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Eckert & Ziegler
Isotope Products

Cs-137 67-6500 Series Brachytherapy Tube Source

Instructions for Use

	**Manufacturer:** **Eckert & Ziegler Isotope Products** **DBA Isotope Products Laboratories** **24937 Avenue Tibbitts** **Valencia, CA 91355** **Toll Free: (866) 476-9767** **Main: (661) 309-1010**

	**Authorized EU Representative:** **Eckert & Ziegler Nuclitec GmbH** **Gieselweg 1** **38110 Braunschweig** **GERMANY**

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Warnings and Cautions

	**CAUTION**	This device contains radioactive material, which may cause injury or death if lost or used incorrectly. The device must be used by persons trained in the safe handling of radioactive sealed sources and in conjunction with a radiation safety program.
	**CAUTION**	Federal (USA) and State law(s) restricts this device to sale by or on the order of a physician.
	**WARNING**	Do not use a damaged source, or source that may have become damaged when loading the applicator.
	**WARNING**	Temperature should not exceed 280°F/ 138°C.
	**WARNING**	Pressure should not exceed 30 PSI / 1435 Pa.
	**CAUTION**	DO NOT autoclave 67-6500 Series Tube Sources in plastic tubing or containers that have a low melting point as it may prevent source recovery.

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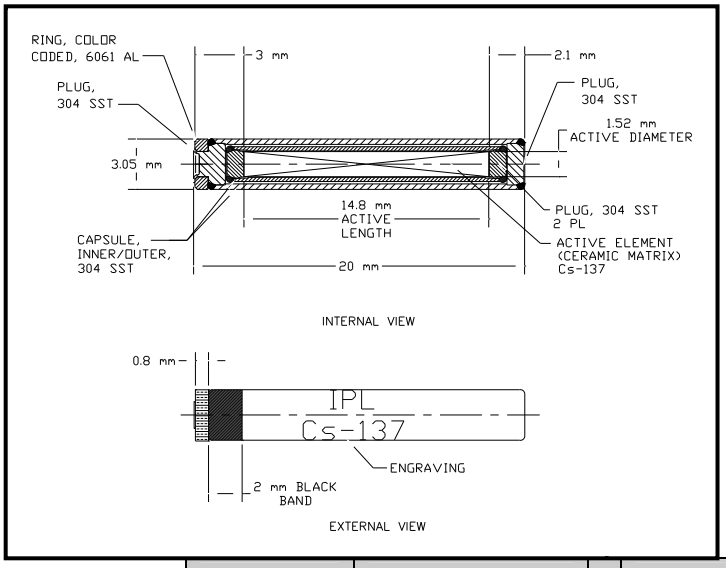
CAUTION: Federal (USA) and State laws restrict this device to sale by or on the order of a physician.

Description

Each EZIP Cs-137 Tube Source for Brachytherapy consists of a ceramic active element surrounded by two stainless steel encapsulations, each of which is of welded construction. The overall size is 20 mm long by 3.05 mm in diameter with active dimensions of 15 mm long by 1.5 mm in diameter. There is a colored ring visible from the side and one end, to facilitate easy source strength identification. Each source is also engraved with a serial number, nominal activity, nuclide (Cs-137) and "IPL". Sources are supplied **non-sterile**.

Physical Characteristics



Cs-137 has a half-life of 30.17 years[1] (11020 days) and decays with the emission of characteristic photons and electrons. The stainless steel walls of the tube source absorb the electrons and x-rays. The principal photon emission is 662 keV. The Cesium-137 is absorbed into a ceramic matrix as Cesium Nitrate. Table 1 shows the decay of Cs-137.

Year	Decay Factor		Year	Decay Factor
0	1.0000		0.5	0.989
1	0.9773		1.5	0.966
2	0.9551		2.5	0.944
3	0.9334		3.5	0.923
4	0.9122		4.5	0.902
5	0.8915		5.5	0.881
6	0.8712		6.5	0.861
7	0.8514		7.5	0.842
8	0.8321		8.5	0.823
9	0.8132		9.5	0.804
10	0.7947		10.5	0.786
11	0.7767		11.5	0.768
12	0.7591		12.5	0.750
13	0.7418		13.5	0.733
14	0.7250		14.5	0.717
15	0.7085		15.5	0.700

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Calibration

67-6500 Series Tube Sources are calibrated by direct comparison against a standard source that has been calibrated by the National Institute of Standards and Technology (NIST) or an Accredited Dosimetry Calibration Laboratory (ADCL) for Air Kerma Strength. The resulting calibration is reported in Air Kerma Strength (μGy m^2/h), apparent activity (mCi) of Cs-137, and equivalent mass (mg) of Ra-226 (mgRaEq). The apparent Cs-137 activity and equivalent mass of Ra-226 values are calculated from the air kerma measurements using the following factors:

2.873 μGym^2h^{-1}/ mCi Cs-137[8]
7.227 μGym^2h^{-1}/ mgRaEq[9]

Available Source Strength Range

The chart below shows the most commonly used source activity levels. Other source strengths are available by special order.

Table 2. Cs-137 67-6500 Series Tube Source Activity Levels

Product Number	mg Ra-226 Equivalent	Color Code	Apparent Nominal Cs-137 Activity	Air Kerma Strength (Nominal)	Air Kerma Strength
	(mg)		(mCi)	(μGy m^2/h)	(μGy m^2/h)
67-6505	5	Purple	12.5	36.1	32.5– 39.7
67-6510	10	Red	25.0	72.3	65.1 – 79.5
67-6515	15	Black	37.5	108.4	97.6 – 119.2
67-6520	20	White	50.0	144.5	130.1 – 159
67-6525	25	Blue	62.5	180.7	163.5 – 197.9
67-6530	30	Orange	75.0	216.8	198.2 – 235.4
67-6535	35	Green	87.5	252.9	236 – 269.8
67-6540	40	Gray	100.0	289.1	270– 308.2

Dose calculations should account for a moderate anisotropic dose distribution around each 67-6500 Series Tube Source, as with other brachytherapy sources.[3, 4] Appropriate parameters should be included in treatment planning.

Source Integrity

EZIP 67-6500 Series Tube Sources are gauged dimensionally, visually inspected, cleaned, assayed, and leak tested in two manners prior to distribution. Prototype sources have passed structural integrity tests as defined by ANSI N44.1-1973 , "American National Standard, Integrity and Test Specifications for Selected Brachytherapy Sources"[11] and have been classified to ISO/99/C64333 in accordance with ISO-2919, "Radiation Protection – Sealed radioactive sources – General requirements and classification"[12]. The sources have high structural integrity and have been approved for licensing for general medical use by the State of California Department of Public Health.

Shipping/Labeling

Eckert & Ziegler Isotope Products Cesium-137 Tube Sources are shipped in a lead storage container and labeled to indicate the isotope, the apparent activity range, total apparent activity, reference date, and source serial number(s). Apparent activity refers to the radiation output and not the contained activity.

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Indications

EZIP Cs-137 Tube Sources are designed for use in appropriate applicators for treatment of gynecological cancer. The sources can be used in other treatment modalities as prescribed by a qualified practitioner.

Contraindications

Contraindications may exist depending on the patient, type of cancer, location inside of body, etc. Contraindications need to be established by the physician.

Adverse Reactions

As brachytherapy sources achieve therapeutic results through radiation, any adverse event associated with tissue radiation damage may be associated with the use of Cs-137 sources.

Radiation Protection & Handling

The 662 keV photons of Cs-137 are substantially absorbed by any high Z material such as lead or concrete and exhibit desirable penetration in tissue.

HVL Lead= 6.5 mm

HVL Tissue= 100 mm

The shielding of Cs-137 Tube Sources results in a reduction of exposure to attending medical personnel and visitors.

Cs-137 Tube Sources should be handled only by those individuals trained by an authorizing governmental agency in the safe use and handling of radionuclides. Direct contact with Cs-137 Tube Sources should be avoided. The use of forceps or tweezers is recommended. Proper precautions must be taken when handling the sources.

Personnel monitoring is required. Dosimetry monitors, such as TLD devices, should be used to monitor hand and whole body exposure. During preparation and source implantation procedures, all practical steps should be taken to keep exposure as low as reasonably achievable. Limited exposure time, increasing distance, careful planning of the administration procedure, and use of shielded barriers should be considered in meeting this goal.

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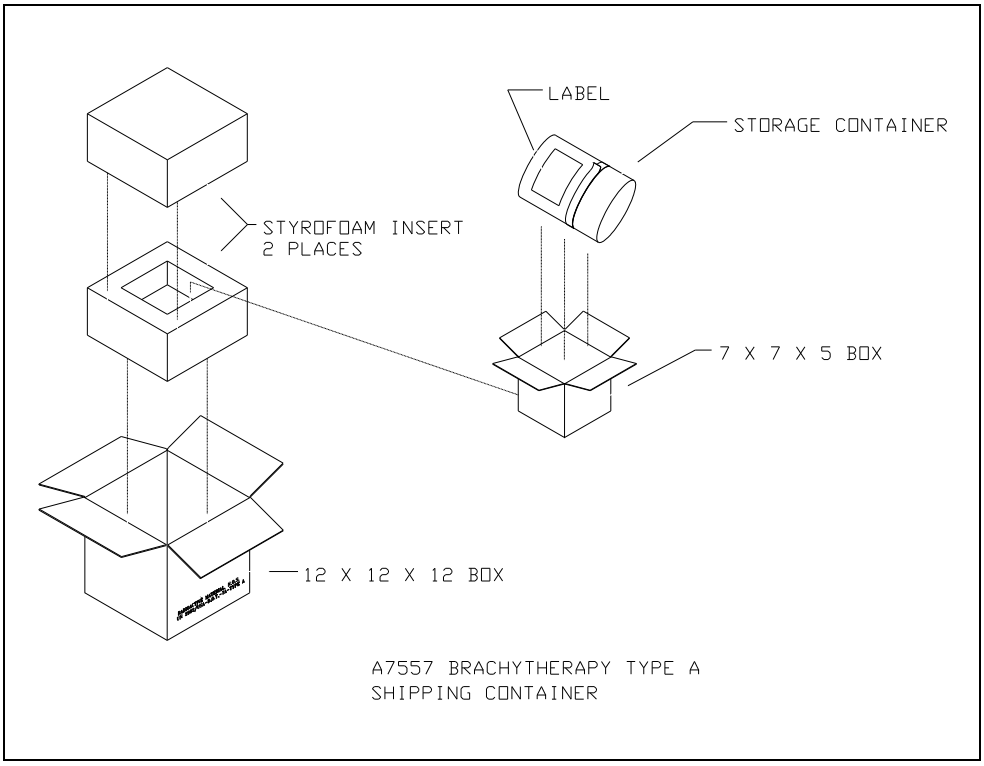
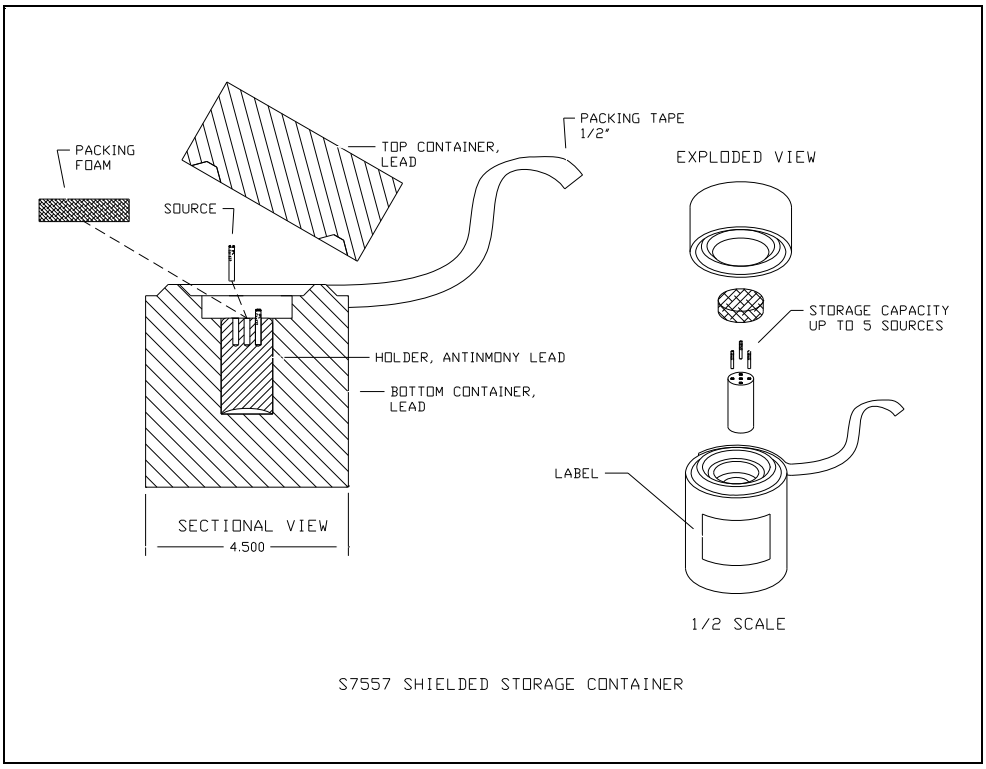
Package Diagram



Storage Container Diagram



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Unpacking Instructions

1. Inspect the outer package for damage.
2. Perform a wipe test on the outer package and assay the wipe to ensure that there has not been a loss of radioactivity during shipment. If the assay of the wipe indicates the presence of radioactivity in excess of your facility's wipe test limits for incoming packages, notify your Radiation Safety Officer or immediate supervisor.
3. If the wipe test indicates that the package is free of contamination or below limits for incoming packages, you may proceed.
4. Cut the fiberglass reinforced tape along the top and transverse seams to open the package.
5. Remove the top layer of Styrofoam packing to expose the inner box.
6. Remove the inner box.
7. Cut the fiberglass reinforced tape along the top and transverse seams to open the inner box and expose the heavy lead shield.
8. Remove any padding and dispose.
9. Remove the lead shield. Do not remove the tape securing the two halves of the shield.
10. Move the shield to a shielded location in order to reduce body dose during the next steps.
11. Assemble handling equipment and survey equipment. Ensure that you are authorized to open the shield and remove the sources.
12. Remove the tape securing the two shield halves (top and bottom).
13. Remove the top shield. The sources are now exposed.
14. Perform wipe test upon sources and assay per AAPM guidelines.[17]
15. Verify serial numbers and certificate data.
16. You can now remove the sources from the shield using long (>12") tongs or tweezers. Do not touch the sources with your hands as the dose rate near the sources is very high. Do not use clamping pliers, or hemostats as these may damage the sources.
17. Transfer source(s) into a secure storage safe. Ensure adequate measures exist to control access to the sources and prevent loss in accordance with applicable regulatory guidelines.

Handling

Eckert & Ziegler Isotope Products Cesium-137 Tube Sources are supplied in a heavy lead shield. The top and bottom portion of the lead shield is secured using tape or shrink-wrap tubing. The shield assembly is then loaded into a small box secured by fiberglass reinforced adhesive tape which is then placed within solid foam dunnage, which is then placed within a fiberboard box secured with fiberglass reinforced adhesive tape.

EZIP Cs-137 Tube Sources are radioactive and appropriate precautions must be taken when handling these sources. All steps of the use procedure should be planned in advance to minimize radiation exposure to personnel consistent with published exposure limits.[2]

Personnel monitoring is required for individuals working with Cesium-137 sources. A film badge or TLD dosimeter worn on the body and, for handling, a ring dosimeter will provide adequate detection.

EZIP Cesium-137 Tube Sources must be stored in a protective lead safe or vault of such thickness as is necessary to reduce exposure rates to permissible levels[3]. When transporting sources within the hospital premises, an appropriate carrier with adequate shielding should be used.

All manipulations involving EZIP Cesium-137 Tube Sources should be carried out behind shielding of such size and thickness as will adequately shield the operator. DIRECT CONTACT WITH THE SOURCES SHOULD BE AVOIDED. In addition, EZIP Cesium-137 tube sources should be handled only with forceps, with as much distance as practical between sources and the operator. EZIP CESIUM-137 TUBE SOURCES SHOULD NEVER BE TOUCHED WITH THE HANDS.

Radiation detection equipment should be available whenever EZIP Cesium-137 Tube Sources are handled.

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Directions for Use

EZIP 67-6500 Series Tube Sources are supplied non-sterile.

The treatment procedure is prescribed by the physician on a case by case basis.

WARNING: Do not use a damaged source, or source that may have become damaged.

Patient Education

Patients and people who come into contact with sources must be informed of the nature of the Cs-137 Tube Sources and follow radiation precautions as outlined by the National Council on Radiation Protection and Measurements, Federal (US), and State Regulations.

Application to Patient

EZIP Cesium-137 Tube Sources should be used only by individuals who are qualified by training and experience in the safe use and handling of radionuclides and whose experience and training have been approved by the appropriate government agency authorized to license the use of radionuclides. The American College of Radiology recommends that the brachytherapy team should include a Radiation Oncologist (physician), Qualified Medical Physicist, Medical Dosimetrist, Radiation Therapist, nurse, and Radiation Safety Officer. The ACR also recommends the qualification of such individuals.[15]

All practical physical protection should be provided during application procedures as determined by a physician. When the use of protective barriers is not practical, operators must rely on distance and speed to minimize radiation exposure.[3] Persons should not remain closer than necessary to the radioactive material, either before or after its introduction into the patient.

In addition, careful planning of the geometrical arrangement of the sources will reduce radiation exposure to personnel during the loading procedure by avoiding hesitation and changes.

Treatment of Patient

All patients should be informed of the nature of treatment with EZIP Cesium-137 Tube Sources and the expected period of time during which radiation precautions will be necessary. Patients, their close associates, and associated medical personnel should be instructed in the necessary radiation safety procedures required for someone who is being treated with Cesium-137. Guidelines for necessary precautions have been established by the National Council on Radiation Protection and Measurements and are detailed in NCRP Reports. [2, 3, 4, 5, 6]

The bed, cubicle, or room of the hospital patient should be marked with a sign or tag indicating the presence of brachytherapy sources. In addition, the patient's chart should indicate the number and nature of the sources, the total amount of activity, and the time and date of application and anticipated removal.

The extent to which a patient with EZIP Cesium-137 Tube Sources must be segregated depends upon the total activity used, its location in the patient, how long it is to be there, and to what exposure other persons near the patient are subjected. Consideration must be given to the proximity of patients in adjoining rooms, since normal wall construction may have little value in shielding gamma radiation.

A patient being treated with EZIP Cesium-137 Tube Sources should be restricted to his or her room. The patient must not be allowed to leave the hospital until the sources have been removed. During the course of treatment, the radiation oncologist on a regular basis should evaluate the patient. Source placement, medical condition, and radiation safety issues should be addressed during the course of treatment[15]. During the course of treatment, the patient should carry a wristband or suitable identification, which provides information regarding the radioactive nature of the treatment.

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During the course of treatment with EZIP Cesium-137 Tube Sources, bandages and dressings should be changed only by individuals trained in radiation safety techniques. Dressings must not be discarded until they have been checked for the presence of sources and none are to be found. Bed baths should not be performed while the sources are in place. Nursing care necessary for the patient's well being should be pre-planned and delivered quickly to minimize time spent at the bedside.

If a source becomes loose or falls out, it should be picked up with forceps and placed in a shielded container in the patient's room. The physician and radiation protection supervisor should be notified of such an event as soon as possible after its occurrence.

Removal & Verification

When EZIP Cesium-137 Tube Sources are removed from a patient, the same radiation protection procedures used for insertion should be observed, or as determined by the physician. All linens, dressings, clothing, and equipment should be kept within the cubicle or room where the removal takes place until all sources are accounted for. Appropriate detectors and a shielded carrier should be available in the room where source removal takes place.

After the removal procedure, it should be determined that all EZIP Cesium-137 Tube Sources have been removed. This may be accomplished by surveying the patient with an appropriate radiation detector.

Following their removal from a patient, EZIP Cesium-137 Tube Sources must be returned to an individual designated as the source custodian for cleaning, inventory, and storage in a controlled area.

Accountability & Disposal

Records of receipt, storage and disposal of Cs-137 Tube Sources should be maintained in accordance with government regulatory policies. Cs-137 sources should be strictly controlled and stored in a secured area. When disposal is indicated, the Cs-137 sources should be transferred to an authorized radioactive waste disposal agency. Brachytherapy sources should not be disposed of in normal waste. Any discrepancies must be reported immediately to the local radioactive materials regulatory agency.

Dosage and Administration

The total activity of EZIP Cesium-137 Tube Sources required for any given treatment depends upon several factors, among which include tumor type and size, anatomical geometry, and previous radiation history to the tumor site. The treatment plan for a particular patient, including the number and strength of sources and the length of treatment time should be prescribed by a qualified physician in accordance with ACR and ABS guidelines [15, 16]. The EZIP Cesium-137 tube source decays at a rate of approximately 2% per year, and as a result, treatment times should be adjusted periodically. Parameters for treatment planning systems may be found in the report entitled, "TG-43 Characterization of the EZIP 67-6500 ^{137}Cs Tube Source using Monte Carlo Transport Calculations", which is available from Eckert & Ziegler Isotope Products on request.

Cleaning

Eckert & Ziegler Isotope Products Laboratories Cesium-137 Tube Sources should be cleaned following their removal from the patient and before being returned to a storage safe. While cleaning sources, adequate precaution should be taken to avoid radiation exposure to the staff, damage to sources, and loss of sources.

Cleaning of Eckert & Ziegler Isotope Products Cesium-137 Tube Sources may be accomplished by rinsing or soaking the sources in water or, if dried fluids are present, in a hydrogen peroxide: water (1:1) solution, Betadyne solution, or enzymatic cleaner (e.g Terg-A-Zyme, Enzyclean). An ultrasonic bath may also be used for 15 minutes. Following cleaning, Eckert & Ziegler Isotope Products Cesium-137 Tube Sources should be air-dried or rinsed in alcohol. Clean the anodized ring with alcohol using a long (>12 inch) cotton swab.

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Abrasive substances (e.g. metal cleaners, polishes) and corrosive substances must not be used to clean Eckert & Ziegler Isotope Products Cesium-137 Tube Sources. In addition, sources should not be allowed to come in to contact with mercury or mercury-containing solutions, or any other toxic or biologically hazardous materials.

Sterilization

WARNING: Sources are supplied non-sterile and are not intended to come into contact with the patient.

Eckert & Ziegler Isotope Products Cesium-137 tube sources may be sterilized with steam (autoclave) only. The sources should be placed in an adequately shielded container prior to placement in the sterilization chamber. Manipulation of the sources prior to or following sterilization should be carried out behind shielding of such size and thickness as will adequately shield the operator. In addition, Eckert & Ziegler Isotope Products Cesium-137 tube sources should be handled only with forceps. Autoclaves should be equipped with traps or other means to prevent source loss through the drain hole.

Eckert & Ziegler Isotope Products Cesium-137 tube sources withstand normal sterilization conditions of temperature and pressure as indicated in the table below.

Sterilizer Type:	Gravity
Minimum Temperature	121º C / 250º F
Maximum Temperature	138º C / 280º F
Full Cycle Time	15 Minutes
Sterilization Assurance Level (SAL)	10^{-6}
Validation Method	BI overkill method

WARNING: Temperature should not exceed 280°F/ 138°C.

WARNING: Pressure should not exceed 30 PSI / 1435 Pa.

CAUTION: DO NOT autoclave 67-6500 Series Tube Sources in plastic tubing or containers which have a low melting point as it may prevent source recovery.

Storage

Cs-137 sources are subject to regulatory control and should, therefore, be strictly controlled and stored in a limited access, locked storage area. Records of receipt, storage, transfer, and disposal should be maintained in accordance with the requirements of government agencies. If Cs-137 sources cannot be accounted for, the loss must be reported to the appropriate licensing agencies.

Accidental Damage

It is possible through rough handling (abrasion, incision, etc.), high temperatures or crushing that a source could rupture and leak. The area should be closed off immediately and personnel limited to avoid radioactive contamination. he damaged sources should be placed in a shielded and sealed container and the radiation protection supervisor should be notified of the event as soon as possible after its occurrence. Traffic in the area of the incident must be minimized to reduce the spread of contamination. The area should be decontaminated as directed by the radiation protection supervisor by individuals trained in the safe handling of radioactive materials.

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Licensing

The California Department of Public Health has approved distribution of the Cs-137 Tube Source to persons licensed to use radioactive material identified in Title 17, California Code of Regulations, section 30170 – 30237 and in 10 CFR 35.65, 35.400, 35.500, and 35.600 as appropriate, and to persons who hold an equivalent license issued by the US Nuclear Regulatory Commission or an Agreement State.

Eckert & Ziegler Isotope Products requires proof of a NRC radioactive materials license as well as agreement state & licensing state information. Orders cannot be processed without license verification. Compliance with the applicable local, state and federal regulations concerning procurement, possession, use and disposal of radioactive materials is the responsibility of the customer.

Leak Testing

Eckert & Ziegler Isotope Cesium-137 Tube Sources are leak tested prior to shipment[13] and have passed a leak test showing < 185 Bq (5 nCi) of removable Cs-137 as required by Title 17, California Code of Regulations, section 30275(c). The leak test date is printed on the Sealed Source Certificate form that accompanies each shipment. Leak tests should be performed upon receipt and at 6 month intervals (or at a different schedule in accordance with prevailing regulatory statutes) in accordance with leak tests defined in ISO-9978[14] or ANSI N.44-2[13].

Returns

Eckert & Ziegler Isotope Products Cesium-137 Tube Sources may be returned for credit under the following terms:

- Prior return authorization ***must*** be obtained from Eckert & Zeigler Isotope Products Customer Support Department by calling (661) 309-1010.
- A return address will be provided with return authorization from Eckert & Ziegler Isotope Products.
- PLEASE DO NOT RETURN SOURCES WITHOUT FIRST OBTAINING A RETURN AUTHORIZATION.

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References

1. Fletcher, GH, M.D., ed. Textbook of Radiotherapy, Lea & Febiger, Philadelphia, Pennsylvania, 1973
2. NCRP Report No. 37, NCRP Publications, P.O. Box 30175, Washington, DC 20014
3. NCRP Report No. 40, NCRP Publications, P.O. Box 30175, Washington, DC 20014
4. NCRP Report No. 41, NCRP Publications, P.O. Box 30175, Washington, DC 20014
5. NCRP Report No. 48, NCRP Publications, P.O. Box 30175, Washington, DC 20014
6. NCRP Report No. 49, NCRP Publications, P.O. Box 30175, Washington, DC 20014
7. IAEA Tech Doc 619, 1991
8. University of Wisconsin calibration report
9. AAPM Report No. 51, "Dosimetry of Interstitial Brachytherapy Sources"
10. AAPM Report No. 21, "Specification of Brachytherapy Source Strength", June 1987
11. ANSI N44.1(1973) , "American National Standard, Integrity and Test Specifications for Selected Brachytherapy Sources"
12. ISO-2919(1999), "International Standard, Radiation Protection – Sealed radioactive sources – General requirements and classification"
13. ANSI N44-2(1973),"American National Standard for leak-testing radioactive brachytherapy sources"
14. ISO-9978(1992), "International Standard, Radiation Protection – Sealed radioactive sources – Leakage test methods"
15. "ACR Practice Guideline for the performance of Low-Dose-Rate Brachytherapy", American College of Radiology, 1996 (Res. 13), revised in 2000 (Res. 24)
16. "The American Brachytherapy Society Recommendations for Low-Dose Rate Brachytherapy for Carcinoma of the Cervix", Int. J. Radiation Oncology Biol. Phys., Vol 52, No. 1, pp. 33-48, 2002
17. "Code of practice for brachytherapy physics: Report of the AAPM Radiation Therapy Committee Task Group No. 56" Med. Phys. 24 (10), October 1997
18. "TG-43 Characterization of the IPL 67-6500 ^{137}Cs Tube Source using Monte Carlo Transport Calculations", May 2004.
19. Council Directive 96/26/Euratom of 13 May 1996 laying down basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionizing radiation.
20. Council Directive 97/43/Euratom of 30 June 1997 on health protection of individuals against the dangers of ionizing radiation in relation to medical exposure, and repealing Directive 84/466/Euratom.

TG-43 Parameters for 67-6500 series tube source

AAPM report 51 describes four parameters, g(r), F(r, θ), S_K, and Λ that can be used to calculate a 2 dimensional dose distribution using the following equation.

$$D(r,\theta)=S_K\Lambda[G(r,\theta)/G(r_0,\theta_0)g(r)F(r,\theta)$$

where

S_K = air kerma strength of the source (defined in sec. III A 2 of AAPM Report 51),
Λ = dose rate constant (defined in Sec. III A 3 of AAPM report 51 in units of cGyh-1U-1),
G(r, θ) = geometry factor (defined in Sec. III A 4 of AAPM Report 51),
g(r) = radial dose function (defined in Sec. III A 5 of AAPM Report 51),
F(r, θ) = anisotropy function (defined in Sec. III A 6 of AAPM Report 51).

The EZIP Model 67-6500 tube source was modeled by the University of Wisconsin's Department of Medical Physics. The full report is available from Eckert & Ziegler Isotope Products upon request. The following pages provide the parameters g(r), F(r,θ), S_K, and Λ.

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Depth of Dose function g(r)

r(cm)	g(r)
0.25	1.009
0.50	1.003
0.75	1.001
1.00	1.000
1.50	0.995
2.00	0.994
2.50	0. 87
3.00	0.981
3.50	0.976
4.00	0.970
4.50	0.964
5.00	0.957
5.50	0.950
6.00	0.943
6.50	0.936
7.00	0.928
7.50	0.919
8.00	0.910
8.50	0.901
9.00	0.892
9.50	0.885
10.00	0.876
10.50	0.865
11.00	0.855
11.50	0.843
12.00	0.833
12.50	0.822
13.00	0.810
13.50	0.800
14.00	0.789
14.50	0.780
15.00	0.766

Air Kerma Strength S_K = 2.7851 cGy cm^2/h mCi where mCi of Cs-137 is contained activity.

Dose rate constant Λ=0.9519cGy/(h U)

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The 2D anisotropy function, F(r,θ), is shown in the table below where r is expressed in cm, θ is expressed in degrees, origin is the center of the active region of the source, and 180º represents the end of the source with the colored ring. The marks ***** indicate areas within the source.

	r(cm)														
deg	0.25	0.50	0.75	1.00	1.25	1.50	2.00	3.00	4.00	5.00	6.00	7.00	8.00	10.00	15.00
0.	*****	*****	*****	0.950	0.946	0.945	0.941	0.938	0.937	0.939	0.935	0.937	0.934	0.946	0.943
1.	*****	*****	*****	0.952	0.946	0.944	0.941	0.936	0.935	0.938	0.934	0.936	0.937	0.952	0.943
2.	*****	*****	*****	0.953	0.946	0.944	0.942	0.938	0.940	0.938	0.930	0.930	0.934	0.940	0.933
3.	*****	*****	*****	0.952	0.946	0.943	0.939	0.930	0.925	0.925	0.919	0.919	0.921	0.932	0.929
4.	*****	*****	*****	0.953	0.946	0.942	0.932	0.923	0.924	0.924	0.918	0.919	0.924	0.930	0.936
5.	*****	*****	*****	0.953	0.940	0.932	0.923	0.915	0.913	0.916	0.911	0.913	0.917	0.925	0.926
6.	*****	*****	*****	0.947	0.929	0.923	0.914	0.907	0.923	0.915	0.911	0.911	0.916	0.927	0.932
7.	*****	*****	*****	0.934	0.924	0.918	0.909	0.904	0.905	0.909	0.906	0.908	0.919	0.925	0.936
8.	*****	*****	*****	0.931	0.917	0.910	0.906	0.905	0.909	0.913	0.909	0.912	0.919	0.924	0.935
9.	*****	*****	*****	0.925	0.915	0.914	0.910	0.908	0.910	0.914	0.912	0.915	0.920	0.928	0.934
10.	*****	*****	*****	0.931	0.918	0.916	0.914	0.913	0.916	0.919	0.916	0.921	0.924	0.933	0.945
20.	*****	1.023	1.003	0.979	0.969	0.964	0.959	0.957	0.956	0.957	0.956	0.969	0.958	0.962	0.964
30.	*****	1.010	1.002	0.992	0.985	0.985	0.983	0.978	0.978	0.980	0.977	0.976	0.976	0.981	0.982
40.	1.018	1.002	0.998	0.995	0.992	0.991	0.990	0.989	0.987	0.989	0.987	0.987	0.988	0.988	0.988
50.	1.009	1.002	1.005	0.997	0.995	0.994	0.993	0.993	0.993	0.993	0.992	0.992	0.994	0.995	1.004
60.	1.005	1.000	0.999	0.997	0.999	0.999	0.996	0.996	0.995	0.997	0.994	0.995	0.995	0.996	0.997
70.	1.003	1.000	0.998	0.999	0.998	1.002	1.000	0.999	0.998	1.001	0.996	0.998	0.998	1.005	0.999
80.	1.001	1.003	0.999	0.998	0.998	0.999	1.000	0.999	0.998	1.000	0.997	0.998	1.002	0.999	1.000
90.	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
100.	1.001	1.001	1.004	0.999	0.999	1.000	1.002	1.000	1.001	1.001	1.007	1.001	1.001	1.000	1.005
110.	1.004	1.002	1.000	0.999	0.999	1.000	1.000	1.000	0.999	1.000	0.995	0.996	0.997	1.001	1.000
120.	1.003	1.000	0.998	0.998	0.996	0.996	0.997	0.996	0.995	0.997	0.996	0.994	0.996	0.998	0.996
130.	1.009	1.002	0.999	0.997	0.996	0.998	0.996	0.995	0.993	0.995	0.993	0.994	0.994	0.996	0.996
140.	1.019	1.005	0.999	0.994	0.992	0.991	0.989	0.990	0.988	0.988	0.985	0.987	0.987	0.987	0.984
150.	*****	1.011	1.001	0.991	0.986	0.984	0.981	0.981	0.979	0.979	0.977	0.976	0.975	0.983	0.979
160.	*****	1.027	1.003	0.978	0.968	0.965	0.960	0.957	0.956	0.956	0.955	0.955	0.958	0.959	0.971
170.	*****	*****	*****	0.933	0.914	0.908	0.906	0.907	0.910	0.913	0.915	0.919	0.923	0.930	0.933
171.	*****	*****	*****	*****	0.906	0.901	0.899	0.901	0.904	0.909	0.910	0.911	0.915	0.928	0.936
172.	*****	*****	*****	*****	0.909	0.900	0.896	0.896	0.899	0.903	0.905	0.907	0.911	0.922	0.931
173.	*****	*****	*****	*****	0.914	0.905	0.898	0.895	0.896	0.901	0.902	0.907	0.909	0.925	0.924
174.	*****	*****	*****	*****	0.918	0.909	0.900	0.895	0.895	0.899	0.899	0.903	0.909	0.919	0.921
175.	*****	*****	*****	*****	0.919	0.915	0.902	0.898	0.897	0.900	0.900	0.905	0.906	0.917	0.922
176.	*****	*****	*****	*****	0.923	0.917	0.909	0.903	0.903	0.906	0.906	0.908	0.911	0.917	0.926
177.	*****	*****	*****	*****	0.924	0.919	0.916	0.910	0.908	0.909	0.910	0.912	0.916	0.921	0.921
178.	*****	*****	*****	*****	0.924	0.925	0.919	0.918	0.917	0.917	0.917	0.920	0.923	0.924	0.928
179.	*****	*****	*****	*****	0.923	0.920	0.919	0.919	0.919	0.923	0.922	0.923	0.929	0.928	0.936
180.	*****	*****	*****	*****	0.925	0.921	0.919	0.920	0.921	0.923	0.923	0.924	0.929	0.930	0.936