worksheet 7.1 page 1

$$data := \begin{pmatrix} 0.01 & 2.2 & 50 \\ 0.02 & 2.6 & 90 \\ 0.05 & 3.4 & 146 \\ 0.1 & 3.8 & 170 \\ 0.2 & 3.95 & 177 \\ 0.5 & 3.95 & 180 \\ 1 & 4 & 182 \\ 2 & 4 & 180 \\ 5 & 3.9 & 172 \\ 10 & 3.8 & 158 \\ 15 & 3.6 & 140 \\ 19 & 3.45 & 124 \end{pmatrix}$$

column 1: Frequency, MHz
column 2: Peak to peak voltage on channel 1, V
column 3: Peak-to-peak voltage on channel 2, mV

$s := 1 .. rows(data)$

$f_s := data_{s,1} \cdot 10^6$

$Vch1_s := data_{s,2}$ $\quad Vch2_s := data_{s,3} \cdot 10^{-3}$

$TFt_s := \frac{Vch2_s}{Vch1_s}$ $\quad Ref_s := \frac{max(TFt)}{\sqrt{2}}$

Figure 7.1.4 Using test results to calculate the transfer function (TFt)

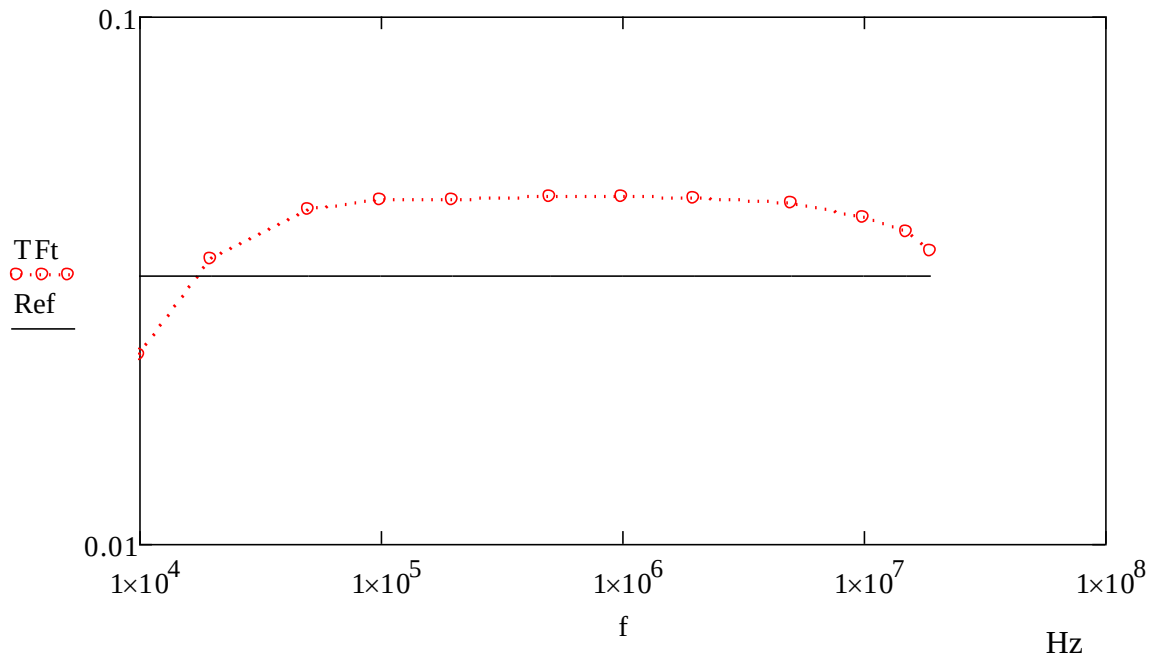

Figure 7.1.5 Transfer function of voltage transformer

worksheet 7.1 page 2

$$y1 := \log\left(10 \cdot 10^{3}\right) \qquad y2 := \log\left(20 \cdot 10^{6}\right) \qquad m := \frac{y2 - y1}{100}$$

$$i := 1 .. 101 \qquad F_i := \left| \begin{array}{l} y \leftarrow m \cdot (i - 1) + y1 \\ 10^{y} \end{array} \right.$$

Figure 7.1.7 Calculating a set of equally spaced frequencies over a logarithmic scale.

$R1 := 16.5 \ \Omega$ $\qquad R2 := \frac{68 \cdot 240}{68 + 240} = 52.987 \ \Omega$

$R3 := 5100 \ \Omega$ $\qquad R4 := 5000 \ \Omega$

$Lp := 64 \cdot 10^{-6} \ H$ $\qquad L1 := 6.0 \cdot 10^{-6} \ H$ $\qquad L2 := Lp - L1 = 5.8 \times 10^{-5} \ H$

$V1 := 1 \ V$ $\qquad V2 := \frac{50 + R1}{50} \cdot V1 = 1.33$

$Turns := 10$ $\qquad C1 := 520 \cdot 10^{-12} \ F$

$TFm_i :=$

$\omega \leftarrow 2 \cdot \pi \cdot F_i$

$Y2 \leftarrow \frac{1}{j \cdot \omega \cdot L2} + \frac{1}{R3 + R4}$

$Z2 \leftarrow \frac{1}{Y2}$

$Y1 \leftarrow \frac{1}{R2} + \frac{1}{Z2 + j \cdot \omega \cdot L2} + j \cdot \omega \cdot C1$

$Z1 \leftarrow \frac{1}{Y1}$

$V3 \leftarrow \frac{Z1}{Z1 + R1} \cdot V2$

$V4 \leftarrow \frac{Z2}{Z2 + j \cdot \omega \cdot L1} \cdot V3$

$V5 \leftarrow \frac{R4}{R3 + R4} \cdot V4$

$\frac{|V5|}{Turns}$

Figure 7.1.8 Calculating the transfer function of the model.

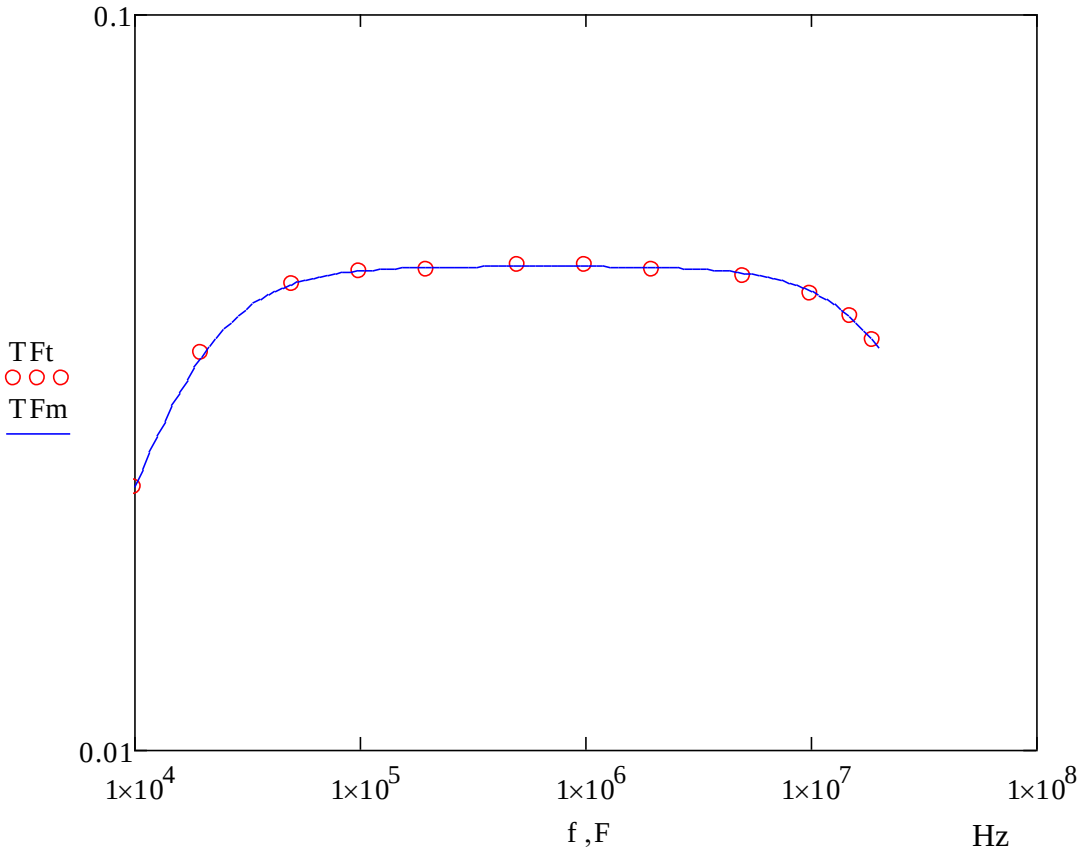

Figure 7.1.9 Transfer functions derived from testing and modelling