

3M Advanced Materials Division

# 3M™ Glass Bubbles

## 5G Applications Comparison

### Introduction

3M™ Glass Bubbles have been used in many industries as a hollow, strong, and lightweight additive and now 3M is designing bubbles specifically for Electronics.

3M Glass Bubbles S4630 and 3M Glass Bubbles S3240-VS are designed for use in electronics and offer benefits beyond Glass Bubbles for general industrial markets such as:

- Attractive dielectric properties
- Consistent and controlled design and quality needed in the electronics space
- Smaller bubble sizes and tighter density control

3M™ Glass Bubbles can be added to materials used in high frequency 5G electronic components such as copper clad laminates (CCL), electrical connectors, and radomes.

### Properties Comparison

	Designed for Electronic Market Applications	
	3M™ Glass Bubbles iM16k	3M™ Glass Bubbles S4630
Crush strength, 90% (psi/MPa)	≥16,000 / ≥ 110	
Dielectric Constant, Dk @10GHz	1.5	
Dielectric Loss, Df @10GHz	0.005	
Size D50 (µm)	18	
Size D95 (µm)	> 40	< 40
Moisture	Not Reported	≤ 0.35%
270 Mesh (53 µm) Sieve Retain	< 0.5%	< 0.05%
Non-white Particles greater than 45 µm	Not Controlled	< 200 / 10g Glass Bubbles
True density (g/cc)	0.46 ± 0.03	0.46 ± 0.02

## Properties Comparison

	Designed For Electronic Market Applications	
	3M™ Glass Bubbles S32HS	3M™ Glass Bubbles S3240-VS
Crush strength, 90% (psi/MPa)	≥ 6,000 / ≥ 41.4	
Dielectric Constant, Dk @10GHz	1.4	
Dielectric Loss, Df @10GHz	0.004	
Size D50 (µm)	22	
Size D95 (µm)	< 47	
Moisture	Not Reported	≤ 0.35%
270 Mesh (53 µm) Sieve Retain	< 0.5%	< 0.05%
Resin Compatibilization Treatment	None	Vinyl Silane
Non-white Particles greater than 45 µm	Not Controlled	< 200 / 10g Glass Bubbles
True density (g/cc)	0.32 ± 0.03	0.32 ± 0.02

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