

U O

W

# New development in the DICOM Interface

V. Giacometti, S. Guatelli, A. Rosenfeld  
and R. Schulte

Collaboration between **CMRP, University of  
Wollongong** and **Loma Linda University**



V. Giacometti

CENTRE FOR  
MEDICAL  
RADIATION  
PHYSICS



UNIVERSITY OF  
WOLLONGONG  
AUSTRALIA

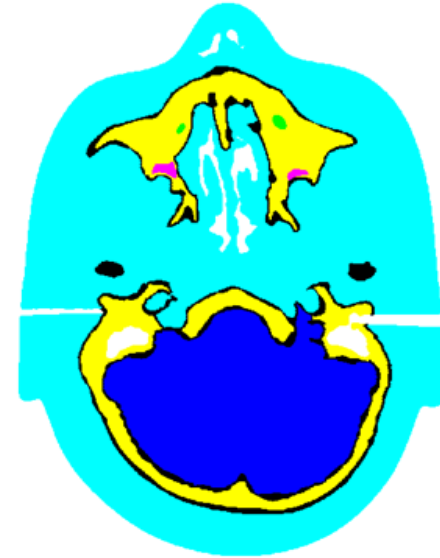
# New development in the DICOM Interface

- The DICOM interface is an extended example of Geant4
- 128 slices and matrix size of 1024x1024 pixels
- Unique for its anatomical details and high spatial resolution (0.18 x 0.18 mm<sup>2</sup> pixel size).
  - Slice thickness: 1.25 mm
  - Homogeneous brain, Spinal disks, ear canals, sinus cavities, deciduous and descending teeth with enamel and dentin.
- To be released in Geant4 10.4 within the DICOM interface
- Flag **DICOM\_HEAD = 1**

**Giacometti, V., Guatelli, S., Bazalova-Carter, M., Rosenfeld, A.B., Schulte, R.W. (2017) Physica Medica, 33, pp. 182-188**

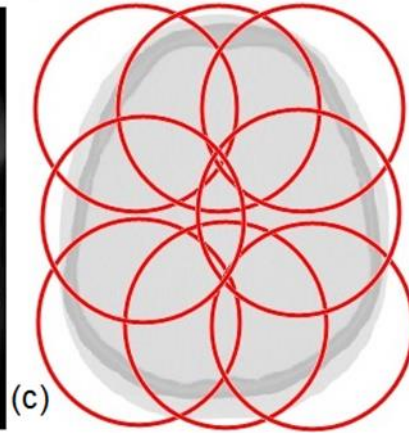


**HN715,CIRS**



**Geant4 model**

# The DICOM\_HEAD



Eight helical CT scans of the head phantom acquired with a 64-detector-row CT scanner (Lightspeed, GE Healthcare, Waukesha, WI)

**Segmentation:** clean from noise and identify uniquely materials, especially at boundaries

# Changes to the DICOM Interface

## Changes:

- DicomHandler
  - DicomDetectorConstruction
  - DicomNestedPhantomParameterisation
  - DicomPhantomParametrisationColour
- Added DICOM\_HEAD directory
    - ColourMap.dat
    - Data.dat
    - 128 DICOM files (each file has a matrix of 1024x1024 pixels) – 250 MB
      - Informal discussion with Gabriele: provide the DICOM\_HEAD from the Geant4 web page, maybe a DICOM library?
  - Updated README and .README.txt
  - Tag: DICOM-V10-03-02
  - To add: macro with few slices for testing

# Note I

- The calibration curve is not used with the DICOM\_HEAD because each material is assigned to its correspondent HU value according to how the high resolution head phantom was created

# How to run the DICOM\_HEAD

At the moment

- User: DICOM\_USE\_HEAD set to 1
- The DICOM\_HEAD directory is copied in the PATH of the executable
- The Data.dat and ColourMap.dat of the DICOM\_HEAD are input

# Note II

Added at the end of the README

--->13) Visualisation

The Geant4 drivers are not meant for visualizing millions of voxel and visualising the DICOM geometries can be very computationally demanding.

The users may want to visualise each DICOM slice separately or use higher compression values when visualising a part of the DICOM project.

# Typo in Phosporous

Corrected.

```
G4Element* eIP = new G4Element( name = "Phosphorus",  
                                symbol = "P",  
                                z = 15.0, a = 30.973976* g/mole );
```

**Z=30**



# Conclusion

- The DICOM\_HEAD ready to be released with Geant4 10.4
- Is it ok to provide the DICOM HEAD as a library from the Geant4 web page?
  - The authors donated the DICOM project to the Geant4 Collaboration