American College of Radiology
PET Accreditation Program

Testing Instructions

Revised May 31, 2019

This guide provides all of the instructions necessary for clinical tests, phantom tests and general submission for the ACR PET Accreditation Program.

For assistance, contact the ACR Monday through Friday 8:30 am to 5:00 pm (ET).
Telephone: 800-770-0145
Email: nmap@acr.org
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## I. Revisions

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<tr>
<td>10-19-18</td>
<td>All</td>
<td>All</td>
<td>Combined the clinical testing instructions, phantom testing instructions and phantom criteria</td>
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<td>2-14-19</td>
<td>6</td>
<td>Clinical Testing Instructions</td>
<td>Added slices should be displayed in AHA/ACC format Cardiology Module</td>
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<td>• DO NOT TAKE CELL PHONE images and upload as electronic.</td>
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<td>2/21/19</td>
<td>7</td>
<td>Clinical Testing Instructions</td>
<td>Exam Identification added</td>
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<tr>
<td>5/14/19</td>
<td>6</td>
<td>Clinical Testing Instructions</td>
<td>• Added: Please do not send CT or MR images or fused images. They are not required at this time. Send PET only images to the Brain Module</td>
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</table>
II. General Instructions

A. Introduction

Successful accreditation is a team effort involving the lead supervising physician, Nuclear Medicine technologist and qualified medical physicist. It is important that each pertinent member of the team read and understand the documents listed below before beginning the PET Accreditation process:

- ACR PET Accreditation Program Requirements
- ACR PET Accreditation Testing Instructions to ensure that your facility's protocols meet the requirements before continuing

The following items are available on the Nuclear Medicine Accreditation page of the ACR website:

1. Clinical Data Forms
2. Phantom Site Scanning Data Form
3. Phantom Order Form (Data Spectrum)
4. Small Phantom Order Form
5. Frequently Asked Questions (FAQs)
6. Instructions for Uploading Images

Forms 1 and 2 are generic forms designed to assist you in gathering data. Do not submit these forms. You must log on to the ACR accreditation database ACRedit (https://acredit.acr.org) to enter the data in your online testing package and submit the package online.

Follow all instructions for every unit being reviewed for accreditation. Every unit must apply for all patient types and modules routinely performed on each unit for a facility to be accredited. Keep copies of all documents and images submitted to ACR for your records.

There are three portions to your ACR PET Accreditation submission:

1. Annual System Performance Evaluation Summary
2. Clinical Testing
3. Phantom Testing

The qualified medical physicist is responsible for the conduct of all surveys of the nuclear medicine equipment. The medical physicist may be assisted by properly trained individuals in obtaining data. These individuals must be approved by the medical physicist in the techniques of performing tests, the function and limitations of the imaging equipment and test instruments, the reasons for the tests, and the importance of the test results. The medical physicist must be present or in general supervision of properly trained assistants (and accessible by phone) during the surveys; review, interpret, and approve all data; and provide a report of the conclusions with his/her signature.

B. Online Application

The application for ACR Nuclear Medicine Accreditation is found online through the ACR website at https://acredit.acr.org. If your facility has never applied for accreditation before, you will “register” as a new facility. New facilities will be assigned a unique identification number (PETAP #) after the online application is submitted. This number appears on all
correspondence from the ACR, your online records. Please use this number on all submitted materials and to identify your facility when contacting the ACR for assistance.

Approximately eight months prior to the expiration of the Nuclear Medicine Accreditation, the ACR will email an Accreditation Renewal Notice to the facility login user. The facility user should login to the online database (https://acredit.acr.org) and select the "start renewal" link no later than 6 months prior to expiration of your current accreditation to ensure that there are no gaps in your continuous accreditation that could affect your reimbursement.

After your application is processed, an online testing package will be activated which will contain all of the clinical and phantom data forms required for accreditation review. Your facility will receive an email with a link to the online testing packet. Your facility user must log into the account and fill out all forms required in the online Testing Package. The testing package must be submitted online.

To achieve ACR PET accreditation, a PET unit must pass both the clinical and phantom image quality tests.

The ACR website (www.acr.org) provides a listing of accredited facilities and facilities that are under review. If a third party payer requests verification of your participation in one of the accreditation programs, please refer them to the ACR website accredited facility search.

C. Materials Due Date

The online testing package has the image submission due date. You must collect your test images and submit them to the ACR by that date. Failure to meet this due date will jeopardize completion of your accreditation. Thus, if your facility is renewing its accreditation, we cannot guarantee completion in a timely fashion before your ACR certificate expires. If your site cannot submit the required materials by your due date, notify the ACR immediately.

D. Image Collection Time Period for Phantom and Clinical Images

All examinations submitted must have been performed within 6 months of the date on the application. No images will be accepted for review that predates the application by more than six months.
III. Annual System Performance Evaluation and Quality Control Testing

Medical physicists for all sites applying for accreditation or renewal must demonstrate compliance with the ACR requirements for quality control and Annual System Performance Evaluation or Acceptance Testing Evaluation (for new units) as outlined in the PET Accreditation Program Requirements.

Additional routine QC testing by the nuclear medicine technologist is also required. If you have been conducting QC for less than one quarter, you may perform QC testing every business day for two weeks to achieve baseline data and set up your action limits. Additionally, if the Annual System Performance Evaluation and/or weekly and/or daily on-site QC data show performance deficits (e.g. problems with the system and/or data outside of the action limits), the facility must take steps to correct the problems and submit documentation of the corrective action with the image submission.

Submit the following:

1. PET Quality Control Summary. Your medical physicist or qualified PET technologist must use the summary form provided by the ACR or one similar that itemizes the results of all the same tests using the same names and order as is outlined on the ACR form.

2. Documentation of any corrective action taken if recommended in the Annual System Performance Evaluation (i.e. test failures or data outside of action limits).
IV. Clinical Testing Instructions

A. Select Images for Submission

1. Clinical images must be submitted for each unit based on the exams you selected in your initial application.

2. A full set of images for each exam must be from the same. The submission of examinations performed on models or volunteers is strictly prohibited and may jeopardize accreditation.

B. Modules

1. Oncology Module
   - Sites are required to submit two separate oncology studies for each unit to be accredited, one of which must be abnormal. The second exam can be either normal or abnormal.
   - The whole body coronal images, with and without attenuation correction, must be submitted.
   - The blood glucose level should be documented in the report.
   - Please do not send CT or MR images or fused images. They are not required at this time. Send PET only images
   - Studies will fail if images are not properly labeled as to laterality and orientation.

2. Brain Module
   - Sites are required to submit two separate brain exams for each unit to be accredited, one of which must be abnormal with attenuation correction. The second exam can be either normal or abnormal.
   - Images must be displayed in multiple planes including transverse, coronal and sagittal.
   - Please do not send CT or MR images or fused images. They are not required at this time. Send PET only images
   - Studies will fail if images are not properly labeled as to laterality and orientation.

3. Cardiology Module
   - Sites are required to submit two separate cardiac exams for each unit to be accredited, one of which must be abnormal. The second exam can be either normal or abnormal.
   - Please submit the study in the same format the interpreting physician would use for interpretation of the exam (i.e. slices). For the myocardial perfusion and myocardial viability exams, the slices should be displayed in AHA/ACC format.
   - The site may select myocardial perfusion and/or myocardial viability exams.
   - Images must be properly labeled, to include the walls of the heart.

NOTE: Two exams must be submitted for each module. Each exam must be from a different patient.
Exam Identification

The following scan protocol attributes for exams must be displayed on each image:

- First and last name
- Medical record number
- Institution name
- Date and time of examination
- Date-of-birth or age
- Type of examination
- Time of acquisition (indicated or easily calculated)
- Images labeled as to laterality and orientation

C. General Instructions

- Complete the Clinical Test Image Data forms for each required examination you submit by logging into your online account (https://acredit.acr.org) and completing your testing package. The Clinical Test Image Data form summarizes the specific techniques including radiopharmaceutical injected, scan time, acquisition parameters, etc. and must be completed for each exam.
- Color images must include color scale, and where possible, standard images should include gray scale.
- Routine information, including patient name, ID#, etc., should NOT be deleted from the images. Patient confidentiality is maintained by the ACR.
- Color images must include color scale, and where possible, standard images should include gray scale.
- A copy of the corresponding, dated physician report must be uploaded for each exam. The report must clearly identify the type of exam performed and clinical history.
- A copy of the written procedure for each exam type must be uploaded.
- The supervising nuclear medicine/PET physician should review and approve all clinical images before they are submitted.

***If you decide to change the type of exam you will be submitting, you must notify the ACR. All submissions will be returned if notification did not occur.***
V. PET Phantom Testing Instructions

A. Introduction

Read this entire section before obtaining images for submission to the ACR PET Accreditation Program. Follow all instructions carefully. If you have any questions about these instructions, please contact the ACR.

This section describes the test procedures in sufficient detail to allow a nuclear medicine technologist or medical physicist to acquire the required images and perform the necessary images using the appropriate ACR phantom.

The intent of the PET Accreditation Program is to use the information obtained from the review of both clinical and phantom images to assess overall image quality. The protocols and images required for accreditation depend on your facility’s use of the unit, and the clinical modules and patient type chosen on your accreditation application for each unit.

This module is for the accreditation of PET imaging systems. Phantom data must be acquired with the ACR-approved PET phantom that may be purchased from Data Spectrum. The phantom described below was chosen for evaluating PET tomographic systems because it is relatively easy to fill and set up for a PET study and can be used to measure tomographic uniformity, spatial resolution, and the detectability of “hot” lesions. The variety of resolution and “hot” components enables the reviewers to see relatively subtle differences in system performance.

NOTE: Data must be collected and images prepared according to the instructions. The procedures may differ from those normally used by the applicant but were designed to minimize the variability in the images that are submitted. Despite the use of a specific protocol, it is understood that there will still be differences in the appearance of the images even when the data are collected on the same type and model of PET system and/or scintillation camera.

B. The Phantom

For each PET system, the applicant is required to submit a list with the frequency of all PET-related quality control procedures (see “PET Quality Control Summary” Appendix C on page 19). This should include yearly, quarterly, monthly, weekly, and daily tests.

The ACR-approved PET phantom must be used for evaluating tomographic image quality. The phantom is a cylinder with an internal diameter of 20.4 cm. The faceplate has fillable thin-walled cylinders (8, 12, 16, and 25 mm in diameter), two additional 25 mm cylinders, one for air and one for “cold” water, and a Teflon cylinder.¹ The lower portion of the cylinder contains six sets of acrylic rods arranged in a pie-shaped pattern with the following diameters: 4.8, 6.4, 7.9, 9.5, 11.1, and 12.7 mm. In addition, for the SPECT/PET version of the phantom, the upper section contains six solid spheres. The spheres must be removed for PET acquisitions. RODS MUST REMAIN.

The protocols for preparing the PET phantom are presented on pages 10 and 11. The Table of Dilutions to produce the 2.5 concentration ratio (2.5:1 ratio may represent a lesion in the liver) is found in the Appendix A (see page 17). The values that you select should be the one with the activity (first column of the Table) used by your facility for ¹The PET phantom faceplate design is being used by the ACR with the permission of Peter D. Esser, Ph.D., Columbia University. The intellectual property rights belong to Dr. Esser, and uses other than through the ACR require his permission.
clinical whole body scans. However, if the activity is between the values, you must use the one with the higher level. For example, if your facility uses a 5 mCi dose for the whole body scan, you must select the 6 mCi row from the Table. The activities that are used for the initial Dose A and for the phantom itself, Dose B, are calculated from the F-18 activity normally used by the facility for whole body scans. As indicated above, the second 25 mm vial must be filled with water and the third left empty (“air”).

The spreadsheet indicates the activity that must be used for filling the phantom (this will also be referred to as the “background”) and the “hot” cylinders (“lesions”). Care must be taken to ensure that the solutions in the background and 1,000 ml bag (or bottle) are thoroughly mixed.

Acquire the best possible images on your system with the same protocol as a routine clinical whole-body scan. All settings must be documented. Reconstruct the entire phantom as you would for clinical studies.

The ACR strongly recommends quarterly testing of each PET system with an appropriate phantom such as described above in addition to other tests recommended by the vendor.

C. Preparation of the Phantom

Please read all of these instructions before preparing the phantom.

Select the appropriate dose in Appendix A (see page 17) that is equal to, or the next one above, the dose that is used by your facility for clinical whole body scans. You will need this spreadsheet for preparing the phantom. Confirm that all calibrations and quality control procedures are current.

Summary

One scan will be acquired with the ACR-approved PET phantom. The phantom scan starts 1 hour after Dose A is measured. During the 1 hour preparation time the other doses are measured, vials are filled, background added to the phantom, and phantom positioned in the gantry.

Scanning Time Line for PET Phantom

Measure Dose A & B

- Fill vials
- Positioning

Start Scan

1 hr

Equipment Required:
1 ACR-approved PET Phantom
1 1,000 ml bag or bottle of distilled water or saline solution
2 tuberculin syringes (for measuring Doses A & B)
3 large syringes (60 ml)
Large-bore needles (18 gauge)
Dose: FDG or F-18 are acceptable (Most vendors provide F-18 for calibrations/tests of scanners at a significantly lower price than FDG.)
Clock or timer
Phantom Dilution Worksheet Appendix B (See Page 18)

For ACR PET Phantom

1) Measure F-18 activity (Doses A, B) using the tuberculin syringes and enter the dose and time in the appropriate boxes on the Phantom Dilution Worksheet. The F-18 solution may need to be diluted to facilitate measurement because the concentration is often as high as 75 mCi/cc. For future reference, enter times into the table below.

2) Fill the phantom with water. Be sure that the Teflon cylinder on the faceplate is secure before fastening the faceplate to the phantom.

3) Add Dose A to the 1,000 ml bag or bottle of distilled water or saline and flush syringe several times. Mix thoroughly. Using a large syringe, withdraw a 60 ml test dose #1. Set aside. From this bag or bottle, using the second large syringe, withdraw approximately 40 ml for use in filling the four appropriate empty cylinders (8, 12, 16, and 25 mm) in the phantom faceplate (see above illustration). Fill the cylinders at this time with the “hot” solution. There should be two 25 mm cylinders remaining. Leave the 25 mm cylinder next to the primary extended filling cap empty (see diagram above), and fill the neighboring 25 mm cylinder with “cold” water.

4) Inject Dose B into phantom and flush syringe several times (phantom background activity). Thoroughly mix (a bubble of air will help ensure a well-mixed solution).

5) Using a large syringe, remove a 60 ml test dose #2 from the phantom.

6) Measure test doses #1 and #2 in the dose calibrator and fill in the appropriate boxes. After recording the activity for doses #1 and #2, inject the activity from dose #2 back into the phantom background. Note: The plastic holder must be removed from the dose calibrator before the individual syringes are assayed. The change in geometry will not affect measurements because the parameters of interest are ratios.

7) Scan must begin 1 hour after the initial Dose A was measured.

Enter Dose A measurement time, mCi and scan start time (these are needed for the worksheet on pg 12):

1) Dose A measured at ____________
2) Dose in mCi ______________
3) Phantom scan to start at ____________

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D. Data Acquisition and Processing

1. Positioning

**Phantom**

If the phantom does not have a flange on the top, place the phantom on its side at the end of the imaging table. Carefully align the phantom parallel to the axis of the table (left to right). Use a bubble level to position the phantom in the horizontal plane. A folded 3 x 5 card positioned under the end of the phantom can be used to make it level. If a metal plate is present, move the phantom to a position where the plate does not attenuate the photons.

If the phantom has a flange at the top, it should be placed on the table with its flange hanging over the edge. Carefully align the phantom so it is parallel to the axis of the table. However, if the imaging table has a metal plate at the end, the phantom should be moved to a position where the plate does not attenuate the photons. Material must be placed under the bottom of the phantom, to make it level. To avoid excessive attenuation, the material should only be under the bottom (rod side) near the end of the phantom, not the entire length of the phantom. If the table is continuous, material must also be used to level the phantom.

2. Acquisition

For the acquisition, use your facility’s whole body protocol (zoom =1) with the same settings that are used for routine clinical studies.

3. Reconstruction

Reconstruct the entire phantom with the same protocol used for whole body scans including pre- and post-reconstruction filters. Generate 1 cm thick transaxial slices for analysis. (If unit is only being accredited for brain or cardiac, use the appropriate protocol for reconstruction.)

*(All acquisition and reconstruction parameters should be recorded on the Acquisition and Reconstruction parameter form Appendix D (See page 20).)*

4. Attenuation Correction

All images must be corrected for attenuation with the same protocol applied to patient data.

*Record the parameters on the Acquisition and Reconstruction parameter form Appendix D (see page 20).*

5. Analysis

The worksheet for calculations can be found in Appendix E (see page21) : SUV Analysis Worksheet
E. ROI Analysis of 1 cm Transaxial Slice from PET Phantom

- Regions-of-interest selection: use the minimum, maximum and mean $SUV^*$ statistics from these regions for the analysis section.

- Select the “best” 1 cm slice showing “hot” cylinders (A, B, C & D)

![Image of PET phantom slice](image1)

Draw a background region (ROI) in the center of the slice as shown below (diameter = 6 to 7 cm). Small variations in size or location of this ROI are not important. Next draw an ROI just inside the largest hot cylinder found in the slice (the ROI is shown below in white over the 25 mm cylinder).

![Image of ROI placement](image2)

Place copies of the smaller ROI (as shown in B) over the other visible objects in the phantom slice as shown below. The ROIs should be inside the Teflon, water, and air regions. Note that all four of the hot cylinders may not be observed; only the visible cylinders require ROIs. Make a hard copy of the final ROIs.

- See Appendix B (page 18): Phantom Dilution Worksheet, for SUV parameter instructions.

**Evaluation of SUV Analysis Worksheet**

**PASS/FAIL CRITERIA for SUV Values:**

- Mean Bkgd: 0.85 – 1.15
- 25 mm cylinder: >1.8 - <2.8
- 16/25 ratio: >.7
F. Images for Upload

A. Transaxial Slices for Phantom Scan

Prepare images that show all of the transaxial slices (1 cm thick) of the phantom. **This should include the rod portion of the phantom.**

Each image should be between 3 and 6 cm in diameter. Images less than 3 cm are too difficult to read and will be returned to the facility without being reviewed.

Use linear mapping of the display with the lower threshold set at zero and the upper threshold set to the maximum count (or whatever is satisfactory to produce a good gray scale). When there is linear mapping in an image, an ROI with twice the number of counts will have twice the intensity.

B. ROI Images from Phantom Scan

Prepare an image that shows the “best” 1 cm slice of the hot cylinders from phantom Scan with the final ROIs image (see previous page).

Each image should be between 3 and 6 cm in diameter.

G. Phantom Scoring

Phantom images will be submitted to a review panel of qualified medical physicists for scoring. The Nuclear Medicine Accreditation Committee has defined acceptable standards for uniformity, spatial resolution and lesion detection. The standards are based on results obtained from a variety of PET systems operating satisfactorily.

Uniformity and noise are evaluated qualitatively by inspection of reconstructed tomographic sections. Optimal density ranges should be comparable to those used for clinical images. Spatial resolution is judged by identifying the smallest “cold” rods in the ACR-approved phantom and lesion detectability is determined from the “hot” cylinders using the region-of-interest protocol on page 8. The same protocol is also used for the “cold” cylinders that demonstrate the effectiveness of the attenuation and scatter corrections.

H. Phantom Criteria

<table>
<thead>
<tr>
<th>PET Phantom (If a phantom receives 2 scores of Marginal this equals a FAIL)</th>
<th>Satisfactory</th>
<th>Marginal</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Contrast</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 mm vial is resolved with low contrast; larger vials resolved with high contrast</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>16 mm vial is resolved with acceptable contrast; larger vials resolved with high contrast</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><strong>Spatial resolution</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.5 mm rods are resolved with low contrast; larger rods are resolved with high contrast</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>11.1 mm rods are resolved with low contrast; larger rods are resolved with high contrast</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><strong>Uniformity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Artifacts are seen in only a few slices of the complete set but are not thought to be clinically significant</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Strong artifacts are seen in a small number of slices</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
VI. Submitting Material for Accreditation

1. Log into the ACRediT database, select “modify” on the appropriate testing package and fill out all required clinical and phantom data forms and upload all required documentation.

2. Follow the User Instructions for Electronic Submission of Images.

**IMPORTANT:** All sites are now required to upload their images for accreditation. In addition to decreasing the turnaround time for receiving an accreditation final report, uploading images mitigates the risk of losing images during transit. If your facility has a technical limitation that prohibits you from uploading images electronically, please contact ACR staff at 800-770-0145 for assistance.

3. View all uploaded images before submitting the online testing package to ensure all appropriate items have been uploaded and are viewable.

4. Submit the online testing package.

5. Review and/or print the submitted data report for your records.

Note the following regarding electronic image submission:

- DICOM images are preferred
- Anonymized images should not be submitted for accreditation purposes
- Do not submit lossy compressed images for accreditation
- Do not upload patient reports with images being uploaded
- ACRediT Web Client should be used when uploading images that are saved on the computer, disk or thumbdrive
- TRIAD Windows Client must be used if uploading images directly from PACS to our system
- All images should be viewed within the testing package prior to submission to ensure all and only required images are uploaded successfully and are viewable
- **DO NOT TAKE CELL PHONE images and upload as electronic.**
- **DO NOT SCAN paper or color photo prints and upload as electronic.**
VII. PET Accreditation Checklist

Be sure to keep copies of the completed application, submitted images and any additional submitted information for your records.

Please ensure that all items below are complete before submitting to the ACR for accreditation review. The review process will not begin until your submission is complete. All items must be submitted for each unit being accredited.

A. Electronic Submissions

- All appropriate items have been uploaded
  - Most recent NRC/State Inspection Report & response to any violations
  - Dose Calibrator Report (Accuracy & Linearity)
  - Dated Physician Report for each examination submitted
- All required images have been uploaded
- All images can be viewed within the online testing package
- Online testing package is in a submitted status
VIII. Appendix A: PET Phantom Activation Based on Patient Dose

From the left column on the Chart below, select the administered FDG whole-body dose for your site. The corresponding phantom Doses A and B are along the same row as the Patient dose. Be sure to adjust the "zero" and "background" settings on your dose calibrator. Follow the directions below to measure (± 10%) the doses and activate the PET phantom. Scanning begins 1 hr after Dose A is measured. (Please record all information on the Appendix B (see page 18): Phantom Dilution Worksheet)

<table>
<thead>
<tr>
<th>Patient Dose</th>
<th>Dose A mCi</th>
<th>Dose B mCi</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 mCi</td>
<td>0.14</td>
<td>0.33</td>
</tr>
<tr>
<td>6 mCi</td>
<td>0.21</td>
<td>0.50</td>
</tr>
<tr>
<td>8 mCi</td>
<td>0.28</td>
<td>0.66</td>
</tr>
<tr>
<td>10 mCi</td>
<td>0.35</td>
<td>0.83</td>
</tr>
<tr>
<td>12 mCi</td>
<td>0.42</td>
<td>0.99</td>
</tr>
<tr>
<td>14 mCi</td>
<td>0.49</td>
<td>1.15</td>
</tr>
<tr>
<td>16 mCi</td>
<td>0.56</td>
<td>1.32</td>
</tr>
<tr>
<td>18 mCi</td>
<td>0.63</td>
<td>1.48</td>
</tr>
<tr>
<td>20 mCi</td>
<td>0.70</td>
<td>1.65</td>
</tr>
</tbody>
</table>

Directions for Activating Phantom and Vials

Protocol Summary for the Two Required Doses (from Chart)
• Dose A will be added to 1000 ml bag (or bottle) to diluted activity for the 4 test vials;
• Dose B will be added to the phantom as background activity.

1) Measurement of Doses A and B
Measure and record the activity of Dose A and Dose B (tuberculin syringes) with time on the work sheet (next page). Scanning begins 1 hr after the Dose A measurement time.

2) Activation of Test Vials on Phantom Cover
Add Dose A to the 1000 ml bag or bottle and mix well. Then with the first 60 ml syringe withdraw 60 ml — this is test Dose #1 (set aside, see Step 4). Next, using the second 60 ml syringe withdraw 40 ml from the bag and fill the 4 appropriate chambers in the phantom top.

3) Activation of the Phantom
Thoroughly mix Dose B into the main chamber of the PET phantom (a bubble of air will help ensure a well-mixed solution).
After mixing, using the third 60 ml syringe, withdraw 60 ml from the phantom — this is test Dose #2 (set aside, see Step 4).

4) Test Dose Measurement with Time
Measure the activity of test Dose #1 and Dose #2 and record. Then, inject Dose #2 back into the phantom. Fill any remaining air-space in the phantom with water and mix again. Scan at the specified time. Dispose of syringes appropriately.
### IX. Appendix B: Phantom Dilution Worksheet

Enter dose and time below:

<table>
<thead>
<tr>
<th>Dose</th>
<th>Time</th>
<th>Dose Ratios</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient Dose:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FDG dose (A), mCi:</td>
<td></td>
<td>FDG Doses: B/A (enter ratio value below)</td>
</tr>
<tr>
<td>FDG dose (B), mCi:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test dose #1, µCi:</td>
<td></td>
<td>Test Doses: 1/2 (enter ratio value below)</td>
</tr>
<tr>
<td>Test dose #2, µCi:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actual start time of phantom scan:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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### Appendix C: PET Quality Control Summary (brief descriptions)

**Type of PET unit:** ________________________________

<table>
<thead>
<tr>
<th>QC for PET Scanner</th>
<th>Frequency</th>
<th>Last Performed (mm/dd/yy)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**QC for CT (for PET/CT units)**

|                    |           |                           |
|                    |           |                           |
|                    |           |                           |
|                    |           |                           |

**QC for Diagnostic Displays/Printers**

|                    |           |                           |
|                    |           |                           |
|                    |           |                           |
|                    |           |                           |
XI. **Appendix D: Acquisition and Reconstruction Parameters (Whole Body Protocol)**

Type of PET(CT) unit: ______________________________

Enter all appropriate acquisition parameters below (list other parameters that may be relevant):

- **Time per bed position:**
  - Transmission scan: ________  Emission scan: ________
  - Number of bed positions: ________
  - Matrix size: ________________  Zoom: ________________

**For CT:**
- Topogram: mAs__________, kVp__________
- CT: mAs __________, kVp _________, Num. Slices______, Thickness _________ mm

Are different protocols used for children?  
- Y  N

Describe any modified pediatric protocols and dose reduction techniques: __________________
_____________________________________________________________________________
_____________________________________________________________________________

Enter all reconstruction parameters below:

**Reconstruction Parameters**
- Type of reconstruction (OSEM, FBP, etc.): ___________________________
  - OSEM: iterations__________, Subsets ____________
  - Processing Filter: _____________________, Setting: _________________
  - Slice Thickness: _________________ cm

Do you use PSF correction?  
- Y  N

Do you use time of flight?  
- Y  N

Additional information:

*If applying for Brain or Cardiac only, please use the corresponding reconstruction protocol.*
XII. Appendix E: SUV Analysis Worksheet

Patient Dose:_____________ PET/(CT) Model: ______________

For SUV calculations, enter the following into the site’s computer: Use the patient dose previously selected from the phantom dose chart on page 10. DO NOT use the value of dose.

B. Use 70 kg (154 pounds) as the patient’s weight. Use the ROI data obtained for the minimum (min.), maximum (max.) and mean SUV values to complete tables 1 & 2 below.

A) Contrast – Table 1

<table>
<thead>
<tr>
<th>Hot Vial 8 mm</th>
<th>Hot Vial 12 mm</th>
<th>Hot Vial 16 mm</th>
<th>Hot Vial 25 mm</th>
</tr>
</thead>
</table>

max SUV

B) Scatter/Attenuation – Table 2

<table>
<thead>
<tr>
<th>Background</th>
<th>Bone</th>
<th>Air</th>
<th>Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>mean SUV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>min. SUV</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

C) Ratio Calculations (using data from Tables 1 & 2 above)

<table>
<thead>
<tr>
<th>max. vial SUV to mean background SUV</th>
<th>8mm/bkgd</th>
<th>12mm/bkgd</th>
<th>16mm/bkgd</th>
<th>25mm/bkgd</th>
</tr>
</thead>
<tbody>
<tr>
<td>e.g., Contrast = 8mm SUV / bkgd SUV</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>max. vial SUV to max. 25 mm vial</th>
<th>8mm/25mm</th>
<th>12mm/25mm</th>
<th>16mm/25mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>e.g., Contrast = max16 mm SUV / max 25 mm SUV</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>min. air or water to min. bone</th>
<th>air/bone</th>
<th>water/bone</th>
</tr>
</thead>
<tbody>
<tr>
<td>e.g., ratio = min air SUV / min bone SUV</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>