

# Thermo-mechanical measurements

- **KEK's independent measurements**

- In addition to the common effort at RAL
- A few reminders of the results

- **Distortion of the hybrid in the module**

- Before and After (10 thermal cycles)
- After (20 thermal cycles) was also measured
- Temperature dependence:  $\sim 0.5 \mu\text{m}/^\circ\text{C}$  sagitta
- E.g., 20  $\mu\text{m}$  from 20  $^\circ\text{C}$  to -20  $^\circ\text{C}$

- **Thermal fatigue in the module**

- 7.5 W power on-off in cold (-12  $^\circ\text{C}$  cooling water)
- Before and After 100 cycles
- No disintegration nor crack
- No change in the temperature dependence of distortion of module

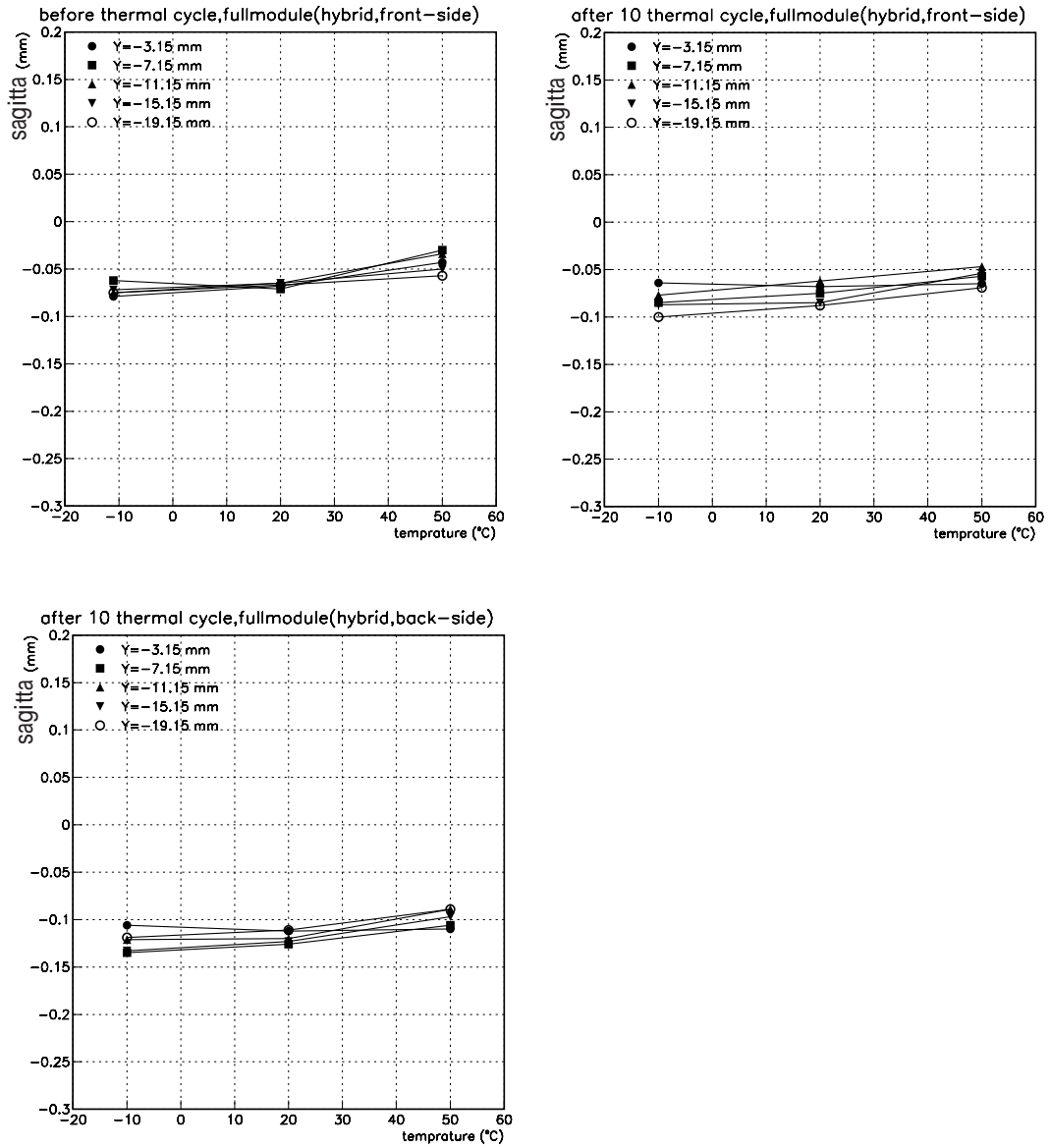


図 6.12: フルモジュールにしたときのカプトンハイブリッド基板の表側の熱サイクル前後での温度による変形率