The Elliptically Polarized Undulator 4.6 (EPU4.6) for the Taiwan Light Source (TLS) was contracted to the vendor in late 2004. Due to various reasons in vendor side, the system was not delivered with full functionalities on time. The contract was terminated and the vendor agreed to deliver it to NSRRC in January 2009 after long negotiation. After intensive examination had been processed, revamp was started from March include mechanical and control system. Due to proprietary design of the vendor and lack of required technical documents of the existed motion control system, abandon these devices and replace the original design with another open solution is the most difficult decision. New control system implementation for the EPU4.6 was done recently. This project is not only to rebuild the entire control system but also to meet the original specifications. Features and benefits of the new control system of EPU4.6 will be summarized in this report.

**Reasons:**
- Various reasons in vendor side, the system cannot delivery with full functionalities on time.
- A lack of detail technical information and complex design of the existed motion control system.
- Before making the rebuild EPU4.6 control system, the schedule, manpower, expertise of current staffs and further requirements were evaluated.

**Advantages:**
- Full functionality.
- Updated motion control hardware and software.
- Simple design.
- Common expertise for EPU4.6 project, the existed insertion devices of TLS and future TPS requirements.

**EPU4.6 New Control System Infrastructure**
- The VME ILC provides the user interface and high level control.
- The motion controllers are connected to the VME CPU via Ethernet directly.
- The interconnection between motion controllers and Compax3 drivers is performed via the adapter boards.
- The motor controllers equipSSI interface to communicate with the encoders.
- All Motor Driver Control mode to setup mode to torque.
- The simple PLC dedicated for interlock protection.

**EPU4.6 New Control System — Hardware**
- CPU board (LynxOS).
- Digital input module.
- Digital Output module.
- Analog input module.
- Analog Output module.
- Motors => Allen-Brandy AC servo motor (MPL-A4530K-MX244A).
- Motor drivers => Parker Hannifin Compax3 S150 motor driver.
- Motion controllers => The Roll DMC-4040 Ethernet based controller for gap and phase motion.
- Encoders => TR Electronic TR-1405 551 absolute linear encoder with 0.1 μm resolution.
- Tilt sensors => ADI’s Tuff Tilt with micro-radian resolution.
- Trim power supplies => MCD30 system manufactured by Bria Systems.

**Performance**
- Gap movement
  - The gap motion profile for 3 mm/s motion.
  - The encoder recorded simultaneously while phase motion in 8 mm/s.
  - The positioning performance in gap and phase seems not good enough due to bad design in mechanical system, reasons of the shortage combine large backlash, less rigidity of the fixture of the driven mechanism, and modification is underway.

**Summary**
- Basic functionalities of the new control system for the EPU4.6 were achieved.
- Optimize the motion control performance, enhance functionality, improve engineering and reliability of the EPU4.6 control system are underway accompany with the mechanical improvement are expected to be done before the end of 2009.
- Setup of EPICS support for motion control to evaluate various functionalities is future work.