Fair-Rite #31 vs. #43

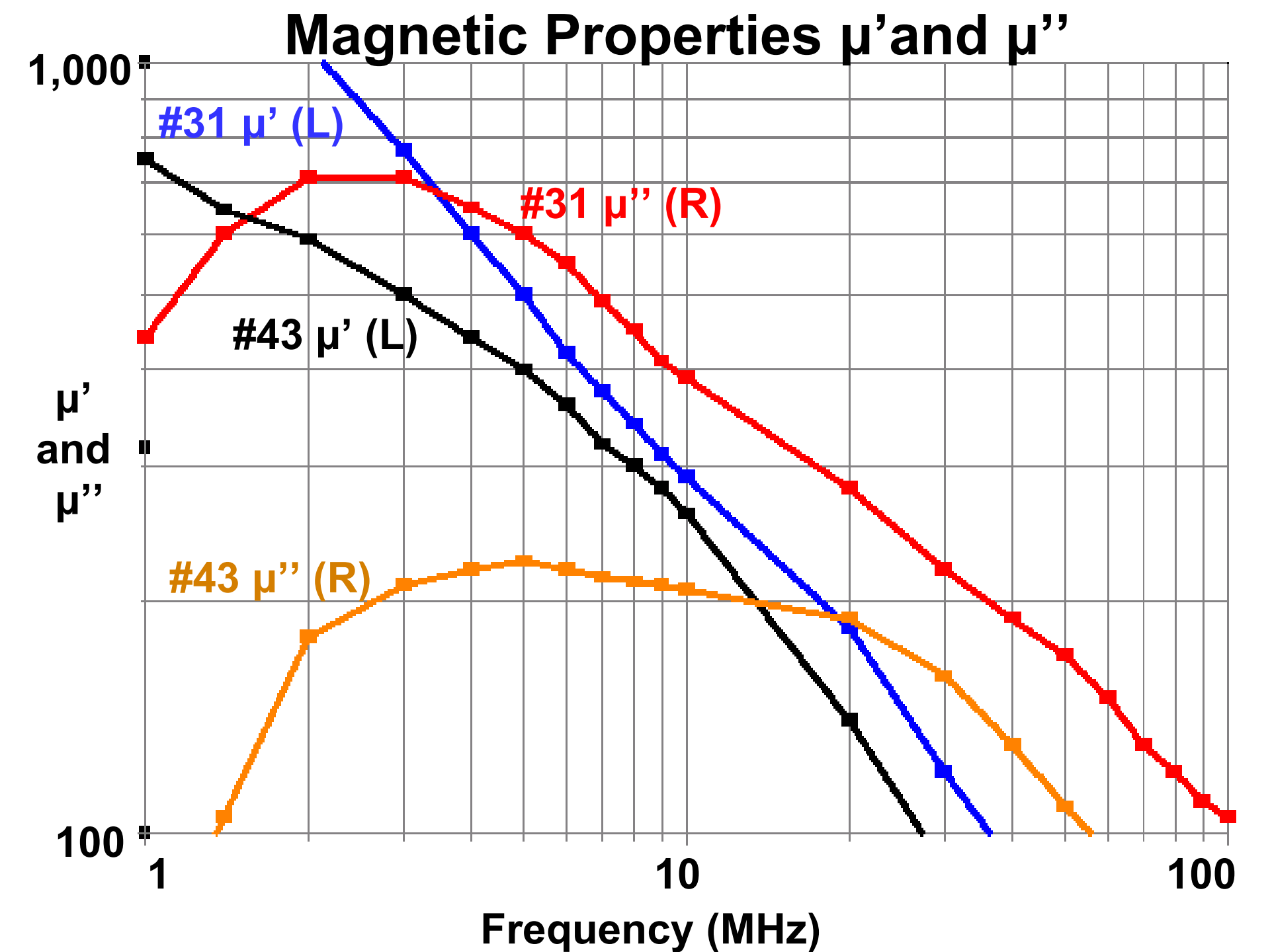
- The first two slides are re-plots of μ' and μ'' from Fair-Rite data sheets from the online pdf catalog
- The remaining slides are measured data for chokes wound with RG58 on several #31 and #43 cores, illustrating
  - Differences between #31 and #43 chokes
  - The effect of component tolerances
- S21 of chokes was measured in series with VNWA output and input, from which the VNWA software computed Zmag (orange), Rs (magenta), and Xs (black). The blue curve is S21.
  - The bottom of the graph is zero for Zmag and Rs (1,000 Ω/div)
  - The center of the plot is zero for Xs(1,000 Ω/div)
  - The top of the graph is zero for S21 (6dB/div)
- The plots are averaged to minimize noise in the measurement for low values of S21
  - This causes the "flat" spots at the frequency limits

Fair-Rite #31 vs. #43

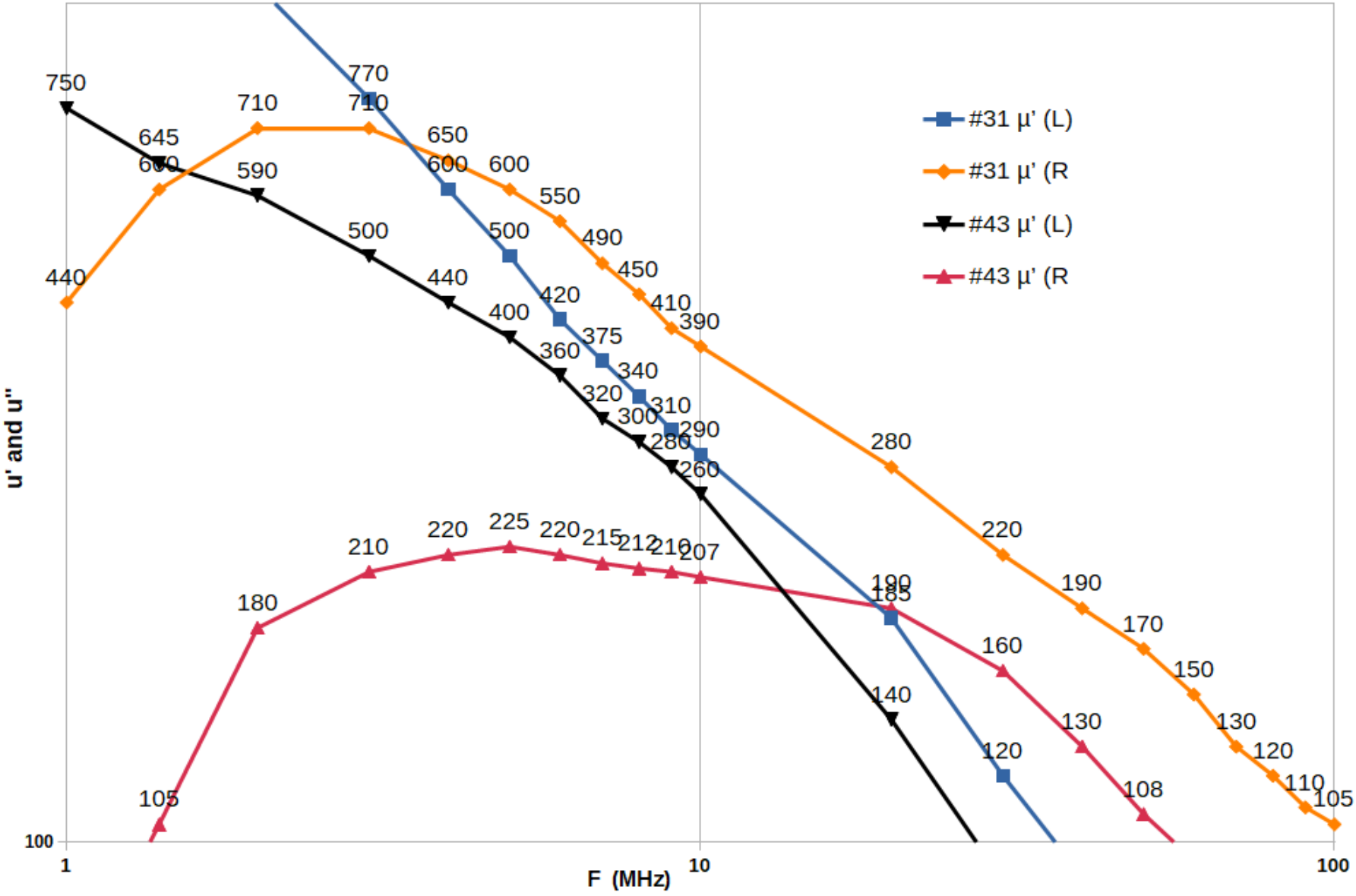
- It is the loss component that provides the most effective suppression
- The circuit into which the choke is inserted has some impedance Rs + jXs by virtue of its electrical length and termination
- Current is reduced by the sum of the impedances of that circuit and the choke
- The inductive or capacitive Xs values can add or cancel, but the Rs always adds, so it always reduces the current
- Resonance is controlled by choice of core, number of turns, and winding style

Fair-Rite #31 vs. #43

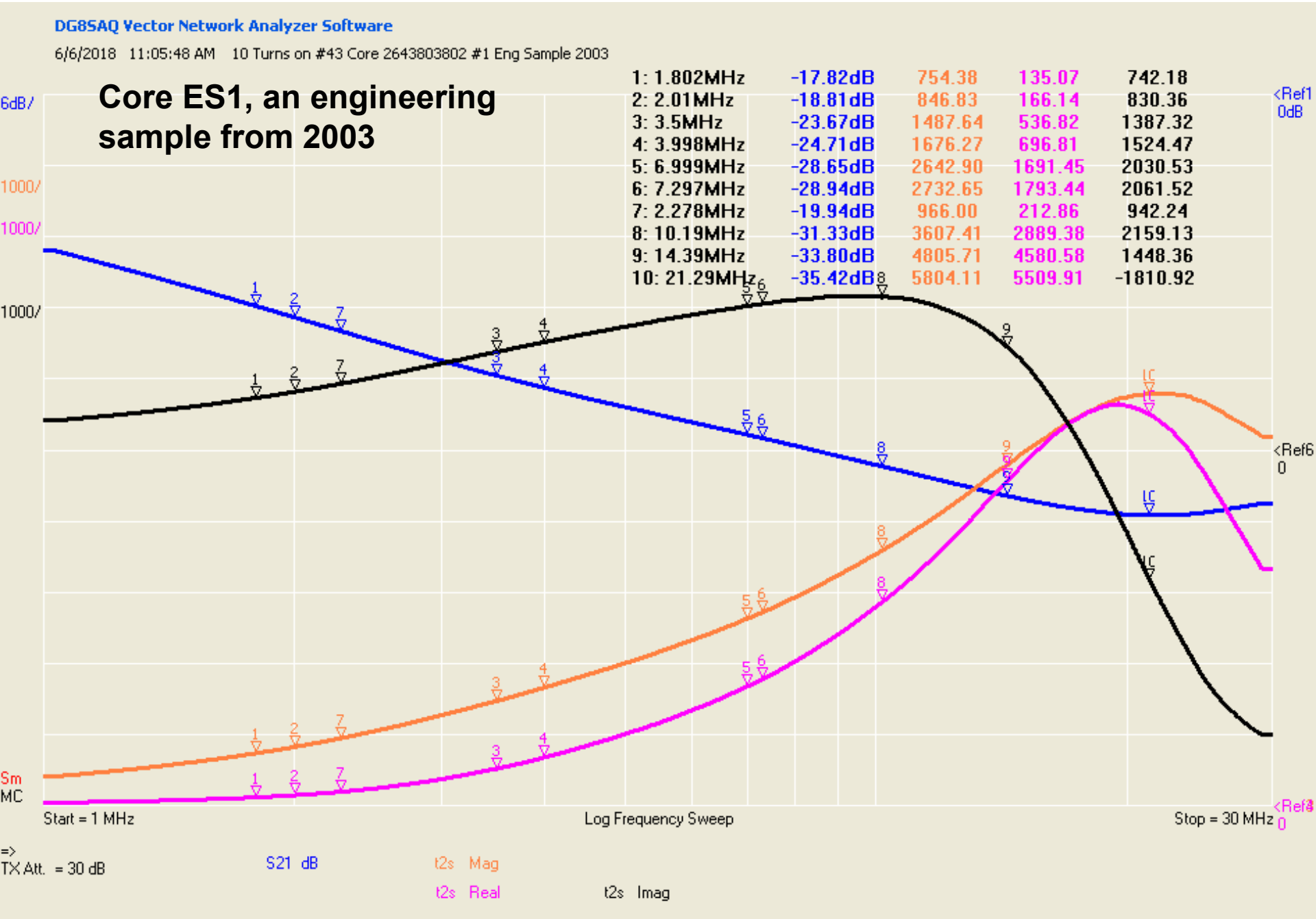
- #43 is a NiZn ferrite, and has only the circuit resonance formed by the winding
- #31 is a MnZn ferrite, and has both the circuit resonance and a dimensional resonance that is the result of standing waves in the cross-section of the core
- The dimensional resonance is fairly high-Q
  - Frequency does not vary with turns or winding style
  - Impedance increases as the square of the turns
  - It can combine with the circuit resonance to provide the broader impedance curves shown in the #31 plots
  - Turns can be varied to provide high Rs values over a frequency range of 4:1 between about 3 and 21 MHz


Magnetic Properties μ'and μ''
1,000
100
μ' and μ''
#31 μ' (L)
#31 μ'' (R)
#43 μ' (L)
#43 μ'' (R)
1
10
100
Frequency (MHz)

Fair-Rite #31 vs. #43



10 Turns RG58 on 2.4-in o.d. Fair-Rite #43 core



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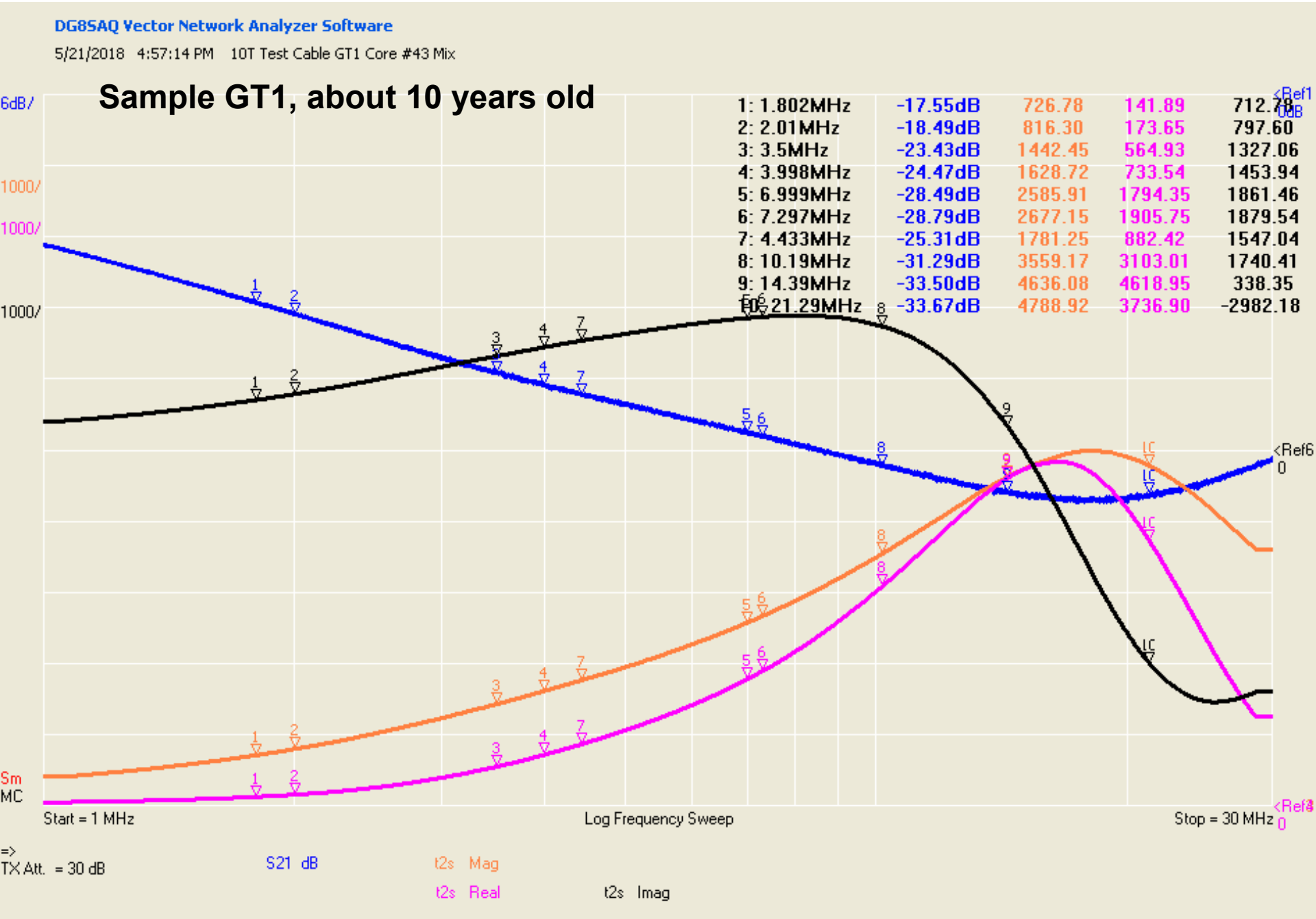
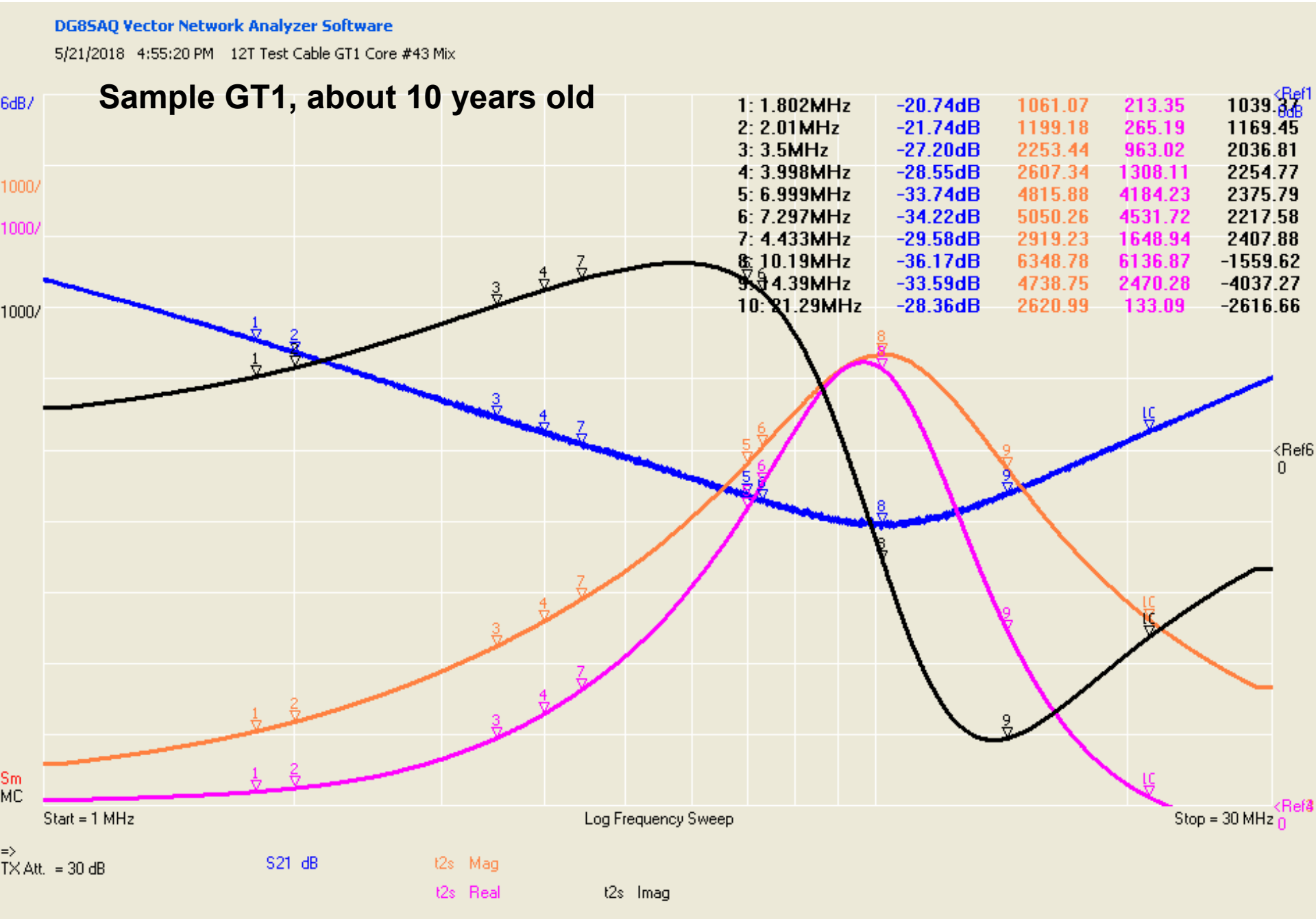
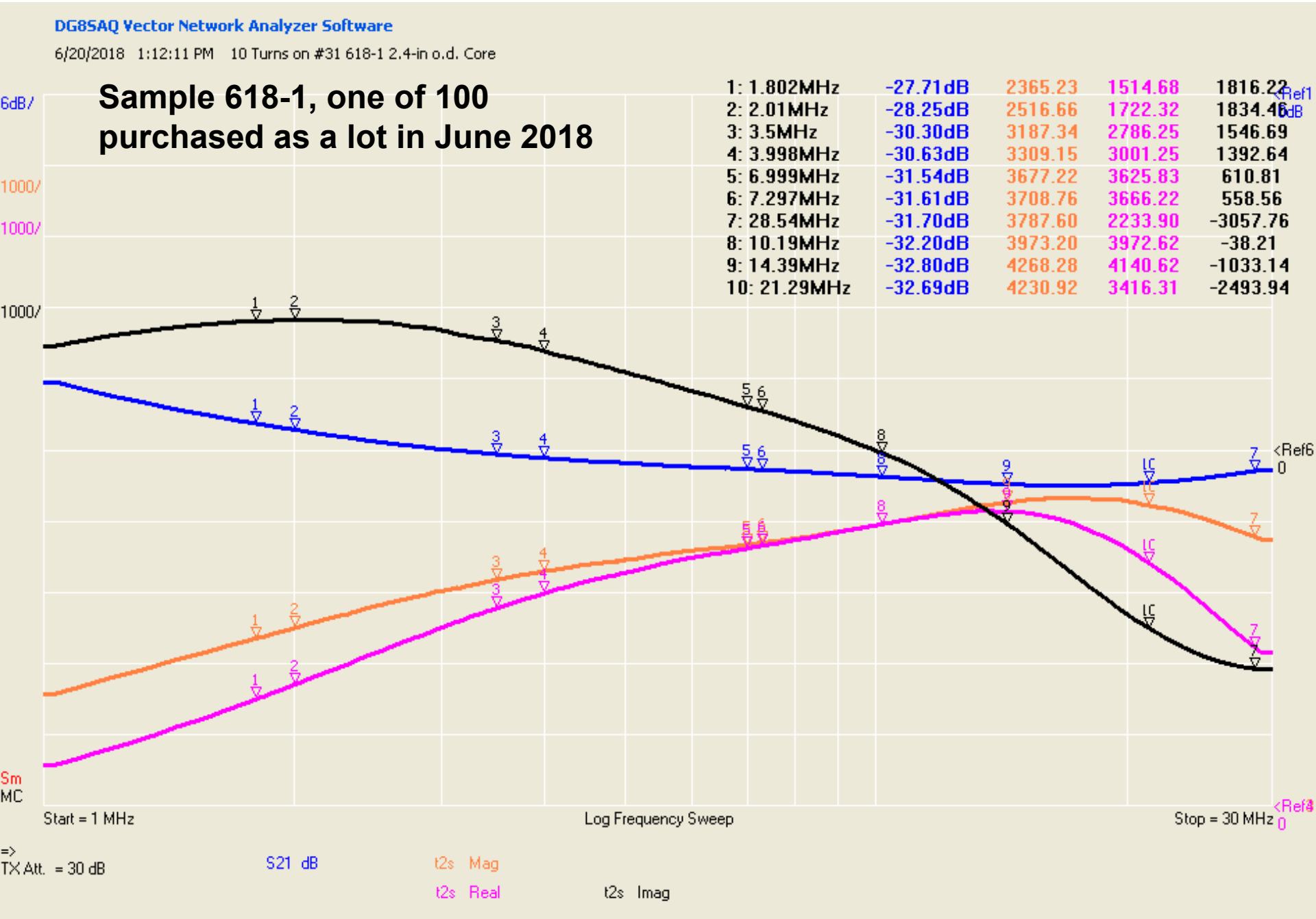


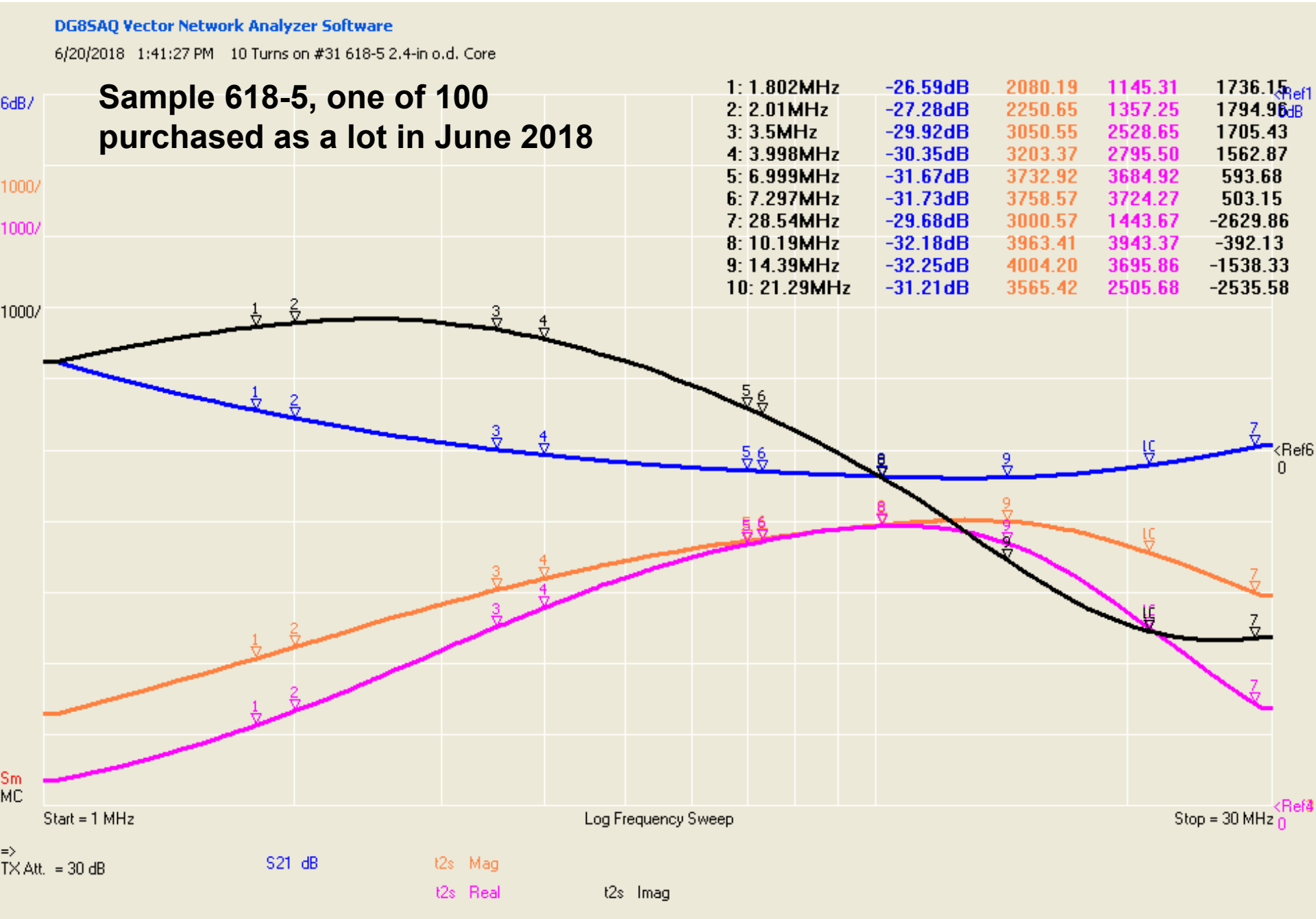
12 Turns RG58 on 2.4-in o.d. Fair-Rite #43 core



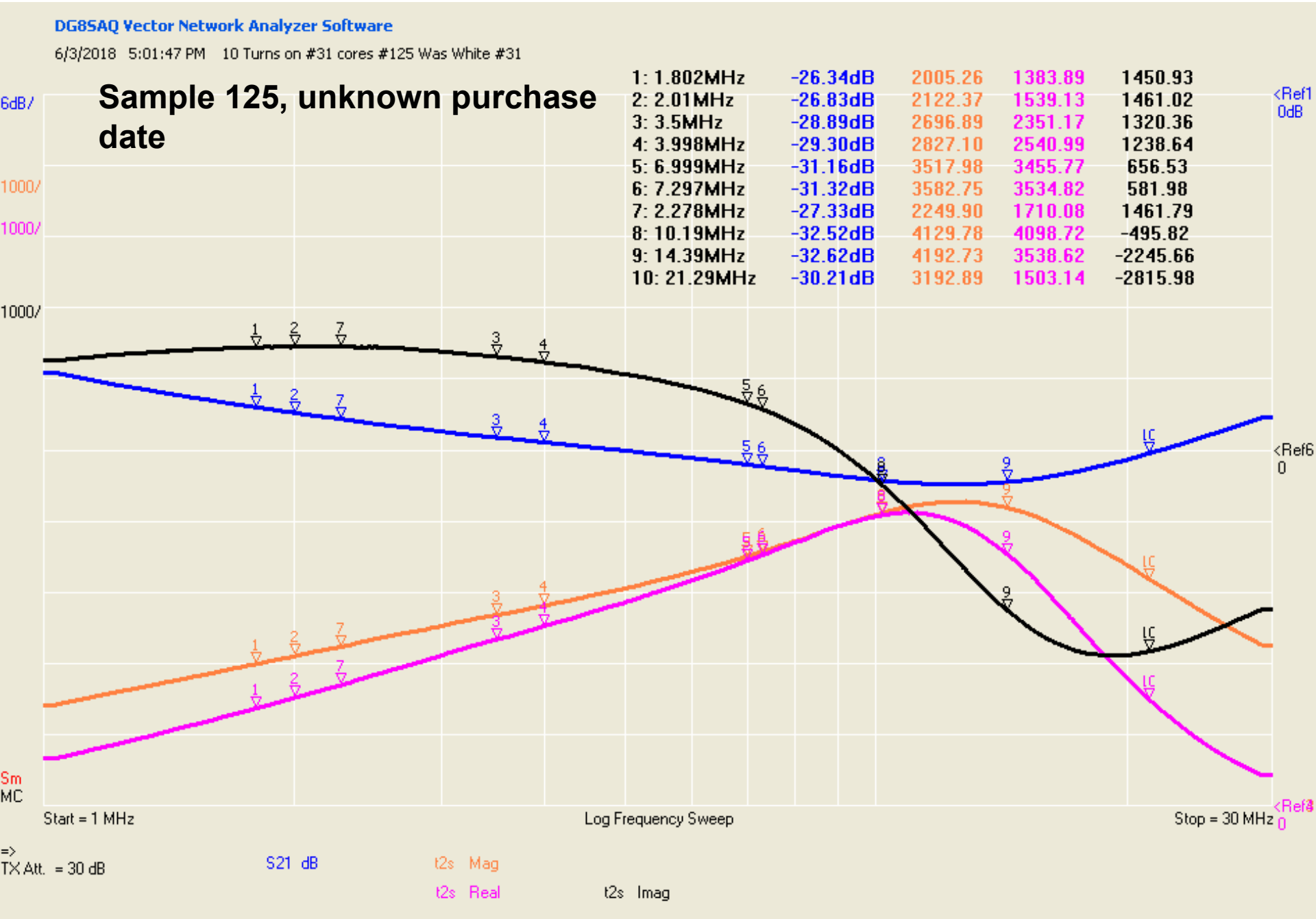
10 Turns RG58 on 2.4-in o.d. Fair-Rite #31 core



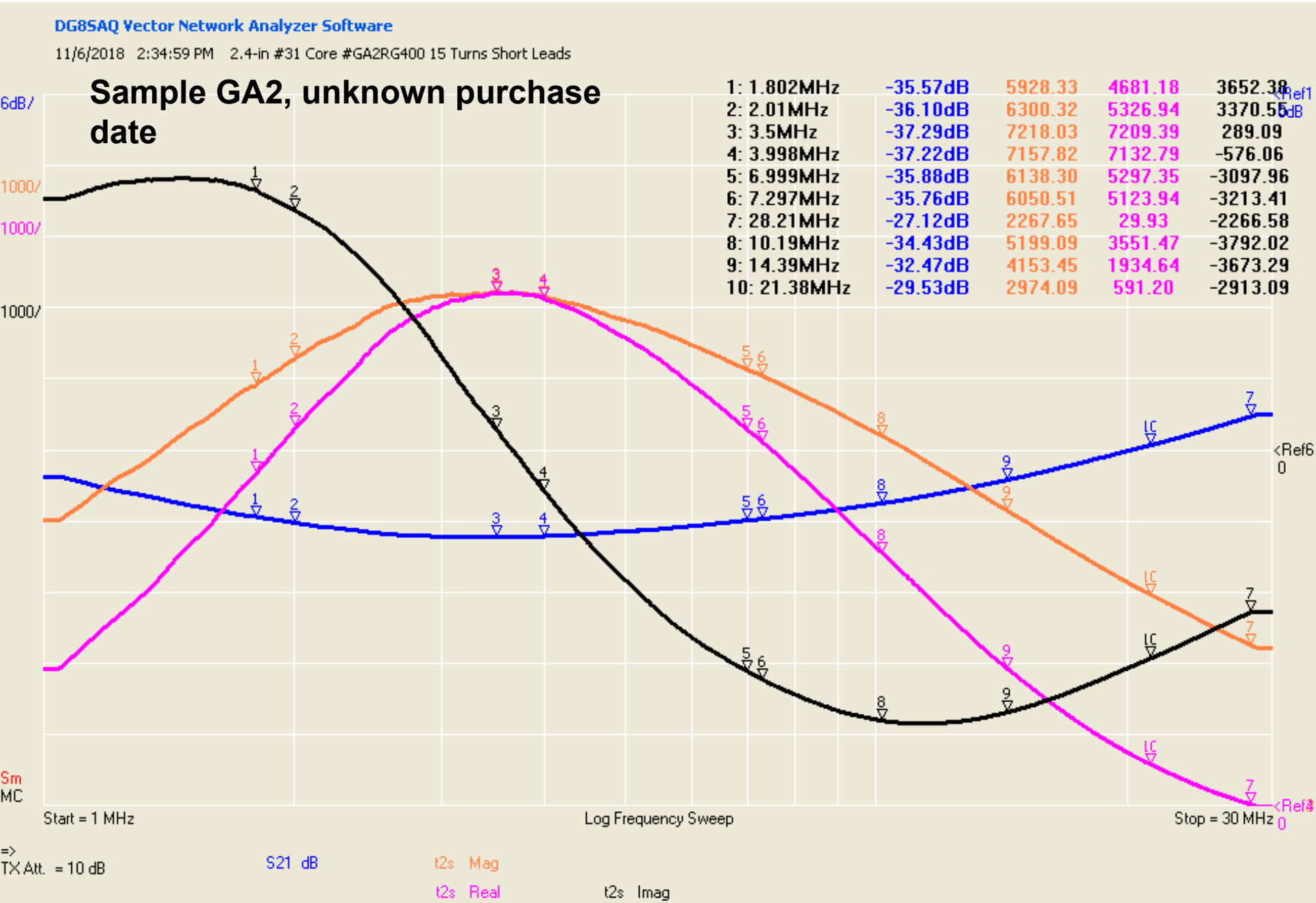
10 Turns RG58 on 2.4-in o.d. Fair-Rite #31 core



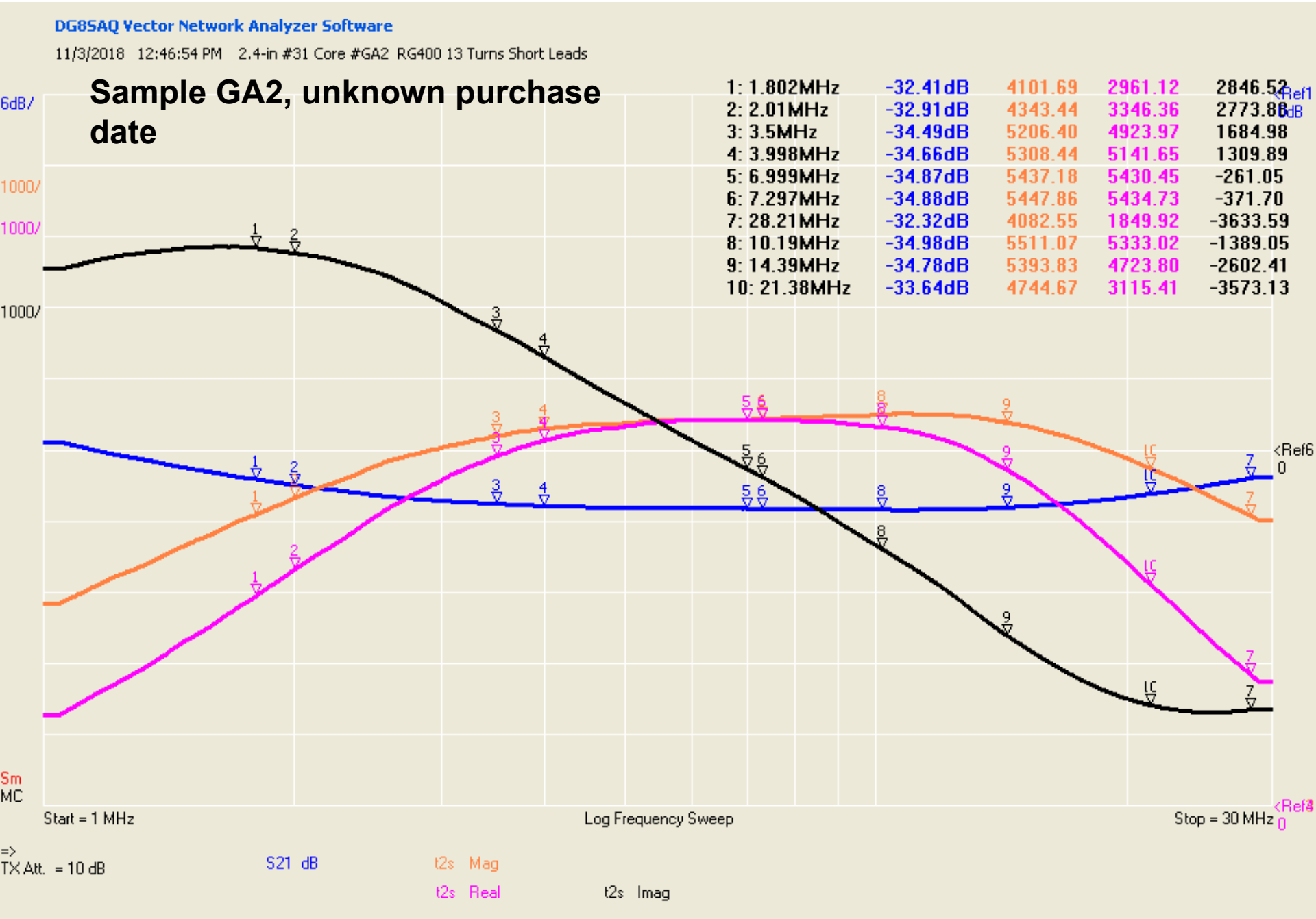
10 Turns RG58 on 2.4-in o.d. Fair-Rite #31 core



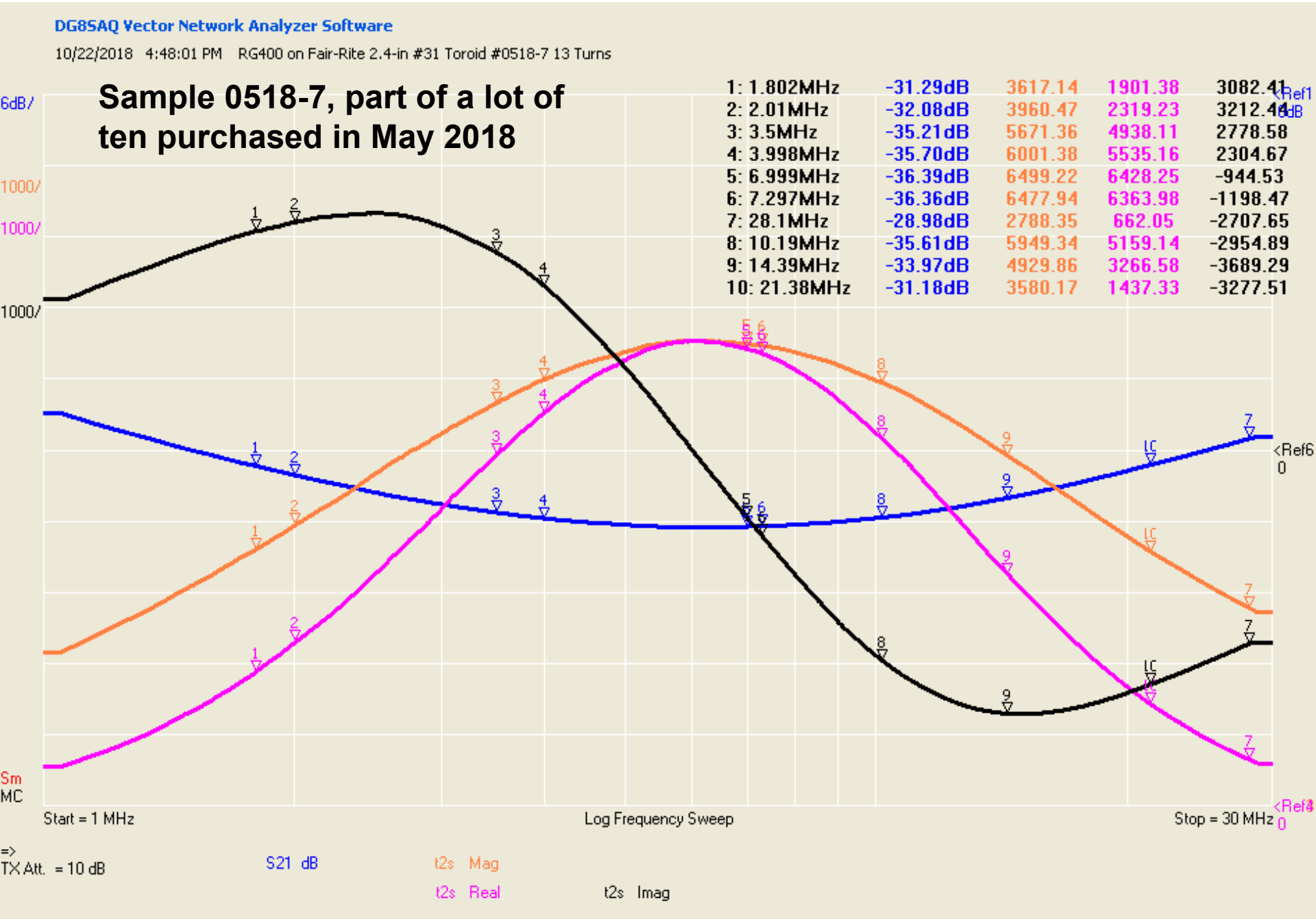
15 Turns RG400 on 2.4-in o.d. Fair-Rite #31 core



13 Turns RG400 on 2.4-in o.d. Fair-Rite #31 core



13 Turns 400 on 2.4-in o.d. Fair-Rite #31 core



21 Turns 400 on 2.4-in o.d. Fair-Rite #31 core