

Emerging UR from Medical Physics domain

S. Guatelli

Geometry UR

- **UR1.1:** Re-incorporate the STEP interface
- **UR1.2:** Create a DICOM interface in the Geant4 kernel
- **UR1.3:** User friendly method to build complex beam line geometries (i.e. multileaf collimator for linac)
- **UR1.4:** Create a component *G4VoxelisedPhantom* in the Geant4 kernel

Note: the phantom is a water box, voxelised by means of RO Geometry

Primary UR

- **UR2.1:** Create an interface to read IAEA phase-space data in the Primary Particle component

The screenshot shows a web browser window displaying the IAEA phase-space database for external beam radiotherapy. The page features a blue header with the IAEA logo and navigation links. The main content area is titled "Phase-space database for external beam radiotherapy" and includes the IAEA NAPC Nuclear Data Section and IAEA NAHU Dosimetry and Medical Radiation Physics Section. A project officer, Roberto Capote, is listed. The page is divided into several sections: "NEWS" (The first set of photon phasespaces prepared in Spain (USC) is available), "Objective" (To build a database and disseminate representative phase-space data of accelerators and Co-60 units used in medical radiotherapy by compiling existing data that have been properly validated), "How to produce phase-space data" (The IAEA phsp format was designed to cover both phase-space files and event generators), "How to submit phase-space data" (Read carefully the INDC(NDS)-0484 technical report, Convert your phsp file to the IAEA format, Edit your IAEA phsp header file, Upload the header and phsp files, Send an email to the Project Officer), and "How to download phase-space data" (You have to select a phsp data type among Co-60 phsp, linac electron phsp or linac photon phsp). The right sidebar contains links to "Tech. Report" (IAEA-NDS-0484), "PHSP format" (List of PHSP variables, PHSP Header, PHSP upload, PHSP to review, PHSP database), and "PHSP database" (List of PHSP variables, PHSP Header, PHSP upload, PHSP to review, PHSP database).

Phase-space database for external beam radiotherapy - Windows Internet Explorer

http://www-nds.iaea.org/phsp/phsp.html

File Edit View Favorites Tools Help

Phase-space database for external beam radiotherapy

IAEA.org
International Atomic Energy Agency

Phase-space database for external beam radiotherapy

IAEA NAPC Nuclear Data Section
IAEA NAHU Dosimetry and Medical Radiation Physics Section

Project Officer: [Roberto Capote](#)

NEWS

The first set of photon phasespaces prepared in Spain (USC) is available

Objective: To build a database and disseminate representative [phase-space data](#) of accelerators and Co-60 units used in medical radiotherapy by compiling existing data that have been properly validated.

How to produce phase-space data: The IAEA phsp format was designed to cover both phase-space files and event generators (see [phsp contents](#)). However, event generators are more difficult to produce; we should wait for improved Monte Carlo codes to be developed. We have implemented the IAEA phsp format in a set of [read/write routines](#) (see [readme file](#)). We have also developed a [converter](#) from the frequently used [EGSnrc](#) phase-space file format (.egspsp1 = mode 0, no zlast) to the IAEA phsp format (see [readme file](#)). A converter from ASCII phsp files to the IAEA phsp format is also available on [request](#). We expect that the IAEA phsp format will be implemented in major Monte Carlo codes during 2007; meanwhile we can use converters to produce phsp files for submission.

How to submit phase-space data:

- Read carefully the [INDC\(NDS\)-0484 technical report](#) (especially before the first submission).
- [Convert](#) your phsp file to the IAEA format. You should obtain both the header and corresponding IAEA formatted phsp file (sample files are [available](#)).
- Edit your [IAEA phsp header file](#) to provide all requested [information](#).
- [Upload](#) the header and phsp files. Alternatively, you can [upload](#) the header, and send the DVD containing the phsp data by mail to the IAEA/NDS [address](#).
- Send an email to the [Project Officer](#) to start the peer-review process.

How to download phase-space data: You have to select a phsp data type among [Co-60 phsp](#), [linac electron phsp](#) or [linac photon phsp](#). Alternatively, you can request an electronic copy of the phsp by sending an [e-mail](#).

Tech. Report
IAEA-NDS-0484

PHSP format
List of PHSP variables

PHSP Header
How to fill header ...

PHSP upload
Upload files

PHSP to review
Files to review

PHSP database
1. Co-60 phsp
2. Photon linac phsp
3. Electron linac phsp

Physics UR (1)

- **UR3.1:** Model Very Low Energy extensions in **vapour water**
- **UR3.2:** Model Low Energy extensions in **silicon**
- **UR3.3:** Model biological effect of radiation (LEM model)
- **Note:** ESA contract **ESTEC/ITT AO/1-6041/09/NL/AT** for the period 2010-2013
- **UR 3.4:** Interface to external physics models
- **UR 3.5:** Update mean excitation energies

Physics UR (2)

- **UR 3.6:** Precise isotope creation in water/tissue
 - Protons, alpha
 - Neutron
 - C11, O15
- Improve and validate existing physics models

Analysis UR

- **UR4.1:** Histogram format compatible with Matlab, Origin, Octave

Quick response: crucial issue

- **UR 5.1:** Increase simulation speed
(DIANE, GPU-CUDA, etc.)
 - Find a general solution?

Other UR

- **UR 6.1:** Store extra information (regions traversed by particles, regions where particles interacted, ...) for debugging
- **UR 6.2:** Reverse MonteCarlo

Other comments

Documentation should be improved

- The G4 Radioactive Decay module documentation should be improved
- More detailed documentation on DICOM interface
- More documentation on the use of variance reduction techniques
- More documentation of the physics lists to adopt, and their validation

Other: user network

- To develop a strong Geant4 European Medical User (G4EMU) Community
 - Like G4NAMU

