Conclusion: We have demonstrated that the γ3%/3mm can be quantitatively estimated from the characteristics of respiratory motion. From the results of multi-regression analysis, reducing the amplitude of respiratory motion would provide high γ3%/3mm.

**EP-1733**

Deep inspiration breath-hold technique using an Arduino P. Gallego1, J. Pérez-Alija1, S. Olivares1, S. Loscos1, E. Ambroa2, A. Pedro1

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**Purpose or Objective:** A large effort has been made in recent years to develop techniques to reduce the dose to normal tissue (especially heart dose) for patients receiving radiation treatment for breast cancer. The deep inspiration breath-hold technique (DIBH) can decrease radiation dose delivered to the heart and this may facilitate the treatment to the internal mammary chain nodes. The aim of this work was both to develop a DIBH method using an Arduino Uno microcontroller board (SmartProyects, Ivrea, Italia) and a simple software to visualize the patient’s level of inspiration. This method provides a cheaper solution to the more expensive commercial ones.

**Material and Methods:** Arduino is an open-source electronics platform based on an easy-to-use hardware and software. We plugged a tri-axial low-g digital acceleration sensor (Bosch’s BMA180) to our Arduino board. This accelerometer is then programmed in Python 2.7 we are able to visualize these breath cycle. With an In-house developed software platform based on an easy-to-use hardware and software. We were able to build a DIBH system using both an Arduino board and an accelerometer. We visualize the patient’s breath cycle with an In-house software and establish a threshold based on its amplitude. We provide patients with a real-time breath cycle visualization, so they can have a visual feedback mechanism in order to properly hold their breath when required.

**Results:** We were able to build a DIBH system using both an Arduino board and an accelerometer. We visualize the patient’s breath cycle with an In-house software and establish a threshold based on its amplitude. We provide patients with a real-time breath cycle visualization, so they can have a visual feedback mechanism in order to properly hold their breath when required.

**Conclusion:** Several DIBH methods are commercially available. These methods can decrease the radiation dose delivered to the heart. We have developed an In-house DIBH system with all the functionalities required to implement this technique in our clinic. Building this system is really cheap and amounts to nearly 60 Euros. We are more than happy to freely provide the software needed to implement this method.

**EP-1734**

IGRT for prostate cancer: intrafraction variation analysis and CTV-PTV margin determination C. Italia1, R. La Rosa1, P. Delia Monica1, S. Masciullo2, O. Ceccarini1, E. Brembilla1, M. Camerlingo1, M. Cardinali5, F. De Osti1, S. Gusmini1, C. Riva1, F. Romeo1

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**Purpose or Objective:**

1. to evaluate first set-up accuracy and corrections needed before treatment administration
2. to assess intrafraction variability
3. to determine CTV-PTV margins according to intrafraction uncertainties

**Material and Methods:** Forty-five consecutive prostate cancer patients, undergoing radical or postoperative image-guided radiation therapy with or without gold seed implant in a newly opened department, were considered. On each session a first set of portal images was obtained at 0° and 90° degrees, using a low-dose MV imager. Positioning errors were measured in the three directions and corrected if >1 mm. After treatment a second set of images was daily produced and displacements measured. Comparison between before-treatment images and planning DRRs represents set-up accuracy. Comparison between end-of-treatment images and planning DRRs shows intrafraction variability Systematic and random errors were analysed and incorporated in the Van Herk formula (2.5 Σ + 0.7 α), to determine ideal CTV-PTV margins.

**Results:** All patients were suitable for the analysis. Results are summarized in the table.

<table>
<thead>
<tr>
<th><strong>AXIS</strong></th>
<th><strong>MEAN (mm)</strong></th>
<th><strong>Σ (mm)</strong></th>
<th><strong>α (mm)</strong></th>
<th><strong>CTV-PTV margin</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FIRST SET-UP</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>0.3</td>
<td>1.7</td>
<td>0.1</td>
<td>2.0</td>
</tr>
<tr>
<td>Y</td>
<td>-0.1</td>
<td>3.7</td>
<td>0.1</td>
<td>4.2</td>
</tr>
<tr>
<td>Z</td>
<td>0.2</td>
<td>3.0</td>
<td>0.2</td>
<td>5.0</td>
</tr>
<tr>
<td><strong>EXTRA FRACTION</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>-0.2</td>
<td>0.5</td>
<td>1.2</td>
<td>2.2</td>
</tr>
<tr>
<td>Y</td>
<td>-0.2</td>
<td>0.7</td>
<td>1.4</td>
<td>2.4</td>
</tr>
<tr>
<td>Z</td>
<td>-0.1</td>
<td>0.4</td>
<td>1.1</td>
<td>1.5</td>
</tr>
</tbody>
</table>

A total of 6632 images were analysed. Mean errors were <1 mm for all measurements. In intrafraction shift analysis systematic errors were <1 mm, random errors were <2 mm and calculated CTV-PTV margins ranged from 1.7 to 2.7 mm.

**Conclusion:** Good accuracy and precision for first positioning procedures were found. If hypothetically IGRT were omitted and CTV-PTV margins were based on first set-up errors only, margins ranging from 6.3 to 8.4 mm in the various directions would be mandatory. On the contrary, according to the policy of our department, with the use of daily IGRT and based on our excellent results of intrafraction variation analysis, CTV-PTV margins can be limited to 2.2, 2.7 and 1.7 mm, respectively in lateral, anteroposterior and cranio-caudal direction.

**EP-1735**

Impact of respiratory motion on breast tangential radiotherapy using the field-in-field technique H. Tanaka1, T. Yamaguchi1, M. Kawaguchi1, S. Okada1, Y. Kajiju1, M. Matsuo1

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**Purpose or Objective:** The field-in-field (FIF) technique has become a widely performed method of administering tangential whole breast radiotherapy. However, as the FIF technique requires the precise setting of the position of the multi-leaf collimators (MLCs) in order to reduce hot spots, there is concern that its use could significantly change the dose distribution to the target volume due to respiratory uncertainties.

A total of 45 patients were treated. Mean errors were <1 mm for all measurements. In intrafraction shift analysis systematic errors were <1 mm, random errors were <2 mm and calculated CTV-PTV margins ranged from 1.7 to 2.7 mm.

**Conclusion:** Good accuracy and precision for first positioning procedures were found. If hypothetically IGRT were omitted and CTV-PTV margins were based on first set-up errors only, margins ranging from 6.3 to 8.4 mm in the various directions would be mandatory. On the contrary, according to the policy of our department, with the use of daily IGRT and based on our excellent results of intrafraction variation analysis, CTV-PTV margins can be limited to 2.2, 2.7 and 1.7 mm, respectively in lateral, anteroposterior and cranio-caudal direction.