

# Linear Accelerator

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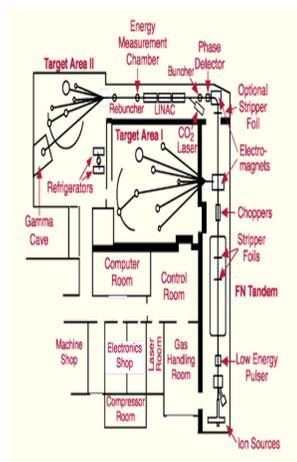
**LINAC- The Linear Accelerator. The new and improved solution to cancer treatments. Where cancer growth is not just paused, but the cancer itself is destroyed from the outside in.**

## I. INTRODUCTION

**T**HE Linear Accelerator device is the new and improved machine to utilize “external beam radiation” to treat cancer. External beam radiation is a medical practice, which uses highly focused beams of radiation (similar to a microwave) on the outer edges where the cancer is found, which therefore destroys abnormal cells, without harming the good cells. A huge improvement in this device opposed to others is that it prevents the regrowth of the tumor in that specific location.

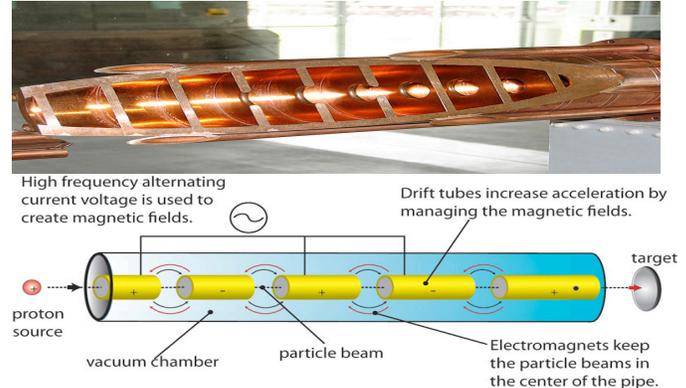
## II. THE SCIENCE BEHIND IT

Linear Accelerator’s are a mix of a physics and engineering device used in the medical field. It uses microwave technology to accelerate electrons in a valuable part of the LINAC called the “wave guide”. The wave-guide consists of a heavy metal sheet which its sole purpose is to allow the electrons to collide into it. This produces high-energy x-rays which are directed to conform to the shape of the patients tumor. A customized beam is navigated to the area to be treated.



## III. PROCESS

The patient undergoes a very similar process as if they were taking an MRI. They will enter the LINAC Activity Room and lay down on a movable couch in which lasers will register the patients body and move then couch accordingly so the gantry (x-ray tube frame) is perfectly positioned to the patient. The gantry is a movable device, and can approach the tumor at different angles by rotating.



[Above is the Gantry cut in half to view the inside]

## IV. SAFETY FACTOR

Prior cancer treatments involved severe and widespread radiation. The Linear Accelerator is a very specific and controlled form of radiation. Due to its effectiveness, it is needed on a less dense schedule. Each treatment is planned by a radiation oncologist, along with the radiation dosimetrist and physicist. Quality-control procedures also ensure that the treatment is perfectly executed. The LINAC is strictly controlled to deliver no more than the prescribed radiation to the patient. The LINAC is serviced after every use to ensure that uniform amounts of radiation are exported. Each LINAC has an OBD- On Board Diagnostics System that is used to monitor the devices every function through a custom computer software. The machine is programmed to only run when all systems are perfect. The LINAC itself is in its own room, with lead and concrete walls, therefore the high-energy x-rays are shielded from the general public and the LINAC operator.

## V. AVAILABILITY & PRICING

The closest location to receive treatment from the LINAC is Rhode Island Hospital’s Radiation Oncology department. Most treatments are covered under medical insurance. The machine itself cost \$4,000,000. Quite the price tag. The annual operating cost of the machine is \$920,000 a year. Most systems need replacement every 5-6 years.

## REFERENCE

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- [4] Radiotherapy: [http://www.myradiotherapy.com/general/treatment/Treatment\\_Machines/treatment\\_machines.html](http://www.myradiotherapy.com/general/treatment/Treatment_Machines/treatment_machines.html)

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