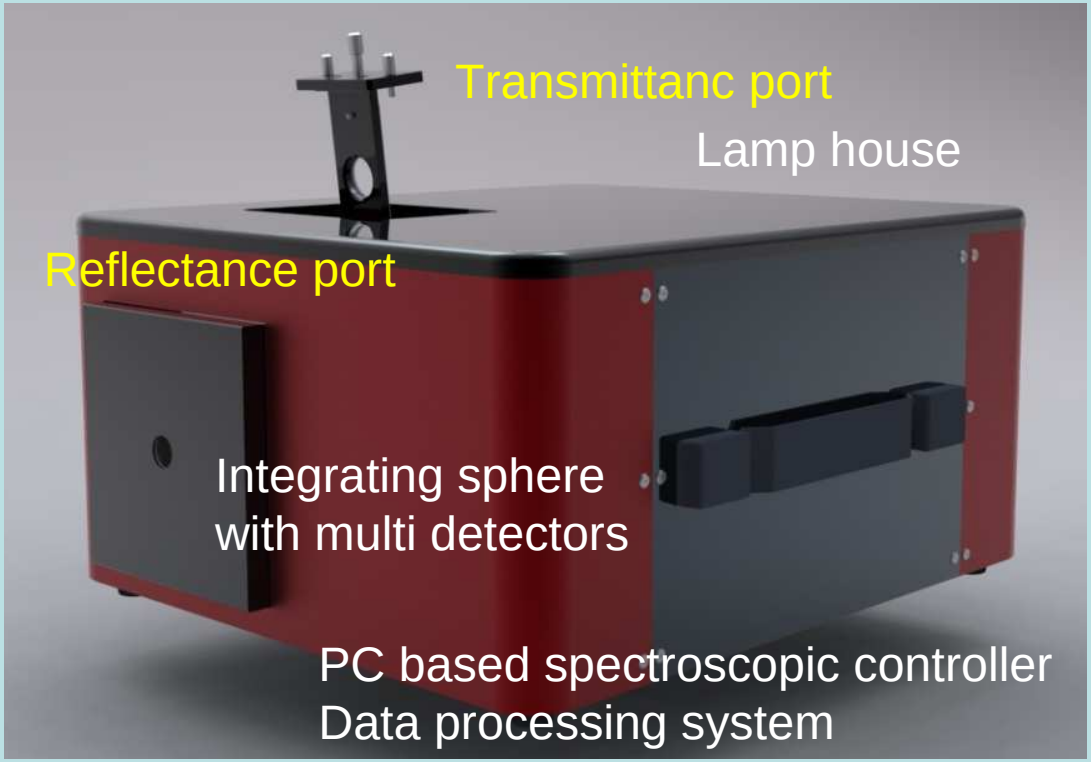
Solar Absorptance and Total Hemispherical Emittance Measurement System

- Portable Solar Absorptance Measurement System PM-A2
- Total Hemispherical Emittance Measurement System PM-E2

Portable Solar Absorptance Measurement System PM-A2

Potable visible spectroscopy with direct driven grating



Measurement Principle

$$\alpha_S(\theta) = \frac{\int_{2500}^{250}\{1 - R(\lambda,\theta)\}I_S(\lambda)d\lambda}{\int_{2500}^{250} I_S(\lambda)d\lambda}$$

R	Spectral reflectance
λ	Wavelength 250～2500nm
θ	Incident angle@7°

Characteristics

- Shortening of the measurement time.
- Measurable from small size sample to large size panel.
- Simple operation, small size, light weight, and cheap.
- High accuracy measurement.
- High-integrity data acquisition system.
- Evaluation data by optical constant method.

Main Specification

System	
Wavelength range	250～2500nm with ozone lamp
Light source	75W Xenon lamp
Measuring methods	・ Reflection measurement ・ Transmission measurement ・ Solar absorptance
Measurement accuracy	・ Within ±2%, ・Repeatability: Within ±1% ・ Solar absorptance ±0.02
Measuring time	Around 2 minutes/1 scan
Standard sample	・ Diffuseness evaluation sample（SRS99/Labsphere） ・ Specular evaluation sample（TFA-25C05-4 Al Deposited mirror/Sigma Koki）
Power source	AC100V±10% 50/60Hz 250VA
External dimensions	W335×D375×H195mm（Excluding outshoot such as integrating sphere）
Weight	Approx. 15kg
Usage environment	・ Temperature：15～40℃ ・ Humidity：10～45%RH
Storage environment	・ Temperature：10～45℃ ・ Humidity：10～50%RH
Accessories & attachments	・ Instruction manual, ・ CD for measuring applications and driver installation ・ USB cable 1m, ・ Power cable

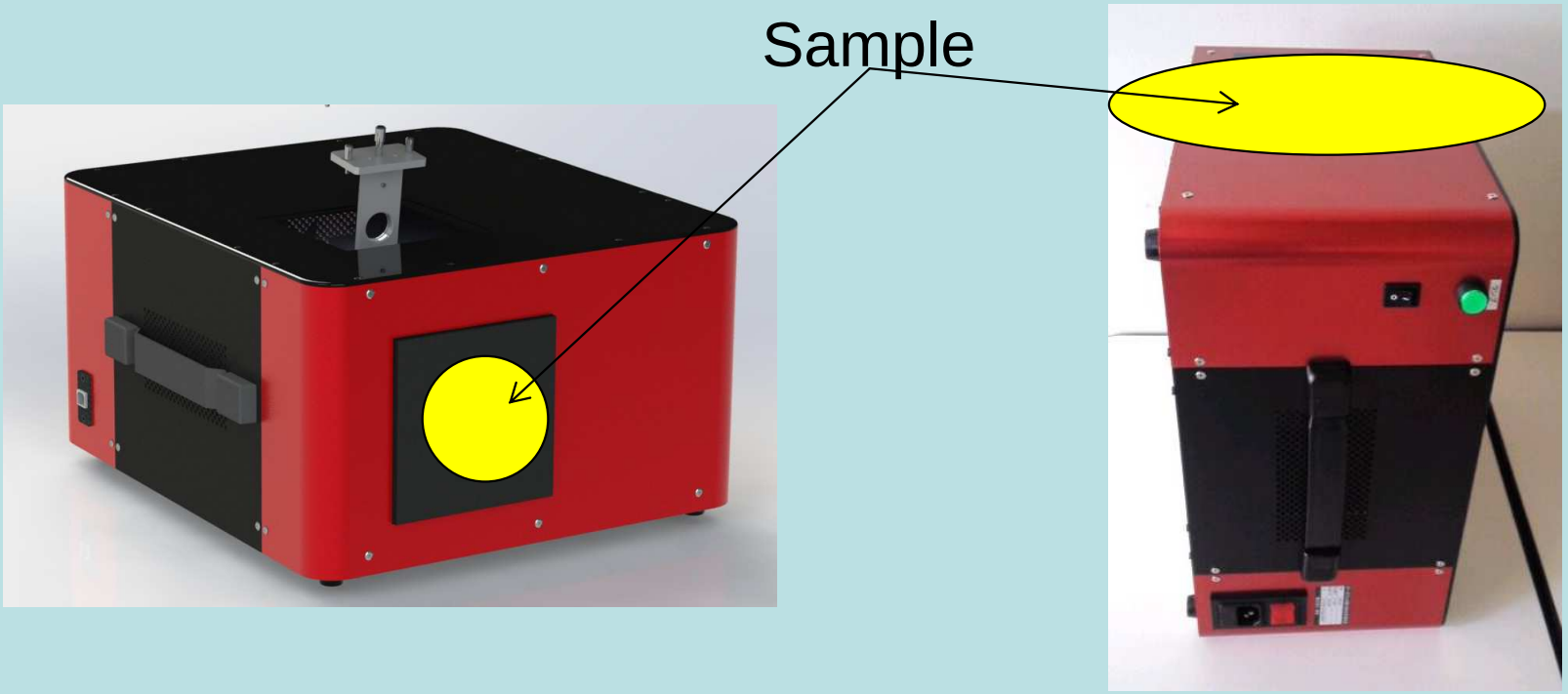
Spectroscope	
Optical arrangement	Crossed Czerny-Turner arrangement
Focal point distance	134mm
Open area ratio	F/3.4
Diffraction grating	3 kinds included ①250nm-1200 number/mm ②800nm-600 numbe/mm ③1500nm-300 numbe/mm
Resolution	① < 11.2nm（50-600nm） ② < 22nm（600-1050nm） ③ < 44.5nm（1050-2500nm）
Dispersion	Maximum 15nm/mm
Wavelength drive	Direct driven system
Slit size	ϕ2mm（Common in both incoming and outgoing）

Integrating spehere・Data acquisition system with PC	
Internal diameter	ϕ100mm
Material	Spectralon®
Detectors used	① Si photodiode ×2 ② InGaAs photodiode ×1 ③ InGaAsPIN photodiode (one step cooling) ×1
Data acquisition system	・ Data table of spectral reflectance and transmittance ・ Graphical representation of spectral reflectance and transmittance ・ Calculation of solar absorptance

Measurement Method

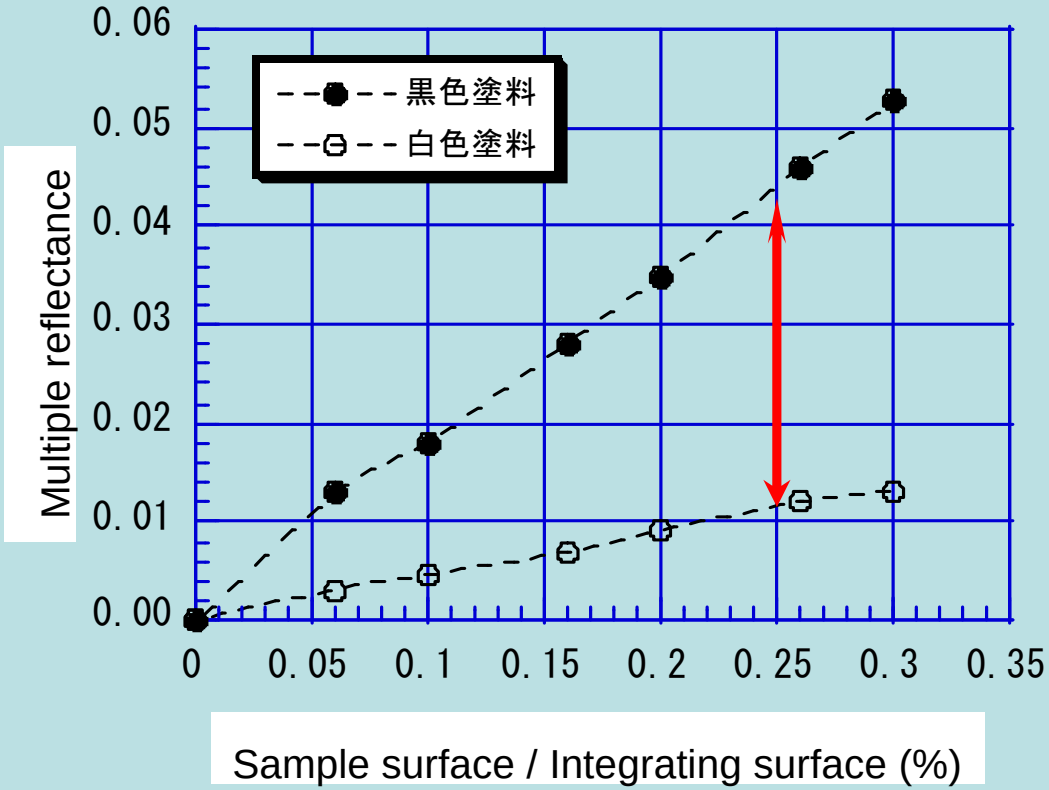
Small size sample

Large size sample



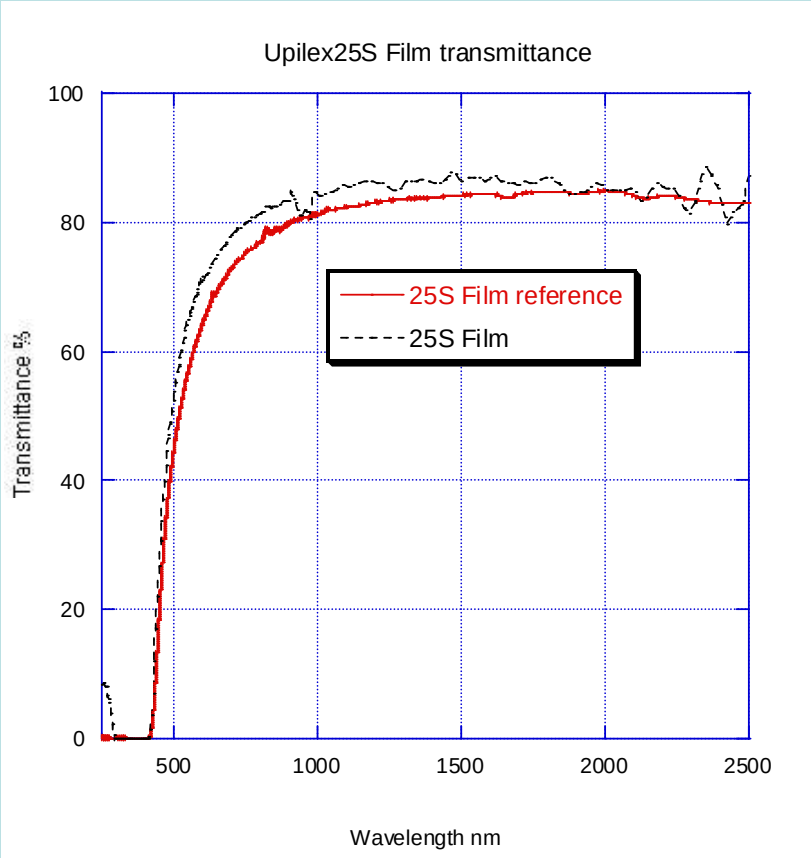
Uncertainty αs

Standard sample (SRS99)	±1.0 ~±2.0%
Influence by the multiple reflection of the sample	0.01~0.04



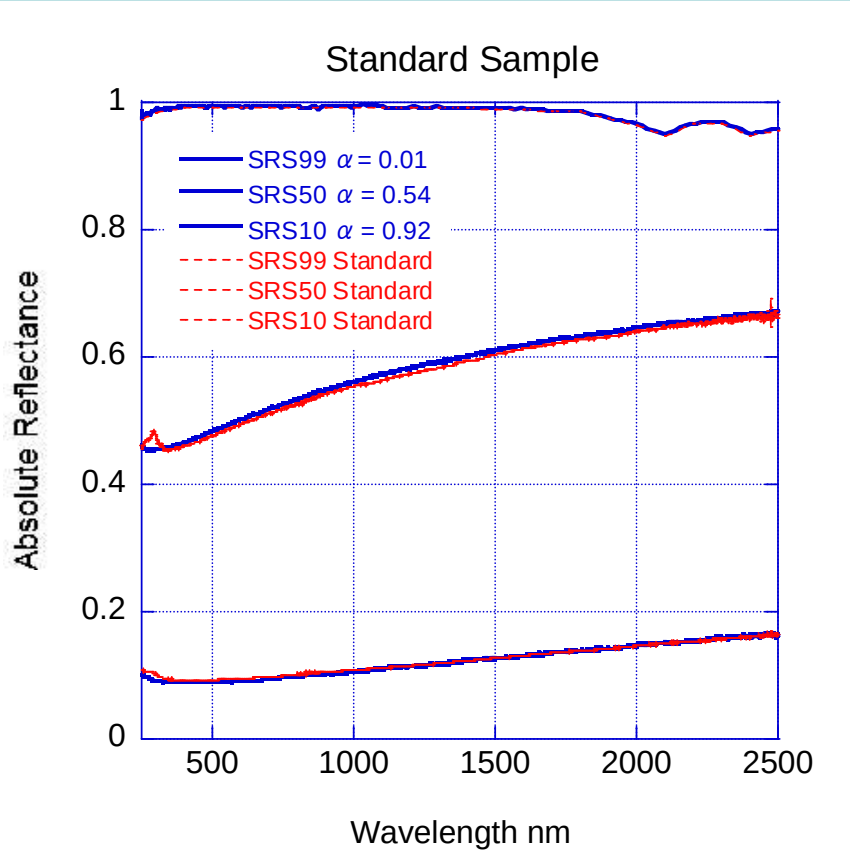
Measurement Example-1

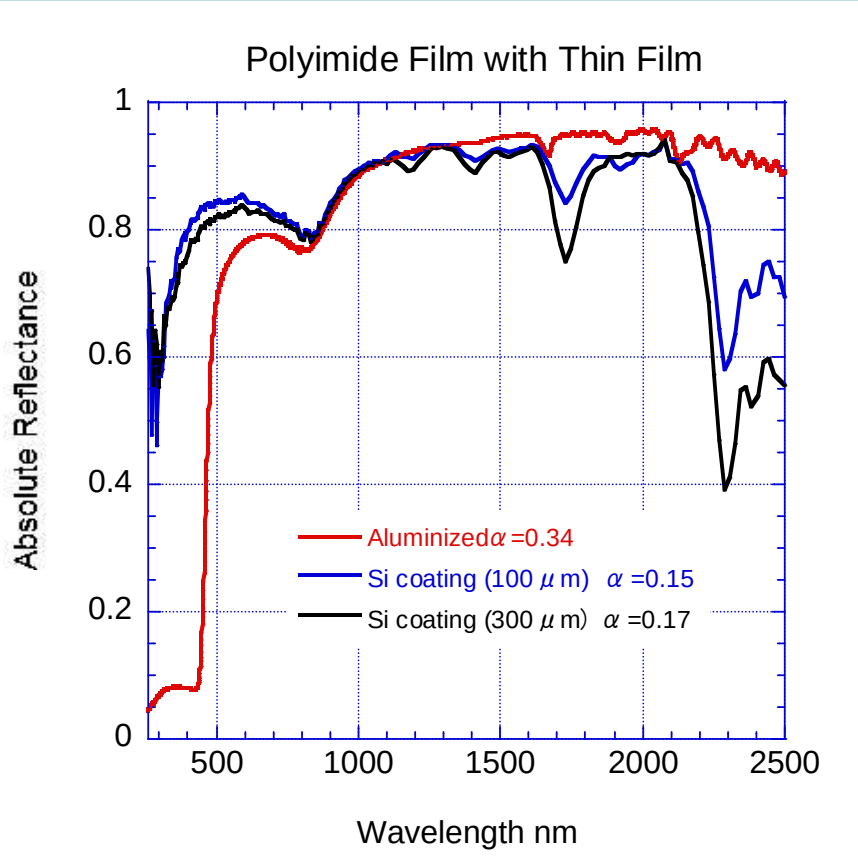
Spectral Transmittance



Measurement Example-2

Spectral Reflectance





Measurement Example-3

Solar Absorptance

Sample	PM-A2	Publication data*
SRS10	0.90	0.89 (0.89)
SRS99	0.01	–
Black Kapton	0.93	0.93 ~ 0.94 (0.94)
Deposited Al Upilex25R	0.39	0.29 ~ 0.33 (0.30)
Deposited Al Upilex25Rnew	0.40	–
CSi100	0.19(Al)	0.17(Al) ~

* JAXA Tukuba, JAXA isas, Kyushu Int.(data)

Delivery Performances

1	JAXA isas	
2	JAXA Mitaka	2011
3	Hokkaido University	2013
4	Nagoya University	2014