802.4L/87-001

OBJECTIVES FOR 802.4 L
Through-the-Air Token Bus Physical Layer
DRAFT--Proposal

1. **GENERAL:** To provide an alternative physical medium for through-the-air communication for mobile equipments as part of a local area network using the 802.4 protocol with 802.1 and 802.2 higher levels. The system should use the special advantage of token bus: **There is no possibility of two stations transmitting simultaneously, and there is no requirement for fixed equipment to resolve contention.**

2. An acceptable solution could use either radio between 900 and 3500 MHz or light from 300 to 1500 nanometers.

3. The covered area assumed is about one square mile (3 square kilometers) for which econmic factors are optimized. More than one fixed antenna/transducer may be used to cover this area. This coverage should be provided under all of the following conditions:

   A. At 95% of all locations (on a 1 meter grid) with a vehicle antenna/transducer height above floor level of 2 meters and a fixed antenna/transducer height of 4 meters.

   B. In all of these environments: 1.) factory floor with large metallic obstructions and high radio noise; 2.) offices with large open areas and 1.5 to 2 meter high area dividers and partitions; and 3.) inside and outdoor storage areas with tall shelving containing metal and non-metal parts/inventory stocks.

   C. The system should operate with some non-Cartesian (non-perpendicular) aisles and passageways.

4. The payload data rate must be greater than 250 kilobits/sec, and a rate exceeding 1 Mbs is very desirable.

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5. The preferred interconnection point for this physical layer is at the 802.4G DTE/DCE interface. The radio/optical system is to look like an alternative type of Modem. Interfaces at level 2 can be considered, but are unlikely to be accepted if the desired type is achieved.

6. Error correction techniques within the physical layer may be used to improve the apparent error rate to a level within an order of magnitude of the other 802.4 physical mediums. The success probability of an error free packet transmission (of 10,000 bits) should be better than 1.000-10^-3 at 95% of all locations, and no worse than 1.000-10^-2 at 99% of all locations.

7. The use of multiple antennas/transducers at fixed points should be assumed. This implies reuse of the same optical or radio frequency within the system for which provisions should be made.

8. For a radio system, the following initial assumptions should be made:

   A. The operating frequency of the system is between 900 and 3500 MHz with an occupied bandwidth of 10 MHz or less. The current assumption is 1700-1710 MHz.

   B. No more transmitter power shall be used than is necessary for the sum of the following factors: 1.) free space path loss for 20 dB C/N with 6 dB excess external noise, 2.) 26 dB allowance for obstacle loss.

   C. Fixed antennas are between 3 and 5 meters above floor level. Mobile antennas are between 1.5 and 2.5 meters above floor level, and their performance must not be significantly degraded by up to 5 degrees floor tilt from the horizontal plane.

   D. Fixed antenna directivity must be designed to reduce long distance propagation and reduce susceptibility to multi-path effects.

   E. Applicable FCC Rules in Part 15 and Part 18 must be recognized.

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9. For an optical system, the following initial assumptions should be made:

A. The power of emitters must be below the level set by OSHA to avoid risk of eye damage from looking directly at it.

B. No dependence may be placed on white walls or ceiling for coverage of shadowed areas since these reflectors may not exist in factory environments.

C. Fixed transducers may be proposed with sufficiently close spacing to have unobstructed paths to mobile units at more than 95% of all locations.

D. Fixed and mobile transducers may employ collimation in the vertical plain. The mobile optical system must accept a 5 degree tilt in the floor plane.

E. There is no requirement for the optical system to work during rainfall, however the equipment shall not sustain permanent damage from exposure to rain, fog or industrial air pollution.

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