Accredited Dosimetry Calibration Laboratory
Schedule of Charges for Calibration Services

**Ion Chambers** (Per Chamber)

| Service Description                                      | Price  
|----------------------------------------------------------|--------
| Absorbed Dose To Water (TG-51)                           | $750   
| Exposure/Air Kerma (TG-21)                               | 750    
| Both Absorbed Dose to water and Exposure/Air Kerma       | 1,100  
| 1st X-ray point (if not calibrated at cobalt)            | 750    
| Discounted 1st X-ray point (if also calibrated at either cobalt point) | 550    
| Additional X-ray points                                  | 350    

**Electrometer** (Per Electrometer)

| Service Description                                      | Price  
|----------------------------------------------------------|--------
| First Range* (see table below)                           | 175    
| Additional Ranges                                        | 50     

**Shipping and Handling** (Next Day Air)

| Service Description                                      | Price  
|----------------------------------------------------------|--------
| Large box                                                | 60     
| Small box                                                | 30     

**Minor Repairs** (prices valid with calibration only)

| Service Description                                      | Price  
|----------------------------------------------------------|--------
| Thimble and battery replacement                          | 50 + cost  
| Other                                                    | 100 min. + parts  

* Electrometer ranges are defined as a unique set of switch settings, excluding a switch that only affects display precision. Auto ranging electrometers are calibrated according to the ranges defined below.

**Energies and Ranges available at the M.D. Anderson ADCL**

<table>
<thead>
<tr>
<th>Ion Chambers</th>
<th>Electrometer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cobalt 60</td>
<td>Charge Scales</td>
</tr>
<tr>
<td>Absorbed Dose to Water (TG-51)</td>
<td>Ranges:</td>
</tr>
<tr>
<td>Exposure/Air Kerma (TG-21)</td>
<td>0.1 nC – 10 nC</td>
</tr>
<tr>
<td>Medium Energy X-rays (Orthovoltage)</td>
<td>1 nC – 200 nC</td>
</tr>
<tr>
<td>M1 – 75 kVp (2.09 mm Al)</td>
<td>(Default)</td>
</tr>
<tr>
<td>M2 – 100 kVp (4.14 mm Al)</td>
<td>10 nC – 600 nC</td>
</tr>
<tr>
<td>M3 – 125 kVp (6.01 mm Al)</td>
<td>Available on request</td>
</tr>
<tr>
<td>M4 – 250 kVp (17.9 mm Al)</td>
<td>If range is not specified on an autoranging</td>
</tr>
<tr>
<td></td>
<td>electrometer the default range (listed above) will</td>
</tr>
<tr>
<td></td>
<td>be used.</td>
</tr>
</tbody>
</table>

Telephone: (713) 792-3233    Fax: (713) 563-2620    Pager: (713) 404-2689
Accredited Dosimetry Calibration Laboratory

Schedule of Charges for Calibration Services

**BRACHYTHERAPY**

Schedule of Charges for Calibration Services

<table>
<thead>
<tr>
<th>Well Chambers (Per Chamber)</th>
<th>Prices</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Dose Rate ($^{192}$Ir)</td>
<td>$650</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Low Dose Rate ($^{137}$Cs, $^{192}$Ir, $^{125}$I, $^{103}$Pd, $^{131}$Cs)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1(^{st}) Point</td>
<td>450</td>
</tr>
<tr>
<td>Discounted 1(^{st}) Point (if also calibrated at HDR)</td>
<td>300</td>
</tr>
<tr>
<td>Additional Low Dose Rate Points</td>
<td>275</td>
</tr>
<tr>
<td>Variation with Pressure*</td>
<td>100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Brachytherapy Sources (Per Source)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Calibration (1(^{st}) source)</td>
<td>575</td>
</tr>
<tr>
<td>Additional sources (each)</td>
<td>450</td>
</tr>
</tbody>
</table>

*Note: Many well-type chambers’ responses do not follow the ideal gas law-so the standard temp/press correction is not adequate.*
Instructions for Submitting an Instrument or Radioactive Source for Calibration at the U.T.M.D. Anderson Accredited Dosimetry Calibration Laboratory:

1. Current prices for standard calibrations are listed on the schedule of charges. Special services are available on request. Please call for a quote.

1.1 Testing and handling of instruments found unsuitable for calibration will result in a minimum charge of $150.00.

1.2 If you do not have a current price schedule, call or check our website for current prices. ([http://adcl.mdanderson.org/](http://adcl.mdanderson.org/))

1.3 Shipping and handling charges apply to instruments shipped within the continental United States only.

1.4 International Shipping: The customer must make arrangements for shipping and Customs clearance both directions (contact us for instructions or check the “international shipping advice” link on the website).

1.5 Include a Contract for Calibration sheet for each instrument to be calibrated. This is available at the end of this packet or available on our website: ([http://adcl.mdanderson.org/](http://adcl.mdanderson.org/)).

1.6 If the instruments have not been previously calibrated at M.D. Anderson, please include a copy of the most recent calibration certificate or include your current working values for your chamber ($N_x$ and/or $N_{D,w}$) and electrometer ($N_e$).

1.7 Do not ship collect to the ADCL. We cannot accept a collect shipment.

1.8 Please allow 7-10 days for surface shipment. **We do not recommend using any ground shipment for delicate instruments.**

1.9 All instruments are returned by UPS (2nd Day Air) with up to $4995.00 insurance unless special requests are made. Special requests will result in higher shipping charges.

1.10 Instruments hand carried to the ADCL will not be charged a shipping and handling fee.
1.11 Our recommendation is to use a container that has twice the dimensions of the instruments. Normally, an outside container of two-ply cardboard is adequate. The packing material should be resilient, but capable of keeping the instrument centered in the container. (NOTE: Styrofoam pellets fail in the last respect.) It is a good idea to wrap the instrument itself in a plastic bag, such as a trashcan liner. The container should be clearly labeled as to the fragile nature of its contents. Gummed labels do not adhere to slick surfaces. Use cellophane tape over labels in case they won’t adhere. When affixing the address, keep in mind that the ADCL will probably use the same container to return the instrument. An address written completely across the top or side of a container makes this difficult. A typical, typed address label is appropriate and sufficient. Covering the label with cellophane tape will help preserve its readability and maintain attachment.

1.12 Ship instruments to: Accredited Dosimetry Calibration Laboratory  
U.T.M.D. Anderson Cancer Center  
Department of Radiation Physics  
Room B1.4532  Attn: Steph Lampe/Nina Gutierrez-Garcia  
1515 Holcombe Blvd.  
Houston, TX  77030

It is important to adhere to this complete address to assure timely delivery of your equipment to our lab.

2. Scheduling

2.1. Call to confirm scheduling before shipping your instrument.

2.2. Turn around time for calibration is normally 3 to 5 working days. Special situations can be accommodated, please call.

3. Payment

3.1. Instruments should be shipped with specific billing instructions, preferably with a purchase order number.

3.2. Other forms of payment (credit cards, checks and wire transfers) are accepted. Please call for details.

3.3. ALL international institutions must submit payment for calibration services rendered prior to the ADCL releasing equipment for return shipment.
4. Calibration Services available:

4.1 Ion Chamber calibrations

4.1.1 Quality Assurance check:
All ion chambers submitted for calibration are checked for general mechanical condition, leakage, atmospheric communication. Connectors are cleaned.

4.1.2 X-Ray Exposure/Air-Kerma (R/C) or (Gy/C)
Exposure calibrations are performed on a Philips RT-250 unit with ADCL supplied custom filtration, the beam energies are listed in table 1. The orthovoltage techniques (M1 – M4) result in half values, layers, and homogeneity coefficients which are consistent with the beam characteristics used at the National Institute of Standards & Technology for moderately filtered (M60 – M250) beams. Calibrations are performed at 50 cm from the source. The field size at the location of the chamber is 10 x 10 cm². The exposure rates for the different energies are provided in Table 1.

### MEDIUM ENERGY X-RAY BEAMS – Table 1

<table>
<thead>
<tr>
<th>Beam Code</th>
<th>1st HVT (mm Al)</th>
<th>1st HVT (mm Cu)</th>
<th>Homog. Coeff. (Al)</th>
<th>Homog. Coeff. (Cu)</th>
<th>Filter</th>
<th>kVp</th>
<th>R/min</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1</td>
<td>2.09</td>
<td>0.068</td>
<td>0.67</td>
<td>0.63</td>
<td>2.2 Al</td>
<td>75</td>
<td>28</td>
</tr>
<tr>
<td>M2</td>
<td>4.14</td>
<td>0.154</td>
<td>0.71</td>
<td>0.55</td>
<td>4.4 Al</td>
<td>100</td>
<td>25</td>
</tr>
<tr>
<td>M3</td>
<td>6.01</td>
<td>0.270</td>
<td>0.75</td>
<td>0.54</td>
<td>6.1 Al</td>
<td>125</td>
<td>31</td>
</tr>
<tr>
<td>M4</td>
<td>17.9</td>
<td>2.94</td>
<td>0.99</td>
<td>0.86</td>
<td>0.8 Th³</td>
<td>250</td>
<td>30</td>
</tr>
</tbody>
</table>

¹The half-value thickness was determined with a 2 cm diameter aperture and high purity aluminum or copper absorbers. The aperture and absorbers were positioned at 50 cm from the target. The ion chamber was at 100 cm from the target.

²The homogeneity coefficient is the ratio of the 1st HVT to the 2nd HVT; HVT1/HVT2.

³Thoraeus filter: 0.9 mm Sn + 0.25 mm Cu + 1 mm Al

4.1.3. Absorbed Dose to Water (TG-51): (Gy/C to water)
Absorbed dose to water calibrations are performed in a 30 x 30 x 30 cm³ phantom at 5 cm depth and 85 cm from the source. Most chambers are calibrated in 1 mm PMMA water-proofing provided by the ADCL. Water proof chambers (except for Farmer type chambers) are calibrated bare in water. The field size at the location of the chamber is 10 x 10 cm². The dose rate at the location of the chamber is between 25 and 50 cGy/min.
4.1.4. Cobalt Exposure/Air Kerma (TG-21) (R/C) or (Gy/C)
Exposure calibrations are performed in air at 105 cm from the source with adequate build up for ⁶⁰Co and no additional scattering material. The customer should provide the ⁶⁰Co build-up, although build-up disks for common parallel plate chambers are provided by the ADCL at no additional charge. The field size at the location of the chamber is 10 x 10 cm². The exposure rate at the location of the chamber is between 15 and 40 R/min.

4.2. Electrometer Calibrations

4.2.1 Quality Assurance checks:
All electrometers submitted for calibration are checked for zero-drift, leakage, general mechanical condition and bias voltage (if applicable).

4.2.2 Scales and Ranges:
A scale on an electrometer is defined either as a unique feedback element (older style electrometers) or a working range of 3 decades on an auto ranging electrometer. A range is generally defined as a switch that changes display precision but not the active feedback element. There is an additional charge for each scale, but not for different ranges. The large variety of electrometers available necessitates specific instructions for calibration. Unusual electrometers should be shipped to the ADCL with instruction manuals. Please call before sending your instrument if you have any questions regarding electrometer calibrations.

4.2.3 Charge Scale (Exposure or Integrate) calibrations (C/Rdg):
Charge scale calibrations are performed by injecting a known amount of charge into the electrometer using a transfer quality capacitor and a voltage source or, for charge rate limited devices, using a constant current source and a timer. The calibration coefficient (C/Rdg) is determined at a number of points that span the scale to be calibrated. The average calibration coefficient over the scale and a measure of the linearity of the scale are reported.

4.2.4 Current Scale (Rate Mode) Calibrations (A/Rdg):
Current scales are calibrated by passing a known current through the electrometer by monitoring the voltage drop across a precision resistor connected to the electrometer input. For low (pA) currents a regulated current supply may be used. The calibration coefficient (A/Rdg) is determined at a number of points that span the scale to be calibrated. The average calibration coefficient over the scale and a measure of the linearity of the scale are reported.
5. Rejection of instruments:

5.1. Electrometers:
Many electrometers are shipped to the ADCL in a state not suitable for calibration. If you have known problems with your electrometer call us before sending the instrument and we will help you to arrange for repairs before calibration. We cannot calibrate any electrometer that does not have a stable display, fully charged batteries (if applicable), or leakage greater than 0.1 pA.

5.2. Ion chambers:
Ion chambers will be rejected if they exhibit obvious mechanical problems (broken thimbles, torn windows, etc.). Ion chambers will also be rejected if they exhibit a leakage of greater than 0.1 pA. The ADCL can replace most broken thimbles and rebuild connectors. Please call to arrange repairs before shipping a broken ion chamber to the ADCL.
Date: ___________________________  Purchase Order Number: ________________
Name: ___________________________  Invoice Address: _______________________
Institution: _______________________

Contact Person for technical questions regarding calibrations: (if different from above):
Name: ___________________________  E-mail: ________________________________
Phone: ___________________________
Address for Mailing Final Report: _____________________________________________
Shipping Address (for returning equipment): ______________________________________

Phone Number: _____________________

Electrometer
Model ___________________________  Serial # _________________________________
Scales and Switch Settings: ___________________________________________________

Chamber 1
Model & Serial # ____________________
Chamber calibration points: (please circle)
- Co-60 Absorbed Dose to water
- Co-60 Exposure/Air Kerma
- M1  2.09 mmAl HVL, 75 kVp
- M2  4.14 mmAl HVL, 100 kVp
- M3  6.01 mmAl HVL, 125 kVp
- M4  17.9 mmAl HVL, 250 kVp

Chamber 2
Model & Serial # ____________________
Chamber calibration points: (please circle)
- Co-60 Absorbed Dose to water
- Co-60 Exposure/Air Kerma
- M1  2.09 mmAl HVL, 75 kVp
- M2  4.14 mmAl HVL, 100 kVp
- M3  6.01 mmAl HVL, 125 kVp
- M4  17.9 mmAl HVL, 250 kVp

If not previously calibrated at the MDACC ADCL please include your current working N_x, N_D,w, and/or N_e Value(s) and copies of your previous official ADCL calibration report, if applicable.

Special instructions or comments: ________________________________________________

Was a constancy check performed on the instrument prior to submission? ____________________
Do you believe the instrument calibration has changed? _____________________________
If so, explain on back.

Although personnel performing measurements will handle the instrument with due care, I understand that neither they nor The University of Texas M.D. Anderson Cancer Center will be liable for any damage or loss of the instrument, unless such damage or loss is due to negligence on the part of the ADCL personnel as determined by the ADCL director.

The above conditions of calibration are hereby contracted to the UT MD Anderson Cancer Center ADCL by the above named institution. Any amendments hereafter are subject to approval by both parties.

Signed: ___________________________  Date: ___________________________

Questions/Scheduling: Contact: Stephanie Lampe or Nina Garcia-Gutierrez
Phone: (713) 792-3233  Fax: (713) 563-2620
adcl@mdanderson.org  http://adcl.mdanderson.org
CONTRACT FOR DOSIMETER CALIBRATION–Brachytherapy

Date: ____________________________  Purchase Order Number: __________________________
Name: ____________________________  Invoice Address: ____________________________
Institution: __________________________

Contact Person for technical questions regarding calibrations: (if different from above):
Name: ____________________________  E-mail: ____________________________
Phone: ____________________________
Address for Mailing Final Report: ____________________________

Shipping Address (for returning equipment): ____________________________
Phone Number: ____________________________

Electrometer

Model ____________________________  Serial # ____________________________
Scales and Switch Settings: ____________________________

Chamber 1

Model & Serial # ____________________________  Chamber 2
Model & Serial # ____________________________

Chamber calibration points: (please circle)

<table>
<thead>
<tr>
<th>HDR</th>
<th>LDR</th>
<th>Model &amp; Serial #</th>
</tr>
</thead>
<tbody>
<tr>
<td>192Ir</td>
<td>137Cs</td>
<td>192Ir Best Medical</td>
</tr>
<tr>
<td>192Ir</td>
<td>125I Mfgr &amp; Model</td>
<td>131Cs</td>
</tr>
<tr>
<td>103Pd Mfgr &amp; Model</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Chamber calibration points: (please circle)

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Signed: ____________________________  Date: ____________________________

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