802.4L/87-003

TO: D. Greenstein, Chairman, IEEE 802.4L (Through-the-air Token Bus)

RE: Minutes of the meeting of IEEE 802.4L on November 20, 1986
Cardiff Room, Hotel Del Coronado, San Diego, CA
(Submitted but not approved or accepted.)

1. The meeting was convened at 0830 by C. A. Rypinski substitute Chairman acting at the request of Chairman D. Greenstein. The Chair called for a volunteer for Secretary. There being none, the Chair said he would keep his own Minutes. No Minutes for the prior interim or plenary meetings were submitted or approved.

2. Attendance was 10-12 persons, and it was determined at the start that no one present had been to a prior meeting except the Chair. The Chair gave a brief summary of the activity to date, reporting that there was no active technical proposal, but that a few Companies had described existing systems which might relate to this problem. A brief description of the Hughes optical through-the-air system was given as described at the interim meeting.

3. The Chair described the objectives of the group as follows:

   A. Through-the-air transmission with either radio or optical signals is required.
   B. To serve an area of approximately one square mile (3 square kilometers) as a model but not restricted to only that size.
   C. If radio is used, there is a preference for the frequency range 1700-1710 MHz (for which a Rule change has been requested and docketed), but not using technology limited to only that frequency band.
   D. Data rate as high as economically feasible, but probably between .25 and 2 Mbs.
   E. A factory environment is assumed which contains many obstacles and RF noise sources. The system cannot depend on optically reflective walls.
   F. A successful proposal must work within present 802.4 definitions, and is probably attached at the 802.4G interface (DTE/DCE).
   G. Acceptable cost levels are higher than those for broadband taps.

4. Present status: The group is open to receive proposals and to consider existing products and technology. No current proposals seemed to fulfill a sufficient number of objectives to be adopted without change.

5. The Chair offered an agenda for the remainder of the meeting which was accepted as follows:

   A. To describe and circulate relevant references submitted by the Chair.
   B. To hear any new proposals to be offered.
   C. To open the floor for general discussion.

6. The Chair circulated a submission "Second Nordic Seminar on Digital Land Mobile Radio Communication--Report to Committee 802.4L" and a reference "Time Delay Spread and Signal Level Measurements of 850 MHz Radio Waves in Building Environments". Since there were not a sufficient number of copies for all attending, the Chair said that copies would be attached to the minutes.

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7. The Chair opened the floor to new submissions. Mr. F. Akashi described two products of NEC (Japan) which could be relevant to the objectives of 802.4L as follows:

   A. A room size optical system enabling fixed computer terminals with RS-232 interface and aimed, raised transceivers to communicate with a ceiling located fixed site by time division multiplex at 768 kbs.
   B. A narrow band UHF (400/450 MHz) FM (Land mobile technology) 9.6 kbs data system with handheld terminals.

   The presentations were accompanied by copies of the related published technical papers copies of which were distributed to those attending and which are also to be attached to copies of the minutes.

8. There being no other offerings, the floor was opened to general discussion. Subjects discussed included the following points all concerned with the radio method:

   A. Reservations were expressed on the feasibility of data rates above 250 kbs.
   B. Concern over multipath propagation problems was expressed.
   C. Possible use of cellular technology was suggested.
   D. Tradeoffs of throughput vs. error correcting code design were discussed, briefly.
   E. Concern was expressed over the discrepancy between 10^8 BER 802 requirement for physical layer and 10^2 performance of simple radio links making layer 1 error correction coding imperative for performance equal to other mediums.
   F. Several thought that the radio and optical solutions are sufficiently different that they should be considered by separate groups. Optical could be an extension of the present 802.8 task group.

9. Rypinski asserted that, based upon submitted references, all rates between .25 and 1 Mbs were feasible, but that higher rates would be more expensive and would be restricted to shorter distances for the through-the-air path. Error correcting codes used consume about 25 to 33% of the link capacity to overcome long burst error patterns.

10. Most of those present concurred in opinions on the following points:

   A. The charter of the group is insufficiently defined. Proposals for more definitive work statements are needed, and they should be considered.
   B. Applications beyond the factory floor are important and needed.
   C. The problem is a general Layer 1 task, and possibly should be assigned to a task group like 802.7 or 802.8.

11. The Chair promised to distribute the circulated references and the attendance list with the minutes. There being no further business, the meeting was adjourned at 1000.

Submitted by,

Chandos A. Rypinski, Substitute for the Chairman of IEEE 802.4L

Post Script: Since I was obliged to leave San Diego before the 802.4 plenary, I gave the first draft of my meeting notes to M. Bush, and requested that he give the Committee report at that meeting. --C. A. Rypinski

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CLYBNDOS RYBIDENCI

ATTENDANCE 802.4L 11/20/86 0830

No.	NAME	CO./ADDRESS/PHONE (OR BUSINESS CARD)	
	ARIEL HENDEL	STANDARD MICROSYSTEMS	(516) 273 3100
	Fumio AKASHI	NEC	(044) 855 0923 (Japan)
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	Ed Lasota	Kodak	716-477-1006
	MIKE BUSH	ALLEN-BRADLEY	313-668-2500
9	Fred Rhine	Allen-Bradley	313 668 2500
10	HOWARD GAGE	TANDEM COMPUTERS	408-748-2154

Director YOSH[illegible]

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FAX [illegible]

MINUTES 802.4L 11/20/86 0830
CARDIFF ROOM, DEL CORONADO

1. CONVENED BY C.Q. RYPINSKI SUBSTITUTING AS CHAIRMAN AT REQUEST OF CHAIRMAN. D. GREENSTEIN

2. ATTENDANCE 10-11 PEOPLE NONE OF WHOM HAD ATTENDED PRIOR MEETING OF 802.4L EXCEPT ~~[illegible]~~ ACTING CHMAN

3. CHMN SUMMARIZED PRIOR MEETINGS GIVING COMMITTEE FUNCTION AS FOLLOWS

A. EITHER RADIO OR OPTICAL
B. TO SERVE ONE SQUARE MILE
C. IF RADIO, POSSIBLY 1700-1710 MHZ
D. DATA RATE AS HIGH AS POSSIBLE BETWEEN 1.25 AND 2 MBS
E. FACTORY ENVIRONMENT NOT DEPENDING ON WHITE WALLS.

4. STATUS: OPEN TO PROPOSALS, SUBMITTALS TO DATE. ~~INCLUDED~~ ARE FEW AND NONE CLOSE TO ALL PRESENT REQUIREMENTS

5. AGENDA: A. TO HEAR ANY NEW PROPOSALS
B. DISCUSSION OF PROBLEM.

6. CHMN CIRCULATED REFERENCES ON RADIO SOLUTION. HE AGREED TO ATTACH COPIES OF NORDIC CELLULAR REPORT TO MINUTES

7. FLOOR TO MR. F. AYASHI DEC FOR PRESENTATIONS:
   A. ROOM SIZE OPTICAL SYSTEM TDM 768 KBS FOR FIXED COMPUTER TERMINAL WITH AIMED STATION TRANSCEIVERS
   B. NARROW BAND, SINGLE CHANNEL FM RADIO SYSTEM AT 9.6 KBPS AND 400/450 MHZ.

8. DISCUSSION OF RADIO PROBLEMS. RESERVATIONS ON FEASIBILITY OF HIGHER RATES (ABOVE 250 KBS). POSSIBLE USE OF CELLULAR TECHNIQUE. TRADEOFFS OF THROUGHPUT AND ERROR CORRECTING CODES.

9. CONSENSUS OPINION: CHARTER OF GROUP IS INSUFFICIENTLY DEFINED. PROPOSALS FOR NAME ARE NEEDED.

10. CONSENSUS OPINION: APPLICATIONS BEYOND FACTORY FLOOR ARE IMPORTANT AND NEEDED.

11. CONSENSUS OPINION: PROBLEM IS GENERAL LAYER 1 AND POSSIBLY SHOULD BE AN 802.X TO CONSIDER OTHER PROTOCOLS.

12. CHAIR PROMISED TO ATTACH TECHNICAL PAPERS AND ATTENDANCE TO MINUTES.

13. ADJOURNED 1800

CLDyke

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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802.4L/87-004
004

DETAIL SUPPLEMENT TO OBJECTIVES FOR 802.4 L
Through-the-Air Token Bus Physical Layer
Proposals by C. A. Rypinski for Radio only

20. Coverage plan should be based on a square cell with quadrant illumination on a separate frequency from each corner. Default length for one side is 300 feet/100 meters.

21. Frequency plan: Mobile is full duplex transmitting on one frequency and receiving on one of four frequencies with duplicate message information. The default assumption is that the mobile transmits on 925-928 MHz and receives on 2400-2410 MHz (See FCC 18.13). One channel is 1.5 MHz (maximum) wide at 99% of radiated power. Receive channels are separated 2.5 MHz. Frequency accuracy is based on 5 PPM below 1000 MHz and 10 PPM at higher frequencies.

22. Data throughput is 1 Mbs in both directions. Baud rate in medium is approximately 1.5 Mbs, the difference being used for error correction and internal overhead.

23. The limitation balance is set by the dimension of the square which sets minimum C/N for given power and environment and which determines the maximum baud rate usable, directivity of the mobile receive antenna which determines C/I, receive diversity and error correcting codes which determine net BER. The tradeoff shall be made with the following priority order for achievements: 1.) 1.5 megabaud symbol rate, 2.) required BER, 3.) required minimum C/I.

24. A transmitter power output of more than 50 milliwatts shall not be used.

25. Responsibility for resolving cochannel interference lies with the mobile receiver using antenna directivity, diversity and with the choice error correcting codes.

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26. Block type error correcting code shall be used with a block size not to exceed 64 bits.

27. The fixed network shall be a head-end, regenerating type with a retransmitting delay not to exceed 100 bits plus propagation time.

28. Dual mobile receivers will be used so that messages transmitted from the fixed stations may be received in duplicate at the mobile. If an uncorrectable error is discovered in any block of the primary channel, a means shall be provided to replace that block with one from the secondary channel.

29. Each receiver at a fixed point in the system shall have a dedicated path to a central head-end logic (presumed to be an optical fiber). The analog level of the binary coding on the dedicated path shall be proportional to receivd signal level. The head-end will select the best received signal for rebroadcast with a delay of one block plus processing time. In the event of a block errror, the head-end will attempt to find a correct block from another receiver.

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GUIDED VEHICLES SET MANUFACTURING IN MOTION

Freewheeling carriers are providing new flexibility in materials handling and assembly

by Jeffrey Zygmont

After three decades of relatively quiet existence, automated guided vehicles (AGVs) are suddenly winning the endorsement of leading U.S. manufacturers, as flexibility and adaptability become critical on the factory floor. The AGV industry had only about half a dozen vendors 10 years ago, but now their number has more than quintupled, and new major players like the robot giant GMF Robotics are still entering the business. This heightening competition, plus demands from users for ever-increasing sophistication, is fostering advances in AGV technology. For example, a whole new class of vehicles is being developed that finds its way without any guidepaths.

Automated guided vehicles fit into two broad manufacturing categories. In materials handling, AGVs deliver inventory from holding to production areas, or between workstations; they replace manually operated equipment like forklifts or rigid automation like transfer lines. In assembly systems, AGVs are themselves the production platforms, supporting products like automobiles, engines, and garden tractors while work is performed. Thus they do away with conventional industrial conveyor lines.

Industry's adoption of AGVs is analogous to the transportation revolution that occurred when trucks largely replaced freight trains. A train passes each stop in sequence, and facilities served by train must cluster near the rails. But a truck goes wherever there are roads. It doesn't have to pass every stop; it can bypass some and hit others in the order of their priority.

The AGV brings similar flexibility to factories. Although the current generation of driverless transporters still follow mapped routes, they are easily reconfigured to meet changing production needs. And unlike a conveyor line, an AGV can be sent to any station in the system's route, in any sequence, at any time.

The benefits of AGV flexibility will be showcased at GM's operation in Oshawa, Ontario. Currently under renovation, it will house the world's largest concentration of AGVs. Two identical factories making GM midsize W-cars will have about a dozen separate systems, totaling about 1100 individual carriers. Volvo Automated Systems (Sterling Heights, Mich.) is the main vendor, supplying all but the 100 or so AGVs that Conco Tellus (Mendota, Ill.) is outfitting for the paint-shop repair lines. At GM's nearby Oshawa pickup truck plant, Conco Tellus is installing a 424-vehicle AGV system.

In Oshawa's labor-intensive areas, AGV systems permit workpieces to stop at each assembly station for an average of 3½ minutes, allowing workers to perform more involved tasks than they can in the one minute permitted on a moving line. "That has quality implications," says Terry R. Kotwa, senior plant engineer at the car facilities. "It gives a worker more ownership; he can see a bigger chunk going together."

What's more, AGV systems allow a single assembly line to split into several parallel lines where identical operations are performed. Kotwa says this was a key determinant for AGVs at Oshawa. "Parallel processing drastically increases your uptime; if one station goes down, the others still produce," he explains. The flexibility of AGVs permits paralleling much more readily than conveyor systems, which can't be split into multiple lines and remerged later without prodigous hardware additions.

To meet the specialized needs of different industries, AGV carriers may be outfitted with a wide variety of fixtures for holding or transferring workpieces. Some have motorized roller tables, for instance, that transfer parts from atop the carrier to the receiving area of a workstation. And large automobile-body carriers can raise cars several feet off their deck to give workers easy access to the underside.

With most AGV systems—installed by major suppliers like Volvo Automated Systems, Conco Tellus, Eaton-Kenway (Salt Lake City), and Por-

Project 802 Resolution

Date: 11-24

Time: 0950

Mover: DO

Motion: TO SUBMIT DOC 87-001 AS EDITED TO ~~ALL~~ INTERESTED PARTIES FOR COMMENT. THE 802.4 GROUP FOR PUBLIC COMMENT.

Second: RICH FORMELSTER

For: 6 Against: 0 Abstain: 0

Project 802 Resolution

Date: 11-24

Time: 1017

Mover: DG

Motion: TO APPOINT C RUPINSKI (KEEPER ORIGINAL PAPERS DOCUMENT) SECRETARY & CO-CHAIRMAN OF 802.4L.4

Second: C THURWACHTER

For: 8 Against: 0 Abstain: 0

0830 N.O., LA

1 ORDER

2. PLANS & DECIDE OBJECTIVES
   1) WRITE CHARTER
   2) OBJECTIVE
   3) GOALS WKG
   4) ATTRACT MORE COMPANIES

3 DISCUSSION OF PLANS

4. RULING ON TWO-TIER JOINT BD

5. TO DESIGNATE ALTERNATE MEDIUMS ~~TO~~ Conduct
   2014 Chairperson minutes to
   advisory bd objectives

6 RICH FAIRBANKS ~~SPEAKS~~ SPEECH ON

6. DIST DISRUPTED FCC RULES

7 NEC REQUESTED FOR DATA ON OPTICAL
   PROGRAMMING LAW

BREAK

3/24 9024

8. CSMM

9. 87-004 DISCUSSED EDITED

87-005 REVISED -004

10. INTRODUCED -002

11 DG DESCRIBES EM DEV

12 DISCUSS -002

HOUSEKEEPING DG 2 THRU 4

1

2. 902.4L/87-002
MEMO 3/22/87 SCIR LWR 8/13

3. 87-003
MINUTES DES NOV 24

87-004
SUPPL OBJECTIVES

5 REVISED CHARTER & OBJECTIVES

December 1982

IEEE Standards Manual

The Institute of Electrical and Electronics Engineers, Inc
345 East 47th Street, New York, NY 10017

The purpose of the review by the IEEE Standards Board is to ensure that IEEE Standards represent a consensus of interests substantially concerned with or potentially affected by these standards and that proper procedures have been carried out in formulation of the standards.

An IEEE Standard gives an authoritative reference to the state-of-the-art which is kept up to date through review at least every five years by the Sponsor* responsible for its preparation. IEEE Standards are routinely submitted to ANSI for adoption as American National Standards.

1.4 Conformance of Products or Systems to IEEE Standards

Neither the IEEE nor any of the Societies, committees, or other parts of the Institute are engaged in product testing or in certification of products or systems to comply with IEEE standards. No member or group of members of the Institute is authorized: (1) to act for the Institute in any such activity, or (2) to offer any opinion in the name of the Institute on the conformance of products or systems to the requirements of IEEE standards or the suitability of the products for their intended use and safe operation.

IEEE Standards may contain testing procedures useful in determining whether products or systems are in compliance with the standards. Compliance in itself does not necessarily imply quality or guarantee proper use. Where IEEE Standards are used as the basis of examination and/or testing of products or systems by laboratories or other agencies in the process of determining their suitability for their intended use and safe operation, the IEEE assumes no responsibility for the use or interpretation of its standards or the adequacy of the testing or certification.

2. Organization and Procedures

2.1 Organization

The organization and basic procedures of the IEEE Standards Board are covered by its bylaws. The following material supplements the provisions of the Bylaws which is the governing document in event of conflict.

The Standards Board is established and organized under Bylaw 309 of the Institute. It is represented on the IEEE Board of Directors and other major Boards as specified in applicable provisions of the Institute's Bylaws. Its organization beyond that specified in IEEE Bylaw 309 is governed by its own bylaws, as supplemented by these procedures.

To provide coordination and communication between the Standards Board and the IEEE Societies and Technical Committees, as well as other organizations involved in standards activities, representatives of IEEE boards and committees, and of other organizations are carried as non-voting participants of the Standards Board.

The Board has overall responsibility for IEEE Standards development and approval, and sole responsibility for participation in, and cooperation with, other organizations on all standards matters.

2.2 Membership

Each year, at the first meeting of the Standards Board, the Chairman appoints a nominating committee to select a slate of nominees for membership on the following year's Standards Board. The nominating committee shall submit a slate of nominees of sufficient size to enable the IEEE N&A Committee to select 16 to 24 nominees for submission to the Board of Directors. Two nominees shall be selected for Chairman. In selecting nominees, due consideration shall be given to the degree of interest and standards activities within the various IEEE Societies, interests of government regulatory bodies, and requirements for balance associated with ANSI accreditation.

2.2.1 Liaison Representatives.

The following persons serve as non-voting (unless already voting members) liaison representatives to the Standards Board and its standing committees to assist in coordinating standardization work with their respective organizations:

(1) The Chairmen of each IEEE Standards Coordinating Committee appointed by the Standards Board.

(2) A representative from each IEEE Society, designated by the Society. Technical Committees may also designate liaison representatives where committee standards activity indicates the need for representation.

(3) Representatives invited from standards organizations outside the IEEE.

(4) Such other liaison representatives as the Standards Board may authorize.

2.2.2 Tenure. Members of the Standards Board may serve up to three consecutive one-year terms except that chairmen of stand-

*See Section 3.1

established its own standards developing or coordinating committees (SCC's) to perform this function when necessary.

The Chairman of an SCC is appointed by the Standards Board Chairman. SCC Chairmen appoint members of their committee with the approval of the Standards Board Chairman.

Interested Societies of IEEE may designate members to an SCC who function as official representatives of the Society. An SCC shall normally have a maximum of 25 members. In special cases, the Standards Board may designate up to five representatives of outside organizations as additional members.

The SCC shall have a balance of interests represented in its membership, and may act as Sponsor for individual standards projects.

With the approval of the Standards Board, an SCC may establish subcommittees as necessary to perform its function.

Members of an SCC who are official representatives of a Society, technical committee, or outside organization may each have a single designated alternate to act on their behalf in their absence. Alternates for other members are not permitted.

3. Standards Development

3.1 Sponsors

All IEEE standards development is the responsibility of "Sponsors" that have projects which have been approved by the Standards Board. Sponsors of IEEE standards projects are committees who are responsible for the development and coordination of the standards project and the maintenance of the standard after approval of the standard by the Standards Board. (On occasion, two or more committees may jointly act as Sponsor.) The Sponsor may be:

1. A Technical Committee within an IEEE Society,
2. A Standards Committee or Standards Coordinating Committee of an IEEE Society,
3. A Standards Coordinating Committee established by the Standards Board,
4. Under special circumstances, a Standards Committee or subcommittee organized by or reporting to a Technical Committee.

Note: The term "Sponsor" as used in this document is used to refer to any or all of the organizations listed in this paragraph.

3.2 Membership of Sponsor

The balloting membership of a Sponsor must provide for the development of consensus by all interests significantly affected by the scope of the standard. This is achieved through a balance of such interests in the committee membership. IEEE members normally constitute the membership of an IEEE Technical Committee. For standards matters, the Institute bylaws provide, with the approval of the Standards Board, for inclusion of non-members of IEEE who represent outside organizations as voting members of Sponsors. All meetings involving standards are open to all interested parties.

Sponsors are required to classify their membership relative to the member's relationship to the scope of standards activity (e.g., producer, user, general interest . . .). Representatives of outside organizations are classified in relation to the interests of their organization. IEEE members are classified based on their technical background, which may be related to their employment, job functions, or experience. Except for the general interest category, no group (classification) may constitute 50 percent or more of the committee membership. Care shall be taken to assure that all classes of interest are represented to the extent possible.

3.3 Duties of the Sponsor

The Sponsor is responsible for supervising the standards project from inception to completion. This includes:

1. Submitting a Project Authorization Request (PAR) properly completed as soon as the decision is made to initiate the project. Forms and information may be obtained from the Secretary of the Standards Board. (See 3.4)
2. After approval of the project, notifying Institute components and organizations specified for coordination, and giving notice of the project in appropriate publications, to solicit expressions of interest to the sponsoring committee within 60 days.
3. Notifying persons who have expressed interest of the time and place of meetings.
4. Organizing the technical development of the standard.

include names, addresses, and telephone numbers of persons to whom requests for information or participation may be sent. This information will normally be included in the PAR. In addition, the chairman is responsible for submission of periodic reports to the Standards Board on the status of the project, at least annually. Failure to receive such reports for two years may result in cancellation of the PAR.

3.6 Standards Ballot by the Sponsor

A letter ballot is conducted by the Sponsor when a proposed standard is ready for balloting. The ballot shall be returned within 30 days. The ballot shall provide three choices:

(1) Approve (Affirmative). This vote may be accompanied by comments suggesting corrections and improvements. (A ballot accompanied by a condition is a negative ballot.)

(2) Do Not Approve (Negative). This vote must be accompanied by specific reasons in sufficient detail so that the specific wording of the changes which will cause the negative voter to change his vote to "approve" can readily be determined. If the changes are made then the vote automatically becomes affirmative. In the absence of reasons for a negative vote after a follow-up inquiry, the ballot shall be classified as "no response."

(3) Abstain. This category is provided to allow for ballot returns from members who do not wish to review the document because of conflict of interest, lack of expertise, or other reasons. A reason shall be given for this vote, otherwise the ballot shall be classified as "no response."

To approve a draft at a meeting held to resolve comments, roll call votes may be taken at such meetings of the Sponsor where all members are familiar with the document, reasons for negative votes are recorded, and at least 75 percent of the members vote. Information recorded must be equivalent to that available from letter ballot.

For a standards ballot to be effective, at least 75 percent of the ballots shall be returned. If the return is less than 75 percent, a follow-up letter shall be sent to those who failed to return ballots. A minimum of 75 percent of those voting (affirmative or negative) must approve the draft in order to submit the ballot result to the Standards Board.

When compelling reasons necessitate early approval of proposed IEEE Standards, the Sponsor may forward copies of the final draft to the Standards Board for distribution and review prior to completing the Sponsor's ballot. No final action shall be taken until the Board receives the results of the ballot including the results of coordination.

3.7 Resolution of Comments, Objections, and Negative Votes

Every attempt will be made to resolve comments, objections, and negative votes.

Comments pointing out obvious mistakes, typographical errors, and improvements in punctuation, grammar and composition, which do not change the technical meaning may be accepted, revised, or rejected. It must be borne in mind that documents are professionally edited prior to publication.

Comments accompanying affirmative votes which advocate changes in the technical meaning of the document may be accepted, revised, or rejected.

To resolve negative votes or for other reasons, changes may be made in the document. If the negative vote is not satisfied, either entirely or in part, the negative voter shall be informed of the reasons for the rejection and be given an opportunity either to change his vote to "approve," or to retain his negative vote.

All substantive technical changes made in the final draft to resolve comments, objections, and negative votes, and all unresolved negative votes together with the reasons of the negative voter and the rebuttal by the members conducting the resolution of the ballots, shall be submitted to the members of the Sponsor, providing each member an opportunity to change his ballot. Further resolution efforts may be required if additional negative votes result.

Copies of all unresolved negative votes, together with the reasons given by the negative voters and the rebuttals by the Sponsor, shall be included with the ballot results submitted to the Standards Board.

Proposed standards receiving a significant number of unresolved negative votes should be considered by the sponsor for Trial-Use. (See 12.2)

3.8 Delegation of Authority

Sponsors may, by at least 75 percent approval by written ballot received from at

The notification shall clearly detail the issues being appealed. It shall provide sufficient information for the Board to determine whether the appeal shall be heard.

If an appeal is based on a technical objection to the requirements of the standard or on a claim of discrimination against a product, the decision of the Board shall be based on the merits of the appeal and not on any procedural consideration.

On receipt of notification of intent to appeal, the Chairman of the Standards Board shall appoint four members of the Board to serve with the Chairman of ApCom. None of these appointees to the Appeals Committee shall have been a direct participant in the development or coordination of the document under question. The Appeals Committee shall review the complaint and, if in its judgment there appears to be sufficient basis for a hearing, copies of the objector's written statement shall be forwarded to the Sponsor of the standard for review. All concerned parties shall be notified of a scheduled hearing to take place no later than 60 days following receipt of notice of appeal.

If the Appeals Committee considers the statement of the objector an insufficient basis for appeal, it may request additional information, providing a reasonable period for reply, or it may dismiss the appeal as lacking in merit.

The conduct of the appeals hearing shall be governed by rules established by the Chairman of the Appeals Committee. He shall be free to establish time limits for the presentation of each position and to determine the order in which positions are presented.

The appellant shall be notified in writing within 60 days as to the disposition of the appeal. Any complaint concerning the fairness or the impartiality of the committee must be made to the Secretary of the Standards Board within 5 days following the hearings or the dismissal of the appeal. In the absence of such complaint the findings of the Appeals Committee shall be final. If a complaint is filed, the matter shall be reviewed by the full Standards Board at its next regular meeting, and the Board shall take such action as it deems appropriate.

The Chairman of the Standards Board shall determine whether or not a standard shall be published and distributed pending the conclusion of an appeal. In the event that a document is distributed and is subsequently withdrawn or modified as the result of an appeal, notification shall be made to all purchasers of the document.

6. Interpretations

While it is always the intent of standards-developing committees to use language that is so clear that it is unnecessary to explain or amplify the original intent of the committee, occasionally questions arise regarding the meaning of portions of standards as they relate to specific applications.

Questions relating to such interpretations require review and evaluation by a balance of committee interests, and no single officer or member of an IEEE Technical Committee or subgroup thereof shall provide a written or verbal opinion concerning any portion of the text of an IEEE Standards document, or American National Standard developed under IEEE secretariat, unless that opinion has first been subjected to consideration by an interpretations subgroup which represents all interested parties on the committee. Requests for interpretations shall be submitted or confirmed in writing, preferably to the Secretary, IEEE Standards Board, who shall forward the request to the appropriate committee designee.

Upon receipt of the interpretation request, the committee designee shall prepare an interpretation or assign its preparation to a qualified member. That draft interpretation shall be circulated to the designated interpretations subgroup and transmitted to the party initiating the request only after it has met the concurrence of the interpretations subgroup. A copy of the written interpretation shall be forwarded to the Secretary of the Technical Committee for consideration as a supplement to the standard or for inclusion in the next revision, and a copy shall also be forwarded to the Secretary of the IEEE Standards Board, together with a list of members of the interpretations subgroup, for its project files.

Similar wording will be included in each IEEE standard published.

At lectures, symposia, seminars, or educational courses on IEEE Standards conducted by officers or members of standards-developing committees, the following statement shall be read at the start of the program, and again, preceding any question and answer period:

> The individuals presenting information on IEEE Standards were participants in the development of the standards under discussion, and they are presumed to have expert knowledge on the subject. How-

objections involves substantive changes, the revised standard must be submitted to the IEEE Standards Board for approval.

8.3 American National Standards Committees

In 1982, ANSI approved a set of procedures calling for dissolution of American National Standards Committees within two years. IEEE's involvement in the activities of these committees is therefore in a state of transition. The following material, though current at the time of writing, is subject to change and is included for general guidance and reference only.

IEEE has assumed the secretariat of many American National Standards Committees within the scope of IEEE. The secretarial duty has been assigned to staff or to volunteer members. IEEE also holds cosecretariats of American National Standards Committees.

8.4 IEEE Representatives on American National Standards Committee

8.4.1 General

The IEEE is represented on American National Standards Committees in which it has a substantial interest in order to provide IEEE influence on American National Standards. Positions have been allotted to the IEEE as a substantially interested standards generating organization.

8.4.2 Assignment of Positions

The positions allotted to the IEEE have been assigned by the IEEE Standards Board to Societies having a substantial interest in the work of the ANSI Committee. The Societies have reassigned the positions to their substantially interested technical committees.

8.4.3 Appointment of IEEE Representatives

IEEE representatives on American National Standards Committees are appointed by the IEEE Standards Board from nominations submitted by the sponsoring organization that provides technical instruction to the representative.

8.5 Instructions to IEEE Representatives on American National Standards Committees

8.5.1 Source of Instructions

IEEE representatives and their alternates shall utilize the expertise of the members of their sponsoring group or technical committee to develop an IEEE position on proposed standards being considered by their ANSI committee. They must report at meetings of their sponsor on the activities of their ANSI committee, either in person or by a written report to be included in the minutes of the meeting, to inform the members on the work of the standards committee. They shall solicit comments and suggestions from interested members of their sponsor in order to establish their position on projects under consideration, and to identify substantially interested members to whom they can turn for advice and recommendations on short notice. They shall work with the chairman and the standards liaison representative to the Standards Board of their sponsor to insure that they act in accordance with the consensus within the sponsor. In the absence of instructions, they shall use their best judgment based on their experience as a member of their sponsor to support the position with which they believe the membership would agree. All ballot actions taken by IEEE representatives shall be reported to the sponsoring committee. On all policy matters coming before this committee the representative shall solicit instructions from the Standards Board.

8.6 Coordination within the IEEE

Where there are two or more representatives, the Standards Board has appointed a head of delegation, generally from the technical committee having the primary interest in the American National Standards Committee. The head of delegation is responsible for supervising the work of the IEEE delegation, particularly the coordination of the positions of the representatives and alternates based on the instructions from their respective sponsors. A unified position must be developed to be supported unanimously by the IEEE delegation. In the case of letter ballots, various methods may be used to secure the unanimous vote:

a. Each representative and alternate may send his completed ballot to the head of delegation who mails it in when a unanimous vote has been obtained.

b. Each representative and alternate notifies the head of delegation how he intends to vote or sends a copy of his executed ballot. The head of delegation notifies them to mail their ballots when the vote is unanimous.

c. The head of delegation sends his recommended vote with reasons to the other

10.2 Supplements

A supplement may be used to make minor corrections and revisions in a standard which are not extensive enough to justify a complete revision. Since a supplement is a revision, it must be processed as a revision in accordance with the requirements of the IEEE Standards Manual, including submission to the IEEE Standards Board.

The approved supplement may be printed as an insert for stock copies of the standard and will be incorporated into the standard at the next printing.

Only two supplements are permitted before a standard must be revised.

11. Publication of Drafts

Drafts of standards under development are normally distributed to members of the group (working group, subcommittee, etc.) involved in their generation for comment and letter ballot. The normal method for generating valid comments is to conduct a letter ballot of the working group or subcommittee.

In projects of broad interest, it is sometimes useful to collect a broader spectrum of comments than that available within the working entity involved in the development of the draft. Although the practice is deprecated by the Standards Board, a small number of IEEE committees publish such drafts for distribution either as separate documents or in Society Transactions. Publication in this manner must be carefully controlled to avoid misunderstandings regarding the status of such documents (N.B. They must not be mistakenly regarded as IEEE Standards). The following conditions must be met for such publication.

1. The document must be clearly labelled on each page in type at least one size larger than the text as an "unapproved draft published for comment only."
2. The draft should be available for no more than twelve months after which circulation and availability will cease. A longer period must be approved by the Standards Board. The expiration date of the draft and last date for comment shall be clearly marked.
3. The draft shall be authorized for publication by the Sponsor under regular committee procedures with notification to the Standards Board.

A preferred alternative to this procedure is to process the document as a Trial-Use Standard. (See 12.2)

12. Updating of IEEE Standards

12.1 General

12.1.1 Periodic Review

All IEEE Standards shall be updated within five years of the date of publication. When an IEEE Standard has been in effect for four years, the Secretary of the Standards Board shall notify the standards liaison representative of the Sponsor that the standard must be updated within the next year. The sponsor has the option of:

1. Reaffirmation
2. Revision
3. Withdrawal

If the standard is not reaffirmed, revised, or withdrawn within five years of the date of publication, the Secretary of the Standards Board shall notify the sponsor that the standard will be submitted to the Standards Board for withdrawal. The sponsor may request, within 30 days of the date of notification, an extension of time of not more than one year. He shall provide evidence that action to update has been initiated. The standard remains in effect until withdrawal action is taken by the Standards Board.

12.2 Trial-Use Standards

12.2.1 At the Standards Development Level

Where a draft has been generated that generally satisfies the standards developing group (i.e. subcommittee or working group) but needs input from a very broad constituency, such a draft may be processed as an IEEE Trial-Use Standard. This is a preferred alternative to the widespread distribution of unapproved drafts. For approval, such a draft requires a letter ballot of the Sponsor and approval by the Standards Board as a trial-use standard.

12.2.2 At the Sponsor Level

When a Sponsor is unable to resolve negative ballots to a satisfactory level, or uncertain aspects of the document justify preliminary distribution, it may consider submission of the draft to the Standards Board as a trial-use standard.

12.2.3 At the Standards Board Level

Index

CHANDOS A. RYPINSKI

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Telephone: 415 435 0642

February 19, 1987

Mr. Jim Sanders
Tandem Computer, Inc.
2550 Walsh Avenue
Santa Clara, CA 95051

408 748 2903

Dear Mr. Sanders:

Your interest in through-the-air LAN is important to me, because I believe that services of this type can be very valuable.

For the last meeting of IEEE 802.4L, I acted as substitute Chairman for David Greenstein of GM, but beyond that I have no official position. This meeting showed more interest than any previous meeting. NEC described two existing systems which I think to be interesting but far from the objectives of this Committee.

I do not know of any existing product which provides data rates of 1 Mbs broadcast, or of FCC rules under which it could be licensed. It is my opinion that development of radio modems and promotion of appropriate frequencies for licensing are both needed. My personal studies are directed to the specifics of these propositions.

For a wide-area system, there is the possiblity of using the present cellular mobile telephone facility with direct modulation rather than via an analog modem. Since I have a friendly relation with L. M. Ericsson, the supplier of much of the fixed radio and switching equipment in the US, I may explore this possibility in greater detail.

Especially defined modems, designed to match any flawed medium, can greatly improve results compared with the attempt to reproduce rectangular logic levels. This is an art with which I have had a long experience, and on which I have strong opinions.

My interest is in participation in the definition and design of Radio LAN equipment with many different uses. This includes a solution to integration of PCM/ISDN telephony with packet data.

If there is interest in discussing these or related topics, I would be very pleased to visit at Tandem for this purpose.

Cordially,

Chandos A. Rypinski

CHANDOS A. RYPINSKI

MEMORANDUM December 5, 1986

TO: Members, IEEE 802.4L subcommittee on "Through-the-air Token Bus"

COPY: D. Greenstein, Chairman and R. Douglas, Chairman 802.4

RE: Transmittal, Minutes of Meeting of November 20, 1986, San Diego, CA

At the request of the Chairman, D. Greenstein, I am directly distributing, attached, minutes of the last meeting and the attachments listed below:

1. Attendees at last meeting.

2. "Guided Vehicles Set Manufacturing in Motion" -- High Technology, Dec 86

3. "Time Delay Spread and Signal Level Measurements of 850 MHz Radio Waves in Building Environments," D. M. J. Devasirvatham, Bellcore, IEEE Transactions on Antennas and Propagation, Nov 86

4. "Second Nordic Seminar on Digital Land Mobile Radio Communication (Oct 14, 1986, Stockholm), Report to 802.4L," C. Rypinski, Oct 86

5. "Radio Terminal System," Miyamoto and Kuki, NEC Research & Development, July 78

6. "C&C-Net STAR Subsystem," Murai et al, NEC Research and Development, Special Issue on "C&C Office System" 85

7. "Objectives for 802.4L--Through-the-air Token Bus Physical Layer--Draft proposal," C. A. Rypinski

All but the last item were presented at the meeting and are referred to in the minutes or in the discussions. (1.) is background for new attendees. (2.) is a valuable technical reference and bibliography. (7.) is my proposal in response to questions raised in the meeting, and isn't approved or accepted by anybody.

C. A. Rypinski

CHANDOS A. RYPINSKI --- 130 STEWART DRIVE --- TIBURON, CA 94920 --- TELEPHONE 415 435 0642

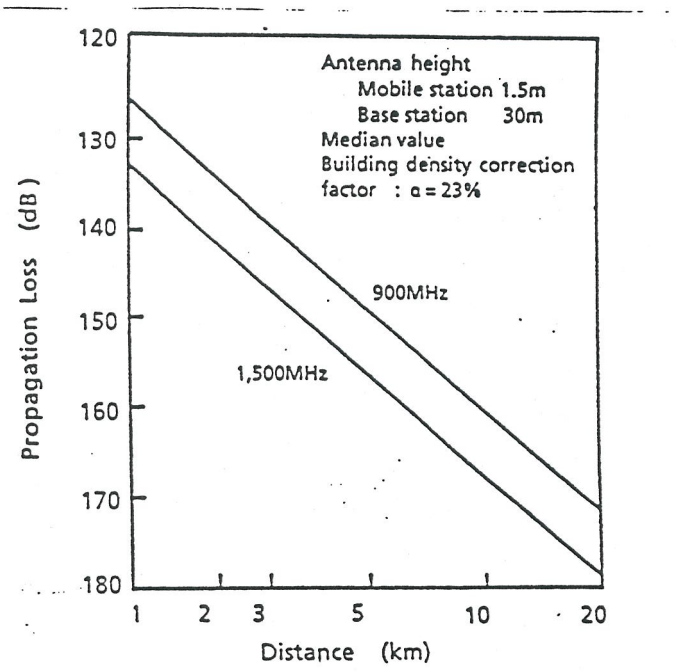
FREQUENCY DEPENDENCE

The frequency dependence of propagation is summarized in the following sections.

SPECIFIC EXPERIMENTAL RESULTS

(a) For mobile radio environments with 20 meter base station antenna heights, the median large scale attenuation in urban areas has been found to increase weakly with frequency between 100 MHz and 20 GHz. Some data indicates that the increase is about 4 dB between 100 MHz and 10 GHz.

(b) Other experiments showed a change of 6 dB between 900 MHz and 1.5 GHz for an antenna height of 30 m. This is illustrated in the Figure below.



Basic Propagation Loss Curve in Urban Areas

(c) Measurements at 940 MHz and 60 GHz at locations within buildings have been reported. They were not concurrent measurments and only qualitative comparisons can be made. Hoever, the signal levels were markedly lower at 60 GHz and coverage estimates for a 1 milliwatt transmitter were made. In a building with metal partition walls, estimated coverage at 940 MHz extended about two rooms from a base station location in a room (i.e. a distance of about 10 m). For a similar environment, estimated coverage at 60 GHz was only within the same room and the immediately adjacent hallway. In frame buildings with plasterboard walls, estimated 940 MHz coverage was about 30 meters. For similar buildings, 60 GHz coverage extended only to adjacent rooms.

DETAIL SUPPLEMENT TO OBJECTIVES FOR 802.4 L
Through-the-Air Token Bus Physical Layer
Proposals by C. A. Rypinski for Radio only

20. Coverage plan should be based on a square cell with ~~quadrant illumination on a separate~~ frequency ~~from each corner~~. Default length for one side is 300 feet/100 meters.

21. Frequency plan: Mobile is full duplex transmitting on one frequency and receiving on one of four frequencies with duplicate message information. The default assumption is that the mobile transmits on 925-928 MHz and receives on 2400-2410 MHz (See FCC 18.13). One channel is 1.5 MHz (maximum) wide at 99% of radiated power. Receive channels are separated 2.5 MHz. Frequency accuracy is based on 5 PPM below 1000 MHz and 10 PPM at higher frequencies.

22. Data throughput 8/1 Mbs in both directions. ~~Baud rate in medium is approximately 1.5 Mbs, the difference being used for error correction and internal overhead.~~

23. The limitation balance is set by the dimension of the square which sets minimum C/N for given power and environment and which determines the maximum baud rate usable, directivity of the mobile receive antenna which determines C/I, receive diversity and error correcting codes which determine net BER. The tradeoff shall be made with the following priority order for achievements: 1.) 1.5 megabaud ~~symbol rate~~, 2.) required BER, 3.) required minimum C/I.

24. A transmitter power output of more than 50 milliwatts shall not be used.

25. ~~Responsibility for resolving~~ Cochannel interference ~~lies with~~ the mobile receiver using antenna directivity, diversity and with the choice of error correcting codes.

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26. ~~Block~~ rrecting code ~~shall be used with a block size not to exceed 64 bits.~~

27. The fi hall be a head-end, regenerating type with a retransmitting delay not to exc us propagation time.

28. ~~Dual~~ DIVERSITY MAY BE s ~~will be~~ used so that messages transmitted from the fixed stations may b uplicate at the mobile. ~~If an uncorrectable error is discovered in any block~~ channel, ~~a means shall be provided~~ to replace that block ~~with one from t~~ hannel.

29. Each ed point in the system ~~shall~~ have a dedicated path to a central head-end ~~(c~~ ~~to be an optical fiber).~~ ~~The analog level of the binary coding on the dedica~~ l be proportional to receivd signal level. The head-end will select the best re or rebroadcast with a delay ~~of one block plus processing time. In the event~~ ~~the head-end will attempt to find a correct block from another receive~~

SOME

CHANDOS A. ~~RYDI~~ 130 STEWART DRIVE - TIBURON, CA 94920 - TELEPHONE 415 435 0642