Simulation System for the Wendelstein 7-X Safety Control System

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For every new operation phase an enhanced version of the central safety system (cSS) is necessary!
The effort for integration tests and validation of the software for cSS is very high.

A simulation platform for the cSS was introduced for integration tests and validation of the cSS software for the operation phase OP1.2b.
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Motivation

The superconducting stellarator W7-X needs for a safe operation a well defined and tested safety system.

- The W7-X control system needs a safe and flexible control of operation and conducting of discharges.
- For every new operation phase an advanced version of the control safety system (CSS) is necessary.
- The effort for integration tests and verification of the software for CSS is very high.
- A simulation system allows developing and testing the software before commissioning and helps to meet the high quality requirements.

A simulation platform for the CSS was introduced for integration tests and verification of the CSS software for the operating system CP1-IA.

Safety System Overview

Functions of the safety system:
1. Emergency shutdown and interlock protection.
2. Supervision of access controlling the different zones of the radiation protection area.
3. Emergency stop system.
4. Control of the safety states of W7-X.
5. Signalization of operation and alarm.
7. Communication interfaces: Control Operation Management (CoOM) (Ravenet), Fast Interface System (FISW), Control components (safety signal interface), Data archive (DARAF).

Safety System Architecture

Layers of the W7-X control system.

Development process

Simulation based simulation platform for the W7-X safety system.

Results:
- W7-X operation safety software development is possible at the same time.
- Early detection and correction of configuration and software errors.
- Thermonuclear exposure period due to a failed configuration.
- Significantly reduced on site debugging.
- Validation of the CSS operation.

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Thanks for attention!

Please contact me during the poster session!
Poster session 2, Poster ID # 370
SIMIT based simulation platform

SIMIT test platform architecture

Realization

SIMIT implementation

Results:

- W7-X operation and safety software development are possible at the same time,
- Early detection and correction of configuration and software errors,
- Shorter commissioning period due to:
  - a tested configuration,
  - extensively tested software,
- Significantly reduced on site debugging,
- Education of the cSS operators,