

OPERA

コンソーシアム名「量子アプリ共創コンソーシアム」

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航空機事故 (Oct. 2008)

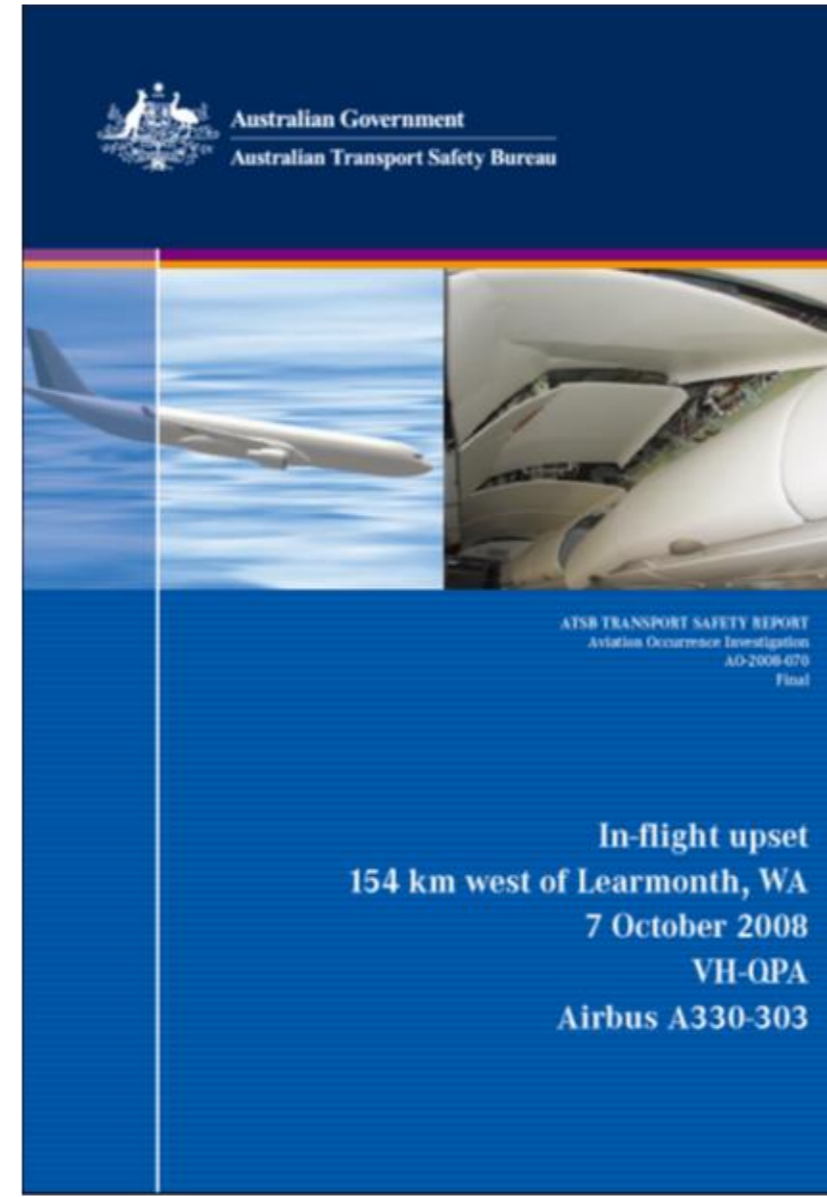
フライバイワイヤの制御システム故障により急降下

- 2008年10月
- 1/3の乗客と3/4の乗員が怪我

Trigger	Key points	Assessment
Software corruption	ADIRU software was verified as intact after the occurrences. Unit 4167's software was reloaded and verified between the two occurrences involving this unit.	Very unlikely
Software bug	Would not be expected to occur twice on one unit without many other occurrences on other units. Functional testing of software found no problems. No unique circumstances identified with the occurrence flights that could trigger a rare bug.	Very unlikely
Hardware fault	Extensive unit and module testing found no problems. Visual examination of the units did not identify any physical damage or other abnormalities. Not consistent with a 'soft fault'.	Very unlikely
Physical environment	Unit testing beyond relevant standards found no problems. Visual examination of the units did not identify any physical damage or other abnormalities that could result in a relevant equipment fault when exposed to normal or abnormal environmental conditions. The physical environment was normal during the three flights. Nothing unusual found with aircraft environment during testing.	Very unlikely
EMI from aircraft systems	Extensive unit testing found no problems. Measurement of the electromagnetic environment within the aircraft during ground and flight tests showed nothing unusual or excessive. It was not possible to reproduce the exact conditions of the occurrence flights during testing. Wiring integrity tests found no problems. The aircraft configuration was not unique or unusual. No problems with the other ADIRUs installed on same aircraft.	Unlikely
EMI from other onboard sources	No sources of concern were identified. Extensive unit testing found no problems. Measurement within the aircraft while PEDs were in use showed very minor effects on the electromagnetic environment.	Very unlikely
EMI from external sources	No sources of concern were identified. Extensive unit testing found no problems. The electromagnetic environment during flight tests showed nothing unusual or excessive. No problems with other systems during the occurrence flights.	Very unlikely
SEE	The intensity of high-energy particles for the three occurrences was not unusual. The ADIRU had limited mechanisms to detect and manage SEE (that is, no EDAC). No SEE testing was performed on the occurrence units. SEE testing on another unit did not induce the data-spike failure mode (although the testing was limited in scope). Difficult to accurately estimate the likelihood of two SEEs occurring on the same ADIRU twice in its operational life.	Insufficient evidence to estimate likelihood

他の要因 (Very) unlikely

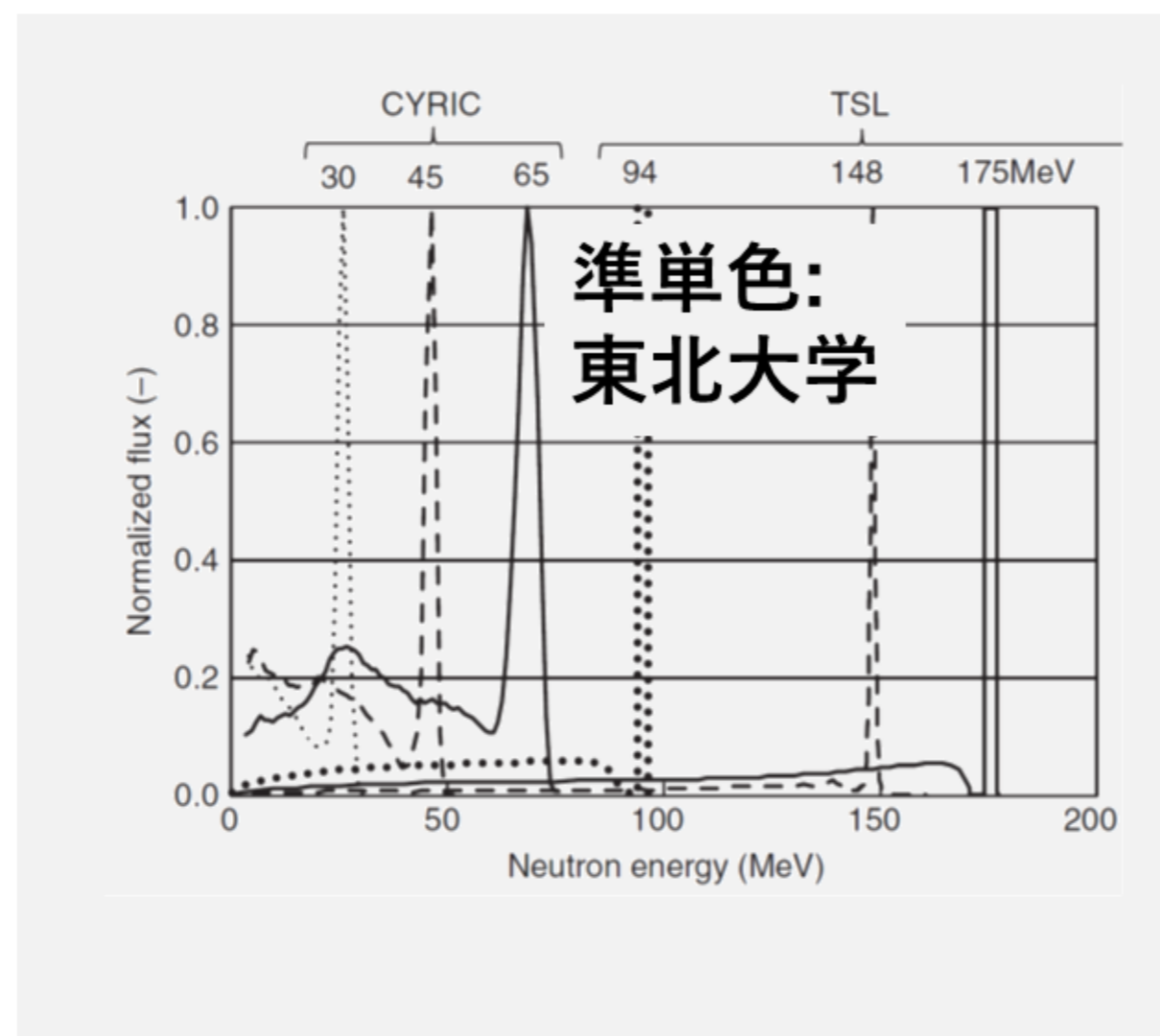
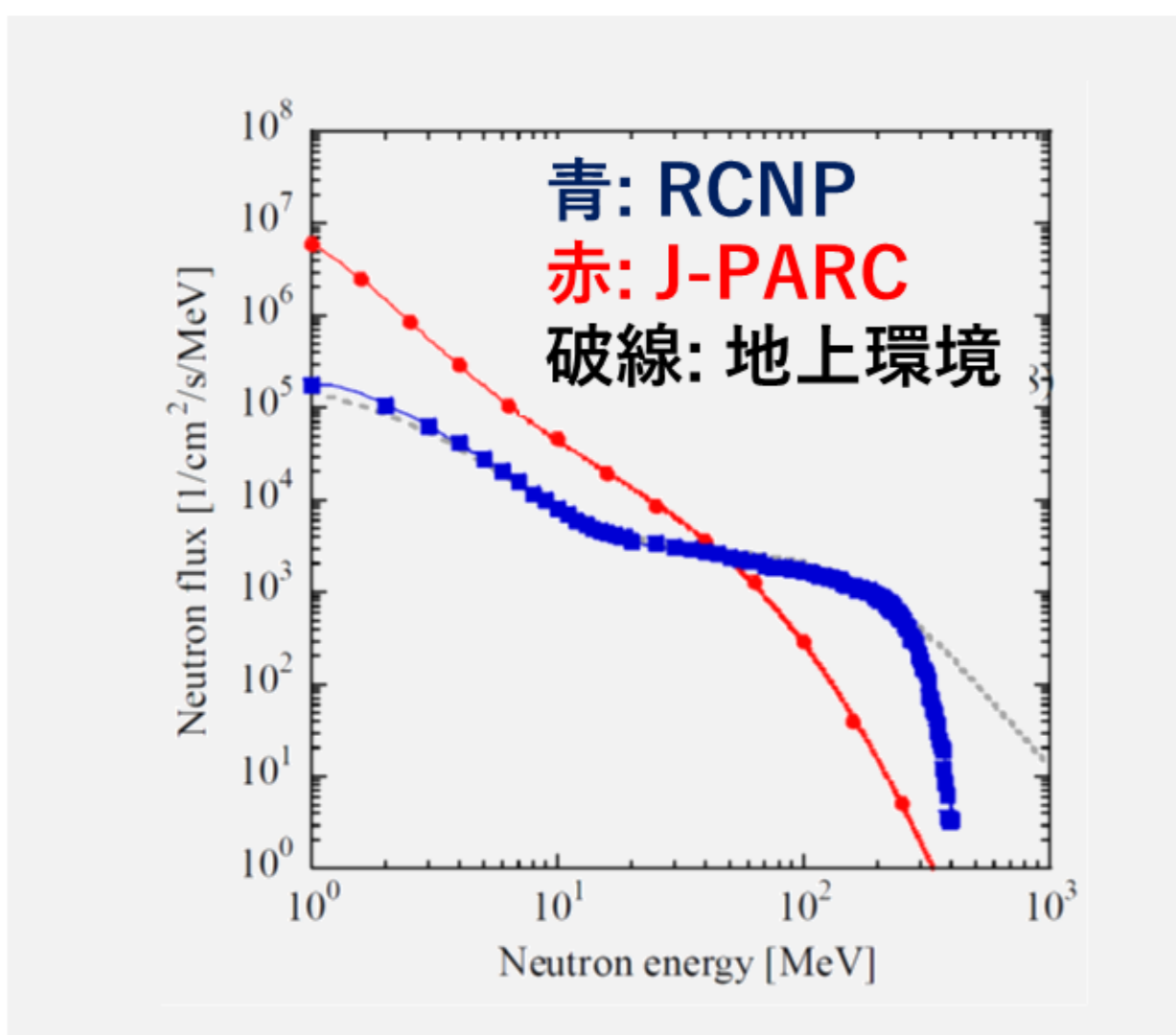
ソフトウェア Insufficient evidence



<https://www.atsb.gov.au/media/3532398/ao2008070.pdf>

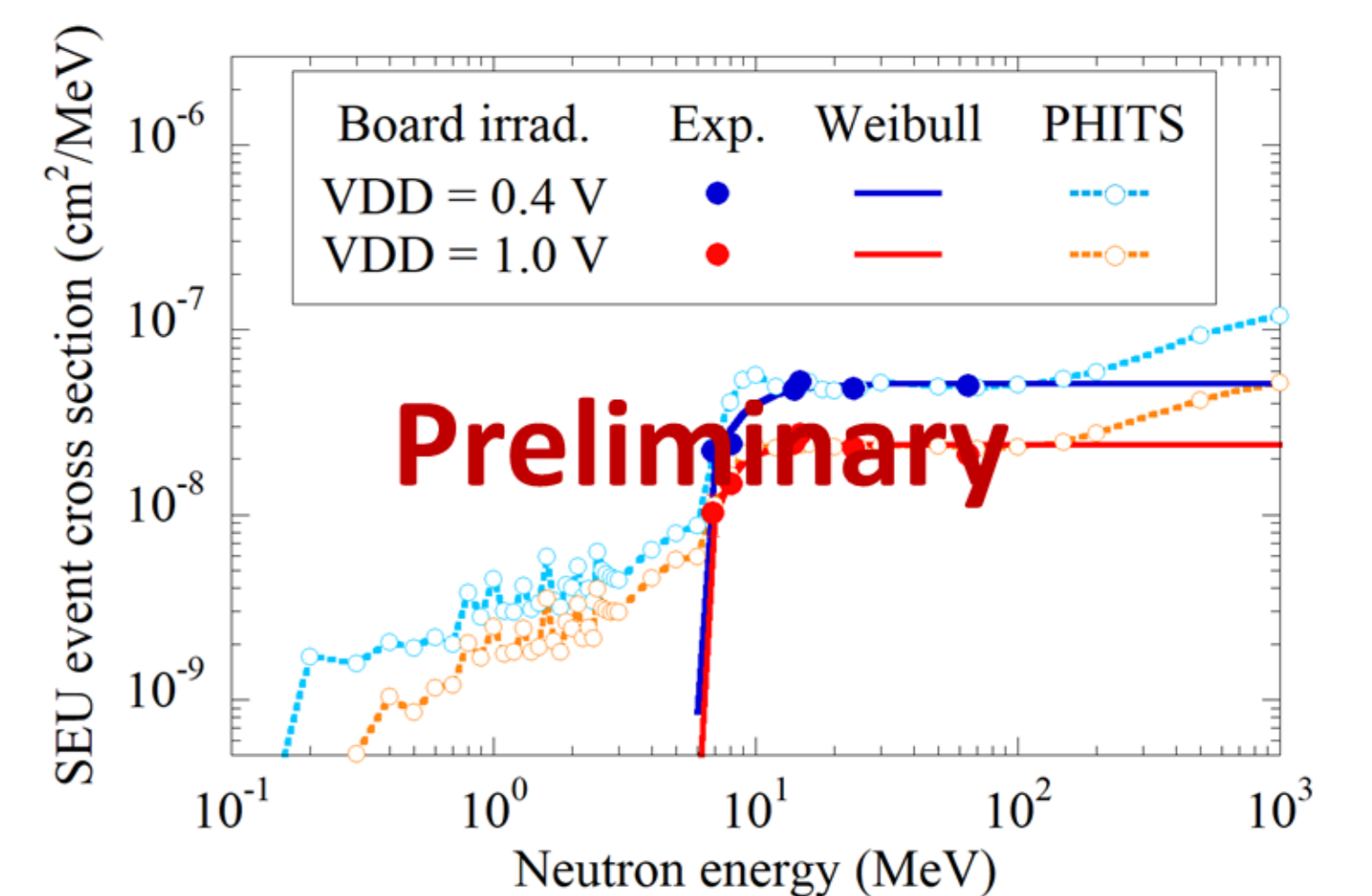
目標: ソフトエラー評価技術の開発と標準化

- 地上環境を再現する試験場所は世界に4箇所しかない
- 多様な国内中性子源を活用し、求められる試験精度に応じた評価技術を開発・提供
 - エネルギースペクトルの違いを様々な測定とシミュレーションの比較により校正



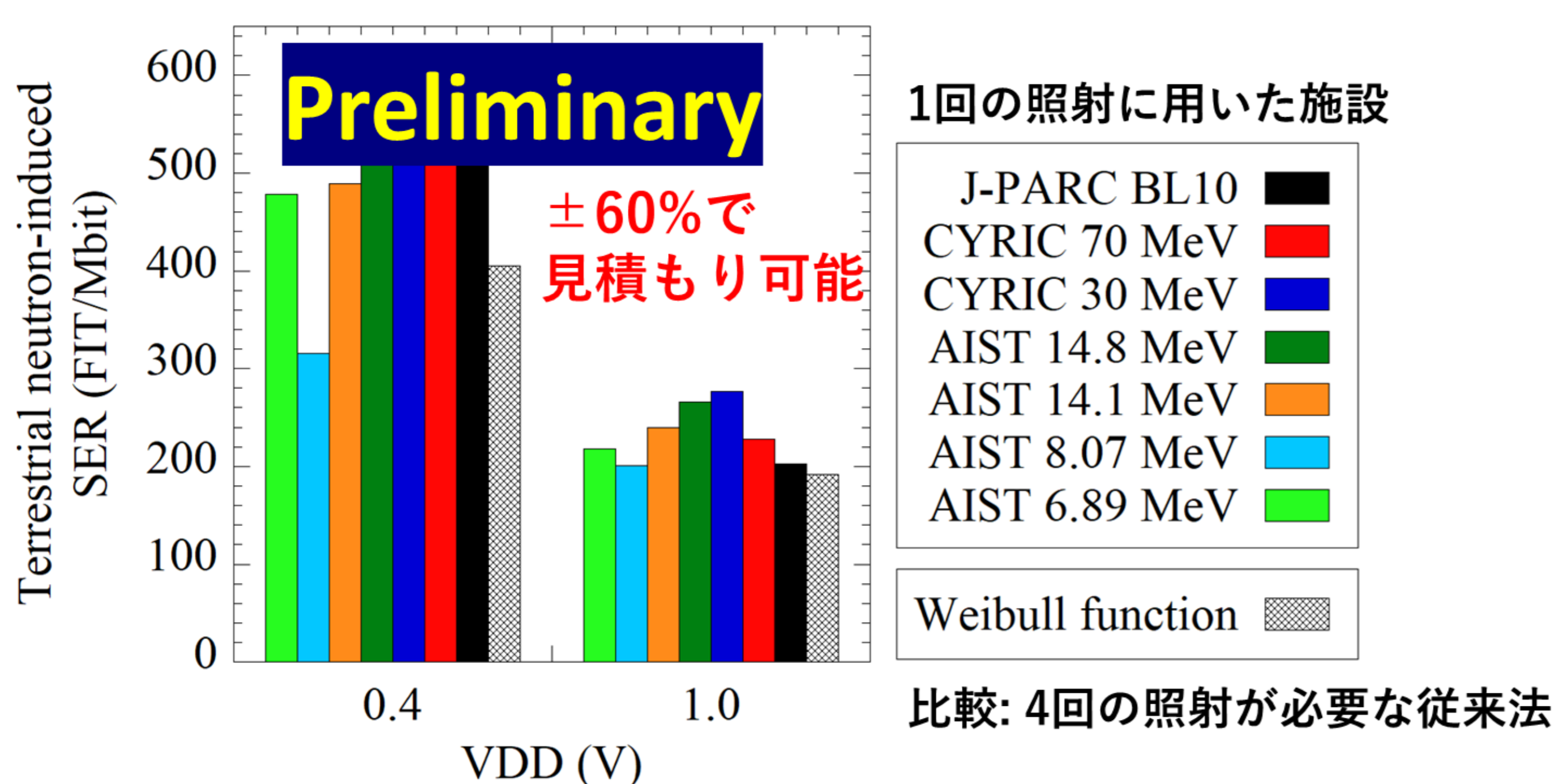
提案: 白色ではない中性子源で一回だけ照射して、地上SERを求める

- シミュレーションでエネルギーごとの断面積を求める
- 測定結果を再現する Q_{crit} を求める
- 地上SERを求める



Q_{crit} : クリティカルチャージ反転に必要な電荷量。デバイス依存

提案手法で求めた地上SER



スペクトルが異なる単一の照射施設を用いた評価が可能

まとめ

- 半導体の信頼性が我々の安全安心に直結
- デバイスの高信頼化に向けたソフトウェア耐性評価技術の開発
 - 多様な中性子源を用いた評価環境構築
 - 評価方法の国際標準化
- QASS((社)量子アプリ社会実装コンソーシアム)での産学プラットフォーム継続
 - 評価技術の標準化の推進
 - システムレベルの評価への展開

