

CONCLUSIONS

CAVs need reliable and fast communication with a high data rate to support different CAV applications, which include safety, mobility, and infotainment applications. Meeting all of these requirements has been a major challenge for existing widely deployed wireless communication services, such as 4G LTE. 5G mm-wave communication is a promising wireless communication option to support CAV applications, especially in a congested area. We have found that increasing the number of CAVs does not deteriorate the end-to-end delay for 5G mm-wave. The end-to-end delay derived from the forward collision application shows that 5G mm-wave satisfies the maximum delay threshold, for safety-critical applications, of 200 ms. As cellular service providers are showing interest in including 5G mm-wave, it will be a viable option for public agencies to include 5G mm-wave supported CAV applications.

Although mm-wave is showing promising results, their signal is susceptible to blockage and non-line-of-sight, which is why the base stations have to be closely spaced. Having closely spaced mm-wave base stations is an ideal scenario for an urban environment where CAVs will operate by communicating with other CAVs, connected pedestrians, and other external data sources. Future studies should consider multiple external data sources, including real-time data feed from traffic cameras, traffic management centers, social media, cloud database etc. Additionally, testing on the performance of a heterogeneous 5G LTE and mm-wave enabled network to provide a reliable communication system for a long coverage area, such as interstates, should be conducted.