

February 27, 2019

## DEFECT INFORMATION REPORT

1. Vehicle Manufacturer Name:

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

Affiliated U.S. Sales Company:

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

Assembler of run-flat tire to wheel:

Topy Industries, Ltd.  
1-2-2 Osaki, Shinagawa-ku, Tokyo, 141-8634, Japan  
Telephone: +81-3-3493-0777

Country of Origin: Japan

2. Identification of Involved Vehicles:

Make/Car Line	Model Year	Manufacturer	Production Period
Lexus / LS	2018	TMC	February 21, 2017 through July 20, 2018

Applicability	Part Number	Part Name	Component Description
MY2018 Lexus LS	42600-5AG80	Wheel Assy	Wheel with run-flat tire
	42600-5AM80		
	42600-5AJ50		
	42600-5AN10		
	42600-5A410		
	42600-5AN40		
	42600-5AL20		
	42600-5AL30		
42600-5AM20			

	42600-5AM30		
	42600-5AM40		
	42600-5AM50		
	42600-5AM60		
	42600-5AM70		
	42600-5AM90		
	42600-5AN00		
	42600-5AN20		
	42600-5AN30		
	42600-5AQ20		

- NOTE: (1) Although the involved vehicles are within the above production period, not all vehicles in this range were sold in the U.S.
- (2) This issue only affects vehicles which are equipped with certain run-flat tires from a specific tire supplier, assembled to wheels by another supplier using a specific assembly process. Other Toyota or Lexus vehicles sold in the U.S. are not equipped with those run-flat tires.

3. Total Number of Vehicles Potentially Involved:

6,296

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

Based on results from non-representative inspections of 1,236 run-flat tires during the investigation, Toyota estimates that approximately 5% of the involved vehicles may have the cracked condition in the tire sidewall described in this document. However, whether the cracked sidewall could lead to tread separation would vary depending on the tire use conditions in each case.

5. Description of Problem:

The subject vehicles are equipped with run-flat tires with a sidewall reinforcement layer inside the tire. Due to an improper tire to wheel assembly process at a specific supplier, conducted prior to vehicle assembly, there is a possibility that a crack could develop on the sidewall reinforcement layer. This crack could expand over time, leading to abnormal noise and vibration. Under certain driving conditions (such as highway driving speeds with lower levels of tire inflation), there is a possibility that portions of the tire tread layer could separate. Tread separation can cause a reduction of vehicle stability and may increase the risk of a crash.

6. Chronology of Principal Events:

July, 2018

In July 2018, Toyota received a field technical report from the Japan market indicating an abnormal noise from the right front of a Lexus LS vehicle while driving at low speed. The dealer inspected the vehicle and found a crack on the inside of the right front tire. The tire was recovered and investigated by the tire supplier. The supplier found that the sidewall reinforcement layer on the inside of the tire, which is designed to enable the vehicle to continue to be driven at reduced speed if the tire loses inflation, had a crack. The tire supplier also investigated the production record but did not find any abnormality in the tire rubber characteristics for their production tires.

Because the mileage of the vehicle of the recovered tire was relatively low, Toyota inspected mass production tires at the supplier where tires are assembled to the wheels. A crack was observed on the sidewall reinforcement layer on some tires which had been assembled with the wheels. This inspection also indicated that tires which had not yet been assembled with wheels did not have any cracks.

Based on the inspection result, Toyota investigated the tire and wheel assembly process at this supplier. In the investigation, Toyota was informed that the process at this supplier included pressing the sidewall of the tire after assembly to the wheel in order to provide better riding comfort. Toyota theorized that this additional pressing process may cause a crack to occur. The sidewall pressing process was stopped, and tire/wheel assemblies were recovered from vehicles at the Toyota plant and port locations for inspection.

#### August, 2018 ~ October, 2018

Toyota inspected these recovered tires. There are three different suppliers that manufacture the run-flat tires for the current generation LS vehicles. However, cracks were observed only on tires manufactured by a specific tire supplier.

To further investigate whether the aforementioned additional pressing process could lead to the observed cracks, Toyota conducted crack duplication tests. Tires manufactured by each supplier were used for the tests. Cracks were observed only on tires manufactured by the specific supplier, supporting the findings from the inspection of recovered tires. In addition, run-flat tires for the previous generation LS model were tested, because these tires had been manufactured at the same facility. However, no cracks were observed resulting from these tests.

To determine the reason why cracks developed only in tires for the current generation LS manufactured by the specific supplier, Toyota evaluated stress on the sidewall of each tire during assembly. As a result of the evaluation, Toyota found that, for the current generation LS tires from the specific supplier, the stress on the sidewall reinforcement layer during the additional pressing process exceeded its tensile strength. Tires produced at the other suppliers and tires for the previous generation LS have a different material elasticity, and the tensile strength is not exceeded during the pressing process. Based on the results of the above investigations, Toyota determined that a crack could develop on the sidewall reinforcement layer of the current generation LS run-flat tires, manufactured by the specific supplier due to an improper tire to wheel assembly process.

To assess the real world impact of potential sidewall cracking resulting from this tire and process combination, Toyota conducted durability tests with multiple speed and distance parameters using cracked tires. Testing was done under the ISO standard for run-flat tires (i.e., test using a travel distance of 80 km and speed of 80 km/h). An additional test model included a travel distance of 30,000 km and a speed of 60 km/h. No abnormality was found on the tires from these tests. In addition, a severe, high speed test (at 250 km/h, the maximum speed of LS vehicles) was also conducted. During this test, a partial separation of the tread layer was observed. To identify whether a crack could lead to separation of the tread layer, Toyota began to investigate the cause of the tread separation.

#### November, 2018 ~ February, 2019

Toyota investigated the tire where the partial tread layer separation was observed when the tire was tested at maximum speed of LS vehicles and found that the tread separation was caused by heat.

In additional testing, Toyota measured tire temperature at the inside of tread portion of cracked tires and non-cracked tires tested at the LS vehicle's maximum speed of 250 km/h. The testing showed that the temperature of the cracked tire was over 127 degrees Celsius, which is higher than the temperature of the non-cracked tire. Toyota theorized that the rigidity of the sidewall could be reduced due to the crack. If rigidity is reduced, deflection of the sidewall could increase causing deflection of the tread portion to increase, resulting in higher tire temperatures.

To determine whether tread layer separation could occur under normal vehicle usage, Toyota conducted additional durability tests of cracked tires at multiple speeds with tire pressure set at a lower level. As a result of this testing, tread layer separation was not observed. However, tire temperature increased to over 132 degrees Celsius, which is also higher than the temperatures observed in tests of non-cracked tires. While tread separation only occurred in the severe, high speed (250 km/h) testing, Toyota could not eliminate the possibility that tread separation could occur under other driving conditions (such as during highway driving or lower levels of tire inflation) based on the observation of higher tire temperatures in the aforementioned testing. Additionally, while the field data and investigation indicate that customers could experience noise/vibration from the tires, Toyota could not determine how much prior detectability to the customer would be present in these cases.

#### February 21, 2019

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

As of February 19, 2019 based on a diligent review of records, Toyota's best engineering judgment is that there are 8 Toyota Field Technical Reports and 24 warranty claims that have been received from U.S. sources that 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 return their vehicles to a Lexus dealer. All four tires will be replaced with new ones at no charge if one or more tire(s) are run-flat tire(s) manufactured by the specific tire supplier.

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 will be sent by late April, 2019. 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 on February 26, 2019. Copies of dealer communications will be submitted as they are issued.

10. Manufacturer’s Campaign Number:

KLC