

## Parabolic Reflector Exercise

Your instructor has brought in two parabolic reflectors for you to examine and to measure. In this exercise, you will be required to make measurements of the parabolic reflectors; all dimensions are to be measured in centimeters (cm). You can do your work individually or with the other members of your team.

Organize all your work on a spreadsheet. Be sure to annotate your calculations and your graphs. Do all your calculations using the spreadsheet calculator functions and not with your calculator.

1. Calculate the focal length for the both G3RUH and keps parabolic antennas with their antenna feeds removed. You will need to measure the appropriate dimensions of the parabolic reflectors.
2. Measure the focal length when the instructor has reassembled the parabolic antennas. Compare your measured value with your calculated value by computing the percent error<sup>1</sup>.
3. Derive the equation of the parabola that describe the shapes of both the G3RUH and keps parabolic antennas.
4. Plot the curves of the two equations in a graph each in a separate sheet on your spreadsheet.
5. Plot by hand a full scale graph of either the G3RUH or the keps parabolic reflector on a large sheet of graph paper. Using a pair of scissors, cut out your parabola and compare it to the actual parabolic reflector. How close does it match? Can you explain any differences?
6. Calculate the length of the parabolic segment from the center of the G3RUH and the keps parabolic reflectors. Compare your calculated length

<sup>1</sup> percent error = (actual value – expected value)/(expected value) \* 100 %

with the radius of the aperture of both parabolic reflectors. Then, measure the length of the parabolic segment from the center of both parabolic reflectors. Compare your calculated values with your measured values.

7. Calculate the area of the aperture of both the G3RUH and the keps parabolic reflectors. Then, calculate the surface area of both parabolic reflectors. Compare the area of the aperture with the surface area of both both parabolic reflectors.
8. Calculate the gain  $G$  of both the G3RUH and the keps parabolic reflectors.
9. The patch antennas located at the focal points of the parabolic reflectors have the following beamwidths.

	<b>G3RUH</b>	<b>keps</b>
Beamwidth (-10 dB)	125 degrees	140 degrees

Calculate the corresponding  $f/D$  ratio for the two parabolic reflectors. Then, calculate the focal length using this ratio for the two parabolic reflectors. Compare your result with the results of steps 1. and 2.

Put your name and team number on your spreadsheets. Print your spreadsheets when you are done and show them to your instructor.