

Figure C and D

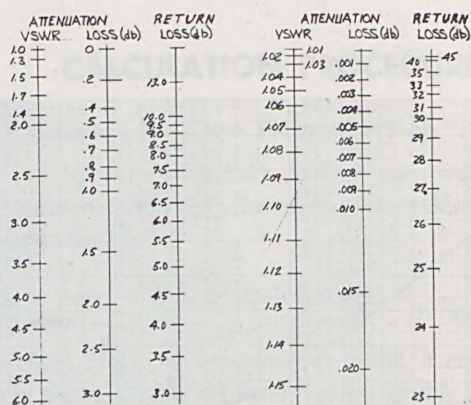


FIG. C- VSWR NOMAGRAPHS

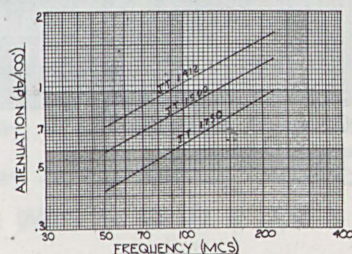


FIG. D ATTENUATION CHARACTERISTICS OF ALUMINUM SHEATH COAXIAL CABLES

MR. W. K. HEADLEY: As we look ahead in our industry, one thing that is important to keep in mind is the standards for the distribution of TV by coaxial cable. On this subject we will hear from Mr. Isaac Blonder, better known to most of us as Ike Blonder, Chairman of the Board at Blonder-Tongue Laboratories.

MR. ISAAC BLONDER: Since this subject took us several years at our plant, and, one might ask, can you condense it into 10 minutes?; of course our answer is no. I hope you will forgive us for handing out copies of a paper commercially designed to sell our products which also covers the subject matter.

However, let me just give you some of the gist of the design philosophy behind the cable compensation which we have attempted to do.

First of all, we investigated the entire range of amplifier and amplifier capabilities. I think all of you know there is a latitude possible in system design between noise figure and output capability. The merit of the system or its dynamic range determines the number of problems that the system can encounter and still survive. The most severe one as far as we are concerned, really resides in the cable, where as you undoubtedly know, the cable slope changes with temperature. In a system that may have as many as 20 amplifiers, if there is a variation between amplifier stages of lets say 1 db, we are likely to wind up with a 20 db variation between one end of the band and the other and since the dynamic range in most long systems is not as high as 12 db obviously you are going to run into either noise or cross-mod.

The first problem that we ran into of course is the amplifier, and there we simulated virtually everything that has been built or that we could think of building, keeping in mind the db per dollar problem, the installation problem and the reliability problem. Since transistors have not yet achieved the output capabilities that we would desire, we had to regretfully delay their usage until

technology improved. This left us with tubes. Going into the very big bottles that burn up lots of energy, represented a real cost problem, and the increased output capability did not look to us as if we could justify their use. We finally determined that we would have to sit with a distributed or chain type amplifier with the best possible noise figure and one other characteristic which unfortunately is not characteristic of the usual chain amplifier, and that is a constant gain. Primarily then, what we tried to do, was to come up with an amplifier that was not only flat, not only had a good noise figure, good output capability, but did not vary these characteristics as you varied the gain setting and this we feel we were able to achieve in the present amplifier, the 1232. Each tube is individually biased and it is what one would describe as a constant gain amplifier. You can put in hot tubes, weak tubes and we have run this thing well over a year and the gain change is small enough to be called negligible in a long system. Now starting with this amplifier, having the basic tool, we are now faced with what to do about the cable and the subject of my discussion essentially is cable compensation.

As I think all of you know, as the cable warms up, the signal goes down, and unfortunately it varies, channel 2 does not lose as much as channel 13, so there is a tilt. We then had to make a tilt compensator and for the approximate 23 db worth of cable loss, a tilt compensation can be achieved with about a 2 db variation from 120 degrees fahrenheit down to minus 20. So we designed an equalizer using channel 2 as the pivot point and therefore we came up with our model 3349 which is essentially the thermo-slope equalizer. Now to this was added a gain control which compensated the cable against the fact that you had a loss at both 2 and 13 and this is essentially a square wave step gain control, that was fed to the AGC input of the amplifier, for compensation on a flat basis across the band. The combination was put into a single unit called model 3348, I don't want to bore you with these numbers, but essentially what we are doing was compensating on the one hand for the slope change, on the other hand for the overall gain change. The actual slope compensation came to something like 7 db worth of cable length and the additional amounts required for the rest of the cable would be done by a fixed equalizer which compensated for the amount of cable you were using.

The paper is essentially split up into a discussion of the individual instruments. A chart which unfortunately came out rather fine, I think it's rather the habit of the draftsman to print a normal size and then when it is stated down everybody is amazed to find that the print is a little too small to be read, but if you put on your reading glasses you can see it and I think the explanation is fairly clear. And then finally we set up a typical design problem showing what would happen with about five miles of cables and the fact that we had what amounted to full compensation. We have transistorized pilot carriers and wherever the transistors can be used usefully, they have been used for reliability. We have also included an alarm system which some perceptive system owners may care to purchase. I sometimes think there seems to be a reluctance to put money into equipment and much more into the pocket than perhaps may be wise for the operation of the system, but we have tried to include all the features that are necessary for a quality system. We have set up such systems and operated them and it's more than amazing to find that the theory has gone out into fact, that you have a system that you can apparently put boiling water on and throw it into a carbon monoxide bath and have it wind up with the same quality signal.

At the risk of sounding like a poor salesman, that's the end of my speech.
(Applause)