IEEE P802.3at Task Force
Power Via MDI Enhancements
Midspan Adhoc

Midspan Requirements below 1MHz

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Objectives

- To define the requirements for a Midspan at the signal path for 100BT operation

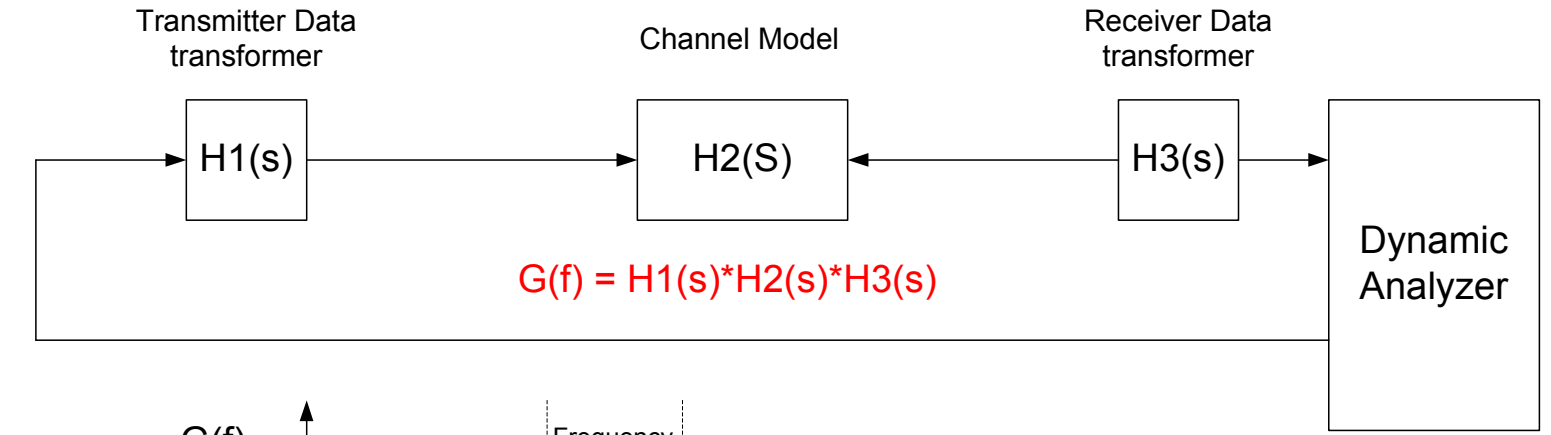
Background

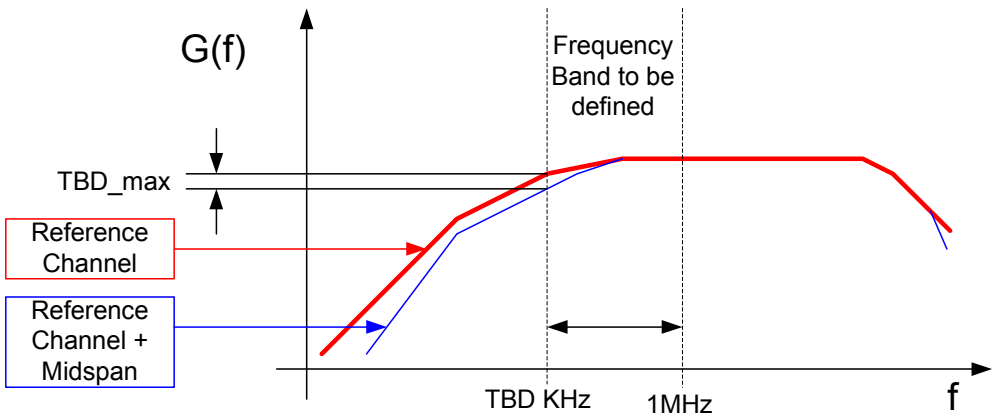
- The IEEE802.3at task force approve using ALT A Midspan.
  - Powering the PD through the signal path
- The IEEE802.3 requires that when a Midspan is inserted in the channel it shall not alter the channel performance.
  - The channel performance is defined from 1MHz and up by 33.4.8
  - The 802.3 doesn't not define requirements for the channel below 1MHz.
- In addition, there is the inductance requirements as specified in ANSI X3.263-1995 (TP-PMD) subclause 9.1.7 which may be affected when a ALT A Midspan is sued in the channel for 100BT
- As a result, the droop of the signal may increased which may affect the BER
- In addition, the effect of BLW on the BER may increase as well
- All of the above may further affected by the presence of DC bias due to the cabling imbalance

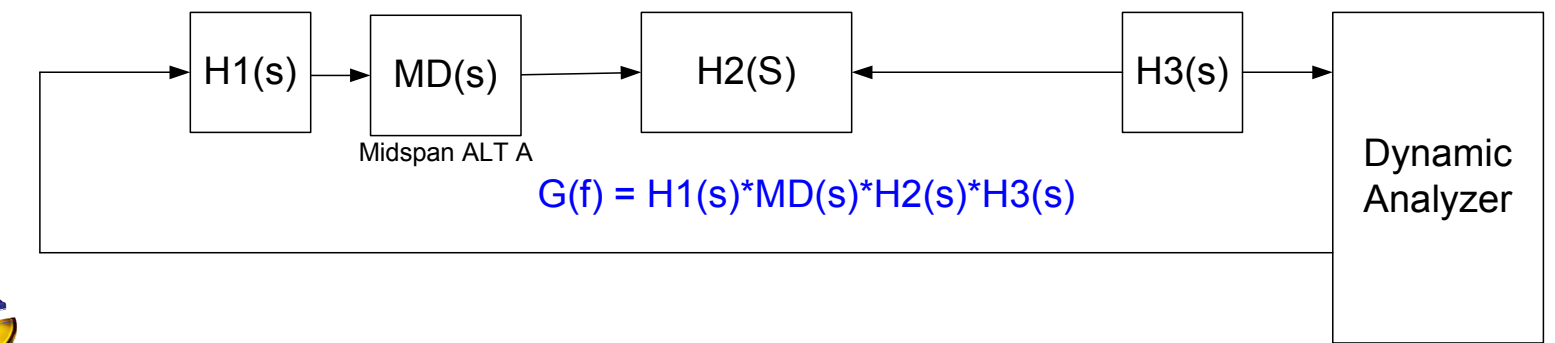
Solution alternatives - Option 1

- Defining a transfer function for the Midspan at the signal path from TBD Hz to 1MHz
- Step 1:Measuring the transfer function of standard compliant channel with out Midspan and without DC bias
- Step 2:Building channel model for frequencies below 1MHz with out Midspan and without DC bias
- Step 3: Align the model to the measurements
- Step 4: Repeat steps 1-3 with DC bias (8mA + IEEE802.3af DC bias)
- At this point we created a reference TF for a channel meeting 802.3af
- Step 5: Insert to the model the minimum requirements for the inductance per ANSI X3.263-1995 (TP-PMD) subclause 9.1.7 under the conditions of 802.3af and worst case channel parameters.
- Step 6: Define TF according to Step 5.
- Compliant Midspan gain shall be above the TF gain vs frequency.

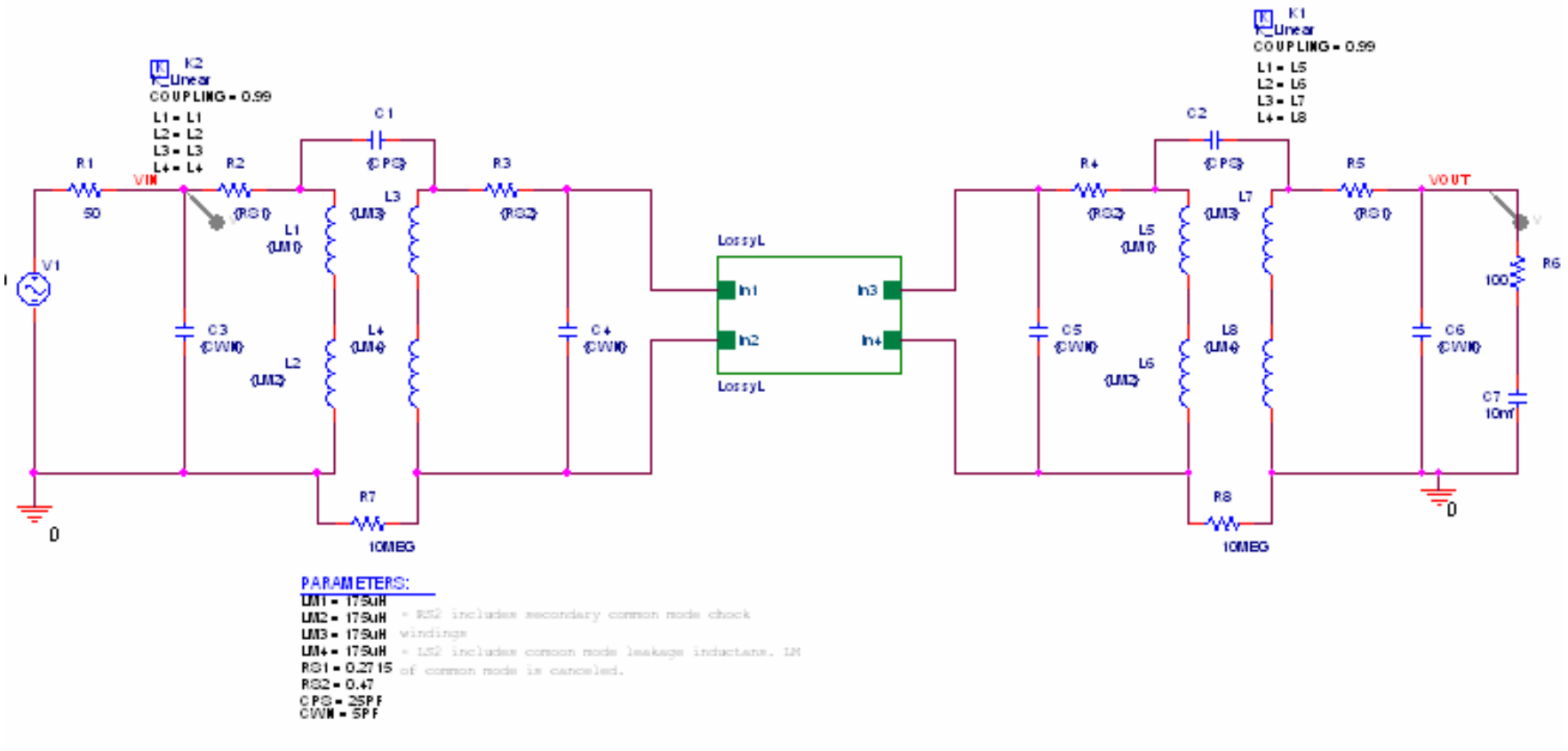
Solution alternatives - Option 1



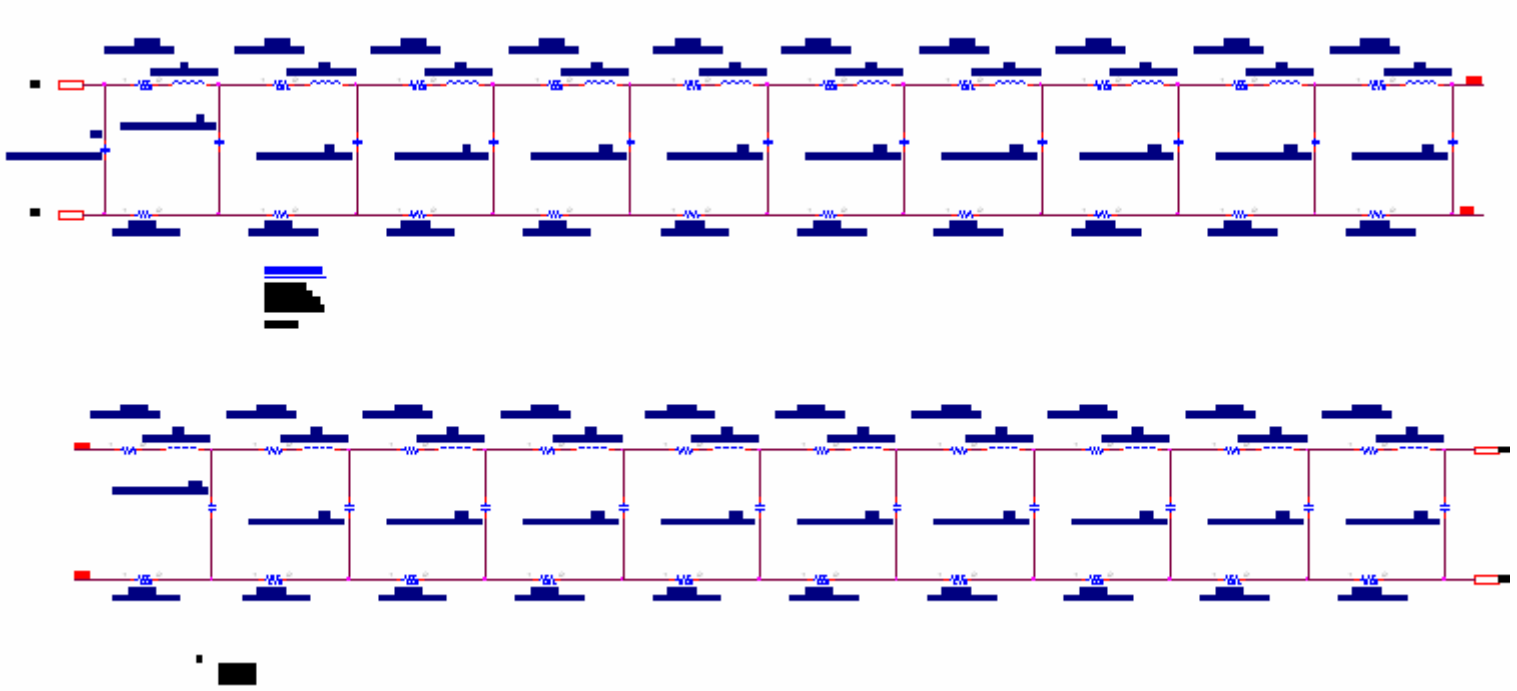




Channel Model w/o DC bias - Preliminary

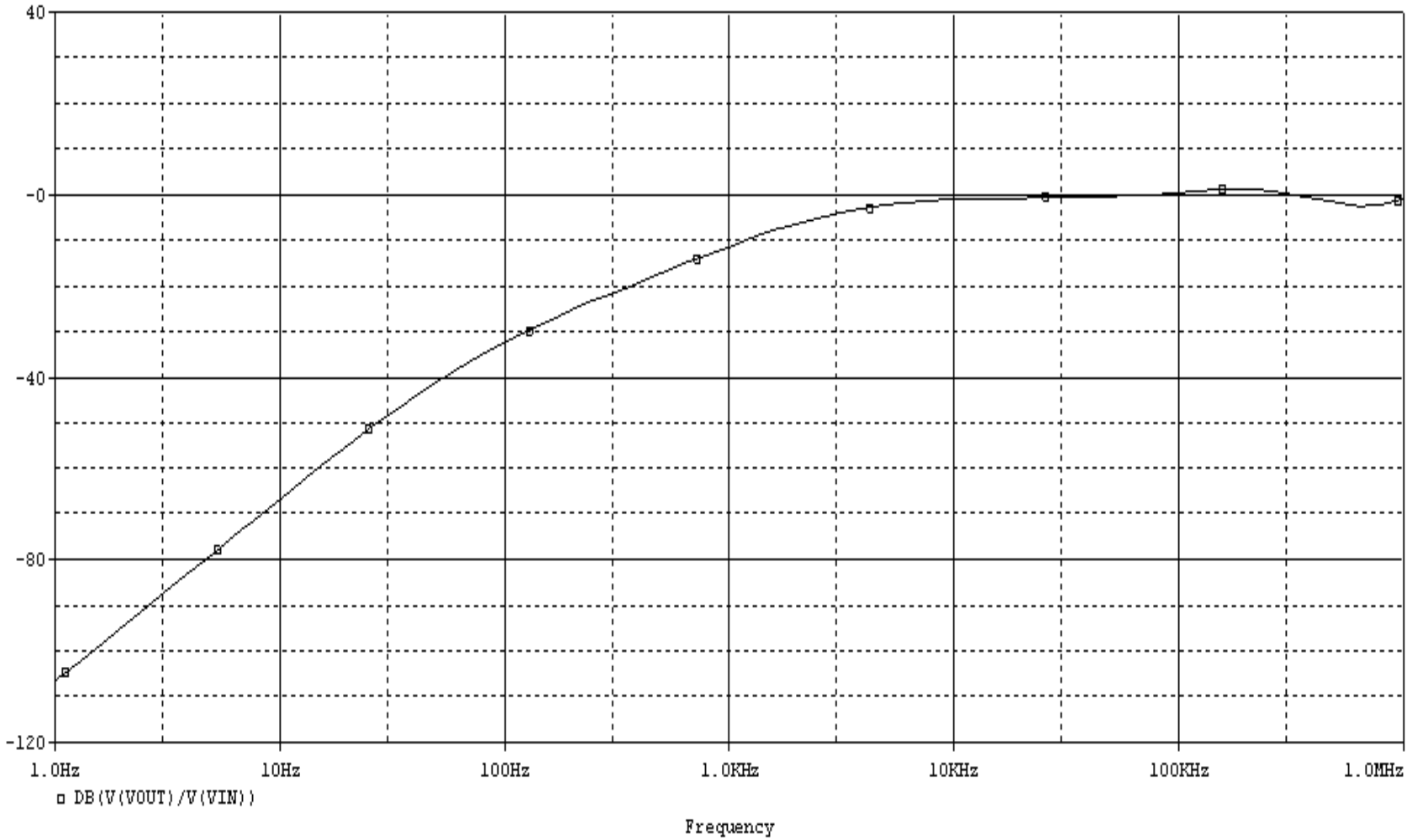


Channel Model w/o DC bias - Preliminary

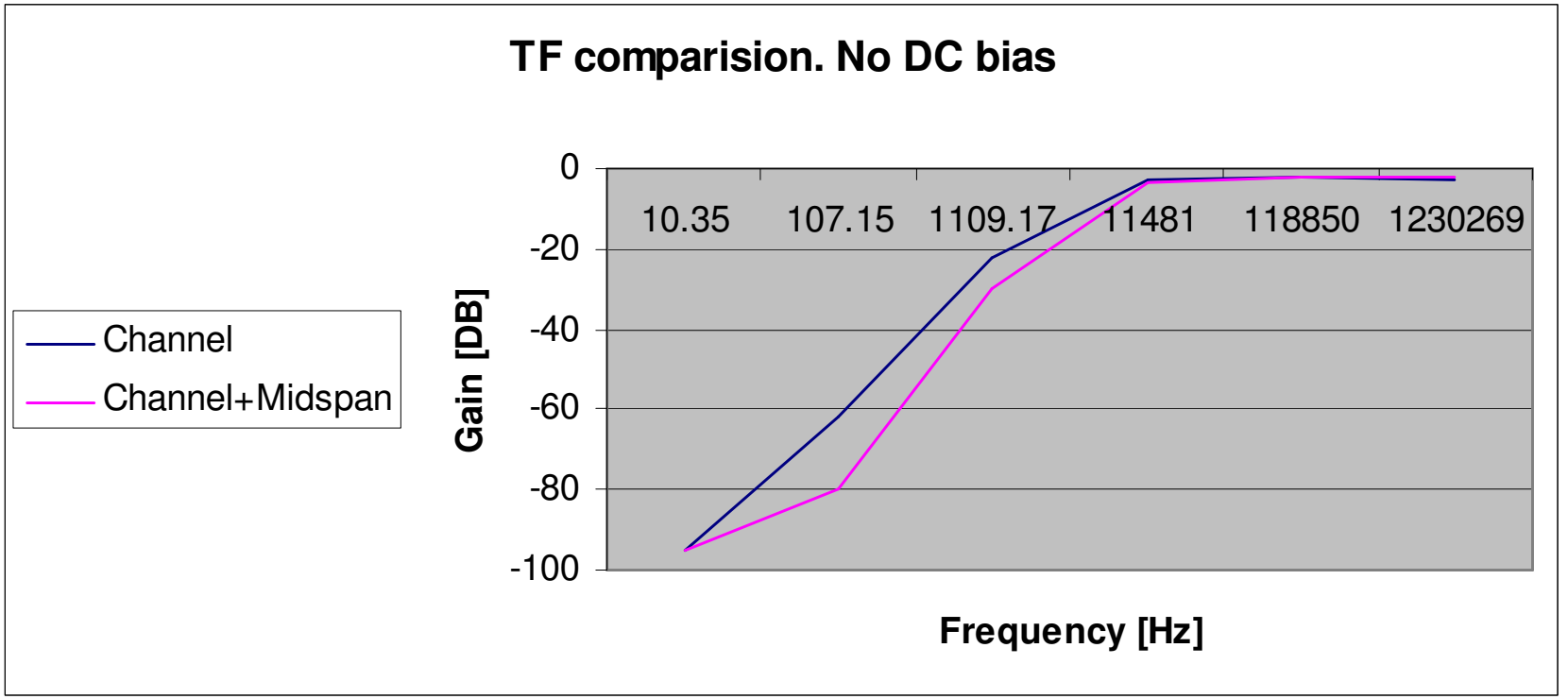


Channel TF w/o a) DC bias b) with Linear Transformer. Preliminary.

Final Model will use non linear transformer



Channel Reference Model measurements w/o DC bias



Next steps

- To add DC bias to measurements and Model
- To add transformer non linearities to the model
- Run tests for different cable length and inductances
- Finalize TF
- To present other work of BER results for a channel with and without Midspan
  - Evaluate data
  - How it affects design margins
  - How it affects relaxation of 350uH under DC bias

Discussions/Summary

- Three groups are working on the project: TF function group and two BER tests groups.
- Preliminary model and lab test results were presented.
- We discuss the differences between the preliminary model and the expected final model.
  - Model parasitics (Leakage, winding capacitance) has negligible effect at the low frequency band under discussion.
  - Current model and lab test results are w/o DC bias and magnetic non-lineary effects which expected to change the TF at very low frequencies
- There is no difference in low frequencies between transformers and auto transformers with the same inductance. The differences appear at high frequencies (above 1MHz).
- Tests and simulations shows negligible differences in TF gain/frequency at well below 100KHz. Final results will be presented with the DC bias as planned.
- **BER tests Results and Conclusions:**
  - Preliminary BER tests shows similar behavior for channel with and without Midspans in most tested equipment.
  - In general, it seems that if a device passes a BLW test without a Midspan in-line, it will pass with the addition of the midspan.
  - There are a few cases where the addition of the Midspan caused the device to go from passing to failing.
  - If the device fails the test without the Midspan, the addition of a Midspan introduces minimal error.
  - For the handful of devices tested it seems that if the device can handle BLW packets properly, the addition of a Midspan will not introduce enough error to cause significant packet loss.
  - All tests done for 100BT for 100BT equipment in different OCLs for 10 random equipment samples and different length. No knowledge if the equipment under test had BLW compensation.
- Ad hoc acknowledge preliminary results as similar to the current knowledge and experience from the field.
- Ad hoc is OK with continuing the proposed concept of TF definition and compliance criteria
- Next steps as proposed