4. RESULTS

The statistics of man-made noise power typically vary over time and between locations and hence, in general are non-stationary. Analysis of the non-stationarity was determined by calculating hourly median values from the median, mean, and peak power statistics of the measured APDs. These hourly median values were then sorted into CDFs, as shown in Figures 29-34. The median, mean, and peak powers are the bottom, middle, and top curves respectively of these graphs. Noise added by the measurement system has not been removed from these values.

The CDFs were plotted on a normal probability graph where a Gaussian distributed variable is represented by a straight line whose mean lies on the 50th percentile and the slope is the standard deviation. The statistics of the means are approximately Gaussian for most frequencies and environments if the lowest 5% are not included. Similarly the medians are also approximately Gaussian. However, the peaks are clearly non-Gaussian.

Of particular interest is the mean-power CDF median. In principle, this value represents the mean power exceeded for 50% of the time and 50% of the locations. These values denoted as F_m are tabulated in Table 3. For clarification, F_m is derived from the f in Equation 1.15 while F_{am} is derived from f_a. In other words F_m includes system noise power while F_{am} does not. F_{am} for 137.5 MHz business and residential are 17.5 dB and 3.6 dB respectively. These results agree with earlier 137.5 MHz measurements that showed a decrease in residential noise and no change in business noise from the ITU model.

The 402.5 MHz and 761.0 MHz F_m are all within one standard deviation of system noise. As a result, we could not determine F_{am} with any reasonable accuracy. This result is significant since this means man-made noise power is less than that predicted by the Hagn model.

Table 3. Measured F_m for All Frequencies and Environments

Environment/type	Frequency (MHz)					
	137.5		402.5		761.0	
	F_m (dB)	F (dB)	F_m (dB)	F (dB)	F_m (dB)	F (dB)
Business	17.6	1.5	2.2	1.4	2.6	0.9
Residential	4.5	1.6	2.6	1.4	2.9	0.4

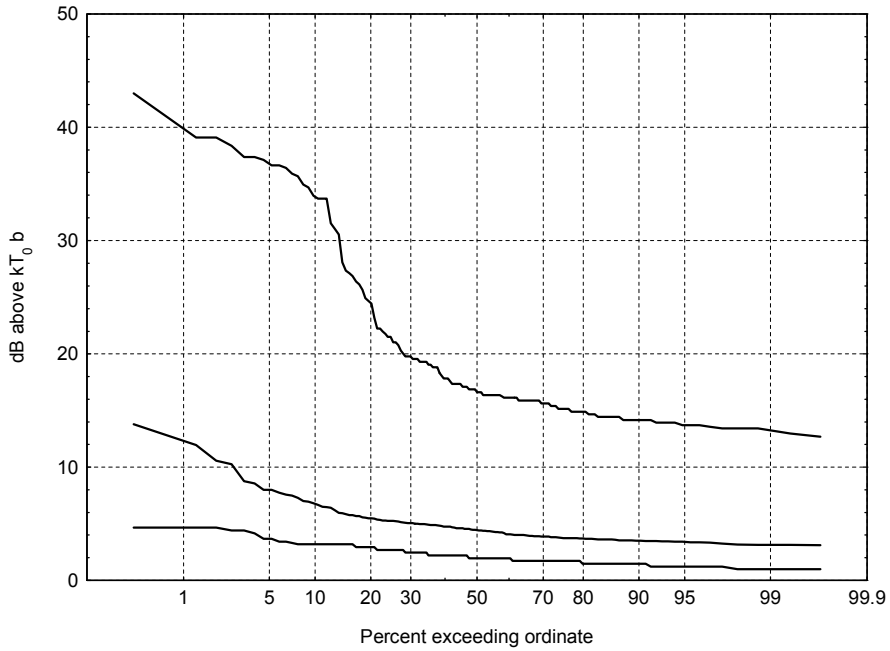

Figure 29. Cumulative distributions of 137.5 MHz residential median, mean, and peak power.

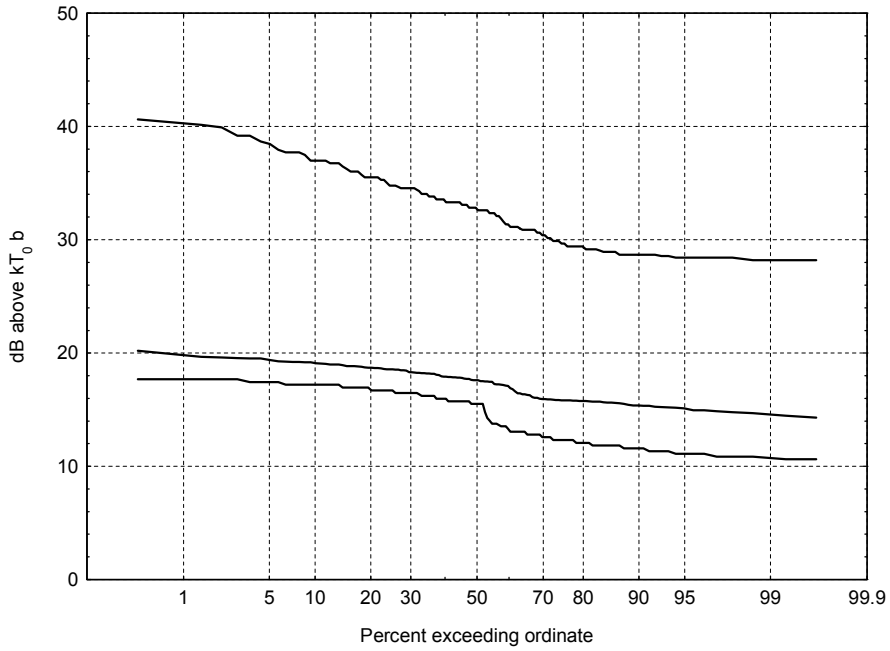

Figure 30. Cumulative distributions of 137.5 MHz business median, mean, and peak power.

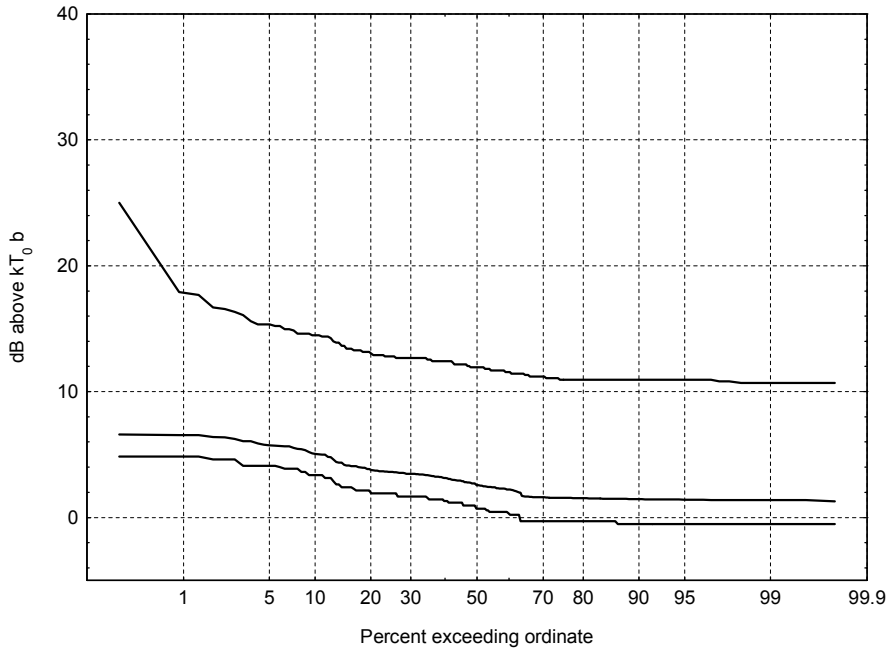

Figure 31. Cumulative distributions of 402.5 MHz residential median, mean, and peak power.

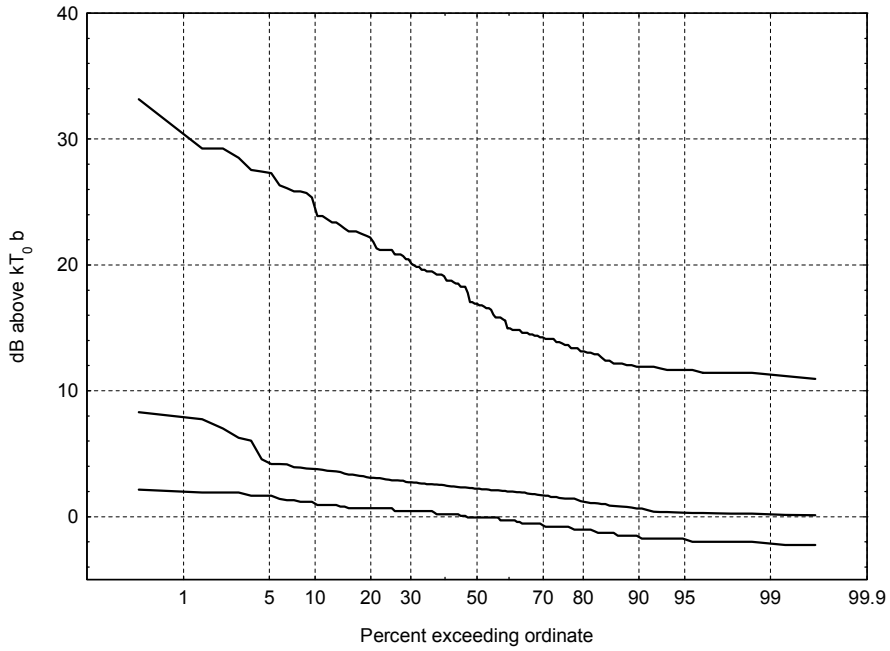

Figure 32. Cumulative distributions of 402.5 MHz business median, mean, and peak power.

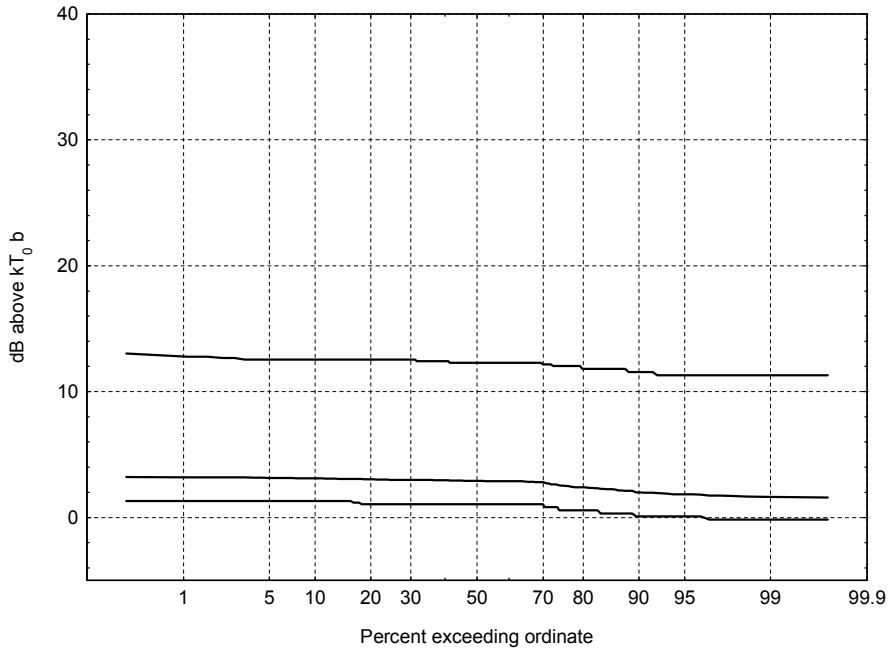

Figure 33. Cumulative distributions of 761.0 MHz residential median, mean, and peak power.

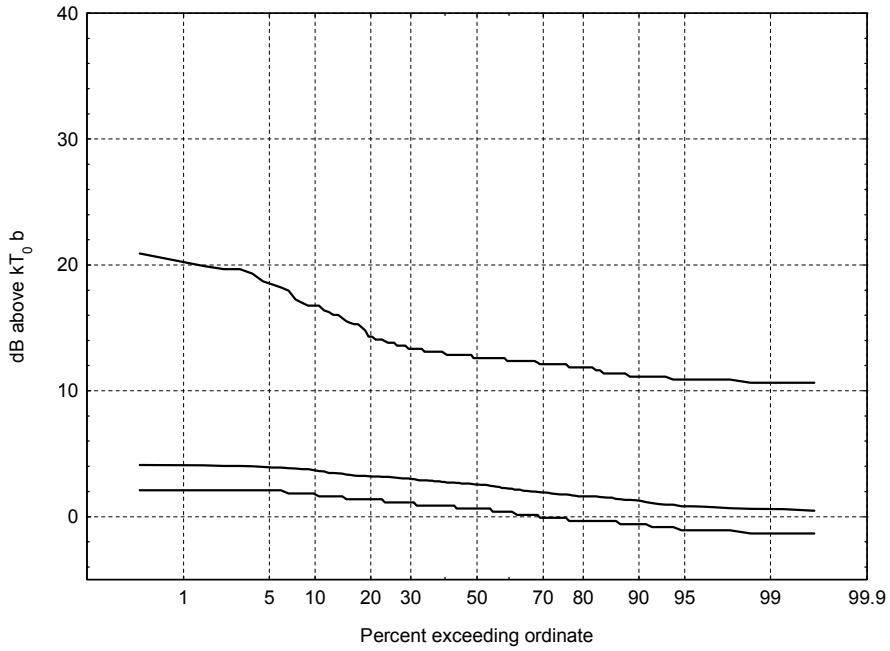

Figure 34. Cumulative distributions of 761.0 MHz business median, mean, and peak power.

5. CONCLUSIONS

Man-made, non-Gaussian noise was observable in all 137.5 MHz and 402.5 MHz business and residential measurements. It was also found at 761.0 MHz in business measurements but absent, for all practical purposes, at 761.0 MHz in residential measurements. VHF measurements were found to be consistent with previous measurements [4]. As in the previous study, 137.5 MHz residential F_{am} seems to have decreased from levels measured 25-30 years ago, while 137.5 MHz business F_{am} has remained constant.

The UHF measurements showed that median mean power at 402.5 MHz and 761.0 MHz is comparable to system noise, indicating that F_{am} may be less than those predicted by Hagn's model [7]. It should be noted, however, that the 402.5 MHz business noise cumulative distribution shown in Figure 32 is peaked. Noise levels at low percentiles are high enough to adversely affect some communication systems. Figure 24 characterizes the long term statistics of this noise. Noise levels are correlated to working hours in that they rise in the morning and fall in the afternoon. However, it is noteworthy that high noise levels are not present during the middle of the day.

Further measurements are needed to determine the extent of these high noise levels. Sources for this noise, such as modern electronic devices, are more likely to be used within buildings and vehicles. Hence, it is important to make future measurements inside of buildings and vehicles.

6. REFERENCES

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