Research Data Management Plan (RDMP)
of
KVI-Center for Advanced Radiation Technology (KVI-CART)

Emiel van der Graaf – September 2015

Introduction

The KVI-CART RDMP documents the procedures to manage and archive research data that is generated by researchers of KVI-CART. The aim of the data management and archiving is to ensure data can be verified, re-used and is safely stored.

Organization of the data storage

The data that is stored in the KVI-CART RDMP is organized by publication. A publication is a publication in a scientific journal or book, a PhD thesis or a MSc thesis. Only data of publications of which KVI-CART is the work address of the primary author will be stored. This first author, the PhD student or the MSc student are further referred to as the author associated with the publication.

Physical location and format of the data storage

The data storage will be a dedicated directory on a network drive[1]. For each publication there will be one entry in the data storage that contains a (zip) file (the Publication Data Archive, PDA) with all the data related to the publication.

What data needs to be stored

The data that needs to be stored in the PDA concerns the publication, the primary and secondary data and the user developed processing tools that were used in the publication. Data that was used from a collection/storage of an external institute or scientific collaboration need not be stored in the data storage. The data that results from processing external data should be part of the stored data. The relation of all entries that are stored to the publication and their interconnections should be explained in a metadocument. This metadocument is the key to the PDA.

<u>Publication</u>

1. Final version of the journal paper or book part (pdf and original text editor format)
2. Final version of the PhD thesis (pdf and original text editor format)
3. Final version of the MSc thesis (pdf and original text editor format)

[1] It is assumed that all data to be stored is digital. This is not really necessary. Notebooks with handwritten notes are still widely used and it is a large effort to scan these notes. Notebooks could be stored in a physical repository and the PDA could be adapted in the sense that for notebooks the relevant page number (s) of the notebook and the location of the physical repository should be specified.

Primary (raw) data

This is data that originates directly from a measurement or simulation before it is further processed. A few examples are given:

1. Spectrometer output
2. Datalogger output
3. CT images
4. Notebooks with numbers read from an instrument
5. Photo’s, video’s, audio
6. Output of a simulation code
7. Coding information of samples
8. Etc.

Secondary data

This is data that results from processing primary data e.g. by a software tool either commercial or in-house developed. This could be data generated by:

1. Spreadsheets (Excel, Quattro, etc)
2. Databases
3. Statistical packages (Root, SSPS, etc)
4. Graphics software (Sigmaplot, Grapher, etc)
5. Advanced analysis tools (Mathematica, Mathlab, etc)
6. Etc.

User developed processing tools

These are tools that are either developed directly from a programming code (C++, Pascal, Python, etc) or from adaptations of commercial software. Some examples:

1. Spreadsheets
2. Computer codes with their inputs
3. Advanced analysis tools with their inputs
4. Inputs for codes stored at external institutes or collaborations with a reference to the code with its version number
5. Etc.

Metadocument

A description of all the files stored in the PDA for the publication and their relation to each other and the publication.

Timing of deposit of PDA in the data storage

The PDA should be available in the data storage:

Journal paper or book part: 3 months after publication
PhD thesis: 1 month after the thesis has been printed
MSc thesis: 1 month after the grade has been awarded

Who deposits the PDA

The PDA is deposited in the data storage by:

Journal paper of book part: the author that is associated with the paper
PhD thesis: the promotor
MSc thesis: the daily supervisor

In case of a MSc thesis the PDA is handed over by the MSc student to the daily supervisor at the same time as the final MSc thesis. A grade can only be given for the MSc project if the data is complete.

In case of a PhD thesis the PDA is handed over by the PhD student to the promotor at the same time as the final PhD thesis for the manuscript committee. The promoter will only sign the PhD approval form if the data is complete.

Who has access the PDA after it is deposited

The PDAs are organized by research group. Each member of the research group can download data from their research group. On request other persons can have access. This access should be granted by the group leader. Files from PDA's can only be downloaded, but cannot be changed and uploaded to the data storage afterwards. Additions and corrections can only be uploaded as separate files of which it is made clear in an updated metadocument what the changes are and why there are made.

Management of the data storage

The data storage is managed by the data manager. The data manager is responsible for the back-up of the data storage and coordinates the access to the different PDA's.

Template Metadocument Publication Data Archive (PDA)

General information

Publication
Title:
Author(s):
Publication type:
Journal name:
Name of book:
Issue:
Page numbers:
Year:

PDA owner information
Research group:
Associated author:
Person responsible for PDA deposit:

Data

Publication
File names of the final version of the publication (pdf and original text editor format):

Primary data information
List of all primary data files names

Secondary data information
List of all secondary data files names

User developed processing tools
List of all user developed processing tools

*Short description of data processing and interrelation between fil*es

Metadocument Publication Data Archive (PDA)

Spectra of clinical CT scanners using a portable Compton spectrometer

General information

Publication

Title:	Spectra of clinical CT scanners using a portable Compton spectrometer
Author(s):	H.A. Duisterwinkel, J.K. van Abbema, M.J. van Goethem, R. Kawachimaru, L. Paganini, E.R. van der Graaf, S. Brandenburg
Publication type:	Journal paper
Journal name:	Medical Physics
Name of book:	n.a.
Issue:	42
Page numbers:	1884-1894
Year:	2015

PDA owner information

Research group:	Medical Physics
Associated author:	E.R. van der Graaf
Person responsible for PDA deposit:	E.R. van der Graaf

Data

Publication

Published paper Compton spectrometer.pdf
Figure 1 Duisterwinkel et al revision.pdf
Figure 2 Duisterwinkel et al revision.pdf
Figure 3 Duisterwinkel et al revision.pdf
Figure 4 Duisterwinkel et al revision.pdf
Figure 5 Duisterwinkel et al revision.pdf
Figure 6 Duisterwinkel et al revision.pdf
Figure 7 Duisterwinkel et al revision.pdf
Figure 8 Duisterwinkel et al revision.pdf
Figure 9 Duisterwinkel et al revision.pdf
Figure 10 Duisterwinkel et al revision.pdf
Figure 11 Duisterwinkel et al revision.pdf
Figure 12 Duisterwinkel et al revision.pdf
Figure 13 Duisterwinkel et al revision.pdf
Figure 14 Duisterwinkel et al revision.pdf
Figure 15 Duisterwinkel et al revision.pdf
Manuscript Duisterwinkel et al revision.pdf
Manuscript Duisterwinkel et al revision.docx

Primary data information

MCNPX output files:
cs5.o to cs19.o; cs37.o to cs45.o; cs51.o to cs55.o
cs23.o to cs36.o
cs47a.o to cs50a.o

Compton spectrometer files:
KVI direct and indirect spectra:
PX4directspectrum 600shots 30-10-2013.mca
PX4 directspectrum background 30-10-2013.mca
PX4 indirectspectrum background 15 shot 15-10-2013.mca
PX4 indirectspectrum with scatterer 70 shots 16-10-2013.mca
PX4 indirectspectrum with scatterer 530 shots 15-10-2013.mca
Siemens buis A:
80_1.mca; 80_2.mca; 80_3.mca; 80_4.mca; ; 80_b.mca
100_1.mca; 100_2.mca; 100_3.mca; 100_4.mca; 100_b.mca
120_1.mca; 120_2.mca; 120_3.mca; 120_4.mca; 120_b.mca
140_1.mca; 140_2.mca; 140_3.mca; 140_4.mca; 140_b.mca
Siemens buis B:
80_1.mca; 80_2.mca; 80_3.mca; 80_extra1002.mca; ; 80_b_1.mca; ; 80_b_2.mca
100_1.mca; 100_2.mca; 100_3.mca; 100_4.mca; 100_b_1.mca; 100_b_2.mca
120_1.mca; 120_2.mca; 120_3.mca; 120_4.mca; 120_b_1.mca; 120_b_2.mca
140_1.mca; 140_2.mca; 140_3.mca; 140_4.mca; 140_b_1.mca; 140_b_2.mca
140sn_1.mca; 140sn_2.mca; 140sn_3.mca; 140sn_4.mca; 140sn_b_1.mca; 140sn_b_2.mca
UMCGspectra:
raw spectra UMCG 1-12-2011.xlsx

SpekCalc pro output files:
Spec - 80kVp 8deg 500Air 0Be 3Al 0Cu 0Sn 0W 0Ta 0.9Ti 0C 0Wa.spec
Spec - 100kVp 8deg 500Air 0Be 3Al 0Cu 0Sn 0W 0Ta 0.9Ti 0C 0Wa.spec
Spec - 120kVp 8deg 500Air 0Be 3Al 0Cu 0Sn 0W 0Ta 0.9Ti 0C 0Wa.spec
Spec - 140kVp 8deg 500Air 0Be 3Al 0Cu 0Sn 0W 0Ta 0.9Ti 0C 0Wa.spec
Spec - 140kVp 8deg 500Air 0Be 3Al 0Cu 0.4Sn 0W 0Ta 0.9Ti 0C 0Wa.spec

Photo:
Comptonspectrometer.JPG

Secondary data information
Analysis cs5-cs19 cs37-cs45 cs51-cs55.xlsx
Analysis cs23-cs36.xlsx
Analysis cs47a-cs50a.xlsx
broadening combined.xlsx

Various contributions to detector.JNB
Spectra cs5-cs19.JNB
Multiple and rayleigh scattering.JNB

All Siemens nanomobil spectra direct indirect.JNB
Broadening total.JNB

sodirectpx4rio.xlsx
soindirectpx4rio.xlsx
sosiemA80.xlsx
sosiemA100.xlsx
sosiemA120.xlsx
sosiemA140.xlsx
sosiemb80.xlsx
sosiemb100.xlsx
sosiemb120.xlsx
sosiemb140.xlsx
sosiemb140sn.xlsx
soumcg80.xlsx
soumcg100.xlsx
soumcg120.xlsx
soumcg140.xlsx
sobroadSCpro80AL3mm.xlsx
sobroadSCpro100AL3mm.xlsx
sobroadSCpro120AL3mm.xlsx
sobroadSCpro140AL3mm.xlsx
sobroadSCpro140SnAL3mm.xlsx

User developed processing tools
MCNPX input files:
cs5.i to cs19.i; cs37.i to cs45.i; cs51.i to cs55.i
cs23.i to cs36.i
cs47a.i to cs50a.i

Mathematica notebooks:
csbindirectpx4rioef.nb
csbinindirectPX4rioef.nb
csbinsiema80.nb
csbinsiema100.nb
csbinsiema120.nb
csbinsiema140.nb
csbinsiemb80.nb
csbinsiemb100.nb
csbinsiemb120.nb
csbinsiemb140.nb
csbinsiemb140sn.nb
csbinumcg80.nb
csbinumcg100.nb
csbinumcg120.nb
csbinumcg140.nb
spectrumbroadeningSCpro80Al3mm.nb
spectrumbroadeningSCpro100Al3mm.nb

spectrumbroadeningSCpro120Al3mm.nb
spectrumbroadeningSCpro140Al3mm.nb
spectrumbroadeningSCpro140SnAl3mm.nb

Mathematica input files:
sidirectPX4rio.xlsx
siindirectPX4rio.xlsx
sisiemA80.xlsx
sisiemA100.xlsx
sisiemA120.xlsx
sisiemA140.xlsx
sisiemB80.xlsx
sisiemB100.xlsx
sisiemB120.xlsx
sisiemB140.xlsx
sisiemB140sn.xlsx
siumcg80.xlsx
siumcg100.xlsx
siumcg120.xlsx
siumcg140.xlsx
sibroadSCpro80al3mm.xlsx
sibroadSCpro100al3mm.xlsx
sibroadSCpro120al3mm.xlsx
sibroadSCpro140al3mm.xlsx
sibroadSCpro140Snal3mm.xlsx

Short description of data processing and interrelation between files
Detector spectra for a range of energies were simulated with MCNPX using input files: cs5.i to cs19.i; cs37.i to cs45.i; cs51.i to cs55.i and resulting in output files: cs5.o to cs19.o; cs37.o to cs45.o; cs51.o to cs55.o. These files were analysed for the various contributions to the detector with EXCEL file: Analysis cs5-cs19 cs37-cs45 cs51-cs55.xlsx and the data was put in graphical form and the data was fitted with the Sigmaplot files: Various contributions to detector.JNB and Spectra cs5-cs19.JNB. Figure 4 results from the Sigmaplot file: Spectra cs5-cs19.JNB; Figures 5 and 6 result from the Sigmaplot file: Various contributions to detector.JNB

Detector spectra were calculated for 90 degree scatter photons with MCNPX using input files: cs23.i to cs36.i and resulting in output files: cs23.o to cs36.o. These files were analysed for the contribution of Raleigh and multiple scatter to the detector with EXCEL file: Analysis cs23-cs36.xlsx and the data was put in graphical form and the data was fitted with the Sigmaplot file: Multiple and rayleigh scattering.JNB. Figure 7 results from the Sigmaplot file: Multiple and rayleigh scattering.JNB

Detector spectra were calculated for 90 degree scatter photons with MCNPX with the option Doppler broadening on using input files: cs47a.i to cs50a.i and resulting in output files: cs47a.o to cs50a.o. These files were analysed for the contribution of Doppler and geometrical broadening with EXCEL files: Analysis cs47a-cs50a.xlsx and broadening combined.xlsx and the data was put in graphical form and the data was fitted with the Sigmaplot file: Broadening total.JNB. Figure 8 results from the Sigmaplot file: Broadening total.JNB.

Figure 9 results from the photo: Comptonspectrometer.JPG

Raw direct, indirect and background spectra of the Siemens nanomobil were measured with the KVI Comptonspectrometer: PX4directspectrum 600shots 30-10-2013.mca; PX4 directspectrum background 30-10-2013.mca; PX4 indirectspectrum background 15 shot 15-10-2013.mca; PX4 indirectspectrum with scatterer 70 shots 16-10-2013.mca; PX4 indirectspectrum with scatterer 530 shots 15-10-2013.mca.
These spectra were converted to Mathematica notebook inputs in: sidirectpx4rio.xlsx and siindirectpx4rio.xlsx. Mathematica notebooks: csbindirectpx4rioef.nb and csbinindirectPX4rioef.nb were used to reconstruct the spectra and the reconstructed spectra are written to Mathematica notebook outputs: sodirectpx4rio.xlsx and soindirectpx4rio.xlsx.
The reconstructed spectra were put in graphical form and compared with the Sigmaplot file: All Siemens nanomobil spectra direct indirect.JNB.
Figure 10 and 11 result from the the Sigmaplot file: Siemens nanomobil spectra direct indirect.JNB.

Raw indirect and background spectra of the Siemens Definition flash tube A for tube settings of 80 kV; 100 kV; 120 kV and 140 kV were measured with the KVI Comptonspectrometer: 80_1.mca; 80_2.mca; 80_3.mca; 80_4.mca; 80_b.mca; 100_1.mca; 100_2.mca; 100_3.mca; 100_4.mca; 100_b.mca; 120_1.mca; 120_2.mca; 120_3.mca; 120_4.mca; 120_b.mca; 140_1.mca; 140_2.mca; 140_3.mca; 140_4.mca; 140_b.mca.
These spectra were converted to Mathematica notebook inputs in: sisiemA80.xlsx; sisiemA100.xlsx; sisiemA120.xlsx; sisiemA140.xlsx. Mathematica notebooks: csbinsiema80.nb; csbinsiema100.nb; csbinsiema120.nb; csbinsiema140.nb were used to reconstruct the spectra and the reconstructed spectra are written to Mathematica notebook outputs: sosiemA80.xlsx; sosiemA100.xlsx; sosiemA120.xlsx; sosiemA140.xlsx.

Raw indirect and background spectra of the Siemens Definition flash tube B for tube settings of 80 kV; 100 kV; 120 kV; 140 kV and 140kV(Sn) were measured with the KVI Comptonspectrometer: 80_1.mca; 80_2.mca; 80_3.mca; 80_extra1002.mca; ; 80_b_1.mca; ; 80_b_2.mca; 100_1.mca; 100_2.mca; 100_3.mca; 100_4.mca; 100_b_1.mca; 100_b_2.mca; 120_1.mca; 120_2.mca; 120_3.mca; 120_4.mca; 120_b_1.mca; 120_b_2.mca; 140_1.mca; 140_2.mca; 140_3.mca; 140_4.mca; 140_b_1.mca; 140_b_2.mca; 140sn_1.mca; 140sn_2.mca; 140sn_3.mca; 140sn_4.mca; 140sn_b_1.mca; 140sn_b_2.mca.
These spectra were converted to Mathematica notebook inputs in: sisiemB80.xlsx; sisiemB100.xlsx; sisiemB120.xlsx; sisiemB140.xlsx; sisiemB140sn.xlsx. Mathematica notebooks: csbinsiemb100.nb; csbinsiemb120.nb; csbinsiemb140.nb; csbinsiemb140sn.nb were used to reconstruct the spectra and the reconstructed spectra are written to Mathematica notebook outputs: sosiemb80.xlsx; sosiemb100.xlsx; sosiemb120.xlsx; sosiemb140.xlsx; sosiemb140sn.xlsx.

Raw indirect and background spectra of the Siemens Definition for tube settings of 80 kV; 100 kV; 120 kV and 140 kV were measured with the KVI Comptonspectrometer. The raw spectra are compiled in: raw spectra UMCG 1-12-2011.xlsx.
These spectra were converted to Mathematica notebook inputs in: siumcg80.xlsx; siumcg100.xlsx; siumcg120.xlsx; siumcg140.xlsx. Mathematica notebooks: csbinumcg80.nb; csbinumcg100.nb; csbinumcg120.nb; csbinumcg140.nb were used to reconstruct the spectra and the reconstructed spectra are written to Mathematica notebook outputs: soumcg80.xlsx; soumcg100.xlsx; soumcg120.xlsx; soumcg140.xlsx

The reconstructed spectra of the Siemens Definition Flash and Siemens Definition were put in graphical form and compared with the Sigmaplot files: All spectra Definition Flash and Definition and models.JNB.
Figure 12 and 13 result from the the Sigmaplot file: All spectra Definition Flash and Definition and models.JNB.

Spectra for tube settings of 80kV, 100kV, 120kV, 140 kV and 140kV(Sn) were calculated with SpekCalc pro resulting in the files:
Spec - 80kVp 8deg 500Air 0Be 3Al 0Cu 0Sn 0W 0Ta 0.9Ti 0C 0Wa.spec;
Spec - 100kVp 8deg 500Air 0Be 3Al 0Cu 0Sn 0W 0Ta 0.9Ti 0C 0Wa.spec;
Spec - 120kVp 8deg 500Air 0Be 3Al 0Cu 0Sn 0W 0Ta 0.9Ti 0C 0Wa.spec;
Spec - 140kVp 8deg 500Air 0Be 3Al 0Cu 0Sn 0W 0Ta 0.9Ti 0C 0Wa.spec;
Spec - 140kVp 8deg 500Air 0Be 3Al 0Cu 0.4Sn 0W 0Ta 0.9Ti 0C 0Wa.spec.

These files were converted into Mathematica notebook input files: sibroadSCpro80al3mm.xlsx; sibroadSCpro100al3mm.xlsx; sibroadSCpro120al3mm.xlsx; sibroadSCpro140al3mm.xlsx; sibroadSCpro140Snal3mm.xlsx and broadened with Mathematica notebooks:
spectrumbroadeningSCpro80Al3mm.nb;
spectrumbroadeningSCpro100Al3mm.nb;
spectrumbroadeningSCpro120Al3mm.nb;
spectrumbroadeningSCpro140Al3mm.nb;
spectrumbroadeningSCpro140SnAl3mm.nb.
The broadened spectra are written to Mathematica notebook outputs:
sibroadSCpro80al3mm.xlsx;
sibroadSCpro100al3mm.xlsx;
sibroadSCpro120al3mm.xlsx;
sibroadSCpro140al3mm.xlsx;
sibroadSCpro140Snal3mm.xlsx.
The broadened spectra were put in graphical form and compared with the Sigmaplot files: All spectra Definition Flash and Definition and models.JNB.
Figure 14 and 15 result from the the Sigmaplot file: All spectra Definition Flash and Definition and models.JNB.