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Guidance for dosimetry for sterile insects release programs

*Lignes directrices de la dosimétrie pour des programmes de lâchers
d'insectes stériles*



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Foreword

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This document was prepared by ASTM Committee E61 Radiation Processing and by Technical Committee ISO/TC 85, nuclear energy, nuclear technologies and radiological protection.

This fourth edition cancels and replaces the third edition (ISO/ASTM 51940:2013), which has been technically revised.

This is a preview of "ISO/ASTM 51940:2022". Click here to purchase the full version from the ANSI store.



Standard Guidance for Dosimetry for Sterile Insect Release Programs¹

This standard is issued under the fixed designation ISO/ASTM 51940; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision.

INTRODUCTION

The purpose of this document is to present information on the use of ionizing energy (radiation) for the radiation-induced reproductive sterilization of live insects for use in pest management programs.

This document is intended to serve as a recommendation to be followed when using irradiation technology where approved by an appropriate regulatory authority. It is not to be construed as a requirement for the use of irradiation nor as a required code of practice. While the use of irradiation involves certain essential requirements to attain the objective of the treatment, some parameters can be varied in optimizing the process.

1. Scope

1.1 This document outlines dosimetric procedures to be followed for the radiation-induced reproductive sterilization of live insects for use in pest management programs. The primary use of such insects is in the Sterile Insect Technique, where large numbers of reproductively sterile insects are released into the field to mate with and thus control pest populations of the same species. A secondary use of sterile insects is as benign hosts for rearing insect parasitoids. A third use is for testing detection traps for fruit flies and moths, and testing mating disruption products for moths. The procedures outlined in this document will help ensure that insects processed with ionizing radiation from gamma, electron, or X-ray sources receive absorbed doses within a predetermined range. Information on effective dose ranges for specific applications of insect sterilization, or on methodology for determining effective dose ranges, is not within the scope of this document.

NOTE 1—Dosimetry is only one component of a total quality assurance program to ensure that irradiated insects are adequately sterilized and fully competitive or otherwise suitable for their intended purpose.

1.2 This document provides information on dosimetry for the irradiation of insects for these types of irradiators: self-contained dry-storage ¹³⁷Cs or ⁶⁰Co irradiators, self-contained low-energy X-ray irradiators (maximum processing energies from 150 keV to 300 keV), large-scale gamma irradiators, and electron accelerators (electron and X-ray modes).

NOTE 2—Additional, detailed information on dosimetric procedures to be followed in installation qualification, operational qualification, perfor-

mance qualification, and routine product processing can be found in ISO/ASTM Practices 51608 (X-ray [bremsstrahlung] facilities processing at energies over 300 keV), 51649 (electron beam facilities), 51702 (large-scale gamma facilities), and 52116 (self-contained dry-storage gamma facilities), and in Ref (1)² (self-contained X-ray facilities).

1.3 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard except for the non-SI units of minute (min) hour (h) and day (d). These non-SI units are accepted for use within the SI system.

1.4 This document is one of a set of standards that provides recommendations for properly implementing and utilizing radiation processing. It is intended to be read in conjunction with ISO/ASTM Practice 52628.

1.5 The absorbed dose for insect sterilization is typically within the range of 20 Gy to 600 Gy.

1.6 This document refers, throughout the text, specifically to reproductive sterilization of insects. It is equally applicable to radiation sterilization of invertebrates from other taxa (for example, Acarina, Gastropoda) and to irradiation of live insects or other invertebrates for other purposes (for example, inducing mutations), provided the absorbed dose is within the range specified in 1.5.

1.7 This document also covers the use of radiation-sensitive indicators for the visual and qualitative indication that the insects have been irradiated (see ISO/ASTM Guide 51539).

1.8 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

¹ This document is under the jurisdiction of ASTM Committee E61 on Radiation Processing and is the direct responsibility of Subcommittee E61.04 on Specialty Application, and is also under the jurisdiction of ISO/TC 85/WG 3.

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² The boldface numbers in parentheses refer to the list of references at the end of this standard.