

WINFORUM SHARING RULES REQUIREMENTS

Intent

This is a strawman document to guide the discussion of the 5 GHz Sharing Rules Drafting Committee in establishing the requirements for the rules. The first section (section 2) is a set of proposed requirements. A point is qualified as an objective when it might conflict with another requirements. We may want to further prioritize.

The objective is to establish a document which reflects a general level of agreement which drafters of the sharing rules can use as a guideline. The document is intended to be a living document and likely will undergo maintenance during the sharing rules development process. The intent is to tie down as firmly as possible a set of requirements that all can work toward in the development of the rules. It is expected that the rules development work will start after the initial requirements are established and will be phased to slightly lag the requirements. Further knowledge developed in the rules generation process will feed back into the requirements.

Sections 1.2 and 1.3 give a set of issues that are likely to develop into requirements.

This document is currently guided by positions taken by WINForum in the petition and rulemaking process. It is only a strawman document intended to get the process started and does not necessarily reflect any firm position of the author.

Section 1. Rules Relative to Interaction with other NII/SUPERNet Systems

1.1 Requirements and Goals Relative to other NII/SUPERNet Systems

1.1.1 Extent of the Rules

The rules will define the following RF characteristics

- Power and EIRP levels
- Antenna directionality
- Channelization
- Out of frequency channel and out of sub-band emissions
- Power spectral density
- Frequency stability
- Other

There will be additional constraints designed to maximize harmonious coexistence among diverse systems using the sub-band. These are the procedural rules.

1.1.2 Variations of the Rules

The spectrum is divided into a upper and a lower sub-bands. The upper sub-band is shared with ISM devices and other part 15 devices.

The spectrum is divided into an upper and a lower sub-band. The lower band is shared with Federal Ground-based, Airborne and Shipborne Radar. The band

adjacent to the lower band is used by the Federal Aeronautical Radionavigation System.

The upper sub-band is shared with Federal Ground-based, Airborne, and Shipborne Radars, ISM devices and other Part 15 devices.

Each sub-band will be considered separately in the generation of the RF rules. It is expected that the RF rules will be different for the separate sub-bands.

There will be two sets of procedural rules, class 1 and class 2. The lower sub-band will be restricted to class 1 rules. Either class 1 or class 2 procedural rules will be permitted in the upper sub-band.

Generally, class 1 is intended for low eirp indoor links and class 2 is for higher eirp, community links.

Class 1 rules:

These will be optimized for the communication of integrated voice, compressed video and data characteristic of multi-media communications.

In-building distances of 30 to 50 meters and omni directional antennas

Propagation exponent $\alpha = 2$ in ranges of up to 5 meters, $\alpha = 4$ in ranges from 10 to 50 meters. This is intended to include some level of RF permeable penetration.

Class 1 systems may also be used for longer distances with antenna gain or outside elevated antennas.

Goal: More robust access procedures to minimize susceptibility to high powered pulsed radar signals.

The class 1 rules will be optimized for systems of the following types:

- Quality of service will be provided in real time operation with mean user signaling rates between (suggest 32 kb/s and 2.0 Mb/s).
 - Burst signaling speeds of up to (suggest 8 Mb/s) per user will be required for up to (suggest 100 ms) to allow MPEG reference frame transmission.
- High burst signaling rate applications will be permitted to use the highest signaling rates up to the full raw signaling speed consistent with the necessary quality of service of all applications.
- Directional and omnidirectional antennas
- Ad-hoc as well as building/campus applications supported by a fixed infrastructure
- Centralized and distributed control systems.
- Raw channel signaling speeds of at least 20 Mb/s.

Goal: One integrated set of rules covering all information flow types. Frequency separation may be necessary but will be the last resort.

Class 2 rules:

These will accommodate applications incompatible with class 1 rules, for example including community networks

- Lower bandwidth channels than class 1 are permissible
- More robust access procedures - capable of operating in the presence of high powered radar signals, ISM and spread spectrum devices
- Longer distances; these affect the protocols as well as EIRP levels because the end-to-end signaling time (mostly propagation time) would be much larger than for short range systems.

1.1.3 Antenna Directionality

Class 1 rules will permit efficient operation of both directional and omnidirectional antennas.

In class 1 procedures, antenna directionality/power level will be limited to an EIRP 6 dB above the permissible omni power level.

1.1.4 Comparison Metrics

Fairness Metric

It is a goal that the rules will operate fairly with directional and non-directional antennas in the same vicinity.

The metric of fairness in all of the rules will be based on:

The objective is to achieve a probability of access that is independent of the type of system requiring access. If system A is utilizing X % of the spectrum, then system B should be equally capable of accessing the remainder 100-X% as is other devices of system A.

Note: It will be necessary to define the word utilize.

1.1.5 Network Access, Interoperability and Wireless ATM

The sharing rules provide spectrum coexistence for intra building multi-media communication as well as interconnection to wired networks for inter location multi-media communications over broadband wired networks.

It is a specific requirement that the access rules specify the necessary functions of the Medium Access Control (MAC) and the Radio PHY (RPHY) as illustrated in the wireless ATM architecture model below to assure spectrum coexistence for mobile terminal interconnection via Wireless ATM to wired ATM networks.

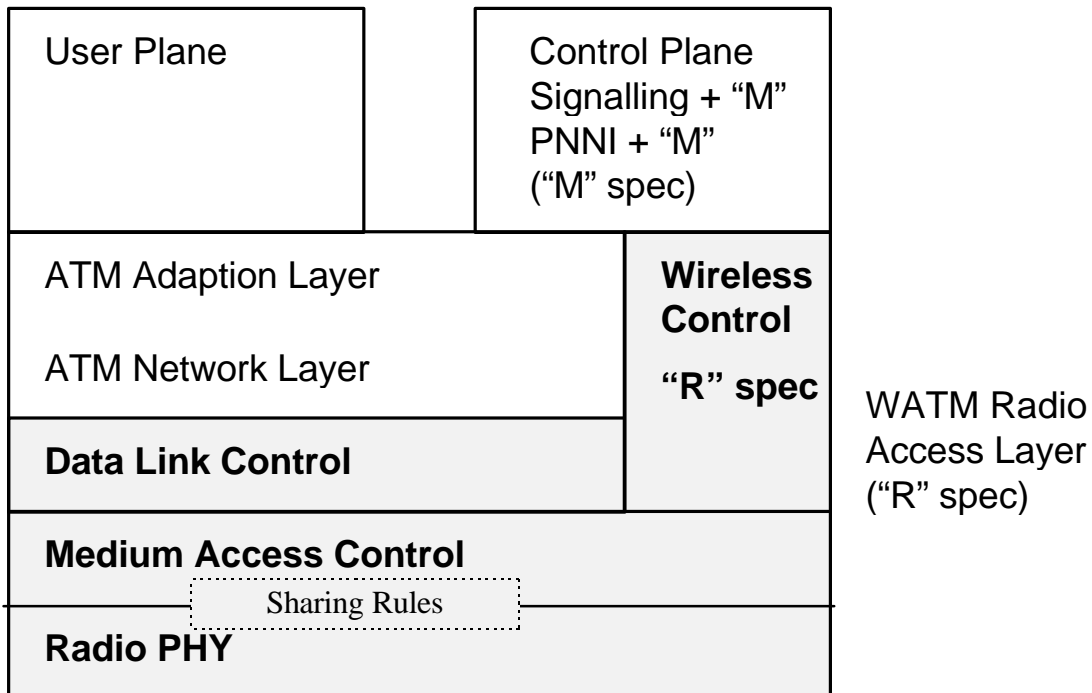
It is a goal of the sharing rules committee to develop rules that allow implementations that support the quality of service requirements of the Wireless ATM Forum to the extent that they are consistent with fair sharing of the spectrum.

The objective of the sharing rules committee is to develop rules that

- a) allow the deployment of radio based networks that provide controlled quality of service to their users (examples of controlled QoS protocols that these networks would have to support are ATM and switched Ethernet). Such networks shall be bounded in the amount of channel capacity they may use.
- b) provide for smooth (re)distribution of SUPERNet spectrum resources to networks operating within range of each other in a manner consistent with a)
- c) provide some SUPERNet spectrum resources for devices that provide a "best effort" type of service or non guaranteed quality of service (e.g. as is the case on the Internet today).

The MAC and Logical Link Control (LLC) layers are specifically not the responsibility of the sharing rules committee. These are referred to in the objectives statement of the committee as the interoperability rules. There is currently no work underway to standardize the interoperability rules in North America. Thus, the role of the sharing rules is to provide the basic foundation required to provide spectrum coexistence for the development of interoperable systems, whether for future interoperability standards or for early proprietary systems.

Note: ETSI RES-10 and the ATM Forum have reached agreement on the division of work for wireless ATM access with regard to HIPERLAN. WINForum Liaison with ETSI RES-10 should be established and is anticipated on a timely basis.



Possible Wireless ATM Architectural Model (For Discussion Purposes)

The Data Link Control and Medium Access Control Layers are also necessary in other applications.

1.1.6 HIPERLAN

Requirement: It is anticipated that the sharing rules developed by this committee will require HIPERLAN type I systems to be modified in order to follow these rules. That is, we do not view strict backward compatibility with HIPERLAN type I systems as a requirement for the sharing rules.

Goal: Permit the functionality of the ETSI HIPERLAN I and II standards.

1.1.7 Efficiency Metric

Goal: The efficiency metric should take into account re-use as well as modulation efficiency (b/s/cell).

1.2 Issues Relative to other NII/SUPERNet Systems

1.2.1 Power and EIRP Issues

A list of power and eirp issues will be developed, taking into account the following:

It will be necessary to study the question of the necessary power levels to achieve the distance requirements in the lower sub-band.

The current position is technologically neutral levels in the upper band.

Directional antennas show promise of achieving good efficiency at higher distances. This must be studied in relationship to the effects on other services and the effect on less directional systems.

Directionality of the antennas may make an LBT rule ineffective.

Out-of-band emissions specifications are necessary. The ETSI HIPERLAN specifications should be considered for the emission limits in the adjacent MLS band.

Inter-channel specifications in the lower sub-band are necessary.

An objective of the sharing rules committee is to yield an etiquette that allows efficient use of power to achieve long battery life.

1.2.3 Monitoring and Assessment

To be added.

1.2.4 North American Standards Development

MAC and DLC Layers are not assigned in North America.

How do we best assure that the sharing rules will meet standardized system needs?

1.2.5 Distributed Control Systems

Can both centralized and distributed control systems be efficiently supported by a single set of rules?

1.2.6 Efficiency Metric

Can one be developed?

1.2.7 Quality of Service Metrics

Should values of the following parameters be established?

Data response times

Data collision/interference probability

Voice/Video quality

Connection blocking and drop probability

1.2.8 Frequency Channelization

Issue: Should the center frequencies be assigned in the rules.

Issue: Should the frequency separation or the channel width be defined.

Section 2. Rules Relative to Interaction with Non - NII/SUPERNet Systems

2.1 Requirements and Goals Relative to non- NII/SUPERNet Systems

To be added.

2.2 Issues Relative to Non- NII/SUPERNet Systems

2.2.1 RLS Sharing

There are concerns that need attention.

1. WINForum has asked for spectrum in the RLS region above 5.35 GHz.
2. RLS interference with NII/SUPERNet may bring pressure against RLS use of the spectrum adjacent to 5.35 GHz. NTIA representatives have mentioned this as an issue in our contacts with them.

Point 1: In order to achieve spectrum in the band between 5.35 GHz and the ISM band, it will be necessary to avoid interfering with RLS systems. These systems are very high power level radar systems. Some preliminary investigation indicates that NII/SUPERNet systems will not cause significant interference in such systems, however, this may not be provable. In cases where NII/SUPERNet devices may interfere with RLS systems, the in-band RLS power levels are so high that such systems can always be detected and differentiated from low power NII/SUPERNet emissions.

Issue: Could NII/SUPERNet systems coexist in this spectrum region if they are frequency agile and can move out of any band in which RLS interference is detected?

Point 2: This involves susceptibility of NII/SUPERNet systems. Susceptibility can normally be left to the discretion of the system providers and can allow competitive differentiation. However, NTIA representatives have expressed fear that future widespread use of susceptible NII/SUPERNet systems will bring public pressure to bear to prevent RLS use in adjacent bands.

Susceptibility can be controlled by both RF and procedural means.

Issue: Should the susceptibility issue be covered in the sharing rules? If, so how?

NTIA Position: The susceptibility of NII/SUPERNet devices must be addressed by the sharing rules.

2.2.2 MLS System Interference

The NTIA is concerned about adjacent band interference to the FAA's MLS system, which will depend on the power, antenna gain, and out-of-band emission limits established in the 5150-5350 MHz sub-band.