Lightweight composite structures have been applied to airplanes and automobiles. For the health diagnostics of the structures, we are developing structural health monitoring systems with optical-fiber ultrasonic sensors and non-destructive inspection techniques using laser ultrasonics.

**Lightweight composite structures**

- CFRP skin/stringer structural elements

**Non-destructive inspection**

- Numerical simulation of wave propagation behavior in laser ultrasonics

**Structural health monitoring**

- Development of monitoring systems
  - PSFBG high-sensitive fiber-optic ultrasonic sensor system
- Damage detection methods for composites
  - Remote sensing method to measure AE waves precisely under ultimate environments

**Intact laminate**

- MFC
  - \(A_1\)
  - FBG
- CFRP laminate

**Laminate with a delamination**

- MFC
  - \(A_1\)
  - \(S_0\) (faster than \(A_1\))
  - FBG

Active detection of delamination damage in a composite plate based on mode conversions of Lamb waves.