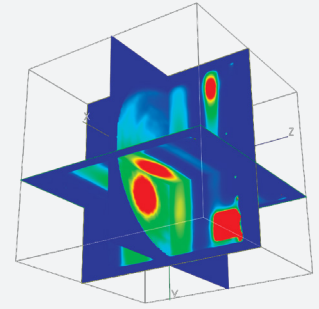


ClearView™ is a non-diffusing, radiochromic hydrogel dosimeter designed for verification of advanced radiation therapy techniques including SRS.

ClearView™

3D DOSIMETER



Visualizing the intricate detail of complex dose distributions and multiple lesion dosimetry, ClearView™ aids users in confirming planned treatments are delivered accurately.

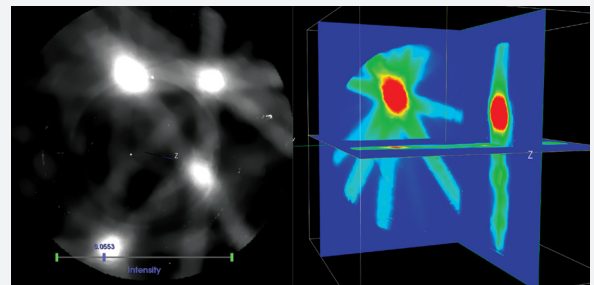
KEY FEATURES	BENEFITS
Stability:	Chemistry is stable for over 60 days prior to irradiation under recommended storage conditions. The signal is geometrically stable at any time after irradiation. For best dosimetric results, optical scanning is recommended between 45 min and 24 hours after irradiation.
Linear Response:	Dose response is linear within range of 0 to 80 Gy, providing utility in SRS applications
High Resolution:	Gel is accurate to a sub-micron level
Clear:	Low scatter substrate makes ClearView™ ideal for optical cone beam CT imaging
90% Water:	Near tissue equivalence provides patient-like testing environment (see table for values)



ClearView™ is optically clear, low scattering, and colorless. It contains a radiochromic indicator dye which turns purple after irradiation. The change in optical attenuation of the gel is directly proportional to the absorbed radiation dose enabling the visualization of dose distributions.

Radiochromic dose response of ClearView™ gel is geometrically accurate on a sub-micron level. Spatial resolution of the dose image is limited by the spatial accuracy of the optical CT scanner.

(The Modus QA VISTA™ 16 Optical CT Scanner is capable of imaging 0.25 mm isotropic voxel sizes, although in practice, spatial resolutions will match the plan)



Principles of radiochromic 3D dosimetry are analogous to film (2D) dosimetry. Dose scaling with ClearView™ is achieved by using a reference dose delivery in the same dosimeter or irradiation of another dosimeter from the same manufacturing batch.

Using ClearView™ Gel Dosimeters

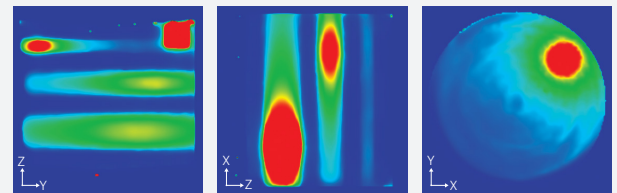
- ▶ Single use. Calibration doses can be delivered within the same dosimeter as the test dose delivery.
- ▶ ClearView™ consists of ClearView™ gel in transparent cylindrical jars.
- ▶ Each ClearView™ jar is optically unique. Scanning dosimeter with 530 ± 10 nm green light source before and after irradiation provides best results.
- ▶ Ensure dosimeter temperature is uniform (room temperature) prior to dose delivery and scanning.
- ▶ ClearView™ gel properties are consistent for each batch. Use dosimeters from the same batch number for calibration and dosimetry.
- ▶ Non-hazardous materials make it safe to handle and safe to dispose as solid waste.
- ▶ Store in refrigerator or a cool, dark place, avoid freezing and maintain temperature history for the same batch. Avoid temps over 30°C .
- ▶ Avoid intense mechanical shock as gel separation can result, negatively affecting results.
- ▶ Avoid direct Sunlight. Keep dosimeters in light-blocking bags until ready for use.
- ▶ Avoid exposing the gel to air unless dosimeter is being modified for safe MR use.

ClearView™ is intended to be used as part of an integrated 3D dosimetry system which includes an optical CT scanner such as Vista™ 16, and analysis software, Vista ACE™ (in development).



Property	Units	Results/Specifications
Volumetric mass density (ρ)	$\text{g}\cdot\text{cm}^{-3}$	$1.016 \pm 0.3\%$
Electron density (ρ_e) relative to water	cm^{-3}	$3.392 \times 10^{23} \pm 0.3\%$
Effective atomic number (Z_{eff}) relative to water	-	$1.015 \pm 0.3\%$
• 1 kV – 10 MV x-ray	-	$0.988 - 0.999$
• 90 kV – 5 MV x-ray	-	$0.998 - 0.999$
Optical background at 530 nm		
• transmittance (T) through $\ell = 1$ cm	-	$>90.0\%$
• optical density, $\text{OD} = -\log_{10}(T)/\ell$	cm^{-1}	<0.046
• attenuation coefficient, $\mu = -\ln(T)/\ell$	cm^{-1}	<0.110
Aging ($\Delta\mu/\Delta t$) at room temp., 530 nm		
• aging of background	$\text{cm}^{-1}\text{day}^{-1}$	$(1 - 2) \times 10^{-4}$
• aging of irradiated gel (20 Gy)	$\text{cm}^{-1}\text{day}^{-1}$	$(3 - 4) \times 10^{-4}$
Minimum dose response ($\Delta\mu/\text{dose}$)		
• Co-60, 100 cGy/min	$\text{cm}^{-1}\text{Gy}^{-1}$	$\geq 4 \times 10^{-3}$
Time for signal development post-irradiation	h	<0.75
Dose response change over 60 days	-	$<10\%$
Dose rate dependence of dose response		
• 400 to 100 cGy/min	-	$<2.0\%$
• 600 to 400 cGy/min	-	$<0.5\%$
Radial and Axial dose response gradients		
• Radial dose response gradient	cm^{-1}	$<0.01\%$
• Axial dose response gradient	cm^{-1}	$\leq 0.1\%$
Image diffusion rate	$\text{cm}^{-2}\text{h}^{-1}$	0
Specifications		
• Optimal scanning wavelength	nm	520-540
• Dose Sensitivity	$\text{cm}^{-1}\text{Gy}^{-1}$	$(4.0 \pm 0.5) \times 10^{-3}$
• Dose Range	Gy	0-80
• Energy range (Electrons/Photons)	MeV/MV	1-20/1-15
• Shelf-life (steady temp 3-10°C)	days	>60

Left: Properties of ClearView™



Dose Distribution of Exposed ClearView™ Gels

ORDERING INFORMATION

- | | |
|----------|--|
| 200-2015 | ClearView™ 15 cm diameter jar (Pkg of 4) |
| 100-2016 | Vista™ 16 Optical CT Scanner System |
| | ▶ Scanner |
| | ▶ Software |
| | ▶ User's Guide |
| | ▶ Aquarium for index of refraction matching liquid |
| | ▶ Wavelength 530 nm (other wavelengths available on request) |
| | ▶ 15 cm Rotary Stage |
| | ▶ 5 Polyethylene terephthalate jars (15 cm diameter) |
| | ▶ Other Rotary Stage and Jar sizes available on request. |

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