Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of

Amendment of the Commission's Rules Regarding Dedicated Short-Range Communication Services in the 5.850-5.925 GHz Band (5.9 GHz Band)
WT Docket No. 01-90

Amendment of Parts 2 and 90 of the Commission's Rules to Allocate the 5.850-5.925 GHz Band to the Mobile Service for Dedicated Short Range Communications of Intelligent Transportation Services
ET Docket No. 98-95

Comments of 3M
Intelligent Transportation Systems
Edmund J. Ring

3M (Minnesota Mining and Manufacturing Company), hereby submits the following comments in response to the dockets:

WT Docket No. 01-90
ET Docket No. 98-95

1 Statement of Interest

3M is currently involved in the Public Safety and Public Service area's with Priority Control systems, vehicle related safety products and traffic control reflective materials. 3M is and will be involved in DSRC, providing services to the Public Safety community to aid in safety, emergencies and natural disasters. Accordingly, 3M is concerned that the spectrum is utilized efficiently, and suitable rules and standards are adopted, for Public Safety and private ITS applications within the band. We are also concerned that Public Safety Quality of Service not be diminished or degraded, now or in the future as DSRC proliferates.

2 Definitions within ITS

We strongly agree that the DSRC band should be primarily Public Safety oriented, as was the `intent of Congress`. We also believe that Traffic Monitoring will be an important, albeit small part of the DSRC mix. Further, private and commercial use should be included within the structure of the ITS hierarchy. The ultimate factor in the ITS band utilization is maintaining the Quality of Service for the Public Safety users. Should the QoS be degraded to the point where Public Safety applications fail, the primary function of the band will be diluted.

The needs of traditional public safety entities, in particular emergency responders such as police, fire departments and medical personnel, for ITS solutions such as emergency vehicle preemption, **are** public safety issues. These *solutions* prevent injuries, fatalities, and property damage and enhance the response time of emergency responders, to the benefit of the public on both the societal and individual level.

We support Section 337(f)(1) of the Act as the preferred definition of Public Safety in the DSRC band. Section 337(f)(1) of the Act defines "public safety services" as services:

(A) the sole or principal purpose of which is to protect the safety of life, health, or property;
(B) (i) by State or local government entities; or
(ii) by nongovernmental organizations that are authorized by a governmental entity whose primary mission is the provision of such services; and
(C) that are not made commercially available to the public by the provider.

Section 337(f)(1) of the Act does not dilute the intention of public safety services but is flexible enough to include entities such as utilities, pipelines, railroads, metropolitan transit systems, private ambulances, or volunteer fire departments as warranted under public safety.

We believe that the word "non-voice" should be retained in the definition of DSRC. Allowing non-defined voice messages would allow pager like operations within the band.

3 Interoperability

National interoperability is required for the success of ITS. Interoperability can only be achieved through standardization of operation within the ITS band. Interoperability covers a large gamut: equipment functionality, communication protocols and applications:

- Communication protocol standardization is necessary i.e. 802.11xx
- OBU's for the general public (not related to a specific RSU) should be standardized under a Part 15 requirement.
- RSU's should be type accepted.
- RSU's from different vendors should be interchangeable (except for specialized applications)
- OBU's from different vendors should be interchangeable (except for specialized applications)
- OBU's for the Public Safety applications (that are not made available to the public) should be type accepted.
- ITS Applications for Public Safety communications between an RSU and OSU for the general public (not related to a specific RSU) must be standardized.
- Specialized Public Safety applications (that are not made available to the public) should not be standardized.

Band channelization is necessary for interoperability. Band channelization provides a structure for compatible utilization and future growth.

4 Licensing

RSU licensing in the ITS band should be determined by the type of RSU. Public Safety sites will be installed along roadway corridors and in intersections along roadway corridors. Therefore, Public Safety RSU's should be licensed by area, where Public Safety is defined in 337(f)(1).

Non-Public Safety users will generally be at specific locations. Therefore, non-Public Safety RSU's should be licensed by site.

The DSRC band is defined as primarily Public Safety and licensing for Public Safety has to have priority over non-Public Safety. Therefore, 'first come first serve licensing' should not be applied in the Public Safety versus non-Public Safety arena. All site and frequency coordination must ensure the integrity of Quality of Service for Public Safety operations.

5 Technical Issues

In general, the ASTM standard provides the necessary basis for compatibility within the ITS band. However, there are technical components of the standard that have not been proven to be realizable. In particular, the spectrum mask pertaining to Class D devices has not been shown to be feasible. The standard needs to have flexibility to adapt to the technical realities as DSRC is deployed. It is important that Public Safety devices are not strangled by inflexible standards.

The **proposed antenna height correction factor** is not required in the proposed DSRC scenario. The DSRC communication system is based on using the minimum RF power necessary to complete a communication link regardless of the maximum operating power. Most intersection and gantries structures are in the 5 to 8 meter range and layering on unneeded regulations and costs that are primarily an obstacle to Public Safety installations are unwarranted. Limiting the maximum power above 6 meters would only apply to the high power Public Safety channel and limit the flexibility of the installation.

As an example of the maximum power limitation of the **proposed antenna height correction factor**, a transmitter operating up to the maximum power limit of 44.8 dbm EIRP at 6 meters is then raised 1 cm (~3/8 inch) and now is limited to 33 dbm EIRP; a reduction of 11.8 db for an increase of 1cm. Technically, there is no basis or support for this restriction. Common sense does not support this feature of the **proposed antenna height correction factor.**

The application of the 2-Ray propagation model in the development of the **antenna height correction factor** is to simplistic to be applicable in the DSRC case. The 2-ray propagation model requires a perfectly flat reflecting surface, a clear Line-of-Sight propagation path, a clear propagation path for the reflected ray and no other refection sources. If any of these requirements are not met the 2-ray model will not be valid.

From the 2-ray model theory, which is the basis for the **proposed antenna height correction factor**, if the transmitting antenna height is doubled the signal strength is doubled beyond the breakpoint, **assuming** the 2-ray model is valid. The following discussion will outline the problems with this assumption.

First, all roadway surfaces have an arc (non- flat surface) to aid in the runoff of rainwater, consequently the reflected ray can appear to be closer or further than a reflected ray off a flat surface, dependent upon the relative location of the transmitter, receiver and the reflection point off the roadway surface. Also, on most roads the elevation relative to the transmitting antenna is constantly changing which also affects the reflection point of the reflected ray.

Second, a clear Line-of-Sight propagation path is not always available when a receiving vehicle is behind another vehicle.

Third, a clear propagation path for the reflected ray is not always available due to intervening vehicles that **will** be present in an urban environment. If a blocking vehicle is located between the reflected ray path and the receiving vehicle, the reflected ray will be blocked. An example of this is shown in Figure 1. Here the vehicle height is set at 1 meter as defined in the technical definition of the **proposed antenna height correction factor**. The transmitting antenna height is 6 meters and the blocking vehicle height is 1.8 meters. It can be seen in Figure 1 that any blocking vehicle in the 400 meters (over 4 football field lengths) from the receiving vehicle to the transmitting antenna will block the reflected ray from reaching the receiving vehicle.

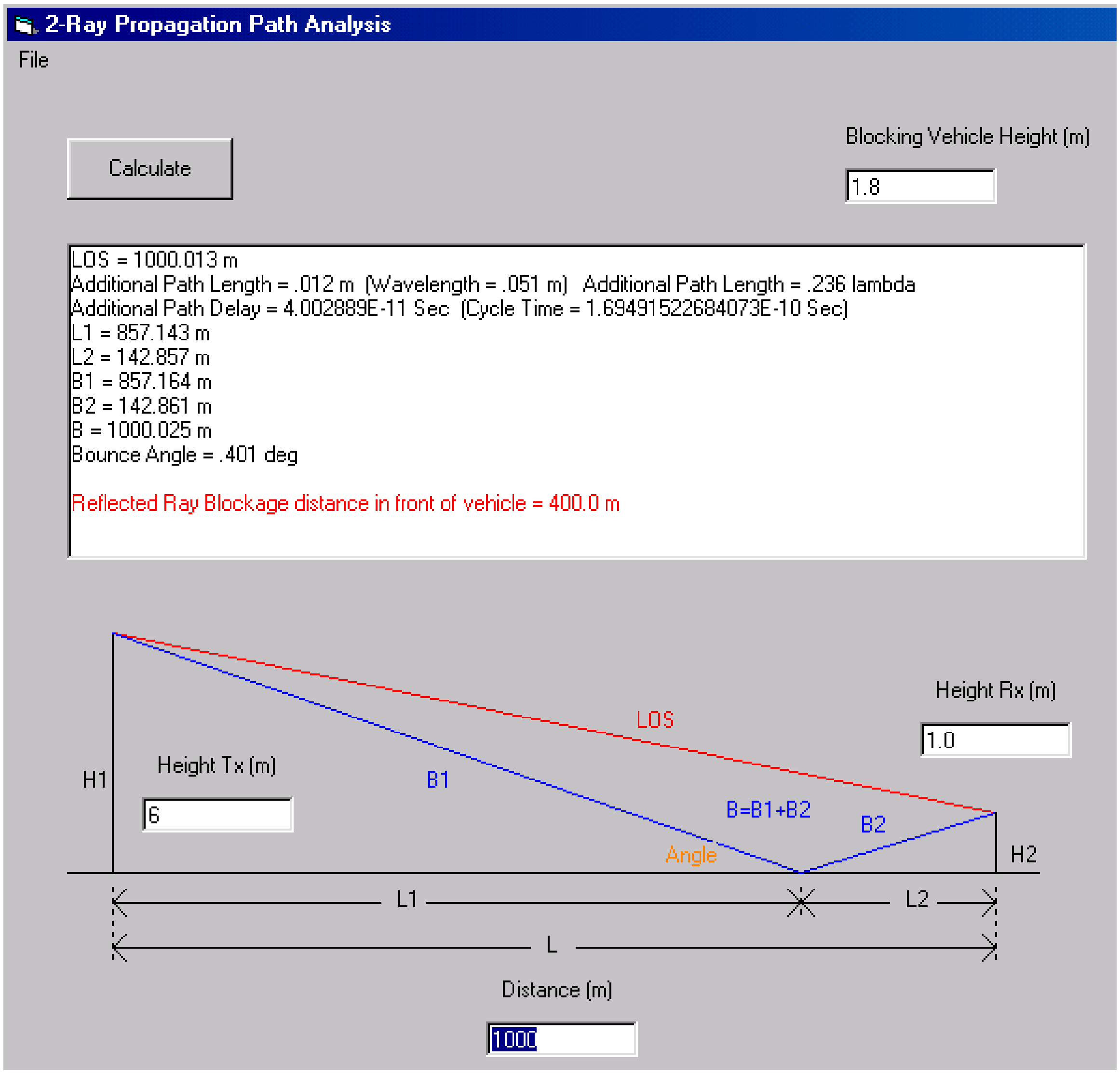

Figure 1) 2-Ray Propagation Blocking Path Analysis

Finally, the DSRC environment consists of many reflection sources such as buildings and structures adjacent to the roadway, other vehicles on and along side the roadway, lighting structures, roadway signs, curbs, etc. These reflection sources will provide many additional signal paths to the receiving antenna.

In Figure 2, a simulation of a single receiving point 1 meter in height, at 455 meters from the transmitter at a height of 6 meters, is shown. This simulation accounts for the presence of buildings along the path. No other vehicles or reflection sources are included in these simulations. It can be seen that with the inclusion of buildings along the path, the 2-Ray propagation model no longer accurately represents the received signal.

In fact, 276 individual rays were generated, many with amplitudes approximately the same as the Line of Sight ray. Each red line represents a single ray path between the transmitter and receiver. The addition of other reflections sources will generate many additional ray paths between the transmitter and receiver.

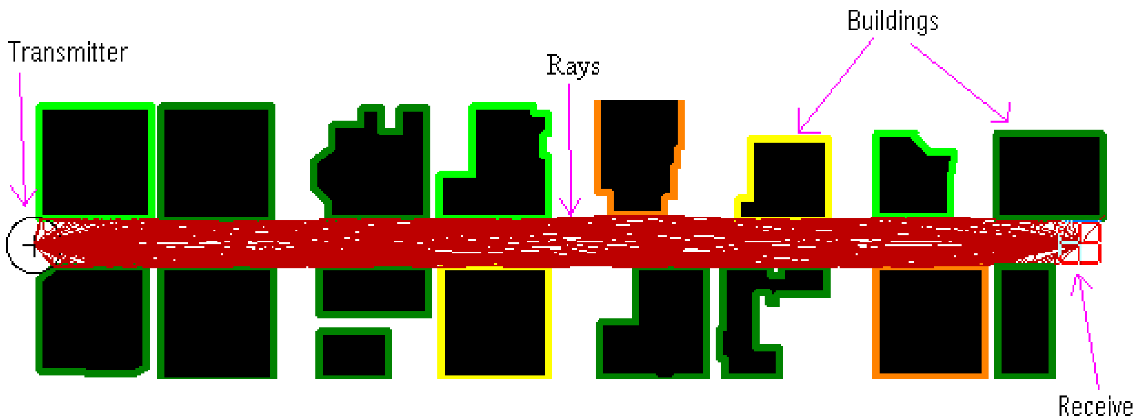

Figure 2) 276 Rays generated between Transmitter and Receiver in an Urban Canyon

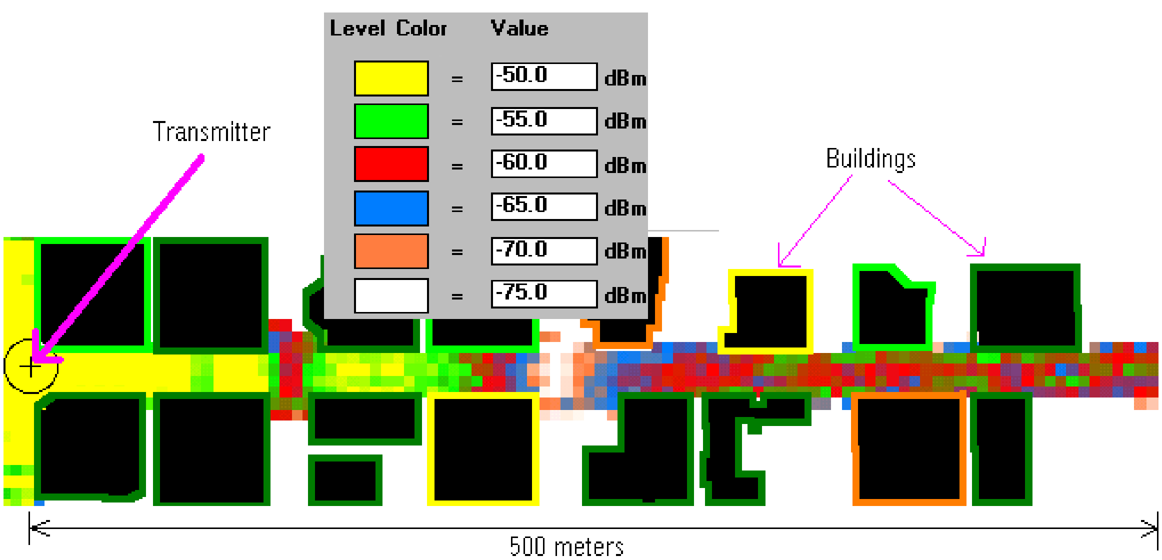

Figure 3) Signal Strength along an Urban Canyon

In Figure 3, the signal strength along the length of an urban canyon is plotted. From this plot it can be seen that the signal strength varies significantly along and across the roadway and does not follow the predictions of the 2-Ray model. This simulation accounts for the presence of buildings along the path. No other vehicles or reflection sources are included.

In conclusion, it can be seen that the **proposed antenna height correction factor** is invalid for the environments that DSRC communication links will operate in. Therefore, the **proposed antenna height correction factor** should be eliminated from consideration.

6 Conclusion

3M supports the need for interoperability and standardization as outlined in the preceding comments.