

NRIC V

Network Reliability and Interoperability Council

Focus Group 3

Wireline Network Spectral Integrity
Status Report and Recommendations
February 27, 2001

Ed Eckert, Chair, Focus Group 3

Phil Kyees, Chair, Spectrum Management Subcommittee

Massimo Sorbara, Chair, Spectrum Compatibility Subcommittee

What has FG3 done since the August 2000 Council meeting?

- Eight days of face-to-face meetings;
- Liaisons to key standards development organizations;
- Reviewed and considered 29 individual contributions towards the FG goals;
- Developed technical standards status and recommendations for this report.

Title & Mission Statement

- NRIC V, Focus Group 3 shall be Titled

“Wireline Network Spectral Integrity”

- The Mission of the *Wireline Network Spectral Integrity* (WNSI) Focus Group is to provide recommendations to the FCC and to the telecommunications industry that, when implemented, will:
 - ensure the integrity of coexisting services in wireline public telecommunications networks;
 - facilitate widespread and unencumbered deployment of xDSL and associated wireline high speed access technologies, and;
 - encourage network architecture and technology evolution that safeguards the integrity of wireline public telecommunications networks while maximizing capacity, availability and throughput in an unbundled/competitive environment.

Scope: Spectrum Management Subcommittee (SC1)

- From 3(b) of the NRIC V Charter: “The Committee will make recommendations concerning the development of spectrum management processes within the wireline network that facilitate competition among CLECs and ILECs using different technologies while still maintaining network integrity.”
- In the execution of the above, the Subcommittee shall rationalize and recommend further actions based on the following work:
 - survey, analyze and report on current or proposed Spectrum Management/line sharing techniques and processes in the loop plant.
 - survey, analyze and report on current or proposed technical standards activity that have relevance to Spectrum Management and line sharing.
 - identify 3 to 5 key Spectrum Management/line sharing issues to target for resolution.

Scope: Spectrum Compatibility Subcommittee (SC2)

- From 3(a) of the NRIC V Charter: “The Committee will make recommendations concerning technical standards to ensure spectral compatibility in wireline networks and facilitate the deployment of xDSL and associated technologies.”
- In the execution of the above, the Subcommittee shall rationalize and recommend further actions based on the following work:
 - survey, analyze and report on the current, as well as the envisaged future, state of Spectrum Compatibility in the loop plant.
 - survey, analyze and report on current or proposed technical standards activity that have relevance to Spectrum Compatibility.
 - identify 3 to 5 key Spectrum Compatibility issues to target for resolution.

WNSI FG Deliverables - Time Line

Jan 6, 2002

2Q2000	3Q2000	4Q2000	1Q2001	2Q2001	3Q2001	4Q2001
Prepare initial status report and recommendations on technical standards activity that have relevance to Spectrum Compatibility and Spectrum Management. (Due August 23, 2000)	Ongoing status reporting and recommendations on technical standards activity that have relevance to Spectrum Compatibility and Spectrum Management (reporting frequency TBD).					Prepare & Issue Final Report.
Identify candidate SM & SC issues to be addressed; prioritize, milestone and assign.	Define and perform work associated with identified issues; Sharply focus recommendations to resolve identified issues					
Perform survey and Analyze results on current or proposed Spectrum Management techniques and processes in the loop plant			Initial report 1Q2001	Monitor topic. Report updates as needed.		
Perform survey and Analyze results on the current, as well as the envisaged future, state of Spectrum Compatibility in the loop plant.			Initial report 1Q2001	Monitor topic. Report updates as needed.		

SME's & Sponsor Organizations

- Service Providers
 - AT& T: Tom Shen
 - BellSouth: Gary Tennyson
 - Covad: David Rosenstein
Previously Anjali Joshi
 - Qwest: Jamal Boudhaouia
Previously Mary Retka
 - Rhythms: David Reilly
 - SBC: Gene Edmon
 - Sprint: Pete Youngberg
 - Verizon: Greg Sherrill
 - WorldCom: Paul Donaldson
 - *Note that Northpoint invitee never attended and that invitee Prism is no longer in business.*
- Equipment Suppliers
 - Adtran: Kevin Schneider
 - Elastic Networks: Patrick
 - Texas Instruments: Jim Carlo
 - Lucent: Harry Mildonian
- Leadership
 - Globespan: Massimo Sorbara
 - Paradyne: Phil Kyees
 - Nortel Networks: Ed Eckert
- FCC
 - Paul Marrangoni

Contribution Categories

- Intermediate TU Issues
 - Repeaters in the loop plant
 - Spectrum Compatibility of Digital Loop Carrier (DLC) based signals with Central Office (CO) based signals
 - Effect of Intermediate TU-Cs
 - Multiple Locations
- Administration of Loops and Technologies in Binders
 - Grandfathering vs. Sunsetting services/technologies
 - Measuring and reporting if particular loop is qualified for a specific spectrum management class (loop length, bridge taps)
 - Measuring & Reporting Loop Parameters for use in xDSL Loop Qualification
 - Equivalent Working Length (EWL), Loop Length, Bridged Tap
 - Reporting Technologies
 - Definition of Known Disturbers
 - Bi-directional Disclosure of Spectrum Management Class and PSD
 - Effectiveness of rules and mechanisms for binder group management and interference in dispute resolution
- Equipment Registration
 - Application of Part 68 to xDSL TU-R (Customer Located Equipment)
 - Certification/registration of xDSL TU-C Equipment to published Technical Requirements
- New Technology
 - Frequency Planning for advancement of high-speed services in the loop plant
 - Short Term Stationary Systems
 - xDSL technology evolution to promote long term spectral integrity
- Line Sharing
 - POTS Quality
 - Data Quality
 - Metallic Test Access
 - Fault Management
 - Splitter Ownership
 - Splitter Physical and Electrical Location
- Ingress/Egress issues
 - Metallic Balance in Network and Customer wiring
 - Effect of In-premises Signals on Wireline Network
 - In-Premises Wireline Transmitters
- Co-Located TU Compatibility
 - Spectrum Compatibility of Co-located xDSL Transceivers
 - TU-Cs at CO
 - TU-Cs at RT

Status of Technical Standards Development and Implementation

- Committee T1's Technical Subcommittee T1E1 has now completed the first "American National Standard - Spectrum Management for Loop Transmission Systems" approved by ANSI as T1.417 on 1/1/2001. Available 3/1/01 at www.atis.org.
- Work towards standards for: Inline Filters (for splitterless DSL), Central Office Splitters and VDSL are progressing in T1E1.
- Work towards technical requirements for DSL Automatic Configuration are maturing in the DSL Forum.
- Cooperative equipment interoperability events coordinated through the DSL Forum and UNH continue to refine the technologies and promote deployment of advance services.

Status of Technical Standards Development and Implementation

- T1E1.4 has started work on Issue 2 of T1.417, with initial discussions and contributions being focused on the spectral compatibility of Central Office based DSL with Remote Terminal based DSLs and Repeaters (a.k.a “intermediate tranceiver units” (TUs)).
- Format (i.e. delta document, addendum, or a completely new version) and Timeline for Issue 2 have not yet been determined.
- Topics for consideration in Issue 2 include:
 - Revision of non-DSL out-of-band metallic and longitudinal signal power limits to provide an adequate level of protection for DSL systems.
 - Addition of VDSL to the basis systems list.
 - Extension of spectrum management class 5 upstream band to lower frequencies.
 - Methods for optimizing PSDs, maximizing throughput and binder group capacity.
 - Trade-offs between loop length guidelines and spectral characteristics.
 - The susceptibility of some deployed systems to short term stationary crosstalk.
 - Spectral compatibility with T1.419 (splitterless ADSL) basis systems.

Recommendations

- General information:
 - FG3 recommendations will be numbered for ongoing reference.
 - In August 2000, FG3 produced recommendations #1 thru #4. Those Recommendations and the FG3 response to comments on them is attached as Appendix A.
 - An update on actions towards the goals of the original recommendations is included in this presentation.
 - Today, we bring to the Council, for approval:
 - An UPDATED Recommendation #1 on “Frequency Planning”
 - A NEW recommendation #5 on “Line Sharing Test Access”
 - A NEW recommendation #6 on “Intermediate TU’s: Remote DSL”
 - In anticipation of their approval by the Council, these recommendations have been circulated to the voting members of NRIC for a period of three weeks prior to today’s meeting.

Status: FG3 Recommendations #1 - #2

- In August 2000, FG3 put forward four recommendations. Shown below is an update on actions towards their goals:
- Rec #1 - New Technology, Frequency Planning:
 - Revision to original recommendations prepared and included herein;
 - Means of “FCC Endorsement” of Band Plan 998 is still unclear;
 - Timing for inclusion of Band Plan 998 in Issue 2 of T1.417 is now.
- Rec #2 – Ingress/Egress Issues; In-Premises Wireline Transmitters:
 - The ITU-T is developing technical requirements for an isolation device; it is presumed that such technical requirements would be adopted by a US standards development organization.
 - We expect to report further on this at the next council meeting.

Status: FG3 Recommendations #3 - #4

- Rec #3: - Equipment Registration, Application of Part 68 to xDSL TU-R (Customer Located Equipment):
 - Part 68 streamlining order issued December 2000;
 - Formation of ACTA (Administrative Council on Terminal Attachments) is moving forward under ATIS and the TIA, with first meeting May 2, 2001;
 - Work towards moving Part 68 Technical Requirements to “ANSI 68” has started in TIA TR41; T1E1 will provide advice on this and further updates to the proposed “ANSI 68”.
- Rec #4 - Intermediate TU Issues:
 - New recommendation by FG3 prepared and included herein;
 - Priority of this issue is shown in T1E1 by the fact that nearly all of the contributions towards T1.417 Issue 2 are intended to help bring resolution to this issue.

Recommendations

Recommendation #1 (REVISED): Frequency Planning

- **Background:** See Appendix B for detailed background. This recommendation replaces the August 23, 2000 original.
- **Recommendations:** For frequencies from 1.1 MHz to 12 MHz:
 1. T1E1 has selected a single high-frequency band plan (known as FSAN 998) for frequencies from 0.138 to 12 MHz for use in the VDSL draft trial use standards, after substantial efforts to optimize it for multiple service types. FG3 acknowledges the selection of this plan and recommends that this good work be recognized and supported by the FCC as the default high-frequency band plan for use in the United States.
 2. We recommend that T1E1 define PSD levels, transmit power limits, and spectral compatibility criteria for signals that support this default band plan (FSAN 998). These parameters should be specified for both the central office and customer premises locations.
 3. FG3 further recommends that T1E1 include the determined PSD levels, transmit power limits, and spectral compatibility criteria in the second issue of the SM standard for protecting systems using frequencies 1.1 MHz to 12 MHz from harm. The development of the spectral compatibility criteria should assume that only Plan 998 systems utilize frequencies 1.1 to 12 MHz.
 4. The following pertains to systems that do not follow the default band plan (FSAN 998) in the frequencies from 1.1 to 12 MHz.
 - a) Frequency agile technologies may deviate from this plan if they continuously monitor and default to the FSAN 998 plan if they are coupled to technologies adhering to the plan.
 - b) Systems not complying with the default band plan must show spectral compatibility per a compliance criteria (see #3 above) determined for the default plan. This requires that Annex A in the next issue of the SM standard contain the compatibility criteria of item #3 to show spectral compatibility in the frequencies of 1.1 to 12 MHz.
 5. FG3 is evaluating the use of an alternative band plan under controlled or limited deployment scenarios.

Recommendations *(Continued)*

Recommendation #5: Line Sharing Test Access

- **Background:** See Appendix C for background.
- **Recommendation:** Regarding Rule 47 CFR 51.319(h)(7)(i):
 1. While some manually accessed, direct physical test points (provided solely for the purpose of manual test access) have been made available by some loop providers, it is the view of FG3 that this is not a scaleable solution and should NOT be required. While it is presumed that such access will continue to be made available by some loop providers to some service providers, we believe that it should be driven by private negotiation between loop owner and loop user ONLY as a matter of business convenience, and not required by rule. Further, such implementations currently in existence should be grandfathered as meeting the requirements of 51.319(h)(7)(i).
 2. FG3 feels that the rule, and moreover, its underlying purpose, is sufficiently met with an automated data interchange (e.g. via terminal emulation, web-based interfaces, electronic bonding, etc.) using the voice switch-based mechanized loop testing system, assuming the following conditions:
 - a. The loop provider should assure that the line-shared loop, when provisioned, is unloaded (See 47 CFR 51.319(h)(5)).
 - b. Some mechanism shall be provided to indicate that a line sharing provisioning order has been completed. One means of satisfying this requirement is to show that the wiring between the voice switch and splitter is completed, which may be accomplished by recognition of the ADSL splitter signature (as provided for in T1.413-1998, Annex E), via the voice switch-based mechanized loop testing system. It is important to note that other means to achieve this end may be available.

It is recognized that not all voice switch-based mechanized loop testing systems are currently capable of detecting and reporting splitter signature information. It is understood that such capability would require upgrades to the software for the test heads as well as for the operational support systems of the providers involved. Software upgrades for the most commonly deployed test heads are understood to be currently available. For successful implementation and utilization of this method, it is necessary that the costs of these upgrades be recognized and that the loop provider's need to recover these costs be addressed by the FCC and state commissions.
 3. DSL service providers can optionally provide their own test access, using their own POTS splitters, and their own access equipment, and their own test equipment. In any case, the DSL service provider's testing shall not interrupt an active telephone call without the end-user's permission.

Recommendations *(Continued)*

Recommendation #6: Intermediate TU Issues – Remote DSL

- **Background:** See Appendix D for background.
- **Recommendation:**
 1. Focus Group 3 recommends that T1E1's continuing work on spectrum management standards embrace, as a whole, the background and recommendations contained herein.
 2. As a preventative measure, the industry should be encouraged to employ available transmit power management mechanisms to minimize the effect of FEXT from remote deployments. One method that has been proposed to do this for ADSL modems is to limit the maximum noise margin per tone to the smallest value where data performance is not affected – this effectively results in tones with lower transmit power and/or fewer tones used. While this will undoubtedly reduce the amount of FEXT caused by remote ADSL, the benefits to be gained from this recommendation are under study.

Furthermore, we recommend that industry standards bodies incorporate and require implementation of appropriate transmit power management mechanisms in future DSL standards, and that T1E1 incorporate and encourage the use of transmit power management mechanisms in future spectrum compatibility standards.

3. We recommend that the FCC consider the following in future rulemaking on the issue of remote ADSL deployments:

Where remote and central office ADSL deployments will serve customers with loops in the same distribution cable, providers of remote deployments should provide means for accommodating CO-based deployments.

Whether this accommodation should be done in a preventative or remedial manner depends on the projected exposure or expected rate of trouble occurrence. If an analysis of the exposure suggests that significant spectral compatibility problems are likely, CO-based ADSL should be accommodated in a preventative manner, as part of the remote ADSL deployment. The extent of this exposure is currently under study in FG3. Therefore, both the strategy (preventative or remedial) and the means (e.g. co-location, derived circuits, amplifiers, etc.) of accommodation will be the subject of future recommendations by FG3.

Special Thanks To:

- Young Carlson, FCC Administrative Assistant for her excellent work on meeting logistics.
- Kent Nilsson (FCC), Designated Federal Officer to NRIC V and Paul Marrangoni (FCC) for their ongoing guidance on, and encouragement of, Focus Group initiatives.
- Our meeting hosts: Globespan, Verizon, SBC (2x), Texas Instruments, Sprint.
- Our volunteer Subject Matter Experts, especially those who have taken on extra assignments.

APPENDIX A

August 23, 2000 FG3 Recommendations and Reply comments

Recommendations

Recommendation #1: Topic - New Technology, Frequency Planning

- **Background & Key Learnings:**
 - Spectrum Management is key to preserving wireline network spectral integrity for current & future services.
 - For frequencies below 1.1 MHz, the draft Spectrum Management standard prepared by T1E1 provides guidelines for deployment of DSL systems. It is anticipated that FG3 will provide additional recommendations on the consistent implementation of this standard when it is approved.
 - Above 1.1 MHz, Frequency Division Duplexing (separation of upstream and downstream transmission frequencies) has been agreed to be used by the industry. A single plan, defining the individual upstream and downstream frequency bands is essential to protect current & future wireline network integrity.
- **Recommendations:** For frequencies from 1.1 MHz to 12 MHz:
 - T1E1 has selected a single band plan (known as FSAN 998) for frequencies from 0.138 to 12 MHz for VDSL draft trial use standards, after substantial efforts to optimize it for multiple service types. FG3 therefore recommends that this good work be recognized and supported by the FCC as the only band plan for use in the United States.
 - Frequency agile technologies may deviate from this plan if they continuously monitor and default to this plan if they are crosstalk coupled to technologies adhering to the plan.
 - FG3 further recommends that T1E1 include the FSAN 998 band plan in the next version of the SM standard for protecting systems using the frequencies 1.1MHz to 12MHz from harm
- **Expected means and timing of implementation:** The FCC should recognize these recommendations in the next Report & Order in the Advanced Services docket (98-147).

Recommendations *(Continued)*

Recommendation #2: Topic - Ingress/Egress Issues; In-premises wireline transmitters

- **Background & Key Learnings:**
 - Signals from home networking systems sharing the public network connected home wiring can leak into the network, which can potentially impact network based services.
 - VDSL will utilize frequencies from 0.138 MHz to 12 MHz
 - HomePNA (G.pnt.f) systems on phone lines use frequencies from 5.5 MHz to 10 MHz
 - FCC Part 68 rules for out of band signal power of network connected CPE only apply up to 6MHz
- **Recommendation:** With respect to isolation devices, FG3 recommends that:
 - open standards development organizations (T1E1/TR41) develop technical requirements for isolation devices that isolate in-premises networking signals (e.g. G.pnt.f) from the public network;
 - the devices allow network signals to pass into the premises for frequencies up to approximately 5MHz;
 - the isolation devices be customer installable;
 - the use of isolation devices for in-premises systems operating above 6 MHz be mandated.
- **Expected means and timing of implementation:** FCC should recognize these recommendations in next appropriate Report & Order.

Recommendations *(Continued)*

Recommendation #3: Topic - Equipment Registration, Application of Part 68 to xDSL TU-R (Customer Located Equipment)

- **Background & Key Learnings:**
 - FCC Part 68 rules are for registration of Customer Premises Equipment to prevent harm to the network
 - Current Part 68 rules and/or Form 730 did not anticipate, and do not adequately address the customer connected equipment used for advanced services, such as xDSL technologies.
- **Recommendation:**
 - FCC Part 68 to be updated to address these needs via the responsible Technical Standards Development Organizations (TIA TR41 and Committee T1 TSC T1E1) on a fast track.
 - “Part 68 Streamlining” in CC Docket 99-216 should be expedited in order to promulgate a system that will ensure that rules can keep pace with technology development.
- **Expected means and timing of implementation:**
 - FCC should provide rapid decision on CC Docket 99-216, with immediate assignment of a priority work item to ensure inclusion of xDSL Remote Transceiver Units in Part 68.

Recommendations *(Continued)*

Recommendation #4: Topic - Intermediate TU Issues

- **Background & Key Learnings:**
 - Some loop transmission system technologies can be deployed in a manner that places Transceiver Unit (TU) devices as intermediate points between the Central Office (CO) and Customer Interface (CI), which substantially increases the likelihood of crosstalk interference.
 - Systems with intermediate TU devices are being deployed today without any industry agreed, standardized spectral compatibility guidelines.
- **Recommendation:**
 - FG3 recommends that Technical Subcommittee T1E1 address this issue immediately and aggressively.
- **Expected means and timing of implementation:**
 - October interim meeting of T1E1 to send draft Spectrum Management standard to default letter ballot with inclusion of the consensus agreed definition of the tools necessary to determine the level of interference that intermediate TUs introduce into the loop plant (agreed to add annex for calculating Intermediate TU crosstalk). November T1E1.4 meeting to begin to develop text for inclusion of spectrum management guidelines in the second version of this standard, with the intent to have this version approved (by Committee T1) not later than mid 2001.

NRIC V - Focus Group 3 Recommendations

Comments received and replies to those comments

Summary

On August 23, 2000, NRIC V, Focus Group 3 presented 4 recommendations to the meeting of the full NRIC Council. At that time, it was agreed that any comments or objections be forwarded to Jack Waters and Tricia Paoletta by September 7th, 2000. If there were no objections, the recommendations would be considered approved by the Council on September 8, 2000.

As of close of business on September 7th, 2000, only four responses were received. None of these responses contained objections. Three of the responses contained comments on the recommendations.

It is the opinion of the Chair of Focus Group 3 that the comments provided fell into one of three categories: (a) Endorsement; (b) Interpretations of the recommendation that required clarification, or (c) Requests for further action. Comments in category (b) have been addressed below. Comments in category (c) were of two types: (i) actionable by the Council or FG3, or (ii) beyond the charter of NRIC or beyond the mission of FG3. These comments are also addressed below.

In consideration of the above, and of the process agreed upon by the Council at its August 23, 2000 meeting, the original recommendations are APPROVED by the Council at this time. The below, containing the comments and replies by the Chair of FG3, should be considered an informative annex to the original recommendations. Both the original recommendations and this memorandum should be considered concurrently by industry and the FCC.

Comments and Reply Responses

A. From Lucent Technologies:

"This is a brief follow-up to the August 23 meeting of NRIC V, where four recommendations were made by the Wireline Network Spectral Integrity Focus Group (FG3). In general, Lucent feels that strong direction from the FCC via these NRIC V recommendations will certainly serve to motivate, prioritize and expedite the work programs of the responsible standards groups.

In summary, Lucent supports all four recommendations while recognizing that some of them (e.g., mandating the isolation device for home networking systems) do represent necessary compromise in an environment that is intended to foster competition and the rapid deployment of new high speed services.

NRIC V - Focus Group 3 Recommendations
Comments received and replies to those comments

Peter V. Lessek
Lucent Technologies member of NRIC V

CC: H. Mildonian
Karl Rauscher
Andrew Dugan
Ed Eckert"

FG3 Reply: This comment is not considered actionable.

2. From Verizon:

"I am responding for Mark A. Wegleitner, Senior Vice President - Technology of Verizon Communications, concerning NRIC V, FG-3 recommendations of the August 23 NRIC meeting.

We are in concurrence with all recommendations. However, suggesting we add to recommendation #2 that vendors supply an isolation device and appropriate installation instructions with all in-premises systems operating above 6 MHz.

Lynn McClure
for Mark A. Wegleitner"

FG3 Reply: This comment requests a specific modification to the text of Recommendation #2. It should be noted that FG3 did discuss this aspect and chose not to explicitly state that the device and installation instructions be supplied; rather that this was implicit in the recommendation.

3. From Cox:

"This is to advise that Cox has no comment or objection to the FG3 recommendations presented at the 8/23/2000 NRIC V council meeting.

Alex Netchvolodoff, VP Public Policy, Cox Enterprises, Inc.
1225 19th Street NW, Washington DC 20036.
202-296-4933

FG3 Reply: This comment is an endorsement.

NRIC V - Focus Group 3 Recommendations
Comments received and replies to those comments

4. From Paul Hart, USTA:

Note: FG3 Replies are numbered by reference to the specific text addressed, and follow in groups after each of the USTA comments.

"USTA Comments on the recommendations of Focus Group 3 to NRICV:

September 7, 2000

#1 New Technology, Frequency Planning

Recognition of FSAN 998 as the "only band plan for use in the United States" and a recommendation that T1E1 "include the FSAN998 band plan in the next version of the SM standard for protecting systems using the frequencies 1.1MHz to 12MHz from harm".

USTA concurs in this recommendation, and is of the understanding that this recommendation is likely to be favorably received and acted upon by T1E1. (1) The recommendation is that "The FCC should recognize these recommendations in the next Report & Order in the Advanced Services docket (98-147)."

USTA believes that this recommendation, while valuable, lacks the specificity necessary to provide the Commission with a basis for practical action. We believe that more information should be included to provide the Commission with the support necessary to implement the recommendation. In order to be actionable, the final recommendation should include the technical detail necessary (2) around which to craft a requirement as well as a recommendation as to where that requirement would fit in the Commission's rule structure (3). We recommend that the Focus Group develop a plan for how this would be accomplished (not to develop the technical requirements itself), which would include request(s) of action on the part of another industry group. USTA would work with the Focus Group to determine the type of additional information that would be most helpful and to determine how it might be developed (4).

FG3 Reply: (1) This part of this recommendation does not request any action from T1E1; it is intended to endorse action already taken by T1E1 and to codify that action in order to preclude further reconsideration of it by T1E1. (2) Focus Group 3 believes that the "...technical detail necessary..." is wholly contained in the description "Band Plan 998". (3) FG3 agrees that further advice on where this would fit in the rule structure should be developed interactively between FG3 and the appropriate Commission staff. (4) We believe that this is addressed by the previous three comments. Further, we believe that we have, with the content of this recommendation, met our objective "to provide recommendations to the FCC and Industry".

#2 Ingress/Egress Issues; In-Premises wireline transmitters.

NRIC V - Focus Group 3 Recommendations

Comments received and replies to those comments

The recommendation is that open standards development organizations develop technical requirements for isolation devices that permit signals to pass from the network into in-premises wiring up to "approximately" 5MHz, and that the use of isolation devices that do not permit passage of signals above 6MHz from home systems into the outside plant be mandated.

USTA concurs with this recommendation and observes that use of the term "mandated" puts this in the form of a very strong recommendation. USTA concurs in the recommendation that industry groups be asked to develop the necessary technical requirements. We believe that the groups to which the development request is made be asked to advise when such development may be concluded and the information forwarded to NRIC for action (5).

We also concur that methods must be developed to permit customers to accomplish this on a voluntary basis, but we believe that additional measures are necessary in order to configure future activities in design and installation of terminal devices so that protection measures from this sort of problem are available to a carrier on its own action. (6) Depending on the configurations of the systems that may be the source of signals that must be kept from passing from the inside wiring to the network, different techniques may be needed to accomplish the desired objectives (7).

In order that the Commission may have the information necessary in order to respond to this recommendation, we believe that the form of requirements necessary and the placement considerations must be developed by a competent technical body. We would participate in an effort to develop the work assignments necessary to accomplish these results and believe that TR41 appears to be an appropriate industry body to address this issue (8).

FG3 Reply: (5) FG3 does not believe it is in the charter of NRIC for us to be specific about the 'means' "Industry" may choose to attain the 'ends' desired in the recommendations. Once industry decides on that means, it is in the mandate of this Focus Group to report on the progress towards the completion of the recommendation. (6) This recommendation does not, and was not intended to, preclude any additional protection measures that may be provided by the "carrier" or any other party. (7) The entire reason for this recommendation was to focus on a single technique to accomplish the desired objective; the technical subtleties of the devices in the protection against interference caused by different sources are left to the technical bodies. (8) While USTA may wish to take this action, it is beyond the mission and scope of FG3.

Recommendation #3 Equipment Registration.

USTA concurs with the basic premise of this recommendation, that xDSL terminals be included in the Part 68 registration program. The recommendation recognizes the open

NRIC V - Focus Group 3 Recommendations

Comments received and replies to those comments

aspects of the Commission's Docket 99-216 and asks for an early decision in that proceeding.

USTA's concern about this recommendation is that we believe that even under the best of circumstances, it would require an enormous amount of time and effort to implement this recommendation. If the industry is to wait for Commission action in 99-216 and then to begin activity on this project, it could be a very long time before this recommendation could be implemented.

We believe that the industry includes technical experts that have wide experience in these issues, and could begin major work activities to develop the needed agreements and recommendations that could be the basis for a future registration regime for xDSL Remote Transceiver Units. The likelihood of adoption of any industry-developed rationale and technical conditions for registration of this equipment in the future Part 68 requirements is highly likely. In any event, the industry will have to proceed through this sequence for this recommendation to be realized. If this recommendation has merit, and is the result of broad industry consensus, the complexity of the task to accomplish it demands that the work effort begin as soon as possible. (9)

We believe that a request from a Federal Advisory Committee (in this case NRIC) could be a powerful incentive for an industry group to begin this process. Accordingly, USTA recommends that NRIC direct Focus Group 3 to develop a recommendation for industry action that would begin the process of developing a registration program for this type of equipment. (10) That recommendation should be presented to NRIC for action at its next regularly scheduled meeting. USTA also suggests that the NRIC recommendation to the Commission in this instant action also include advice that the NRIC is developing an action plan to encourage the industry to begin the work necessary to develop the rationale and rules necessary to bring Remote Transceiver Units within the scope of the Part 68 terminal equipment registration program.

USTA offers to work with Focus Group 3 to develop this recommendation.

FG 3 Reply: (9) Focus Group 3 believes that much (possibly up to 90%) of the technical work towards the inclusion of xDSL modems in Part 68 is already completed. The remainder of the work is relatively minor and requires a great deal of understanding of who will be performing the functions described in 99-216. It should be noted that this recommendation is put forward from the viewpoint of the FG3 mission regarding Wireline Network Spectral Integrity, and that this aspect may be only a fractional driver of the overall need to expedite decision on 99-216. (10) The registration process is clearly not in the charter of NRIC or the mission or scope of FG3.

Recommendation #4 Intermediate TU issues.

NRIC V - Focus Group 3 Recommendations
Comments received and replies to those comments

USTA concurs with the recommendation that T1E1 aggressively address the matter of spectrum compatibility. We believe that NRIC should so advise T1E1 of that determination on the part of NRIC. (11)

Reply: (11) FG3, via its designated liaison to T1E1, will convey this recommendation along with the others now that they are approved by the full Council.

**NRIC V - Focus Group 3
Wireline Network Spectral Integrity
Washington, DC; January 30 – 31, 2001**

NRIC5FG3/2001-058R3

CONTRIBUTION

TITLE: UPDATED FG3 Recommendation #1 – Frequency Planning
SOURCE*: Focus Group 3
TOPIC: New technology (Frequency Planning)
DISTRIBUTION: NRIC V Focus Group 3 Plenary – For Information
NRIC V Steering Committee – For Information
NRIC V Full Council – For Approval

ABSTRACT

This document contains an UPDATED Recommendation from NRIC V Focus Group 3 on Frequency Planning. It is provided for distribution to the members of the NRIC V full council in preparation for its approval at the February 27, 2001 NRIC Council meeting.

NOTICE

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Background:

The construction of the telephone loop plant cables results in the coupling of signals from one pair to another. This coupling, known as crosstalk coupling, is one of several factors that limit the information delivery capacity of the twisted-pair loop plant. Spectrum Management is the name given to the complex problem of managing the effect of crosstalk coupling in a manner that results in effective use of the loop plant.

In the lower-frequency portion of the loop plant (less than approximately 1 MHz) the spectrum management process accommodates several overlapping ways of using the spectrum: frequency division duplexed (FDD), full-duplex echo-canceled (EC), time-division duplexed (TDD) and their various combinations.

FDD systems achieve their rates and performance by splitting the available frequency spectrum into portions reserved for upstream transmission and other portions reserved for downstream transmission, thereby effectively eliminating self Near-End Crosstalk (self-NEXT) as an impairment, and leaving the lower self Far-End Crosstalk (self-FEXT) as the dominant impairment. With FEXT limited systems, power backoff mechanisms are required to keep FEXT below the design limit when transmitters on nearby pairs are not all co-located. Because of the allocation of frequencies to either upstream or downstream, FDD frequency plans are optimal only for a particular service data rate.

EC systems use roughly the same spectrum for simultaneous transmission in both directions on the loop. They are usually employed to deliver symmetric service. In the US, Basic Rate ISDN, SDSL, HDSL and HDSL2 are examples of widely deployed EC systems. EC systems are usually performance limited by self-NEXT when all systems deployed in nearby loops are using approximately the same transmit power.

TDD systems transmit in the different directions on the loop at different times, thus minimizing self-NEXT. Therefore, they become performance limited by FEXT and crosstalk from other systems.

While simultaneous deployment of systems employing the various duplexing methods has been accommodated when using the lower frequency portion of the loop plant, this becomes more difficult at the higher frequencies, where the crosstalk coupling is greater. VDSL, which has been identified by the industry as a viable means for delivering multi-megabit advanced services over relatively short local loops, transmits in these higher frequencies. The industry has selected a FDD approach for transmitting data bi-directionally over a single pair. In order for these systems to attain their designed data rates, all transceivers which share nearby pairs in a cable must adhere to the same basic frequency plan.

The T1E1.4 working group of Committee T1 has spent considerable effort trying to develop a VDSL band plan to accommodate the wide range of potential service offerings made possible by the technology. In the end, it was decided that consumer video delivery was the most important application and that the VDSL band plan should emphasize asymmetric data rates to best accommodate video delivery, while also allowing a reasonable rate of symmetric service as well.

It should be noted that an area of current research is that of treating the loop plant as a multiple-input multiple-output system and using the additional knowledge to cancel a substantial amount of the crosstalk between systems. These techniques are of substantially lower complexity when all of the transmit symbol clocks are frequency locked to a common reference.

Recommendations:

- 1) T1E1 has selected a single high-frequency band plan (known as FSAN 998) for frequencies from 0.138 to 12 MHz for use in the VDSL draft trial use standards, after substantial efforts to optimize it for multiple service types. FG3 acknowledges the selection of this plan and recommends that this good work be recognized and supported by the FCC as the default high-frequency band plan for use in the United States.
- 2) We recommend that T1E1 define PSD levels, transmit power limits, and spectral compatibility criteria for signals that support this default band plan (FSAN 998). These parameters should be specified for both the central office and customer premises locations.
- 3) FG3 further recommends that T1E1 include the determined PSD levels, transmit power limits, and spectral compatibility criteria in the second issue of the SM standard for protecting systems using frequencies 1.1 MHz to 12 MHz from harm. The development of the spectral compatibility criteria should assume that only Plan 998 systems utilize frequencies 1.1 to 12 MHz.
- 4) The following pertains to systems that do not follow the default band plan (FSAN 998) in the frequencies from 1.1 to 12 MHz.
 - o Frequency agile technologies may deviate from this plan if they continuously monitor and default to the FSAN 998 plan if they are coupled to technologies adhering to the plan.
 - o Systems not complying with the default band plan must show spectral compatibility per a compliance criteria (see #3 above) determined for the default plan. This requires that Annex A in the next issue of the SM standard contain the compatibility criteria of item #3 to show spectral compatibility in the frequencies of 1.1 to 12 MHz.
- 5) FG3 is evaluating the use of an alternative band plan under controlled or limited deployment scenarios.

C O N T R I B U T I O N

TITLE: FG3 Recommendation #5 – Line Sharing Test Access
SOURCE*: Focus Group 3
TOPIC: Test Access
DISTRIBUTION: NRIC V Focus Group 3 Plenary – For Information
NRIC V Steering Committee – For Information
NRIC V Full Council – For Approval

ABSTRACT

This document contains a Recommendation from NRIC V Focus Group 3 on Line Sharing Test Access. It is provided for distribution to the members of the NRIC V full council in preparation for its approval at the February 27, 2001 NRIC Council meeting.

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Regarding Rule 47 CFR 51.319(h)(7)(i):

1. While some manually accessed, direct physical test points (provided solely for the purpose of manual test access) have been made available by some loop providers, it is the view of FG3 that this is not a scaleable solution and should NOT be required. While it is presumed that such access will continue to be made available by some loop providers to some service providers, we believe that it should be driven by private negotiation between loop owner and loop user ONLY as a matter of business convenience, and not required by rule. Further, such implementations currently in existence should be grandfathered as meeting the requirements of 51.319(h)(7)(i).
2. FG3 feels that the rule, and moreover, its underlying purpose, is sufficiently met with an automated data interchange (e.g. via terminal emulation, web-based interfaces, electronic bonding, etc.) using the voice switch-based mechanized loop testing system, assuming the following conditions:
 - 2.1. The loop provider should assure that the line-shared loop, when provisioned, is unloaded (See 47 CFR 51.319(h)(5)).
 - 2.2. Some mechanism shall be provided to indicate that a line sharing provisioning order has been completed. One means of satisfying this requirement is to show that the wiring between the voice switch and splitter is completed, which may be accomplished by recognition of the ADSL splitter signature (as provided for in T1.413-1998, Annex E), via the voice switch-based mechanized loop testing system. It is important to note that other means to achieve this end may be available.

It is recognized that not all voice switch-based mechanized loop testing systems are currently capable of detecting and reporting splitter signature information. It is understood that such capability would require upgrades to the software for the test heads as well as for the operational support systems of the providers involved. Software upgrades for the most commonly deployed test heads are understood to be currently available. For successful implementation and utilization of this method, it is necessary that the costs of these upgrades be recognized and that the loop provider's need to recover these costs be addressed by the FCC and state commissions.

3. DSL service providers can optionally provide their own test access, using their own POTS splitters, and their own access equipment, and their own test equipment. In any case, the DSL service provider's testing shall not interrupt an active telephone call without the end-user's permission.

**NRIC V - Focus Group 3
Wireline Network Spectral Integrity
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CONTRIBUTION

TITLE: FG3 Recommendation #6 - Intermediate TUs: Remote DSL

SOURCE*: Focus Group 3

TOPIC: Intermediate TUs: Remote DSL

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NRIC V Full Council – For Approval**

ABSTRACT

This document contains a Recommendation from NRIC V Focus Group 3 on Intermediate Transceiver Units – Remote DSL. It is provided for distribution to the members of the NRIC V full council in preparation for its approval at the February 27, 2001 NRIC Council meeting.

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Introduction:

The following FG3 recommendations are based on the following premise: “We believe that there is consumer value in Central Office DSL deployment. We also believe that future consumer value will rely upon establishing a framework for migrating the TU-C closer to the customer via broadband transport. Such a framework must provide the consumer with more advanced service choices (type and supplier) while maintaining wireline spectral integrity in a competitive, cost-effective, business-driven manner”.

Background and Discussion:

- A. While the performance of a Central Office (CO)-based NEXT limited DSL system (e.g. SDSL, G.shdsl, HDSL) is little affected by the increased FEXT coupling from remote DSL deployments, performance of CO-based ADSL systems may be significantly reduced when crosstalk from remote ADSL deployments is encountered. This crosstalk may be seen when customers whose loops are in the same distribution cable are served both from CO-based and remote ADSL deployments. The expected rate of occurrence of this condition is not yet fully known, but is expected to vary from region to region and even locality to locality.
- B. These potential spectral compatibility problems can be significantly reduced (if not eliminated) by moving the appearance of all ADSL TU-Cs that serve the same distribution cable to the same location. Several techniques have been identified for moving all ADSL TU-C appearances to the remote location. These include the use of derived logical circuits from the remote deployment (whether through co-location at the remote site, handoff of the ATM payload from the remote provider’s deployment, or some other method) and the amplification of CO based ADSL signals to raise the power level at the remote location to a level comparable to that of the remotely deployed ADSL signals. It is important to note that some of these techniques may be more scaleable than others.
- C. While we desire to migrate TU-C’s closer to the customer, it is important to recognize the current investment in CO-based DSL equipment. This investment must be considered and weighed against the benefits of the more robust and higher speed service offerings enabled by TU-C migration when proposing possible resolutions to the spectral compatibility problems that may appear in the course of the migration.
- D. The foundations of spectrum management and wireline spectral integrity are based on the premise that the guidelines will reduce the occurrence of service degradation to a rate where these events can be remedied in a timely manner, without requiring the dedication of excessive resources to remedy the problems. Therefore our recommendations on intermediate TUs involve the application of both preventative measures and remedial “after the fact” measures, depending on the expected problem occurrence rate.

Recommendations:

1. Focus Group 3 recommends that T1E1's continuing work on spectrum management standards embrace, as a whole, the background and recommendations contained herein.
2. As a preventative measure, the industry should be encouraged to employ available transmit power management mechanisms to minimize the effect of FEXT from remote deployments. One method that has been proposed to do this for ADSL modems is to limit the maximum noise margin per tone to the smallest value where data performance is not affected – this effectively results in tones with lower transmit power and/or fewer tones used. While this will undoubtedly reduce the amount of FEXT caused by remote ADSL, the benefits to be gained from this recommendation are under study.

Furthermore, we recommend that industry standards bodies incorporate and require implementation of appropriate transmit power management mechanisms in future DSL standards, and that T1E1 incorporate and encourage the use of transmit power management mechanisms in future spectrum compatibility standards.

3. We recommend that the FCC consider the following in future rulemaking on the issue of remote ADSL deployments:

Where remote and central office ADSL deployments will serve customers with loops in the same distribution cable, providers of remote deployments should provide means for accommodating CO-based deployments.

Whether this accommodation should be done in a preventative or remedial manner depends on the projected exposure or expected rate of trouble occurrence. If an analysis of the exposure suggests that significant spectral compatibility problems are likely, CO-based ADSL should be accommodated in a preventative manner, as part of the remote ADSL deployment. The extent of this exposure is currently under study in FG3. Therefore, both the strategy (preventative or remedial) and the means (e.g. co-location, derived circuits, amplifiers, etc.) of accommodation will be the subject of future recommendations by FG3.