SPECT GATE simulation and image reconstruction using STIR

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Outline

- **Clinical SPECT image reconstruction(Symbia T2)**
  - **Standard Jaszczak phantom**

- **Small animal SPECT image reconstruction**
  - **Ultra-Micro Hot Phantom**

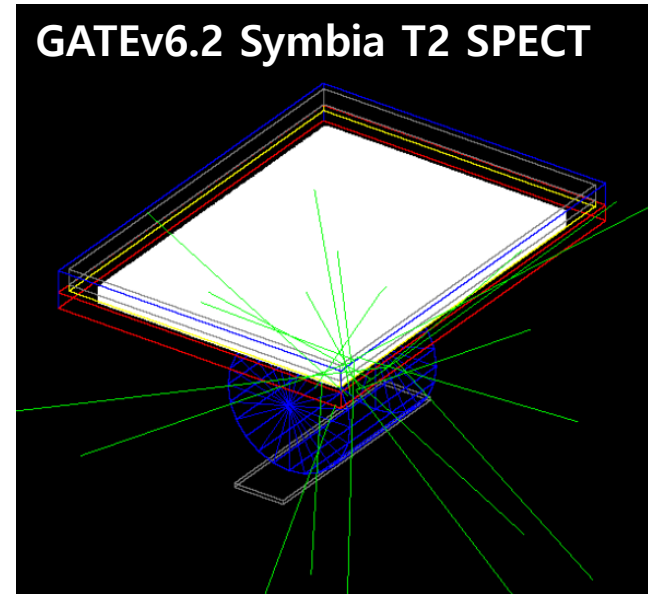# GATEv6.2 Symbia T2 SPECT STIR Recon (FBP2D, OSMAPOSL)

2016.05.02.
Han Gyu Kang

GATEv6.2 Symbia T2 SPECT

Sinograms → STIR → OSMAPOSL

Axial Coronal Sagittal

Standard Jaszczak phantom
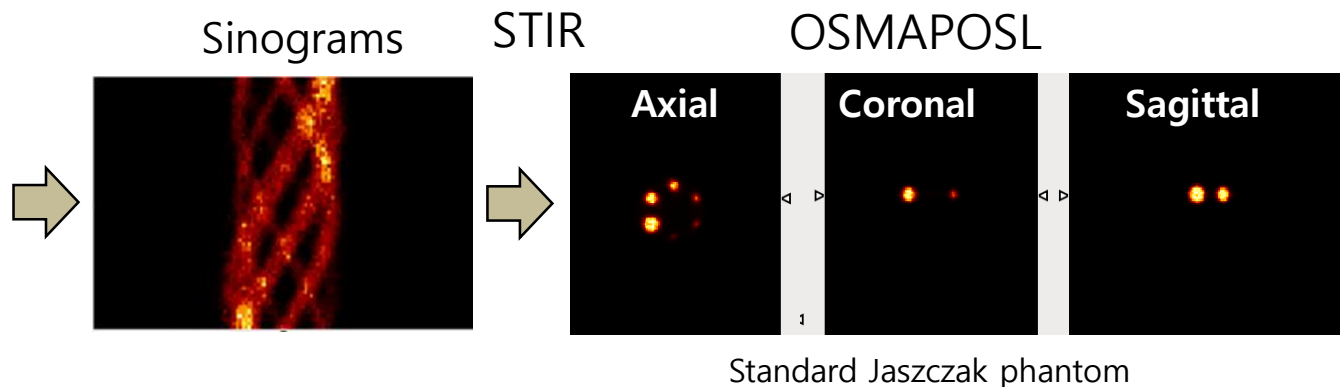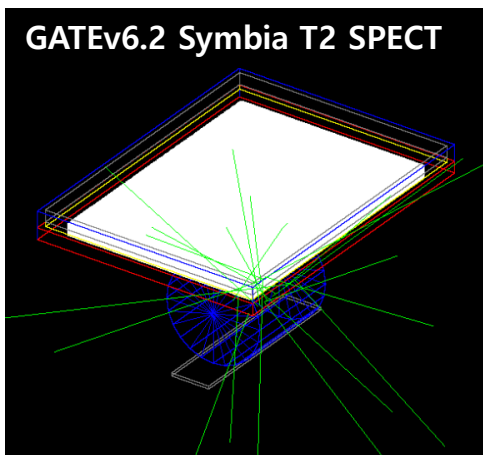
Clinical SPECT simulation

Clinical SPECT

GATEv6.2 Symbia T2 SPECT

SIEMENS
Symbia T2 SPECT/CT

GATEv6.2 SPECT simulation and STIR OSMAPOSL recon proccess

GATEv6.2 SPECT simulation

Projection file (interfile)
- *.hdr (header)
- ***.sin (Binary image)**

STIR

- OSMAPOSO_osem_SPECT.par
- SPECT_Interfile.hs
- Projection data(*.sin)

FBP2D(Reconstruction)
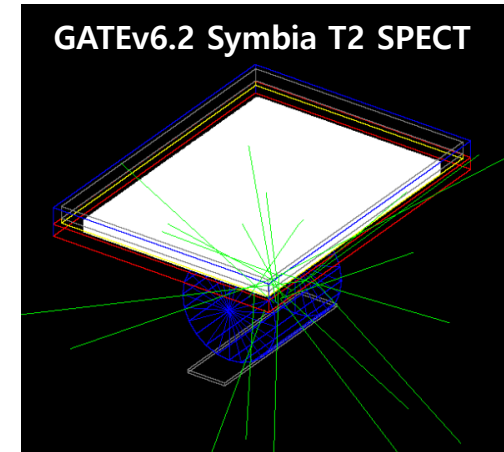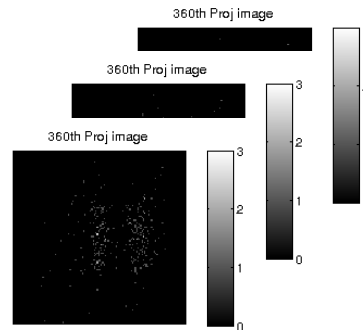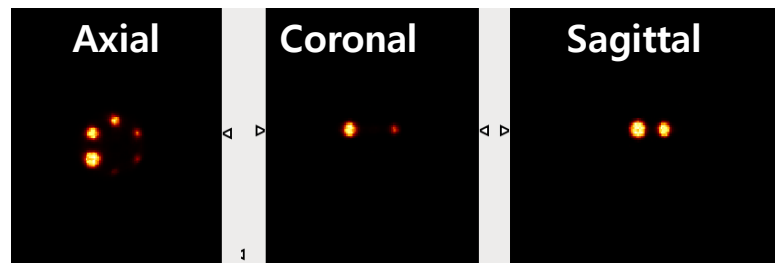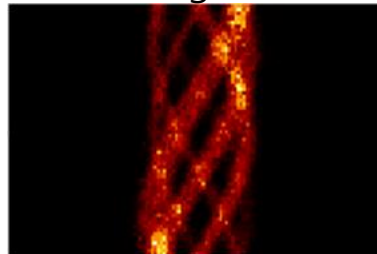>**FBP2D FPB2D_SPECT.par**

Reconstructed images
- ✓ ***.v (Recon image)**
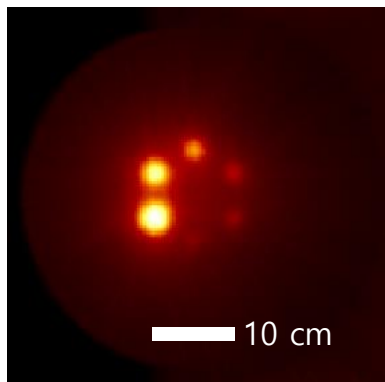- ✓ ***.hv (Header)**
- ✓ *.ahv

#of Projection = **64**

360th Proj image

360th Proj image

360th Proj image

Sinograms

GATEv6.2 Symbia T2 SPECT

Axial | Coronal | Sagittal

1

Unpublished

SPECT image of
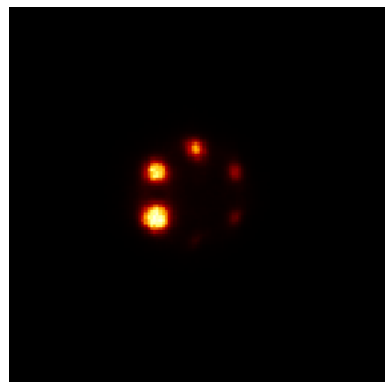# Standard Jaszczak phantom (Hot)
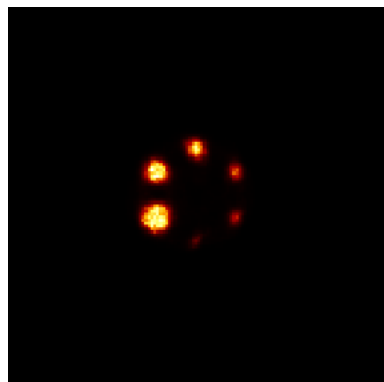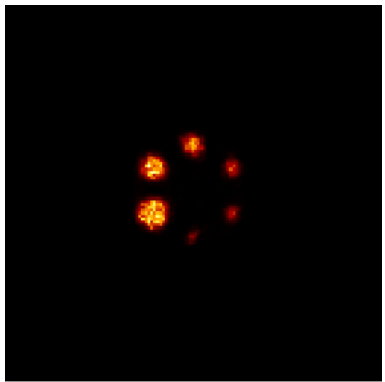
#subset = 1

99mTc concentration = 1 kBq/mm³

#iter=1 #iter=2 #iter=5 #iter=10

10 cm

#iter=20 #iter=30 #iter=40 #iter=50

OSMAPOSL (Ordered Subsets Maximum A Posteriori One Step Late) **Unpublished**

SPECT image of
Standard Jaszczak phantom (Cold)

#iter=1

#iter=2

#iter=5
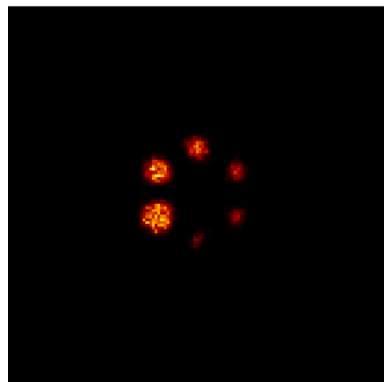
#iter=10

10 cm
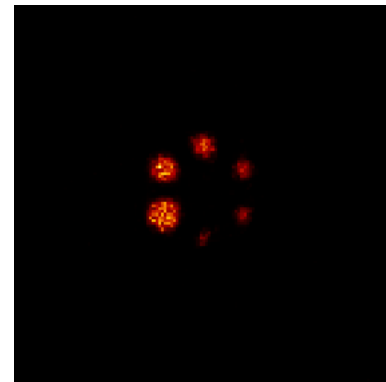
#iter=20
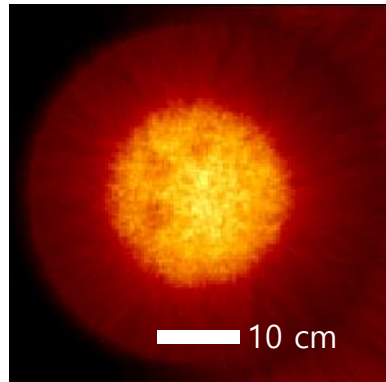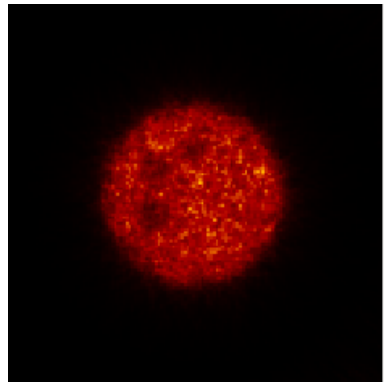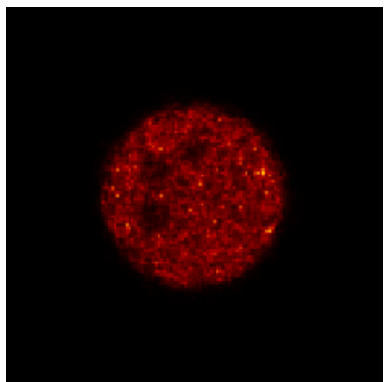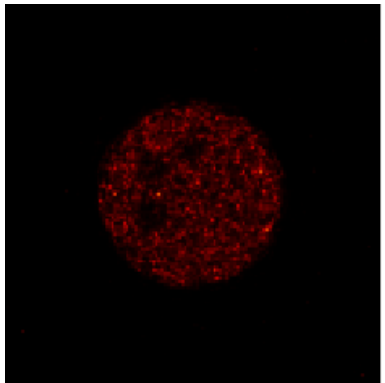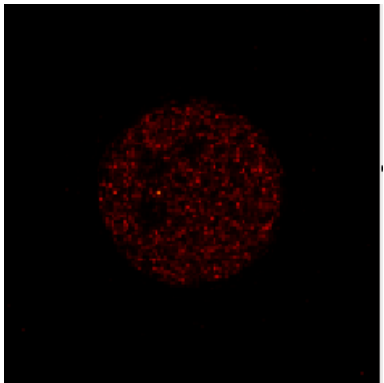
#iter=30

#iter=40

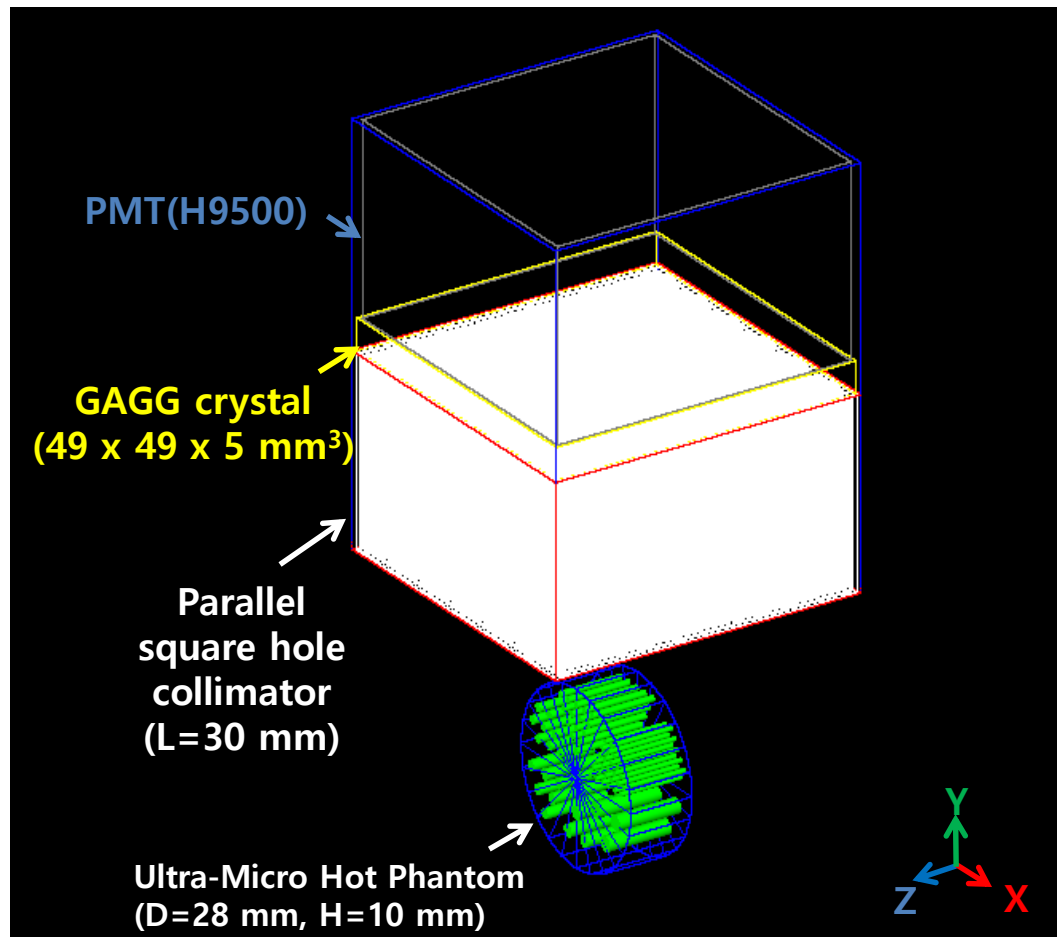#iter=50

OSMAPOSL (Ordered Subsets Maximum A Posteriori One Step Late) **Unpublished**
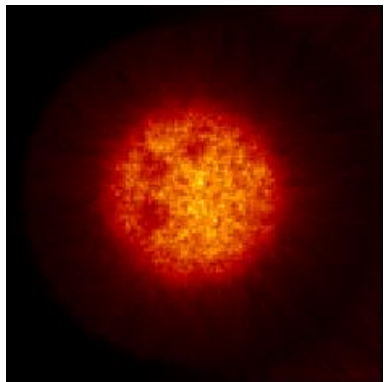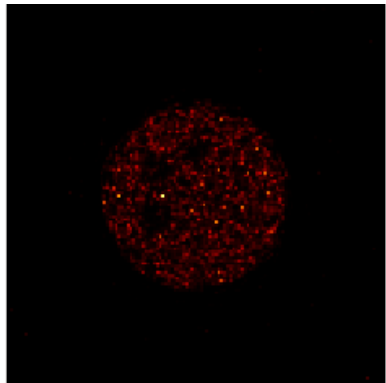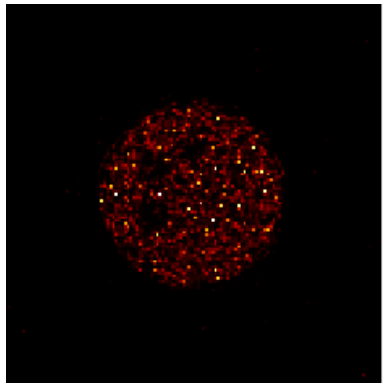
Small animal SPECT simulation using GATE

SPECT simulation using GATE

GATEv6.2 SPECT simulation setup

PMT(H9500)

GAGG crystal
(49 x 49 x 5 mm³)

Parallel square
hole collimator
(L=30 mm)

Ultra-Micro Hot
Phantom (D=28 mm)

Radius of rotation
= 30 mm
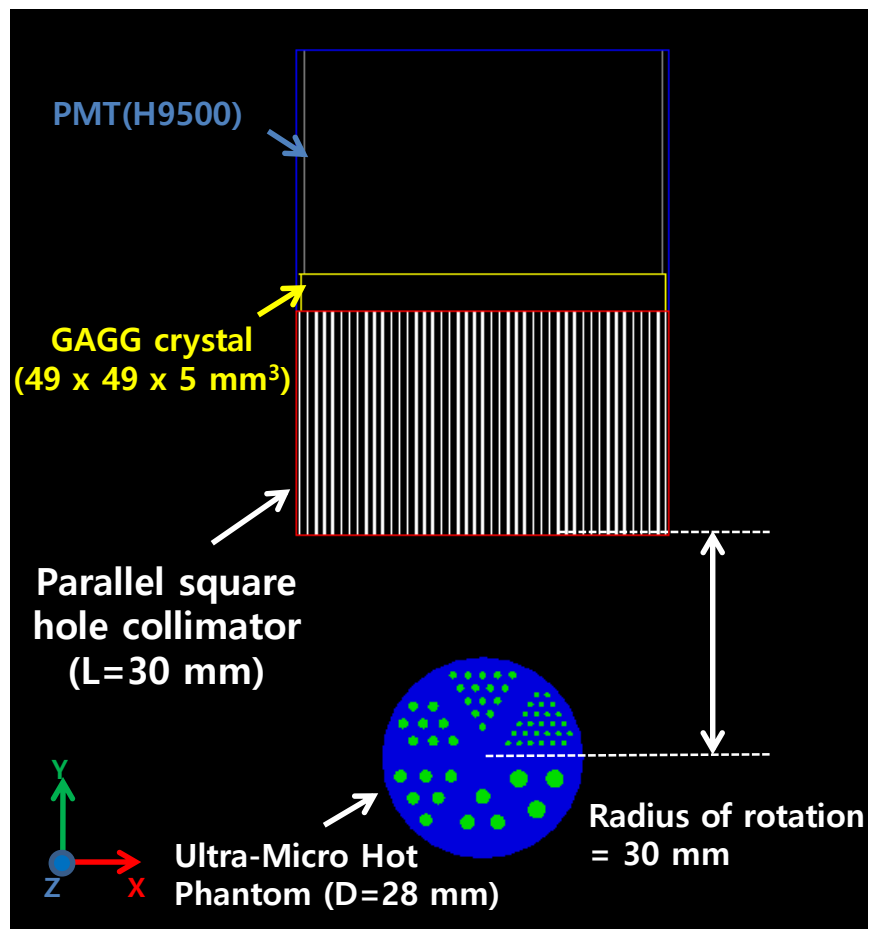
SPECT head rotation = 360°
#Projections =128
Scan time/proj = 100 [sec]
Rotation speed [degree/sec] = 0.028125
Total scan time = 128000 [sec]

Small animal SPECT specifications

Characteristics	Value
Scintillator	GAGG:Ce
Crystal dimensions [mm]	49 x 49 x 5
#of PMT	1
Diagonal FOV [mm]	69.3
Intrinsic spatial resolution [mm]	1.0 mm
Collimator	**LEHR**
Hole shape	Square
Material	Tungsten
Hole length [mm]	30
Septa thickness	0.12
Hole diameter across the flats	1.0 mm

SPECT images of an ultra-micro hot phantom

Tungsten collimator
Septa = 0.1 mm
Length = 30 mm
R_{int} = 1.0 mm

Energy range = 140 keV±10%(126~154 keV)

Hole dia. 1.2 mm   1.0 mm   0.8 mm

2.0
1.7   2.4
1.35   0.75 mm
1.0
10 mm
10 mm   10 mm
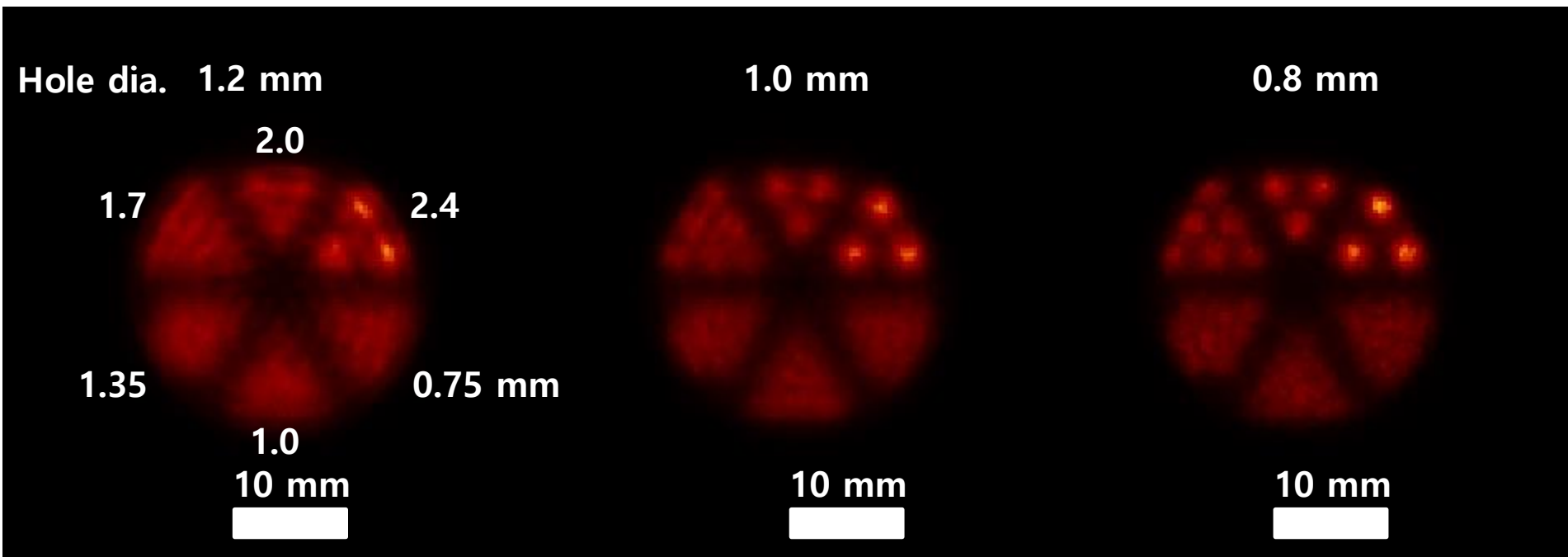
OSMAPOSL (Ordered Subsets Maximum A Posteriori One Step Late): STIR software

^{99m}Tc activity = 300 [kBq/mL]   **Unpublished**
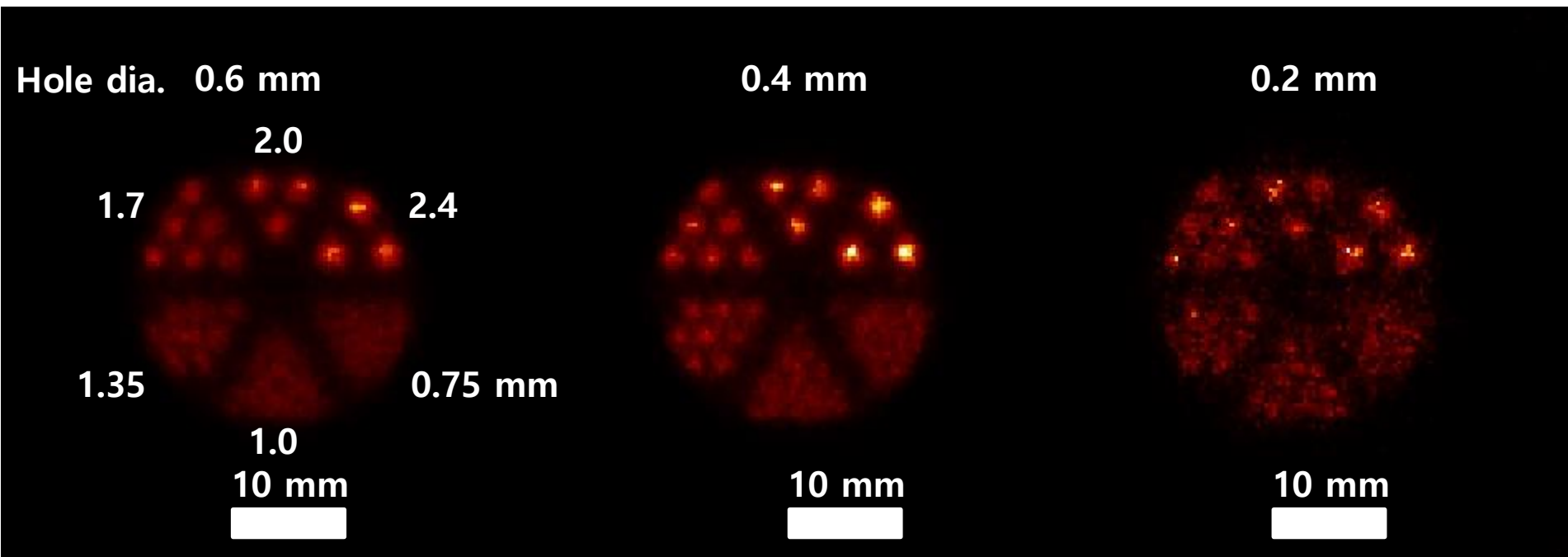
SPECT images of an ultra-micro hot phantom

Tungsten collimator
Septa = 0.1 mm
Length = 30 mm
R_{int} = 1.0 mm

Energy range = 140 keV±10%(126~154 keV)

Hole dia.   0.6 mm   0.4 mm   0.2 mm

2.0

1.7   2.4

1.35   0.75 mm

1.0

10 mm   10 mm   10 mm

OSMAPOSL (Ordered Subsets Maximum A Posteriori One Step Late): STIR software

^{99m}Tc activity = 300 [kBq/mL]   **Unpublished**