

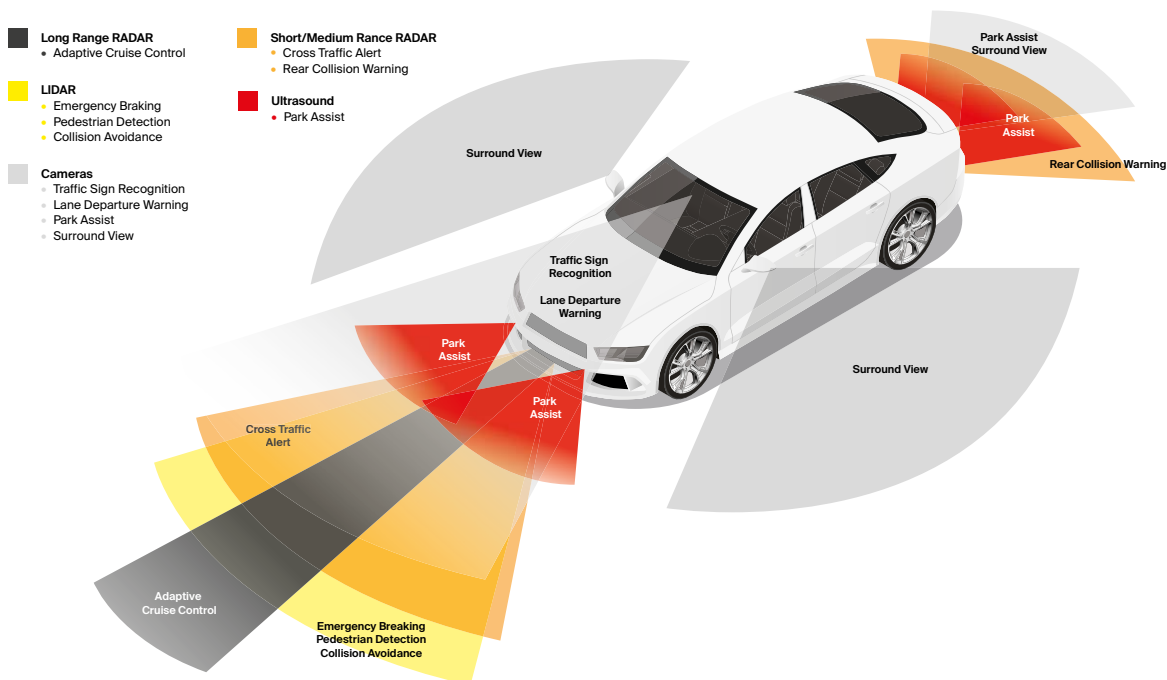
## Specialist Colour Processes: RADAR

### Advanced driver assistance systems:

Vehicle manufacturers around the world are increasingly incorporating advanced driver assistance systems (ADAS) into their products, including RADAR, ultrasound, cameras and LiDAR.

The various ADAS systems offer adaptive/traffic-dependent cruise control, parking assistance, lane departure warning, traffic sign recognition, forward collision warning, cross traffic warning, emergency braking and collision avoidance.

By 2025, it is expected that 85% of new passenger cars and light commercial vehicles will be equipped with at least one type of ADAS.



### ADAS and coatings:

ADAS devices are typically located behind the painted surfaces of cars and light trucks, so there can be an interaction between the devices, the panels (metal or plastic), and the coatings.

### RADAR equipment:

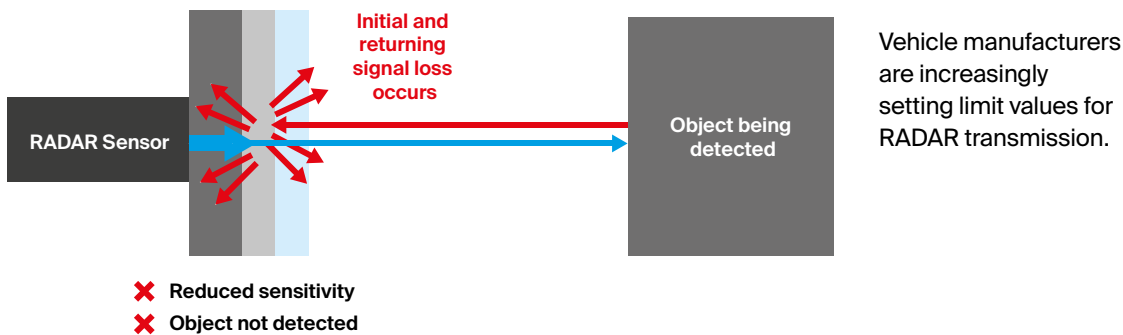
RADAR devices are increasingly being used in new cars and light trucks at long-range, adaptive cruise control (also known as traffic-dependent cruise control) and warning of cross-traffic and rear-end collisions are being used at short-range.

## Specialist Colour Processes: RADAR

### Coatings and RADAR:

RADAR devices are typically located behind the bumpers of cars and light trucks. The RADAR signals penetrate the bumpers and the coatings as they are transmitted into the environment, and the reflected signals re-penetrate the coatings and the bumpers before being received by the RADAR equipment.

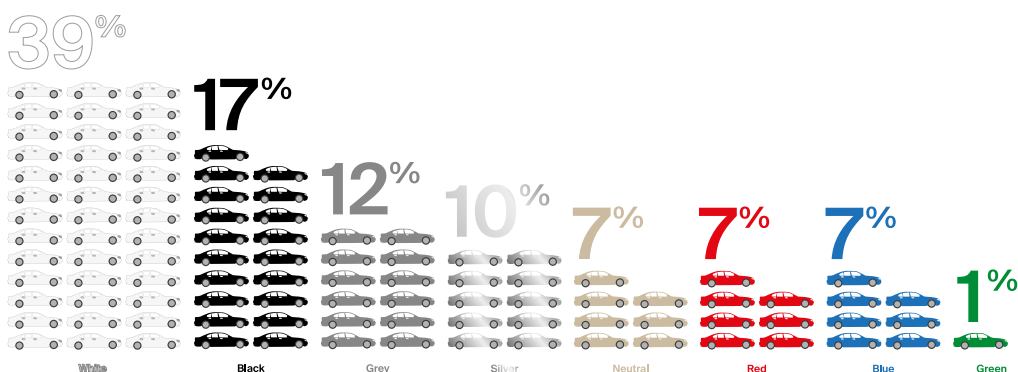
Under certain circumstances, there may be a loss of transmission of RADAR signals passing through painted substrates (plastic bumpers). If the loss of RADAR transmission through the painted plastic bumper exceeds a certain threshold/layer thickness, the RADAR may become impaired and may not function as intended.



### RADAR transmission loss:

RADAR transmission loss through painted bumpers does not affect all colours and is mostly associated with metallic effect paints. The aluminium pigments used to create metallic paint effects interfere with the transmission of RADAR signals.

According to PPG's Global Automotive Color Trend information, approximately 25% of all new passenger cars and light trucks are painted metallic colours (see silver and grey below).



## Specialist Colour Processes: RADAR

### Repair and overhaul of RADAR-equipped vehicles:

To determine if a vehicle is equipped with RADAR, please refer to the vehicle manufacturer's equipment/equipment manual. In addition, your collision repair estimate system can provide information about the presence of RADAR devices on the vehicle being repaired.

### RADAR-capable colour formulations:

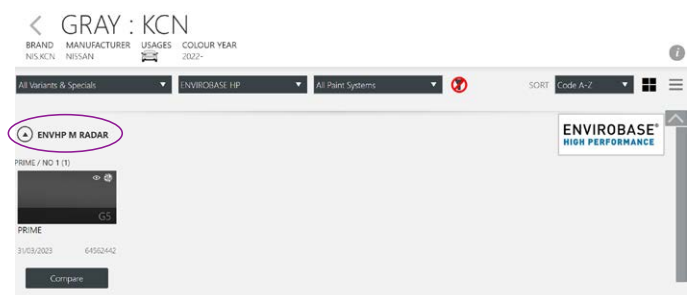
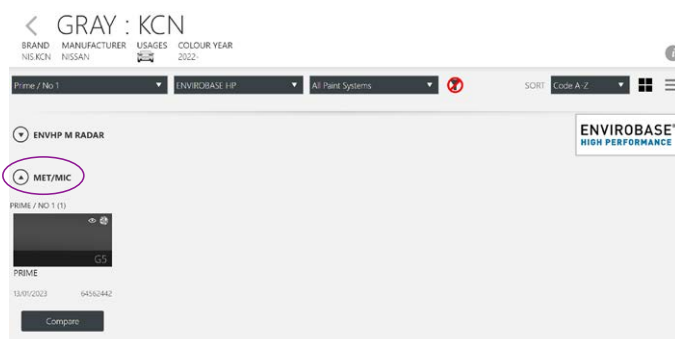
During the colour toning process, PPG's Refinish colour labs now measure vehicle colour formulas for RADAR transmittance. Most colours can pass RADAR signals with little or no loss and the standard colour formula can be used.

For the few colours where the measured RADAR transmission loss is above the threshold set by the vehicle manufacturer, PPG offers a special, additional "RADAR Enabled".

### Colour Formula:

When searching for a shade using the vehicle manufacturer's colour code using PAINTMANAGER® XI or PPG LINQ™ Colour software, the results screen will indicate if a RADAR-enabled match formula is available. If a RADAR-enabled colour formula is available, it will also be displayed when using a colour chip or RAPIDMATCH® search.

When searching for a colour, the available paint systems will be displayed in the *PaintManager XI* or *PPG LINQ* Colour software (in this case MET/MIC is the default paint system).



## Specialist Colour Processes: RADAR

### RADAR-enabled colour matching:

For those few colours that have a measured RADAR transmission loss above the limit set by the vehicle manufacturer, PPG offers a special “RADAR Ready” paint system and paint formula. This is usually done by replacing some or all of the aluminium mixing paints with existing, alternative mixing paints, such as Pearls.

There may be some colour differences between the standard colour formula and the RADAR-enabled formula.

This is because the standard colour formula prioritises colour alignment, while RADAR-enabled matching also needs to consider RADAR transmission loss. It is recommended to first create a spray pattern card to check the colour (see below).

The screenshot shows the 'Formula & Mixing' software interface. A warning dialog box is displayed in the center, stating: 'Warning: This is a RADAR capable formula, please spray a test panel before use.' The background interface shows the 'Formula Details' for 'GRAY : KCN : PRIME' with various fields like CODE, MANUFACTURER, COLOUR YEAR, MATCH DATE, PAINT LINE, and PAINT SYSTEM. Below this, there is a table of ingredients with columns for 'INCREMENTAL' and 'CUMULATIVE' weights. The ingredients listed are: 4 x 472 FINE LENT. METALLIC, 5 x 443 VIOLET, 6 x 411 BLUE, 7 x 440 TRACE RED OXIDE, and 8 x 4281 SOLID YELLOW. The cumulative weight for the last ingredient is 1018.3 g.

|                             | INCREMENTAL | CUMULATIVE |
|-----------------------------|-------------|------------|
| 4 x 472 FINE LENT. METALLIC | 323.1 g     | 323.1 g    |
| 5 x 443 VIOLET              | 260.6 g     | 583.7 g    |
| 6 x 411 BLUE                | 200.6 g     | 784.3 g    |
| 7 x 440 TRACE RED OXIDE     | 177.3 g     | 961.5 g    |
| 8 x 4281 SOLID YELLOW       | 28.5 g      | 990.1 g    |
|                             | 16.9 g      | 1007.0 g   |
|                             | 9.6 g       | 1016.6 g   |
|                             | 1.7 g       | 1018.3 g   |

In addition, the “Comments” section will include the following statement related to this technical bulletin.

**RADAR Enabled Formula:** Specially formulated to minimize RADAR transmission loss. Observe the vehicle manufacturer’s repair guidelines and the PPG technical data sheet.

## Specialist Colour Processes:

# RADAR

### Using a RADAR-enabled colour formula:

It is important to use the RADAR-enabled paint formula when painting a bumper that has RADAR equipment located behind the bumper. This ensures that the RADAR continues to function as intended by the vehicle manufacturer.

If the repair includes a bumper and additional parts such as fenders and/or hood, the RADAR-enabled paint formula can be used for the bumper and other parts.

If the vehicle to be repaired is RADAR equipped but the damaged area does not include the bumper (behind which the RADAR is located), it is not necessary to use the RADAR-enabled paint formula.

Thus, a mixture of one colour can be the most efficient way to repair the vehicle. i.e the bumper with adjoining areas to use the RADAR colour formula and transition to the general formula outside of the bumper / fade-in.

It is recommended to spray a test area first to check the colour.

### Additional Information:

Always be sure to follow the manufacturer's guidelines for repairing vehicles with RADAR.

It is also important to follow the manufacturer's guidelines for testing the correct operation of RADAR and/or other ADAS before returning the repaired vehicle to service.

### Legal notice

When refinishing RADAR-equipped vehicles, two paint formulas may be available for the paint. The standard formula may have a more accurate colour match but could affect the performance of the RADAR. The RADAR-enabled colour formula is specially formulated not to interfere with the functioning of RADAR, but the colour match may not be as precise.

Please check whether the vehicle to be repaired is equipped with RADAR and observe the vehicle manufacturer's repair guidelines. In case the vehicle is equipped with RADAR, please ensure that the vehicle owner is aware of the two formulas available. PPG makes no guarantee or responsibility for the selection of the formula and assumes no liability for it.