

Engineering Assessment of RFR for WTOP-FM Aux Antenna

A power density calculation can be made using the techniques outlined in the EPA report titled: *An Engineering Assessment of the Potential Impact of Federal Radiation Protection Guidance on the AM, FM, and TV Broadcast Services* (P. Gailey & R. Tell, April, 1985).

The equation used below, contained, in part, in the above mentioned report is used to determine the level of non-ionizing radio frequency radiation from an isotropic radiator on the ground near the perimeter fence at the WTOP-FM site in Warrenton, Va.

$$S(\mu\text{W}/\text{cm}^2) = \frac{(\text{Total ERP in Watts}) \times 1.64 \times 2.56}{4 * \pi * (\text{Distance in meters})^2}$$

Where: Total ERP in Watts is the combined watts of WTOP-FM Aux 20KW Horizontal and 20KW Vertical.

Distance: The closest portion of the perimeter fence is 30 meters from the base of the tower. The radiator is at the 26 meter level on the tower making the vector length to a 2m tall man standing near the fence 40 meters.

If the antenna were an isotropic radiator the above equation would indicate that power density at the location of the fence at **.835mW/cm²** which is 84% of the maximum occupational controlled limit. Further calculation is done to determine safety in the uncontrolled area outside the fence. The antenna used is a 2 bay Shively, model 6810 with the bays mounted at half-wave spacing providing a substantial decrease in power density at the base of the tower, out to the fence, and in the near field.

A second calculation is made using the “*RFS, RF Specialties Technical Program Disk*”, Version 2.48. Under section II, *FM Antenna Calculations*. The power density for the proposed Shively 2-bay antenna with elements at a .5 degree separation result in a maximum power density at the fence of **144 uW/cm²**. This is just 14% of the 1000 uW/cm² (the ANSI standard for controlled environments). The power density on this type of antenna decreases from the fence to the base of the tower. The maximum power density in the uncontrolled environment beyond the fence is calculated to be at 46 meters from the base of the tower with a power density of **195 uW/cm²**. This is just under the maximum allowed under the rules. Careful ground measurements using an ETS-Lindgren, model HI-4433 meter will be taken after construction and during initial turn-on to prove this facility meets specifications outlined in O.E.T. bulletin 65.

The permittee/licensee in coordination with other users of the site have a program in place to reduce power or cease operation as necessary to protect persons having access to the site, tower or antenna from radio frequency radiation in excess of FCC guidelines.

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