

Collection of Broadband HF Antenna Designs: Part – 3

Antenna and Performance Figures

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[This article is presented in three parts. Part – 1 of the main article contains Sections 1 through 7 and includes only Figures of antenna details, Part – 2 of the main article contains Section 8 through 10 with antenna detail Figures. This Part – 3, the **QEXfiles**, contains all of the Figures, including those that show antenna performance details. — *Ed.*]

==== Part 1 =====

3 Terminated Folded Dipole

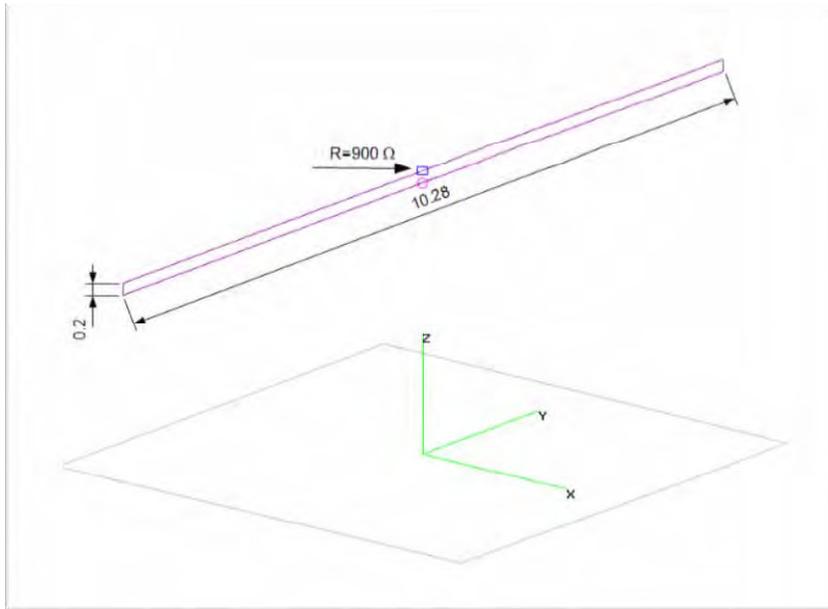


Figure 1 – Terminated Folded Dipole.

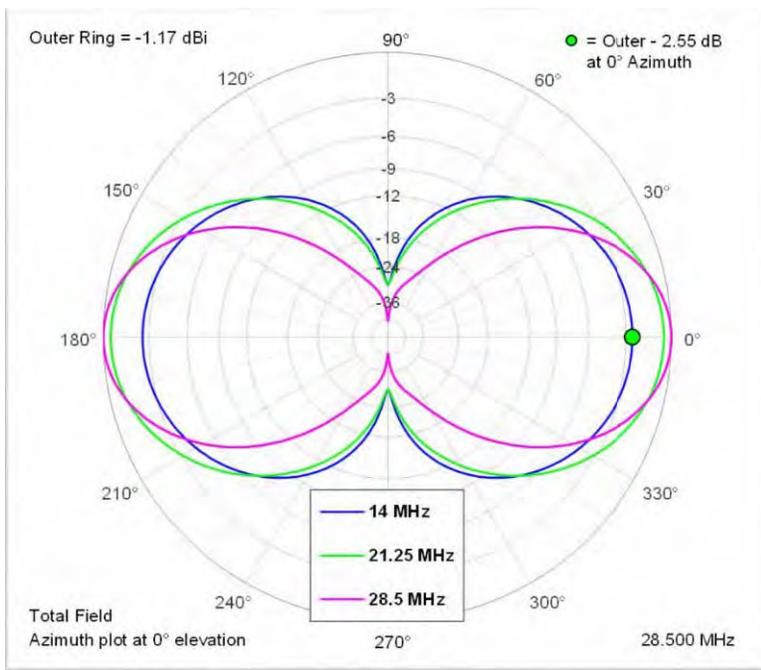
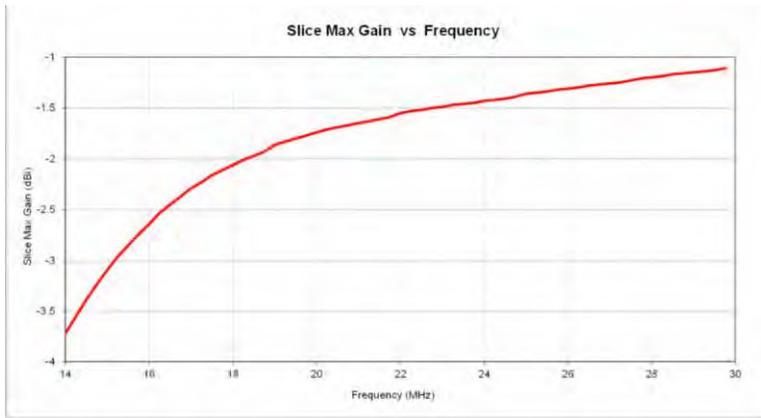
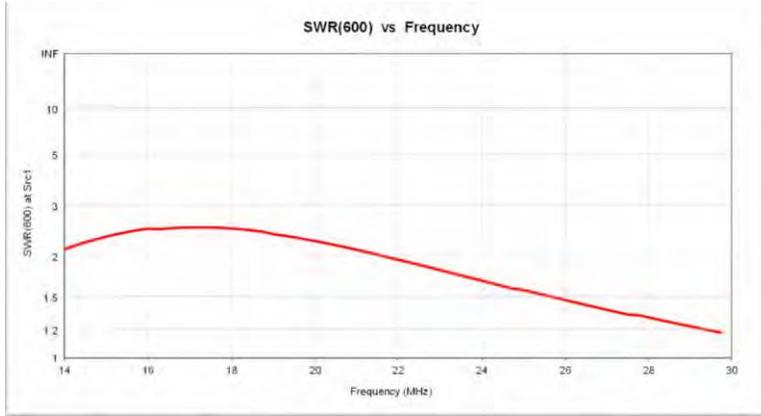


Figure 2 – Performance graphs of the TFD.

4 Converging Element Doublets

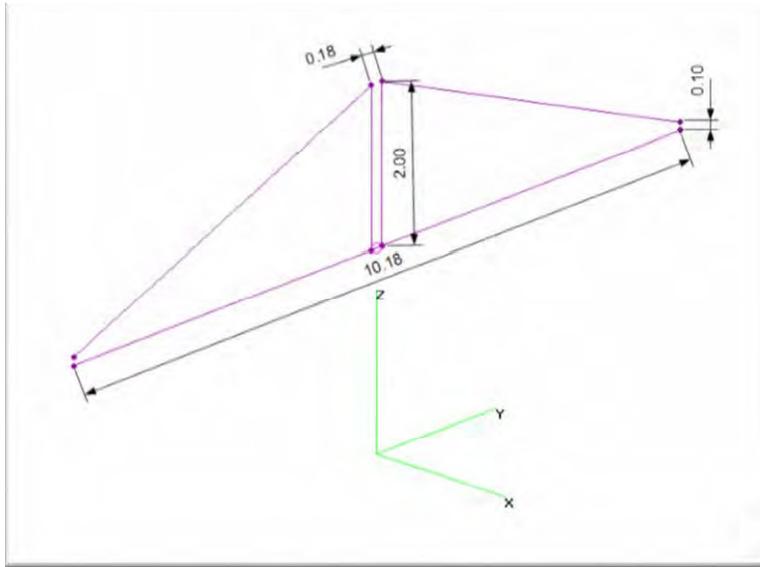
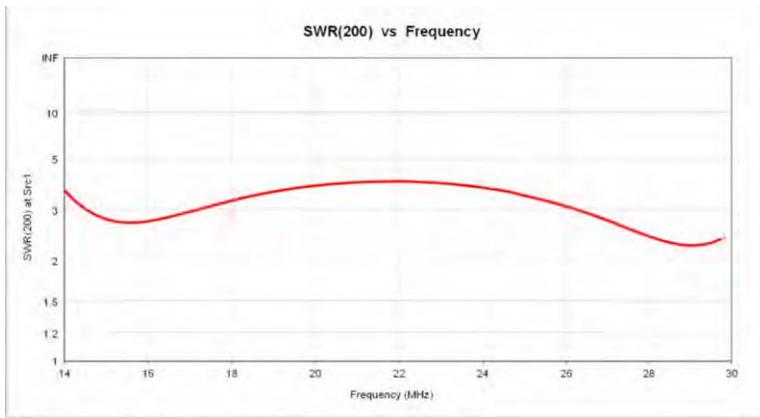


Figure 3 – 2-element CED is one of the simplest bidirectional broadband antenna. Its maximum radiation direction is along X axis. All dimensions are in meters.



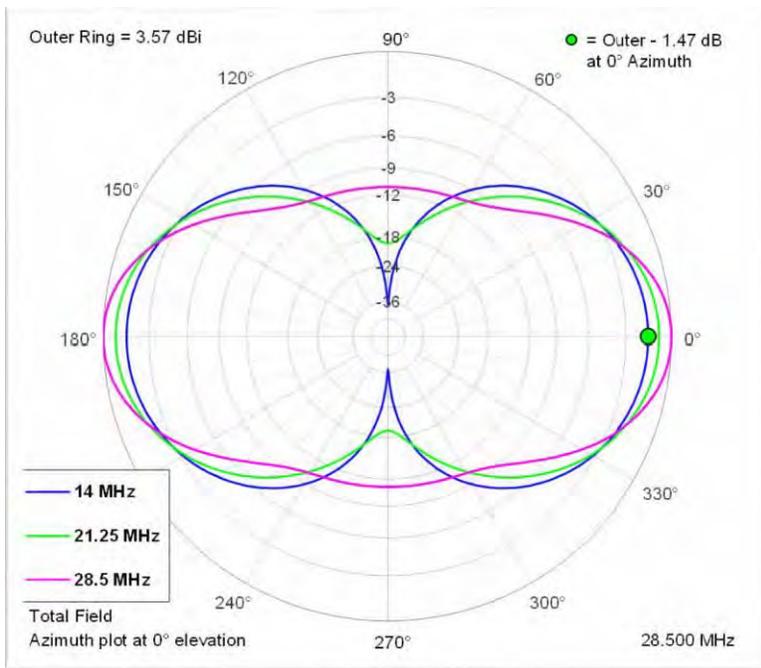
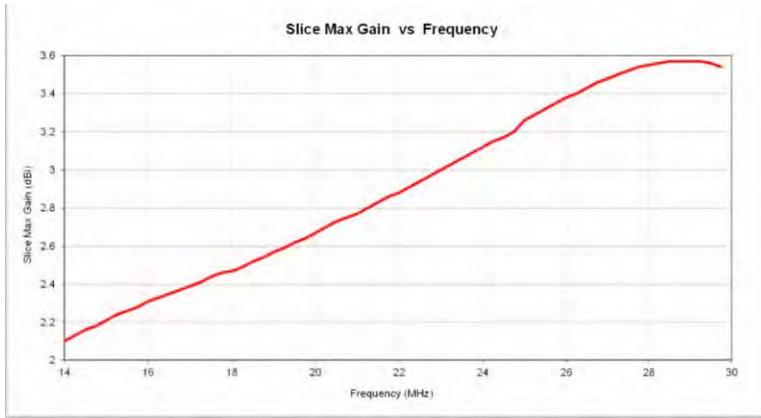


Figure 4 – Performance graphs of the 2-element CED.

4.2 3-Element CED

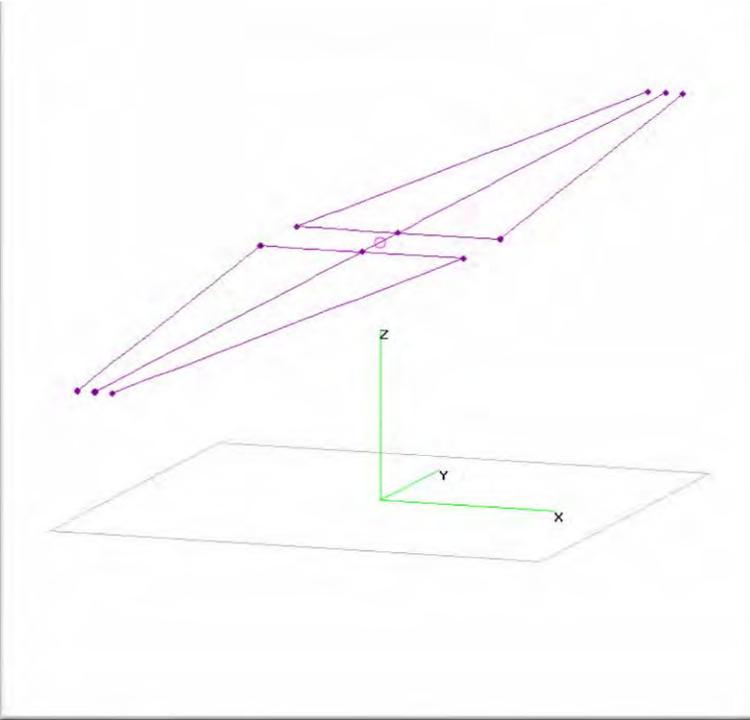


Figure 5 – One of the possible 3-element CED designs. All three elements in the same plane.

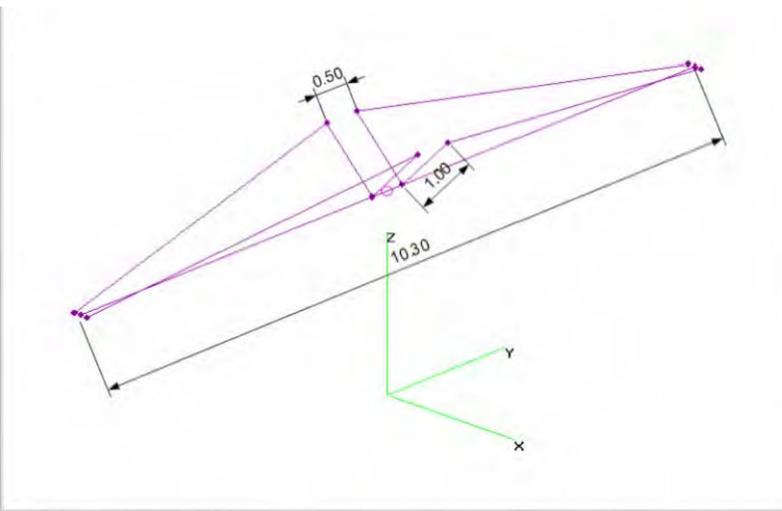


Figure 6 – Such 3-element CED shows improvement in SWR_{ANT} and gain over 2-element CED.

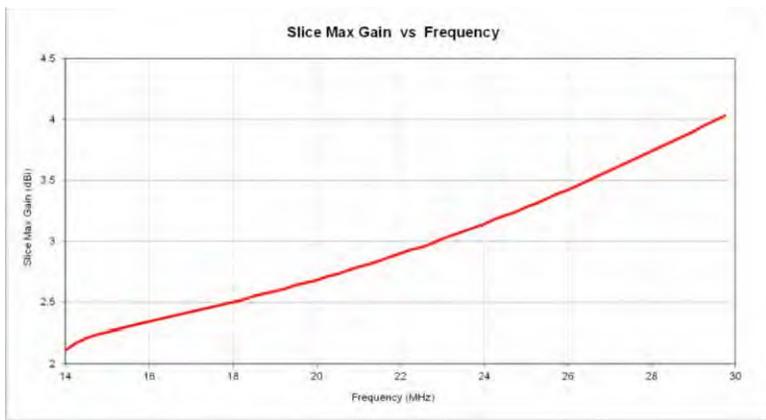
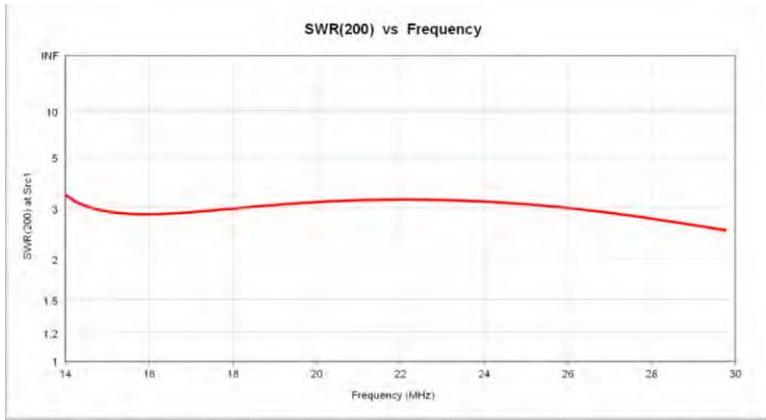


Figure 7 – SWR_{ANT} and gain plots of the 3-element CED.

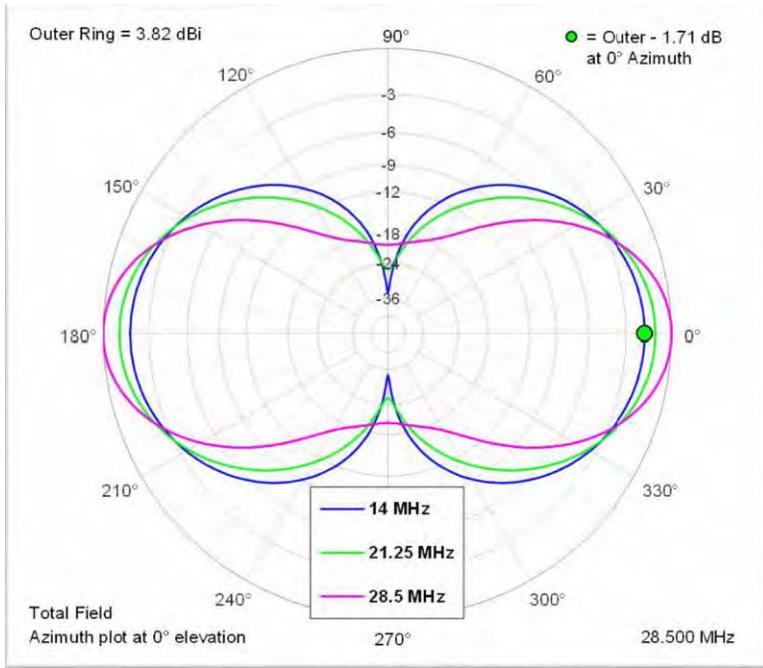


Figure 8 – Radiation patterns of the 3-element CED.

4.3 4-Element CED

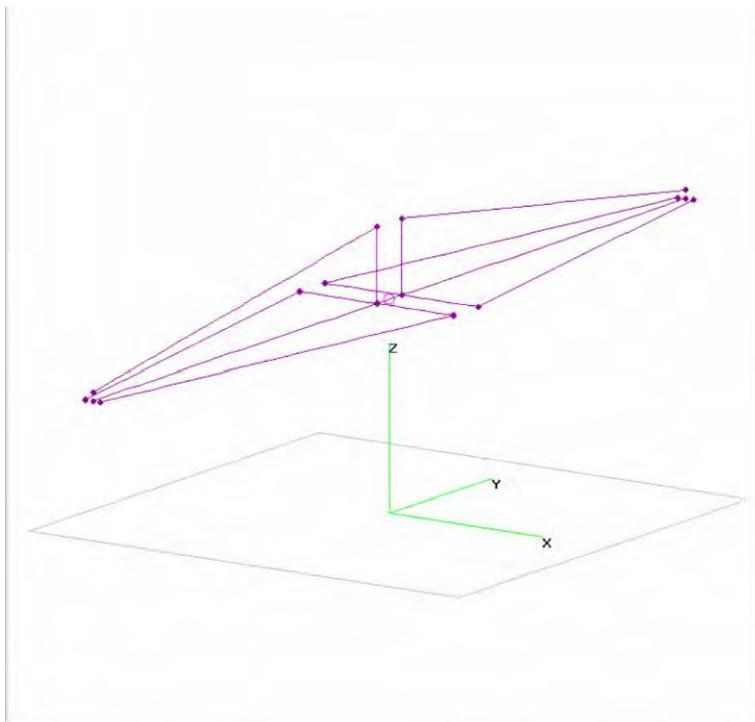


Figure 9 – 4-element CED.

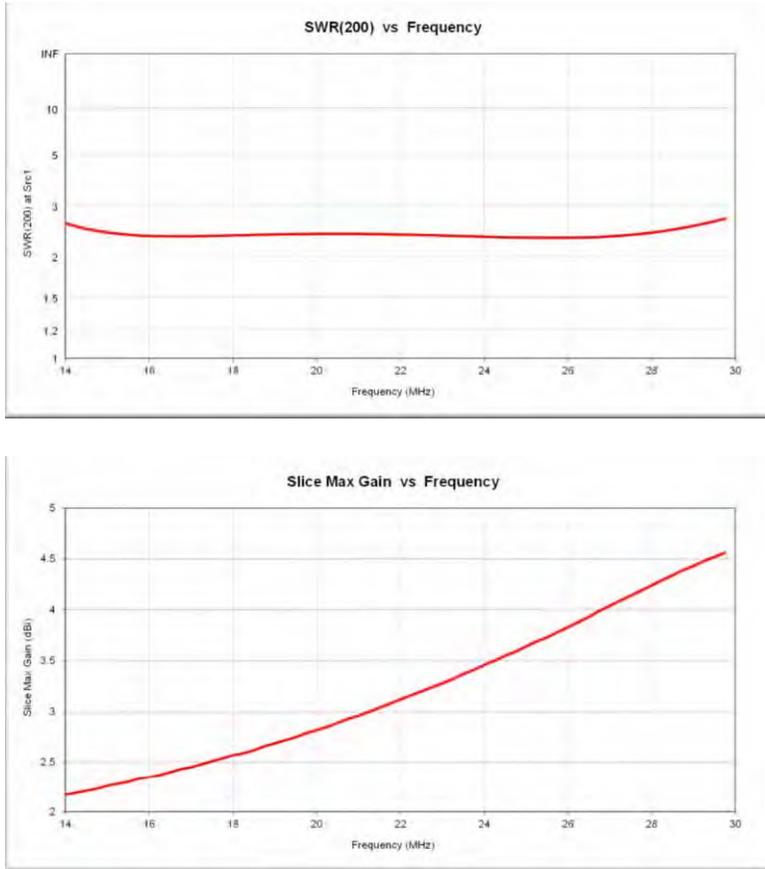


Figure 10 – SWR_{ANT} and gain plots of the 4-element CED.

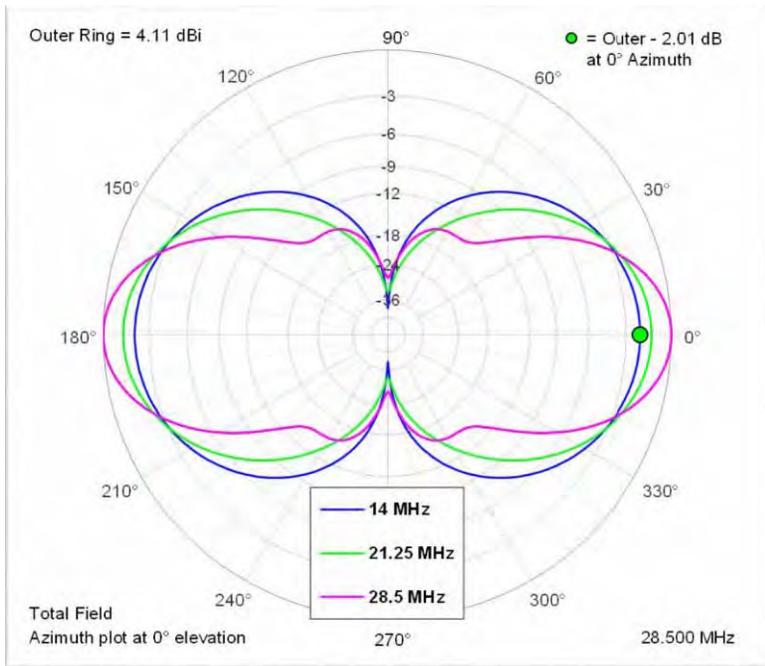


Figure 11 – Radiation patterns of the 4-element CED.

4.4 5-Element CED

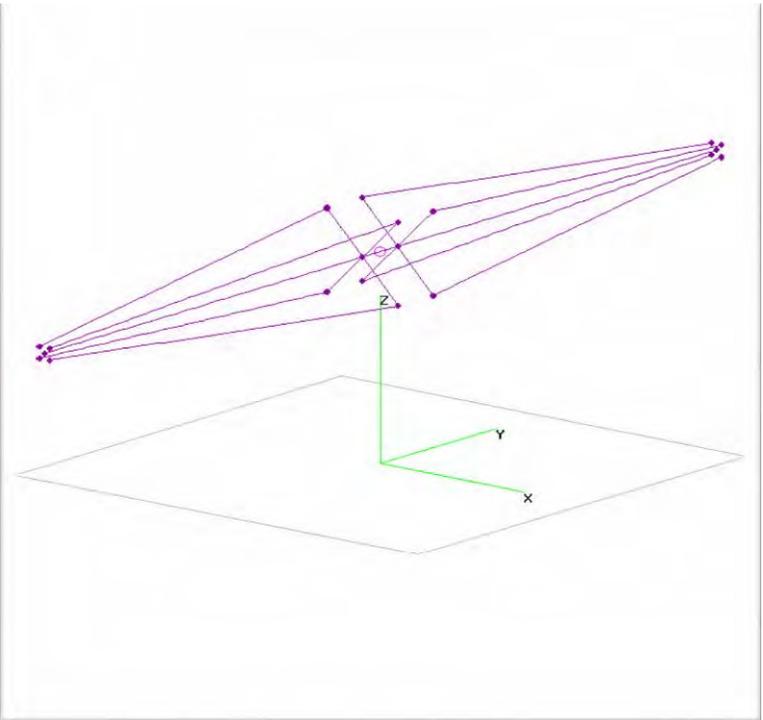
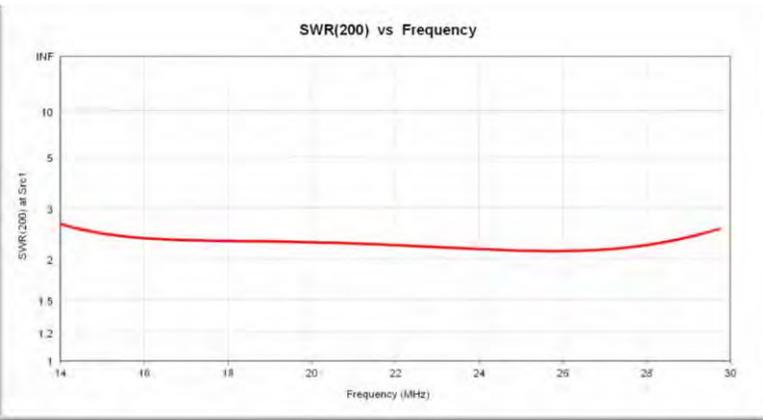


Figure 12 – 5-element CED.



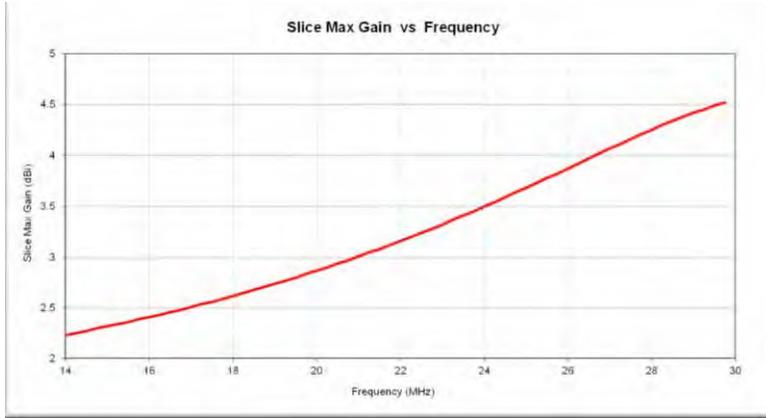


Figure 13 – SWR_{ANT} and gain plots of the 5-element CED.

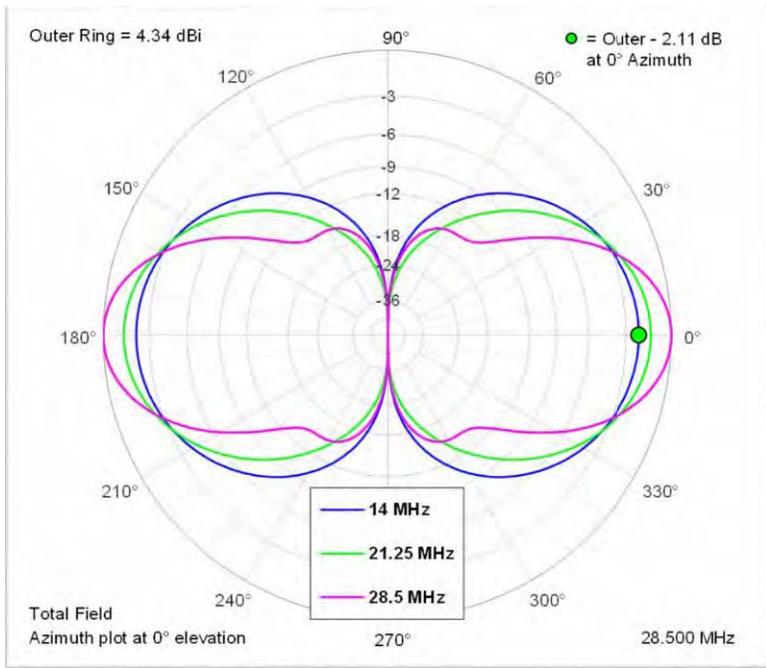


Figure 14 – Radiation patterns of the 5-element CED.

5 Spreading Element Doublets

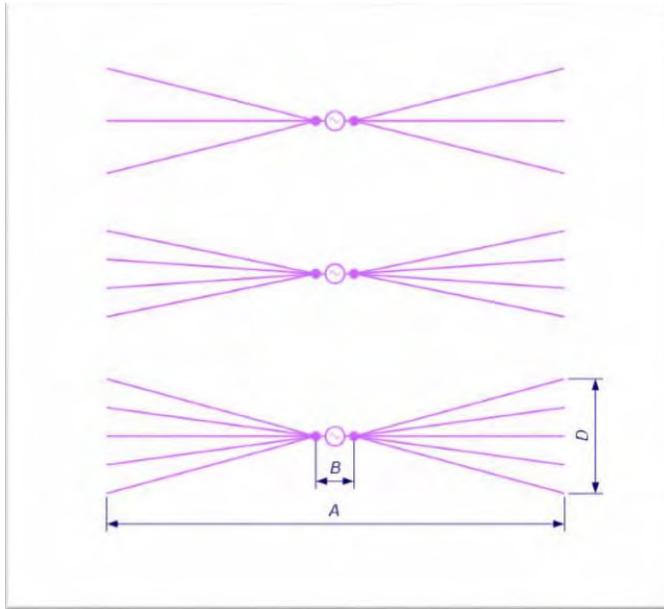


Figure 15 – Spreading Element Doublets from 3-element (top) to 5-element (bottom) version.

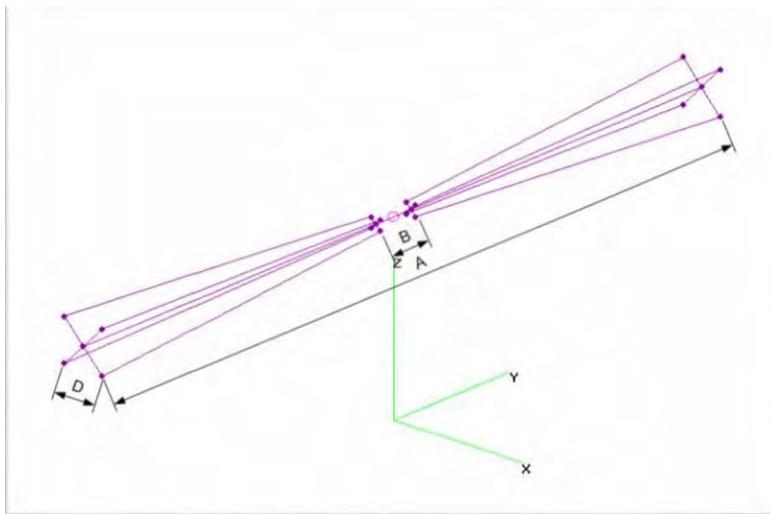


Figure 16 – 5-element SED Mk.2.

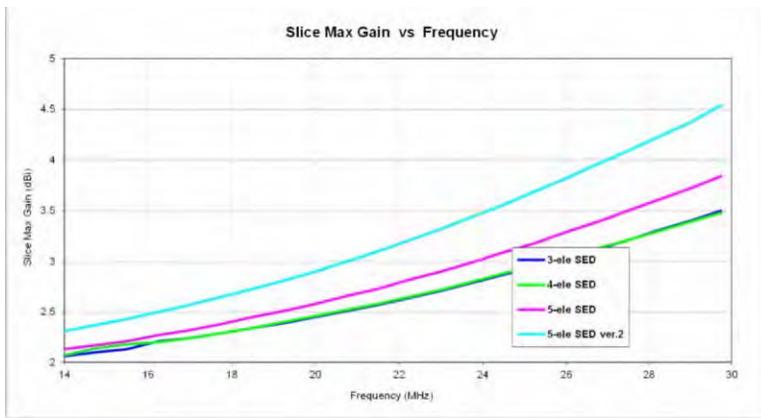
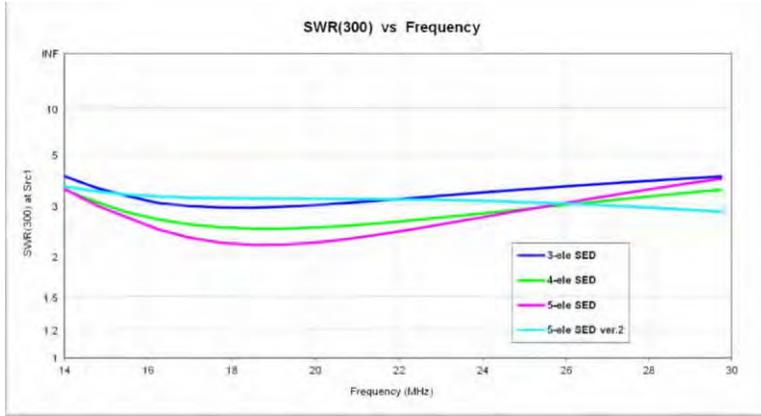


Figure 17 – Performance graphs of four versions of SEDs: SWR_{ANT} and gain.

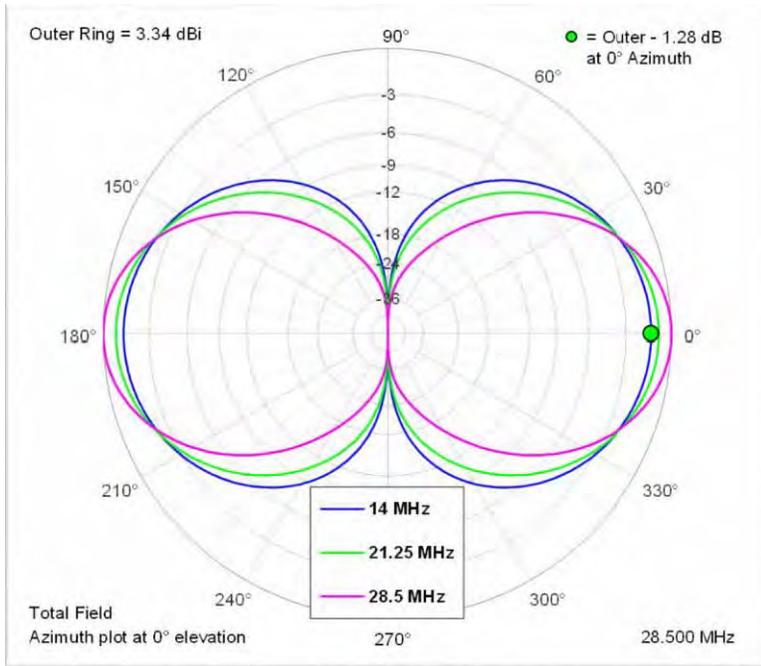


Figure 18 – Radiation patterns of the 3-element SED at three frequencies: 14, 21.25 and 28.5 MHz.

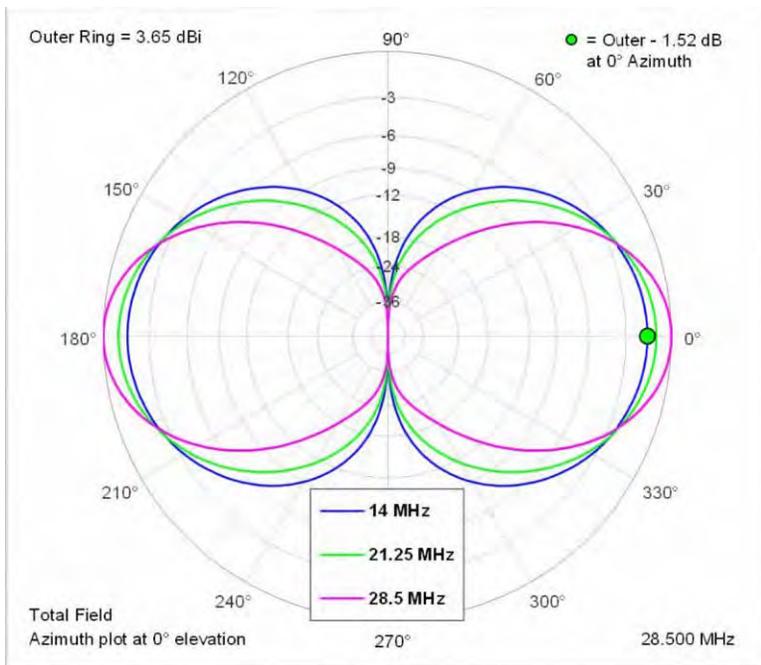


Figure 19 – Radiation patterns of 5-element SED at three frequencies: 14, 21.25 and 28.5 MHz.

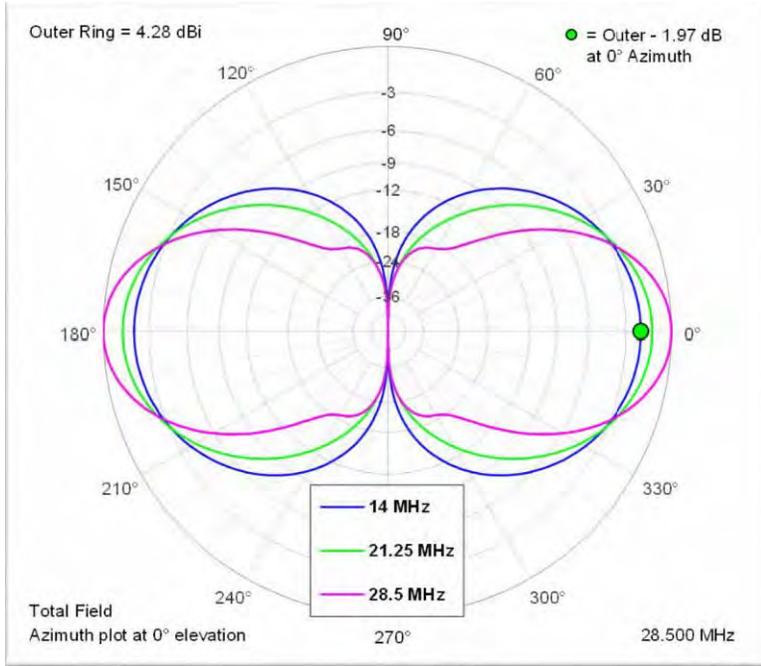


Figure 20 – Radiation patterns of the 5-element SED Mk. 2.

6 Broadside Doublet Arrays

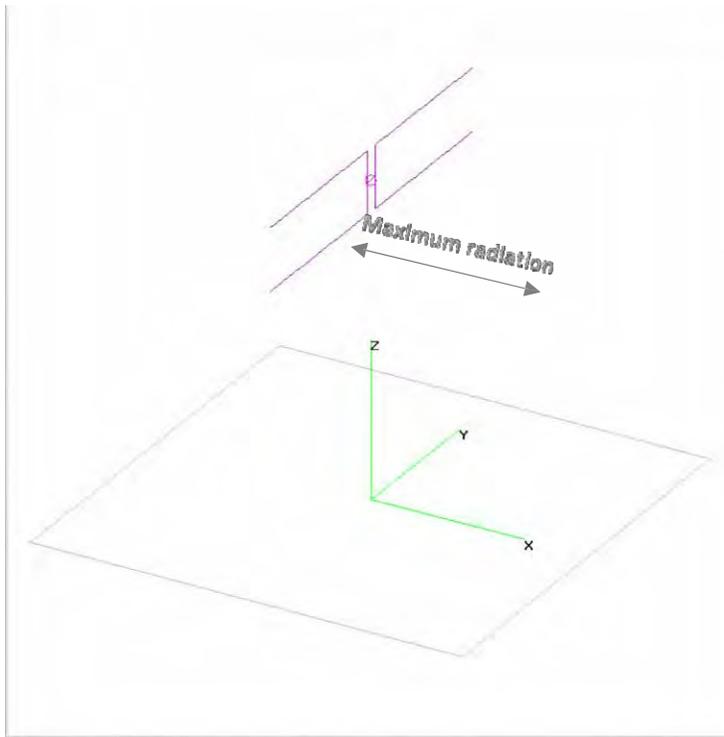


Figure 21 – Maximum radiation direction for BDA happens along X-axis when the antenna is oriented in vertical plane.

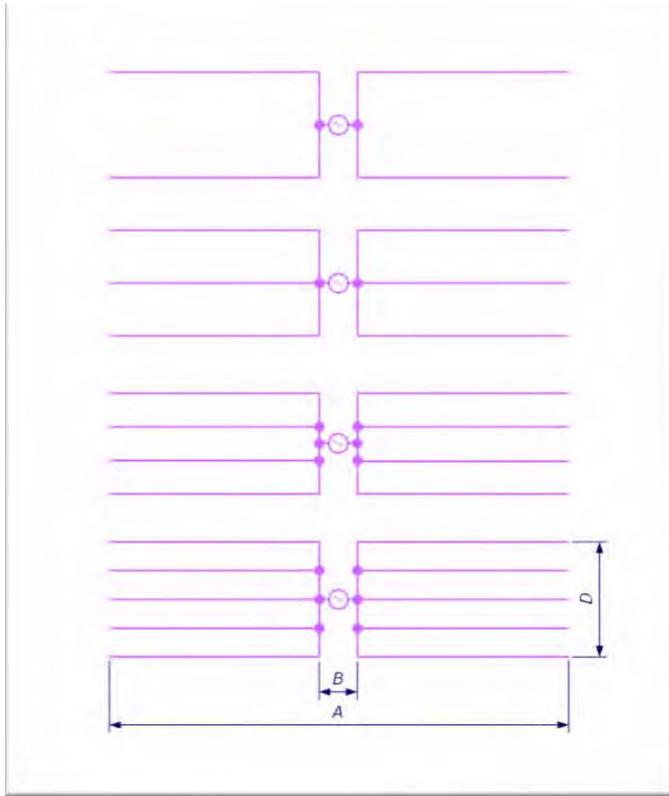
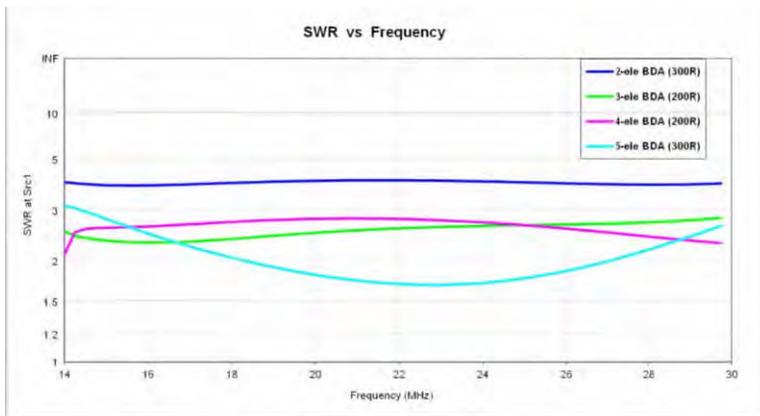


Figure 22 – Broadside Doublet Arrays from 2-element (top) to 5-element (bottom) version.



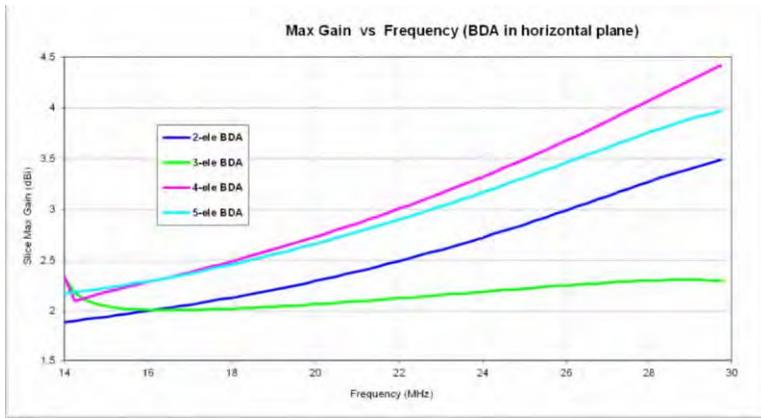
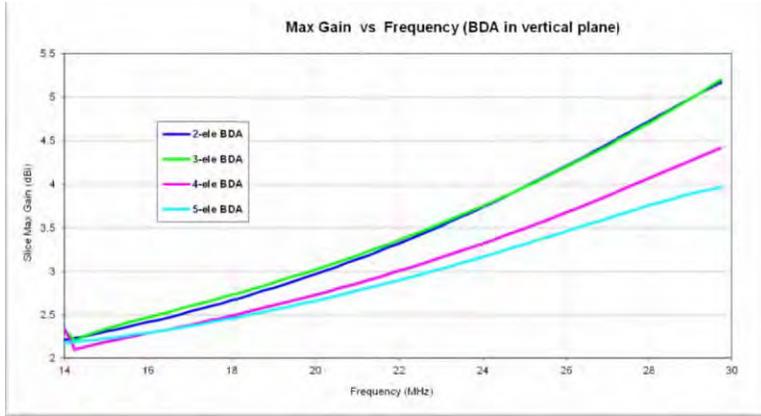
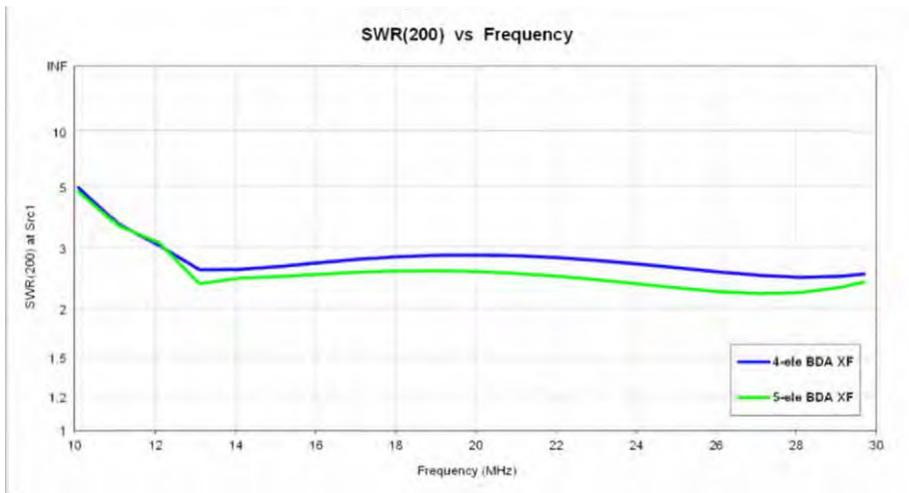


Figure 23 – Performance graphs of four versions of BDA: SWR_{ANT} and forward gain in dBi.



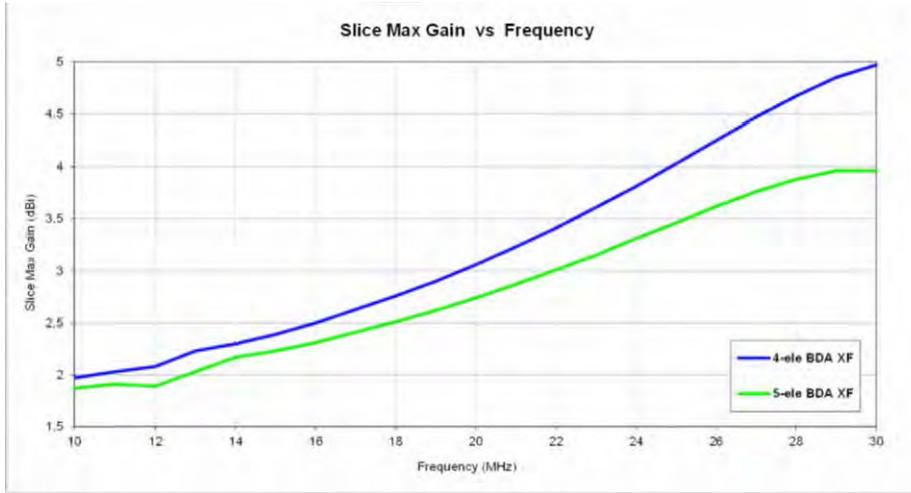


Figure 24 – Performance graphs of the 4-element and 5-element BDA XF (10.1 – 29.7 MHz).

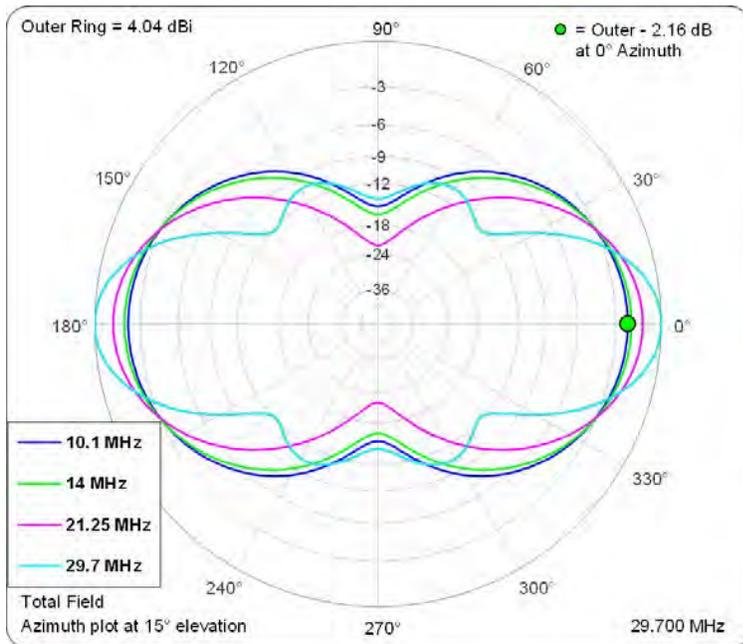


Figure 25 – Radiation patterns of the 4-element BDA XF.

7 End-Fire Doublet Arrays

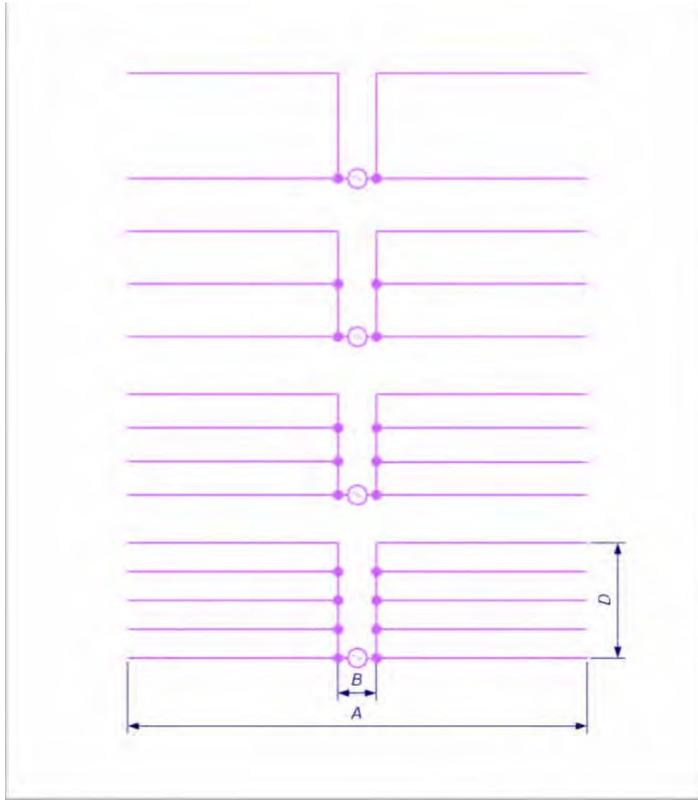
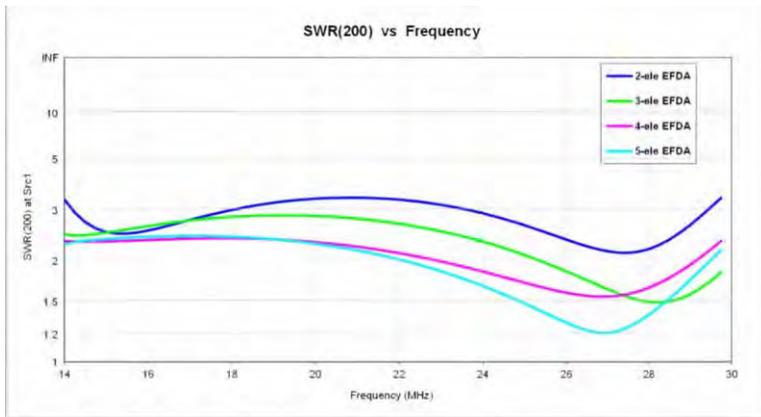


Figure 26 – End-Fire Doublet Arrays from 2-element (top) to 5-element (bottom) version. Direction of maximum radiation is upwards in this drawing.



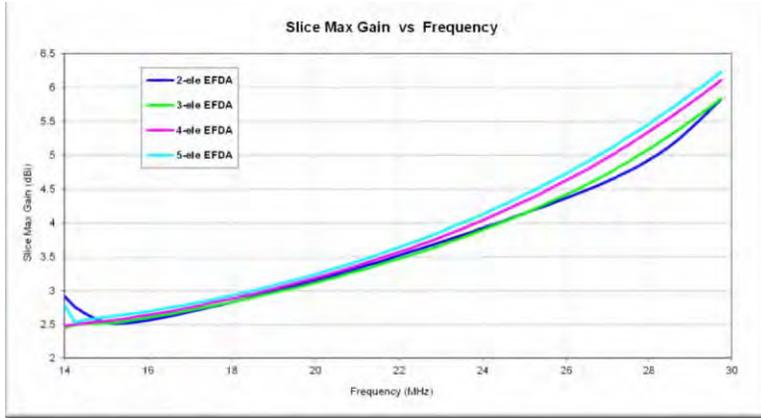


Figure 27 – Performance graphs of four versions of EFDA: SWR_{ANT} and forward gain in dBi.

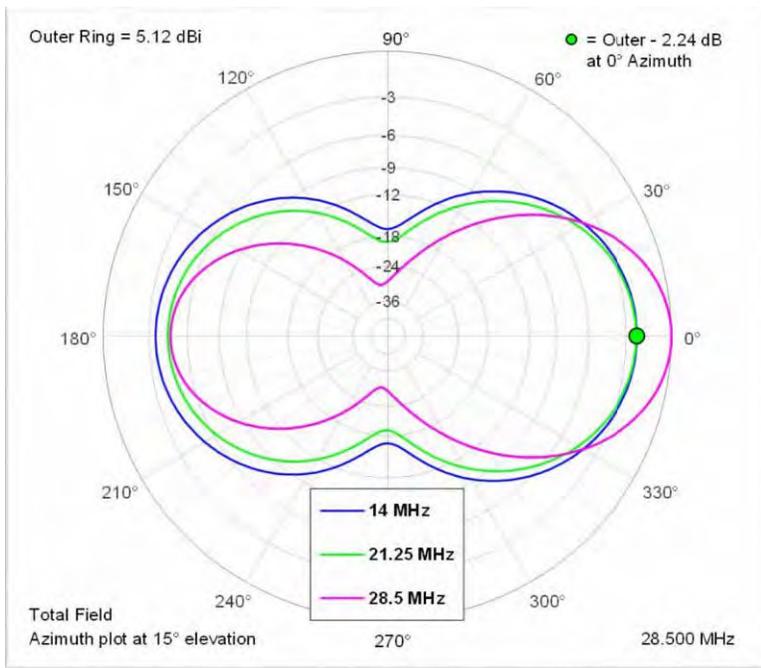


Figure 28 – Radiation patterns of 2-element EFDA at three frequencies: 14, 21.25 and 28.5 MHz.

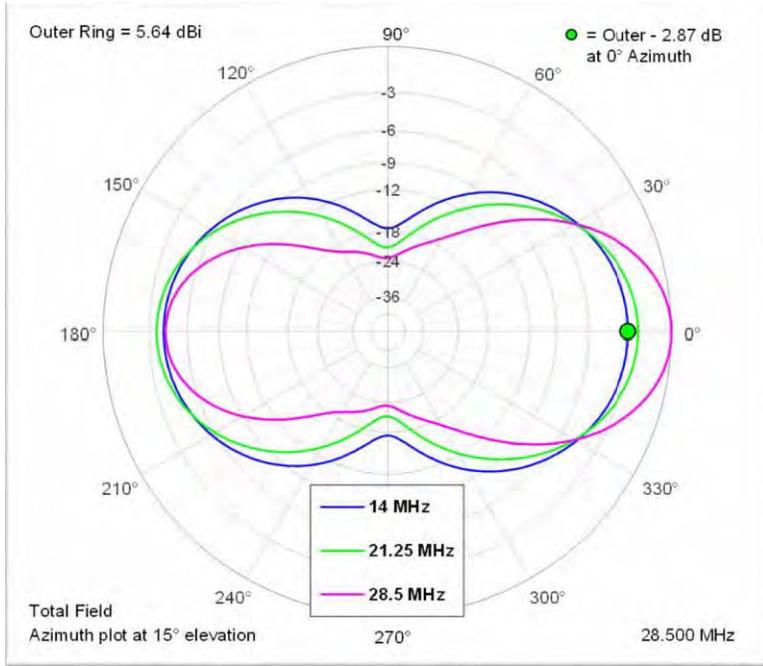


Figure 29 – Radiation patterns of 5-element EFDA at three frequencies: 14, 21.25 and 28.5 MHz.

7.1 2-Element EFDA Mk. 2

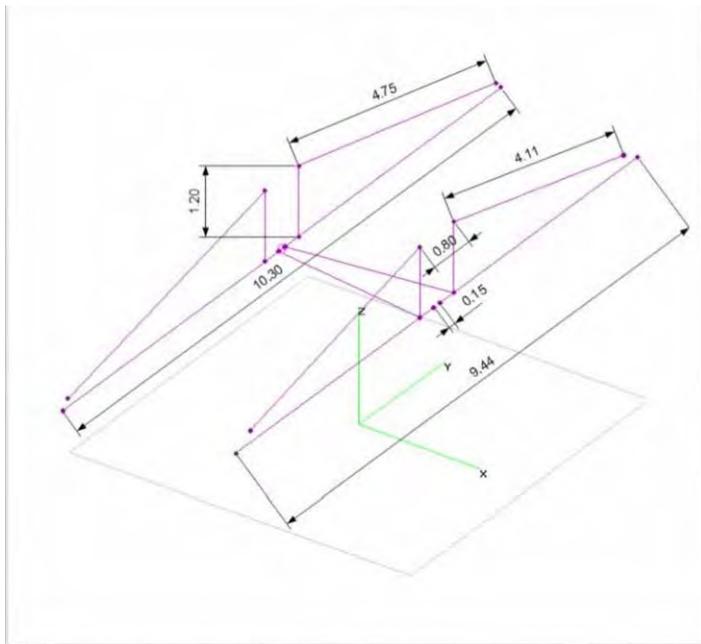


Figure 30 – 2-element EFDA Mk. 2. Maximum radiation is towards +X.

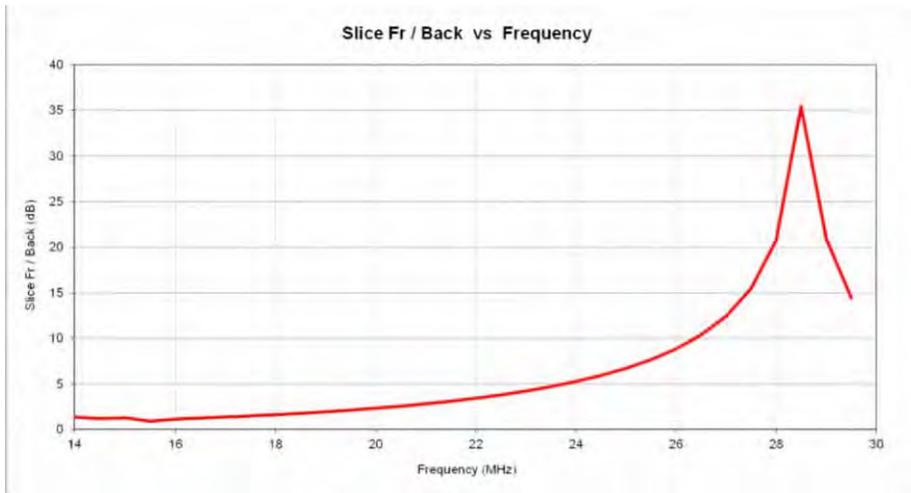
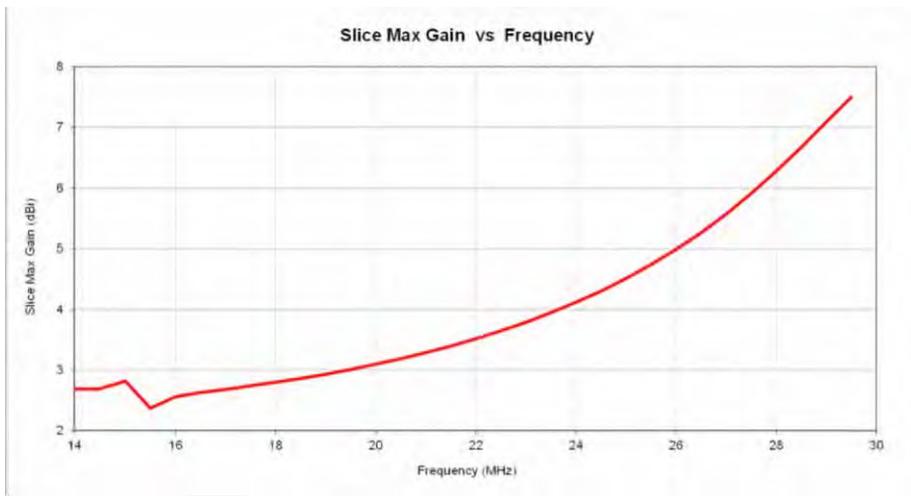
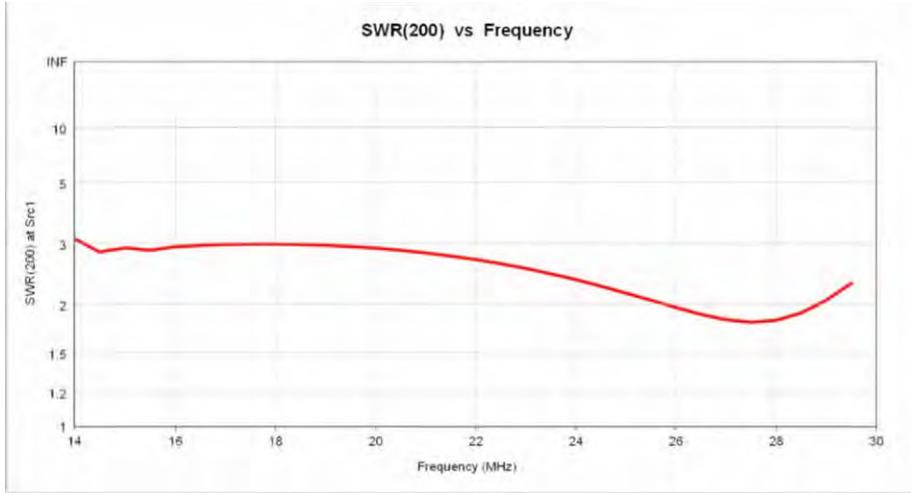


Figure 31 – Performance graphs of 2-element EFDA Mk. 2: SWR_{ANT}, forward gain and F/B ratio.

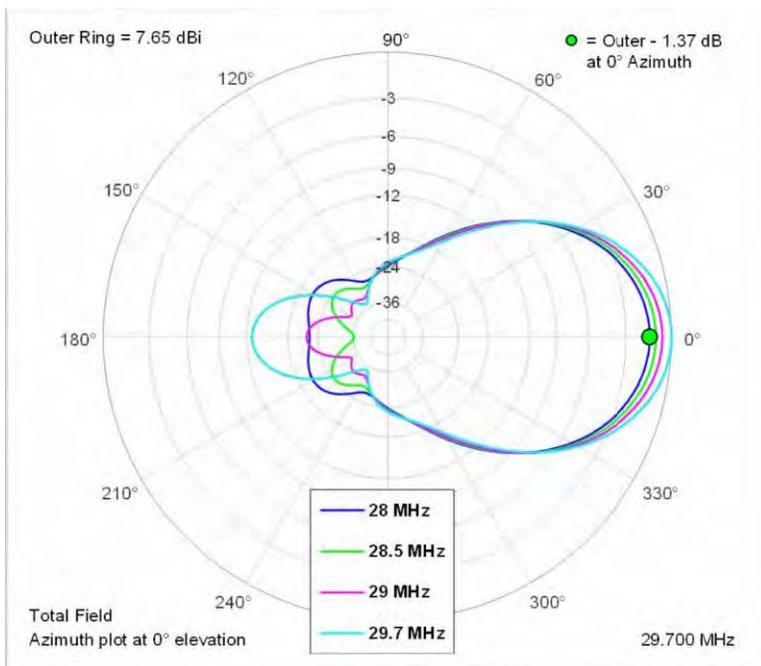
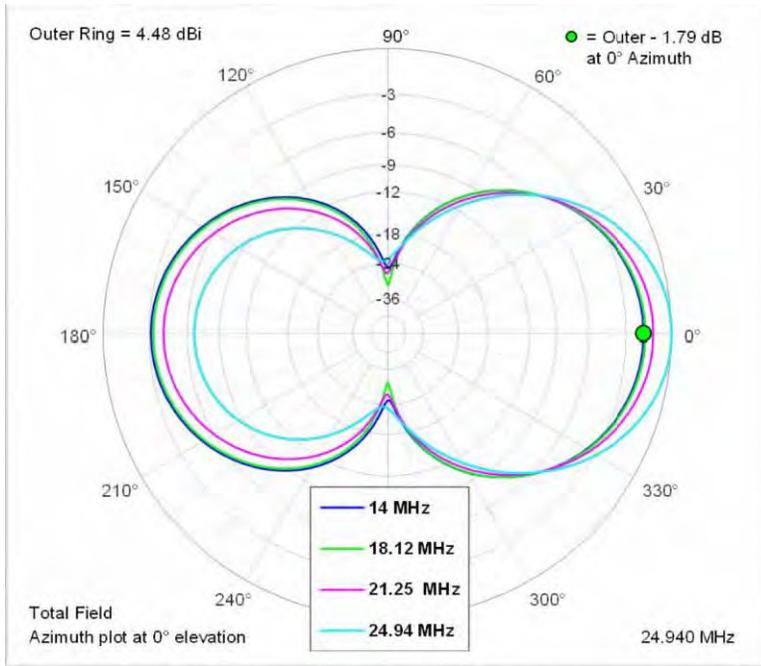


Figure 32 – Radiation patterns of the 2-element EFDA Mk. 2 at various frequencies

Part 2

8 Multi-Loop Antennas

8.1 Origami-01

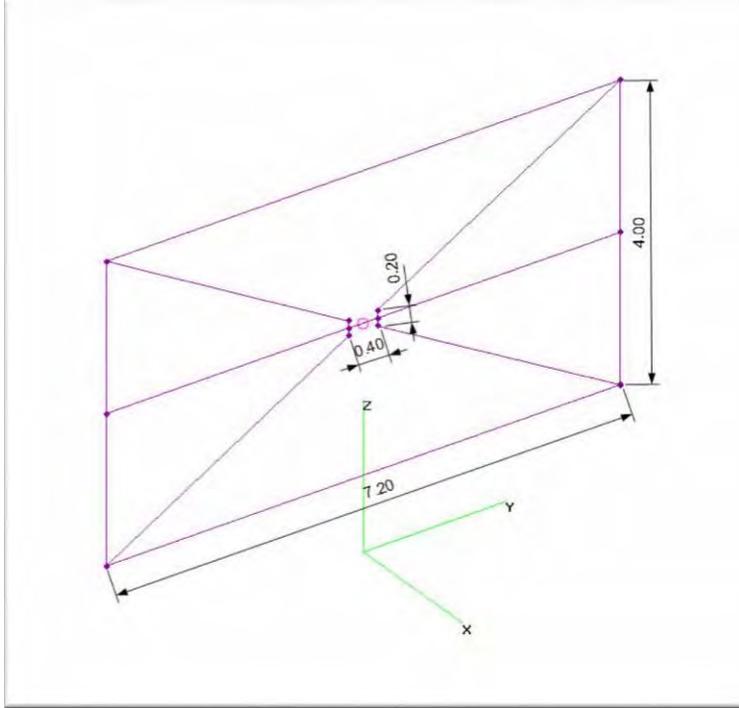
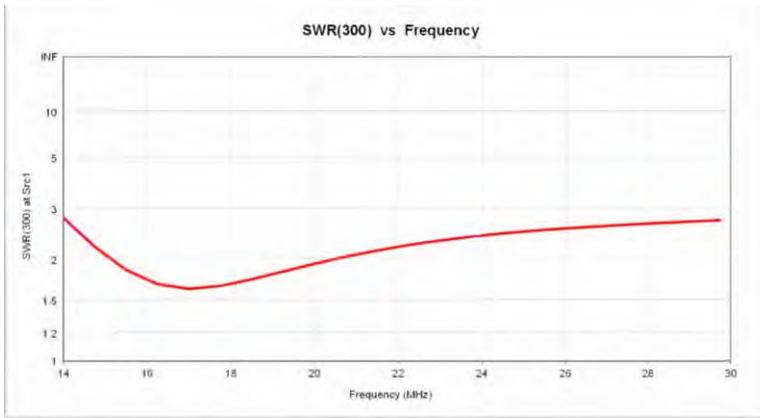


Figure 33 – The view of Origami-01 antenna.



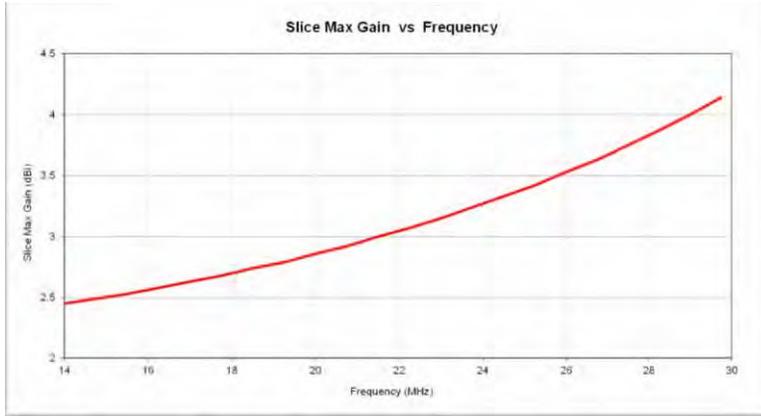


Figure 34 – Performance graphs of Origami-01: SWR_{ANT} and gain.

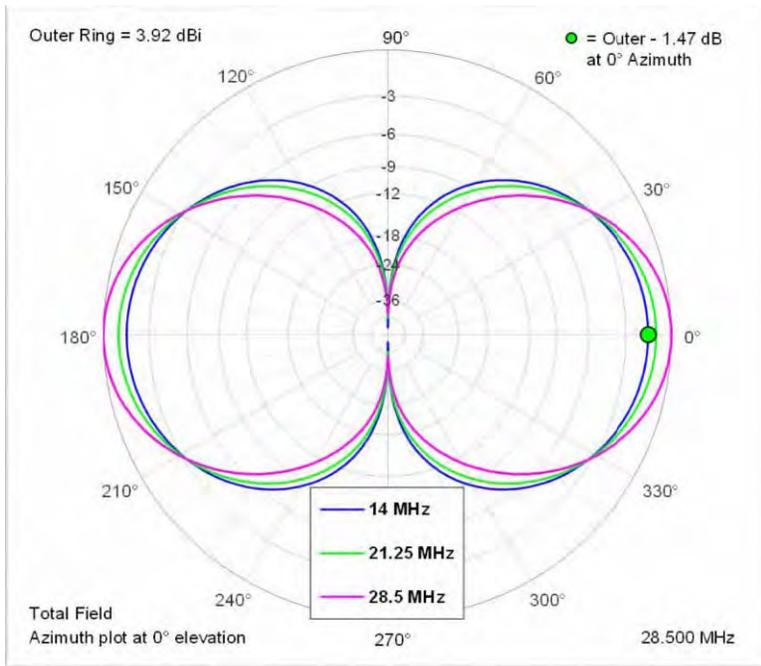


Figure 35 – Radiation patterns of Origami-01 at various frequencies.

8.2 Origami-02

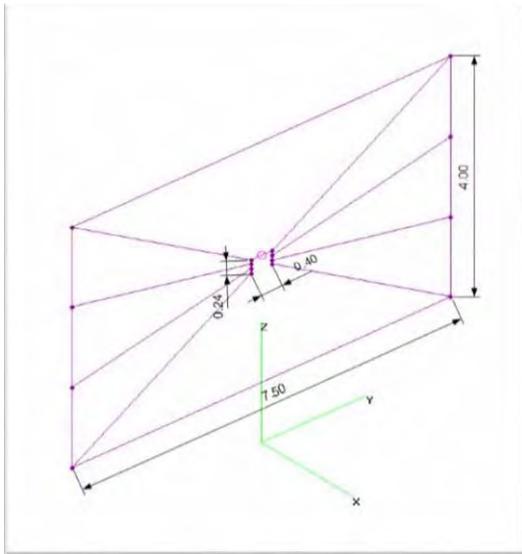


Figure 36 – The view of Origami-02 antenna.

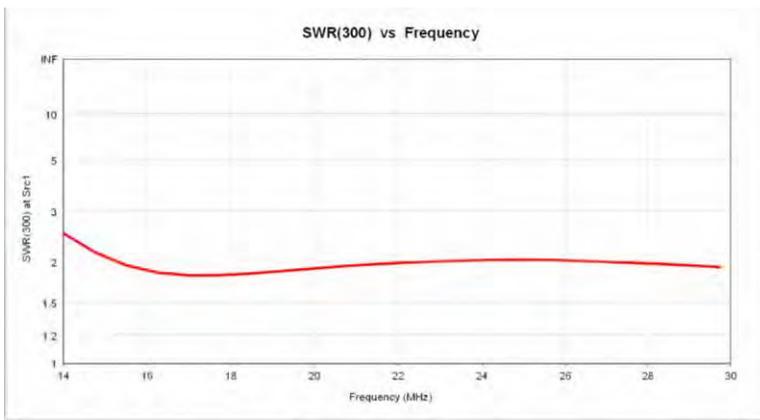


Figure 37 A – Performance graphs of Origami-02: SWR_{ANT} and gain.

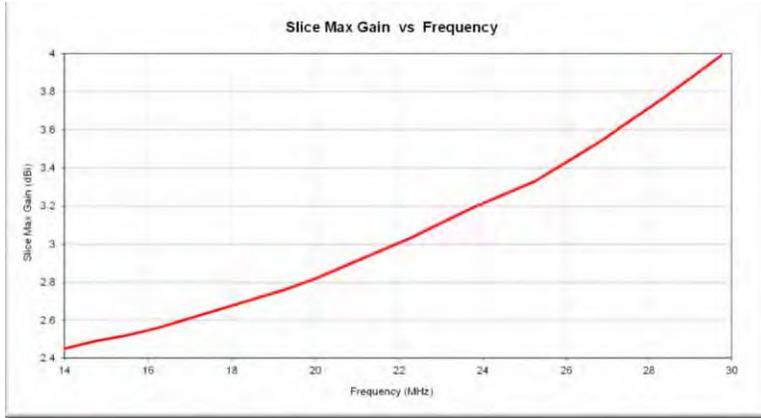


Figure 37 B – Performance graphs of Origami-02: SWR_{ANT} and gain.

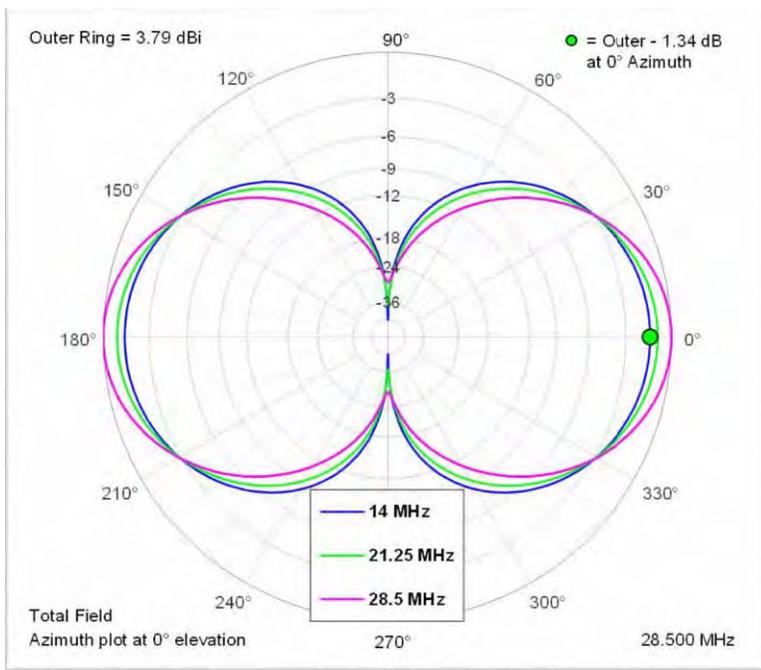


Figure 38 – Radiation patterns of Origami-02 at various frequencies.

8.3 Cat Whiskers

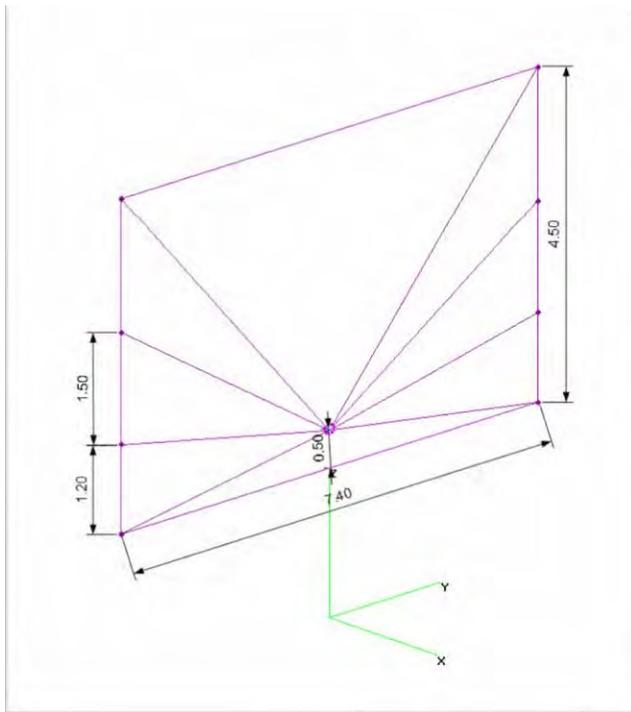


Figure 39 – The view of Cat Whiskers antenna.



Figure 40 – First prototype of the Cat Whiskers antenna.

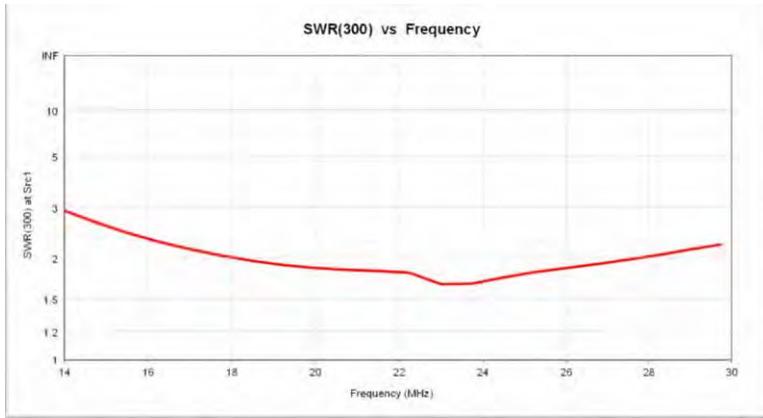
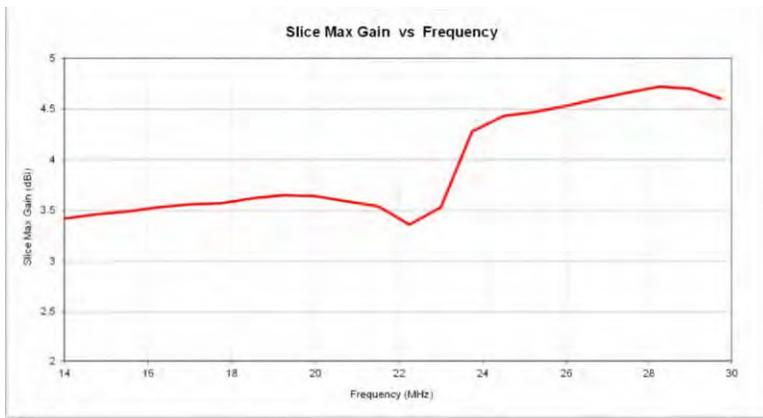


Figure 41 – The Cat Whiskers SWR_{ANT} plot.



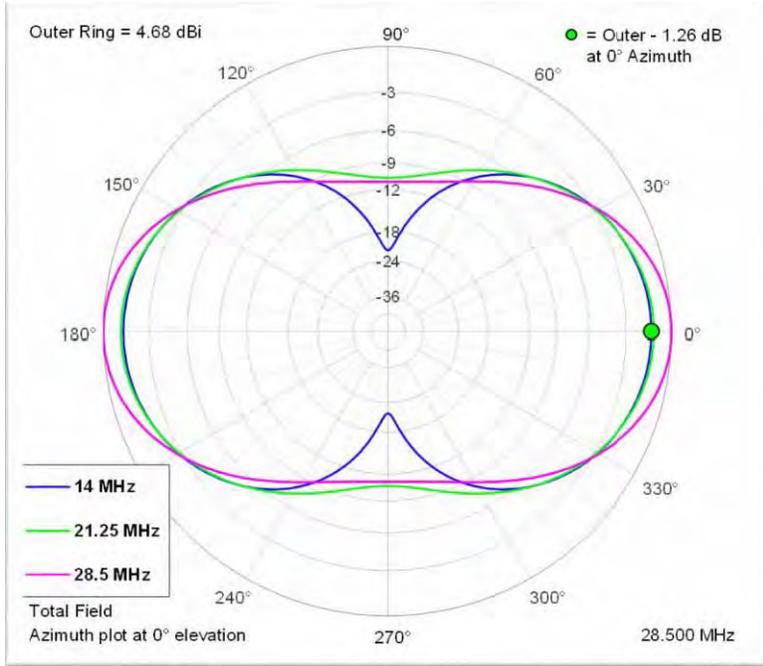


Figure 42 – The Cat Whiskers gain plot and radiation patterns.

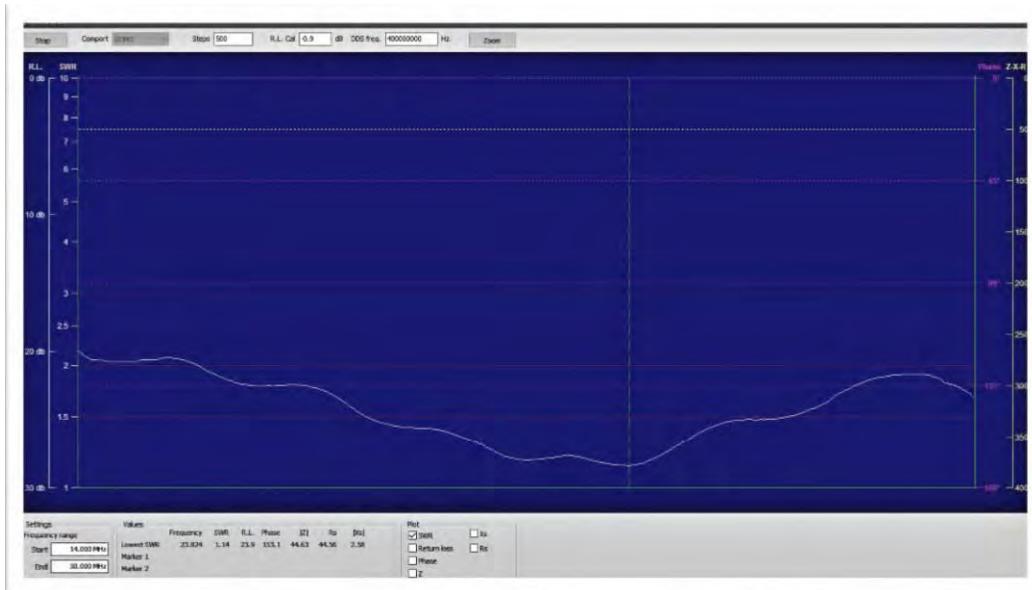


Figure 43 – Cat Whiskers SWR_{TRX} when measured with 40 meters of low-loss RF7 coax.

8.4 Multi-Loop Doublet

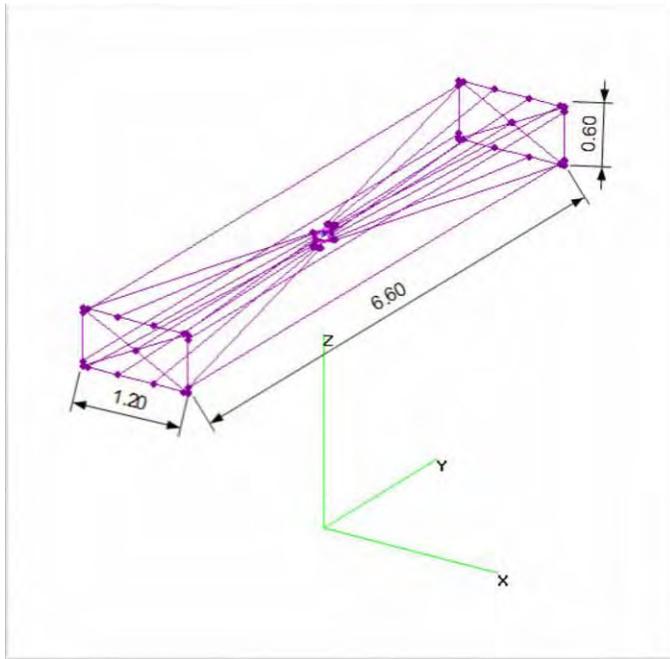


Figure 44 – The Multi-Loop Doublet is a compact antenna.



Figure 45 – The first prototype of Multi-Loop Doublet.

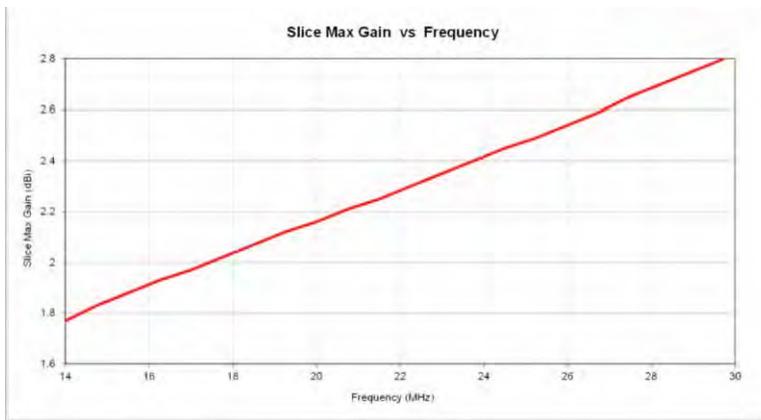
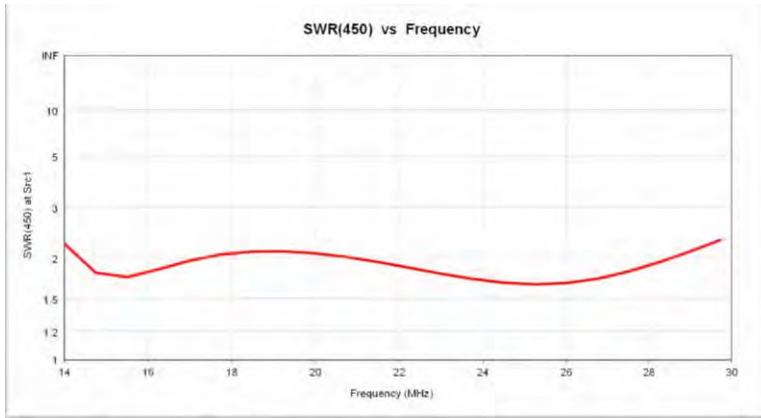


Figure 46 – The Multi-Loop Doublet SWR_{ANT} and gain.

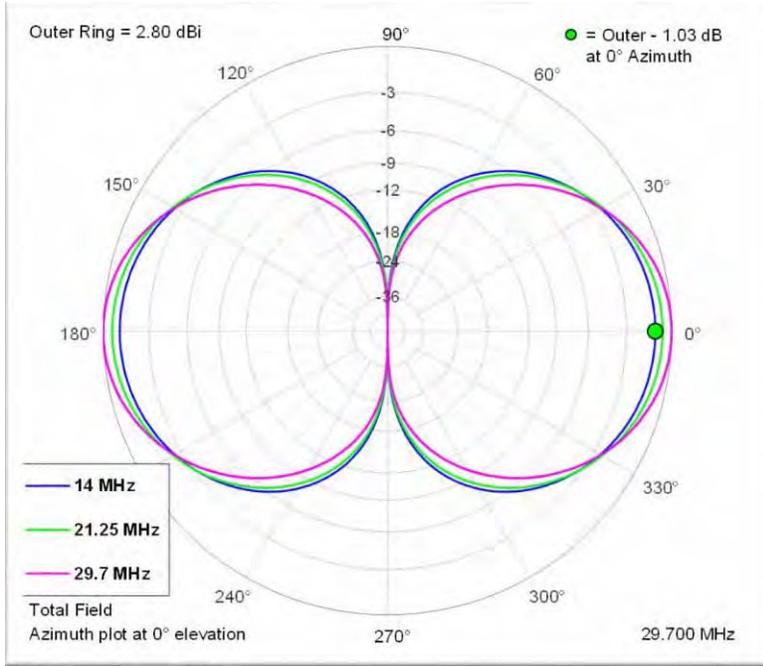


Figure 47 – Radiation patterns of the Multi-Loop Doublet.

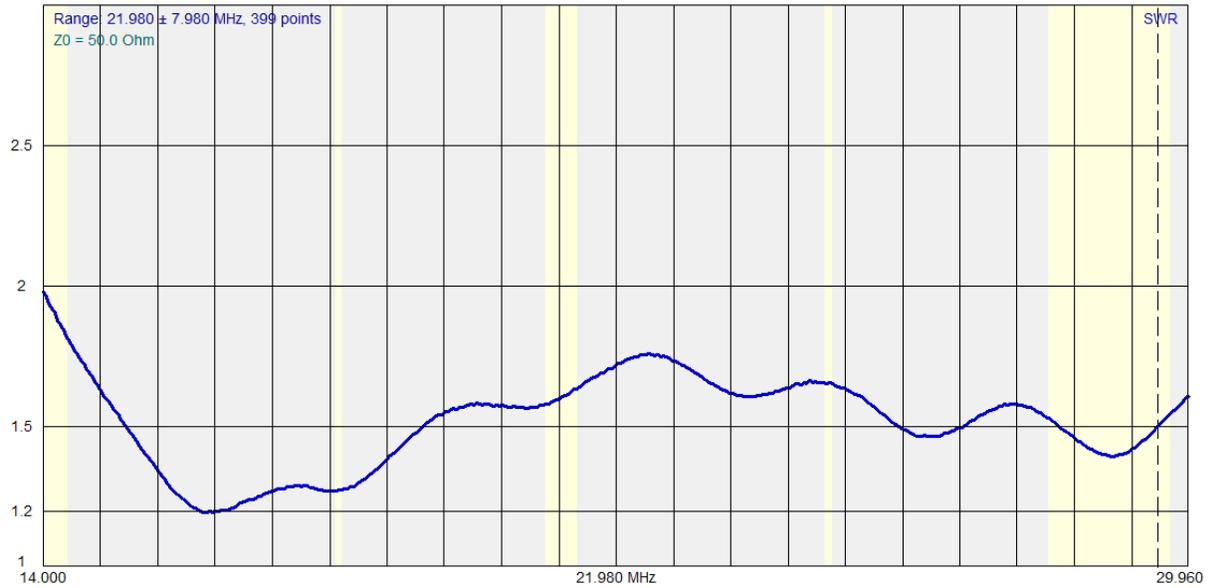


Figure 48 – Compact Multi-Loop Doublet SWR_{TRX} when measured with 9:1 balun and 40 meters of RF7 coax.

9 Broadband Verticals

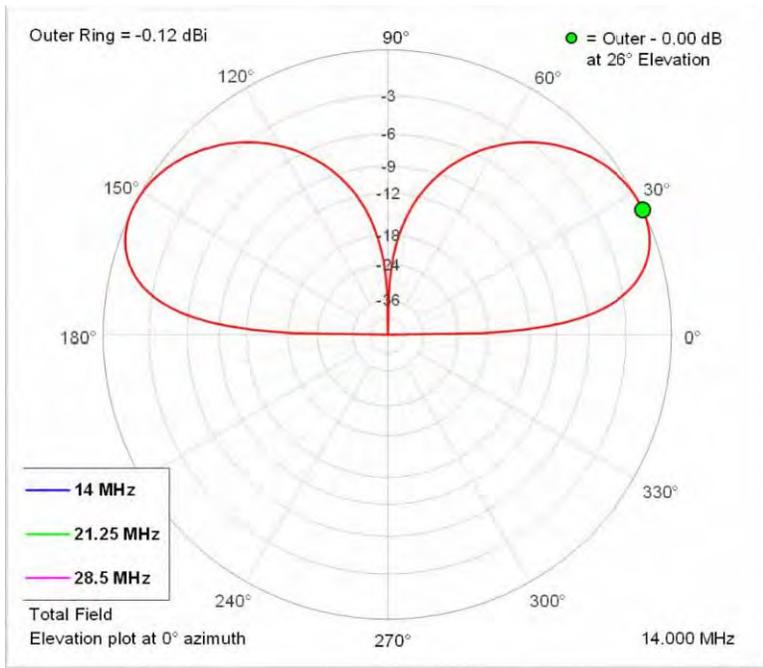


Figure 49 – Radiation pattern of the reference quarter-wave monopole.

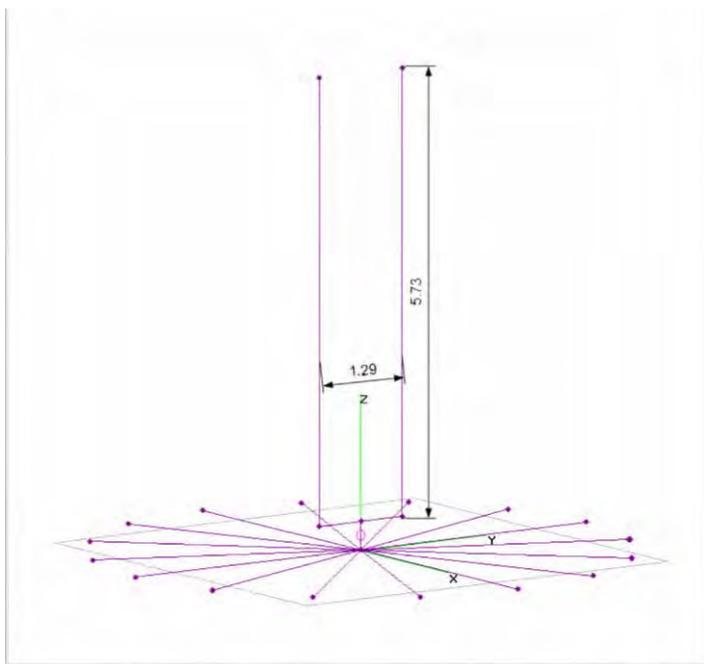


Figure 50 – 2-element BMA main dimensions.

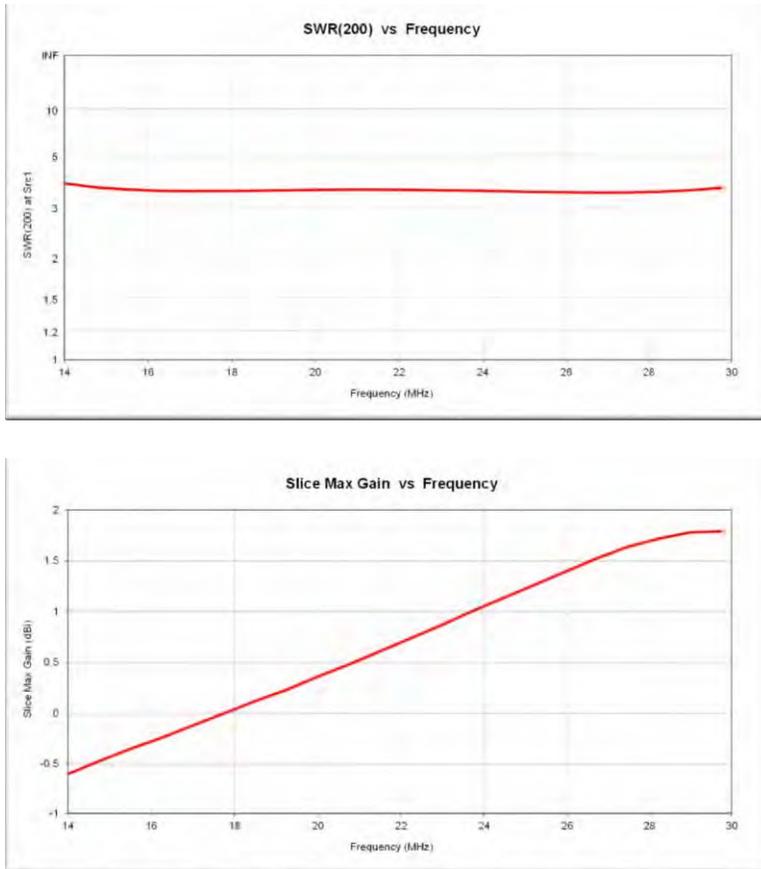


Figure 51 – Performance graphs of the 2-element BMA.

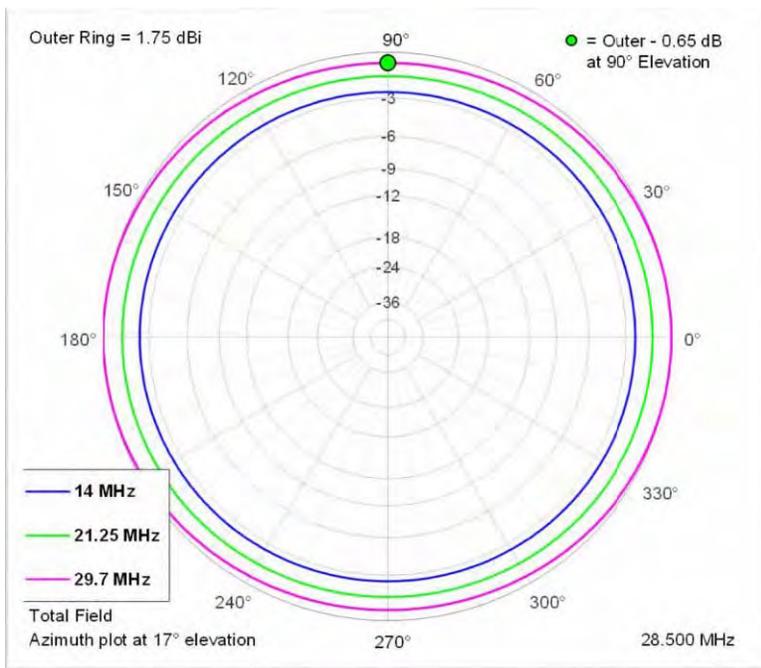
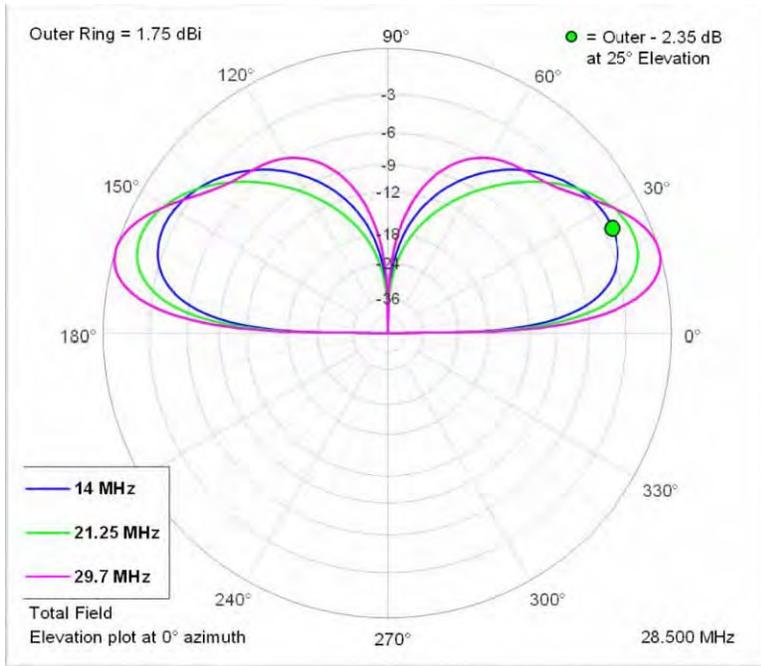


Figure 52 – 2-element BMA radiation patterns.

9.2 Converging Element Monopoles

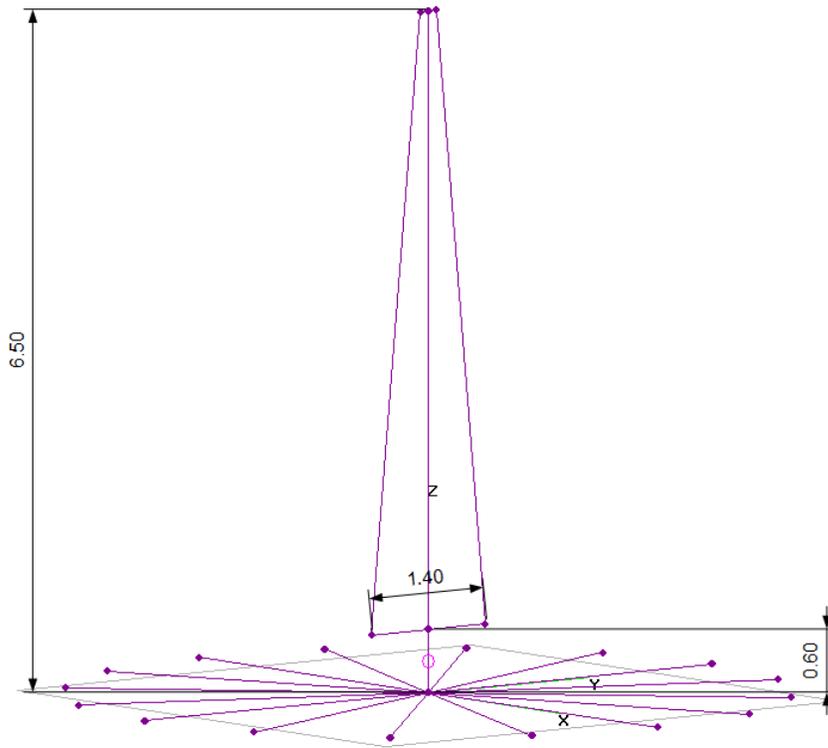
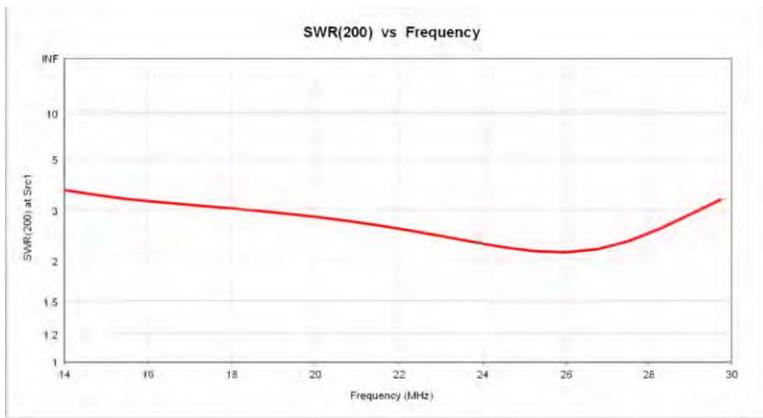


Figure 53 – View of the 3-element CEM



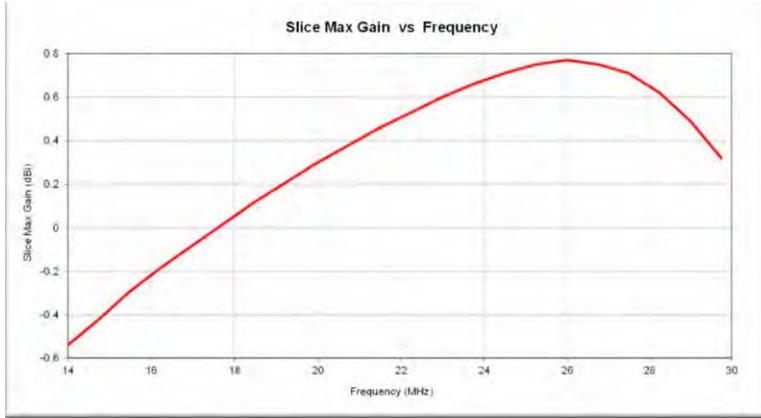


Figure 54 – SWR_{ANT} and gain graphs of the 3-element CEM.

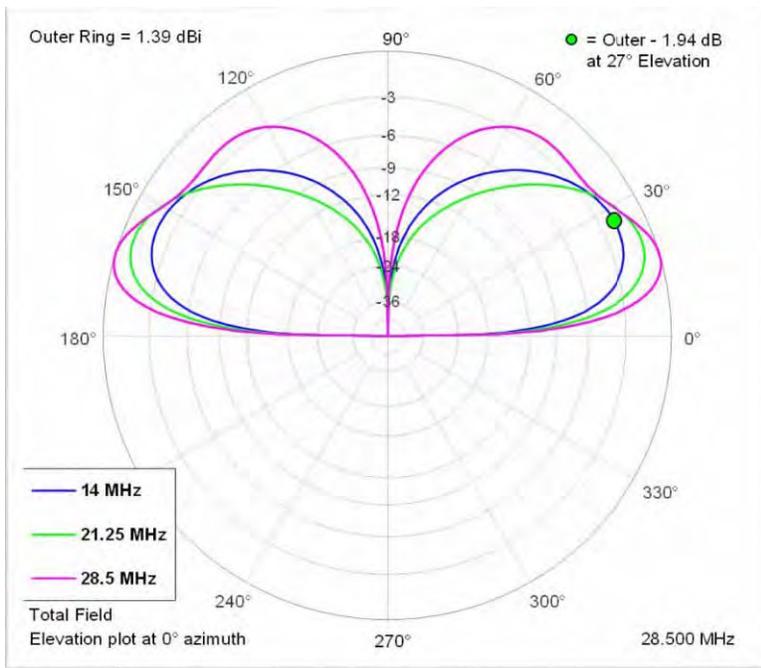


Figure 55 – Radiation patterns of the 3-element CEM.

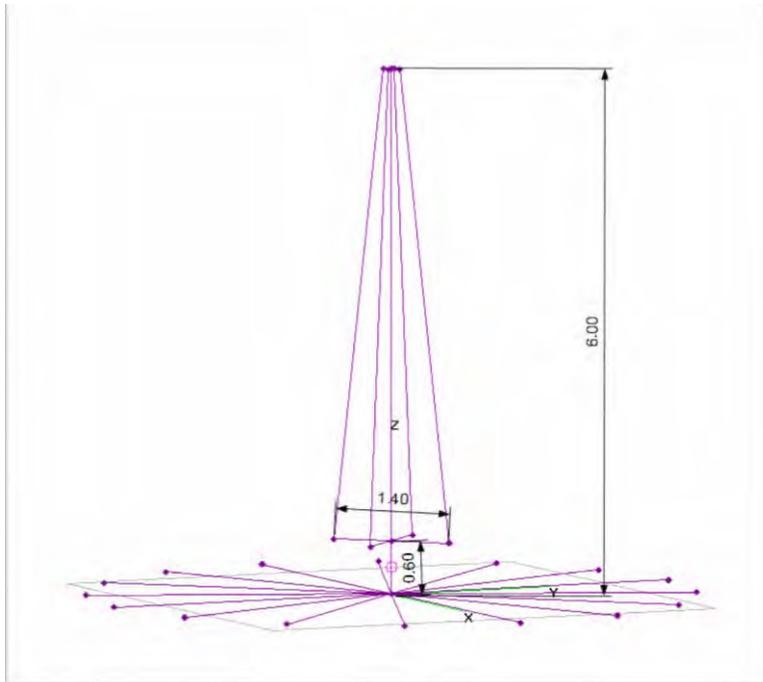


Figure 56 – View of the 5-element CEM.

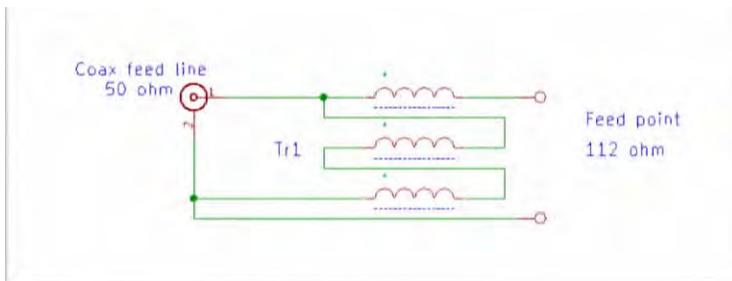


Figure 57 – The 2.25:1 matching transformer [Transmission Line Transformer Handbook, Amidon Associates Inc.]

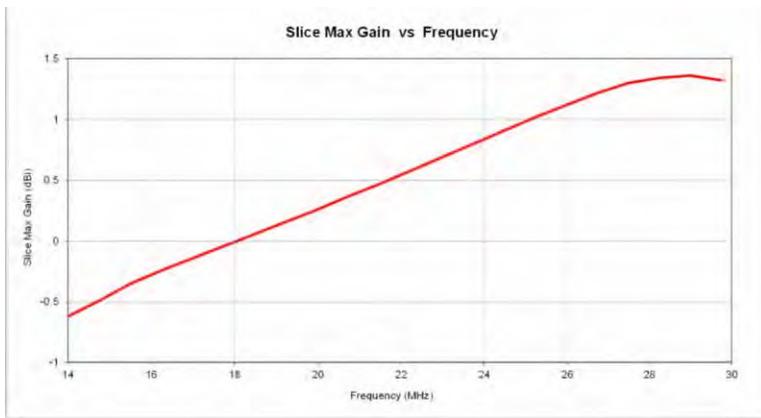
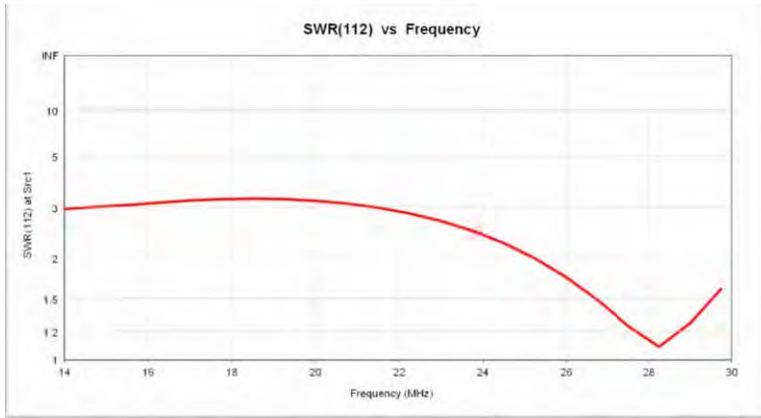


Figure 58 – The SWR_{ANT} and gain plots of the 5-element CEM.

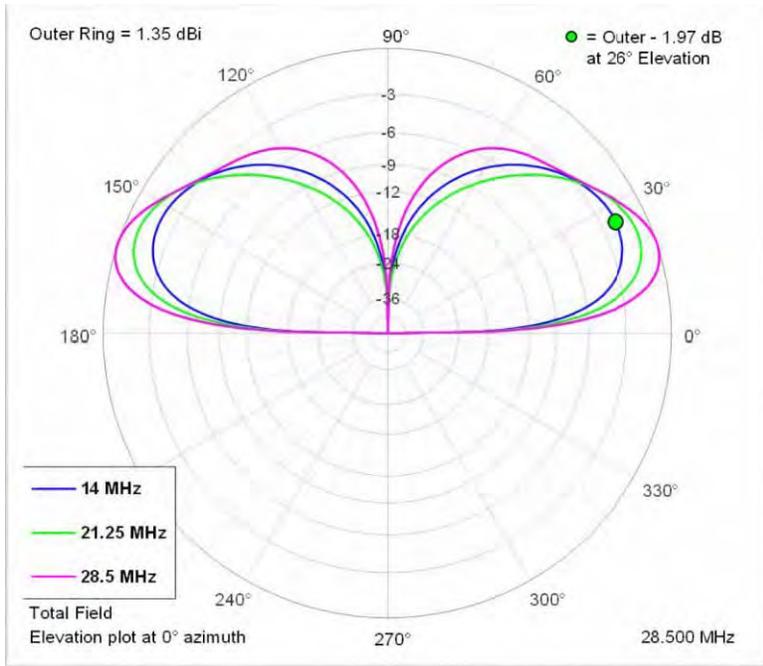


Figure 59 – Radiation patterns of the 5-element CEM.

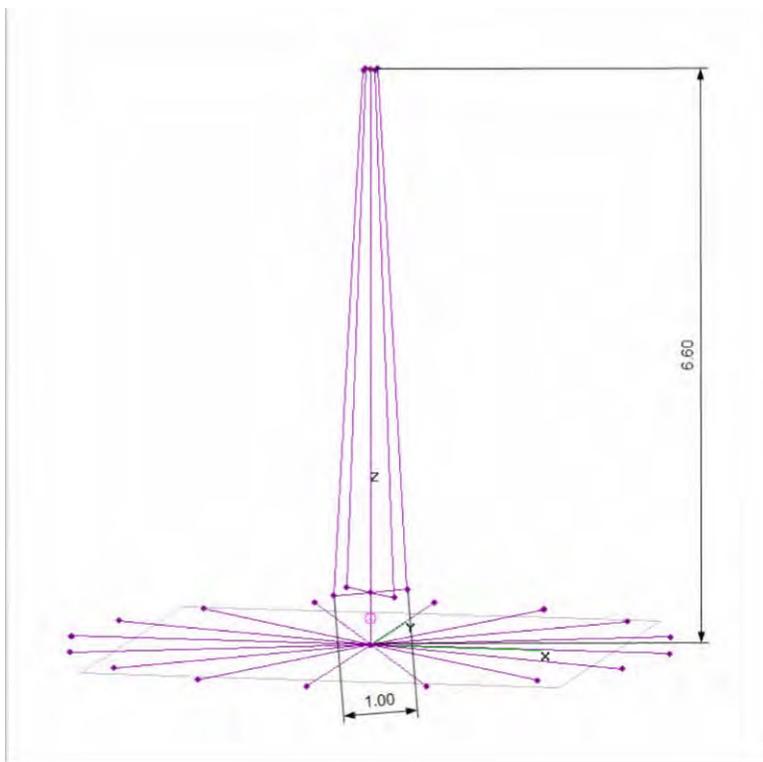


Figure 60 – View of the 5-element CEM XF.

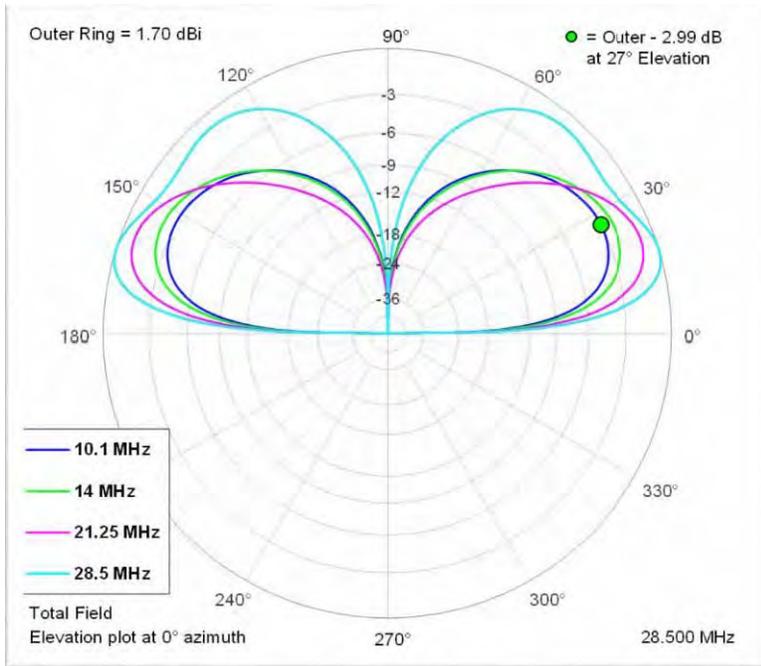
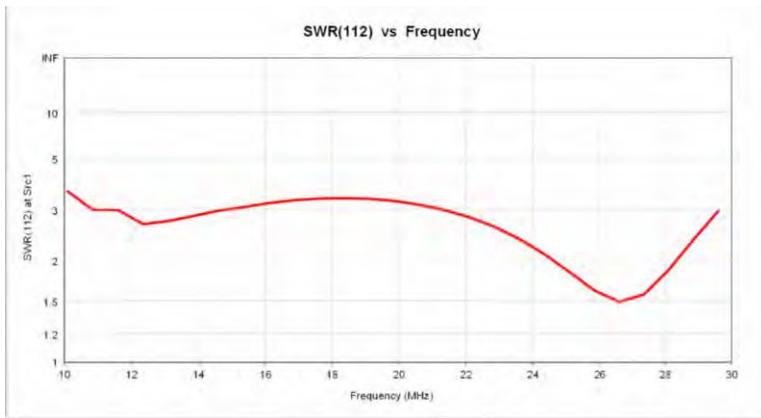


Figure 61 – Radiation patterns of the 5-element CEM XF.



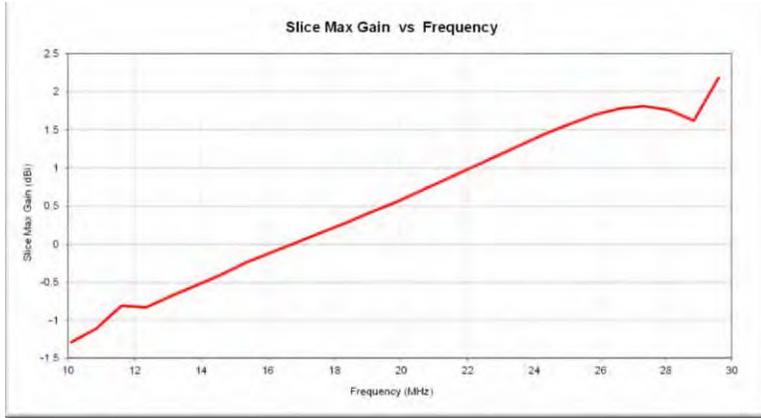


Figure 62 – SWR_{ANT} and gain plots for 5-element CEM XF.

9.3 Manta Ray

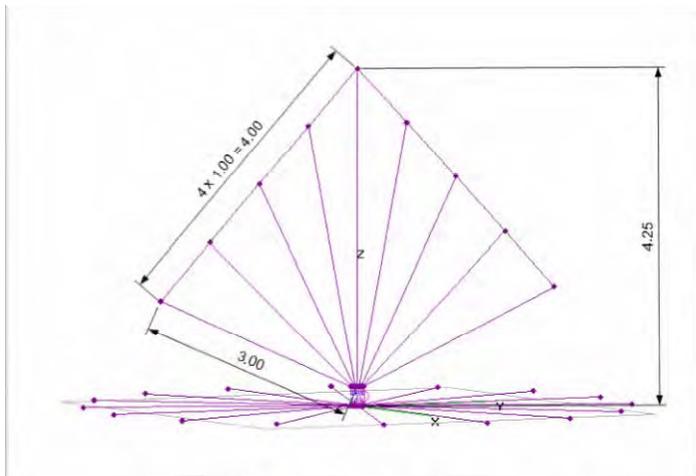


Figure 63 – The view and dimensions of Manta Ray.

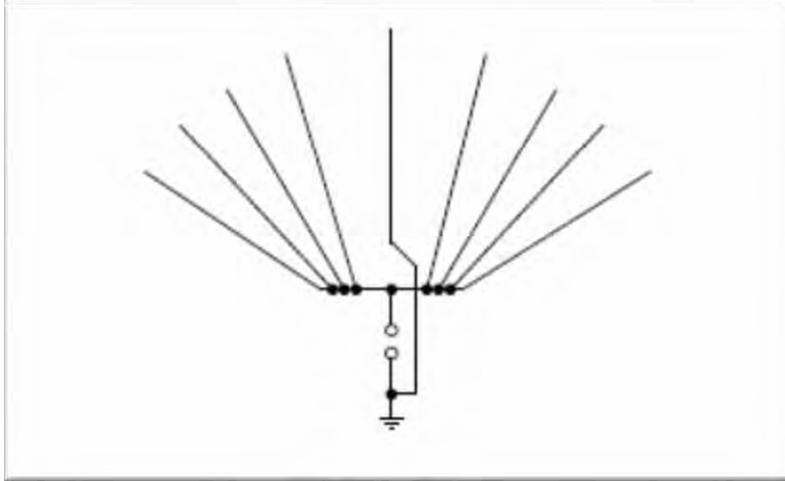


Figure 64 –Wire connections near the feed point of Manta Ray.

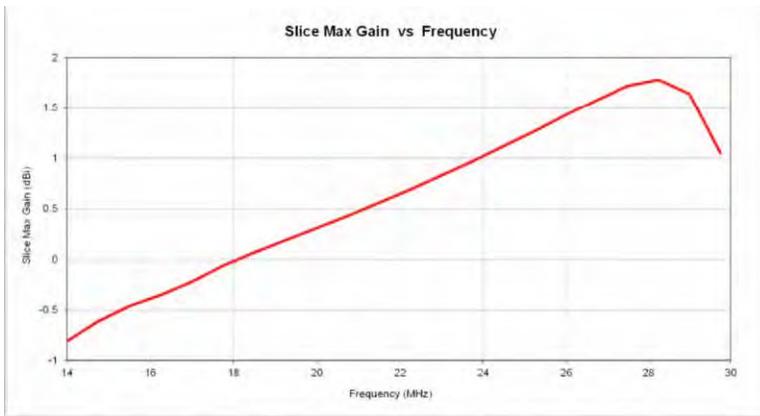
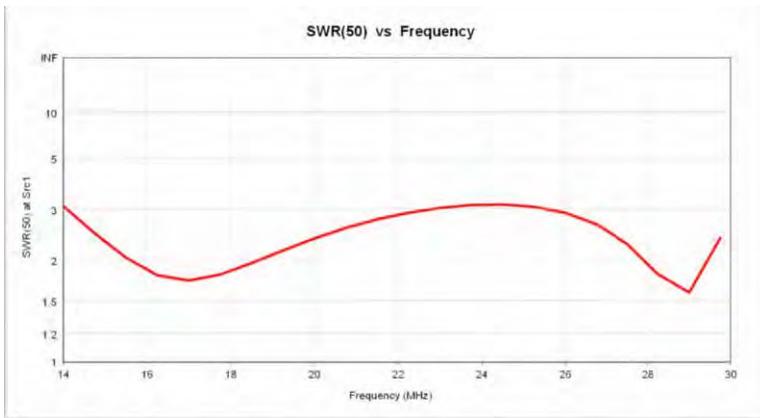


Figure 65 – SWR_{ANT} and gain of the Manta Ray.

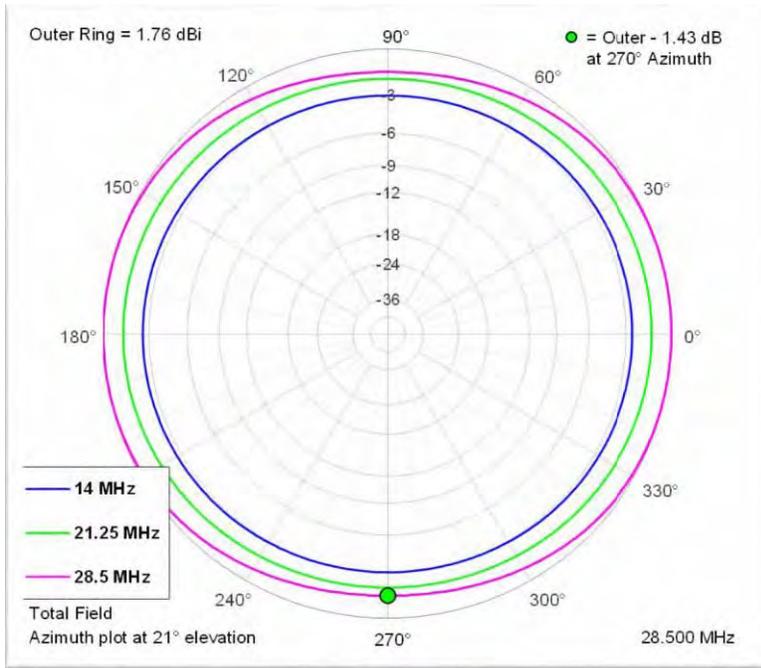
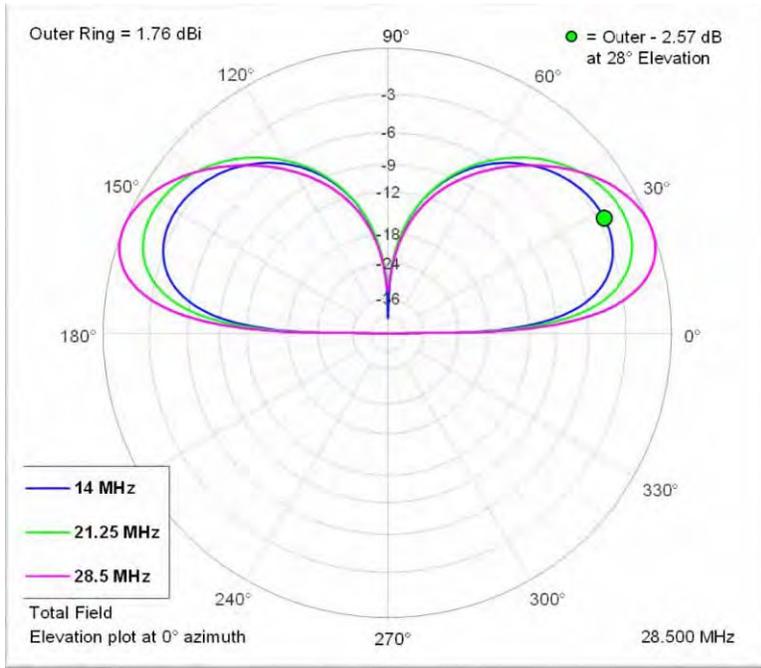


Figure 66 – The Manta Ray radiation patterns.



Figure 67 – The Manta Ray prototype built for testing.

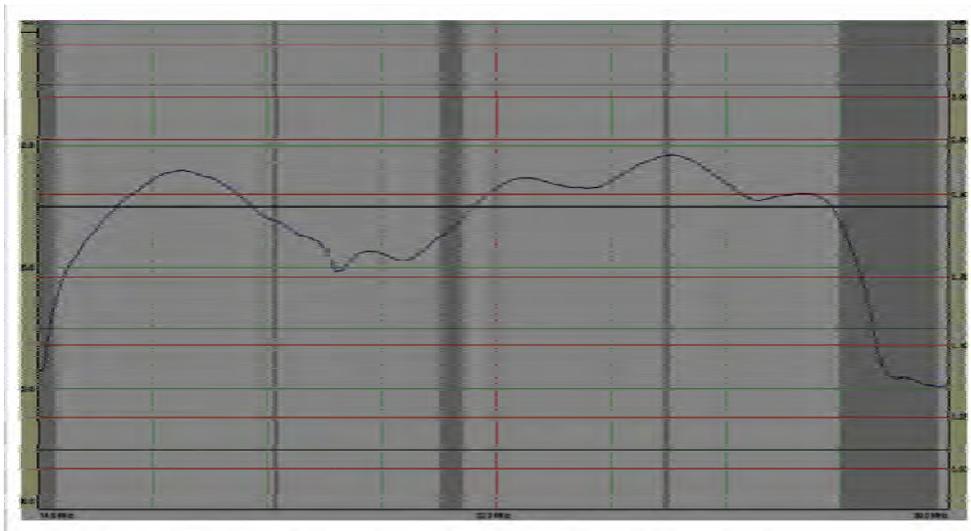


Figure 68 – The actual Manta Ray SWR_{TRX} when measured with RF choke and 35 meters of RG-58 coax stayed below 2:1 for any frequency. SWR is on the right hand scale.

9.4 5-Element CEM GP

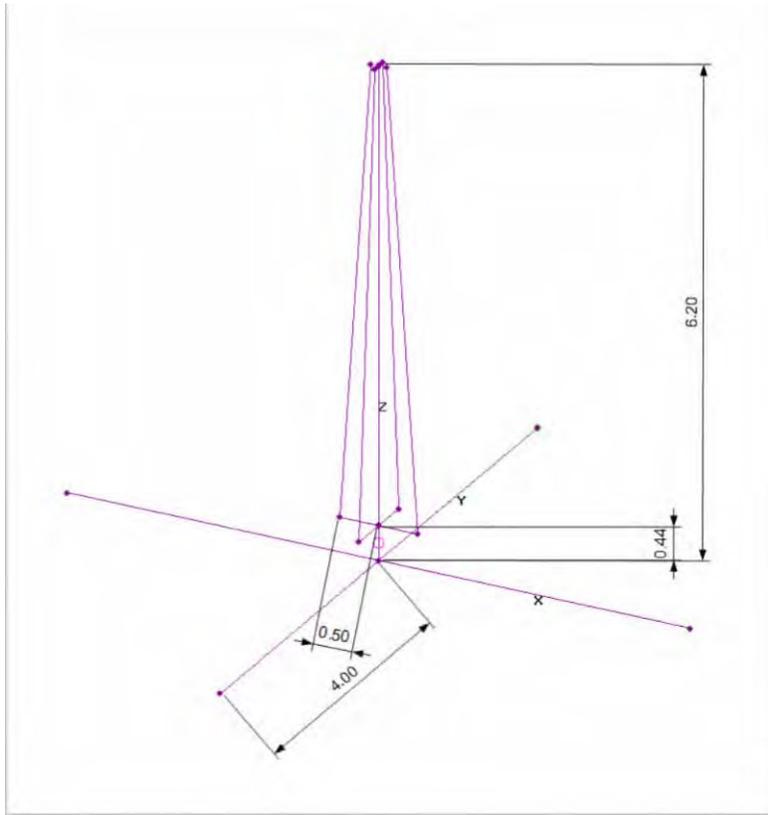
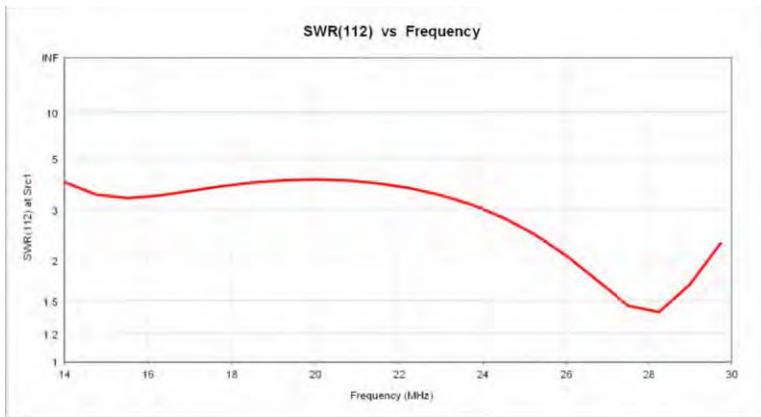


Figure 69 – View of the 5-element CEM GP.



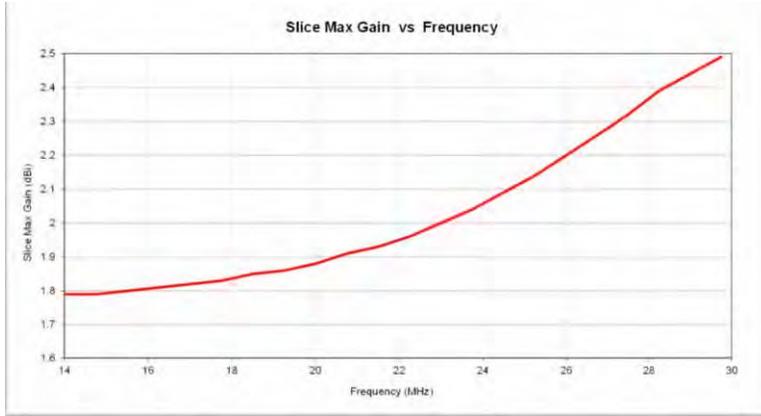


Figure 70 – SWR_{ANT} and gain plots of the 5-element CEM GP.

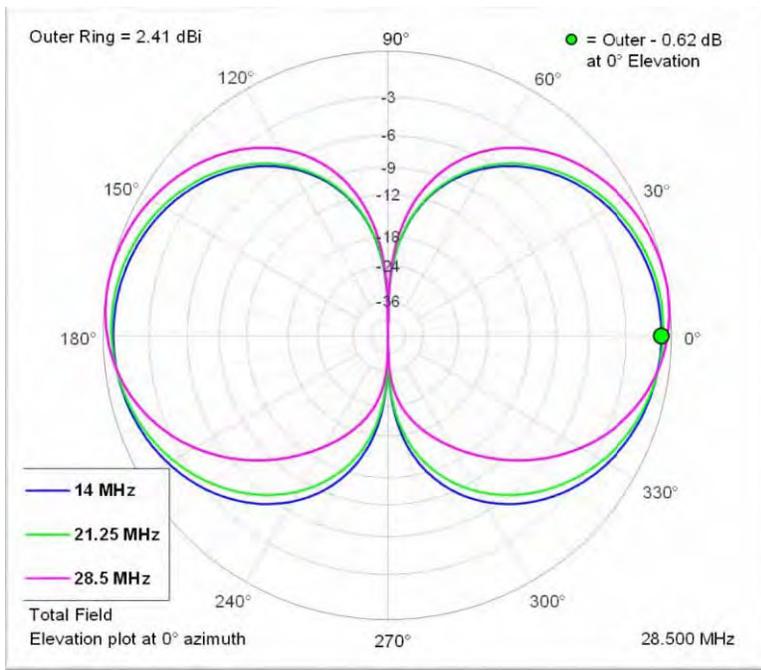


Figure 71 – The 5-element CEM GP radiation patterns in free space.

9.5 5-Element CEM GP Mk.2

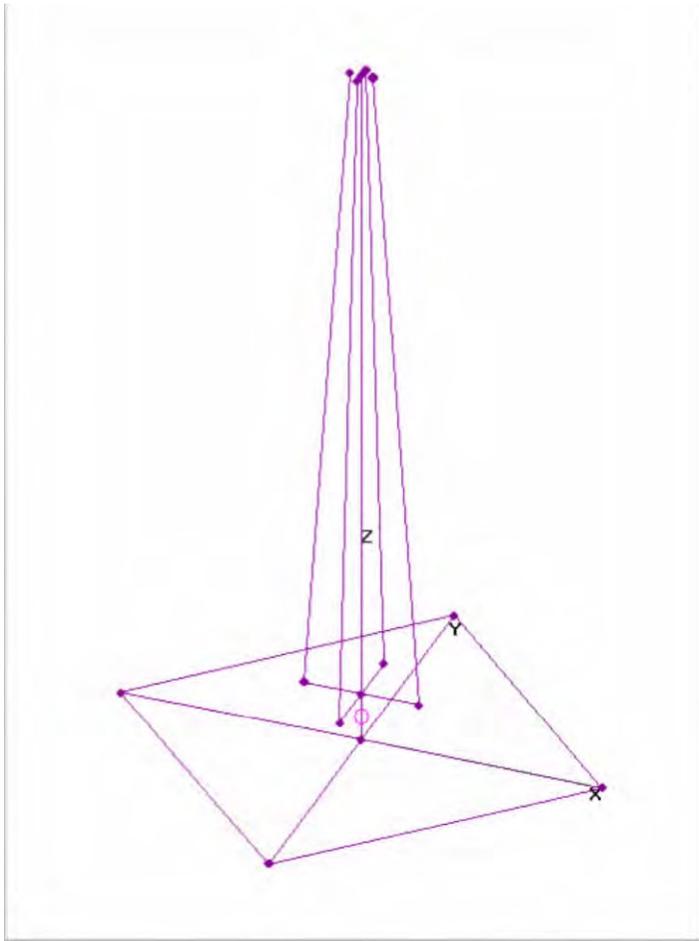


Figure 72 – The view of 5-Element CEM GP Mk.2.

