

Trusted information barriers can be built using open source tools and vintage hardware.

New Concepts for Template-Based Information Barriers: IBX & IBX II

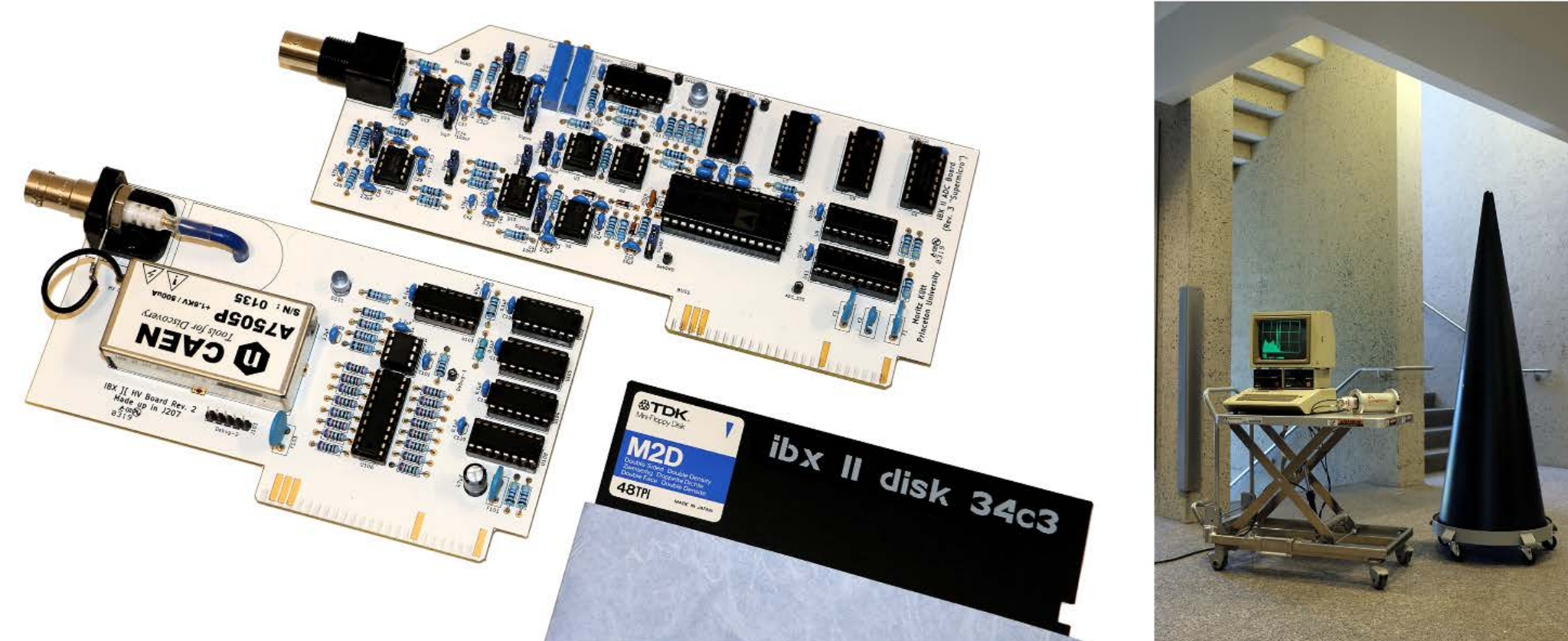
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INTRODUCTION

- information barriers convert sensitive information into simple pass/fail outputs
- **host party interest**: no leakage of restricted information (not even accidentally)
- **inspector requirement**: device without cheating mechanism

NEW APPROACH

- simplified data processing as possible option to help overcome lack of trust for information barriers
- based on publicly available information, resulting design public
- template-based: comparison of two gamma spectra recorded using low-resolution NaI scintillator



IBX: "HACKABLE PROTOTYPE"

- digital data acquisition approach using *Red Pitaya* platform
- no analog signal processing
- low-cost (~\$700), simple to assemble, for comprehensive hardware and software authentication studies

IBX II: "VINTAGE VERIFICATION"

- vintage hardware-based system: Apple IIe, MOS 6502 processor
- old CPUs drastically limit concerns for backdoors or hidden switches
- two custom extension cards, software in 6502 assembler for calibration & measurement

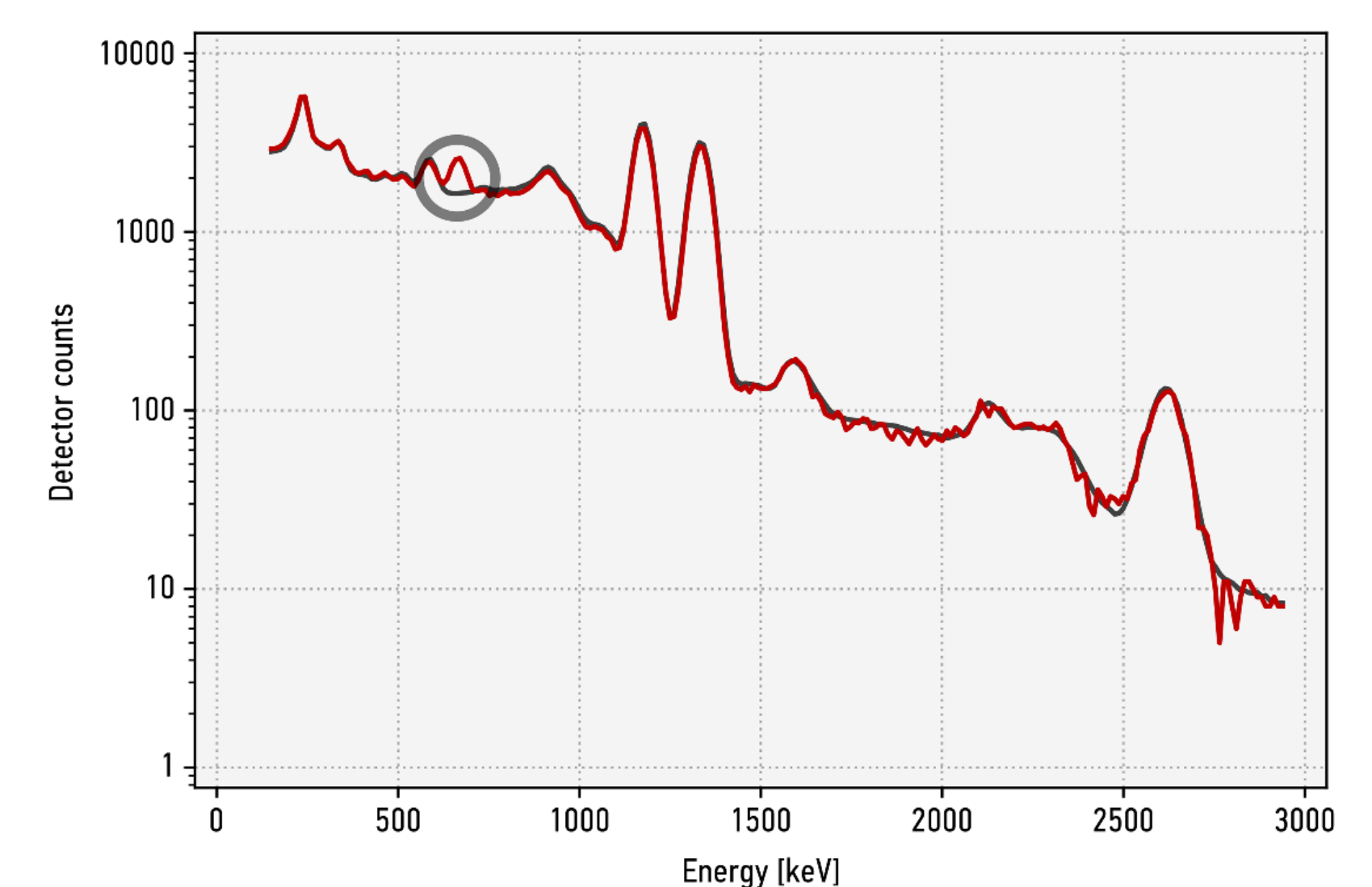


Fig A1: The Challenge. Both devices need to be able to detect small differences in measured gamma spectra. A Co-60 calibration source serves as a template (black). An "invalid" item is created adding a weak Cs-137 to the initial test source (red).

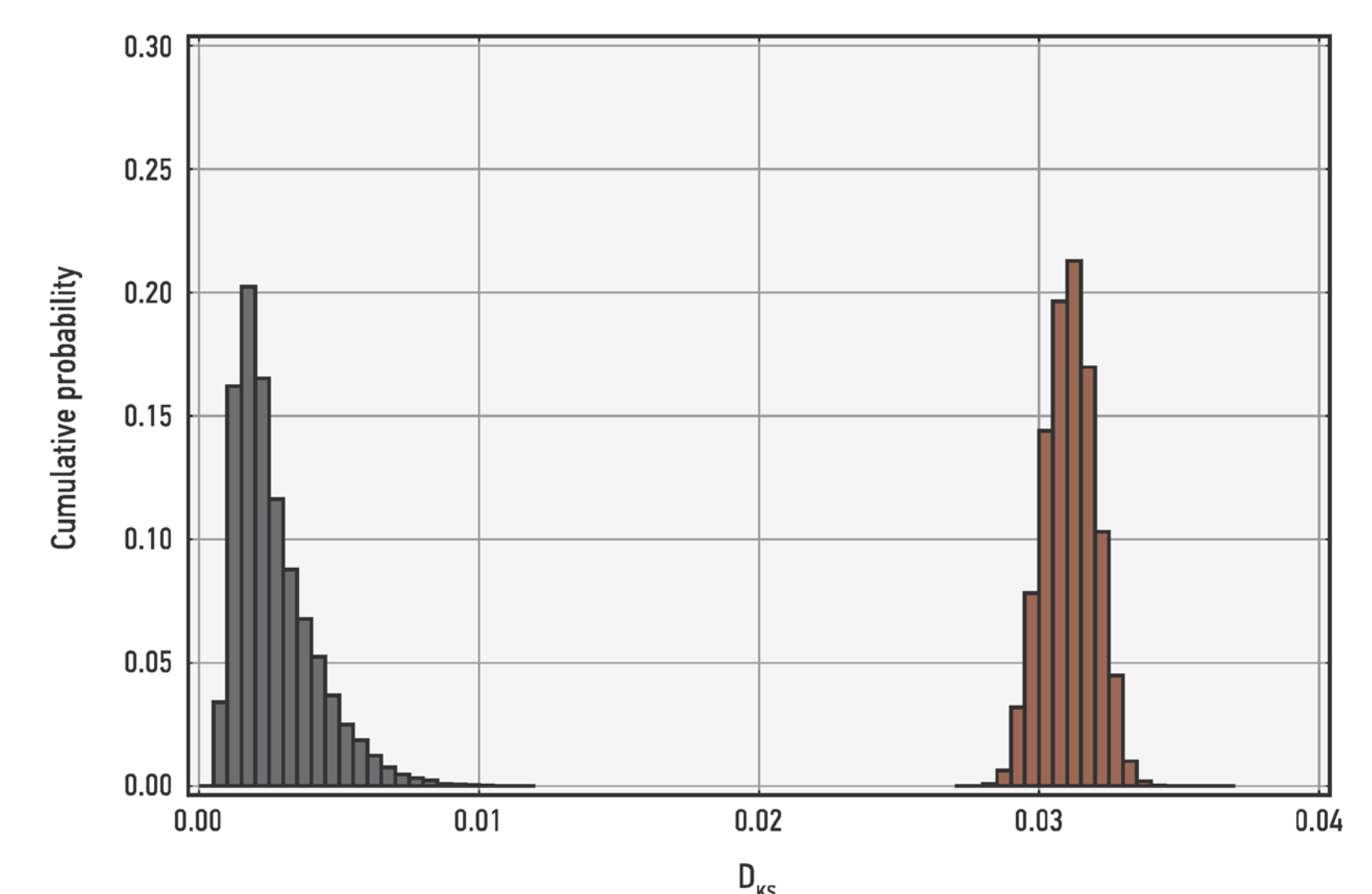


Fig A2: IBX results using a Kolmogorov-Smirnov test to compare different spectra. D_{KS} from measurements for a valid item (Co-60 calibration source, gray, about 25,000 comparisons) versus an invalid item (Co-60 source and a Cs-137 source at a distance, red, about 10,000 comparisons).

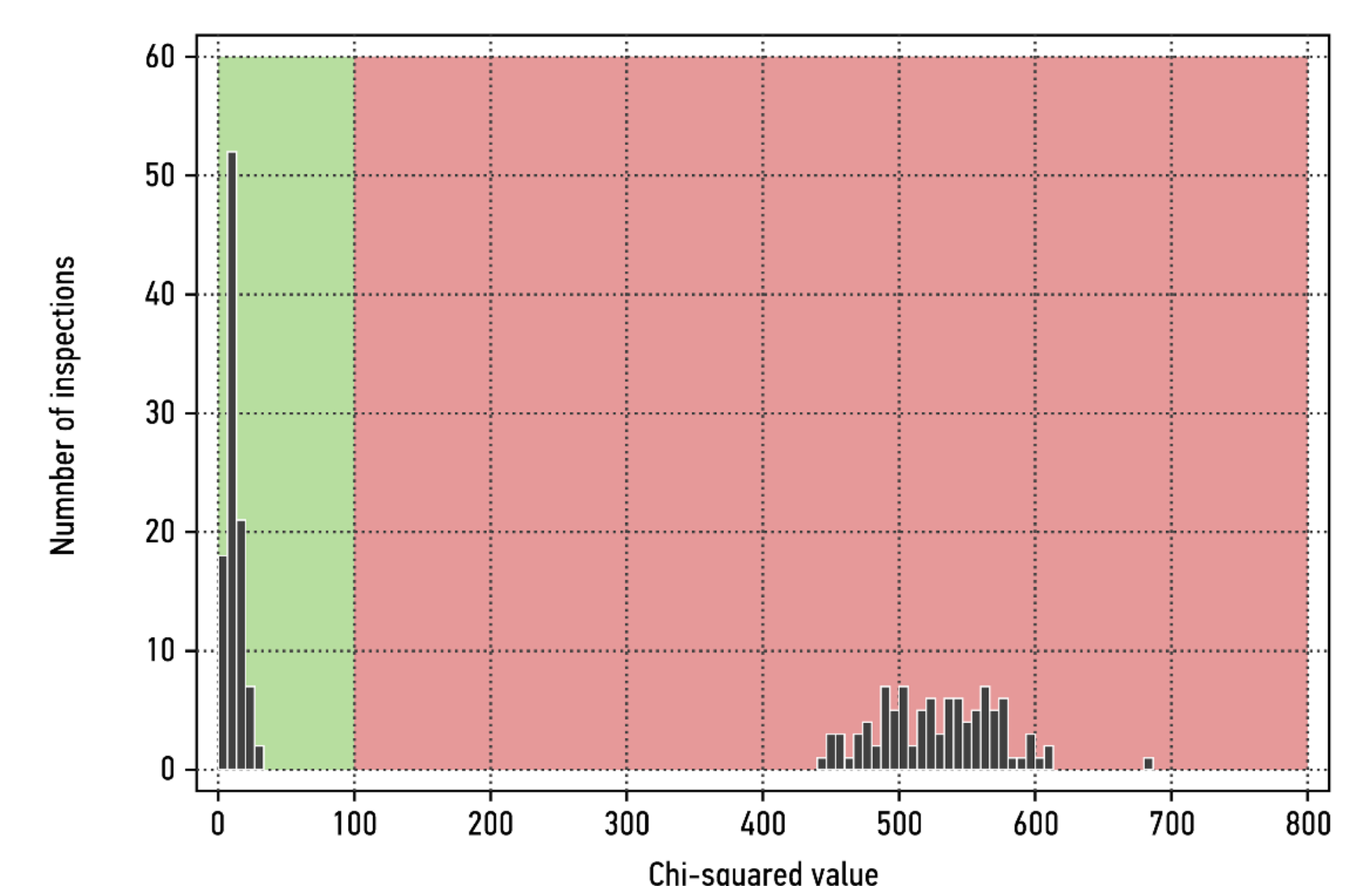


Fig A3: IBX II results using a Chi-square test to compare different spectra. Comparisons of valid items to a template (Co-60 calibration source) result in small differences (green area), invalid items (Co-60 source and a Cs-137 source at a distance) result in significantly larger differences (red area).

