

## CTB Information

Title	Photon Beam Asymmetry in High Energy Clinacs®		
DWG Number	100048759	CTB	CN-732
Complaint No.	CP-01924	Est. Labor Hrs	Not Applicable
Purpose	To clarify that small dosimetry circuit changes observed in some Clinacs can lead to delivering a beam with symmetry that is outside of Varian Beam Specifications. To describe the issue to the user, provide recommended customer actions, and describe the actions Varian is taking to address the issue.  <b>On November 11, 2010 Varian distributed mandatory modification CP-01117 (ref. 3, implemented via STB-CN-212) regarding Beam Asymmetry for Electrons; this modification also resolves the photon asymmetry issue described herein. This modification will be applied to most, but not all, Clinacs affected by the photon issue; see the Varian Actions section for details.</b>		
Product Code(s) Affected	Product Code: H14, 26, 27, 29 and HCX Product Name: All high energy C-Series Clinac® linear accelerators, including Clinac®, Trilogy®, Trilogy Tx™ and Novalis Tx™		
Prerequisites	N/A		
AN UPDATE TO THIS CTB MAY BE AVAILABLE ON MY.VARIAN.COM			

## Tools Information

<b>Tools and Equip</b>	As required for local verification needs.
<b>Reference Documents</b>	<ol style="list-style-type: none"> <li>1. <i>Comprehensive QA for radiation oncology: Report of AAPM Radiation Therapy Committee Task Group 40</i>, Medical Physics (21) 4, April 1994. Available at <a href="http://www.aapm.org">www.aapm.org</a>.</li> <li>2. <i>Task Group 142 Report: Quality assurance of medical accelerators</i>, Medical Physics 36 (9), September 2009. Available at <a href="http://www.aapm.org">www.aapm.org</a>.</li> <li>3. Product Notification Letter CP-01117, Clinac® C-series: Potential for Treating with Asymmetric Electron Beam.</li> <li>4. Beam Symmetry Interlock Upgrade, STB-CN-212</li> </ol>
<b>Modification Overview</b>	Information only.

## Order Kit Information

Order Number	Description
100048759-01	N/A
Order from CSS Logistics	

## Revision Information

REV	DATE	STB	AUTHOR NAME	DESCRIPTION OF CHANGE	FILE NAME
A	February 15, 2012	N/A	Todd Holmes	Initial Release	CTB-CN-732-A.doc

ATTENTION: This information is provided for use by qualified service technicians. Varian Medical Systems, Inc. makes no representation to the qualifications of any service technicians other than its own employees. Improper or uninformed maintenance or repair of the Product may expose a maintenance technician, operator and/ or patient to safety hazards including but not limited to one or more of the following: mechanical collision, electrical shock, and radiation. Any of these hazards could cause serious injury and even death. Copyright © 2012, Varian Medical Systems, Inc. All rights reserved.



A partner for **life**

SHEET

1 OF 5

100048759  
DWG NO.

A  
REVISION

## GENERAL INFORMATION

Read this entire document, carefully reviewing all instructions.

## PERFORMANCE CHECK

Complete a thorough performance verification before disassembling and modifying any system. Make a note of any operational discrepancies.

## SAFETY PROCEDURES

Become familiar with Customer Support Service's safety policies before working on Oncology Systems Products. Ensure compliance with CSS's safety practices and procedures while performing this modification. Refer to the Product Users' Manual for safety instructions.

## CONTACT INFORMATION

If there are any questions, issues, or concerns contact Varian at 1.888.VARIAN.5 (1.888.827.4265) or go to <http://my.varian.com> and click on **Contact Us**.

**ATTENTION:** This information is provided for use by qualified service technicians. Varian Medical Systems, Inc. makes no representation to the qualifications of any service technicians other than its own employees. Improper or uninformed maintenance or repair of the Product may expose a maintenance technician, operator and/ or patient to safety hazards including but not limited to one or more of the following: mechanical collision, electrical shock, and radiation. Any of these hazards could cause serious injury and even death. Copyright © 2012, Varian Medical Systems, Inc. All rights reserved.

100048759  
DWG NO.

CN-732 Rev A

SHEET  
2 of 5

## PHOTON BEAM ASYMMETRY IN HIGH ENERGY CLINACS

Under certain conditions photon beams in High Energy Clinacs may experience a gradual change in beam symmetry, potentially reaching an asymmetry of up to approximately 7% before interlock occurs. At maximum asymmetry this may result in no more than approximately 3.5% dose deviation from expected at any point in the beam.

The modification currently underway for electron beam asymmetry (ref. 3, CP-01117) will be extended to include photon beams on most affected machines. See the Varian Actions section for details.

### 1. DEFINITIONS

The following definitions and abbreviations are used throughout this document:

Term	Definition
Asymmetry	For the purposes of this document, the Varian definition of beam asymmetry is used:  $\text{Percent Asymmetry} = 2 \times \left  \frac{A - B}{A + B} \right  \times 100$ <p>Where A and B are doses at points equidistant, and in opposite directions, from the beam centerline.</p>
Profile constancy	As defined in AAPM TG-142 (ref. 2), a beam constancy concept focusing on consistent beam shape rather than the calculated beam characteristics of flatness and symmetry.
Radial	The beam plane in the gantry-target direction. Also referred to as "inplane".
Transverse	The beam plane in the right-left direction, and perpendicular to the gantry-target direction. Also referred to as "cross plane".

Table 1: Definitions

### 2. DESCRIPTION

The High Energy Clinac dosimetry ion chamber is composed of several individual ion chambers, including ion chambers positioned to separately monitor radial and transverse beam symmetry. This is coupled with dosimetry circuitry that monitors the ion chamber signals and steers the beam accordingly. Under certain conditions dosimetry circuit components may change slowly and asymmetrically over time. The resulting imbalance situation may not be detected by the interlock circuitry, allowing for an asymmetric photon beam to be delivered without interlock.

The change in the dosimetry circuit occurs very slowly, resulting in a change in beam symmetry of typically less than 1-2% per month. At or beyond a beam asymmetry of approximately 7% an underdose (UDR1, UDR2) interlock will prevent beam on. It is expected that typical customer quality assurance testing, such as that recommended by AAPM TG-40 or TG-142 (references 1 & 2, respectively), will identify the asymmetric beam at much less than a clinically significant asymmetry. Once detected, this asymmetry is corrected by adjustment of beam tuning, or by repair or replacement of the circuit components.

This type of asymmetry normally results in a beam which is higher than desired on one side of the central axis, lower on the other side, and approximately correct at the central axis. Asymmetry value as used here means the peak to peak (over to under) differences observed. Therefore a maximum asymmetry of 7% will result in a dose deviation of no more than 3.5% at any point in the beam, with a smaller deviation near the central axis of the beam. Normally, the central axis dose values represent the calibration point and are not affected.

### 3. RECOMMENDED CUSTOMER ACTIONS

#### 3.1. Quality Assurance Testing:

Varian recommends that the user perform a monthly verification of photon beam symmetry or profile constancy. This recommendation follows typical guidance provided by local professional bodies, such as those recommendations provided by the American Association of Physicists in Medicine (AAPM) in their TG-40 and TG-142 documents (references 1 & 2, respectively).

### 4. VARIAN ACTIONS

#### 4.1. Notification to all affected customers is by way of this letter.

#### 4.2. Additional beam asymmetry monitoring circuitry:

Following a previous issue of undetected electron beam asymmetry (ref. 3, CP-01117), Varian has developed new dosimetry circuitry to detect certain beam asymmetry conditions. This functionality will detect the photon beam asymmetry conditions described herein. **All installations include configuration for both photon and electron beams.**

- The modification has been developed for those Varian High Energy Clinacs built using the current electronics architecture, which represents the large majority of HE Clinacs in use worldwide. This includes all H14xxxx; H27600 and higher; H29100 and higher; and all HCXxxxx.
- No similar modification will be developed for other High Energy Clinacs, including: all H26xxxx; H27599 and lower; and H29099 and lower.

If your accelerator is within the included serial number range and this modification has not already been performed, you will be contacted by your local service office to arrange installation.

We sincerely apologize for any inconvenience and thank you in advance for your cooperation. If you require further clarification or assistance, please contact your local Varian Customer Support District or Regional Manager, or Varian's Help Desk.

**ATTENTION:** This information is provided for use by qualified service technicians. Varian Medical Systems, Inc. makes no representation to the qualifications of any service technicians other than its own employees. Improper or uninformed maintenance or repair of the Product may expose a maintenance technician, operator and/or patient to safety hazards including but not limited to one or more of the following: mechanical collision, electrical shock, and radiation. Any of these hazards could cause serious injury and even death. Copyright © 2012, Varian Medical Systems, Inc. All rights reserved.

100048759  
DWG NO.

CN-732 Rev A

SHEET  
4 of 5

Bill Of Materials					
			-01	Part Number	Description
				N/A	No materials; information only
				Drawing or Document Number	Other Documents Included
				N/A	No materials; information only

**ATTENTION:** This information is provided for use by qualified service technicians. Varian Medical Systems, Inc. makes no representation to the qualifications of any service technicians other than its own employees. Improper or uninformed maintenance or repair of the Product may expose a maintenance technician, operator and/ or patient to safety hazards including but not limited to one or more of the following: mechanical collision, electrical shock, and radiation. Any of these hazards could cause serious injury and even death. Copyright © 2012, Varian Medical Systems, Inc. All rights reserved.

100048759  
DWG NO.

CN-732 Rev A

SHEET  
5 of 5