High Voltage Plateau and Data Reliability Test for the DSNC Troubleshooting

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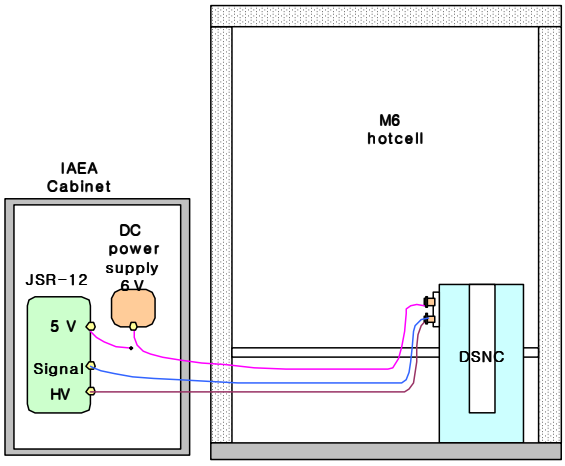
1. Introduction

DSNC(Dupic safeguard neutron counter) was installed in the Dupic fuel development facility (DFDF) for the nuclear material accounting in the end of 1990s[1)] and had operated normally until 2003. But there have been a problem after that time. It has an abnormal state in the function of counting the neutrons emitting from the Dupic process product as well as the spent nuclear fuel at present.

In this study, high voltage plateau and data acquisition reliability test were carried out as a method of troubleshooting for DSNC. As a result of the test, it was confirmed that the high voltage plateau was not formed but data acquisition reliability was good at some high voltages and at 6V applied to the electronic circuit of the counter.

2. Experiments and Results

These tests were carried out after IAEA approval because the high voltage and Vcc(current circuit voltage) of DSNC have to apply through the IAEA cabinet as shown in Figure.



New DC power supply for DSNC upgrade at IAEA Cabinet

2.1. High Voltage Plateau Test

The high voltage plateau test was performed by using Cf-252 neutron source in the HV range from 1,000V to 2,000V at the interval of 50V. And Vcc were applied from IAEA cabinet to the preamplifier and amplifier of DSNC to 5.0V, 5.5V and 6.0V respectively.

2.2. Data Acquisition Reliability Test

Data acquisition reliability tests were carried out by using the spent fuel standards (SFS), and the high voltage range was decided to think about the result of the high voltage plateau test and the recommended high voltage of neutron detector manufacturer.

2.3. Results

2.3.1. High Voltage Plateau Test

It was able to confirm that high voltage plateau was not formed in the range of 1,000V to 2,000V as shown in Fig.1. It is just different from a normal condition of DSNC, and a cause of this troublesome phenomenon should have to find out in the near future.

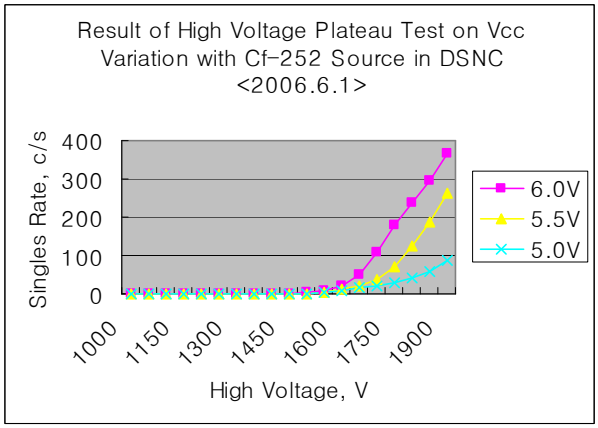


Fig.1. Result of high voltage plateau test of DSNC.

2.3.2. Data Acquisition Reliability Test

The data acquisition reliability test was performed in the high voltage range from 1,700V to 2,000V and it is able to find that the result is agreed with the almost same values at each high voltage as shown in Fig.2 and Fig.3.

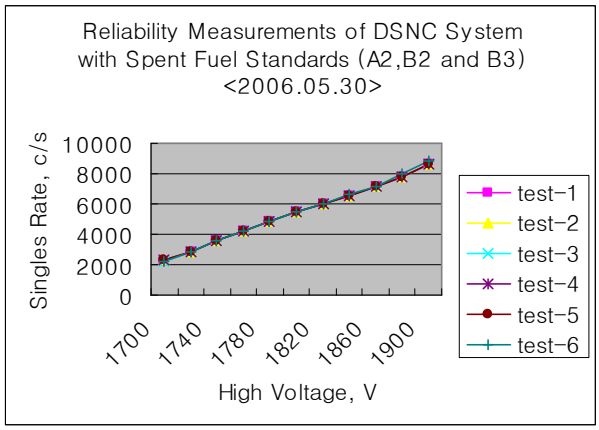


Fig.2. Result of data acquisition reliability test of DSNC.

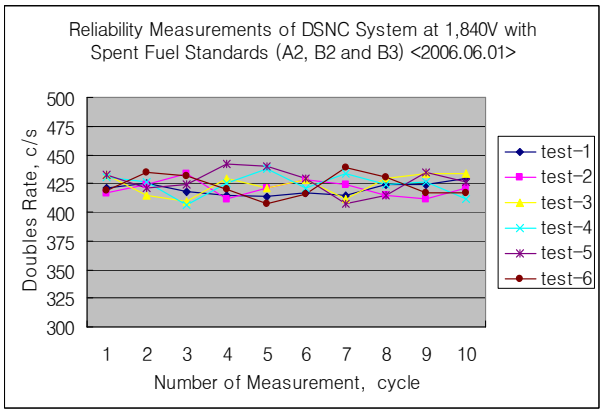


Fig.3. Result of data reliability test of DSNC at 1,840V.

3. Conclusions

In this study, high voltage plateau and data acquisition reliability test were carried out as a method of troubleshooting for DSNC. As a result of the test, it was confirmed that the high voltage plateau was not formed but data acquisition reliability was good at some high voltages and at a given Vcc applied to the electronic circuit of the counter. And it is necessary to have more experiments in order to recover the original performance.

Reference

[1] Ho-Dong Kim et al., "Development of DUPIC Safeguards Technology", KAERI/RR-2016/99, 1999.