Appendix E

CONTENTS OF THE EGS5 DISTRIBUTION

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This EGS5 Distribution Listing is Appendix E of a document called
SLAC-R-730/KEK-2005-8, which can be obtained from the SLAC and KEK web sites.

The EGS5 distribution archive contains six main groups of files: documentation; EGS FORTRAN source codes; PEGS FORTRAN source codes; material data files; example and tutorial run-time scripts and user codes (including FORTRAN source codes, input files and sample output); and FORTRAN source codes for auxiliary functions which users may find useful.

E.1 Documentation

Documentation has been included within the EGS5 distribution for two reasons. First, the most heavily used parts of SLAC-R-730/KEK-2005-8 are expected to be the user manuals, and so .pdf versions have been placed in the archive so that they can be accessed (or printed) at the discretion and convenience of the user. Second, it is anticipated that when changes and additions are made to the EGS5 code base, the user manuals will be updated appropriately, while SLAC-R-730/KEK-2005-8 may not be. Documentation files includes with the EGS5 distribution are:

egs5_user_manual.pdf	Appendix B of SLAC-R-730/KEK-2005-8
pegs_user_manual.pdf	Appendix C of SLAC-R-730/KEK-2005-8
installation_guide.pdf	Appendix D of SLAC-R-730/KEK-2005-8
distribution_contents.pdf	Appendix E of SLAC-R-730/KEK-2005-8
Writing_HOWFAR.pdf	Presentation describing construction of user code subroutine `HOWFAR`

These files can be found in the subdirectory **docs** of the under the main **egs5** directory in the distribution. In addition, a complete copy of SLAC-R-730/KEK-2005-8 is included in the main **egs5** directory, as the .pdf file **slac730.pdf**.

E.2 EGS-Related FORTRAN Source Files

There are two types of files which are part of the EGS Monte Carlo shower simulation package. As described in the EGS5 User Manual (Appendix B of SLAC-R-730/KEK-2005-8), some of the utility of MORTRAN macro substitutions used in EGS4 has been retained in EGS5 by having all FORTRAN `COMMON` blocks be defined in the subprograms of the source code through `include` statements which reference files containing just the FORTRAN listing of each `COMMON` block. This makes changing variables and parameters in any `COMMON` block a global process, similar to what could be done with a MORTRAN macro in EGS4. Each EGS5 `COMMON` block is thus contained in a unique file which is named after the `COMMON` block as in **egs5_media.f** for the file containing the declarations for `COMMON` block `MEDIA`. All of the FORTRAN `PARAMETERS` used to the specify array dimensions in the various `COMMON` blocks have been collected in a single "header" file called **egs5_h.f**, and all of the EGS5 `COMMON` block files have been placed in a directory called **include** under the main **egs5** directory. These files contain nothing other than the declarations of the variables in each `COMMON`, along with some documentation.

All of the actual FORTRAN source code files used in simulating showers have been collected in a subdirectory of **egs5** called **egs**. Each file contains the source code for one EGS5 subroutine (some source code files actually contain more than one subroutine, when groups of subprograms are very closely related), and the naming convention used with the `COMMON` block files in **include** has been followed. Descriptions of the functionality of the various subprograms of **egs** can be found both in Chapter 2 of SLAC-R-730/KEK-2005-8 and in the EGS5 User Manual. List below are the names of all of the files in **egs** and **include**, which are subdirectories of **egs5** in the EGS5 distribution.

EGS FORTRAN source files:

```
counters_out.f          egs5_eii.f              egs5_mscat.f
egs5_annih.f            egs5_electr.f           egs5_pair.f
egs5_aphi.f             egs5_hardx.f            egs5_photo.f
egs5_bhabha.f           egs5_hatch.f            egs5_photon.f
egs5_block_data.f       egs5_kauger.f           egs5_raylei.f
egs5_block_data_atom.f  egs5_kshell.f           egs5_rk1.f
egs5_block_set.f        egs5_kxray.f            egs5_rmsfit.f
egs5_brems.f            egs5_lauger.f           egs5_shower.f
egs5_collis.f           egs5_lshell.f           egs5_uphi.f
egs5_compt.f            egs5_lxray.f            randomset.f
egs5_edgbin.f           egs5_moller.f           rluxinit.f
```

EGS "included" `COMMON` block files:

```
counters.f     egs5_edge.f    egs5_mscon.f   egs5_useful.f
egs5_bcomp.f   egs5_eiicom.f  egs5_mults.f   egs5_userpr.f
egs5_bounds.f  egs5_elecin.f  egs5_photin.f  egs5_usersc.f
egs5_brempr.f  egs5_epcont.f  egs5_scpw.f    egs5_uservr.f
egs5_cdcsep.f  egs5_h.f       egs5_stack.f   egs5_userxt.f
egs5_cdcspl.f  egs5_media.f   egs5_thresh.f  randomm.f
egs5_coefgs.f  egs5_misc.f    egs5_uphiin.f
egs5_csplcf.f  egs5_ms.f      egs5_uphiot.f
```

Also included in the **egs** subdirectory is the EGS5 copyright file, **COPYRIGHT**, in a version suitable for inclusion with FORTRAN user codes.

E.3 PEGS-Related FORTRAN Source Files

As with EGS, there are two types of files comprising PEGS, those containing actual FORTRAN source code (in a subdirectory of **egs5** called **pegs**) and those containing just `COMMON` block declara-

tions (in a subdirectory called **pegscommons**). While all of the `COMMON` blocks in PEGS are found in unique files (named after the `COMMON` block with no prefix) all of the subroutines and functions previously a part of PEGS4 are contained in one file **pegs5.f**. All of the other source code files in the **pegs** subdirectory are new to EGS5 and are either required for calculating the scattering strength and scattering power data needed for the new electron transport mechanics of EGS5, or are part of the implementation of the new multiple scattering distribution, both of which are described in Chapter 2 of SLAC-R-730/KEK-2005-8. The full lists of the PEGS-related files found in **pegs** and **pegscommons**, which are both subdirectories of **egs5** in the EGS5 distribution, are given below.

PEGS FORTRAN source files:

```
csdar.f       elinit.f      g1e.f       k1e.f       sumga.f
dcsel.f       esteplim.f    gauleg.f    legenp.f    wmsfit.f
dcsn.f        estepmax.f    gscoef.f    makek1.f
dcsstor.f     findi.f       gsdist.f    pegs5.f
dcstab.f      fitms.f       inigrd.f    prelastino.f
elastino.f    g1dedx.f      integ.f     spline.f
```

PEGS "included" `COMMON` block files:

```
bcom.f     elemtb.f   lbhabm.f   mimsd.f    radlen.f
bremp2.f   elmtbc.f   lbremr.f   mixdat.f   rngspl.f
cohcom.f   epstar.f   lbremz.f   molvar.f   rslts.f
cpcom.f    funcs.f    lcompm.f   mscom.f    scpspl.f
dbrpr.f    funcsc.f   legacy.f   mxdatc.f   sfcom.f
dcsstr.f   k1spl.f    lpairr.f   phpair.f   spcomc.f
dercon.f   lamolm.f   lpairz.f   pmcons.f   spcomm.f
eimpact.f  lanihm.f   lspion.f   pwlfin.f   thres2.f
```

E.4 Material Data Files

The EGS5 distribution contains six primary data files plus five subdirectories containing material dependent data files, as described below. All files and directories are found in the subdirectory **data** of **egs5**. More complete descriptions of the data contained in the files can be found in Chapter 2 of SLAC-R-730/KEK-2005-8.

Data files: The main material data files in **data** are briefly described below:

aprime.data	Data for empirical bremsstrahlung correction.
bcomp.dat	Bound total Compton cross section data (σ_{bC}) for elements $Z = 1 \sim 100$.
incoh.dat	Incoherent scattering function data ($S(x, Z)$) for all elements $Z = 1 \sim 100$.
K1.dat	Tables of optimal initial scattering strengths as a function of geometry region size at various energies for various reference materials.
pgs5form.dat	Rayleigh scattering form factor data ($F(x, Z)$), identical to **pgs4form.dat** from PEGS4.
pgs5phtx.dat	Photo-electric cross section data, pair-production cross section data (for photon energies less than 50 MeV), and Rayleigh scattering cross section data from PHOTX for all elements $Z = 1 \sim 100$.

Data subdirectories: Data subdirectories of **data** are briefly described as follows:

dcslib	Differential nuclear elastic scattering cross sections for electrons and positrons for elements $Z = 1 \sim 95$.
density_corrections	Explicit values of the density effect correction to stopping power which can be used to reproduce ICRU-37 values. Placed in two subdirectories, **elements** and **compounds**.
int_coherent_cs	Coherent scattering cross sections (with interference effects modeled) for selected materials.
int_form_factor	Form factors (including interference effects) for selected materials.
shellwise_Compton_profile	Shellwise Compton profiles for elements $Z = 1 \sim 100$.

Files in dcslib: Files containing elemental partial-wave differential elastic scattering cross section data for both electrons and positrons are included in the EGS5 distribution in subdirectory **dcslib** of **data**. A straight-forward convention has been used to name these data files, which are listed below

```
eeldx001.tab  eeldx039.tab  eeldx077.tab  peldx020.tab  peldx058.tab
eeldx002.tab  eeldx040.tab  eeldx078.tab  peldx021.tab  peldx059.tab
eeldx003.tab  eeldx041.tab  eeldx079.tab  peldx022.tab  peldx060.tab
eeldx004.tab  eeldx042.tab  eeldx080.tab  peldx023.tab  peldx061.tab
eeldx005.tab  eeldx043.tab  eeldx081.tab  peldx024.tab  peldx062.tab
eeldx006.tab  eeldx044.tab  eeldx082.tab  peldx025.tab  peldx063.tab
eeldx007.tab  eeldx045.tab  eeldx083.tab  peldx026.tab  peldx064.tab
eeldx008.tab  eeldx046.tab  eeldx084.tab  peldx027.tab  peldx065.tab
eeldx009.tab  eeldx047.tab  eeldx085.tab  peldx028.tab  peldx066.tab
eeldx010.tab  eeldx048.tab  eeldx086.tab  peldx029.tab  peldx067.tab
eeldx011.tab  eeldx049.tab  eeldx087.tab  peldx030.tab  peldx068.tab
eeldx012.tab  eeldx050.tab  eeldx088.tab  peldx031.tab  peldx069.tab
eeldx013.tab  eeldx051.tab  eeldx089.tab  peldx032.tab  peldx070.tab
```

```
eeldx014.tab  eeldx052.tab  eeldx090.tab  peldx033.tab  peldx071.tab
eeldx015.tab  eeldx053.tab  eeldx091.tab  peldx034.tab  peldx072.tab
eeldx016.tab  eeldx054.tab  eeldx092.tab  peldx035.tab  peldx073.tab
eeldx017.tab  eeldx055.tab  eeldx093.tab  peldx036.tab  peldx074.tab
eeldx018.tab  eeldx056.tab  eeldx094.tab  peldx037.tab  peldx075.tab
eeldx019.tab  eeldx057.tab  eeldx095.tab  peldx038.tab  peldx076.tab
eeldx020.tab  eeldx058.tab  peldx001.tab  peldx039.tab  peldx077.tab
eeldx021.tab  eeldx059.tab  peldx002.tab  peldx040.tab  peldx078.tab
eeldx022.tab  eeldx060.tab  peldx003.tab  peldx041.tab  peldx079.tab
eeldx023.tab  eeldx061.tab  peldx004.tab  peldx042.tab  peldx080.tab
eeldx024.tab  eeldx062.tab  peldx005.tab  peldx043.tab  peldx081.tab
eeldx025.tab  eeldx063.tab  peldx006.tab  peldx044.tab  peldx082.tab
eeldx026.tab  eeldx064.tab  peldx007.tab  peldx045.tab  peldx083.tab
eeldx027.tab  eeldx065.tab  peldx008.tab  peldx046.tab  peldx084.tab
eeldx028.tab  eeldx066.tab  peldx009.tab  peldx047.tab  peldx085.tab
eeldx029.tab  eeldx067.tab  peldx010.tab  peldx048.tab  peldx086.tab
eeldx030.tab  eeldx068.tab  peldx011.tab  peldx049.tab  peldx087.tab
eeldx031.tab  eeldx069.tab  peldx012.tab  peldx050.tab  peldx088.tab
eeldx032.tab  eeldx070.tab  peldx013.tab  peldx051.tab  peldx089.tab
eeldx033.tab  eeldx071.tab  peldx014.tab  peldx052.tab  peldx090.tab
eeldx034.tab  eeldx072.tab  peldx015.tab  peldx053.tab  peldx091.tab
eeldx035.tab  eeldx073.tab  peldx016.tab  peldx054.tab  peldx092.tab
eeldx036.tab  eeldx074.tab  peldx017.tab  peldx055.tab  peldx093.tab
eeldx037.tab  eeldx075.tab  peldx018.tab  peldx056.tab  peldx094.tab
eeldx038.tab  eeldx076.tab  peldx019.tab  peldx057.tab  peldx095.tab
```

Files in density_corrections: To access values of collision stopping powers derived from ICRU Report 37, the user must provide density effect values explicitly for each material. Files containing the appropriate data for 450 elements and compounds are provided in the EGS5 distribution in subdirectories **elements** and **compounds** of **data** subdirectory **density_corrections**. Files are titled using a unique and explicit name for each material along with a **.density** extension. The full list of elemental material files (without the **.density** extension) is given below. A list of the 345 files containing data for compounds can be found in a **README** file provided in **density_corrections**.

```
actinium                germanium               protactinium
aluminium               gold                    radium
aluminum                hafnium                 radon
americium               helium                  rhenium
antimony                holmium                 rhodium
argon                   hydrogen                rubidium
arsenic                 hydrogen_liquid         ruthenium
astatine                indium                  samarium
barium                  iodine                  scandium
berkelium               iridium                 selenium
```

```
beryllium                    iron                         silicon
bismuth                      krypton                      silver
boron                        lanthanum                    sodium
bromine                      lead                         strontium
cadmium                      lithium                      sulfur
calcium                      lutetium                     sulfur_1.92g_cm3
californium                  magnesium                    sulfur_2.07g_cm3
carbon_graphite_1.700g_cm3   manganese                    tantalum
carbon_graphite_2.000g_cm3   mercury                      technetium
carbon_graphite_2.265g_cm3   molybdenum                   tellurium
cerium                       neodymium                    terbium
cesium                       neon                         thallium
chlorine                     neptunium                    thorium
chromium                     nickel                       thulium
cobalt                       niobium                      tin
copper                       nitrogen                     titanium
curium                       osmium                       tungsten
dysprosium                   oxygen                       uranium
einsteinium                  palladium                    vanadium
erbium                       phosphorus                   xenon
europium                     platinum                     ytterbium
fermium                      plutonium                    yttrium
fluorine                     polonium                     zinc
francium                     potassium                    zirconium
gadolinium                   praseodymium
gallium                      promethium
```

Files in int_coherent_cs: For computations in which coherent scattering is modeled with interference effects included, the user must provide the interference coherent scattering cross section data. Included in subdirectory **int_coherent_cs** of **data** in the EGS5 distribution are files of coherent scattering cross section data with interference effects for seven materials: water, PMMA, fat, muscle, kidney, liver and blood. The data files are provided are named **ics_** followed by the first letter of the material, as below.

```
ics_b.dat       ics_k.dat       ics_m.dat       ics_w.dat
ics_f.dat       ics_l.dat       ics_p.dat
```

Files in int_form_factor: When coherent scattering interference effects are modeled, the user must also provide the appropriate form factors. Sample data files containing form factors with interference effects included are provided in subdirectory **int_form_factor** of **data** of the EGS distribution for the same seven materials in **int_coherent_cs**. The naming convention analogous to that described above is employed, and the exact EGS5 file names are listed below.

```
iff_b.dat       iff_k.dat       iff_m.dat       iff_w.dat
iff_f.dat       iff_l.dat       iff_p.dat
```

Files in shellwise_Compton_profile: The elemental shellwise Compton profile data files included in the EGS5 distribution in subdirectory **shellwise_Compton_profile** of **data** are named as follows. This data is used in modeling Compton scattering from bound atomic electrons on a shell-by-shell basis. The naming convention employed is intuitive.

```
z001.dat   z019.dat   z036n.dat  z054.dat   z072.dat   z090.dat
z002.dat   z020.dat   z037.dat   z055.dat   z073.dat   z091.dat
z003.dat   z021.dat   z038.dat   z056.dat   z074.dat   z092.dat
z004.dat   z022.dat   z039.dat   z057.dat   z075.dat   z093.dat
z005.dat   z023.dat   z040.dat   z058.dat   z076.dat   z094.dat
z006.dat   z024.dat   z041.dat   z059.dat   z077.dat   z095.dat
z007.dat   z025.dat   z042.dat   z060.dat   z078.dat   z096.dat
z008.dat   z026.dat   z043.dat   z061.dat   z079.dat   z097.dat
z009.dat   z027.dat   z044.dat   z062.dat   z080.dat   z098.dat
z010.dat   z028.dat   z045.dat   z063.dat   z081.dat   z099.dat
z011.dat   z029.dat   z046.dat   z064.dat   z082.dat   z100.dat
z012.dat   z030.dat   z047.dat   z065.dat   z083.dat   z101.dat
z013.dat   z031.dat   z048.dat   z066.dat   z084.dat   z102.dat
z014.dat   z032.dat   z049.dat   z067.dat   z085.dat
z015.dat   z033.dat   z050.dat   z068.dat   z086.dat
z016.dat   z034.dat   z051.dat   z069.dat   z087.dat
z017.dat   z035.dat   z052.dat   z070.dat   z088.dat
z018.dat   z036.dat   z053.dat   z071.dat   z089.dat
```

E.5 Sample User Codes and Run Scripts

The EGS5 distributions includes three sets of example user codes and two sample shell scripts for setting up and executing EGS5 simulations, as described below:

egs5run	Sample script for compiling and executing user code.
run5again	Sample script for rerunning previously compiled user code.
tutorcodes	Directory containing a series of sample problems, each in a unique subdirectory with FORTRAN source codes, input files, and output files for the step-by-step tutorials on using EGS5 found in Chapter 3 of SLAC-R-730/KEK-2005-8.
samplecodes	Directory containing subdirectories with advanced user codes and input files for example problems described in Chapter 4 of SLAC-R-730/KEK-2005-8.
extra_ucodes	Directory containing subdirectories with additional sample user codes.

The tutorial problems and advanced user codes are discussed in detail in Chapters 3 and 4 of SLAC-R-730/KEK-2005-8, respectively, while the programs (based on PEGS) included as "extra codes" are described briefly in Appendix C. Listed below are the input, source, and sample output files included in the EGS5 distribution in each of these subdirectories.

Files in subdirectories under egs5/samplecodes:

```
uc_lp/uc_lp.f          uccyl/uccyl.out         ucsampl5/ucsampl5.inp
uc_lp/uc_lp.inp        ucbend/ucbend.f         ucsampl5/ucsampl5.out
uc_lp/uc_wlp.out       ucbend/ucbend.inp       ucsampcg/ucsampcg.data
uc_lp/uc_wolp.out      ucbend/ucbend.log       ucsampcg/ucsampcg.f
uccyl/uccyl.f          ucbend/ucbend.pic       ucsampcg/ucsampcg.inp
uccyl/uccyl.inp        ucsampl5/ucsampl5.f     ucsampcg/ucsampcg.out
```

Files in subdirectories under egs5/tutorcodes:

```
tutor1/tutor1.f        tutor3/tutor3.out      tutor6/tutor6.inp
tutor1/tutor1.inp      tutor4/tutor4.f        tutor6/tutor6.out
tutor1/tutor1.out      tutor4/tutor4.inp      tutor7/tutor7.f
tutor2/tutor2.f        tutor4/tutor4.out      tutor7/tutor7.inp
tutor2/tutor2.inp      tutor5/tutor5.f        tutor7/tutor7.w.out
tutor2/tutor2.out      tutor5/tutor5.inp      tutor7/tutor7_wo.out
tutor3/tutor3.f        tutor5/tutor5.out
tutor3/tutor3.inp      tutor6/tutor6.f
```

Files in subdirectories under egs5/extra_ucodes:

```
uc_examin/uc_examin.f          ucpegs/ucpegs.f           uctestsr/uctestsr.out
uc_examin/uc_examin.inp        ucpegs/ucpegs.inp         uctestsr/hplt1.inp
uc_examin/uc_examin.out        ucpegs/ucpegs.pegs5dat    uctestsr/hplt1.pegs5lst
uc_examin/uc_e_mfps_AL.xvgr    uctestsr/uctestsr.f
uc_examin/uc_ph_mfp_AL.xvgr    uctestsr/uctestsr.inp
```

E.6 Auxiliary Subprogram FORTRAN Source Files

The final set of files included with the EGS5 distribution are the "auxiliary" FORTRAN source codes (in subdirectory **auxcode** of **egs5**) and files containing the `COMMON` blocks (in subdirectory **auxcommons**) associated with these codes. The auxiliary codes contain functions and subroutines

that are useful in performing input, geometry setup, distance-to-boundary, and scoring computations for many generic problems, and are referenced by some of the advanced user codes provided with the EGS5 distribution. Detailed descriptions of the functionality of the subprograms can be found in the comments in the source code and in Chapter 3 of SLAC-R-730/KEK-2005-8. Lists of the files provided with the distribution are given below.

Auxiliary FORTRAN source files found in auxcode:

cg_related.f	cyl2.f	edistr.f	plan2p.f	sph2.f
chgtr.f	cylndr.f	fintrn.f	plan2x.f	sphere.f
cone.f	decod_xyz.f	finval.f	plane1.f	sphtrn.f
cone2.f	decodeir.f	geomout.f	plotxyz.f	swatch.f
cone21.f	ecnsv1.f	ntally.f	rdistr.f	xyzbound.f

"Included" auxiliary `COMMON` block files found in auxcommons:

aux_h.f	etaly2.f	instuf.f	sphdta.f
condta.f	etaly3.f	lines.f	trndta.f
cyldta.f	geom_common.f	nfac.f	voxel.f
dataconst_common.f	geortz.f	ntaly1.f	watch.f
edata.f	georz.f	pladta.f	
etaly1.f	geoxyz.f	rdata.f	