Introduction

- NEMA NU 1 „Performance Measurements of Gamma Cameras“ is used to specify and evaluate the performance of Gamma cameras
- „System Spatial Resolution without Scatter“ is one of the tests in the group „Gamma camera detectors with collimators“
- This test applies to discrete pixel detectors – but minor adjustments have to be applied:
  - If PixelSize > 1/3 FWHM: ensemble of measurements → displacing the capillary tube in 1 mm steps over a distance of at least 10 mm

Method with high precision dovetail slide / cont.

- Advantages | Programming (MatLab)
  - each (dis)placement of capillary tube = one DICOM-File
    1. read DICOM-Files → find line source + orientation
    2. build (one or several) LSF = sum over width ≤30 mm
    3. based on displacement → build overall LSF
    4. calculate FWHM of overall LSF
  - no parabolic fit needed for FWHM calculation

Method: why/how to mimic a pixilated Gamma camera

- Why: To prepare for the first pixilated Gamma camera in the department
- How:
  - Meth 1: Acquisition with larger pixel size = (matrix, zoom)
    - if: 1024 × 1024 + 0.6 mm
    - use: 256 × 256 → 2.4 mm
  - Meth 2: Use finest image matrix (i.e. 1024 × 1024) and sum m pixels in column to get the desired pixel size (MatLab) → very flexible
  - take care of offset
  - additional degree of freedom: displacement of capillary tube:
    - NEMA: 1.0 mm
    - possible: 0.5 | 0.7 | 1.2 | x x mm

Results

Method 1: 1024-Matrix + sum m Pixels Method 2: 256-Matrix + displacement offset

<table>
<thead>
<tr>
<th>Method 1: 1024-Matrix + sum m Pixels</th>
<th>Method 2: 256-Matrix + displacement offset</th>
</tr>
</thead>
<tbody>
<tr>
<td>sum m Pixels</td>
<td>Gaussian Pixel (in mm)</td>
</tr>
<tr>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>0.7</td>
<td>0.5</td>
</tr>
<tr>
<td>1.0</td>
<td>0.5</td>
</tr>
</tbody>
</table>

- Meth 1-2: good agreement
- Several meas. with displacement slightly better than „normal“ meas. (no displacement)
- for larger PixelSize → use smaller displacement!
- be careful about unfortunate combinations of PixelSize/Offset and displacement

Conclusions

- using high precision dovetail slide + MatLab (Methode-2)
  - simple handling: only one capillary tube
  - very flexible: arbitrary displacement of single cap. tube
  - multiple LSF per cap. tube position can be calculated

Literature: