Several types of photovoltaic modules (sc-Si, mc-Si, hetero-junction, a-Si, and CIS) were exposed since 2004 in AIST, Tsukuba, Japan. The performance change for 10 years outdoor exposure test is reported in this paper. 15 modules were mounted south faced and 30 degree tilted, and were kept open circuited during the standby time for all the test period. The I-V curves of the modules were measured periodically by one I-V curve tracer with 16 channel switcher. One set of series measurements for 15 modules takes 8 minutes. The in-plane irradiance and the module temperature were also measured when each I-V curve was measured. The I-V curve data under stable irradiance condition (in-plane irradiance is no less than 750W/m², the irradiance difference ratio between the maximum and minimum value in 8 minutes is no more than 0.02) were selected for the analysis. The temperature coefficients for each module were estimated by the regression line with measured data. The selected I-V curve data was converted to the standard test condition data by JIS procedure with measured and estimated parameters. The converted data was firstly averaged to monthly data, and then averaged to yearly data.

Figure 1, Fig. 2, and Fig. 3 show the yearly change of Pmax (maximum power), Isc (short circuit current), and Voc (open circuit voltage), respectively. These yearly data were normalized by the initial year (2004-2005) data. All Pmax of the modules showed degradations in 10 years, but the trends of the change are not the same. Whereas all the Isc degraded, the Voc were varied over a band of 0.02 either side of 1.0.