Greg Best
Consulting, Inc.
5541 Vantage Vista Drive
Colorado Springs, CO 80919
719-592-9781

Before the
Federal Communications Commission
Washington, DC 20554

In the Matter of

Amendment of Parts 73 and 74 of the Commission's Rules To Establish Rules for Digital Low Power Television, Television Translator, and Television Booster Stations And To Amend Rules for Digital Class A Television Stations	))))))	**MB Docket No. 03-185**

To: The Commission

COMMENTS OF GREG BEST CONSULTING, INC

Greg Best Consulting, Inc. ("GBC") hereby submits its comments in response to the Commission's Notice of Proposed Rule Making ("Notice") in the above-captioned proceeding, FCC 03-198, released August 29, 2003, and published at 68 FR 55566 (Sep. 26, 2003).

The Notice is detailed and thorough. GBC appreciates the effort that the Commission has made to examine the digital transition for Class A, LPTV, and translator stations in such detail. These comments will set forth GBC's views on proposals made in NPRM, based on the following principles:

A speedy transition of LPTV and Translator operation to digital service

Minimizing the disruption of analog services.

The appropriate NPRM section number will be addressed with each comment.

Section 12. I believe a definition consistent with the FCC "vision" is that a digital translator station is one that broadcasts at least one program stream provided by a primary station using the 8 VSB modulation standard. I believe that a digital translator will have essentially the same function as an analog translator in that it passes through at least one of the program streams provided by a primary station. A digital translator may choose to pass the entire 6 MHz signal through or it may choose to decode one program stream and to pass it on to its intended audience. Local message insertions should be permitted but not required.

Section 13. During the "sunset" of analog TV, a concern is raised about markets that meet the criteria for turning off analog transmitters but that still have significant population "pockets" that are currently served by translators. To permit a smooth transition to digital in rural areas where the sales of digital TV sets has not achieved a sufficient penetration, it is proposed to allow a existing translator licensees to receive the 8 VSB signal, convert that signal to analog, and rebroadcast the analog signal at the existing licensed power. The translator should be permitted to re-transmit that signal at the existing licensed power for a period of up to one year after its primary station has turned off its analog channel. This will likely mean a unique definition of the "end of the digital transition." The technical requirements of the analog transmission would not change from the current FCC rules that address analog transmission. It is also believed that before primary station analog signals are shut off, it should be permitted to receive the analog input signal and convert this to the digital 8-VSB for re-broadcast (with consent of the primary station) or to relay to other translators for final broadcast in analog or digital format. This scenario is more likely to be of benefit in sparsely populated areas with multiple hops so this type of operation could be handled on a waiver basis.

Section 14. Both heterodyne and regenerative digital translators should be allowed provided they meet all technical criteria established by the FCC for digital translators. Approximately 90% of existing translators in service today are of the heterodyne type. The simplest and quickest route to convert to digital is to modify their existing heterodyne translators. In most single hop translator systems, digital heterodyne translators will function adequately provided they meet the emission mask and frequency stability requirements addressed later in this document. To require the conversion to regenerative type of translator will create a very significant burden on the translator operators from an expense point of view when it may not be necessary. It is estimated that the present cost of modifying an existing translator to a regenerative digital translator is around $10000. This cost is expected to drop significantly in the next 2 years. In situations where adjacent channels are utilized, regenerative translators may be required. The primary determining factor is whether the D/U ratios for NTSC or DTV in adjacent channel operations are maintained. Depending on the number of stations that convert immediately to digital, it may be difficult for manufacturers to assemble test and distribute enough regenerative modulators in a relatively short period of time given that there are approximately 4700 translators in the field already.

In multiple hop operations, regenerative translators are preferred because the retransmitted signal can provided a high SNR compared to its received SNR. However, this depends more upon the path characteristics more than anything else. For example, a 3 hop system could have a long first hop with lots of multipath and utilize a digital regenerative translator while the remaining hops could be short and have fewer multipath issues so that digital heterodyne translator would be adequate. So, the choice of heterodyne or regenerative digital translators should be left to the system designer.

Section 15. Digital translators should permit local insertions. The technical means to accomplish these messages is available today but is not likely to be used by translator operators until prices of this equipment decrease further.

Section 16. A digital LPTV station should be allowed to multicast in the same manner as a full service DTV station. My opinion is that a digital translator will receive a single input channel and should be permitted to rebroadcast its primary station programs in the approved formats that are transmitted by full service stations. I believe it would be advantageous to allow the reception of several programs and the recombination and multicasting of such program streams. I agree that consent to alter the format must be provided by the primary station if the translator wants to change it. A translator station historically has had a single input signal channel and single output channel. DTV translator operators should be permitted to provide (A & S) to defray the costs of operation of the translator systems.

Section 17. Translator relays should be permitted to receive their input signals from other sources than off air. I agree with the proposal as stated.

Section 20. The distinction between a translator and a digital LPTV station should be maintained. LPTV stations that originate local programming typically add more value to the community of license and therefore could be treated with a higher priority. I believe the definition of a digital LPTV station is one that originates 3 or more hours of programming per day. In general, when two incumbents apply for the same digital channel the LPTV applicant could be given priority.

Section 23. I agree with proposal made by FCC.

Section 24 I agree with proposal made by FCC.

Section 25. I believe that it is acceptable to broadcast “A & S” services along with a free over the air video program but not without it.

Section 28. I agree with using channels 2-13 and 14 through 59 (except channel 37) for new digital TV stations. For those existing analog LPTV and translator stations operating on channels 52-59, I seek to allow existing analog licensees to convert to digital (on channel conversion), and continue the policy of allowing them to operate indefinitely on a secondary non-interfering basis.

Section 29. I believe that channels 52-59 should be allowed to be used for digital LPTV or translator licensees regardless of whether lower channels are available or not. Consider the case of a digital LPTV applicant that files an application for channel 48. It is then granted and built only to find out that a full service station desires to move to that channel. It is believed that using the channels from 52-59 will allow less channel “churning” and will permit less disruption to the general public. In some cases, an adjacent channel could be used for paired digital channel next to the NTSC and thus the applicant can possibly make use of the existing antenna. In addition, the applicant would be concerned about interference into itself so there may be more flexibility with regard to interference. I believe that there will be a time where it makes sense to move all digital transmitters into the “core” channels (2-51) but not until such time as when the primary DTV stations are stable and essentially no movement is occurring.

Section 30. I believe that existing analog LPTV and translators operating on channels 60-69 that cannot find additional spectrum for a digital signal be permitted to continue to use these frequencies for digital transmission until the end of the digital transition. I believe that the completion of the digital transition can be defined in such a manner to allow the station using these channels a period of time (grace period) of one year such that they may be able to change the frequency of their digital station operation to a channel in the 2-59 range. I would propose that stations that fall into this category could file displacement applications such that their applications would receive priority in application processing. All channels, including ones licensed for public safety is the primary service, should be utilized. If public safety equipment is not utilizing the spectrum it makes sense to use it for incorporating digital channels until such time as when public safety applications are presented. As always, digital LPTV or translator stations must not cause interference and take measures necessary accordingly or cease broadcasting.

Section 33. I agree with the proposal made by the FCC.

Sections 34-40. These Sections address the common issue of protection. I agree that the protection should be executed on the basis of D/U ratios. I also agree on using the D/U ratios as proposed by Section 38 for co-channel situations. The adjacent channel analysis provided by the Sgrignoli paper has merit because of the basis on which it is developed. However, this only applies to co-located adjacent channel situations. The resulting D/U ratios assume a given amount of the shoulder level splatter from a co-located adjacent channel station and meeting the stringent or simple masks proposed. The co-located calculations indicated in the Sgrignoli paper also assume very high signal to noise ratios present for the NTSC station. This will not always be the case but it is a conservative approach and is less likely to create interference. There are two conditions that need to be addressed separately when it comes to performance of splatter from LPTV transmitters and translators—one is the conversion of existing analog equipment in the field (on-channel conversion) and the other is for new digital transmitter equipment to be placed into operation after the adoption of proposed rules.

Existing Equipment.

I believe there is significant merit in allowing the conversion of analog Class A & LPTV transmitters and translators for digital transmission. It is significantly more cost effective rather than requiring new generation power amplifiers to be employed at all sites. Measurements have been carried out on existing analog LPTV and translator power amplifiers to see if the mask levels indicated in the Sgrignoli paper can be met. The primary limiting factor was found to be the power amplifier. Furthermore, the tested power output from the existing analog translator and LPTV amplifiers converted to digital operation is typically –6 dB relative to its nominal NTSC peak sync output power. Measurements made on that equipment using DTV signals indicate that the shoulder level in the adjacent channel from these amplifiers is typically -30 dB compared to the flattop of the main channel. Results of the measurements made on a small but realistic sample of existing translators using a bandpass filter at the output are attached. (See attached Figures 1-9). This is about 6 dB different than proposed by masks identified in the Sgrignoli paper. The general shape of the simple mask can be met by most existing equipment but not the shoulder levels. Some existing equipment use notch filters rather than bandpass filters to eliminate out of channel emissions. The cost of a bandpass filter that would likely allow the transmitter to meet the same performance as in the attached photos is typically less than $750. Therefore I believe any equipment modified in the field should be required to meet the modified “Simple” emission mask shown in Figure 10. I believe that any digital Class A, LPTV, or translator application for license to cover for “on-channel” conversion to digital should provide a showing that the combination of transmission equipment does meet this modified mask.

Assuming the modified “Simple” mask is adopted, the only way to meet the identified NTSC Threshold of Visibility (TOV) and Threshold of audibility (TOA) on a co-located adjacent channel is to reduce the ERP of the proposed station until the desired D/U ratios are obtained. The same result applies when the calculations are performed for the situation of two adjacent DTV channels. However, I believe in most cases, a digital LPTV or translator will still replicate its existing coverage even if the average DTV signal is 15 dB below the analog transmitter of the same power.

To permit a quick transition to digital, it makes sense to utilize existing equipment where possible. Therefore I believe it is in the public interest to existing licensees who apply for a digital LPTV or translator license to “grandfather” those licenses into the modified emission mask (Figure 10) upon the technical showing and proper application as indicated earlier. But some incentive needs to be provided to upgrade equipment as soon as possible to permit more efficient use of spectrum. Therefore I would recommend that this mask would only be available to use for a period of a maximum of 5 years. As an alternative, the license renewal cycle could require that updated equipment that meets the New Equipment performance requirements (identified in the next Section) be installed at that time.

New Equipment

The present generation of translator and LPTV power amplifiers is capable of meeting the shoulder level associated with the “Simple” and the “Stringent” Mask. I believe the administration of two emission masks is feasible but complex and requires additional consideration. The stringent mask provides for more efficient use of spectrum and the ability to allocate more channels. To meet the stringent mask described in the Sgrignoli paper, the group delay of the output filter will generally require some compensation. This is not a problem for a regenerative translator or an LPTV transmitter that creates the 8-VSB signal because the circuitry to do this can be easily built in to the encoder. However, it is a more significant problem in a digital heterodyne translator because the group delay compensation circuit is extra cost, and because the alignment of it is tedious and could require expensive equipment. In this case, it appears that some distinction can be made between the types of transmission equipment employed. It is proposed that new digital heterodyne translators meet the “Simple” Mask (as defined in the Sgrignoli paper) and that re-generative translators and LPTV transmitter that create the 8-VSB signal from a transport stream meet the “Stringent” mask (identified as #1B in the Sgrignoli paper). It is estimated that the cost of substituting a filter capable of meeting the stringent mask versus the simple mask is on the order of $700. As time goes on, the cost of regenerative translators will drop and the benefits of using all regenerative translators will outweigh any disadvantages so that there could be a “sunset” on the “Simple” mask.

To summarize the emission masks proposed, with reference to the total average power in the 6 MHz channel, they are broken down into distinct categories.

GRANDFATHER CONVERSION OF EXISTING EQUIPMENT

Conversion of existing equipment must meet the following mask. (This mask would no longer be valid after 5 years (or at next renewal of the license) of adoption of the rules.)

$A\,(dB) = 41 + (\Delta F^2/1.44)$ ΔF from 0 to 6 MHz

$A\,(dB) = 66$ dB ΔF greater than 6 MHz

EQUIPMENT PLACED INTO SERVICE AFTER ADOPTION OF NEW RULES

New Heterodyne Translators must meet:

A (dB) = 47+ (□F^2/1.44)	□F from 0 to 6 MHz
A (dB) = 71dB	□F greater than 6 MHz

New Regenerative Translators and LPTV transmitters must meet:

A (dB) = 11.5 * (□F + 3.6)	□F from 0 to 6 MHz
A (dB) = 76 dB	□F greater than 6 MHz

□F is measured from the channel edge

A (dB) is measured relative to the total average power in the channel

If these masks are chosen, I believe the resulting D/U ratios and emission masks should also be applied to digital Class A stations.

Section 41-49
Sections Concerning Interference Prediction Methodology.
I believe the Longley-Rice (L-R) propagation methodology described in OET-69 should be used instead of the previously used contour method. I also believe that the FCC 50-90 curves should be applied rather than the FCC 50-50 curves for protected coverage contours. I believe this is warranted because this method makes better use of the spectrum compared to the protected contour analysis. Another reason I believe this method is best is due to the fact that most LPTV and translators are located west of the Mississippi River and a large part of this area has widely varying terrain which the contour method does not effectively consider. Finally, modern computer analysis programs are available to utilize the L-R analysis and effectively analyze the possible scenarios to vary the antenna patterns and more effectively utilize the spectrum available. The deficiencies with the contour methodology pointed out in the FCC NPRM (Section 42.) combined with the need to utilize the spectrum resources efficiently during the DTV transition favor the use of the OET 69 L-R methodology. Assuming that a L-R analysis methodology would be entertained, the antenna types that digital LPTV and translator stations could have significantly different characteristics from the antennas described currently in OET-69. I believe that specific antenna types should be added to the table of antennas for OET-69 and that the analysis be tailored based upon the antenna. For example, digital translators or LPTV stations that serve small communities may use Yagi or other highly directional antennas that have a very different vertical plane pattern than those currently identified in Table 8 of OET 69. Specifically, values of beam tilt of 1 degree would be more appropriate for the more common antennas. However, antenna manufacturers are in the best position to comment on the more common values of beam tilt and vertical field values provided. I believe that there should be a vertical pattern default for low band, high band, and UHF multiple bay antennas and a separate set of patterns (again for low band, high band, and UHF) that would apply for such antennas as Yagis or “Paraflector” type antennas. I would support the opportunity to insert a custom vertical pattern for the L-R analysis.

I also believe that the L-R interference method should be adopted for analog LPTV and translator analyses as well as digital and analog Class A analyses. Since there is less likelihood that there will be a significant level of analog applications filed from this point forward, there is less likelihood of concerns of unequal treatment and this methodology again makes the best use of the spectrum resources available so it makes sense that it should be employed as soon as possible.

Another factor to consider making optimum use of spectrum is the application of *de minimus* interference among digital LPTV and translators stations. The FCC departed from earlier practice zero interference by allowing *de minimus* from full service DTV stations into full service NTSC stations unless the full service station was already receiving 10% interference from all sources. I believe that a 2% *de minimus* interference standard should be applied for digital LPTV and translators into other LPTV and translator stations, analog or digital, to a maximum of 10% interference from all sources including full service stations. To clarify this proposal, it is saying that a full service station can cause more than 10% interference to a digital LPTV or translator (it can even displace the digital LPTV or translator). If a combination of full service, LPTV, Class A, and translator stations are already predicted to cause 10% or more interference, then new applicants would be only be permitted to utilize the figure of 0.5% or less rather than the 2% de minimus). This I believe that this will permit more efficient use of spectrum resources and allow more digital channels to be allocated and thus hastening the digital transition. To avoid more interference to full service station programs that many of the translator and LPTV stations carry, the 2% *de minimus* criteria should only apply for digital LPTV or translator service into other LPTV or translator stations (digital or analog). Presently, Class A stations may not cause interference into LPTV or translator services and likewise digital Class A station interference into other Class A is not permitted (except for .5% rounding). I believe more efficient use of spectrum would occur and that it would make sense that a consistent philosophy would apply to interference between a common class of stations. Therefore, I submit that the FCC should also amend the class A rules to permit a 2% *de minimus* interference from digital Class A into analog Class A to a maximum of 10% from all sources. Furthermore, since the facilities of digital class A stations are similar to digital LPTV and translators in terms of ERP, it would seem reasonable to permit digital LPTV and translators to cause 2% *de minimus* interference with digital Class A stations and vice versa up to the 10% maximum.

Section 50. I agree with the proposal regarding interference agreements as outlined.

Section 51. I also agree with the proposal regarding the waiving of adjacent channel analog operation provided the relevant D/U ratios are met.

Section 54. I agree with the proposal to allow co-located adjacent channel operation. However, if subsequent information is available to determine no D/U ratios are violated and interference into NTSC is below the Threshold of Visibility (TOV) and Audibility (TOA) or for adjacent channel DTV stations, the amount of interference present is less than 32 dB (which corresponds to less than .1 dB threshold degradation), I see no need for written agreements except those which affect the public safety regarding RF radiation.

Section 55. I believe based on practical experience that co-location can be defined as within 3 seconds of one degree in longitude and one degree in latitude. If it can be shown that wider distances still allow the TOV, TOA, and DTV threshold limits to be met, then those situations can be granted based upon a waiver.

Section 56. The precision offset of N-1 configurations present in full service DTV was identified in roughly 50% of the TV sets during ATTC tests. These tests were made in the absence of any other interference. I believe locking the DTV pilot to the analog visual carrier is not worth the benefit gained. This is a due to a combination of the lower output powers of analog LPTV and translator stations and associated reduced signal to noise ratios, and the relatively high expense involved in accomplishing this.

Section 57. I agree with the philosophy of requiring an offset for all analog LPTV and translator stations. Also, I believe it is beneficial to apply a NTSC into DTV co-channel offset of 28.615 kHz with a tolerance of +/- 1 kHz. As time goes on and spectrum is more occupied I believe it may be necessary to also implement an offset for DTV into DTV interference of 19.403 kHz with a +/- 10 Hz tolerance. I suggest that this be a voluntary agreement between DTV stations at this point with further review in the future.

Section 58. I agree with this philosophy.

Section 59. Consideration should be given to the methodology on which the adjacent and co-channel field strength values were created. For example, the noise-like spectrum of a DTV signal may have less effect on the public safety receivers than the periodic nature of NTSC signals. Again, the emission mask of grandfathered equipment and new equipment should be considered when evaluating whether the current limits are appropriate. I have not yet executed the necessary calculations to determine if other values are more appropriate.

Section 60. I believe that digital Class A, LPTV, and translator stations will not pose a significant problem due to the lower ERP compared to full services stations and that the FCC has multiple ways of preventing such interference from occurring.

Section 61. I agree with the proposed power limits.

Section 62 through 67. Comments regarding emission mask for digital LPTV and translators have been previously addressed in this document. I do stress that I believe it is prudent to grandfather existing equipment (for a period of time) using an emission mask that has -30 dB shoulders in order to expedite the digital transition and not to unduly place a financial burden upon LPTV and translator operators.

Section 68. I believe the establishment of a specific emission limit at those frequencies upon manufacturers and digital LPTV, and translator stations will prevent any interference to those systems. Assuming that the emission mask from a full service station attenuates the signal in this region by 110 dB, and that the emissions from the amplifier from a full service station are 30 dB down in this frequency region, the maximum level radiated is around -50 dBm from a DTV station licensed for 1 MW. Therefore digital Class A, LPTV, and translator emissions at these frequency ranges should not be greater than -50 dBm. Typically, the 2^{nd} or 3^{rd} harmonic levels from LPTV amplifiers are also down typically 30 dB from the power in the digital channel. Therefore an emission mask filter would need to provide about 95 dB of attenuation at these frequencies to reduce the level of a 15 kW ERP station to the -50 dBm limit. In the case of "grandfathered" equipment it may be necessary to add a notch filter for this. The most practical way to ensure no interference results is to establish the -50 dBm limit. In practice, I believe the emission mask filters will provide sufficient attenuation to those frequencies that the chance for interference to occur is very slight.

Section 69. As previously stated, I believe the emission masks presented earlier should apply also to digital Class A stations.

Section 70. Support data has been presented earlier for the basis of the recommended emission masks along with cost estimates of using a filter capable of getting the equipment to meet a stringent mask.

Section 71-79. I believe that transmitter and translator manufacturers are competent in their designs to prevent interference given reasonable test equipment. Therefore, I believe it is appropriate to allow manufacturers to use the verification process regarding digital transmitters for Class A, LPTV, and translators. However, if certification is chosen as the standard for new equipment, I believe that the translator or transmitter with emission mask filter should be certified by the manufacturer as a whole system. I believe that the system of permissive changes should also be applied to circumstances that are likely to occur such as the enhancement of encoders, cost effective adaptive precorrection, etc. I believe that the process of verification can also be applied to analog transmitters and translators. To persuade digital equipment manufacturers that it is imperative to make these measurements, I believe it is beneficial for the FCC to conduct random audits of the verification files of the manufacturers.

Since the power output of a digital transmitter or translator dictates the coverage and interference potential of it, I believe it is important to limit the power output to no more than 0.5 dB variation with environment including temperature and supply voltage. Whatever value the rated maximum output power is, the emission mask should be maintained at that value. This would apply to equipment placed into service after the rules are adopted. The factor is equally important in the conversion of existing equipment. Therefore I believe it is required to implement some form of power limit on this equipment. This power limit should be based on a sample taken at the output of the mask filter. Automatic gain control should be permitted in digital translators. I believe that practice will dictate when the input signal to noise drops below some given value near threshold (15 dB) that the automatic gain circuit should place the translator in a non-radiating state. The frequency tolerance of multiple hop translator systems can stack up in the same direction. Thus it is proposed to limit the frequency tolerance to +/- 1 kHz for non-offset operation. Offsets for digital transmitters have been identified earlier in this document.

Section 80. The application of analog rated components for digital transmitters or translators offers a great potential for cost savings. There is a set of minimum changes to be made when converting an analog transmission system to digital. At a minimum, that must include changing (or calibrating) the power metering to respond to the digital waveform, ensuring the emission mask is met, and that the station can be uniquely identified (either by insertion of identification message in the transmitter program by the primary station, or locally, or by the previously mentioned FSK keying method). When modifications to existing systems obtain compliance with the proposed grandfathering requirements, it is imperative that a "qualified person" provide evidence that the changes made ensure compliance with the outlined requirements. The major item of concern is the emission mask. Another concern is regarding the phase noise performance of local oscillators within the transmission system. Since the equipment to measure this is expensive and seldom required, demonstration of reception on a digital TV set could be used as a measure of compliance. I agree that the license application should contain a showing prepared by such a "qualified person" indicating that the minimum set of changes have been made with specific showings regarding emission mask compliance, frequency tolerance, and demonstrate that the transmitted signal can be decoded by a digital TV set.

Section 84. I agree with this proposal.

Section 85 through 90. A method of identifying the unique digital translator should be required. Existing equipment and new equipment should be permitted to use FSK (encoded by Morse Code) of the output signal of 10 kHz frequency shift maximum. I believe no additional information other than call sign should be required but that the amount of data is left up to the station. A digital heterodyne translator can be simply modified to frequency shift key the upconverter local oscillator to produce FSK controlled by a morse code generator.

Section 92. I agree that a digital conversion of an existing analog license or construction permit should be considered a "minor" change. The first come first serve basis should also apply. Perhaps other procedures of applying for conversions could be examined such as each week a new DMA is allowed to submit its applications or several states are allowed each month.

Section 91-108. These Sections deal mostly with legal issues of authorizations of digital licenses and the implementation policies. I am primarily concerned with the technical nature of the digital LPTV and translator services to be implemented. However, I do support the FCC proposed filing window for incumbents. I also support using the auction exemption of resolving mutual exclusivity authorizations.

Section 112 I believe that analog displacement applications should have a higher priority than providing new digital channels for LPTV, translator and Class A stations.

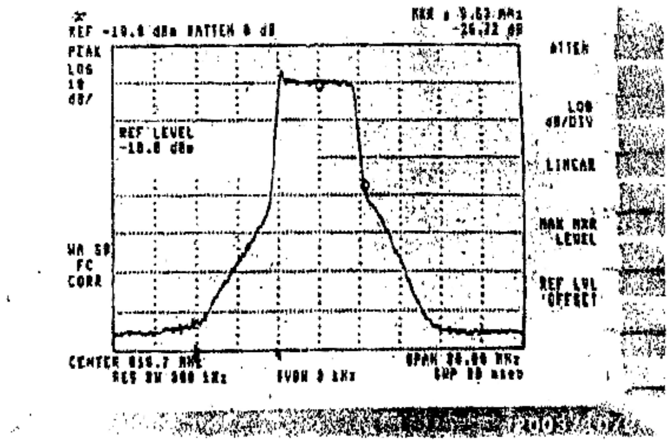
Section 116 It appears that an accelerated construction permit period would certainly be acceptable for new digital translator stations since the amount of physical hardware is typically less than digital Class A or LPTV stations. Digital Class A and LPTV stations may need more time depending on the equipment needed to obtain and originate programming. In general the on-conversion of analog transmission plants to digital will take place within a much shorter timeframe and thus do not need a lengthy construction period.

Section 118-122 Digital booster stations can provide an engineering solution to provide service when translator channels may not be available. I believe this service is another ingredient in achieving a quicker and more complete solution to digital coverage. I support the establishment of the digital booster class of stations. I also see that extension of booster coverage beyond the protected contours will in most cases be beneficial. I find no technical reason why the boundary of the booster station should be limited to the stations protected contour as long as no interference is caused. I believe that some overlap of the digital booster station with the protected contour is required. Perhaps a test can be devised to ensure the spirit of creation of the digital booster station is met. I believe the same interference technical analysis applied to digital Class A, LPTV, and translators should be applied to applications for digital boosters.

ATTACHMENTS

Figures 1-9 are measured performance of existing translators

Figure 10 is a proposed emission mask for "grandfathering" existing equipment



Chn 8-23 Translator
LARCAN MX100 @ 25W with Drake Upconverter, with 3 pole filter

Figure 1 Span = 30 MHz

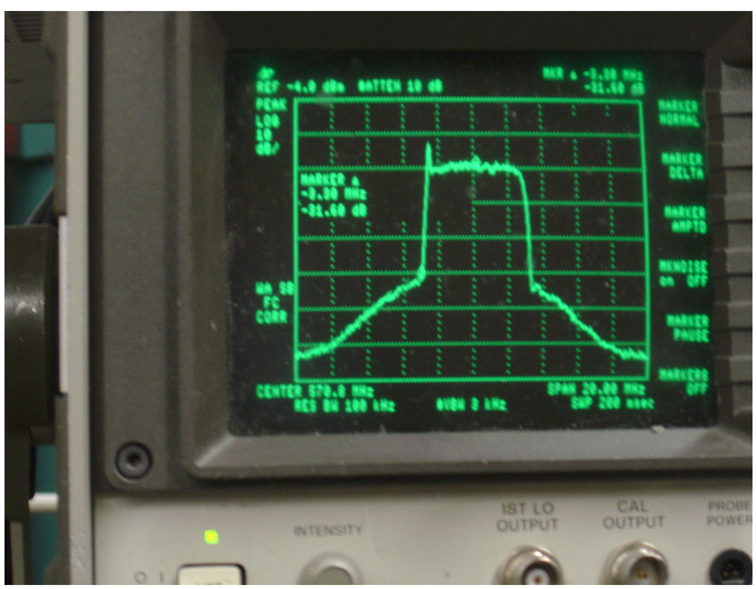


Figure 2 Span = 20 MHz, Same transmitter as above

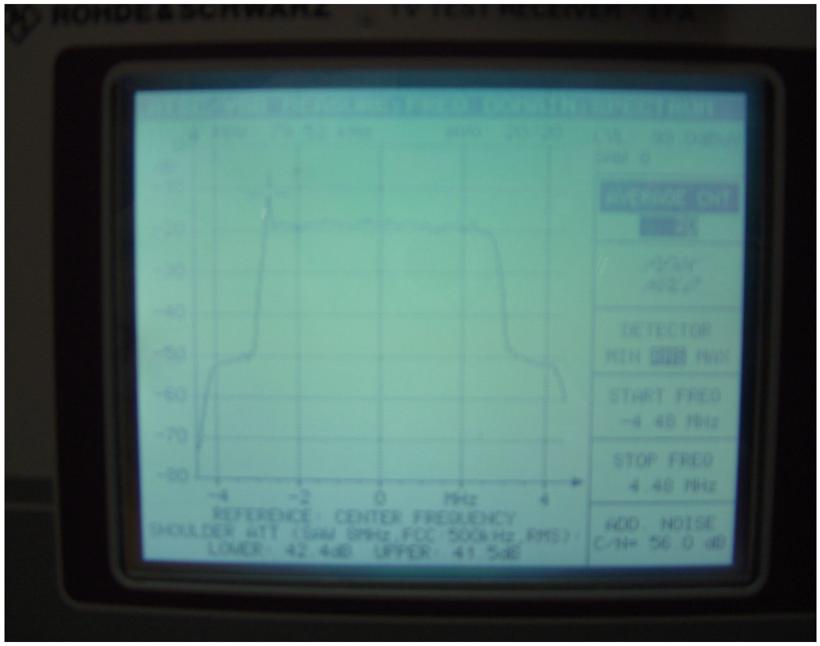
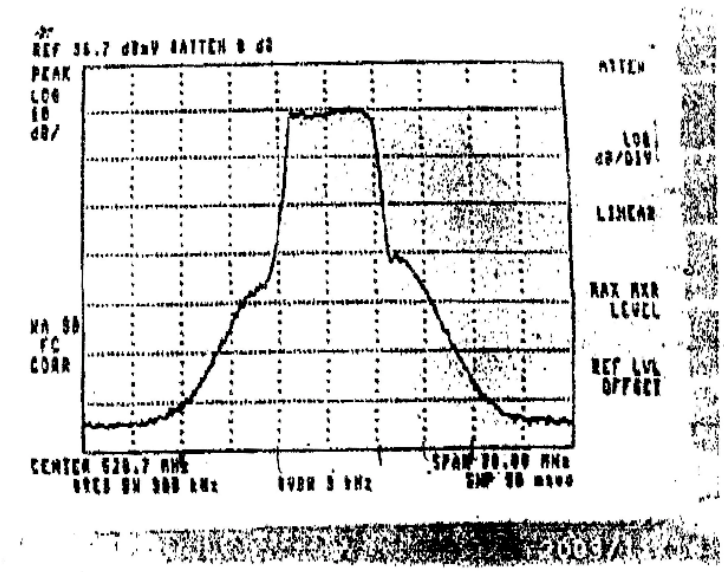


Figure 3 Shoulder Level

LARCAN MX-100 at 25 watts output



TTC Chn 4-23 Translator
XL20 @ 5W with 3-pole filter

Figure 4 Span = 30 MHz

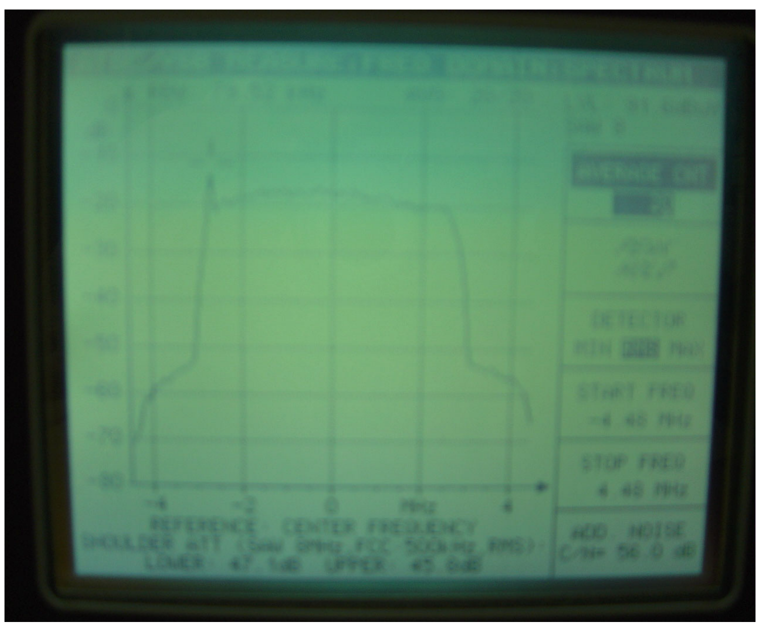
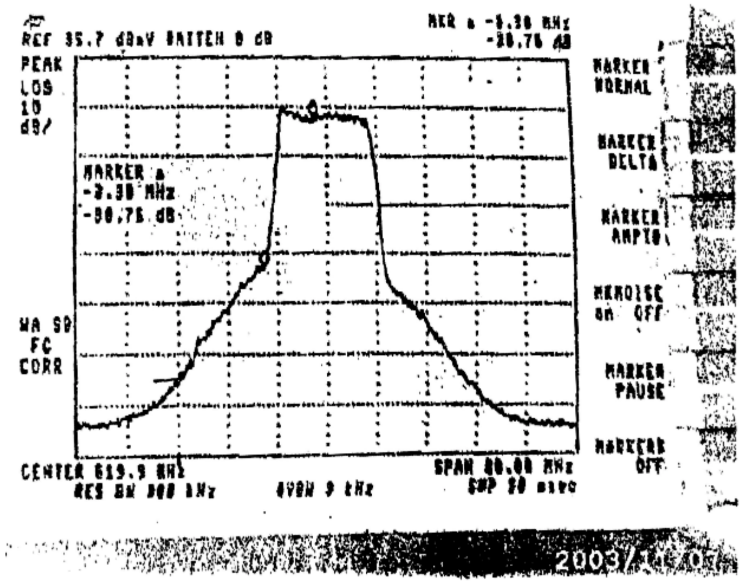


Figure 5 Shoulder Level

TTC-XL20 at 5 watts output, same translator as above



Chn 8-38 Translator
Acrodyn Amp @ 25W with 3 pole filter

Figure 6 Span = 30 MHz

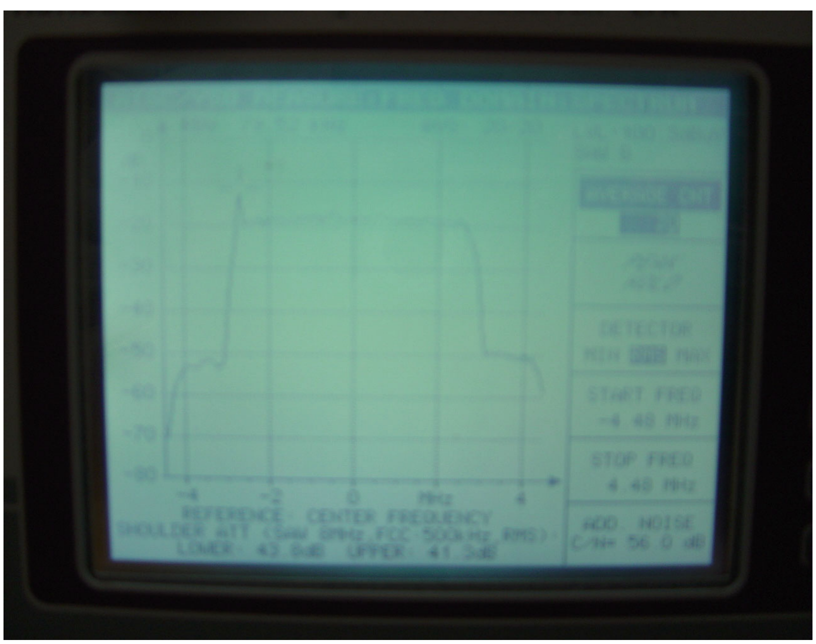


Figure 7 Shoulder Level

Acrodyne TLU/300ST at 25 Watts Output, same translator as above

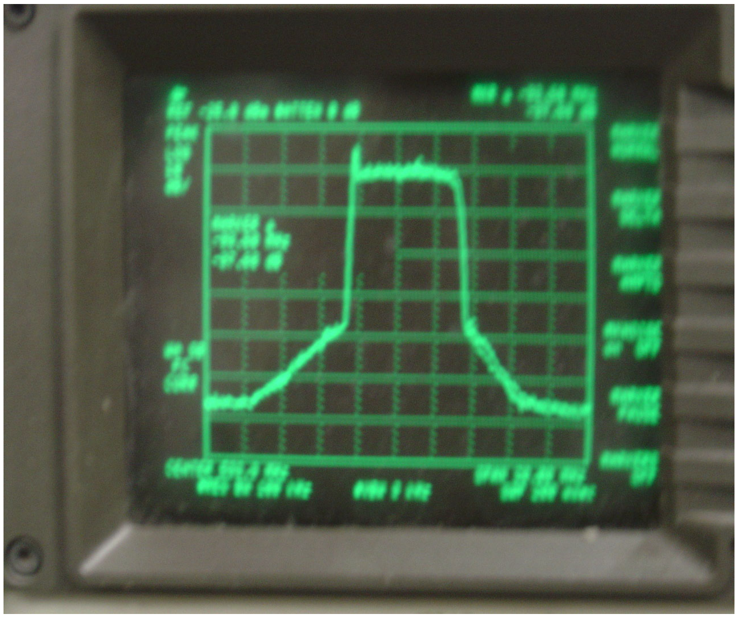


Figure 8 Span = 20 MHz

EMCEE TUA10E at 2.5 Watts output
(Note this has a Class A amplifier which yields better shoulder performance)

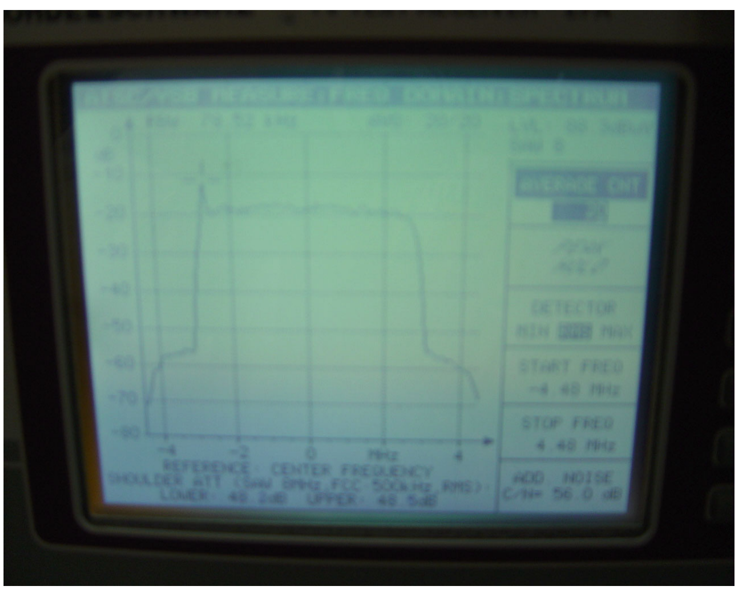


Figure 9 Shoulder Level of EMCEE TUA10E at 2.5 Watts output

Same translator as above

FIGURE 10 Modified “Simple” Mask”