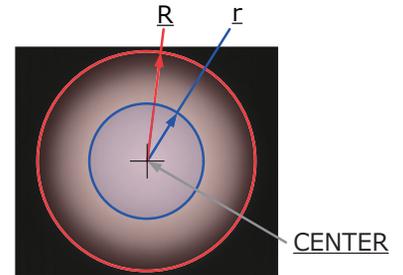
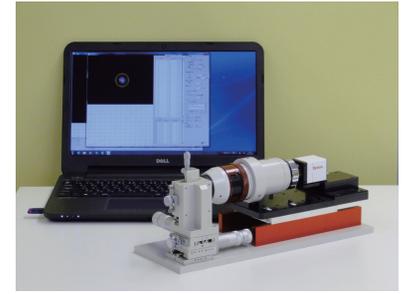


ENCIRCLED FLUX (EF) & ENCIRCLED ANGULAR FLUX (EAF) MEASUREMENT SYSTEM

Rapid evaluation of encircled flux and encircled angular flux parameter of multi-mode optical fiber.

[Product overview]

Encircled Flux (EF) and Encircled Angular Flux (EAF) measurement system is to measure mode diffusion of GI type or SI type multimode optical fiber with the image analysis of NFP and FFP images. The system equips NFP optics, **M-Scope type S/L** (EF measurement) and FFP optics, **M-Scope type F** (EAF measurement). It analyzes EF/EAF with these optics, imaging detector, optical beam analysis module **AP013**. These optics can be used for NFP / FFP measurement and other optical parameter measurement for various kind of optical devices. Corresponding to measurement wavelength and purpose, two types of imaging detectors, high resolution digital CCD detector **ISA011** for visible to 1100nm and InGaAs high sensitivity NIR detector **ISA041H2** for 950nm to 1700nm, are prepared.



$$EF = \frac{\int_0^R x \cdot I(x) dx}{\int_0^R x \cdot I(x) dx}$$

● EF MEASUREMENT AND CALCULATING FORMULA

[About EF & EAF measurement]

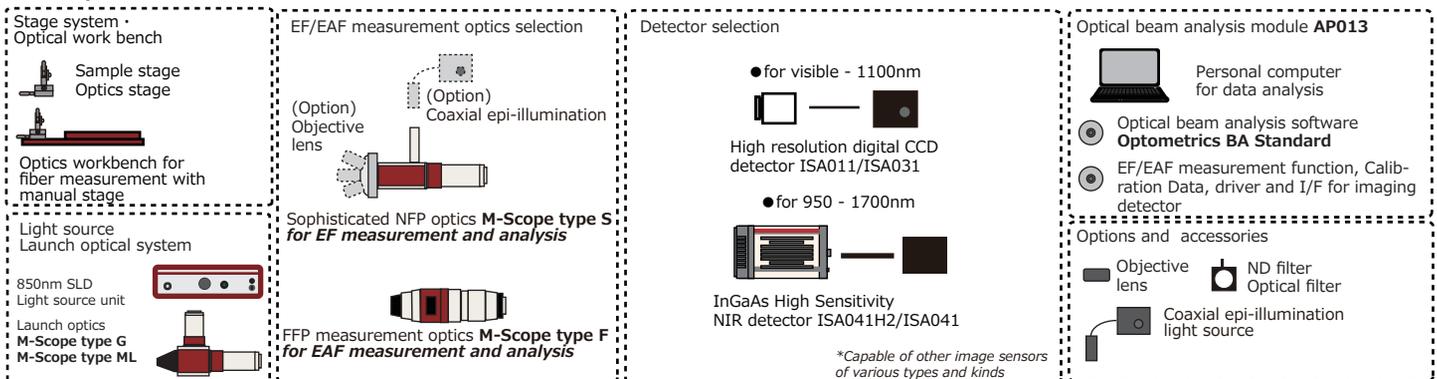
● EF (Encircled Flux) Measurement

The loss of multimode fiber will vary depending on launch condition so that it is necessary to verify launch condition at the measurement. As a new method, Encircled Flux is used to define such launch condition. Especially, Encircled Flux plays an important role for high speed multimode transmission. Encircled flux is a value obtained by integrating from the center toward the outer peripheral portion of the light intensity distribution of optical fiber edge. Against light intensity distribution of the entire optical mode, it is an indicator of what is a percentage on the intensity in the range from the center to radius(r) and is represented by the formula and graphs in the figure on the right side.

● EAF (Encircled Angular Flux) Measurement

Encircled Angular flux is the integral value for the intensity distribution of the emission angle from the edge, from the center of angular spread to NA direction. Generally, it is said that Encircled flux is applied for GI (Graded Index) type optical fiber and Angular flux is for SI (Step Index) type optical fiber.

[Component selection]



[Feature]

- Equipped with a standardized parameter measurement function
 - *Mode distribution analysis such as Encircled Flux and Power Coupling Coefficient
- Can be measured by changing the irradiation condition with Underfilled launch optical system
 - *In combination with Under-filled launch optical system and mode-selective launch optical system, it is possible to analyze by changing irradiation N.A. and irradiation beam spot diameter, mode condition. This makes it analyze the mode transmittance characteristics with the change of launch condition.
 - ☞About underfilled launch & mode-selective launch optical system in details, please refer to P10.
- Encircled Flux Measurement System equips **M-Scope type S** which is NFP measurement optics.
 - ☞About NFP measurement optics in details, please refer to P7.
- Encircled Angular Flux Measurement System equips **M-Scope type F** which is FFP measurement optics.
 - ☞About FFP measurement optics in details, please refer to P8.
- Image sensor selection (recommendation)
 - *For visible-1100nm: Synos' Hi-resolution digital CCD detector **ISA011/ISA031**
 - *For 950nm-1700nm: Synos' InGaAs high sensitivity NIR detector **ISA041H2**
 - ☞About imaging detector in details, please refer to P25-28.
- Optical beam analysis module **AP-013**
 - *Personal Computer system for data analysis
 - *Image processor board & interface board set
 - *Optical beam analysis software : **Optometrics BA Standard** (Optometrics BA Standard main program, calibration data set, driver and I/F software for imaging detector)
 - ☞About **AP013** in details, please refer to P24.

