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Standards Project:	PN-3-4350.310
Title:	3-Meter Antenna Polar Plot Data and Simulated Range Data with Head Effect Measurement Corrections
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1. INTRODUCTION

The TIA-470-C.310-Draft (PN-3-4350-RV3: Cordless Telephone Range Measurement Procedures) standard includes the following procedures:

1. Measure the antenna field strength as a polar plot without a head effect (i.e., polar plot of cordless handset alone).
2. Measure the antenna field strength as a polar plot with a head effect (i.e., polar plot of cordless handset with a human head, or head model, in place while measurements are taken).
3. Measure range using a range simulator to provide range data that is “uncorrected for head effects”.
4. The polar plot with the head effect is specified to be used as a correction factor for range measurements made with the range simulator.

This contribution presents measurement data obtained by AST when testing a 900 MHz DSS cordless handset and a narrow band 900 MHz cordless handset. This data is presented to provide information to the working group relating to the standard’s specified measurements. The intention is to provide this data as a point of discussion and to verify the method specified in the standard will be appropriate and useful for presenting the corrected range measurement data.

2. 3M SITE ANTENNA POLAR PLOT MEASUREMENTS

1. The 3m site used for these measurements meets the physical requirements specified in ANSI C63.4-1992. Because this site is being used for relative measurements rather than absolute power measurements (as would be done for emissions tests on a 3m site) the absolute values obtained are not important and are used for relative comparison for polar plots with and without a head effect.
2. The receive antenna used was a ½ wave dipole oriented vertically. It was considered that the antenna used for these measurements was not important as the measurements obtained are all used for relative measurements.
3. The 3m site included a mast with the receive antenna which was raised vertically for each angle of the antenna tested to find the maximum receive signal level (similar to procedure used for RF emissions testing).
4. The head effect used was an actual (live) human head holding the telephone in a “normal” manner which included a hand effect.

3. MEASUREMENTS MADE ON EACH TELEPHONE

1. Polar Plot without head effect
2. Polar Plot with head effect
3. Range measurement in AST’s range simulator

4. PRESENTATION OF TEST DATA

Figure 1 below is the 3-Meter Antenna Field Strength polar plots for sample #1 cordless phone. The purple line represents the normalized data without a head model. The black line represents the normalized data with a head model.

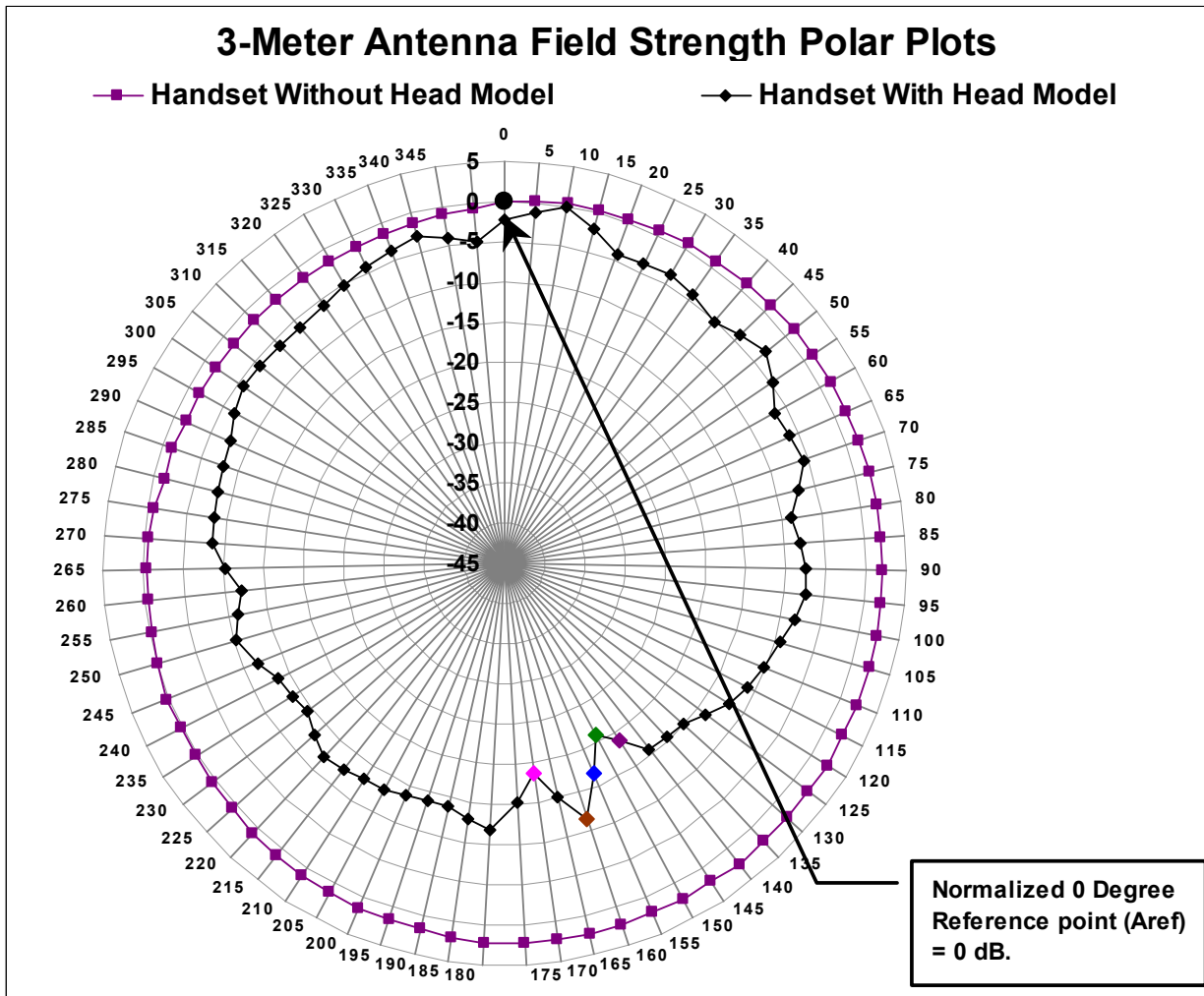


FIGURE 1 – Sample #1 Antenna Field Strength Polar Plots

Figure 2 below is the 3-Meter Antenna Field Strength polar plots for sample #2 cordless phone. The blue line represents the normalized data without a head model. The black line represents the normalized data with a head model.

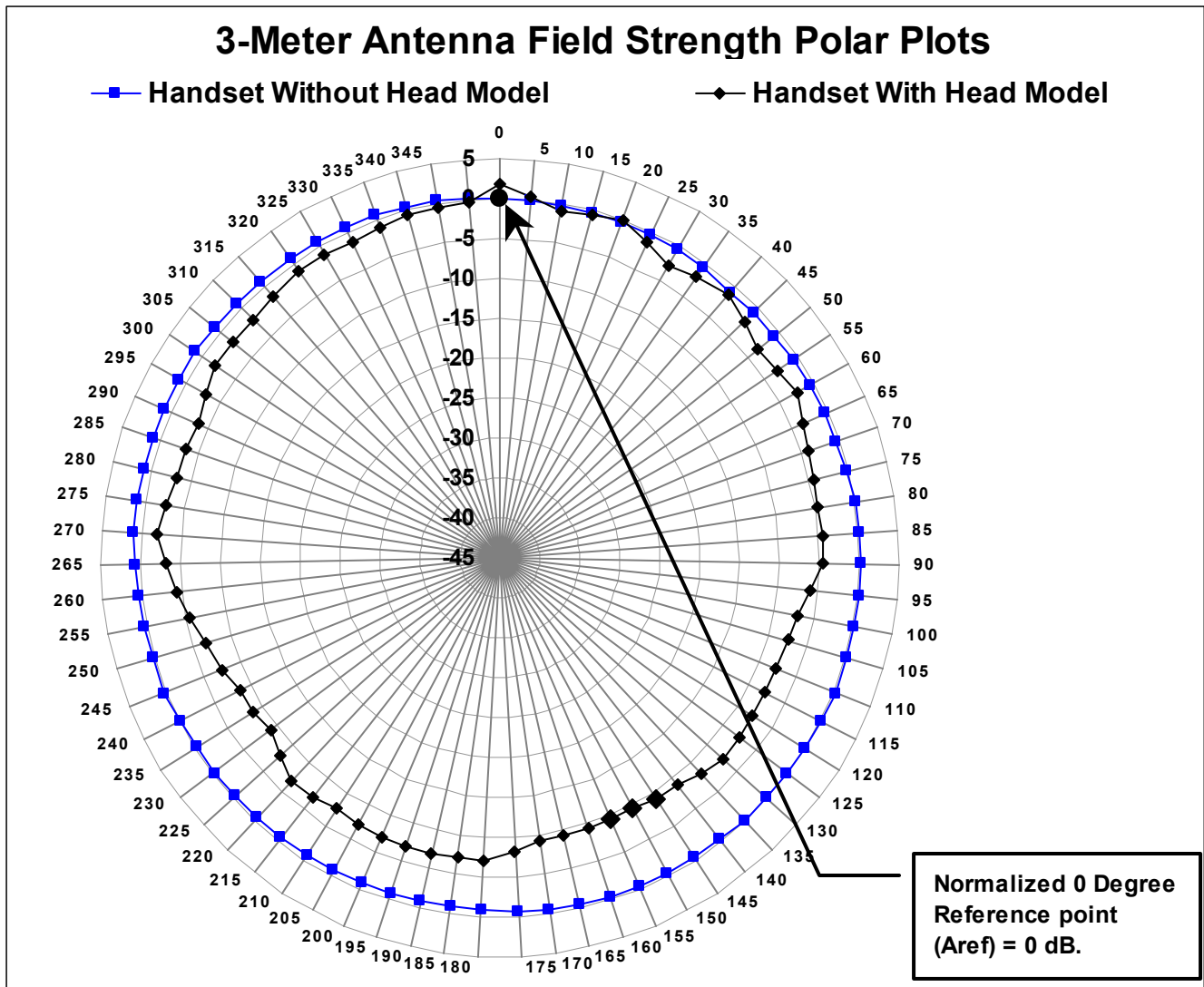


FIGURE 2 – Sample #2 Antenna Field Strength Polar Plots

Table 1 provides the calculated compensation for the head effect (Amin) using 6 different averaging methods on the data in figure 1 & 2.

Sample	360 Deg Average (dB)	15 Deg Minimum Calc Avg (per .310) (dB)	30 Deg Minimum Calc Avg (dB)	45 Deg Minimum Calc Avg (dB)	60 Deg Minimum Calc Avg (dB)	90 Deg Minimum Calc Avg (dB)
#1	-9.1	-17.9	-16.8	-16.3	-15.5	-14.8
#2	-4.7	-9.5	-9.3	-8.8	-8.6	-8.2

Table 1 – Calculated Compensation For The Head Effect (Amin)

Table 2 below provides the uncorrected simulated range and the corrected simulated range, with head effect corrections (Acomp) applied, using the 6 different averaging methods in table 1. The uncorrected range data was obtained using AST's range simulator.

Note – The range data below is defined as the point (meters) where the SINAD first falls below 12 dB.

Sample	Uncorrected Range (meters)	Corrected with 360 Deg. Acomp (meters)	Corrected with 15 Deg Acomp (meters)	Corrected with 30 Deg Acomp (meters)	Corrected with 45 Deg Acomp (meters)	Corrected with 60 Deg Acomp (meters)	Corrected with 90 Deg Acomp (meters)
#1	873	520	310	328	347	347	368
#2	437	328	260	260	260	260	276

Table 2 – Simulated Range & Simulated Range with Compensations Applied

5. CONCLUSIONS / RECOMMENDATIONS / DISCUSSION

AST suggests the use of a 15 degree average for calculating the head effect correction value does not accurately represent an actual person's experience using a telephone on an open range where the person would actually report the end of the usable range. In making open field range measurements, it was found that the first "phasing point" or dropout may be experienced at a short range compared to the actual range that may be considered as the "usable range".

The recommendation is to use one of the other (wider) averages presented from 30 deg. to 360 deg. 90 deg. is recommended as a starting point for discussion and is AST's choice for this average.