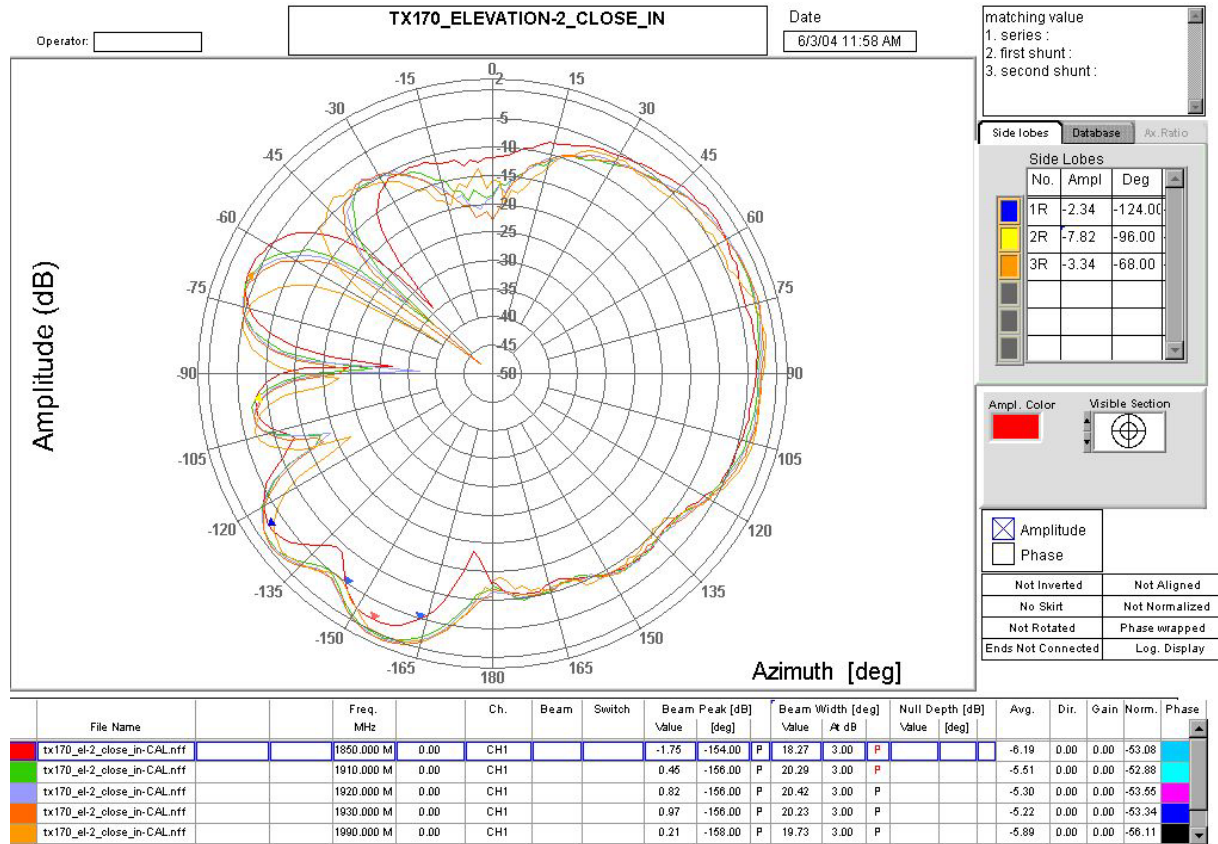


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| MRW ANTENNA SPECIFICATION | Doc. No MRWPQR-14114 | Rev. No. 1 |
| | Date 2004.06.03 | Page 43/56 |

Retractable Antenna

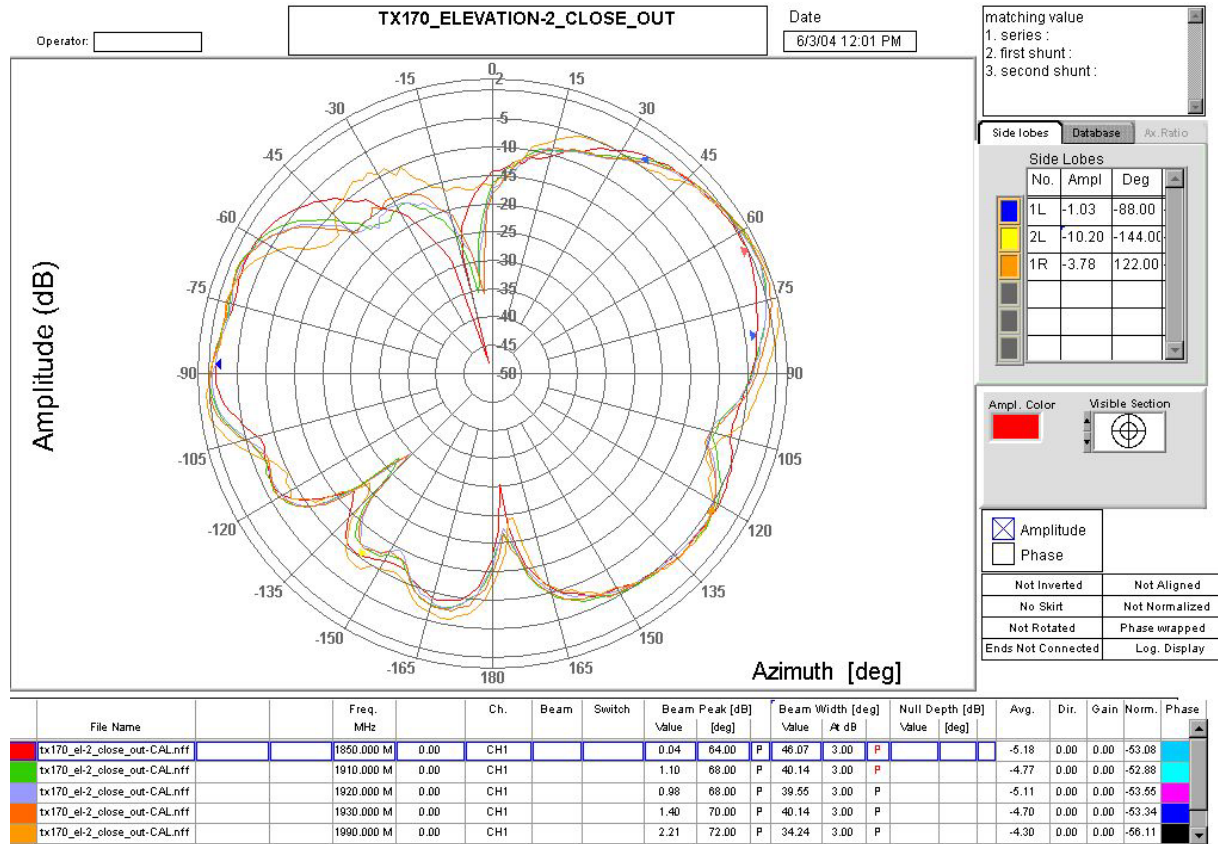
US-PCS ELEVATION-2 CLOSE IN



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| MRW ANTENNA SPECIFICATION | Doc. No MRWPQR-14114 | Rev. No. 1 |
| | Date 2004.06.03 | Page 44/56 |

Retractable Antenna

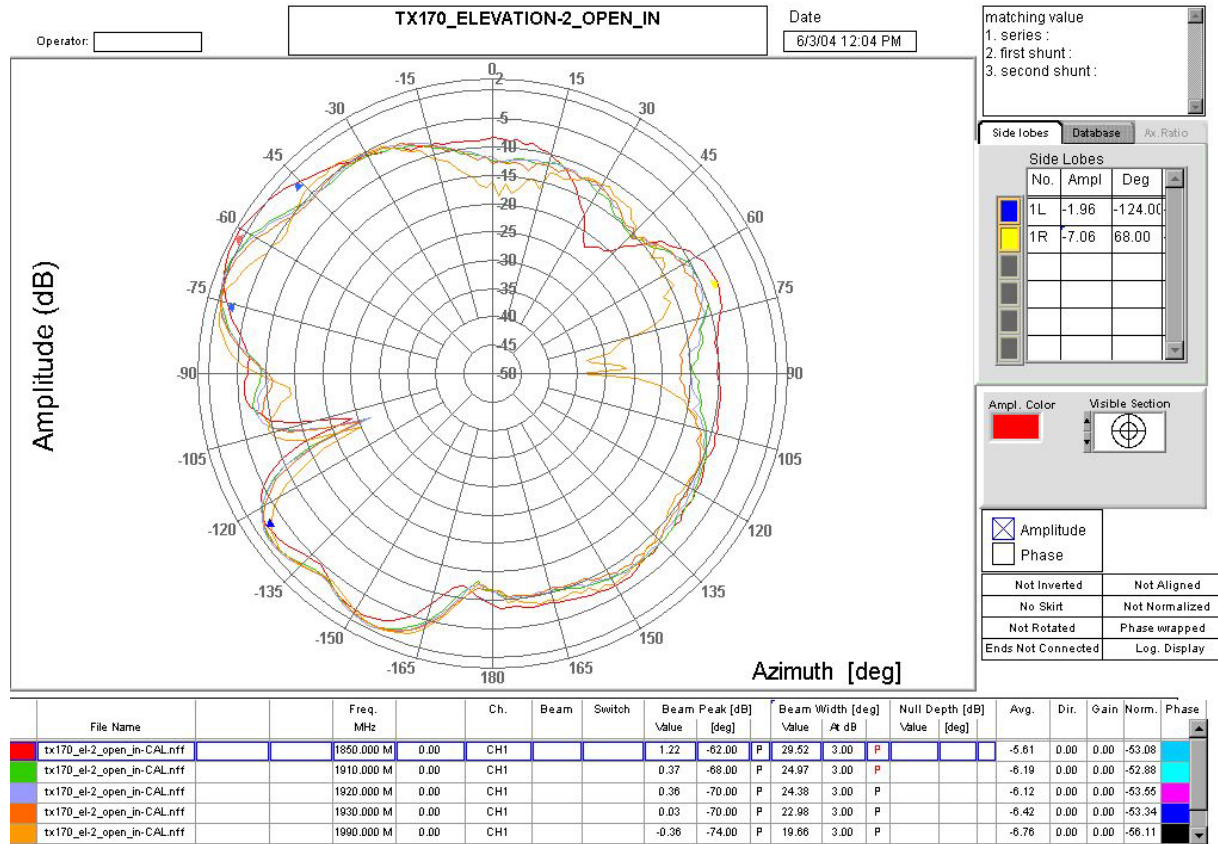
US-PCS ELEVATION-2 CLOSE OUT



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| MRW ANTENNA SPECIFICATION | Doc. No MRWPQR-14114 | Rev. No. 1 |
| | Date 2004.06.03 | Page 45/56 |

Retractable Antenna

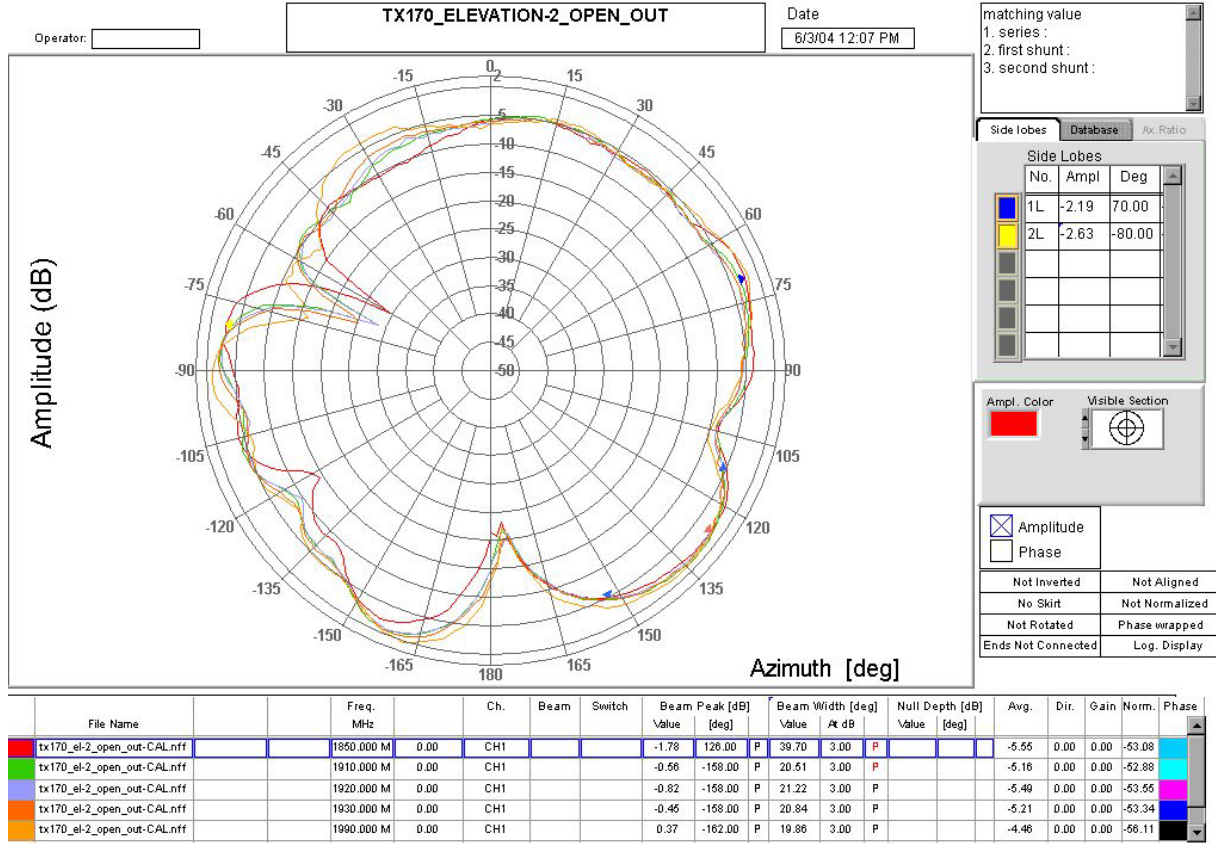
US-PCS ELEVATION-2 OPEN IN



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| MRW ANTENNA SPECIFICATION | Doc. No MRWPQR-14114 | Rev. No. 1 |
| | Date 2004.06.03 | Page 46/56 |

Retractable Antenna

US-PCS ELEVATION-2 OPEN OUT



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| MRW ANTENNA SPECIFICATION | Doc.No MRWPQR-14114 | Rev. No. 1 |
| | Date 2004.06.03 | Page 47/56 |

3.3 Antenna Gain

Antenna gain shall be measured in decibels relative to a half wavelength dipole reference antenna (unit : dBi)

The peak gain of the antenna as follows.

| | | |
|------------|--------------------|----------|
| GAIN(Peak) | CELLULAR CLOSE IN | > 0 dBi |
| | CELLULAR CLOSE OUT | > 1 dBi |
| | CELLULAR OPEN IN | > -1 dBi |
| | CELLULAR OPEN OUT | > 1 dBi |
| | GPS CLOSE IN | > -2 dBi |
| | GPS CLOSE OUT | > -2 dBi |
| | GPS OPEN IN | > -2 dBi |
| | GPS OPEN OUT | > -3 dBi |
| | US-PCS CLOSE IN | > 0 dBi |
| | US-PCS CLOSE OUT | > 0 dBi |
| | US-PCS OPEN IN | > 0 dBi |
| | US-PCS OPEN OUT | > 0 dBi |

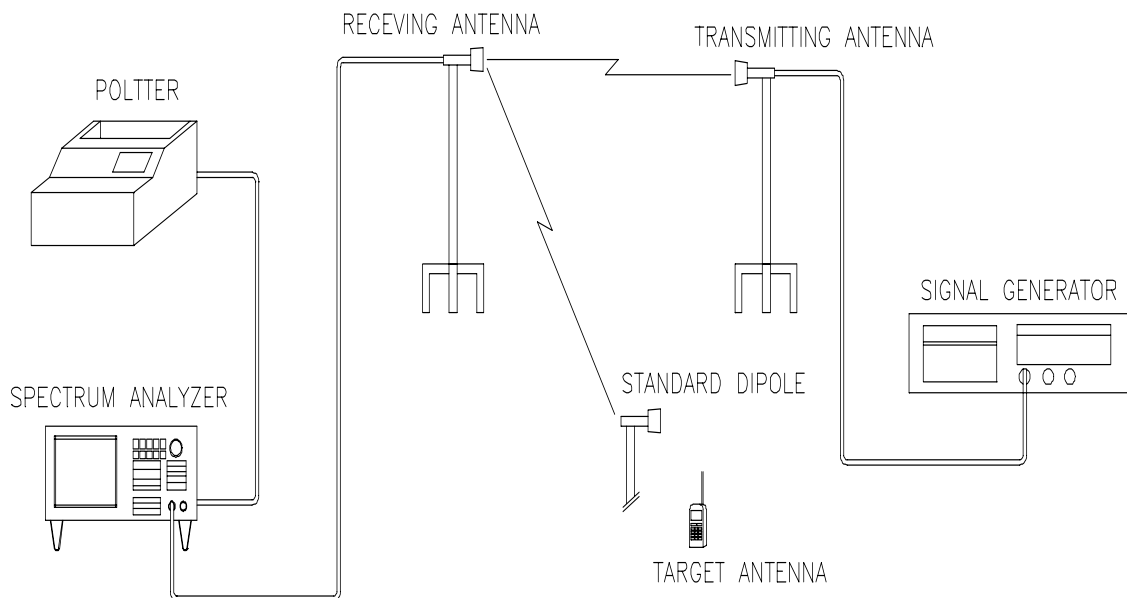
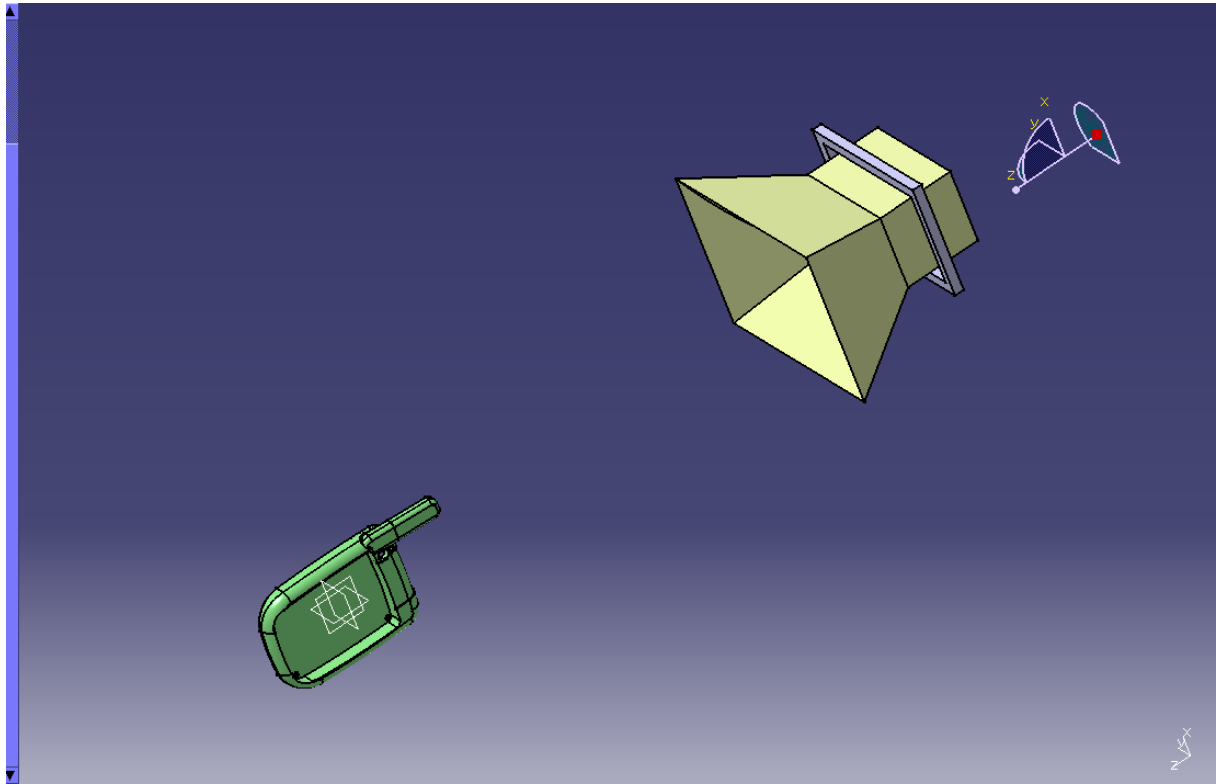


Figure. 2 Antenna Gain Measurement System

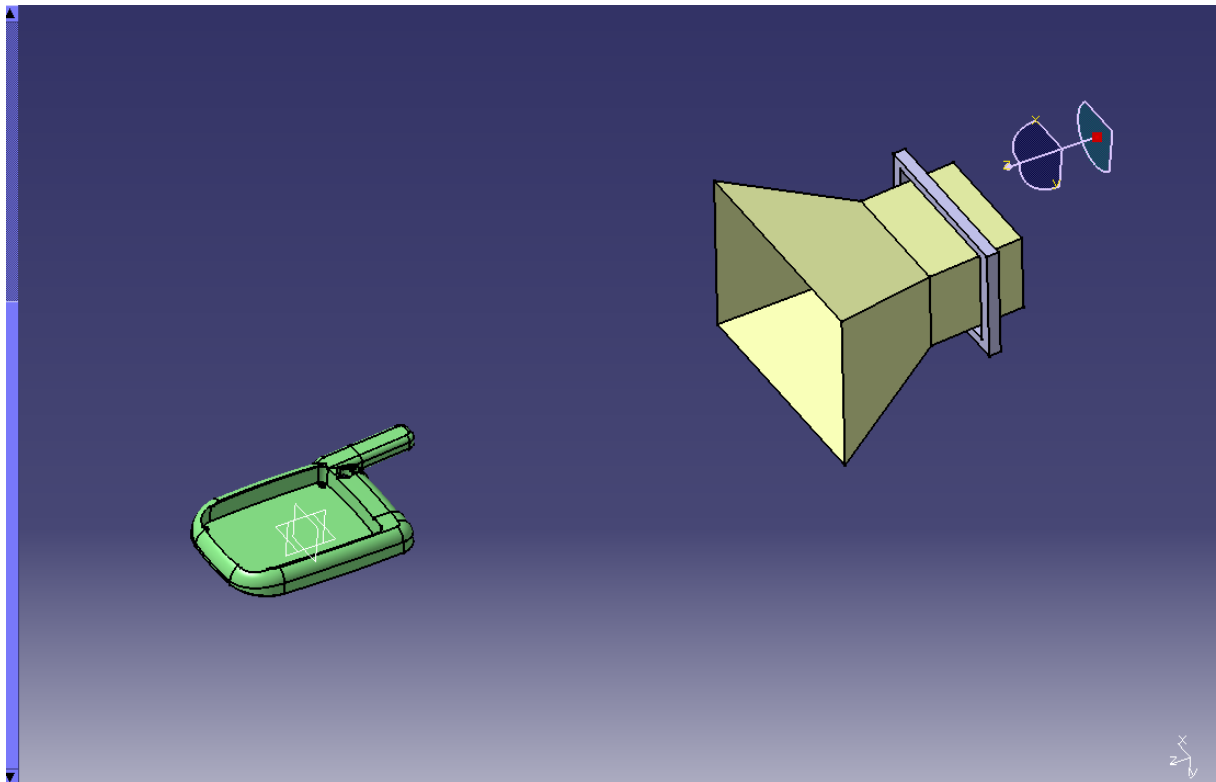
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| MRW ANTENNA SPECIFICATION | Doc. No MRWPQR-14114 | Rev. No. 1 |
| | Date 2004.06.03 | Page 48/56 |

Retractable Antenna

ELEVATION-1 MEASUREMENT

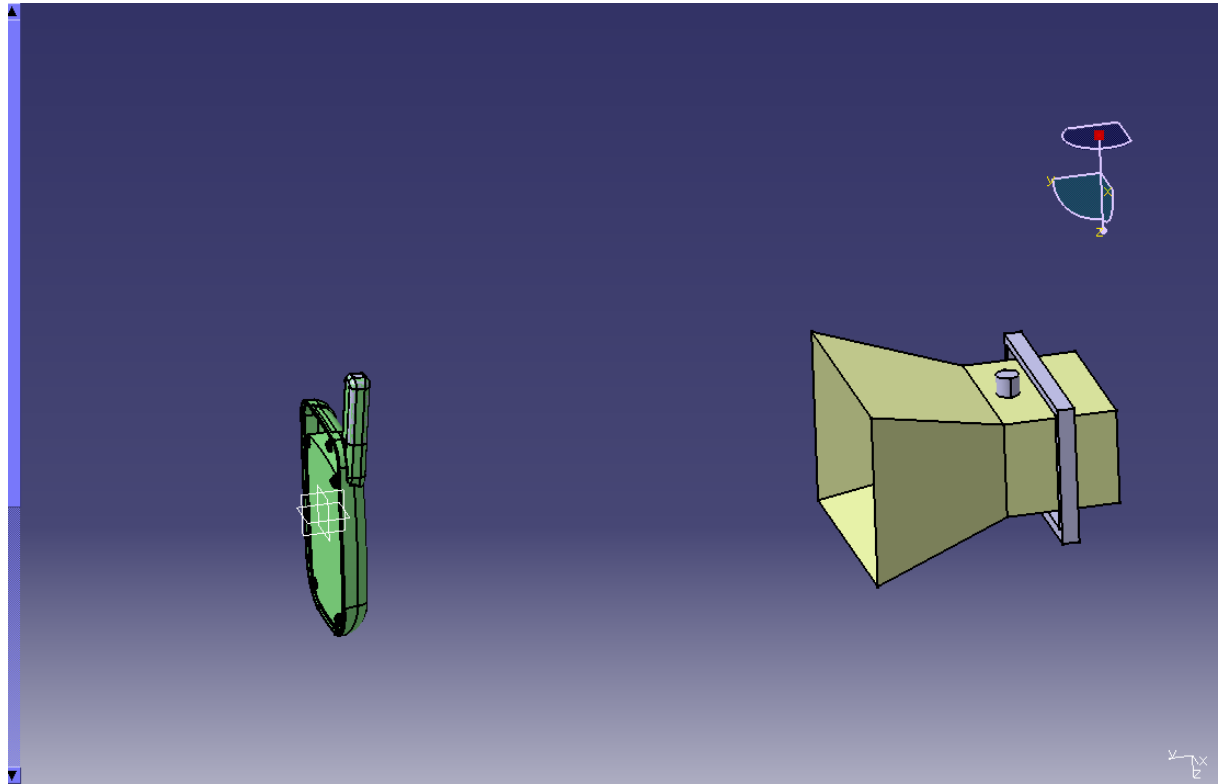


ELEVATION-2 MEASUREMENT



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| MRW ANTENNA SPECIFICATION | Doc. No MRWPQR-14114 | Rev. No. 1 |
| Retractable Antenna | Date 2004.06.03 | Page 49/56 |

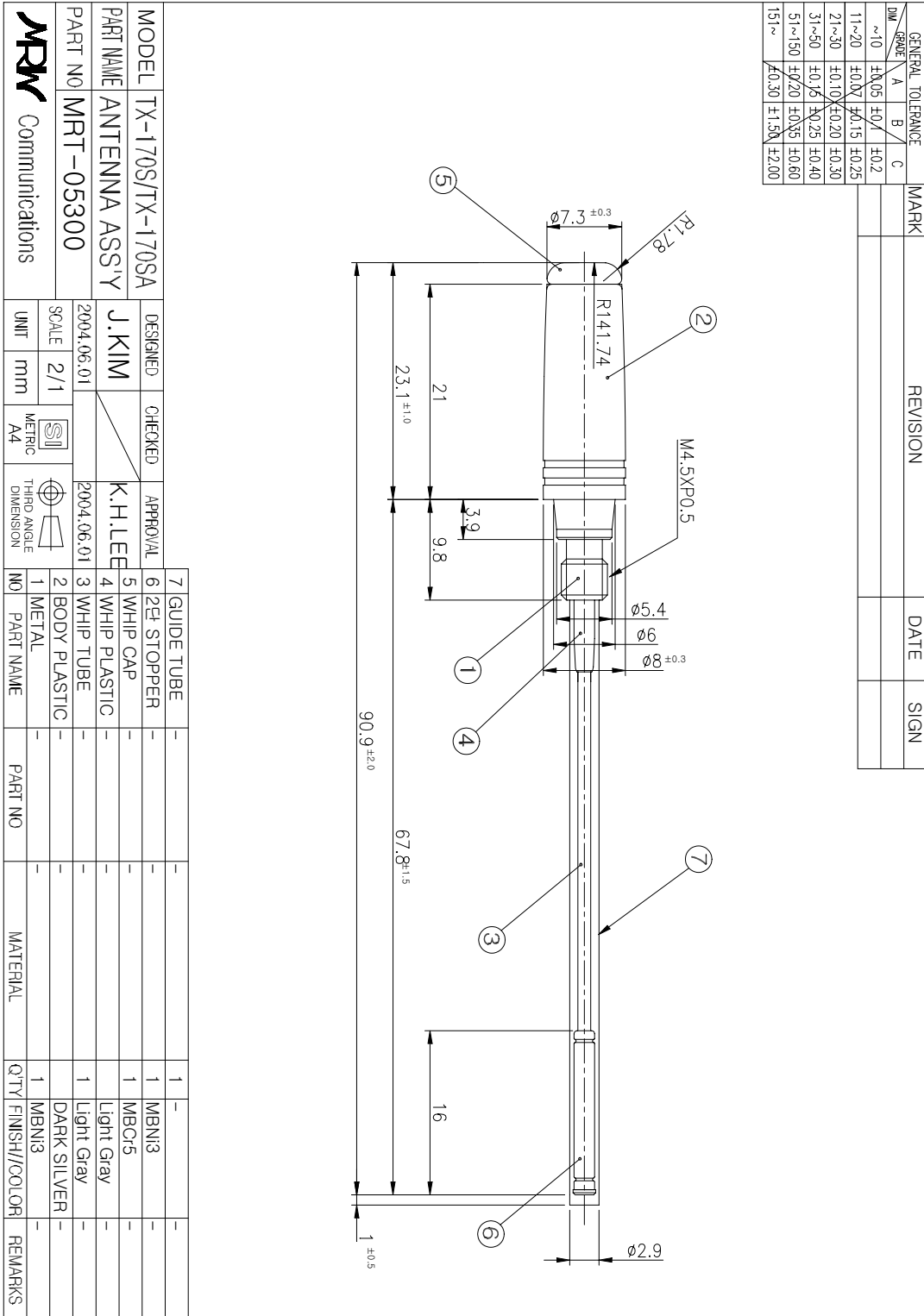
AZIMUTH MEASUREMENT



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| MRW ANTENNA SPECIFICATION | Doc. No MRWPQR-14114 | Rev. No. 1 |
| | Date 2004.06.03 | Page 50/56 |

4. Mechanical Specification

4.1 Dimension (Refer to the drawing.)



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|----------------------------------|-------------------------|---------------|
| MRW ANTENNA SPECIFICATION | Doc. No MRWPQR-14114 | Rev. No. 1 |
| | Date 2004.06.03 | Page 51/56 |

4.2 Bending Test

There shall not be any visible damage and shall met electrical specification after 1,000 times bending at 90° form side to side.

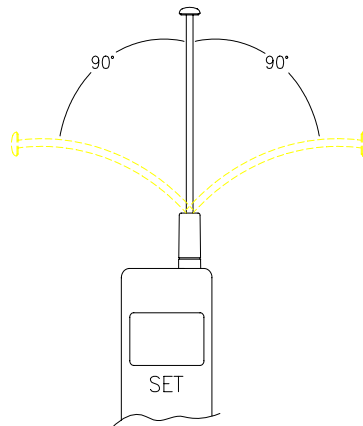


Figure. 3 Bending Test

4.3 Extraction / Retraction Test

When the whip of antenna is pulled up for extraction in retracted position, the force should be 100 ~ 350gf and when the whip of antenna is pushed down for retraction, he release force of stopper shall be 100 ~ 350gf.

4.4 Drop Test

The handset installed with antenna is dropped from 1.5m onto the concrete bottom for 3 times.

There shall not be any major visible damage and the antenna shall perform normally as defined in this specification after the test.

4.5 Pull Test

The antenna is assembled in the test equipment and pulling force with 7kgf is applied to the antenna for 10 seconds.

No visual deterioration shall occur and the antenna shall satisfy the electrical demands after the test.

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| MRW ANTENNA SPECIFICATION | Doc.No MRWPQR-14114 | Rev. No. 1 |
| | Date 2004.06.03 | Page 52/56 |

4.6 Torque Test

The antenna is assembled to the test equipment. After applying the torque force with 3kgf in clockwise direction between fitting and plastic, no visual deterioration shall occur, the antenna shall satisfy the electrical demands after the test.

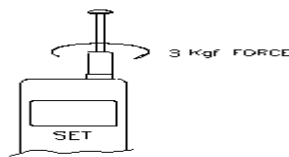


Figure 4. Torque Test

4.7 Cycle Test

The antenna is fully extended / retracted (1 cycle) with 10000 times and the extraction / retraction force is measured every 2000 cycles.

The extraction/retraction force of antenna shall keeps 50 ~ 350gf.

No visual deterioration shall occur and the antenna shall satisfy the electrical demands after the test.

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| MRW ANTENNA SPECIFICATION | Doc. No MRWPQR-14114 | Rev. No. 1 |
| Retractable Antenna | Date 2004.06.03 | Page 53/56 |

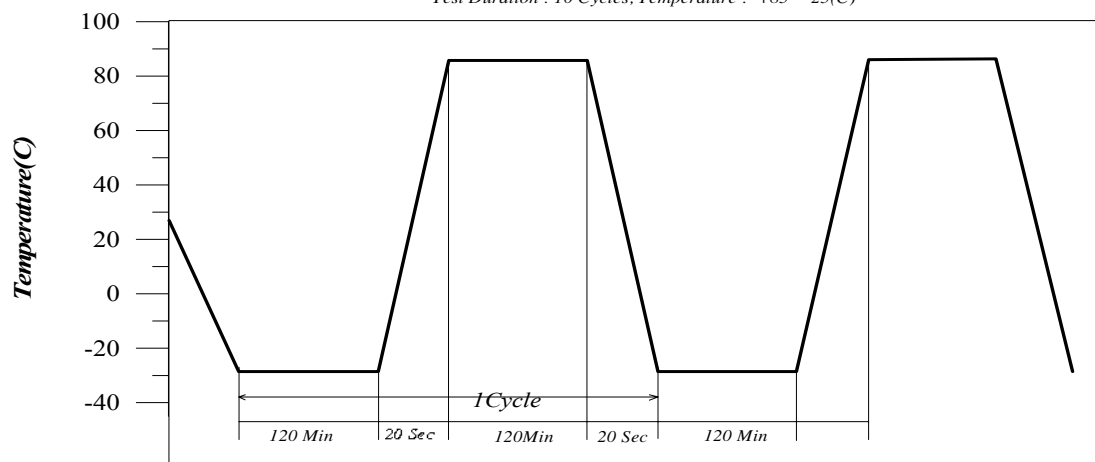
5. Environmental Specification

5.1 Thermal Shock

The antenna shall withstand 10 repeated cycles of 120 minutes at -25°C and 120 minutes at $+85^{\circ}\text{C}$ with a maximum transition time between temperature extremes of 20 seconds. The antenna shall satisfy the electrical specification after the test. The antenna shall have no deterioration after the test.

Temperature Shock Test

Test Duration : 10 Cycles, Temperature : $+85 - -25(\text{C})$



5.2 Temperature Cycling

The antenna is placed in the temperature chamber with -40 for 3 hours and measured after taking out of chamber.

After that, the antenna is again placed in the temperature chamber with $+70^{\circ}\text{C}$ for 3 hours and measured after taking out of chamber.

The antenna shall not be any visible damage and it shall meet electrical spec.

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| MRW ANTENNA SPECIFICATION | Doc.No MRWPQR-14114 | Rev. No. 1 |
| Retractable Antenna | Date 2004.06.03 | Page 54/56 |

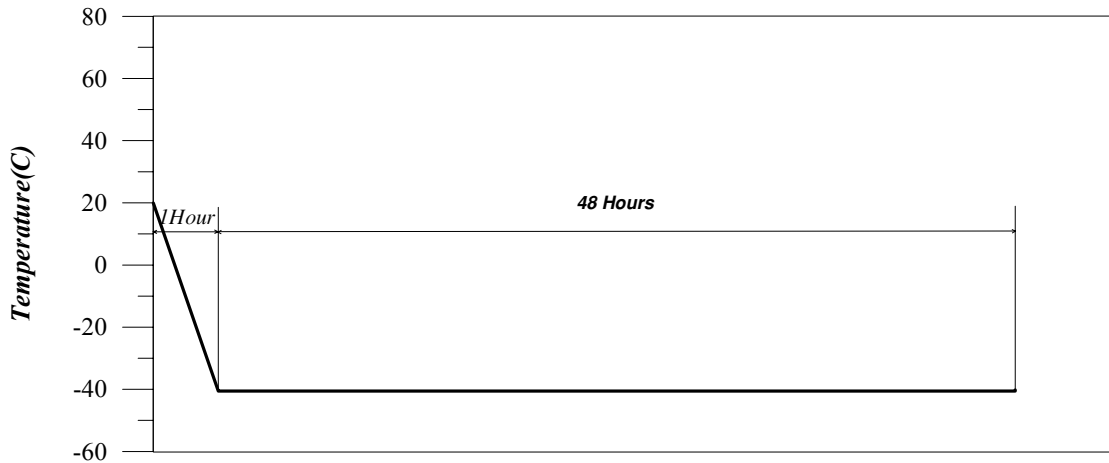
5.3 Low Temperature Test

The antenna is placed in the temperature chamber with -40°C for 48 hours and measured after taking out of chamber.

The antenna shall not be any visible damage and it shall meet electrical spec.

Low Temperature Test

Duration : 48 Hours, Temperature : -40°C



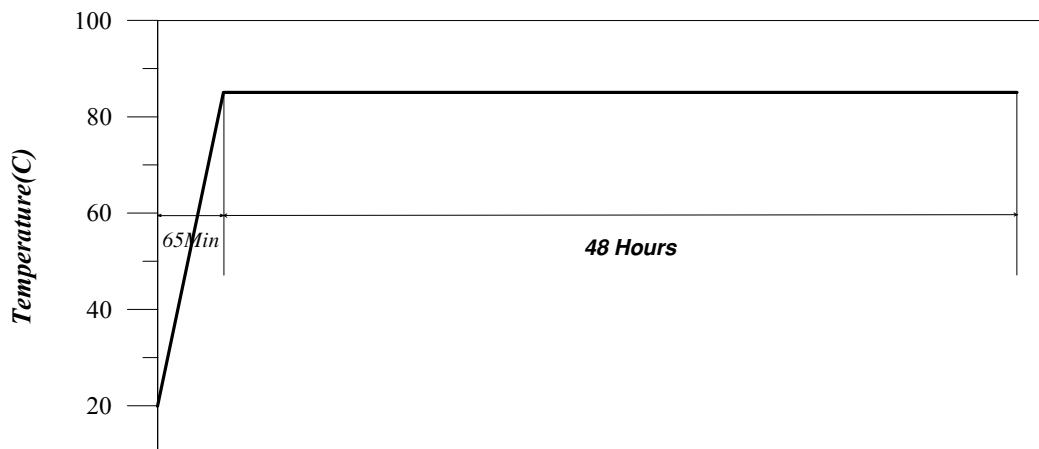
5.4 High Temperature Test

The antenna is placed in the temperature chamber and test it under below condition and measured it after taking out of chamber.

The antenna shall not be any visible damage and it shall meet electrical spec.

High Temperature Test

Duration : 48 Hours, Temperature : $+85^{\circ}\text{C}$



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| MRW ANTENNA SPECIFICATION | Doc.No MRWPQR-14114 | Rev. No. 1 |
| | Date 2004.06.03 | Page 55/56 |

Retractable Antenna

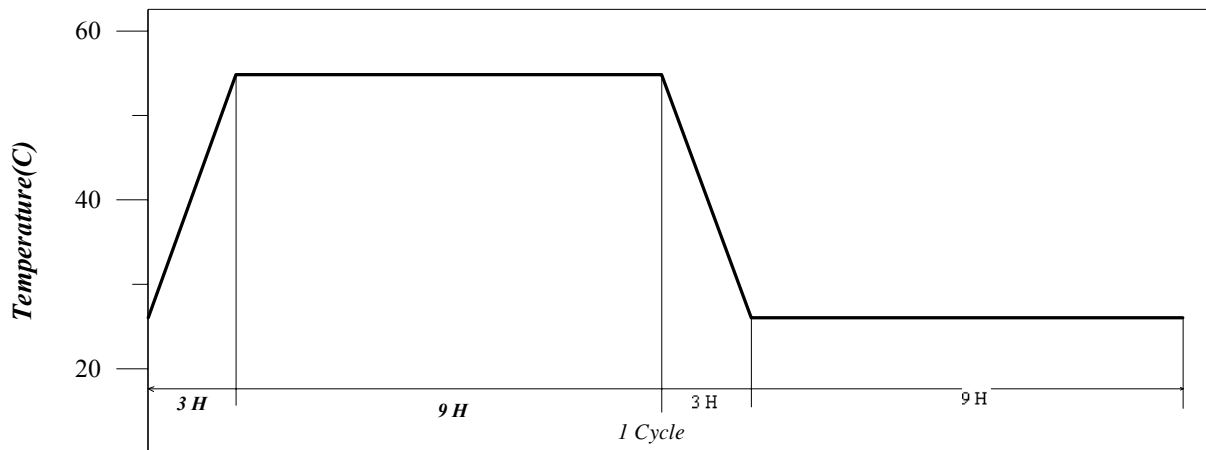
5.5 Humidity Test

The antenna is placed in the temperature chamber and test it under below condition and measured it after taking out of chamber.

The antenna shall not be any visible damage and it shall meet electrical spec.

Temperature Change in High Humidity

Test Duration : 1 Day, 1 Cycle --> 24 Hours, Temperature : +25 - +55(C), RH : 95%



5.6 Vibration Test

The antenna shall withstand 2G's RMS(10Hz – 150Hz – 10Hz / 1cycle) with 0.5 octave/min, 12cycles in X,Y,Z direction.

No appearance or function changes shall be found after the test.

5.7 Salt Spray Test

The antenna shall be exposed for 48 hours at +35°C to a 5% Sodium Chloride fog and have no appearance or function changes after the test.

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| MRW ANTENNA SPECIFICATION | Doc.No MRWPQR-14114 | Rev. No. 1 |
| | Date 2004.06.03 | Page 56/56 |

Appendix A. Reference of TestMethods

| | | Test Items | Reference |
|---------------------|----------|---------------------------|-------------|
| Mechanical | MRWS-Ma | Drop Test | IEC 68-2-31 |
| | MRWS-Mb | Insertion/Extraction Test | - |
| | MRWS-Mc | Pulling Test | - |
| | MRWS-Md | Bending Test | - |
| | MRWS-Me | Torsion Test | - |
| | MRWS-Mf | Helix Breaking Test | - |
| | MRWS-Mg | Endurance Test | - |
| Enviromental | MRWES-Na | Temperature Shock Test | IEC 68-2-14 |
| | MRWES-Nb | Temperature Cyclng Test | IEC 68-2-14 |
| | MRWES-Ab | Low Temperature Test | IEC 68-2-1 |
| | MRWES-Bb | Hot Temperature Test | IEC 68-2-2 |
| | MRWES-D | Humidity Test | IEC 68-2-30 |
| | MRWES-Fc | Sinusoidal Vibration Test | IEC 68-2-6 |

. MRWS-M : MRW Mechanical Standard

. MRWES- : MRW Environmental Standard