Exradin Ion Chambers

Exradin (**EX**acting **RAD**iation **IN**strumentation) **Ion Chambers** have been built for over 33 years, are recognized by top research institutes and standards laboratories, and have a worldwide reputation for integrity and excellence. Since being acquired by Standard Imaging in 2000, the Exradin line has maintained the same standards for quality workmanship and continues the tradition of exacting precision.

What attributes make Exradin the smart choice?

Durable, dependable and reliable

- Construction material is durable and more robust than typical chambers (i.e. PMMA thimble tips), and therefore is more suitable for routine measurements
- Excellent inherent material conductivity eliminates the need for troublesome conductive coatings found in many other chambers, which can flake off and require very careful handling
- Inherently waterproof construction for use in most water tanks – eliminating the need for waterproofing sleeves or protective coatings
- The Exradin A12 Ion Chamber Chamber survived 3 drop tests from 1 meter high onto a hard floor without a change in calibration.

Stable behavior

- Proper guard design defines a consistent collecting volume with uniform field lines providing a stable and repeatable signal
- Exradin chambers feature some of the quickest settling times of any ion chamber manufacturer
- Exceptionally wide guard rings on all parallel plate chambers eliminate any perturbation volume effects

Accuracy through a proper, theoretically ideal design

- Only the guard defines the collecting volume
- Axially symmetric design, along with proper guard design, ensures a uniform isotropic response
- Collection efficiencies of 99.9% or better
- Chamber vents through a flexible tube surrounding the triaxial cable – vent tube is sealed to the chamber body and vents to the ambient near the connector; ideal for use in water or plastic phantoms
- All chamber models can handle up to 1000V of polarizing potential
- Homogeneous construction on most chambers – collector, guard and shell are made of same conductive material developed by Dr. Francis Shonka, the creator of A150 tissue-equivalent and C552 air-equivalent plastics

Quick response upon hookup

- Ionization currents may be read immediately after electrometer and extension cable transients subside because Exradin chambers do not exhibit voltage soakage or stem effect phenomena
- All chambers have leakages $< 10 \times 10^{-15}$ amps

Repairable

- Repairing a chamber can be a cost effective option to buying a new chamber if a thimble or entry window were to become damaged – Standard Imaging receives chambers for service that have been in the field for decades!

Other Exradin benefits

- Chambers constructed of Shonka conductive plastics, some available in three varieties – C552, D400 or A150
- Extensive build-up cap options are available for most chambers including homogenous C552, A150, D400, Delrin, and Brass
- Handsome wooden case included; protects chamber during storage and shipment

EXRADIN Ion Chambers Product Matrix

	THIMBLE ION CHAMBERS							MICRO ION CHAMBERS		
MODEL	**1**	**A1SL**	**2**	**18**	**A19**	**A12**	**A12S**	**14**	**A14SL**	**A16**
Collecting Volume	0.057 cc	0.057 cc	0.54 cc	0.125 cc	0.62 cc	0.65 cc	0.25 cc	0.016 cc	0.016 cc	0.007 cc
Centroid of Collecting Volume from exterior tip of shell	4.0 mm	4.1 mm	7.0 mm	5.3 mm	13.0 mm	12.9 mm	5.8 mm	~2.0 mm	~2.1 mm	~1.7 mm
Centroid of Collecting Volume from exterior surface of window										
Outside Diameter of Shell Collecting Volume	6.0 mm	6.35 mm	11.4 mm	6.9 mm	7.1 mm	7.1 mm	7.1 mm	6.0 mm	6.35 mm	3.4 mm
Inside Diameter of Shell Collecting Volume	4.0 mm	4.0 mm	9.5 mm	4.9 mm	6.1 mm	6.1 mm	6.1 mm	4.0 mm	4.0 mm	2.4 mm
Window Collector Gap										
Shell Wall Thickness	1.0 mm	1.1 mm	1.0 mm	1.0 mm	0.5 mm	0.5 mm	0.5 mm	1.0 mm	1.1 mm	0.5 mm
Collector Diameter	1.0 mm	1.0 mm	4.6 mm	1.0 mm	1.0 mm	1.0 mm	1.0 mm	0.3 mm	0.3 mm	0.3 mm
Guard Ring Width (Radial)										
Collector Length	4.4 mm	4.4 mm	8.4 mm	6.4 mm	21.6 mm	21.6 mm	7.5 mm	1.5 mm	1.5 mm	1.27 mm
Window Material*										
Window Thickness										
Window or Support Rings, Collector and Guard Material*										
Shell, Collector and Guard Material*	A, T	A	A, P, T	A	A	A	A	SHELL ONLY A, T	SHELL ONLY A	SHELL ONLY A
Nominal Air Kerma Calibration Factor†	550 Gy/μC	550 Gy/μC	55 Gy/μC	230 Gy/μC	45 Gy/μC	45 Gy/μC	120 Gy/μC	2.5 Gy/nC	2.5 Gy/nC	3.5 Gy/nC
Nominal Leakage	$<10^{-15}$ amps	$<10^{-15}$ amps	$<10^{-15}$ amps	$<10^{-15}$ amps	$<10^{-15}$ amps	$<10^{-15}$ amps	$<10^{-15}$ amps	$<10^{-15}$ amps	$<10^{-15}$ amps	$<10^{-15}$ amps
Maximum Polarizing Voltage	1000 volts	1000 volts	1000 volts	1000 volts	1000 volts	1000 volts	1000 volts	1000 volts	1000 volts	1000 volts
Waterproof	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Included Buildup Cap	None	None	None	Co-60	Co-60	Co-60	Co-60	None	None	Co-60

* ***MATERIAL:*** ***A*** *– C552 Shonka air-equivalent plastic* ***P*** *– D400 polystyrene-equivalent plastic* ***T*** *– A150 Shonka tissue-equivalent plastic*

† *Nominal calibration factor for Co-60*

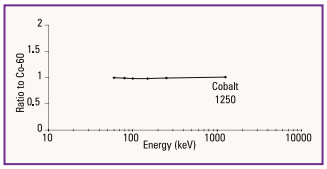
CT ION CHAMBERS		SPHERICAL ION CHAMBERS					PARALLEL PLATE ION CHAMBERS					
101	**17**	**A3**	**A4**	**A5**	**A6**	**A8**	**A10**	**11**	**11TW**	**A20**	**Magna A600**	**Magna A650**
4.6 cc	1.91 cc	3.6 cc	30 cc	100 cc	800 cc	15.7 L	0.051 cc	0.62 cc	0.92 cc	0.074 cc	1.0 cc	3.0 cc
							1.0 mm	2.0 mm	1.5 mm	1.8 mm	4.0 mm	4.0 mm
10.0 mm	12.7 mm	19.6 mm	39.1 mm	63.1 mm	120.4 mm	323.2 mm						
8.0 mm	6.0 mm	19.1 mm	38.1 mm	57.2 mm	114.4 mm	311.2 mm						
							2.0 mm	2.0 mm	3.0 mm	5.0 mm	7.95 mm	7.95 mm
1.0 mm	3.3 mm	0.25 mm	0.5 mm	3.0 mm	3.0 mm	6.0 mm						
2.5 mm	2.5 mm	2.1 mm	4.1 mm	6.5 mm	11.6 mm	22.4 mm	5.4 mm	20.0 mm	20.0 mm	1.93 mm	12.7 mm	21.9 mm
							4.3 mm	4.4 mm	4.4 mm	1.2 mm	3.9 mm	7.6 mm
100 mm	80 mm	13.3 mm	24.9 mm	37.3 mm	74.0 mm	166.7 mm						
							3.86 mg/cm^2 Kapton	1.0 mm, A, P, or T	3.86 mg/cm^2 Kapton	7.72 mg/cm^2 Kapton	3.86 mg/cm^2 Kapton	3.86 mg/cm^2 Kapton
							0.05 mm	1.0 mm	0.05 mm	0.09 mm	0.05 mm	0.05 mm
							A	A, P, T	A, P, T	A	A	A
A	A	A	A	A	A	A						
5.2 Gy/μC	1.2 R/nC	0.9 R/nC	0.09 R/nC	0.03 R/nC	0.004 R/nC	0.00022 R/nC	530 Gy/μC	48 Gy/μC	30 Gy/μC	370 Gy/μC	180 Gy/μC	2.1 R/μC
$<10^{-15}$ amps	$<10^{-15}$ amps	$<10^{-15}$ amps	$<10^{-15}$ amps	$<10^{-15}$ amps	$<10^{-15}$ amps	$<10^{-15}$ amps	$<10^{-15}$ amps	$<10^{-15}$ amps	$<10^{-15}$ amps	$<10^{-15}$ amps	$<10^{-15}$ amps	$<10^{-15}$ amps
1000 volts	1000 volts	1000 volts	1000 volts	1000 volts	1000 volts	1000 volts	1000 volts	1000 volts	1000 volts	1000 volts	400 volts	400 volts
No	Yes	No	No	No	No	No	Yes, with included cap	Yes	Yes, with included cap	No	No	No
Acrylic sleeve	Co-60 integral	None	None	Co-60 integral	Co-60 integral	None	1.0 mm acrylic, TG-51 Compliant	None	1.0 mm acrylic, TG-51 Compliant	None	None	None

THIMBLE ION CHAMBERS

- For absolute dosimetry calibrations in water, air or other phantom material
- Inherently waterproof construction for use in most water tanks — eliminating the need for waterproofing sleeves or protective coatings
- Chamber vents through a flexible tube surrounding the triaxial cable — vent tube is sealed to the chamber body and open near the connector; ideal for use in water or plastic phantoms
- Matching 2.8 mm thick Cobalt-60 build-up cap of C552 Shonka air-equivalent plastic included for in-air measurements. Additional Delrin and brass build-up caps available.

EXRADIN A19 ION CHAMBER 0.62 cc

Classic Farmer®-type



- Exterior classic Farmer-type chamber design assures the ion chamber will fit existing plastic phantom cavities, build-up caps, and standard cesium check sources
- Maintains the high quality internal design of the Exradin A12 Ion Chamber
- One-piece, non-removable 4.6 cm stem made of black anodized aluminum styled after traditional Farmer-type chambers

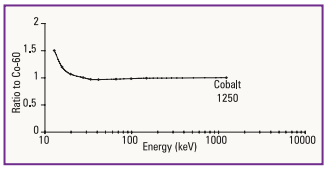
ORDERING INFORMATION

EXRADIN A19 ION CHAMBER REF 92734

Farmer is a registered trademark of PTW Freiburg GmbH

EXRADIN A12 ION CHAMBER 0.65 cc

Farmer-type



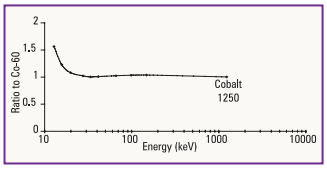
- Completely characterized in TG 51 & TRS 398
- Two separate stem pieces of 5.1 cm and 12.7 cm can be coupled together for flexibility of operation and additional length when needed
- The Exradin A12 Ion Chamber survived 3 drop tests from 1 meter high onto a hard floor without a change in calibration

ORDERING INFORMATION

EXRADIN A12 ION CHAMBER REF 92700

EXRADIN A12S ION CHAMBER 0.25 cc

Farmer-type



- Two separate stem pieces of 5.1 cm and 12.7 cm can be coupled together for flexibility of operation and additional length when needed

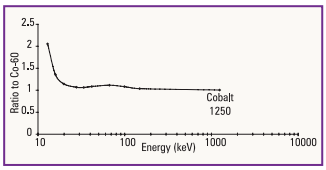
ORDERING INFORMATION

EXRADIN A12S ION CHAMBER REF 92725

THIMBLE ION CHAMBERS
continued

EXRADIN A1 ION CHAMBER 0.057 cc

Miniature Shonka – *P1, T1 also available*



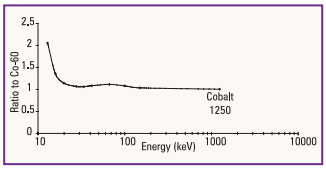
- Two separate stem pieces of 5.1 cm and 12.7 cm can be coupled together for versatility of operation and additional length when needed
- The Exradin A1 & T1 Ion Chambers are characterized in TRS-398
- Cobalt-60, Delrin, and brass build-up caps available for in-air measurements

ORDERING INFORMATION

EXRADIN A1 ION CHAMBER REF 92705

EXRADIN A1SL ION CHAMBER 0.057 cc

Slimline Miniature Shonka



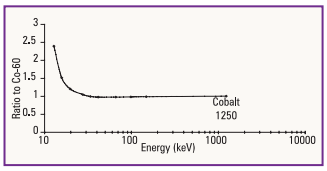
- The Exradin A1SL Ion Chamber has a one-piece, non-removable 5.6 cm stem made of black anodized aluminum for use in plastic phantoms with small cavities or confined water tank mounting scenarios
- Cobalt-60, Delrin, and brass build-up caps available for in-air measurements

ORDERING INFORMATION

EXRADIN A1SL ION CHAMBER REF 92722

EXRADIN A2 ION CHAMBER *0.54 cc*

Spokas – *P2, T2 also available*



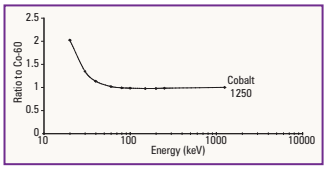
- Intended for exposure, air kerma measurement and facilitating the determination of absorbed dose water; ideal for routine beam calibration
- Suitable for pulsed radiation with excellent saturation characteristics
- The Exradin A2 & T2 Ion Chambers are characterized in TRS-398
- Two separate stem pieces of 5.1 cm and 12.7 cm can be coupled together for flexibility of operation and additional length when needed
- Cobalt-60 build-up cap available for in-air measurements

ORDERING INFORMATION

EXRADIN A2 ION CHAMBER REF 92718

EXRADIN A18 ION CHAMBER 0.125 cc

Scanning



- One-piece, non-removable 5.6 cm stem made of black anodized aluminum for use in plastic phantoms with small cavities or confined water tank mounting scenarios
- Matching 2.0 mm thick Cobalt-60 build-up cap of C552 Shonka air-equivalent plastic included

ORDERING INFORMATION

EXRADIN A18 ION CHAMBER REF 92729

MICRO IONCHAMBERS

- For assessing pinpoint radiation fields for IMRT, orthovoltage, x-rays, stereotactic, and superficial skin therapy
- Inherently waterproof construction for use in most water tanks – eliminating the need for waterproofing sleeves or protective coatings
- Chamber vents through a flexible tube surrounding the triaxial cable — vent tube is sealed to the chamber body and open near the connector; ideal for use in water or plastic phantoms

EXRADIN A16 ION CHAMBER 0.007 cc

Micropoint

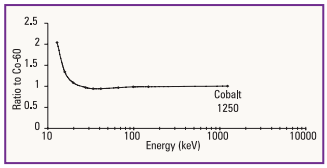
- Capable of measuring extremely small field sizes of 3.4 x 3.4 mm — allowing for accurate measurements while minimizing partial volume effects
- Ideal, nearly-spherical collecting volume
- One-piece, non-removable 5.6 cm stem made of black anodized aluminum for use in plastic phantoms with small cavities or confined water tank mounting scenarios
- Matching 2.5 mm thick Cobalt-60 build-up cap of C552 Shonka air-equivalent plastic included for in-air measurements. Additional Delrin and brass build-up caps available

ORDERING INFORMATION

EXRADIN A16 ION CHAMBER REF 92726

EXRADIN A14 ION CHAMBERS 0.016 cc

Microchamber – *T14, P14 also available*



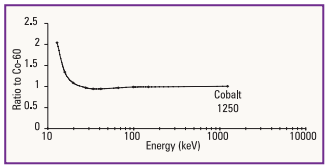
- Capable of measuring extremely small field sizes of 4 x 6 mm — allowing for accurate measurements while minimizing partial volume effects
- The Exradin A14 Ion Chamber has two separate stem pieces of 5.1 cm and 12.7 cm can be coupled together for flexibility of operation and additional length when needed
- Cobalt-60, Delrin, and brass build-up caps available for in-air measurements

ORDERING INFORMATION

EXRADIN A14 ION CHAMBER REF 92711

EXRADIN A14SL ION CHAMBERS 0.016 cc

Slimline Microchamber



- Capable of measuring extremely small field sizes of 4 x 6 mm — allowing for accurate measurements while minimizing partial volume effects
- The Exradin A14SL Ion Chamber has a one-piece, non-removable 5.6 cm stem made of black anodized aluminum for use in plastic phantoms with small cavities or confined water tank mounting scenarios
- Cobalt-60, Delrin, and brass build-up caps available for in-air measurements

ORDERING INFORMATION

EXRADIN A14SL ION CHAMBER REF 92723

CT ION CHAMBERS

- For performing the measurements necessary for calculating the CTDI, as described in TG-74, Quality Control in Diagnostic Radiology
- Fiducial markers identify center and both ends of the collecting volume providing easy setup in relation to the beam
- Body tube and guard constructed of C552 Shonka air-equivalent conducting plastic, providing robust design and excellent conductivity — eliminates fragility or flaking of painted conductive layers found in many chambers

EXRADIN A101 ION CHAMBER 4.6 cc

CT

- Excellent response uniformity over the central 10 cm of chamber length — variation less than ± 3%
- An acrylic sheath is included for use in phantoms that have a typical 13.1 mm cavity
- Designed for in-air and phantom measurements

ORDERING INFORMATION

EXRADIN A101 ION CHAMBER REF 92680

EXRADIN A17 ION CHAMBER 1.91 cc

Slice Therapy

- Provides an extremely flat response within ± 1.5% across its active length of 8 cm without polarity or perturbation effects
- Inherently waterproof, the Model A17 is a unique CT ion chamber used for checking the consistency of the beam at various jaw widths
- Designed for helical tomotherapy measurements
- Chamber vents through a flexible tube surrounding the triaxial cable — vent tube is sealed to the chamber body and open near the connector; ideal for use in phantoms
- Inherent Cobalt-60 build-up cap built into wall thickness
- 6MV in-air buildup cap available

ORDERING INFORMATION

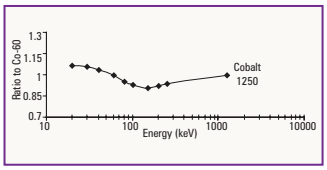
EXRADIN A17 ION CHAMBER REF 92675

PARALLEL PLATE CHAMBERS

- Exceptionally wide guard rings ensure precision in depth-dose measurement with no perturbation in field lines even at low energies — exceeding the 3 mm width as recommended in TG-39
- Rigid stem allows accurate positioning of chamber
- Chamber vents through a flexible tube surrounding the triaxial cable — vent tube is sealed to the chamber body and open near the connector; ideal for use in water or plastic phantoms

EXRADIN A10 ION CHAMBER 0.051 cc

Markus®-type Parallel Plate



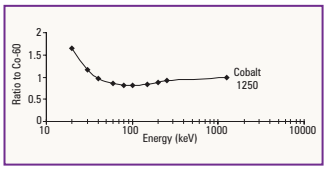
- Markus-type chamber for use in routine electron beam measurements and for depth-dose studies in electron, photon, proton, and neutron beams
- Capable of measuring at zero depth in build-up region of an electron field
- Markus-type design assures the ion chamber will fit existing plastic phantom cavities and build-up caps
- Ideally suited for smaller electron field measurements in a water tank — the Kapton film window is sealed by using the included 1.0 mm, TG-51 compliant, PMMA waterproofing cap
- Characterized for TRS-398†
- Cobalt-60 build-up cap available for in-air measurements

ORDERING INFORMATION

EXRADIN A10 ION CHAMBER REF 92702

EXRADIN A11 ION CHAMBER 0.62 cc

Roos®-type Parallel Plate – *T11, P11 also available*



- For use in routine electron beam measurements and for depth-dose studies in electron, photon, proton, and neutron beams
- Ideally suited with larger volume for routine electron field measurements in a water tank — inherently waterproof, no additional waterproofing cap required
- Model P11 (D400 polystyrene-equivalent plastic version) is characterized in TG-51 and TRS-398
- Cobalt-60 build-up cap available for in-air measurements

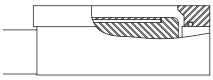
ORDERING INFORMATION

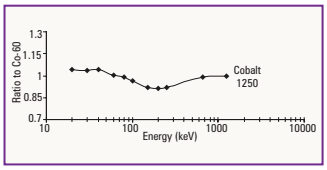
EXRADIN A11 ION CHAMBER REF 92701

† Ref: Calculations for Plane-Parallel Ion Chambers in 60Co Beams Using the EGSnrc Monte Carlo Code, Med. Phys. 30 (2), February 2003

EXRADIN A11TW ION CHAMBER 0.92 cc

Thin Window Parallel Plate – *T11TW, P11TW also available*





- For use in routine electron beam measurements and for depth-dose studies in electron, photon, proton, and neutron beams
- Ideally suited for low energy x-rays, and mammography
- Waterproof while using the included 1.0 mm, TG-51 compliant, PMMA waterproofing cap over the Kapton film window
- Cobalt-60 build-up cap available for in-air measurements

ORDERING INFORMATION

EXRADIN A11TW ION CHAMBER REF 92708

EXRADIN A20 ION CHAMBER 0.074 cc

Low Energy X-ray Parallel Plate

- Exceptionally small field size and sensitive volume ensure confident, low energy dose measurements

  This vented and fully guarded ion chamber is ideally suited for low energy X-ray regions and surface applicator measurements.
- Durable construction, build to last

  The .074cc end-on style Parallel Plate Chamber is constructed of rugged C552 Shonka air-equivalent plastic, providing excellent conductivity and years of reliable use.

Features

- End-on measurement chamber style designed to minimize backscatter
- Chamber window material is conductive Kapton film of thickness 7.6 mg/cm2
- Designed to follow the recommendations of AAPM Radiation Therapy Committee Task Group 61
- Collecting volume is 0.74 cc

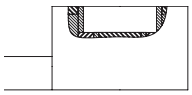
ORDERING INFORMATION

EXRADIN A20 ION CHAMBER REF 92736

PARALLEL PLATE CHAMBERS
continued

EXRADIN MAGNA A600 ION CHAMBER 1.0 cc

Diagnostic Parallel Plate



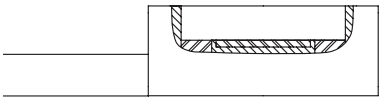
- For use in all air kerma, absorbed dose, and exposure measurements
- Ideally suited for low energy x-rays and mammography
- Designed for in-air and phantom measurements

ORDERING INFORMATION

EXRADIN A600 ION CHAMBER REF 92600

EXRADIN MAGNA A650 ION CHAMBER 3.0 cc

Diagnostic Parallel Plate



- For use in all air kerma, absorbed dose, and exposure measurements
- Ideally suited for low energy x-rays and mammography
- Designed for in-air and phantom measurements

ORDERING INFORMATION

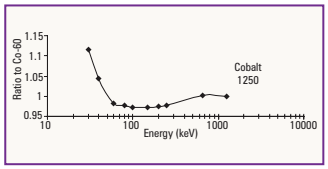
EXRADIN A650 ION CHAMBER REF 92650

SPHERICAL ION CHAMBERS

- For calibration laboratories, research applications, manufacturing, and accelerator room scatter measurements
- Precise in-air measurements from multiple fields without moving the chamber
- Obtain accurate measurements in any direction without absorption of the radiation by the body of the chamber
- Spherical volume chambers are easily centered for precise positioning resulting in accurate measurements
- Rugged design with 9" integral rigid stem for easy, precise positioning

EXRADIN A3 ION CHAMBER 3.6 cc

Shonka-Wyckoff Spherical



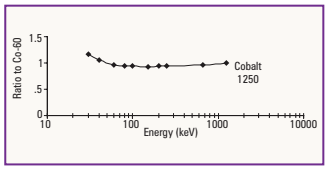
- Extended energy range through the use of available build-up cap

ORDERING INFORMATION

EXRADIN A3 ION CHAMBER REF 92717

EXRADIN A4 ION CHAMBER 30 cc

Shonka-Wyckoff Spherical



- Extended energy range through the use of available build-up cap

ORDERING INFORMATION

EXRADIN A4 ION CHAMBER REF 92715

SPHERICAL ION CHAMBERS
continued

EXRADIN A5 ION CHAMBER 100 cc
Shonka-Wyckoff Spherical

- Inherent Cobalt-60 build-up cap built into wall thickness
- Triaxial BNC connector mounted to the stem

ORDERING INFORMATION

EXRADIN A5 ION CHAMBER REF 92724

EXRADIN A6 ION CHAMBER 800 cc
Shonka-Wyckoff Spherical

- Inherent Cobalt-60 build-up cap built into wall thickness
- Triaxial BNC connector mounted to the stem

ORDERING INFORMATION

EXRADIN A6 ION CHAMBER REF 92716

EXRADIN A8 ION CHAMBER 15.7 L

Shonka-Wyckoff Spherical

- Relied upon by standards laboratories worldwide

  Exradin Shonka-Wyckoff Spherical Chambers are designed for the measurement of radiation exposure and exposure rates. They are easily centered for precise positioning and are excellent for 'in air' measurements.
- Fast, precise measurement

  Chamber design assures there are no stem or voltage soakage effects, providing more confident measurements
- Durable construction, build to last

  Durable C552 Shonka air-equivalent plastic produces excellent conductivity and years of reliable use

Features

- Proven guard design yields stable, precise measurements and minimizes settling time by creating uniform field lines
- Shell, collector, and guard are made of durable, long lasting Shonka conductive plastic
- Use of homogeneous material throughout the chamber minimizes perturbation of the beam due to the presence of the chamber and optimizes measurements
- Axially symmetric design of the chamber provides an uniform, isotropic response
- A non-removable, triaxial BNC connector is mounted to the neck of the Model A8
- The Model A8 has no stem, instead mounting to an included Acrylic Support Stand
- Model A8 venting is located on the chamber neck
- Collecting volume is 15.7 liters

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EXRADIN A8 ION CHAMBER REF 92737