

◈ Satellite-based FT-IR Measurements & Retrievals

- Data/Period: Spatially-averaged XCO2 & XCH4 around 1300LST / 2015.1.~12.
- Area/Satellite: KGAWC ±0.5 Lat & Lon / OCO-2, GOSAT

	XCO2 Dif.	XCH4 Dif.
2015. 4. 21.	2.449	0.013
2015. 4. 27.	2.707	0.004
2015. 5. 21.	2.830	0.005
2015. 5. 27.	-0.507	0.007
Average	1.870	0.007





Summary

◈ Ground-based FT-IR measurements show significant stability with high accuracy and reliability.

- after consistently maximizing the incoming solar intensity by using the OASIS
- in the accuracy of spectral measurement over 99.9% since Feb 2015

◈ The features of seasonal variability of CO2 & CH4 are well captured

- in both insitu and ground-based FT-IR measurements

◈ Retrieved XCO2 & XCH4 from the ground-based FT-IR represent reliable annual cycles.

- with high concentration in winter-spring season and low in summer season

◈ Limited CO2 & CH4 retrievals have obtained from the satellite-based FT-IR.

- due to the spectrum contamination resulted from clouds, aerosols and interferences of other atmospheric species
- Validation results against the G-B FT-IR are likely to be reasonable.

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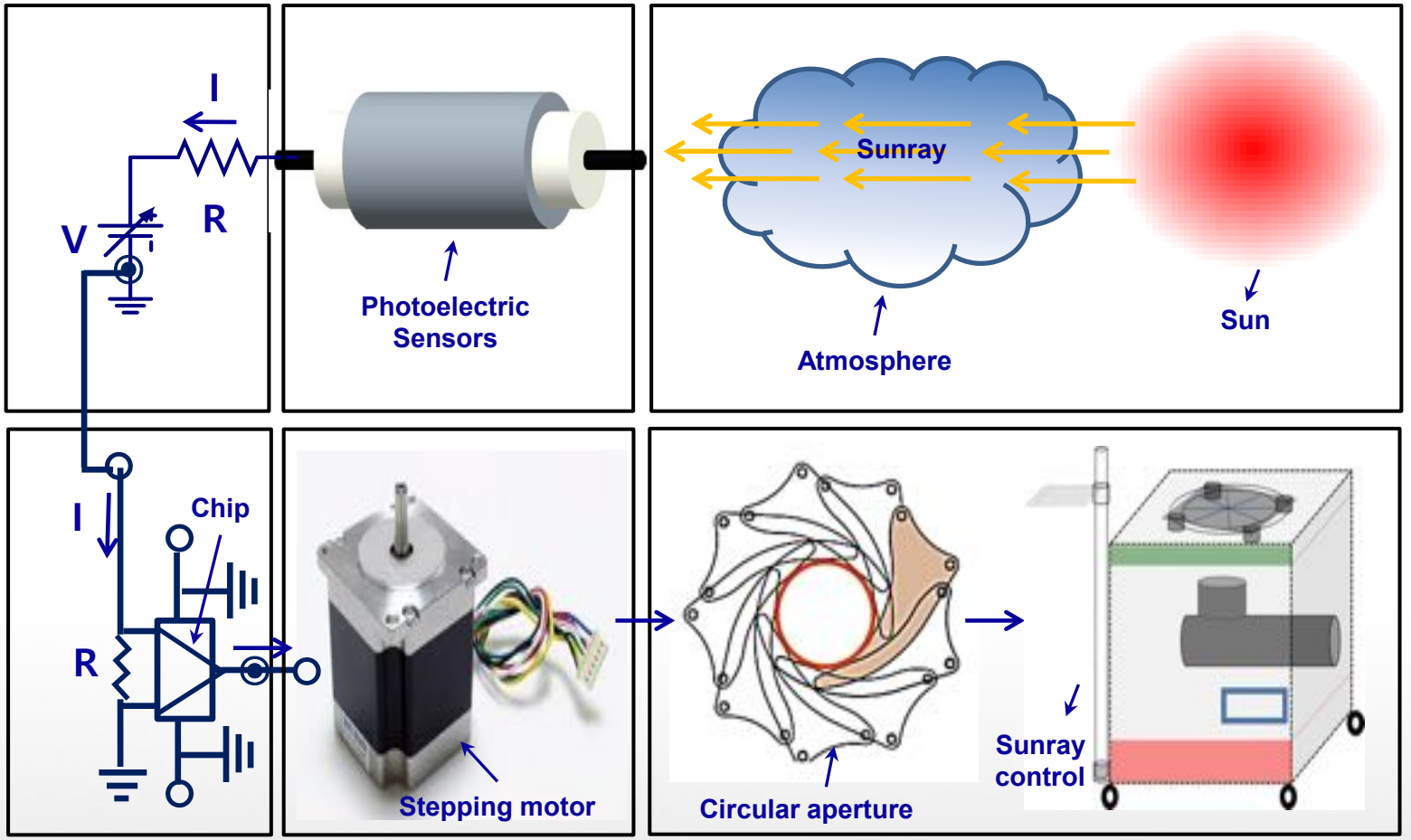
Thank you

▣ FTS Consolidated system (2015년 TCCON 발표내용)

№> **Phase 1. OASIS (Operational Automatic System for Intensity of Sunray)**



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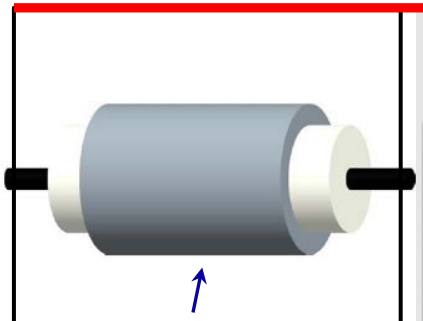
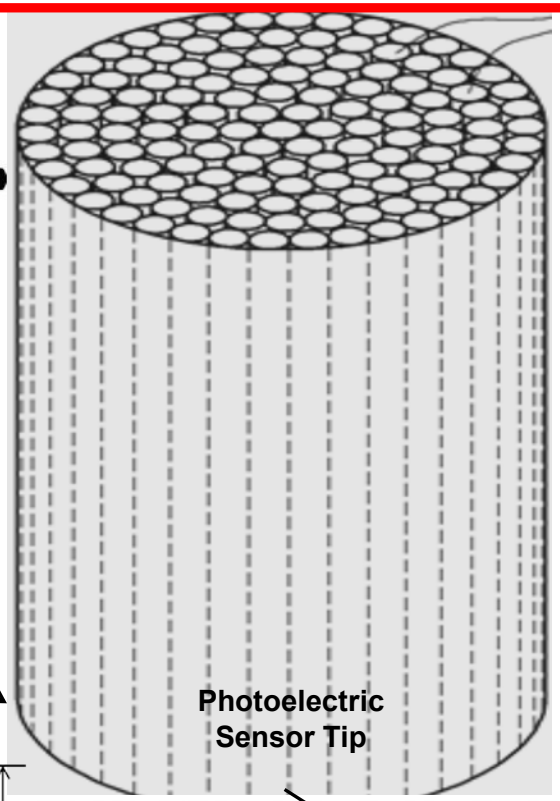
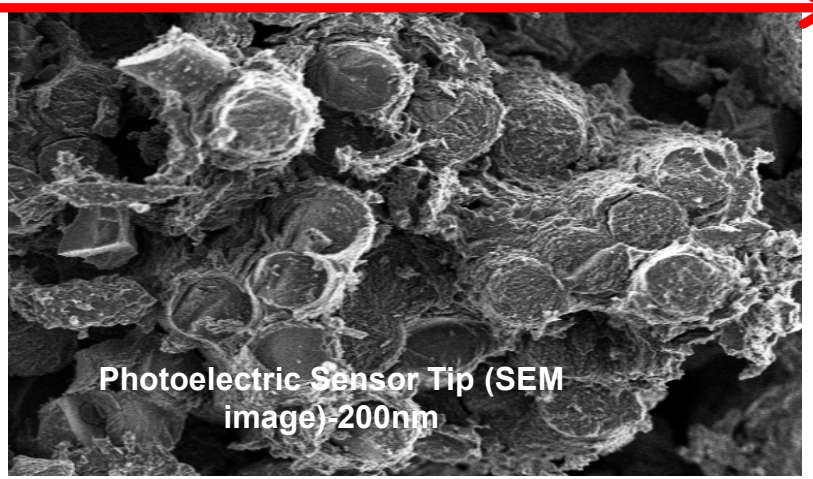
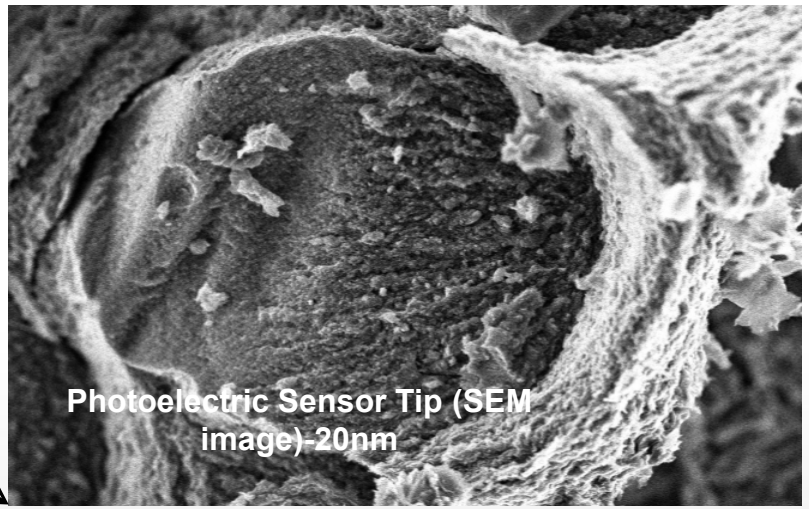
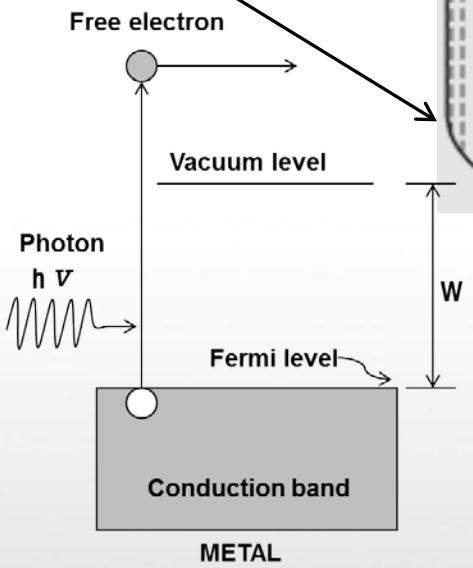
1. Photoelectric Sensor











Main Physical Mechanism of the Sensor Tip

Sensor Tip Price: 1,259,23 $

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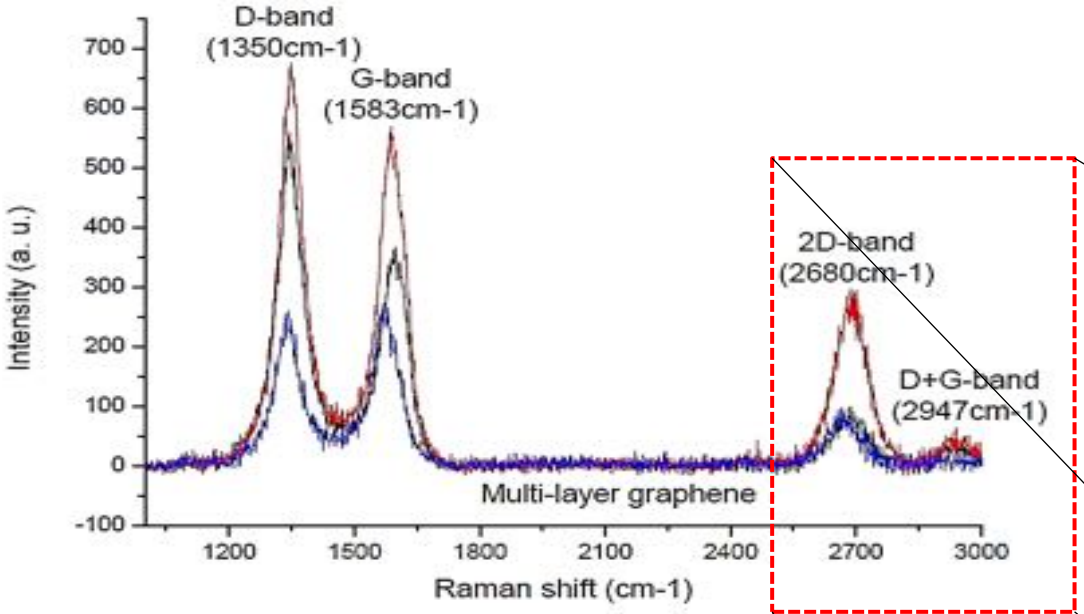
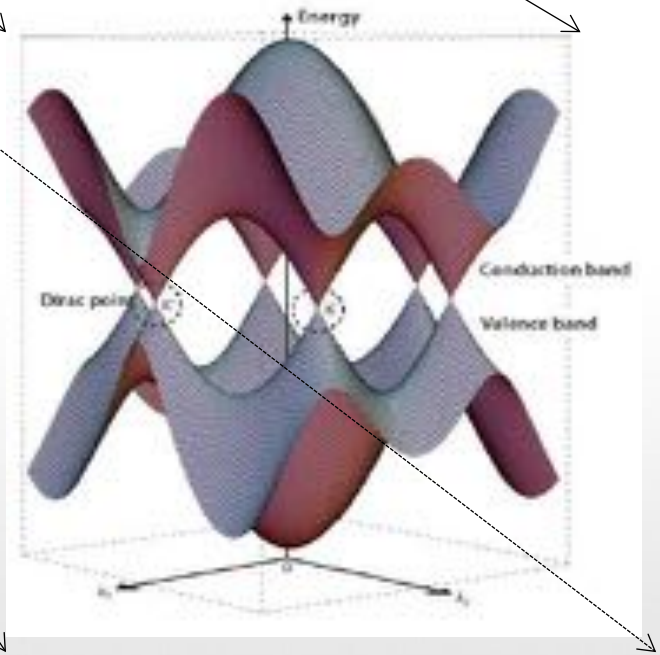
2. Physical Properties of the Photoelectric Sensor



Main Bond Structure of the Graphene Tip



Driac Point----->Transfer Port

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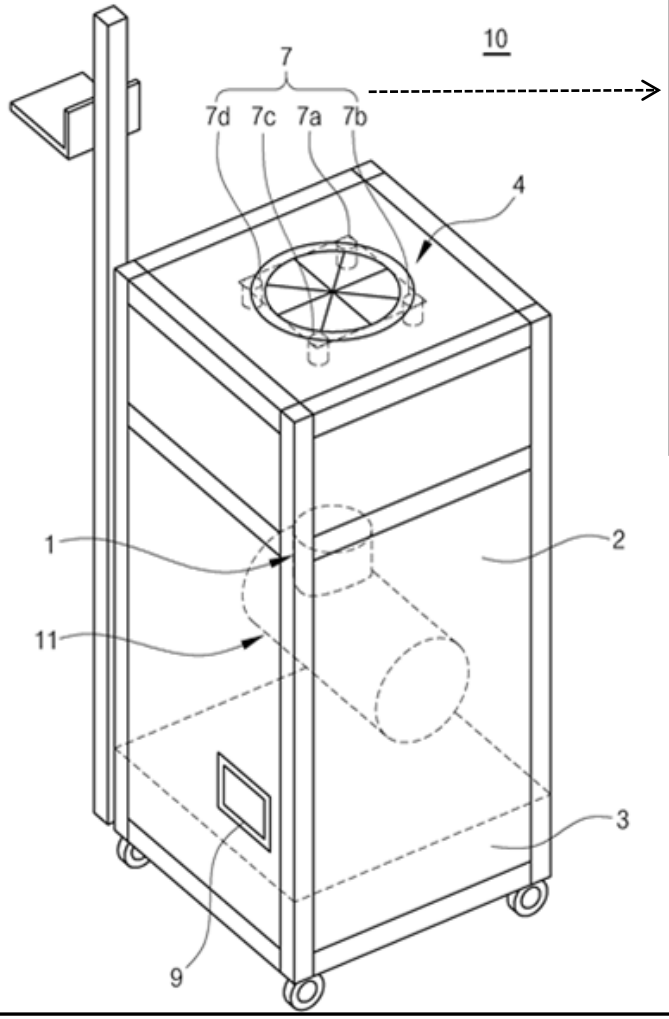
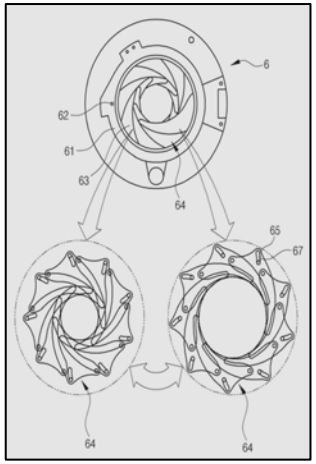
3. OASIS Configuration and Price



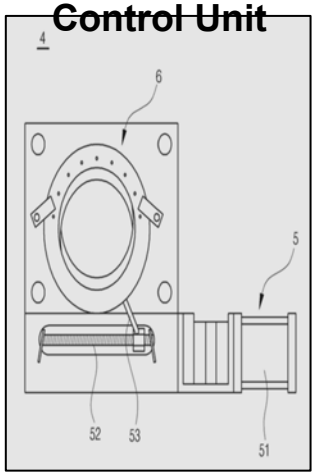
Aperture



335,80 $

+

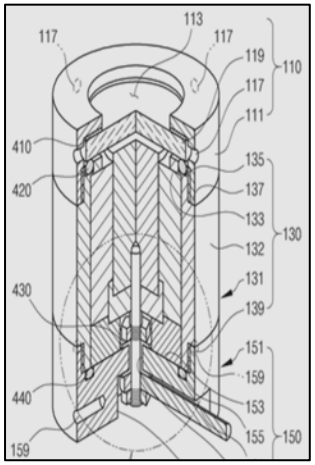
Aperture Control Unit



923,44 $

+

Sensor



3,357,96 $

OASIS

Aperture Control Unit

Sensor

OASIS: 20,987,24 $ (total)

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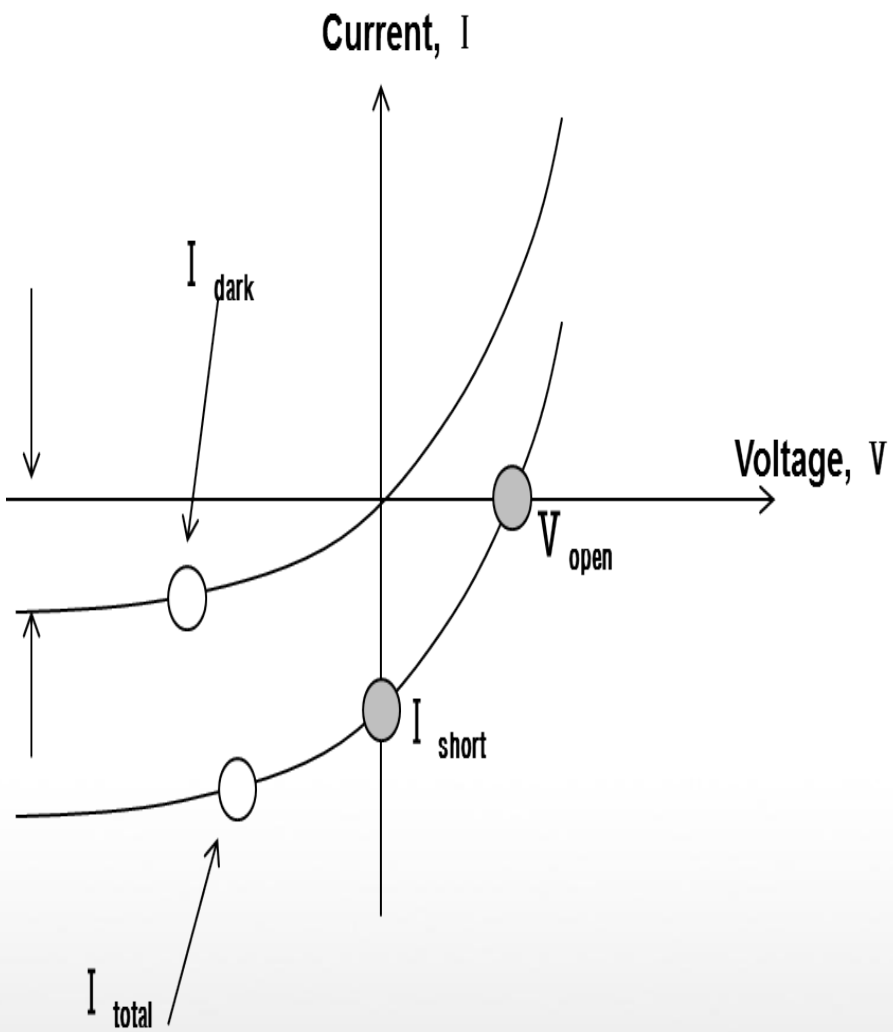
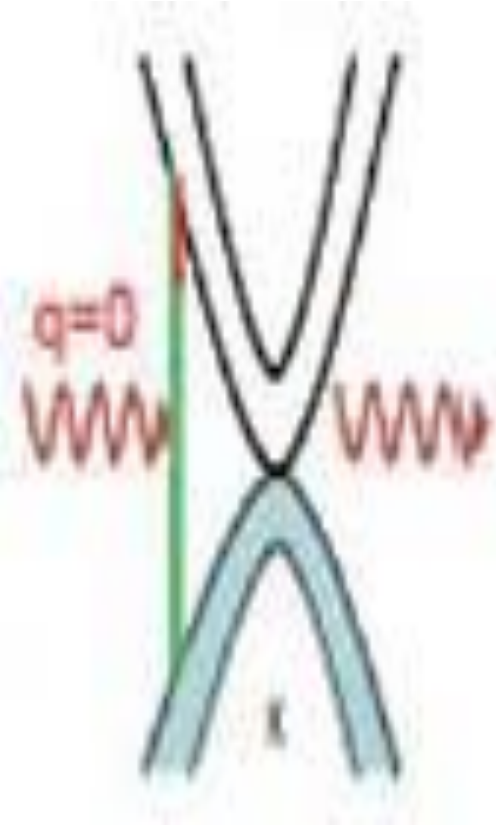
1. Photoelectric Sensor(보충 자료)

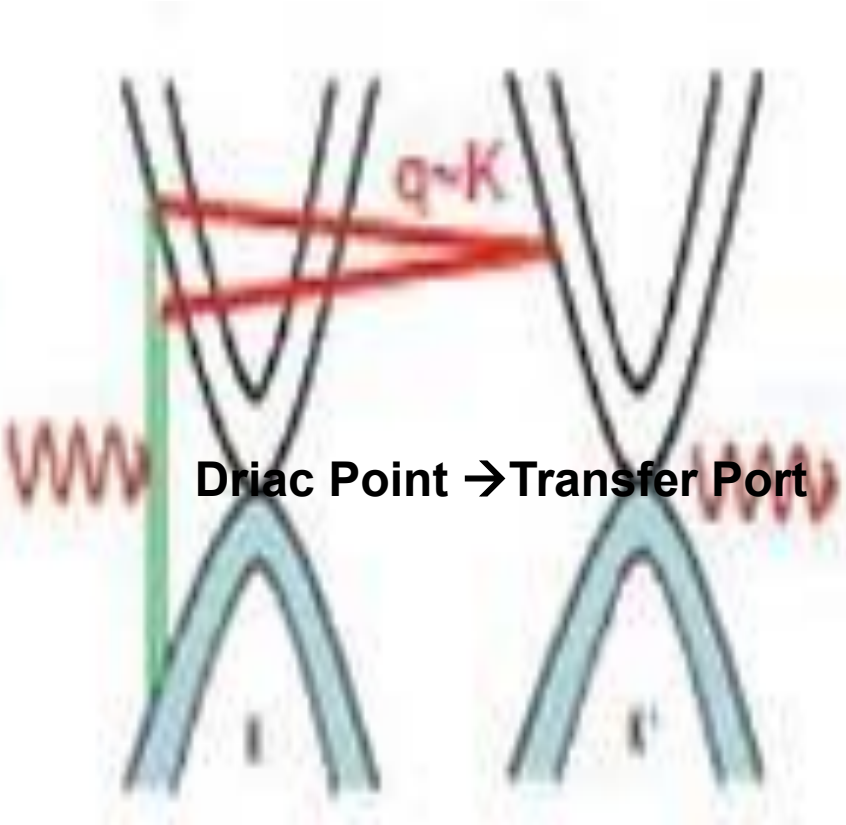
전기적,기계적,열 특성 요약			
성질	특성	5D_CFC	비고
전지적 성질	전하 이동도 ($cm^2/v{\cdot}sec$)	200000	구리(Cu)의 150배
	허용 전류 밀도 (A/cm^2)	$5X10^8$	구리(Cu)의 100배
	면 저항 (ΩS)	<50	구리(Cu)의 35% 미만
	밴드 갭 (eV)	0~0.3	실리콘이 1.11
기계적 성질	강도 (Gpa)	1100	구리(Cu)의 200배
	유연성/신축성	원 면적의 20%	타 금속 물질은 1~5% 미만
열 적 성질	열전도율 (W/mK)	5000	CNT의 1.5배



2. Physical Properties of the Photoelectric Sensor (보충 자료)



G _band



2D-band and G band

3. OASIS Configuration and Price (보충자료)

Phase 1. Application and Verification of OASIS