Measurement of Camber

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Measurement of Camber

The measurement of camber is easily misunderstood. Mathematically, camber is the measurement of the midpoint (m) of an arc across a specific chord length (c). On a given sample, the radius (r) is constant, so if the chord length changes, the midpoint (or camber) will also change. See the formulas and depiction below:

\[ r = \frac{m^2 + c^2/4}{2m} \]
\[ m = r - \sqrt{r^2 - c^2/4} \]
\[ c = 2\sqrt{2mr - m^2} \]

There is not a linear relationship when comparing camber measurements of different length samples. For example, if camber is measured as 1mm in 250mm, the same piece of tape that is 750mm long would not measure a camber of 3mm, but rather 9mm (the square of the multiplier).

Equivalent Midpoints (or camber) for various chord lengths are shown below. These equivalents are all based on the EIA 481 camber maximum of 1mm per 250mm.
By plotting the amount of camber for various chord lengths, we can see the exponential (non-linear) growth exhibited, as a sample gets longer.

\begin{table}[h]
\centering
\begin{tabular}{|c|c|c|}
\hline
\textbf{Input} & \textbf{Measured} & \textbf{Equivalent} \\
& Midpoint & Chord Length \\
\hline
\textbf{Output} & \textbf{Equivalent} & \textbf{Based on Midpoint Chord Length} \\
\hline
Radius & 1.00 & 250 \\
7813 & 16.0 & 1000 \\
23.8 & 1219 \\
6.0 & 610 \\
\hline
\end{tabular}
\end{table}

All dimensions in mm

The following is a pictorial representation of the camber measurement of an arc with different chord lengths. The radius of the arc is constant, but as the chord length grows, the measured camber grows at a faster rate. Doubling the chord length increases the camber measurement by 4 times (2 squared)