



APPLICATION EXHIBIT – FORM 442

Introduction

By this application modification, Ford Motor Company seeks experimental authority to operate certain modular Cellular-V2X (C-V2X) prototypes within the United States of America for purposes of testing, development, and evaluation.

The Commission has established the Dedicated Short Range Communications (DSRC) service in the 5.850- 5.925 GHz band for enabling vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communications. See 47 CFR §§90.371-90.377; Amendment of Parts 2 and 90 of the Commission's Rules to Allocate the 5.850-5925 GHz Band to the Mobile Service for Dedicated Short Range Communications of Intelligent Transportation Services, ET Docket No. 98-95, Report and Order, 14 FCC Rcd 18221 (1999). Recently, cellular specifications have emerged that support vehicle-to-everything (V2X) communications – V2V, V2I, vehicle-to-pedestrian (V2P), and vehicle-to-network (V2N). In recognition of the emerging C-V2X platforms, Ford Motor Company wishes to test modular technologies that would employ C-V2X functionality as an add-on module in a manner that allows for developmental flexibility.

Ford acknowledges currently having multiple experimental licenses granted via Form 442 submissions; Ford is aware that the granting of this request would subsequently nullify/ result in the expiration of some of the prior grants. We would like to call special attention to the grant under call sign WK2XQQ, file number 1023-EX-CN-2019. This grant was issued with special consideration given to fixed transmitters installed above the 6m threshold that required extra elevational assessment be provided for approval. This request for modification to call sign WK2XQP, file number 1024-EX-CN-2019, is specifically for mobile transmitters and fixed transmitters at or under the 6m threshold only, not requiring the additional elevation assessments. Therefore, it is our understanding that the grant under call sign WK2XQQ should not be nullified/ expired due to this request given the difference in requirements. Ford's license under call sign WJ2XYG, file number 0030-EX-CR-2020, which is an extension of call sign WJ2XYG, file number 0296-EX-CM-2019, may be impacted if this request is granted.

Proposed Testing and Objectives

The proposed testing would support equipment research and development, field testing, and proof of concept. Ford Motor Company is integrating the C-V2X functionality into the Telematics Control Units (TCU) by using an add-on module that would attach to the TCU. The devices to be tested would operate on frequencies allocated to DSRC service. Ford has ongoing relationships with many external parties, including state level DOTs and local municipalities, that are currently seeking to investigate the feasibility of connected vehicle infrastructure environments. Ford's ability to assist, participate, and help drive these initiatives is contingent upon licenses granted under Form 442. The connected vehicle environment is currently experiencing an increasing number of pilots, explorations, and proof of concepts that are

occurring at accelerated rates; Continuing to make individual license requests per project and locality is resulting in prohibitive burdens to logistics, cost, and efficiency. Therefore, Ford Motor Company seeks to expand the granted license under call sign WK2XQP to cover the continental United States of America with minor additions of potential transmitters to facilitate public safety testing. If granted, this license would greatly simplify the process by which innovations and advancements to the connected vehicle environment can occur, which are brought about through engagements with critical municipalities and institutions that have committed resources to realizing this new technology evolution.

The proposed testing will be done in two stages: (1) Indoor Laboratory; and (2) Outdoor Vehicular.

(1) Indoor Laboratory Testing

The C-V2X module would be tested using a “bench” setup. Various parameters of basic operational states would be evaluated, including message transmission and reception statistics; latency; error rate; effects of fading and congestion; and effects of variations in transmit power.

Transmitter operating parameters:

Type	Frequency (MHz)	Bandwidth (MHz)	Power (dBm EIRP)	Power (mW EIRP)	Antenna Height (m)
Fixed	5850-5925	10, 20	23 dBm (max)	200 (max)	3 (max)

(2) Outdoor Vehicular Testing

The C-V2X module would be installed in test vehicles, and communication between the vehicles would be evaluated while engaged in controlled maneuvers emulating real world driving paths and configurations. Transmission and reception would be tested using up to fifty vehicles simultaneously. In addition to the same parameters tested in the indoor laboratory, various use cases would be evaluated, including, but not limited to: collision avoidance messaging, intersection messaging, vehicle-to-infrastructure (V2I) messaging, blind-spot warnings, and emergency braking warnings.

Transmitter operating parameters:

Regular Vehicles:

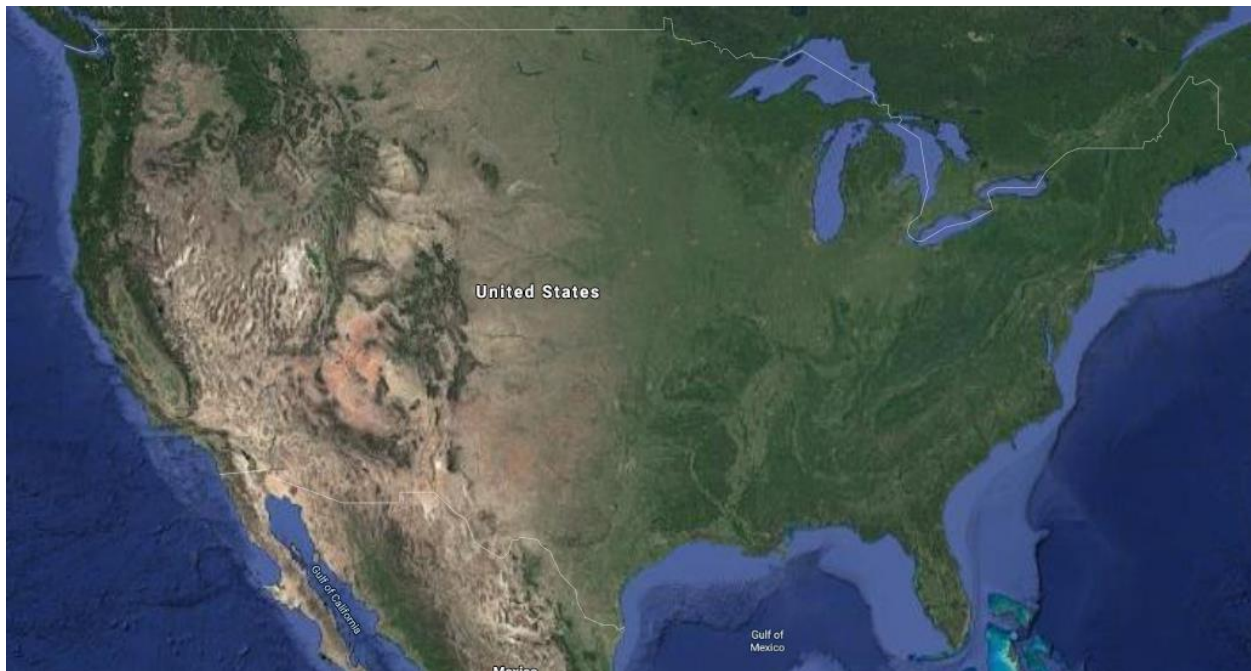
Type	Frequency (MHz)	Bandwidth (MHz)	Power (dBm EIRP)	Power (mW EIRP)	Antenna Height (m)
Mobile	5850-5925	10, 20	23 dBm (max)	200 (max)	6 (max)

Public Safety Vehicles:

Type	Frequency (MHz)	Bandwidth (MHz)	Power (dBm EIRP)	Power (mW EIRP)	Antenna Height (m)
Mobile	5850-5925	10, 20	33 dBm (max)	2000 (max)	6 (max)

Geography

Testing will be limited to within the borders of the continental United States of America.



Minimizing Interference

Ford understands that the proposed experiment under Part 5 of the Commission’s rules must avoid causing interference to co-channel licensed operations. As noted, the devices to be tested would operate on frequencies allocated to DSRC service. Through searches, Ford is aware of many co-channel licensed operations occurring within the U.S.A. Given the maximum transmitting antenna height of 6 meters, the low power operation, and the sporadic and non-continuous nature of the testing, it is highly unlikely that the proposed experiment would result in harmful interference. Multiple other institutions, agencies, municipalities, and DOTs with licenses are cooperatively experimenting with the same technologies, incurring low probability of interference. Any interference with Ford owned operations would be internally resolved.