**Technical Report Documentation Page**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **1. Report No.**  DOT HS XXX XXX | **2. Government Accession No.** | | **3. Recipient’s Catalog No.** | |
| **4. Title and Subtitle**  Cost and Weight Analysis of Automatic Emergency Braking Systems for Passenger Vehicles Optional Task: LiDAR-based AEB System | | | **5. Report Date**  August 21, 2019 | |
| **6. Performing Organization Code** | |
| **7. Author**  Ricardo Inc. | | | **8. Performing Organization Report No.** | |
| **9. Performing Organization Name and Address**  **Detroit Technical Center**  **Van Buren Twp., MI**  **48111 USA** | | | **10. Work Unit No. (TRAIS)** | |
| **11. Contract or Grant No.**  DTNH2216D00037  Task Order: 693JJ918F000185 | |
| **12. Sponsoring Agency Name and Address**  National Highway Traffic Safety Administration  Evaluation Division; National Center for Statistics and Analysis  1200 New Jersey Avenue SE.  Washington, DC 20590 | | | **13. Type of Report and Period Covered**  NHTSA Technical Report | |
| **14. Sponsoring Agency Code**  NSA-310 | |
| **15. Supplementary Notes** | | | | |
| **16. Abstract**    Ricardo has analyzed the cost and weight of a LiDAR-based Automatic Emergency Braking (AEB)system as implemented in the 2019 Audi A8. AEB systems can avoid or mitigate forward collisions by either assisting the driver if enough braking force is not being applied (called Dynamic Braking Support, DBS) or automatically applying the brakes if a forward collision is imminent (Crash Imminent Braking, CIB.)  The Audi AEB system employs a forward-looking visible camera, a night vision (IR) camera, a long-range radar, two forward-side looking short range radars and a first-to-market automotive grade laser scanner (LiDAR.) In addition, a central Driver Assistance Systems (DAS) controller is used to offer level 3 autonomous driving capability that Audi calls Traffic Jam Pilot which not only incorporates AEB functionality but goes well beyond it with automated driving capabilities under limited conditions.  Manufacturing costs for the sensor, controller and wiring systems have been broken down by labor, material, variable and fixed cost elements. Furthermore, the wholesale price from a supplier to an automotive OEM for each component was determined; higher SG&A costs and profit margin have been applied to the sensor and controller modules than commodity items due to the fact that higher development costs are typically encountered for these leading edge technologies and there is a lack of competition for new entries in the marketplace. Finally, dealer costs and markup have been factored in to arrive at an end-user price increase that a retail customer might be expected to pay as determined from the should-cost analysis. These incremental costs are summarized in Table 1.  **Table 1 Manufacturing costs, wholesale prices and end user price increase are tabulated for the Audi A8 LiDAR-based AEB system**    This work was completed by Ricardo Strategic Consulting (RSC) a division of Ricardo, Inc. Ricardo’s two subcontractors for this work were Yole Inc., and MeC US, Inc.[[1]](#footnote-1) | | | | |
| **17. Key Words**  Automatic Emergency Braking Systems Passenger Vehicles, AEB, PV, LIDAR | | **18. Distribution Statement**  This report is free of charge from the NHTSA Web site at [www.nhtsa.dot.gov](http://www.nhtsa.dot.gov) | | |
| **19. Security Classif. (Of this report)**  Unclassified | **20. Security Classif. (Of this page)**  Unclassified | | **21. No. of Pages**  74 | **22. Price** |

**Form DOT F 1700.7** (8-72)

1. System Plus Consulting (SPC) conducted work for and is a part of the Yole Group of companies. MeC SrL conducted work for MeC US, Inc. [↑](#footnote-ref-1)