# BOSON
# A Web-Based Platform For Radiation Dosimetry

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## ABSTRACT

Widely used internal dosimetry tools such as OLINDA/EXM and MIRDcalc are well-validated but largely desktop-based software, which creates barriers to accessibility, cross-platform use, and extensibility for both clinical and research applications. BOSON (Brown's Online Suite for radiatiON dosimetry) addresses these limitations as an open, browser-based platform that implements ICRP Publication 155 specific absorbed fractions (SAFs) for interactive internal dose calculations, requiring no software installation and running entirely within a standard web browser.

At its core, a Rust/WebAssembly computational engine executes the complete SAF dataset over 3,000 source–target organ combinations spanning all ICRP reference ages and both sexes—fully client-side, ensuring fast performance while keeping patient data local. The platform further supports user-defined radionuclides and custom biokinetic models within the standard MIRD formalism, enabling flexibility beyond fixed reference datasets. Clinical and research modules include organ-level S-value dose calculations, an I-131 patient-release calculator, a Y-90 radioembolization planning tool, and an integrated DICOM viewer for visualization, together forming a comprehensive, accessible dosimetry workflow.

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## INTRODUCTION

Accurate internal dosimetry is central to radiopharmaceutical therapy, radiation safety, and nuclear medicine research, underpinning decisions from patient-specific dose planning to regulatory release criteria. The MIRD schema, and more recently ICRP Publication 155, provide the reference specific absorbed fractions (SAFs) that make these calculations possible across a range of source and target organs, radionuclides, and patient models. However, translating this reference data into usable dose estimates has historically depended on desktop software, tools such as OLINDA/EXM and MIRDcalc, which, while thoroughly validated, require local installation, licensing, and platform-specific compatibility.

BOSON (Brown's Online Suite for radiatiON dosimetry) was developed to close this gap by bringing full ICRP 155-based dosimetry into a modern web browser, with no installation, licensing barrier, or operating-system dependency. By running the complete computational engine client-side via Rust/WebAssembly, BOSON combines the rigor of established dosimetry formalisms with the accessibility and immediacy of a web application.

## METHODS AND MATERIALS

BOSON is a single-page application with a Rust backend compiled to WebAssembly (WASM) for fast, fully client-side execution. The ICRP 155 specific absorbed fraction (SAF) datasets for photons, electrons, alpha particles, and neutrons were parsed, validated, and converted into compact indexed binary formats, queryable by particle type, age, sex, and source and target region.

Organ S-values are precomputed for 1,252 radionuclides across all 12 age-and-sex phantom combinations by combining ICRP-107 decay spectra, including continuous beta spectra integrated numerically, with the ICRP 155 SAFs via PCHIP interpolation. Clinical modules add an I-131 patient-release calculator (parameter-driven and measured-reference modes with multi-compartment retention modeling) and a Y-90 planner offering body-surface-area and MIRD single- and dual-compartment models, alongside an integrated DICOM viewer.

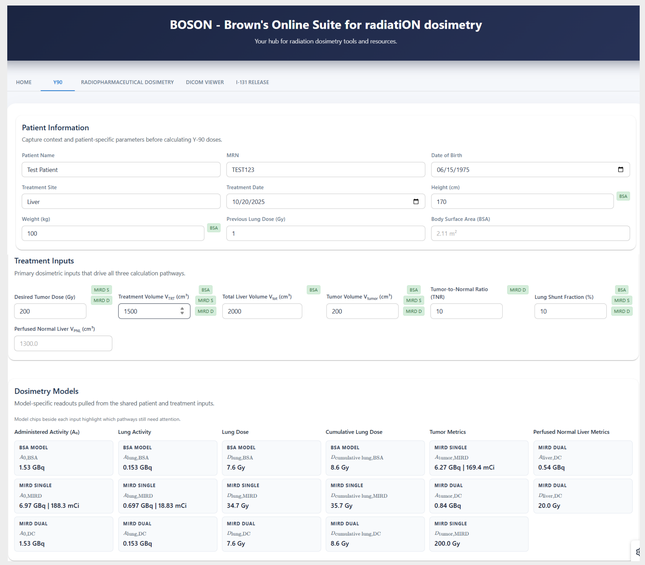


**Figure 1.** Y-90 dosimetry calculator.

## RESULTS

The complete ICRP 155 SAF dataset, comprising over 3,000 source-target combinations, was implemented across all supported reference models and radiation types, and WebAssembly execution delivers rapid dose calculations with no server-side dependencies. Interactive modules allow for Y-90 dosimetry (Figure 1), visualization of decay spectra, organ-dose calculation from user-supplied biokinetic inputs(Figure 2), and a DICOM viewer(Figure 3)

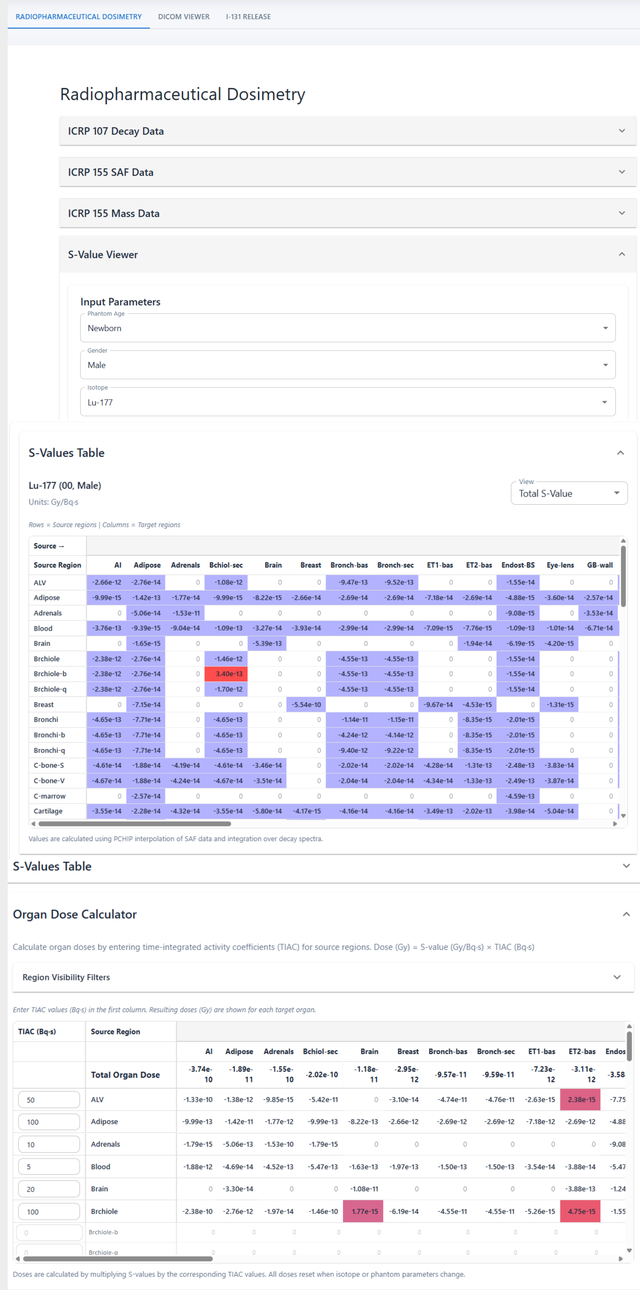


**Figure 2.** MIRD schema based organ dose calculation with ICRP 155 SAF values and ICRP 107 decay data.

## DISCUSSION

Unlike desktop alternatives, BOSON exposes the underlying SAF data and imaging context, enhancing transparency and educational value. Browser-native delivery removes installation barriers and runs on any modern operating system or device, while the Rust/WebAssembly engine provides near-native performance and keeps all patient and imaging data on the client, with nothing uploaded to a server. Its open, extensible architecture accepts custom radionuclides and biokinetic models, supporting research, teaching, and clinical workflows.

## CONCLUSIONS

BOSON demonstrates that high-quality internal dosimetry data can be delivered through an accessible, browser-native platform without sacrificing performance, improving accessibility, transparency, and extensibility relative to established desktop tools. By combining the rigor of ICRP 155 SAF data with the immediacy of a client-side web application, BOSON offers a practical path toward broader adoption of standardized internal dosimetry methods in both clinical and academic settings. Future work will integrate decay data, time-activity modeling, patient-specific and voxel-based dosimetry, and formal benchmarking against validated tools, further extending the platform's clinical and research utility.

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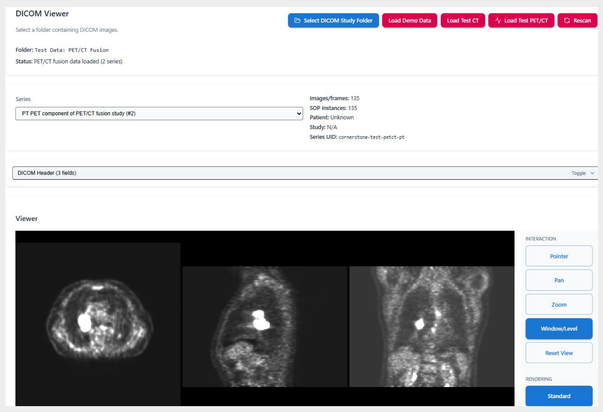


**Figure 3.** DICOM viewer for future expansion into voxel-based dosimetry and patient-specific biokinetic modeling.

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