castor-converter-signa-pet-mr is a linux 64-bit binary for the conversion of GE SIGNA PET/MR PET data in HDF5 and 'sav' formats to the CASToR datafile format.

Even if this tool can be used to handle data acquired on a clinical scanner, it is not supported nor validated by its manufacturer. Note also that the CASToR software associated or not with this converter is not approved for any medical use. The CASToR developers and collaboration members cannot be responsible for any consequences resulting from the use of any tool distributed on the CASToR website.

The user of *castor-converter-signa-pet-mr* shall have access to the GE petrecon toolbox to compute all the correction factors mandatory to reconstruct a quantitative PET image.

***castor-converter-signa-pet-mr* can generate the following CASToR files:**

- the scanner description as a geometry ASCII file or as a binary LUT file. The values of the parameters are solely determined from the information included in the header of the input HDF5 file. There are no hard-coded values.
- the PET data in an histogram event file, without co-polar (ring difference) mashing.
  If $|\Delta z| == 1$, the data are split between $\Delta z = +1$ and $\Delta z = -1$. The histogram events are stored as (ϕ,r,z_1,z_2) and not (r,ϕ,z_1,z_2) to prevent artefacts when using OSEM-like reconstruction methods.
- the PET data in a list-mode event file.

***castor-converter-signa-pet-mr* takes as input the following files:**

- mandatory: an uncompressed HDF5 file (list-mode or sinogram) to extract relevant information from the header about the scanner geometry and the scan
- for list-mode output: an uncompressed list-mode HDF5 file
- for histogram output: an uncompressed list-mode HDF5 file (binning from list-mode to histogram is done within the converter) or an uncompressed non ToF sinogram HDF5 file or the prompts.n.m.sav output of the Petrecon toolbox
- the randoms.n.m.sav output of the Petrecon toolbox for random coincidences correction
- the normDeadtime.n.m.sav output of the Petrecon toolbox for normalization correction
- the scatterNG.n.m.sav output of the Petrecon toolbox for scattered coincidences correction
- the ctac.n.m.sav output of the Petrecon toolbox for attenuation correction
- the wcc3d output of the Petrecon toolbox for calibration to Bq/mL

Usage for *castor-converter-signa-pet-mr*:

- Input data
  - Mandatory
    -i uncompressed list-mode (typically LIST00*.BLF) or sinogram file name in HDF5 format (typically, SINO00* or rdf.n.m)
  - Optional
    --prompt=prompt coincidences file name in *.sav format (typically prompts.n.m.sav), otherwise extracted from the list-mode or non ToF sinogram HDF5 file
    --acf=attenuation factors file name in *.sav format (typically ctac.n.m.sav), default is no attenuation
    --norm=normalization factors file name in *.sav format (typically normDeadtime.n.m.sav), default is no norm
    --random=random coincidences file name in *.sav format (typically

randoms.n.m.sav), default is no random
--scatter=scattered coincidences file name in *.sav format (typically scatterNG.n.m.sav), default is no scatter
--wcc=well counter calibration file (typically wcc3d), default is no calibration

- Optional output data

-geomCastor[=CASToR scanner geometry file name (*.geom), default file name is PET_GE_SIGNA.geom]
--lutCastor[=CASToR scanner LUT file name (*.lut), default file name is PET_GE_SIGNA.lut]
--listCastor=CASToR list-mode events file name, no default file name
--normCastor=CASToR normalization events file name, default file name is derived from the normalization and attenuation factors file names
--sinoCastor=CASToR histogram event file name, no default file name

- Other options

-h display castor-converter-signa-pet-mr help
-m maximum number of processed list-mode events (default: 1e+09)
--frameStartTime=frame start time in ms for list-mode events (default: from the begining of the scan, i.e. from the first time stamp)
--frameDuration=frame duration in ms for list-mode events (default: the entire duration of the scan)
--ignoreTimeStamp ignore time stamps (read all events, even before the first time stamp)

Example of conversion to an histogram event file from the prompts sinogram (prompts.4.1.sav), including all correction factors:

castor-converter-signa-pet-mr -i rdf.4.1 --prompt=prompts.4.1.sav --norm=normDeadtime.4.1.sav --random=randoms.4.1.sav --acf=ctac.4.1.sav --scatter=scatterNG.4.1.sav --wcc=wcc3d --sinoCastor=prompts.4.1.hcastor

Example of conversion to an histogram event file from the uncompressed HDF5 list-mode file (LIST0003.BLF), including all correction factors:

castor-converter-signa-pet-mr -i LIST0003.BLF --norm=normDeadtime.4.1.sav --random=randoms.4.1.sav --acf=ctac.4.1.sav --scatter=scatterNG.4.1.sav --wcc=wcc3d --sinoCastor=SINO0003.hcastor

Example of conversion to a list-mode event file and a normalization event file from the uncompressed HDF5 list-mode file, including all correction factors:

castor-converter-signa-pet-mr -i LIST0003.BLF --norm=normDeadtime.4.1.sav --random=randoms.4.1.sav --acf=ctac.4.1.sav --scatter=scatterNG.4.1.sav --wcc=wcc3d --listCastor=LIST0003.lcastor --normCastor=normDeadtime_ctac.4.1.ncastor

Examples of generation of scanner description files:

castor-converter-signa-pet-mr -i rdf.4.1 --geomCastor=PET_GE_SIGNA.geom

castor-converter-signa-pet-mr -i rdf.4.1 –lutCastor=PET_GE_SIGNA.lut

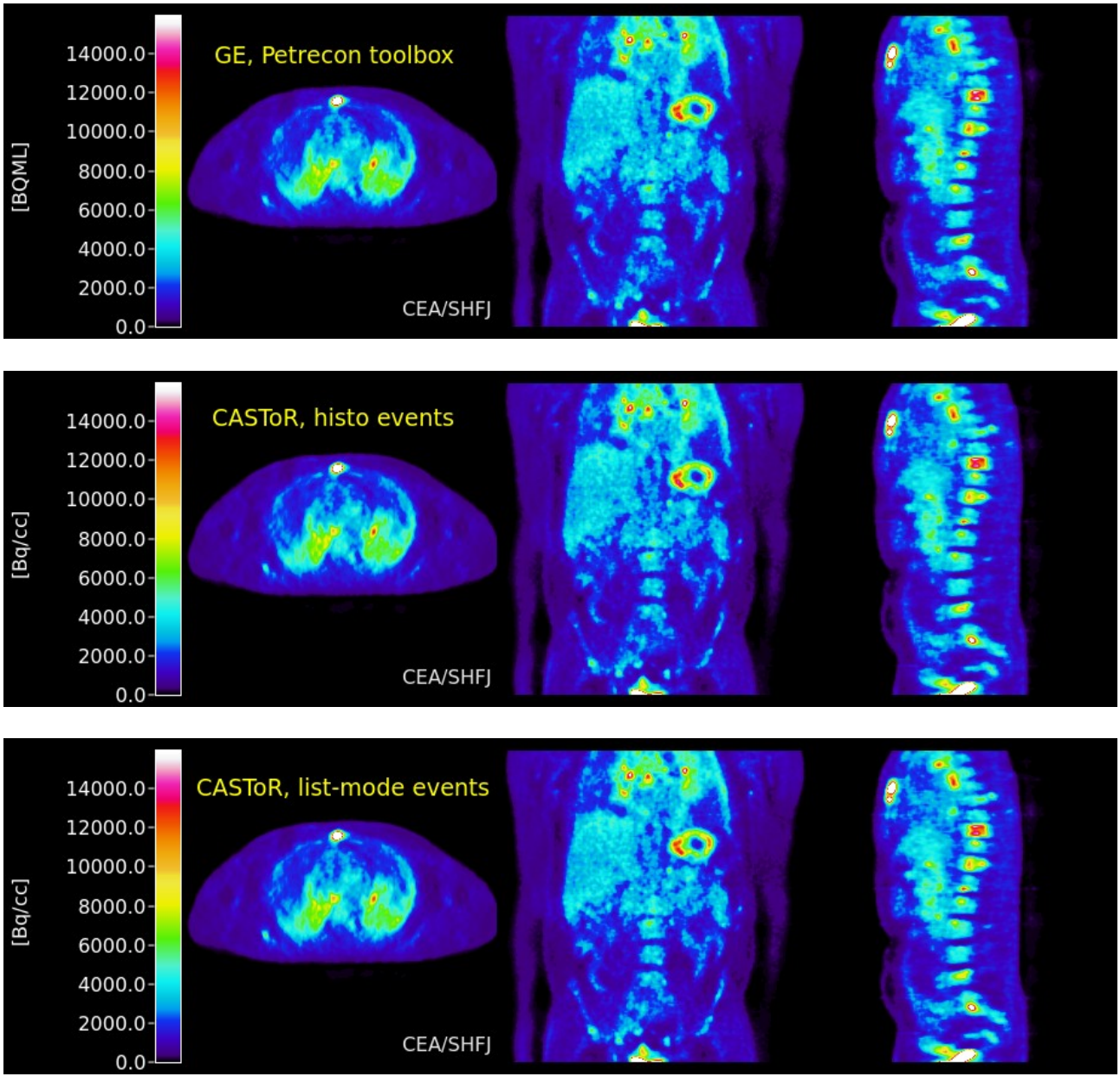
Reconstruction illustrations with the GE petrecon toolbox and with CASToR:

- list-mode events reconstruction with CASToR:

  castor-recon.exe -df LIST0003.lcastor.hdr -dout IMG0003-2i28s-list -it 2:28 -dim 192,192,89 -vox 3.125,3.125,2.780 -vb 2 -th 16 -norm normDeadtime_ctac.4.1.ncastor.hdr -proj joseph -fov-out 98

- histogram events reconstruction with CASToR:

  castor-recon.exe -df prompts.4.1.hcastor.hdr -dout IMG0003-2i28s-histo -it 2:28 -dim 192,192,89 -vox 3.125,3.125,2.780 -vb 2 -th 16 -proj joseph -fov-out 98



OP-OSEM3D, no PSF modelling, no ToF, 28 subsets, 2 iterations, post-reconstruction smoothing with a 3D isotropic Gaussian kernel with 4 mm FWHM.