Before the

Federal Communications Commission

Washington, D. C. 20554

In the Matter of:	)	
An Inquiry into the Commission's Policies and Rules Regarding AM Directional Antenna Performance Verification	)	**RM 7594**

COMMENTS of R. Morgan Burrow, Jr., P. E.

1. R. Morgan Burrow, Jr., a consulting engineer whose qualifications are known to the Federal Communications Commission herby submits his comments relevant to the topics discussed in the Notice of Proposed Rulemaking. The comments submitted herein are strictly those of the writer and do not express the views of any employer, engineer, station licensee, or any other concerned organization or individual. Any agreement with other parties is strictly a coincidence.

2. It is timely to consider revision of certain sections of 47CFR73 which pertain to the performance of AM directional antenna systems. This commenter believes such revision must be done with caution since excessive reliance on non-measurement techniques may indeed result in increased interference. However, there are some items in the present regulations that can and should be deleted or revised. In light of the current cash flow problems facing many AM licensees, perhaps some incentive such as tax credits should be offered for rehabilitation of older AM transmission systems. There is a balance between attempting to

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continue to run WW-II or Korean War vintage antenna phasing or coupling equipment versus newer designs which incorporate broadbanding and parameter stability for operation within 10 kHz. of the assigned channel. Computer-aided design methods for directional antenna phasing and coupling equipment can rapidly select optimum values for use in AM transmission systems that would have required months of hand computations in 1939 when the FCC AM rules were developed or in 1950 prior to the simplest computers. Continued use by licensees of most older equipment does nothing but defeat the purpose of many of the results desired from some items of the "AM Improvement" docket. Without some incentive most licensees will make no effort to rehabilitate or improve their AM transmission facilities.

3. This commenter believes that the requirement for close-in field strength measurements detailed in Section 73.186(a)(1) between one wave length and three kilometers at an interval of 0.2 kilometer can be revised safely. This commenter believes that such measurements can be taken at convenient intervals where public roads or parks cross the radial in question and the desired accuracy should not be significantly compromised. Accessibility problems to measurement locations on private property are the primary reason why a revision of this section of the rules is necessary.

4. Changes in the physical environment have contributed to the difficulty of making suitable AM antenna performance measurements. **This does not mean that the performance measurements should be discarded completely. Some type of verification method should be retained, especially in situations involving self-supported towers and/or directional antenna arrays incorporating unequal height towers.** Examination of "operating" parameters versus "theoretical" parameters of many stations in the Commission's files shows that a good number of the stations' antenna arrays are set up to other than calculated parameters, which would imply that the null radials were determined more from

measurements rather than computation.

5. There is no real definition of "unobstructed" in Section 73.186. This matter is a sore point among those involved in the measurement or analysis of directional antenna data. Recent trends of development in the vicinity of AM transmission sites has worsened the availability of totally "unobstructed" measurement locations, forcing compromises in most cases. Is "unobstructed" defined where a nearby power line with respect to the measurement location is at least two times the height of the supporting pole? Is one-half kilometer from the 230 kV high line supported by metal transmission towers sufficient spacing for measurement? What is to be done about the electric fence which borders the road along which the radial runs and the fence charger emits an arcing-type electrical noise which blots the entire AM band -- short the fence to ground with a battery jumper cable and then take the measurement so the graph going to the FCC has a "sufficient number of properly spaced points" and looks "good"?? Overhead power lines are also a notorious source of electrical interference to AM measurements, either by reradiation of the AM signal or random electrical noise.

6. Changes in computational methods for evaluating antenna arrays have improved since the original trigonometric methods for array computations were developed. One significant area of attention has been to a category of analysis methods referred to commonly as "Matrix Methods" or the "Method of Moments" or "Wire Analysis Models". These methods are relatively new (1967) compared to the classical array computations. Computers are required to obtain timely solutions to the matrix methods since a large number of computations are involved with filling and/or inverting matrices in order to obtain the desired results. Some of the computer programs in the literature such as NEC (Numerical Electromagnetics Code - Lawrence Livermore Lab), Mininec (NOSC), MMA (J. Westberg), TWAP (Thin Wire Antenna Program) [Syracuse

of moments (MoM) and are either a tool when used properly or a tragedy if used by those who expect to just run the program and utilize the results without proper interpretion. The MoM scenario would be tantamount to turning NEC loose on the Commission staff without proper training and interpretation of the results.....interpretation of NEC output data is much more difficult than interpretation of data generated by the Commission's AM antenna array program RADIAT. Furthermore, MoM computations are considerably more expensive and time consuming

dumping power. A licensee is putting himself at risk of going out of business fast if the signal is not going anywhere. Since most licensees are businessmen and probably care less about engineering matters, retention of the measured RMS rule would be some form of "insurance" that an AM array is performing properly, especially if it is checked via partial proof once every five years or whenever the facility is transferred to a new owner.

Unlike FM or television systems, AM transmission systems incorporate a complex ground system which will deteriorate in time and change the characteristics of the signal transmission. Due to their size, AM antenna systems are constructed on site and not shipped tested and ready to install on the tower from the factory in a couple of crates like their FM or TV counterparts.

8. This commenter believes that the concept of "field monitor points" should be retained. This is a means by which outside persons (such as the FCC engineer) can get some indication of the performance of a certain directional antenna array without having to physically enter the station premises to examine the antenna monitor and/or antenna base currents. Since most AM transmitter sites are remote controlled and unattended, accessibility to indicating instrumentation is more difficult. In allocation situations where field intensity measurements are used to determine the location of a contour, some initial measurements should be available to the public as a means of establishing a reference for the performance of that facility. Even though classical field strength measurement measures the magnetic field using a loop and relates it to mV/m, some measurement is probably better than no measurement.

9. The use of toroidal R.F. ammeters for antenna current indication should be encouraged. These units have proven themselves to be very durable and immune to many types of damage and instability that the traditional thermocouple ammeters suffer. The toriodal R.F. ammeters are less sensitive to damage from high current

surges unlike their thermocouple R.F. ammeter counterparts. The toriodal current transformers are also less susceptable to damage than tower-mounted current sampling loops exposed to the weather. Use of toroidal current sampling transformers also eliminates the necessity for special isolation of the sampling line across the base insulator in the case of series-fed towers. It is well known that minimizing the number of items crossing the base insulator of a series-fed tower will help improve the bandwidth if the matching and coupling circuits are optimized. The use of sampling transformers should be encouraged for all radiators regardless of height if manufacturer and/or field data supports their use on tall towers.

Respectfully submitted:

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