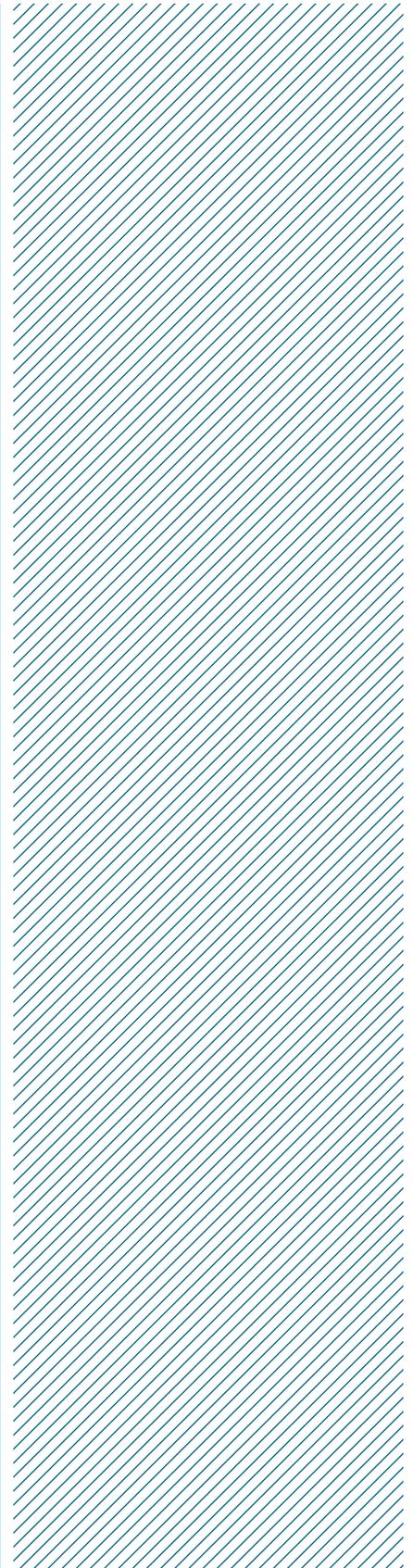


White Paper

Predictive Monitoring with Elekta IntelliMax[®] eliminates unplanned clinical downtime for linac electron gun replacement



The Challenge:

Electron Gun

Failures Create

Clinical Disruption

Real-time monitoring of vital linac components is a key feature of Elekta IntelliMax[®]. One critical component is the electron gun, which emits electrons that are accelerated down the waveguide toward the target in order to produce radiation.

The electron gun's lifespan is essentially the amount of "beam on" time. How quickly a linac's electron gun reaches its lifespan can vary dramatically, however, depending upon patient load, dose rate and other factors.

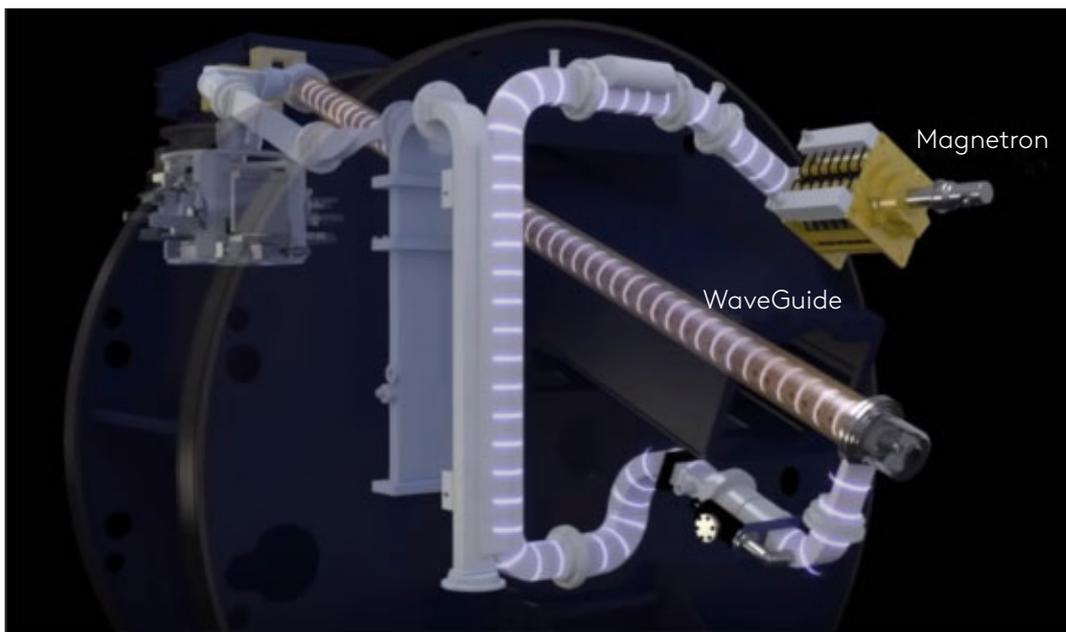


Figure 1.
The electron gun is attached to the waveguide and heats the filament within the cathode to create electrons.

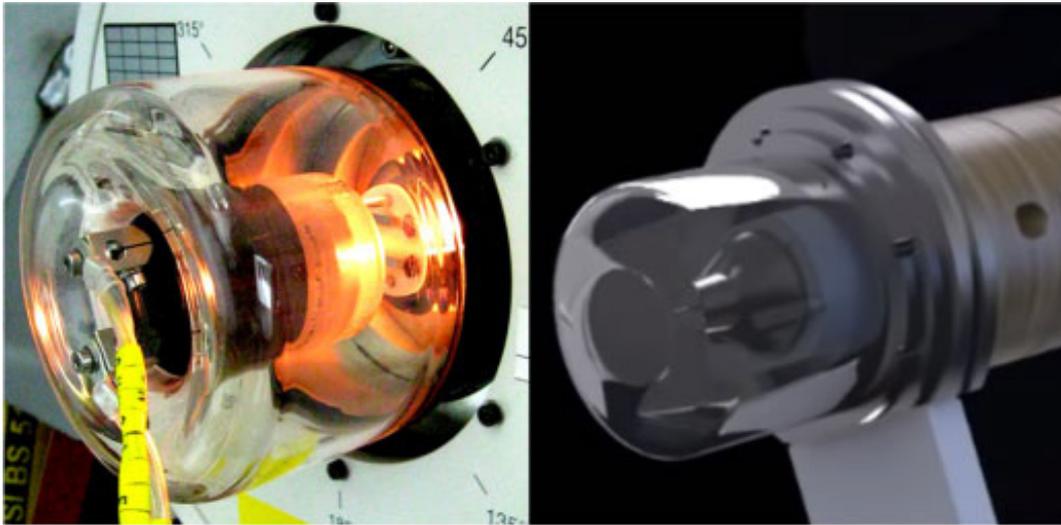
The most common cause of electron gun deterioration is a thinning of the electron gun filament over time. Failing to optimally maintain the linac's vacuum system also affects the gun's lifespan.

When an electron gun deteriorates, or begins to fail, it may produce abnormal terminations or prevent the radiation beam from starting at all.



Figure 2.

Image of electron gun assembly.



According to Chris Flint, an Elekta Remote Command Center Engineer, customers historically would record their gun current on a weekly or monthly basis on a spreadsheet in an effort to

track usage. “Besides being a manual and time-consuming process, it was also difficult to associate the data with lifespan based on usage,” he adds.

Figure 3.

Image of electron gun assembly in the gantry.



Without adequate visibility into an electron gun’s true age, some customers may replace the component earlier than necessary, while others may experience a failure before replacing the part, causing unplanned clinical downtime.

Solution: Predictive electron gun replacement prevents unexpected disruption

Elekta IntelliMax continuously monitors the linear accelerator’s electron gun, allowing the service team to plan the part’s replacement well in advance of a problem. Sophisticated algorithms point the Elekta support team’s attention to the machines that need action, enabling them to align replacement with a planned maintenance activity at a time that is convenient for the customer.

Additionally, poor vacuum performance may contribute to a shorter electron gun lifespan. Elekta IntelliMax also monitors the linac’s vacuum system so maintenance can be performed when needed to extend the electron gun’s lifespan.

“The electron gun use case is another example of how Elekta IntelliMax is always looking out for the customer in the background,” says Flint. “There shouldn’t be that worry for the customer about an unexpected disruption, because we can predict when replacement should occur.”

Results:

Prior to Elekta IntelliMax monitoring, 70 percent of electron guns were replaced due to reaching the end of their lifespan. By July 2017, 69 percent of replacements were proactive, prior to deterioration—achieved without increasing the number of replacements.

Eliminates Unplanned Downtime

A comparison of three linear accelerators where a predictive case was not raised and three machines where predictive electron gun replacements occurred realized:

Reactive replacement



Predictive replacement



66% decrease in downtime



“The electron gun use case is another example of how Elekta IntelliMax is always looking out for the customer in the background. There shouldn’t be that worry for the customer about an unexpected disruption, because we can predict when replacement should occur.”

Chris Flint

Elekta Remote Command Center Engineer

Machine data today informing fleet performance going forward

In addition to standardizing the point at which the electron gun is replaced, IntelliMax also monitors electron guns that exhibit a high level of performance, which enables recommendations to improve the lifetime of the part for the entire install base. For example, IntelliMax allowed us to identify and correlate different data trends across multiple parts that can help improve electron gun lifespan. The various data elements and more complex alarms like this help Elekta continue to strengthen IntelliMax’s patented predictive algorithms.

Elekta IntelliMax®
predictive monitoring
solution identified

887 electron gun issues
predictively identified

10k clinical hours potential
downtime avoided

About Elekta IntelliMax

Elekta IntelliMax is the software system used to enable system availability and optimization as part of Elekta Care™. It provides capability for securely-controlled remote access by the Elekta Care Support Center for corrective maintenance, extraction of machine data for planned maintenance and proactive support for your linear accelerator.¹

- More than 80% of global linear accelerator install base monitored
- More than 30% of linac product issues resolved with remote assistance
- Collection of proactive and artificial intelligence-enabled alarms



The Power of Elekta IntelliMax

Wherever possible, Elekta uses Elekta IntelliMax to monitor, diagnose and correct issues before they happen to reduce unplanned downtime, which is disruptive to patient care and treatment delivery. Secure remote access to customer hardware or software solutions allows Elekta to provide faster response times through remote investigation and diagnosis by experts and facilitate over-the-shoulder guidance.

When an event requires an on-site visit, remote access helps maximize the efficient use of the engineer's time by pre-diagnosing the issue.

Elekta continues to expand IntelliMax functionality in existing products and add new products to help eliminate unplanned clinical downtime. We know how important every hour is to your patients, your team, your bottom line. What is an hour worth to you?

To learn more about Elekta IntelliMax or Elekta Care solutions, contact your local representative.

IntelliMax is available via Elekta Care Service agreements.

¹Connectivity and the benefits of Elekta IntelliMax[®] requires IntelliMax Agent with restricted internet access to be installed and permanently connected to the relevant systems within the medical facility.



For almost five decades, Elekta has been a leader in precision radiation medicine.

Our nearly 4,000 employees worldwide are committed to ensuring everyone in the world with cancer has access to—and benefits from—more precise, personalized radiotherapy treatments.

Elekta Offices

Elekta AB

Box 7593
SE-103 93
Stockholm, Sweden

T +46 8 587 254 00
F +46 8 587 255 00

Europe

T +46 8 587 254 00
F +46 8 587 255 00

Turkey, India, Middle East & Africa

T +90 216 474 3500
F +90 216 474 3406

North & Central America including the Caribbean

T +1 770 300 9725
F +1 770 448 6338

South America & Cuba

T +55 11 5054 4550
F +55 11 5054 4568

Asia Pacific

T +852 2891 2208
F +852 2575 7133

Japan

T +81 3 6722 3800
F +81 3 6436 4231

China

T +86 10 5669 2800
F +86 10 5669 2900

 [elekta.com](https://www.elekta.com)

 [/elekta](https://www.facebook.com/elekta)

 [@elekta](https://twitter.com/elekta)

 [/company/
elekta](https://www.linkedin.com/company/elekta)

