



## » APPLICATION BULLETIN

# PREPERM™ Low Loss Dielectric Thermoplastics PPE-Based Grades for mmWave Radome Applications

## MEETING THE CHALLENGES OF NEXT-GENERATION MMWAVE APPLICATIONS

As Advanced Driver Assistance Systems (ADAS) adoption accelerates and advanced robotics demand rises globally, manufacturers face a common set of material challenges. Conventional polyesters solution, such as glass fiber-reinforced polybutylene terephthalate (PBT+GF), often exhibit high signal loss at millimeter wave (mmWave) frequencies, limiting radar detection range and angle. Furthermore, warpage during injection molding can extend qualification timelines and can lead to costly assembly rework. Finally, attaining Blind Spot Information System (BSIS) certification required for European market access may also be difficult with conventional materials.

Avient's portfolio of modified polyphenylene ether (PPE)-based PREPERM™ formulations provides a high-performance alternative. Specially engineered for mmWave radomes, these materials deliver low dielectric constant (Dk) and loss tangent (Df) performance, low moisture absorption, wider detection angles, and exceptional dimensional stability, helping manufacturers accelerate product commercialization and reduce development costs.

## KEY PERFORMANCE BENEFITS

- **Low Signal Loss:** Delivering a dielectric constant (Dk) of 2.53 to 2.94 and a loss tangent (Df) as low as 0.001 at 2.5 GHz, PREPERM PPE grades provide maximum signal transmission and minimal attenuation.
- **Enhanced Radar Performance:** In RF testing at 30+ GHz, PREPERM grades demonstrated measurable improvements in gain, elevation angle, and detection angle compared to conventional PBT+GF benchmarks.
- **Superior Dimensional Stability:** Low-warpage formulation ensures excellent flatness and dimensional accuracy during injection molding, eliminating assembly rework and streamlining qualification.
- **Laser-Welding Compatibility:** Select grades are optimized for laser transmission (up to 74% at 1 mm) and laser absorption, enabling clean, hermetic, and reliable assembly of sensor and radar module housings.
- **High Isotropy:** Uniform electrical and mechanical properties in all directions, enabling consistent RF performance across the entire radome surface.

## TARGET APPLICATIONS

- **Automotive Radar Systems:** Forward-looking and corner radar radomes requiring high rigidity, low signal loss, and precise laser assembly.
- **Traffic Monitoring Infrastructure:** Radomes and protective housings for traffic radar systems operating in demanding, variable outdoor environments.
- **Intelligent & Humanoid Robotics:** mmWave sensor and radar module housings and radomes for industrial service robots and humanoid systems requiring high-impact resistance and signal clarity.

## AVAILABLE GRADES

Grade	Type	Key Features & Performance	Primary Applications
RS 260	Unreinforced, ultra-low Df	Lowest Df in the portfolio: Dk 2.58 and Df 0.0009 at 2.5 GHz. Low density (1.06 g/cm <sup>3</sup> ) and HDT 169°C. Maximizes signal transparency for precision RF designs	Precision mmWave radomes, antennas and RF lenses
PP7600-8025 HI LW	High-impact, laser weldable	Designed for superior impact resistance. Excellent laser transmission: 74% at 1 mm and 56% at 2 mm	High-impact radomes
PP7600-8029 RS LW	Glass fiber reinforced, laser weldable	Optimized for high rigidity, low warpage, and laser assembly	Automotive forward and corner radar radomes
PP7600-8031 RS LA	Glass fiber reinforced, laser absorbing	Serves as the laser-absorbing base layer in laser welding assembly processes	Robotics sensor housings, laser-welded radome assemblies





## MATERIAL PERFORMANCE COMPARISON

Parameter/Property	Conventional PBT+GF	PREPERM PPE Grades
Dielectric Constant (Dk)	High (typically 3.2–4.2)	Low & stable (2.53–2.94)
Loss Tangent (Df)	High signal loss (typically 0.01)	Ultra-low loss (as low as 0.001 at 2.5 GHz)
Isotropy	Poor (due to glass fiber orientation)	High isotropy (stable RF properties in all directions)
Dimensional Stability	Prone to warpage during molding	Excellent (low warpage, high-dimensional stability)
Assembly Options	Mechanical/adhesive/laser weldable with low transmission	Mechanical/adhesive/laser weldable with up to 74% transmission
BSIS Certification	Difficult to attain (due to signal loss)	Facilitated by superior RF performance

## GLOBAL AVAILABILITY & TECHNICAL SUPPORT

PREPERM Low Loss Dielectric Thermoplastics for mmWave radome applications are available globally. Avient provides comprehensive technical support, including material selection guidance, mold flow analysis, and RF performance testing to help you optimize your designs and accelerate your development cycle.



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