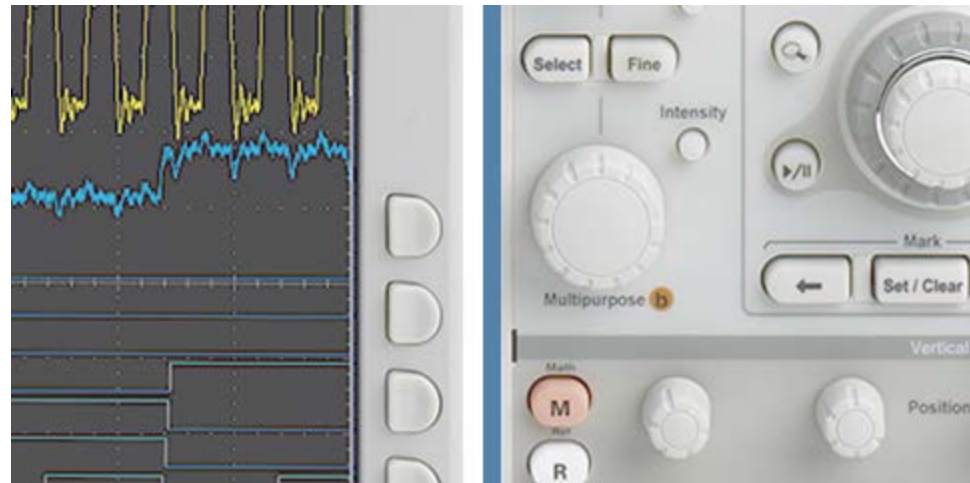


# S-parameters extrapolation to DC: Performance of extrapolation

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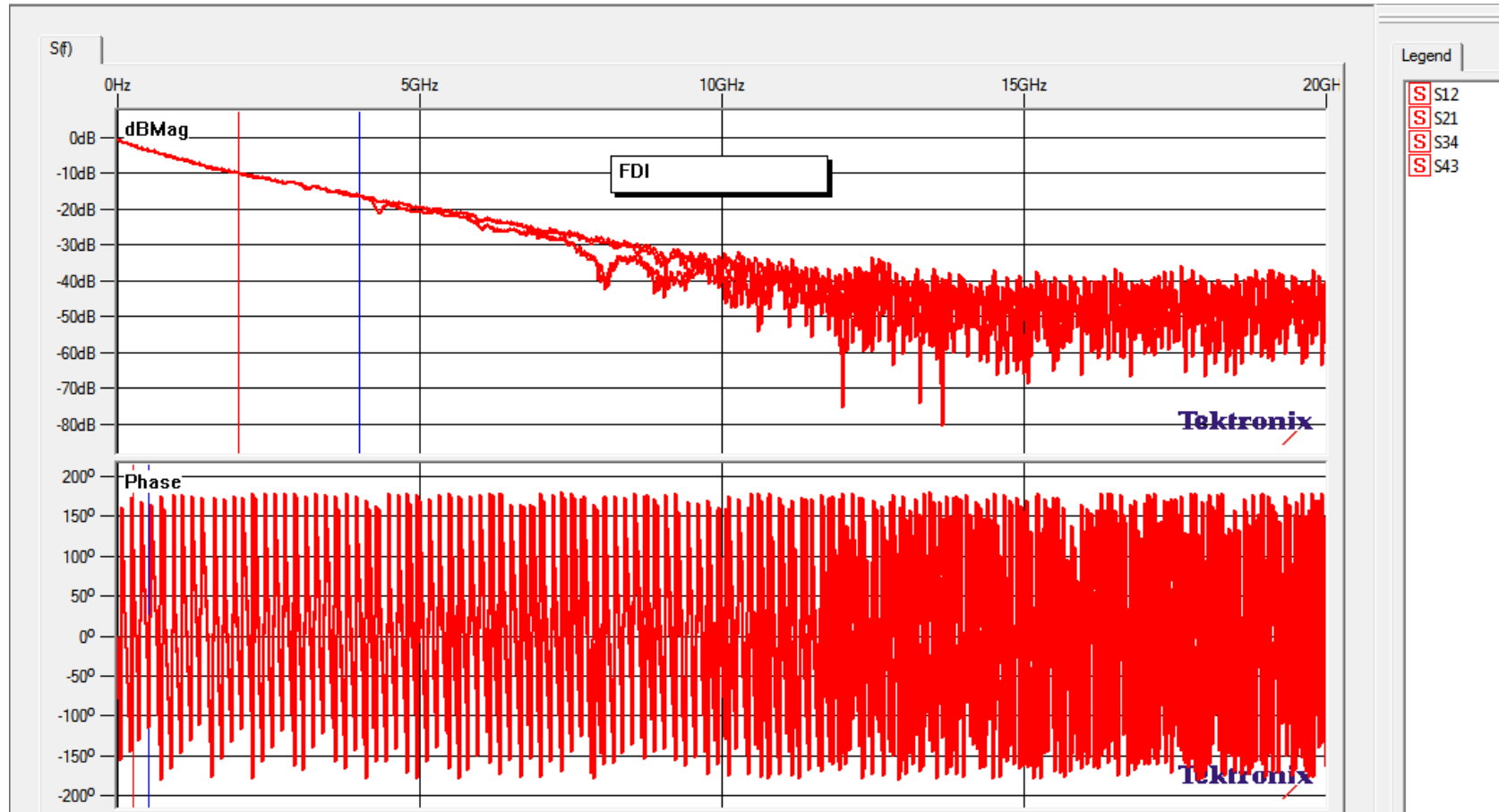
**Tektronix**<sup>®</sup>

# Setup

- DUT: an FR4 backplane and a 2 'rogers' fixture runs (one AC coupled)
- S-parameters DC to 40 GHz
- The DC-coupled device have an a change of loss-dependency around 50 MHz; the AC coupled device a change of inflection of loss-dependency at around 10 MHz
- 'cropped' S-parameters were edited - files were cropped below 100 MHz - and read them two S-parameter tools (each using a different extrapolation mechanism); the tools extrapolated to DC
- The plots of the SE Through of the measured data and the extrapolated data were compared

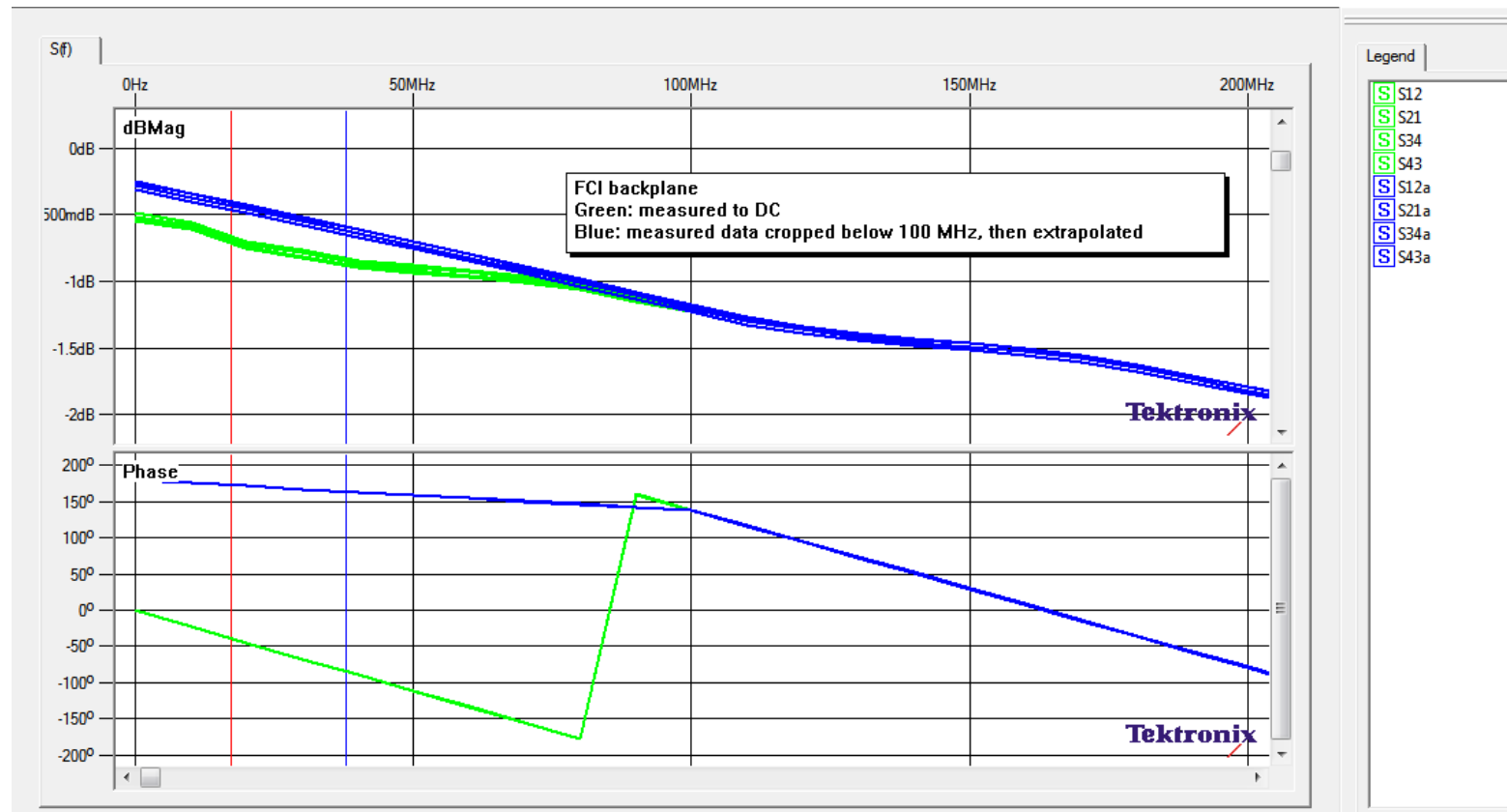
# DUT nr 1 “FDI” overall

- An old backplane, ca. 0.5 span, via paddle cards. A 20 GHz windows shown (Data acquired to 40 GHz)



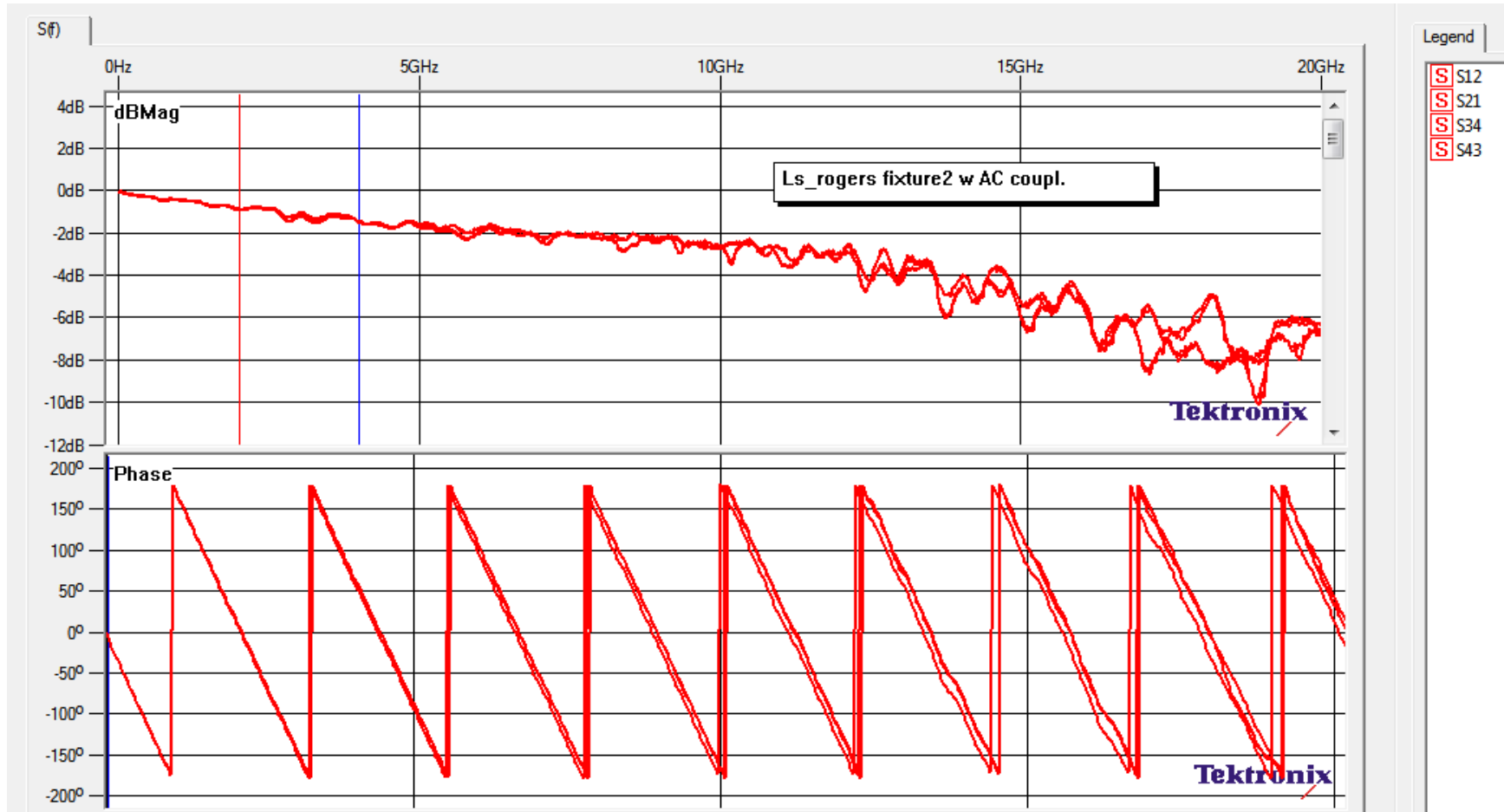
# DUT nr 1 “FDI” DC Extrapolation

- Comparison of measured-to-DC data (blue; 10 MHz spacing) vs. data cropped below 100 MHz, then extrapolated in the S-param viewer. 100 MHz window.



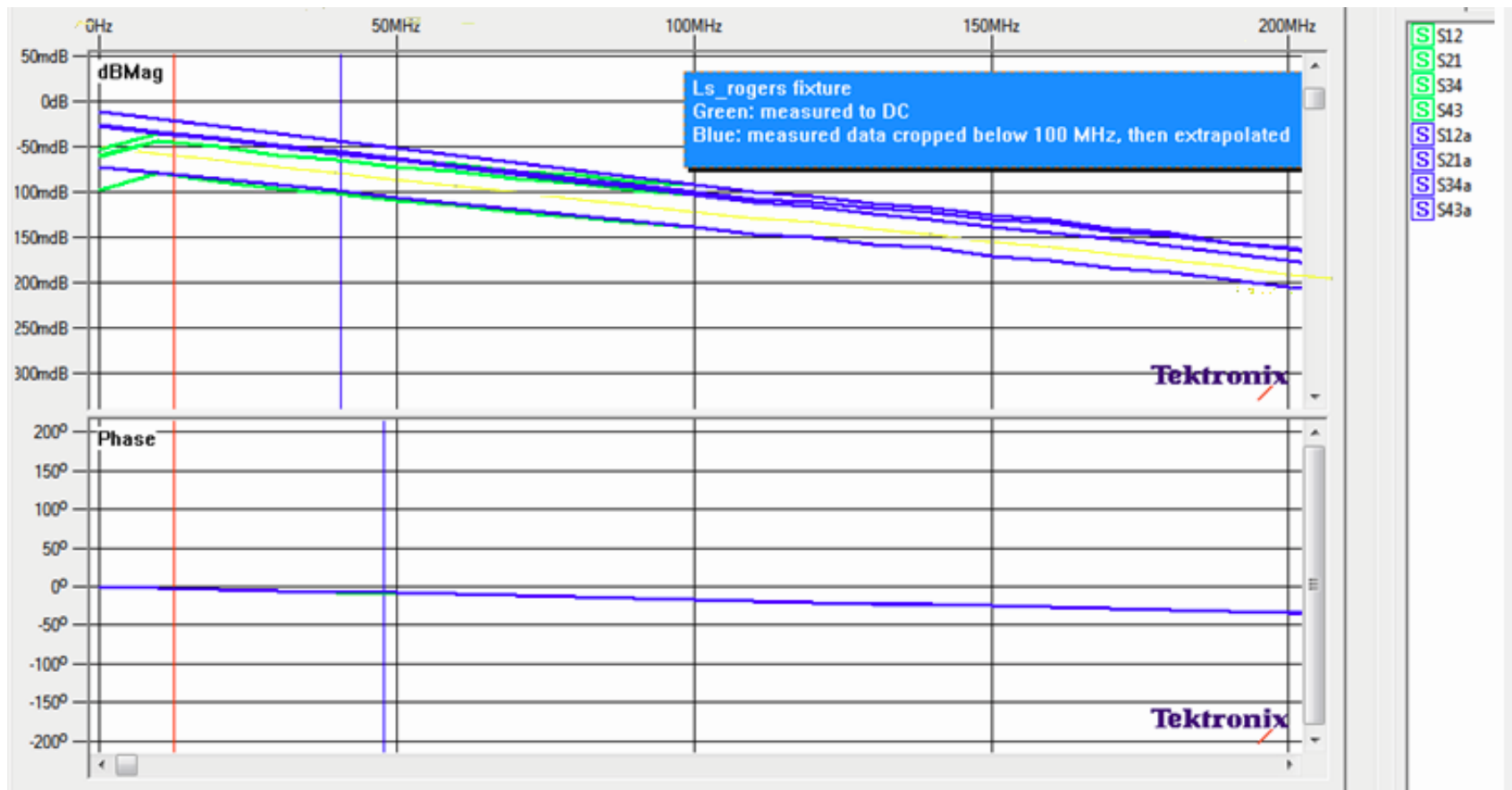
# DUT #2 Ls\_rogers fixture with AC coupling overall

- Through data from DC to 20 GHz



# DUT #2 Ls\_rogers fixture with AC coupling

- Comparison of measured-to-DC data (blue; 10 MHz spacing) vs. data that was cropped below 100 MHz, then extrapolated in the S-param viewer. 100 MHz window AC caps 0.1 uF . Yellow trace: different extrapolation mechanism, S21dd plotted.



# Summary of extrapolation algorithms' performance

- The DC-coupled device's loss-dependency change is not well extrapolated, but the error is small (two devices measured, one shown)
- The AC coupled device with change of inflection is not extrapolated by any tool

Following comments on this experiment overall:

- It is unclear how much impact this has in the time-domain; this should be investigated more
- The extrapolations were done on data that is clean at low  $f$  around 100 MHz; this should be investigated more
- As a side-note: even the 'measurement to DC' doesn't preserve the true AC nature of the DUT due to spacing constraints. Is that a concern?