AAMI
National
Standard

AAMI RT3: 2020

Radiation therapy machine characterization

AAMI
Advancing Safety in Health Technology

Radiation therapy machine characterization

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AAMI

Abstract: This standard defines a standard XML format for publishing and reporting the physical parameters of a C-Arm Radiation Therapy Linear Accelerator or the physical parameters in a software model of such a device.

Keywords: radiotherapy equipment, machine characteristics, XML, treatment delivery

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Contents

Figures

Tables

Committee representation

Association for the Advancement of Medical Instrumentation

Radiation Therapy Committee

This AAMI standard was developed by the **AAMI Machine Characteristics Working Group** under the auspices of the AAMI Radiation Therapy Committee. Approval of this standard does not necessarily mean that all working group members voted for its approval

At the time this document was published, the **AAMI Radiation Therapy Committee** had the following participants:

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NOTE: Participation by federal agency representatives in the development of this standard does not constitute endorsement by the federal government or any of its agencies.

Foreword

As part of its ongoing commitment to provide safe and effective radiation therapy (RT) equipment, AdvaMed sponsored an industry-wide initiative to provide a standard way to report treatment machine and treatment machine model characteristics.

Using this document, manufacturers can publish their equipment characteristics digitally and manufacturers can digitally report these values as they are stored within a software model of this radiation treatment device.

The primary use cases for this document are anticipated to be:

1 Digital publication of physical equipment behavior that is needed by other manufacturers.

When a new treatment delivery system (TDS), or other radiation delivery accessory, is released into the RT industry, a machine characterization report is issued digitally by the manufacturer along with other marketing literature, technical white papers and release-for-talk documents. The digital report will be useful for users and other RT manufacturers (e.g. treatment planning systems) in assessing if the device is supported via existing implementations, models, etc. and to avoid time consuming and error prone manual entry of machine parameters into software models.

2 Cross system/cross machine model comparison.

A user creates an electronic report of the internal models of each system in their department and compares them to confirm a match of parameters.

Within the same system, it may be required to have variations of a machine due to optional features that it supports. The standard allows the user to easily identify these model differences.

3 Periodic quality assurance (QA) of machine models.

The report output can be utilized during periodic QA to confirm model consistency over time.

4 New software release check.

The report can be used to compare treatment machine models from one software release to the next; this is especially useful if the format of the internal treatment machine model has changed.

For use case 1, it is intended that each manufacturer create and publish a digital file in XML format as defined in the tables in this standard with the ELEMENTs and values that describe the full range of equipment parameters of their device. This file will be identified by having a value of PUBLISHED for the ELEMENT called report_type.

For use cases 2 through 4, it is intended that each manufacturer of a system that uses a software model of the treatment device provides a software routine that extracts the equipment parameters from their proprietary internal format or database and creates a report in the standard XML format as defined in the tables below. This file will be identified by having a value of MODELED for report_type. These manufacturers or third-party software developers then provide a way to compare the two reports and detail the differences.

Therefore, this standard provides the following:

– an XML based format for reporting treatment device parameters;

– a standard methodology for showing which parameters are being set, limited or fixed;

– a list of parameters to report for each device;

– the categorization of the parameters as mandatory, conditional or optional.

NOTE—This foreword does not contain provisions of the AAMI standard, *Radiation therapy machine characterization* (AAMI RT3:2020), but it does provide important information about the development and intended use of the document.

Radiation therapy machine characterization

1 Scope and purpose

1.1 Scope

This document provides specific requirements and guidance for the documentation of the physical behavior of an isocentric medical electron accelerator and other devices that are used for the purposes of a radiation treatment such as C-Arm Linear Accelerators.

Tomotherapeutic, multiple fixed source, robotic arm, light and heavy ion and other radiation treatment devices are not covered in this version.

This document does not claim full coverage of all configuration content. The scope is not intended to be comprehensive but to cover the majority of model conflict areas.

This document does not describe all the requirements and testing which might be necessary to validate that a combined system is safe and effective for use. For example, output factors are considered part of the dose calculation model and not part of the physical model. The physical model parameters are within the scope of this document.

Individual device manufacturers may have additional requirements beyond compliance to this document, including joint verification and validation of the combined system. Manufacturers are free to add additional private modules following the format described in Clause 4 for their own internal uses. These private tags are optional and shall be prefixed with “private_COMPANYNAME_” where COMPANYNAME is any self-chosen company name (that is, COMPANYNAME does not have to match the value of the tag “manufacturer_name” in the *manufacturer macro*).

This document intends that the characteristics will be published or reported in an electronic template format that is defined herein. The template will be in XML format to facilitate interchange and digital comparison of the data (see Annex A).

This document is intended to be used by medical device manufacturers and users in the field of radiation therapy.

1.2 Purpose

The purpose of this document is to provide a format for the electronic publication of Linac and treatment device specification information for participating components in the RT Machine Characterization (RT3) standard template exchange process.

The uses of this content standard are not defined in this document but may be mandated or referenced by other workflow or performance standards in the radiotherapy environment like those developed by Integrating the Healthcare Enterprise – Radiation Oncology (IHE-RO) and the International Electrotechnical Commission (IEC).

There are various potential actors in the standard template exchange process. They are:

– Treatment management system (TMS)

– Treatment planning system (TPS)

– Treatment delivery system (TDS)

– Treatment accessory manufacturers

– Quality assurance system (QAS) or secondary calculation systems

– Users (medical physicists)

In the case of an older machine that is no longer in production, the data may only be available from one of the above devices that is planning, controlling or otherwise working with the legacy machine or legacy device.

The consumers of published data and comparers of actual data instances are: