# Physics "Cases"



# Floods and Bars







What is this?









# Cracked Crystal









## After Tuning



# **Energy Correction**



# **Energy Correction**



### Detector 1



Curvature Corrected Flood

%

75

25

Study: Monthly Intrinsic Flood Series: Monthly Intrinsic Flood	
Uncorrected Uniformity Central FOV	Useful FOV
Integral: 2.00 %	2.53 %
Differential: 1.36 %	1.63 %

## Detector 2 % 75 25 Curvature Corrected Flood Acquired Flood

Study: Monthly Intrins	ic Flood	
Series: Monthly Intrins	ic Flood	
Uncorrected Uniformity Centr	al FOV	Useful FOV
Integral:	3.72 %	4.57 %
Differential:	3.37 %	3.37 %

#### Detector 1



Acquired Flood

Curvature Corrected Flood

Stud	Study: Daily Intrinsic Flood QC Study			
Serie	s: Daily Intrinsic	Flood		
Uniform	ity Centr	al FOV	Useful FOV	
	Integral:	2.09 %	2.40 %	
	Differential:	1.60 %	1.60 %	

### Detector 2



Study: Daily Intrinsic Flood QC Study				
Series:	Daily Intrinsic	Flood		
Jniformity	Centra	al FOV	Useful FOV	
	Integral:	2.15 %	2.95 %	
	Differential:	1.16 %	2.51 %	

Acquired Flood

Curvature Corrected Flood

### After New Energy Calibration

# Linearity Correction





## **Bad Linearity Correction**



## **Bad Linearity Correction**



### Patient HIRES EXTRINSIC FLOOD 120M 1-30-2010

#### Detector 1



Acquired Flood

#### Detector 2



### Patient UHR EXTRINSIC FLOOD 120M 2-1-2010

#### Detector 1



#### Detector 2



Acquired Flood



### Det 2 Corrections Off



-10%

+10%

**Off-Peak Window** 



### 30 Mct Flood Courtesy of Beth Harkness, Henry Ford Hospital



### 30 Mct Flood Courtesy of Beth Harkness, Henry Ford Hospital



### 200 Mct Raw Flood Courtesy of Beth Harkness, Henry Ford Hospital



### 100 Mct Tl-201 Flood Courtesy of Beth Harkness, Henry Ford Hospital

## Intrinsic Flood with <sup>99m</sup>Tc



Curvature Corrected Flood

## Intrinsic Flood with <sup>99m</sup>Tc



Curvature Corrected Flood

Contamination dripped on detector From uniformity source

## <sup>67</sup>Ga Intrinsic Bars



### <sup>67</sup>Ga Intrinsic Bars



### **Bad Multi-Window Spatial Registration**

# <sup>99m</sup>Tc Extrinsic Flood



### Patient UHR EXTRINSIC FLOOD 120M CTS 1-29-2010

#### Detector 1



Acquired Flood

Detector 2



## UHR with <sup>57</sup>Co sheet source between heads

### Patient HIRES EXTRINSIC FLOOD 120M 1-30-2010

#### Detector 1



Acquired Flood

Detector 2



## HIRES with <sup>57</sup>Co sheet source between heads

### Patient: UHR EXTRINSIC FLOOD 120M 2-1-2010

### Detector 1



Acquired Flood

Detector 2



HIRES with <sup>57</sup>Co sheet source between heads rotated 180°





# Dent In Collimator





## Bone Scan - Distance




## Bone Scan - Energy



### <sup>99m</sup>Tc spectra with 15% window











### **Posterior static**







### **Posterior static**

Radioactive urine contamination on the patient's clothing





# Lung Pacemaker





# Bone Scan with <sup>131</sup>I on board



### Ga-67



# Ga-67 with Low-Energy Collimator



Ga 67 Ga peak, Med E collimator

Ga 67 Ga peak, High res LE coll

# Septal Penetration



## <sup>123</sup>I with Different Collimators



### **Ultra-High Res**

Med Energy

Note: <sup>123</sup>I has 2-3% high energy photons in addition to the 159 keV gamma ray.

# Sinogram



One slice, All angles

### Routine Patient QC Projection Cine Display





MIP

Cine of Projection Images For QC, these are what we want!!



# Routine SPECT QC

- Planar QC (Floods and bars)
- Overall evaluation
  - Tomographic phantom
  - Clorox bottle and capillary tube





ACR Flangeless Deluxe Jaszczak Phantom™ ACR ECT/FL-DLX/P



## Data Spectrum (Jaszczak) Phantom



### Ring artifacts? Number of spheres and rods seen?



### What causes ring artifacts?



What causes ring artifacts?

Inadequate uniformity calibration

#### Patient HIRES EXTRINSIC FLOOD 120M 1-30-2010

#### Detector 1



Acquired Flood

#### Detector 2



Patient UHR EXTRINSIC FLOOD 120M 2-1-2010

#### Detector 1



Acquired Flood

#### Detector 2



Acquired Flood

## **Dual Headed Camera**

HERMES Name: UNE 3AS PH Econ: CALIBRATION Label: 3AS PHINT	TRANSVERSE Slices ANTUM 3-29-10 S GM SUM [ - Recom]	18: QCS Study Date/Time: 2	8010:03:29 09:14:17	Study IB; 1 Added Sinces: 1.1	l (Vidth 2.4 m)						A		RERMES Volume Display
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						THR ()		T:B	T:49			1:5	T-45
		THR THR	THE OP	T-M				THE OPENING					
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States 1

20150

## Detector 1

HERMES Name: UHR 345 PM Exm:CALIBRATION Label: 345 PMW/F	TRANSVERSE Slices INTON 3-29-10 I M SOM [ - Recon D	ID: QCV Study Dats/Tine	: 2010:03:29 09:14	Study ID: 1 :17 Added Slices:	1.0 (Vidth 2.4 m)	1							NERMES Volume Display
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1:70	T:59	<sup>1:4</sup>	THE O	T:55	1.55		T:ER	THE OPENING		T:60	T:19		TIP CO
									THE SECOND	T:46	<sup>1-4</sup>	•	
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1:28	1.2		1:25	T.N	1:a	1:2			<b>1</b> .19	T:18	EN CON	T:16	T:15

## Detector 2

HERMES Name: UHE JAS PRO Dome:CALIDRATION Labot: JAS PROVID	TRANSVERSE Slices OKTUM 3-29-10 G M SOM [ - Recon DJ	ID: QCV Study Dutn/Tine 2]	2010:03:29 09:14	Study ID: 1 :17 Added Slices:	1.0 (Vidth 2.4 mm)		5-77 <u>9</u> 0-11		1012		24594771111		NERNES Volume Display
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	1.65			-		1.4	*.9			**			
			T:45	5:40 (5)		THE OPEN	THE O	<b>1.4</b>	<b>1</b> -0	THR OP		T:40	1:2
		••							T:29				1.8
		"" ()		*.#									
T:10				1.5					<sup>ti</sup>				



What is wrong with this brain SPECT?

### Inadequate COR Calibration





### ost likely cause of loss os SPECT resolut



What is wrong?



ACR Flangeless Deluxe Jaszczak Phantom™ ACR ECT/FL-DLX/P







### No attenuation correction

### Attenuation Correction

## ACR (Esser) PET Phantom





Flangeless PET Phantom Lid<sup>TM</sup>



Flangeless PET Phantom<sup>TM</sup>





## ACR (Esser) PET Phantom



A: SUV(B:0,T:2.15)

## PET/CT



# Problems with temporal resolution mismatch between PET and CT (for atten correction) ("Mushroom" Breathing artifacts)



### Banana artifact: misregistration of diaphragm





### Where is this lesion?


### Mis-placed liver lesion



#### Is this lesion real?



#### Oral contrast in bowel

#### What is this?



# Patient Motion





## Thank you!

# **Questions**?