

An Example of Reliability Test against Soft Errors Using a Compact Neutron Irradiation Source

— Smart Environment Panel on new ITU standards on soft errors that affect telecommunications—

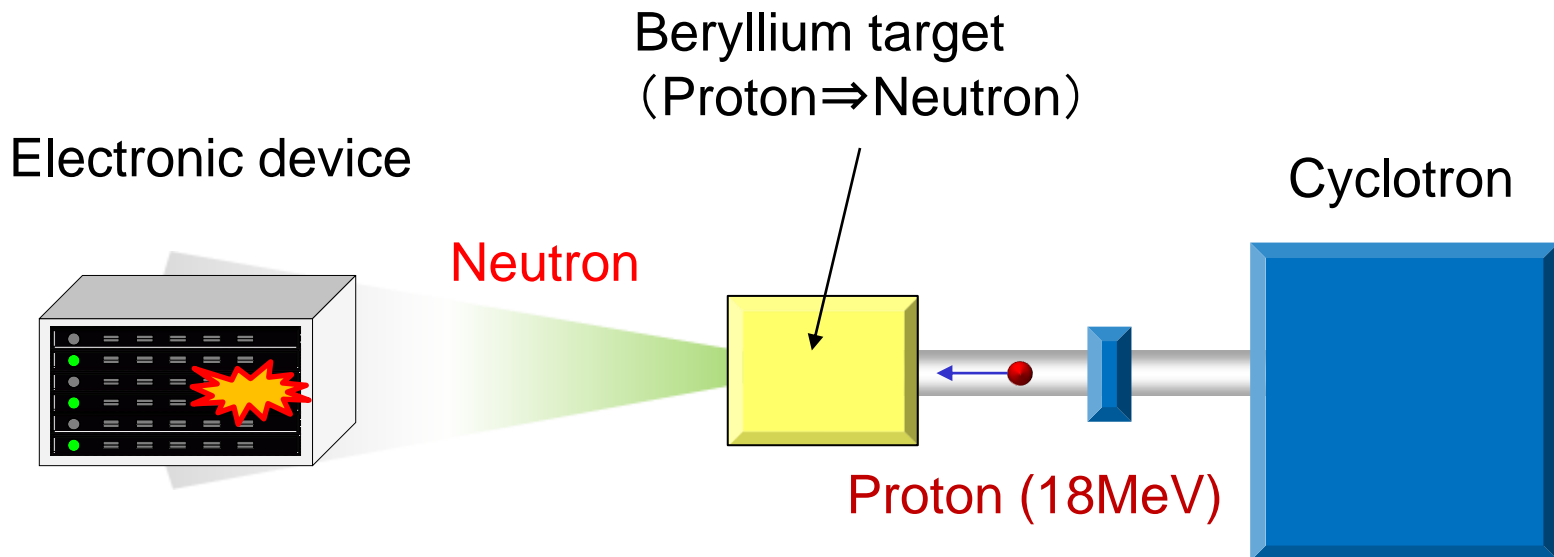
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NTT Advanced Technology Corporation

1 Objectives of the neutron irradiation test

Neutron irradiation test is carried out

- to estimate the occurrence rate of soft errors in electronic devices
- to check the effect of countermeasures



Advantages of the test using compact neutron source

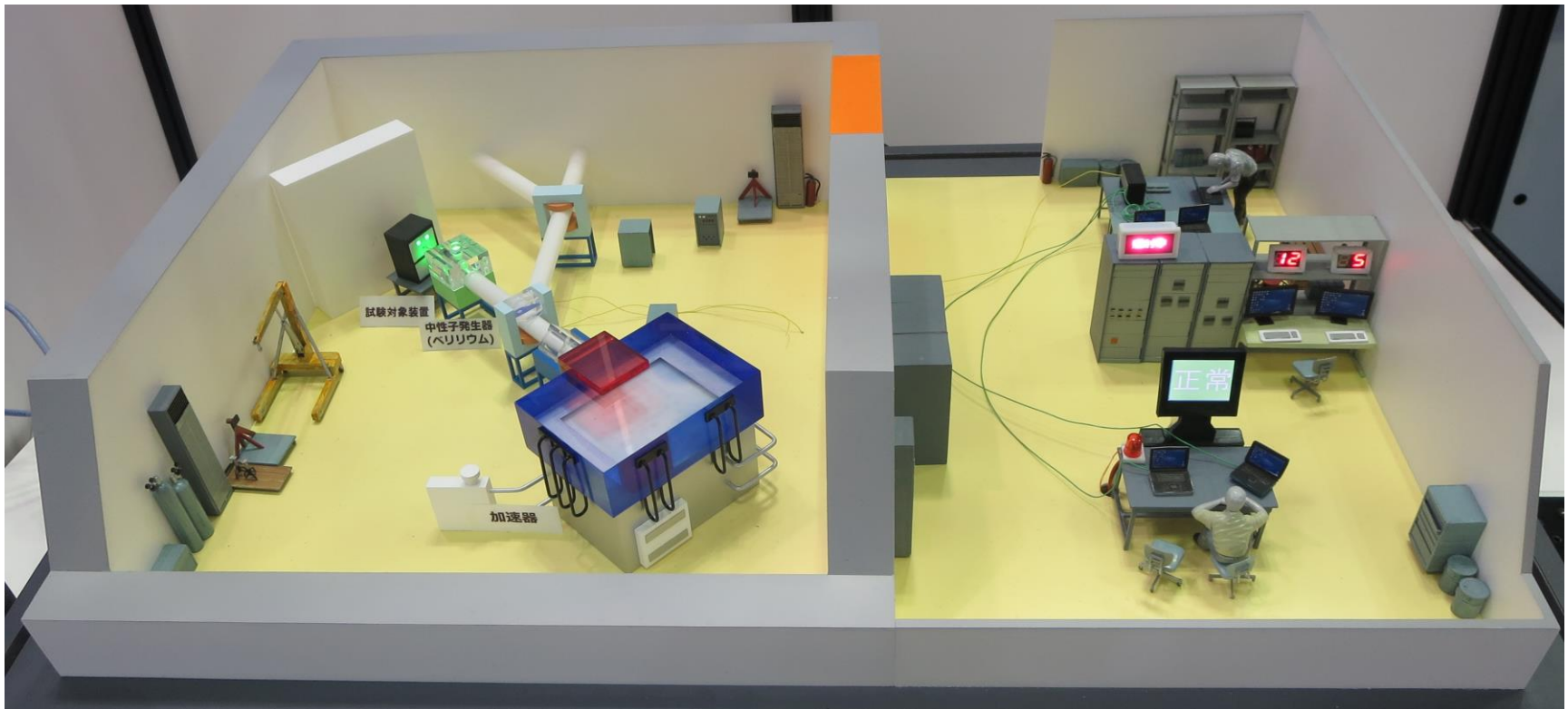
1. Flexible application by use of compact neutron source
2. Remarkable reduction of test period
3. The irradiation area can be controlled
4. Conformance test to ITU-T Recommendation is available
5. Reliability regarding soft error can be estimated
6. Unexpected failures by soft error can be found
7. Quantitative effect check of soft error countermeasures

Particle accelerator (Neutron source, SHI-ATEX)



Manufacturer/Type	Sumitomo Heavy Industries, Ltd./CYPRIS370
Accelerated particle	Proton
Particle Energy	18MeV
Size of accelerator	2.4 m X 1.8 m X 2.0 m

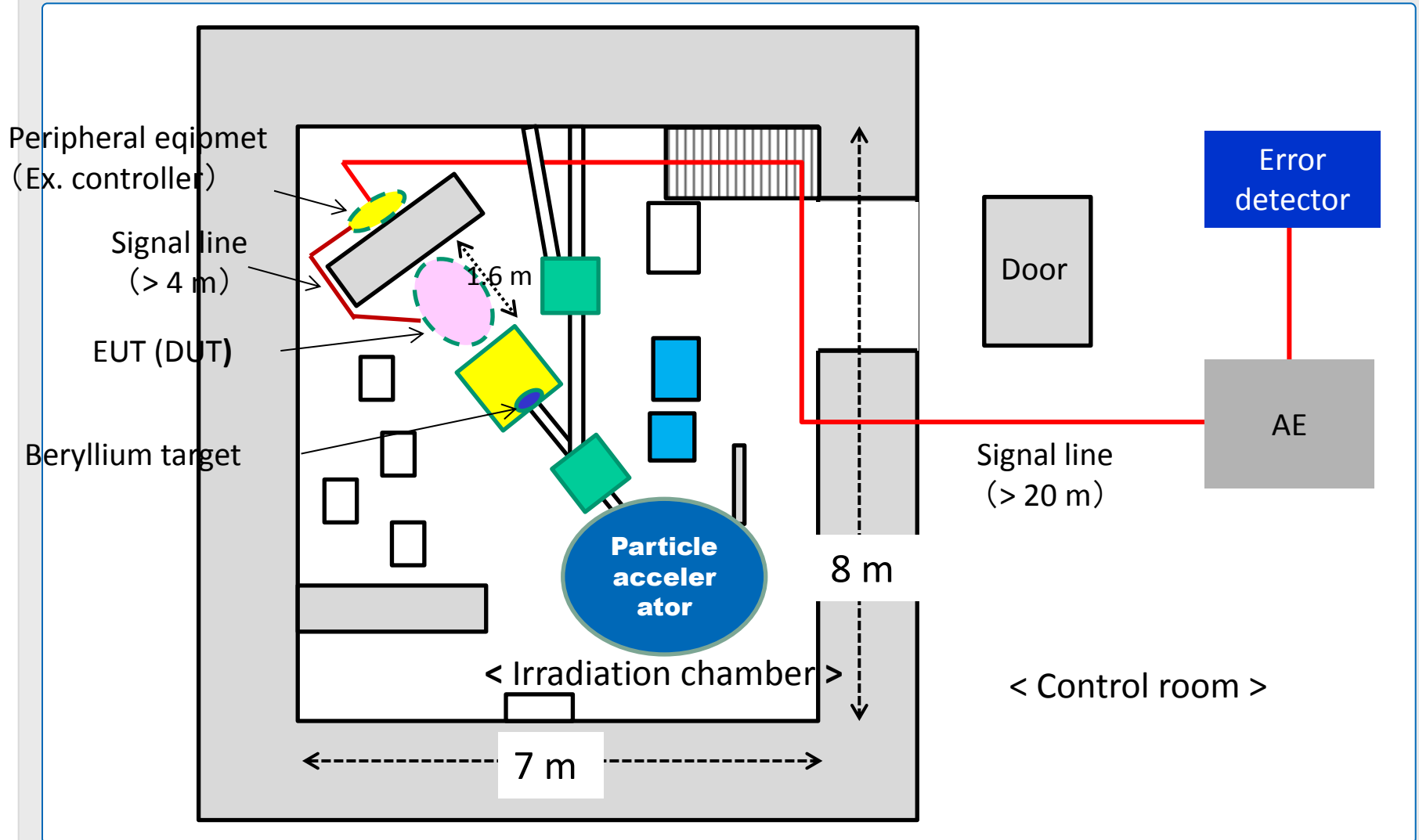
Diorama of the test facility (SHI-ATEX)



< Irradiation chamber >

< Control room >

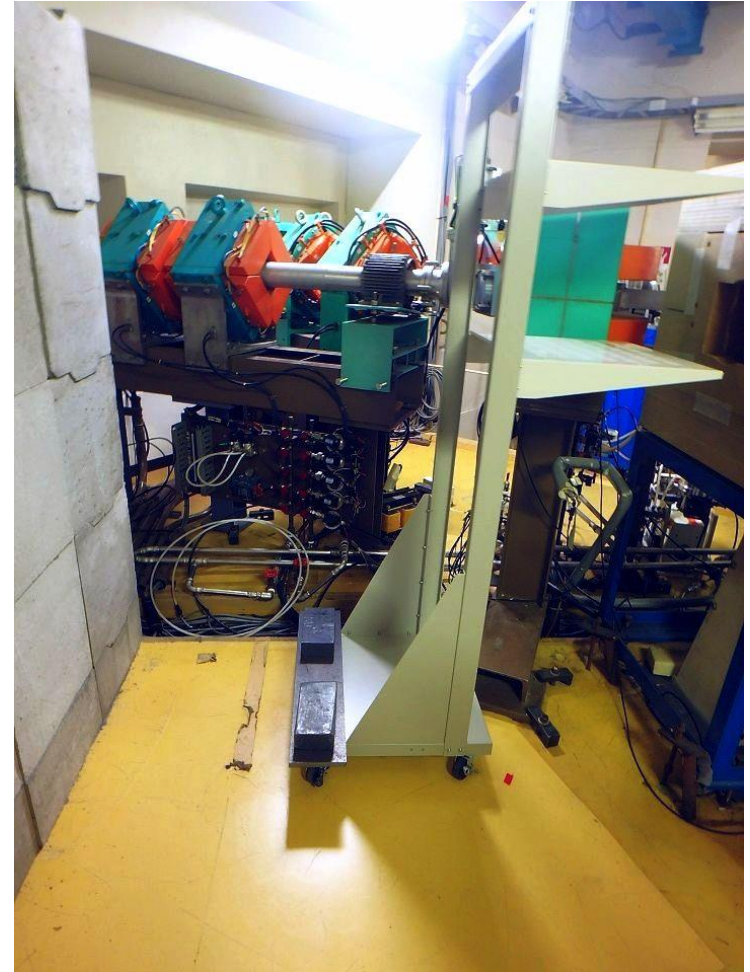
Plan of the facility and an example of test setup



Picture of the test facility (SHI-ATEX)



< Control room for setting AE and error detector >



< Irradiation space >

An example of test schedule

One month
before test

- Test planning
- Preparation of EUT, peripherals, AE, error detector etc.

A day
before test

- Logistics of EUT etc.
- Setup of the test configuration

First day of
test

- Preliminary test
- Adjustment of neutron flux
- Start test

Second day
of test

- Execution of the test
- Finish of the test and remove the test setup
- Measurement of radiation level from the devices irradiated in the test chamber

After the
test

- Measurement of radiation level from the devices irradiated in the test chamber
- Send back the EUT etc. when the radiation level become less than the limit.

- About 10 types of EUT are tested in last year.
- Failures occurred in real environments were reproduced by the test.
- Similar failure rate was obtained comparing to the real situation.
- Manufacturers of equipment used in infrastructure system conduct neutron irradiation test using compact neutron source.
- Obtaining acceleration factor for multi-bit error is one of future studies.

Thank you for your attention.