Before the

FEDERAL COMMUNICATIONS COMMISSION
Washington, DC

In the Matter of:

Creation of the Low Power FM (LPFM) Broadcast service	)))	MM Docket No. 99-25

COMMENT

Submitted by:

Jim Trapani
JT Communications
579 NE 44th Ave.
Ocala, FL 34470-1421
352-236-0744

I respectfully submit the following opinions, replies and comments in this matter. All paragraph references in this reply directly relate to the NPRM references. Please note that these comments show heavy emphasis on the technical, and minimal emphasis on the ownership and programming portions of this NPRM.

COMMENTERS OPINION:
It is this commenters objective to show that further study needs to be conducted on the methods and measurements which determine realistic interference and protection assurances to the existing broadcast stations in accordance with the proposed low power broadcasting service.

It is the opinion of this commenter that the NAB, NPR, and the number of individual licensees that responded in the negative matter indicated failed to realize that many stations, in their determination to conserve operating funds, are often persuaded to depend on network and non-community related programming. Such programming further separates the stations ability to provide the community wants and needs in which the station is licensed to. It is the opinion of this commenter that such groups wish to restrain trade of commerce and do not want the additional competition that would result in the additional low power service. It is the opinion of this commenter that the AM band would not be a good choice for low-power community broadcasting primarily due to the detrimental effects of nighttime propagation.
A "not-for profit" organization as defined in the FCC rules and

regulations should not have to
comply with IRS Code 501C3. This requirement is directed towards large organizations, and not
individuals. The IRS Code 501C3 compliance places a financial burden on small entities interested in
obtaining a low power licenses in accordance the current FCC requirements for non-profit
organizations. Only non-commercial stations should be allowed channels 200-220 assignments. Microradio
stations should not be required to be non-commercial only, as this would be a restraint of trade to
commerce. Furthermore, compliance with IRS code 501C3, as explained in paragraph 18 would be
financially burdensome to small entities to comply with.
Micro radio stations request for studio-to-transmitter links, as such low-power stations signal
coverage may not warrant the need for such a link, provided communities do not place antenna
restrictions on micro radio stations. Auxiliary service licenses such as remote pick-up could be
authorized, but only for the duration of the transmission.
If the LPFM service is incorporated into the rules, a determination of whether or not the service is
defined as "primary" or "secondary" service must be decided. Primary stations should protect other
primary services, and secondary services can accept interference from primary services.
A low (10 watt) power "Microradio" service could prove useful in smaller community areas.
In the case of low power stations, it may not be necessary to protect the 1 mV/m signal contour.
Perhaps protecting the 0.5 mV/m contour would significantly reduce interference to the existing
services. This reduced protection criteria would also increase low power channel availability.

The LP1000 station interference requirement needs to be studied further. Rather then using
minimum distance separation requirements, contour overlap predictions may better determine coverage
requirements and protection criteria. Furthermore, the 1 mV service contour requirement should be
reduced so that additional protection would be available to already existing stations, and the possibility
of additional LPFM assignments could be achieved.

Operation of a low-powered station may not warrant high levels of power for satisfactory
reception, as well as antenna height concerns. There is not a significant difference in received signal
strength between 1000W and 3000W at the same HAAT. The 60 Meter antenna height is a good stop
gap for LP1000 proposals.

All applicants for all three classes of stations should be allowed to adjust power for various
heights. By specifying a minimum power level for each class, the use of

interference contours for a specified power level would suffice for each class of station for a given community service area. By allowing dynamic service contours (where a small vs. large community size would dictate the coverage area), stations could fit in specific communities that may otherwise be not serviced by interference generated by a station operating with a minimum power level. The use of minimum distance separations would not necessarially be the foremost method for interference calculations. Furthermore, the 1mV/m primary grade contour for LPFM may be reduced to a lower level. This may further reduce interference, and allow additional LPFM assignments. There are many methods to calculate coverage; Field strength (73.313), contour overlap, PTP, and Longely-Rice. Each method should be studied and reviewed to determine which method would provide the most efficient use of the spectrum, while insuring the protection the existing primary stations currently in use. Whatever method(s) are decided additional study needs to be made to determine the best method for the process.

It may be possible to allow LP1000 stations to operate as a secondary status if there was an interference concern. This may allow additional LP1000 assignments in locations where a "protected" station may not fit.

The use of contour overlap vs. minimum separation requirements should be investigated, as well as reduction in the 1 mV contour requirement.

Firstly, LP1000 stations should be classified as primary stations. Secondly, it is the opinion of this commenter that digital broadcasting on the current broadcast band will result in further interference constraints on current stations. Digital broadcasting on the current 88-108 mHz band will result in reduction of spectrum protection for the current services. For example, Appendix C in FCC 99-6 paragraph 4 of the NPRM states that "...NAB argues that....an IBOC system...will increase the potential for an IBOC signal to interfere with the reception of an analog signal...". In paragraph 5 of this same appendix, it is stated "...second-adjacent interference is the primary challenge facing IBOC designers...". Further, consumer receivers will have to be upgraded to allow the digital signal to be received, at the expense to the consumer. The various technologies used in the myriad of consumer receivers makes it financially prohibitive for a typical consumer. A typical consumer FM receiver contains an IF bandpass response of +/- 280 kHz. This excessively wide response further increases adjacent channel interference. As a manufacturer of broadcast transmitters, this

commenter has experimented with narrower (+/- 150 kHz bandwidth) filters in various consumer receivers, and has been able to reduce adjacent channel interference by better than 25 dB, with minimal to no changes in the demodulated harmonic intermodulation distortion, stereo separation, and sub-carrier demodulation. It is the opinion of this commenter that a significant reduction in adjacent-channel interference could be significantly reduced if manufacturers utilized IF filters of slightly narrower bandwidth. The filters are readily available in the industry, at similar costs to the currently supplied filters. The pioneers of digital broadcasting have most likely tested the effects of digital broadcasting utilizing the 280 kHz bandwidth. It is not known how a narrower filter would affect the digital tests that have already been conducted. It is the opinion of this commenter to allocate separate spectrum for digital broadcasting.

Thirdly, it is the opinion of this commenter that booster and translator frequencies could be better utilized if they were assigned to low power broadcasting services. When a broadcast station conducts engineering studies prior to construction, the contour studies clearly indicate the areas that the station may not properly cover. With current technology, antenna systems can be electrically adjusted to compensate for some of the anomalies that occur due to irregular terrain. Unfortunately, the translators and boosters are already in place. It is this commenters opinion to place a freeze on further licensing of translator or booster stations, and expand services as highlighted in paragraphs 10 through 14 in this reply. Furthermore, translators and boosters should remain as a "secondary" service.

There should be a 12-15 watt minimum power limit to the LP100 proposal for the same reasons listed in paragraph 26. Secondly, due to improvements and cost savings in technological advances, the financial differences between a 100 and 1000 watt station are not significant enough to be considered as a financial restriction. Thirdly, LP100 stations should not be restrained from commerce and trade; LP100 stations should enjoy the financial gain of commercial broadcasting. This would increase competitiveness of existing stations, which is most likely the primary reason for the opposition of the NAB, etc. as highlighted in Paragraph 9 in this reply.

It is the opinion of this commenter to allow the LP100 stations to operate as a secondary basis, provided that primary stations need not protect the LP100 stations, and LP100 stations accept any interference that may occur from a primary station to an LP100 station. It is the opinion of this commenter that the 3rd adjacent channel protection not be

considered when applying for an LP100 station license. Furthermore, contour overlap may be a more
preferred method of signal protection determination.

LP1000 stations at a minimum should protect an LP100 stations 1st adjacent contour. It is the opinion of this commenter that further study needs to be conducted to
determine the proper field strength contour necessary to determine the interference. Furthermore,
LP100 stations should be permitted to apply for channels for which up to 10% maximum of the area
within the 60 dBu contour would be predicted to receive interference. Perhaps a 54 dBu (0.5 mV/m)
contour protection would be better suited for LPFM station assignments.

This commenter believes that the LP100 service would serve the public interest. It is the opinion of
this commenter that further study needs to be conducted as to the interference prediction methods
selected to best serve the spectrum, while simultaneously protecting existing services from interference
from low power stations. This commenter does not believe that digital broadcasting on the existing FM
band should be further studied as well as the introduction of additional FM booster or translator
stations (see paragraph 29 in this reply).

A "Microradio" class would be beneficial to small communities and should not be restricted to only
the non-commercial group. This class should operate on a secondary basis on any frequency
assignable on the FM broadcast band.

All broadcast transmitters, regardless of license type, should be verified as per the current rules.
This commenter operates a transmitter manufacturing facility, and markets equipment either type
notified or verified for the FM broadcast services. The transmitters manufactured at this facility are
carefully tested and measured to insure that they remain in full compliance with applicable FCC rules,
as well as industry standards. This commenter receives many inquiries from many persons or
organizations looking to start a "community" radio station, sand recommends that those persons
investigate part 15 of the FCC rules. This commenter is aware of the many "hobbyist" products that
are mentioned by others, and is well aware of their inability to meet the technical requirements of the
applicable rules pertaining to use as a broadcast transmitter for licensed services. This commenter
knows that persons partaking in unlicensed broadcasting utilize the "hobbyist" equipment; the same
equipment that causes damaging interference to other sensitive services. Therefore, it is paramount that
all broadcast transmitters regardless service class need to be type verified by the manufacturer.

Actual experimental studies need to be conducted to determine the effects of interference and the separation requirements of this "micropower" class would have on existing licensed services. Since translators and boosters are a secondary service, "micropower" class stations should not have to absolutely protect these type stations. It is the opinion of this commenter that digital broadcasting in the current FM band should not be utilized. See paragraph 29 in this reply.

The "micropower" class at the onset should be approximately 10 watts ERP. The "dynamic" community contours this commenter refers to in paragraph 26 in this reply would better suffice power requirements. Protection criteria has not yet been determined realistically. This commenter is willing and financially able to determine by experimentation, observation, and realistically measuring actual radiated signals for given community service areas. Further, the need for these experiments and measurements would help determine the maximum allowable protection available to existing services.

Before incorporating interference requirements, this commenter will illustrate that successful reception of an LPFM broadcast signal can be received successfully with reduced power. This example will show the theoretical explanation:

a) The open-circuit voltage of a diploe for any length up to 1/2 wavelength is:

E(oc)= FS(5.59 sqr(R))/F mV, where:
E(oc)=open circuit antenna voltage, in volts,
FS=Field strength in mV/m,
R= Antenna radiation resistance in ohms,
F= Frequency in mHz.

b) The noise found at the receiver output is caused by the antenna noise and thermal noise at the receiver input. The input noise generates more noise than that of an equivalent resistor at room temperature. The noise generated is:

Enr= En*sqr((2-nf)-1) V, where:
Enr= equivalent noise generated at receiver input in volts,
En=equivalent thermal noise (sqr[4Rin*KTDF] Rin), where
Rin= receiver input resistance, ohms
K= Boltzman's constant (1.38*10e-23)J/K
DF= half-power bandwidth measured at discriminator
nf= receiver noise figure in dB.

For a receiver with a 300 ohm input resistance, and a 200 kHz bandwidth, En=0.98uV. A typical noise figure of a receiver is 3dB, which is 1.39uV.

The S/N of an AM receiver is a direct measure of the S/N to be measured at the audio output of the receiver. By mathematical calculation, the S/N ratio of an FM system with a modulation index of 5 is 18.8 dB higher than that of AM. Adding 75 uS pre-emphasis adds an additional 13.2 dB, giving a total of 32 dB. For a 12 dB SINAD at the receiver and a 44 dB S/N ratio at the audio output, the required field strength using a half-wave dipole is 11.5 uV/m. If stereo transmission were employed, an additional 23 dB would be needed for the same S/N ratio, which corresponds to 162.44 uV/m. Therefore, satisfactory performance can be achieved from the transmission of low-powered signals on the current FM broadcast band. Note that this does not take into account adjacent channel interference received.

It is the opinion of this commenter that theoretical calculations are not sufficient, and actual dynamic field measurements need to be conducted to properly determine protection criteria. As explained in Paragraph 26 in this reply, there are many computer models, measurement processes, and methods to determine the proper calculations for interference predictions. When FM broadcasting was conceived, many actual experiments were conducted to determine how to establish protection contours, govern separation requirements, and determine interference predictions. From these measurements, documentation was produced illustrating the effects of these measurements. These measurements have been used for years as the criteria for establishing protection contours. Since LPFM is a proposed new service, new actual experiments and tests should be conducted to determine the what actual field strengths LPFM broadcast transmissions would have on existing licensed services.

This commenter is in partial agreement with the current methods utilized for existing services, however, these measurement methods have been recently challenged with newer and improved methods of calculations such as PTP, Longley-Rice, etc. With the introduction of low-power stations, this is best timeframe to select alternative methods to calculate and measure interference criteria, while insuring protection to current services.

Minimum distance separation concepts are one acceptable method of determining means to govern interference, however, some additional methods and calculations need to be visited and discussed such as:

a) The 320 kilometer limit for the common borders of Canada and Mexico need to be relaxed for

low and micropower stations. Such a large distance eliminates almost 40% of the bordering areas of
the United States. This eliminates many opportunities for low power and micropower station
placement. Experiments and measurements need to be conducted to determine what the actual useable
realistic distance would be.

b) Appendix B has been derived from empirical, and not actual calculations. The need for further
studies and experiments are extremely significant if any realistic determinations are to be concluded.
This commenter has the resources and will conduct actual experiments to what the realistic numbers
should be to determine what power levels would suffice, while maintaining the maximum protection to
existing services.

c) It may be advisable to change the 1 mV/m contour reference for LPFM to 0.5 mV/m.
This will reduce interference concerns without sacrificing LPFM assignments.

d) The use of contour overlap vs. minimum distance computations should be considered
as an alternative to interference prediction criteria. This may better allocate the LPFM
assignments, as well as reduce interference.

e) Investigate Point-to-Point (PTP), and Longley-Rice methods for signal coverage
predictions.

All of the above examples should be backed up with actual experimentation and measurements.
Minimum distance separation predictions as illustrated in Appendix B may not be appropriate for
LPFM assignments. Experimentation and evaluation needs to be conducted to determine exacting
specifications to determine how much and to what level interference is considered acceptable. It is
important to protect the existing stations; if LPFM stations were assigned on a secondary basis, LPFM
stations would have to accept interference from existing non-LPFM stations to some degree. Although
the simplicity offered by station separation requirements my be viewed as the most efficient, it may
not be the most effective. Whatever requirements are sought, the expenditures to incorporate the
requirements must remain reasonable and affordable to the proposed LPFM entities.

This NPRM has been created to create a low-power broadcasting service on a band already
assigned, frequencies already determined, technical specifications similar to existing FM services, and

signal specta already known. To take into consideration specifications for a digital service whose
specifications and parameters have not yet even been finalized could result in negative and
complications not yet realized. It is the opinion of this commenter that the proposed digital services
comply 100% with existing broadcast services or assign a new band for digital broadcasting as defined
in paragraph 29 of this reply.

Rather than try to "shoehorn" a low-power spectrum specification into an unknown digital system,
demand that the digital system 100% comply with current analog spectrum requirements, or better yet,
do not assign any digital stations in the current band, as highlighted in paragraph 49 of this reply. To
attempt to restrict spectrum by requiring spectrum filters to a low-power service would be financially
prohibitive to the equipment. Furthermore, it would not be logically sensible to require low-power
stations whose power and projected interference would be significantly lower due to the radiated field
strengths, yet allow higher powered stations the enjoyment of the full spectrum currently allowed. See
also paragraph 29, and 47 of this reply for additional comments.

The LPFM interference calculations should be re-considered to an alternative method to that used
in Appendix D, and further study needs to be conducted on this matter. See paragraphs 26 and 40
through 49 of this reply.

It would be financially prohibitive for both the manufacturer and user of transmitters to have to
comply with an even further reduction in spectrum emissions. Secondly, it would not be logically
sensible from both a technical and operational standpoint to restrict low-power stations' spectra and
allow higher powered stations to operate with the current spectrum requirements of 47 CFR 73.317.
This commenter manufactures transmitters for use in the radio broadcast services. To add special
filtering to further mask emissions would not be financially advantageous to the users of this
equipment, particularly if this requirement was for low-power users. The cost to purchase transmission
equipment would be prohibitively higher than what current transmitters cost to purchase. As indicated
in paragraph 35, all transmitters used in the FM service should be verified per current FCC rules. This
would insure that emissions radiated from all broadcast transmitters would remain in compliance.
Modulation limits should not be regulated by the transmitter; the current rules require the operator of
the equipment to remain in compliance with the applicable rules for modulation limits.
The current emission requirements should remain unchanged, and remain

the de-facto standard for
all broadcast services.
It is this commenters opinion that attempting to create costly
modifications to equipment that is
sold to the low-power marketplace would be financially prohibitive to
both the equipment
manufacturers and end users of such equipment. Further, as discussed in
Paragraphs 29, 35, 51, and
52, it would be better to conduct actual experiments to determine actual
emission limits and standards.

It is technologically backwards to create limitations on
a current proposed standard when a digital standard has not yet been
established. Secondly, placing
emission limits (which would be financially restrictive to manufacturers
and users) on low power
stations without including existing stations would be financially
discriminatory to the marketplace.

Reduction of the spectrum width to satisfy future digital broadcasting
and existing stations would
be financially discriminatory to the marketplace. Although reduction in
bandwidth of low-powered
stations would reduce some interference, these stations may not enjoy
the ability to broadcast stereo or
sub-carrier services. Furthermore, reduction of deviation would
jeopardize the signal-to-noise of LPFM
stations. It is this commenters opinion not to place such a restriction
on a service whose entire concept
is expansion of users without burdensome expenses. See also paragraphs
26, 29, and 40 of this reply.

Reduced bandwidth emissions need to be studied further before any
conclusions can be obtained.
It is the opinion of this commenter that actual experimentation and
measurements need to be taken to
determine any useful conclusions. Reduced spectral emissions should not
be considered an alternative
due to the excessive financial burdens that would result.

This commenter is primarily concerned with the technical aspects of this
NPRM. This commenter
does not, however have a significant interest in the programming,
ownership, and licensing procedures
of this NPRM. This commenter does, however believe that strict ownership
rules need to be
investigated and considered.

Cross-ownership may prevent individuals with "valuable broadcast
experience" from contributing to the success of the service, however the
results of cross-ownership in
the current broadcasting marketplace has severely monopolized the
industry, disallowing the financially
disadvantaged to ownership ability. Although this commenter does not
offer or recommend specific
suggestions, specific ownership rules need to be created to prevent such
monopolization.

LPFM stations should select their own programming schedule which they feel
meets the needs and interests of the community to be served , and not necessarially delegated by FCC
rules. A LPFM-2 stations program content could exceed an LPFM-1 stations program content for a
given community service area. This is the entire basis of establishing a new class station. Small
community-oriented stations better meet the needs of the local community, without having to service
areas beyond the community in which the station is licensed to.

TECHNICAL CONCLUSIONS:

1) It may be possible to reduce the "primary" protection contours for the LPFM service. This would
result in better spectrum management for LPFM stations, while providing additional protection to
existing stations.

2) Reduction of spectrum bandwidth for LPFM stations is not a cost-effective method of increasing
protection to existing stations.

3) By utilization of contour overlap predictions, rather than minimum distance separation charts may
even better determine protection criteria.

4) To assure absolute protection to existing and LPFM stations, any proposed digital broadcasting on
the existing band must comply 100 percent with the current spectrum and emission rules. Since no
rules or standards have yet been established, do not restrict a future technology with current standards.
Instead, select design criteria for digital broadcasting so that it would comply with existing rules. This
would result in coexistence of both analog and digital technologies without interference concerns. If
100% coexistence cannot exist, the incorporation of a separate band for digital band needs to be
investigated further.

5) Reduce the mileage limits for the borders of Canada and Mexico for the LPFM service. Since the
field strengths will be considerabally lower, LPFM stations would be able to operate closer to the
borders.

6) Experimental tests by independent organizations should be conducted to determine the actual
conclusions for protection criteria. These tests should incorporate:

a) receiver design criteria,

b) current methods approved by the FCC,
c) interference overlap,
d) investigation of calculation methods like PTP, Longley-Rice, and others.

_____

James Trapani
President,
JT Communications