

February 24, 2022

## DEFECT INFORMATION REPORT

1. Vehicle Manufacturer Name:

Toyota Motor Corporation ["TMC"]  
1, Toyota-cho, Toyota-city, Aichi-pref., 471-8571, Japan

Toyota Motor Manufacturing Turkey Inc. ["TMMT"]  
Toyota Caddesi No:2 54580 Arifiye, Sakarya, Turkey

Affiliated U.S. Sales Company:

Toyota Motor North America, Inc. ["TMNA"]  
6565 Headquarters Drive, Plano, TX 75024

Manufacturer of Millimeter Wave Radar Sensor:

Conti Temic microelectronic GmbH  
Ringlerstraße 17 85057 Ingolstadt, Germany  
Phone: +49-841-811-0

Country of Origin: Germany

2. Identification of Involved Vehicles and Affected Components:

Based on production records, we have determined the involved vehicle population as in the table below.

Make/Car Line	Model Year	Manufacturer	Production Period
Toyota / C-HR	2021	TMC TMMT	June 12, 2020 through July 26, 2021

Applicability	Part Number	Part Name	Component Description
MY2021 Toyota C-HR	88210-F4070	Sensor Assy, Millimeter Wave Radar	Millimeter wave radar sensor

Note: (1) Although the involved vehicles are within the above production period range, not all vehicles in this range were sold in the U.S.

(2) Only the subject vehicles are equipped with a radar sensor of a certain design from a specific supplier that may not have been properly initialized during production. Other Toyota or Lexus vehicles sold in the U.S. are not equipped with a radar sensor of this design or contain a radar sensor that was properly initialized during production.

3. Total Number of Vehicles Potentially Involved:

36,558

4. Percentage of Vehicles Estimated to Actually Contain the Defect:

Toyota estimates that approximately 0.03% of the involved vehicles contain a millimeter wave radar sensor with the incomplete initialization described in this report based on a representative sample of vehicles that were inspected at multiple manufacturing facilities globally. However, as the NHTSA manufacturer portal requires an integer value be entered, Toyota has entered the value “1” in response to this question in the portal. For the purpose of this report, “1” means “less than 1%.” Whether this issue, in each case, will actually lead to the increased risk of a crash described in Section 5 is dependent on (1) whether a potentially affected vehicle actually contains a radar sensor that has not been initialized, and (2) whether the driving patterns of an individual driver may lead to certain driving situations in which a PCS activation would occur.

5. Description of Problem:

The subject vehicles are equipped with a millimeter wave sensor (radar sensor) and a camera to detect objects, such as another vehicle, in front of the subject vehicle. These sensors support certain driver assistance features, including the Pre-Collision System (PCS). Under certain circumstances, the initialization of the radar sensor may not have been completed correctly at the vehicle assembly plant. If this occurs, the radar sensor would not be activated. In this condition, the PCS would not be able to detect a vehicle in front of the subject vehicle and would not provide warnings or braking assist, as designed, in certain driving situations that would otherwise result in a PCS activation. In addition, the vehicle would not display a

message or indicator to the driver that PCS is not functional. An inoperative PCS, without a PCS malfunction indicator to the driver, may increase the risk of a crash in certain driving situations.

6. Chronology of Principal Events:

**December 2020 – April 2021**

In December 2020, Toyota began to receive field reports related to the vehicles sold in the Japan market alleging that the vehicle did not detect the preceding vehicle when using the Traffic Movement Notification feature (a Japan-market feature not available in the U.S.). In these cases, dealer technicians observed that the beam axis for the radar sensor was out of specification and adjusted the beam axis during an inspection. After completing the beam axis adjustment and initializing the radar sensor, the vehicles in these cases were able to detect the preceding vehicle.

Toyota began a number of activities to further investigate this condition. Based on the reports from the dealers indicating that the repair to correct the reported issue was to perform the radar sensor beam axis adjustment and complete the initialization of the radar sensor, Toyota suspected that an uninitialized radar sensor was linked to the field allegations that Toyota had received up to this point, all of which alleged that the Traffic Movement Notification feature was unable to detect the preceding vehicle. An uninitialized radar sensor also meant that other features, which rely on the radar sensor could be affected by this condition. As a result, Toyota contacted the supplier to assist in this analysis and began a Fault Tree Analysis (FTA) with the supplier to attempt to identify potential causes for the uninitialized radar sensor. At this time, all functions that rely on the radar sensor including Pre-Collision System (PCS), Dynamic Radar Cruise Control (DRCC), and Lane Tracing Assist (LTA) were thought to be affected by this condition.

In March 2021, Toyota used remote data retrieval in the Japan market to attempt to identify vehicles that may have an uninitialized radar sensor. Toyota identified one potential vehicle and requested a dealer to recover the part.

In April 2021, Toyota received the recovered radar sensor from the aforementioned vehicle in Japan. Based on an inspection of the sensor, Toyota determined that it was not initialized due to an incomplete beam axis adjustment. At this time, it was unclear what may have led to the sensor having an incomplete beam axis adjustment.

In addition, no field reports or warranty claims related to an uninitialized radar sensor had been received for vehicles in the U.S. market at this time.

## **May 2021 to December 2021**

In May, Toyota investigated the recovered part and discovered that, while a judgement flag which indicates the completion of the beam axis adjustment was found in the diagnostic area of the sensor ECU internal memory, a judgement flag in the operation area of the sensor ECU internal memory was missing. The missing judgment flag in the operation area indicated that the unadjusted beam axis caused the radar sensor to remain uninitialized.

Based on the results from this investigation and the review of the FTA that had been created in conjunction with the supplier, Toyota confirmed what systems on the vehicle might be affected by the uninitialized radar sensor. The results of the study identified that the potentially affected features included: PCS, DRCC and LTA, all of which rely on an initialized radar sensor to operate as designed.

In parallel, Toyota reviewed the FTA for the radar sensor and identified that a constant power supply is necessary to complete the initialization of the radar sensor. As a result, Toyota conducted bench testing in an attempt to determine how the beam axis adjustment could be incomplete during the initialization process, resulting in the same condition as the recovered part. At first, Toyota hypothesized that a low voltage input may be contributing to the incomplete initialization. However, testing with this condition determined that this would not cause the radar sensor to fail to initialize.

Beginning in September 2021, Toyota conducted additional testing to examine whether a low voltage input coupled with a low current input (to create an even more severe scenario) could result in an incomplete initialization of the radar sensor. In addition, the supplier developed new data analysis equipment that could be used during testing to analyze each data processing step within the internal memory of the radar sensor ECU.

In December 2021, during the duplication testing, Toyota was able to observe a temporary writing error in the internal nonvolatile memory during the beam axis adjustment task. During this testing, however, the error was corrected a few seconds later, because the system defaulted to reinitializing and completing the beam axis adjustment task. Although an incomplete initialization was initially observed, the automatic reinitialization of the radar sensor that occurred led to the successful initialization of the radar sensor, which was not the same condition observed in the field.

Although this testing failed to show how a radar sensor could fail to be properly initialized in the same manner as found in the reports from the field, Toyota observed that there were complex communications taking place between the radar sensor ECU and the other ECUs during the initialization process that could cause the time it takes to complete the initialization of the radar sensor to be longer than expected in some cases. At this point, Toyota had conducted approximately 60 duplication tests (a low voltage input coupled with a low current

input) of the radar sensor initialization process using the recovered part, but the testing did not result in a failure to initialize the radar sensor.

Still no field reports or warranty claims related to an uninitialized radar sensor had been received for vehicles in the U.S. market at this time.

### **January 2022 – February 2022**

Based on the observations from the testing conducted in December that revealed the additional communication that occurs during the initialization process, Toyota reviewed the manufacturing process for initializing the radar sensor. After a review of the production process, Toyota found that the time for the radar sensor to complete the initialization process (in some cases where reinitialization is potentially required) may be more than the time allotted during the vehicle production process.

Toyota also theorized that during vehicle inspection at the vehicle assembly plant, if the ignition was prematurely turned off before the processing of all necessary data, then the initialization of the radar sensor would be incomplete and there would be no further reinitialization to complete the process. Based on this information, from mid-January to early February, Toyota conducted another bench test on the recovered part to attempt to understand the effect of turning the ignition off prior to initialization of the radar sensor during the production process. As a result, Toyota was able to replicate the scenario of a radar sensor failing to initialize during the production process by turning the ignition off prematurely prior to completing the initialization of the radar sensor.

As stated above, if the initialization does not occur, the radar sensor would not be active. Thus, Toyota evaluated the implications of the performance effect that the uninitialized radar sensor would have on certain driver assistance systems (i.e., the effect that portions of the DRCC and LTA features would be deactivated and that the PCS would not be able to provide warnings or braking assist, as designed, in certain driving scenarios that would otherwise result in a PCS activation). Based on Toyota's evaluation, Toyota's engineering judgment concluded that an inoperative PCS, without a PCS malfunction indicator to the driver, may increase the risk of a crash in certain driving situations.

### **February 21, 2022**

Based on the results of the above investigation, Toyota decided to conduct a voluntary safety recall campaign.

As of January 20, 2022, based on a diligent review of records, Toyota's best engineering judgement is that there are 0 Toyota Field Technical Reports and 0 warranty claims that have been received from U.S. sources that relate or may relate to this condition and which were considered in the decision to submit this report.

7. Description of Corrective Repair Action:

All known owners of the subject vehicles will be notified to take their vehicles to a Toyota dealer. For all involved vehicles, Toyota dealers will inspect the radar sensor and, if necessary, properly initialize the radar sensor, free of charge.

Reimbursement Plan for pre-notification remedies

As the owner notification letters will be mailed out well within the active period of the Toyota New Vehicle Limited Warranty (“Warranty”), all involved vehicle owners for this recall would have been provided a repair at no cost under Toyota’s Warranty.

8. Recall Schedule:

Notifications to owners of the affected vehicles will occur by April 25, 2022. A copy of the draft owner notification will be submitted as soon as it is available.

9. Distributor/Dealer Notification Schedule:

Notifications to distributors/dealers will be sent by February 24, 2022. Copies of dealer communications will be submitted as they are issued.

10. Manufacturer’s Campaign Number:

[Remedy] 22TA02