BLS-to-ADF Transition System

Existing and proposed calorimeter trigger rack layouts. The color code shows how the calorimeter trigger inputs will be reassigned from the existing trigger crates to the new ADF crates.

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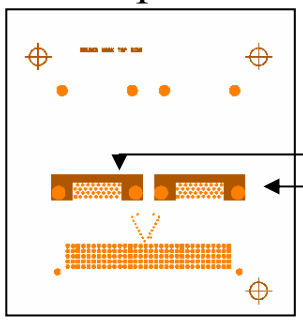
Patch Panel

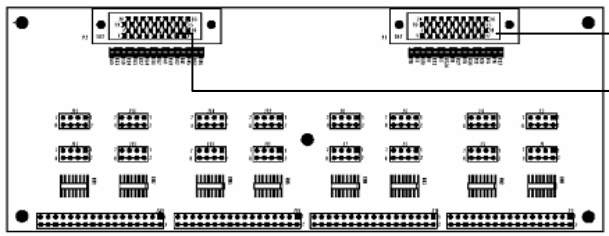
Paddle Card

2 Pleated Foil Cables input from the Patch Panel Card
ERNI connector output to the ADF backplane



3M Pleated Foil Cables

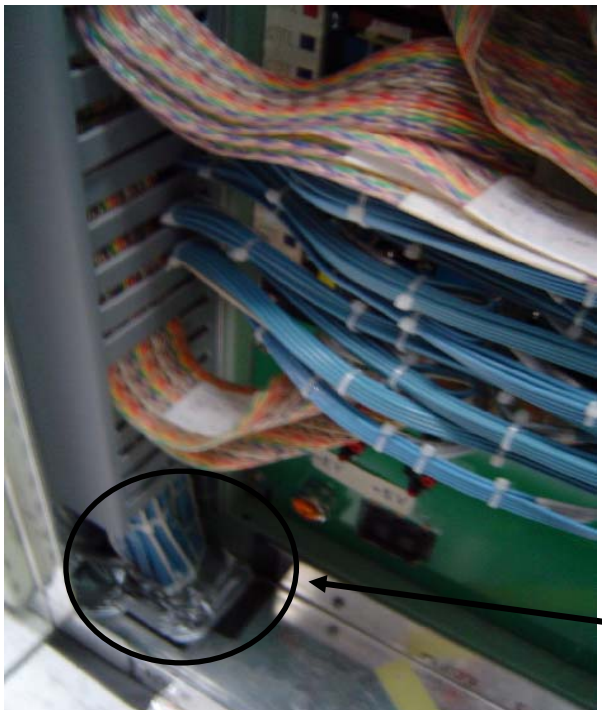
Patch Panel Card (2 per Patch Panel)
16 BLS inputs
2 Pleated Foil Cables output to the Paddle Card)

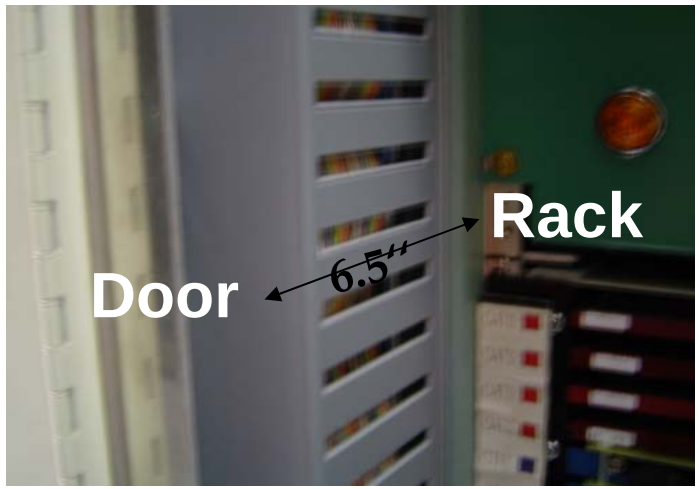


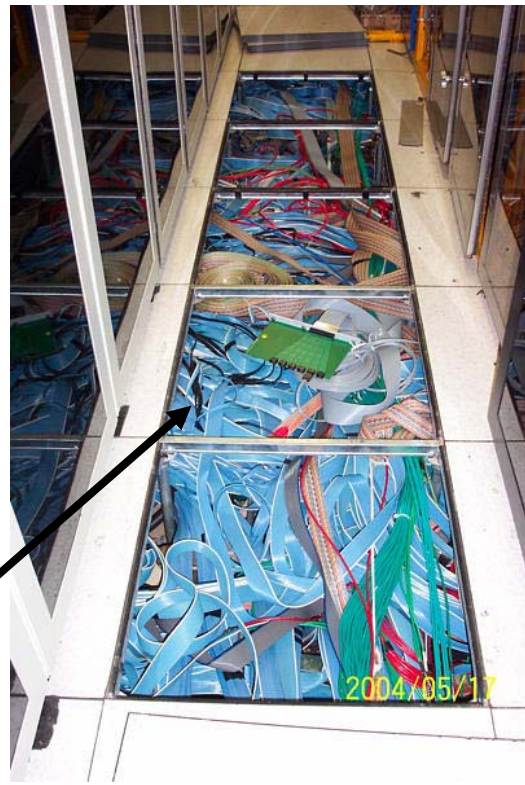
Design made by John Foglesong

Current BLS Cables Layout

- How the BLS cables are set.



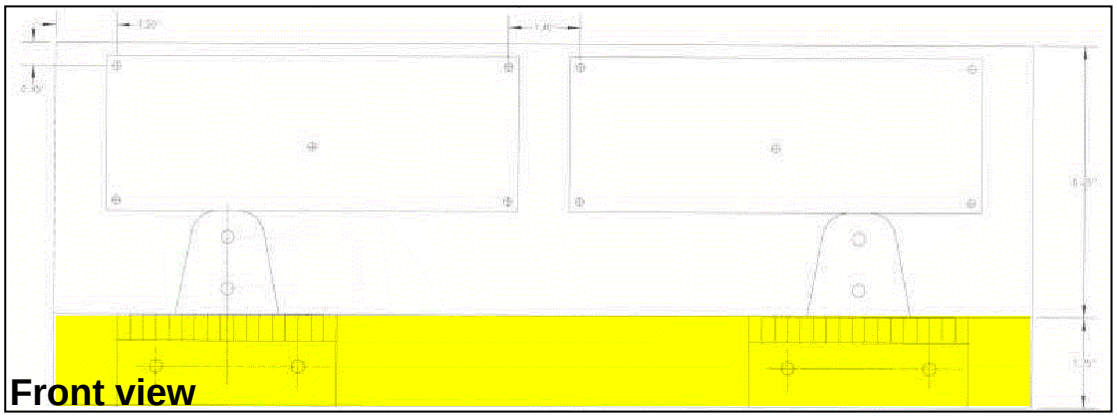


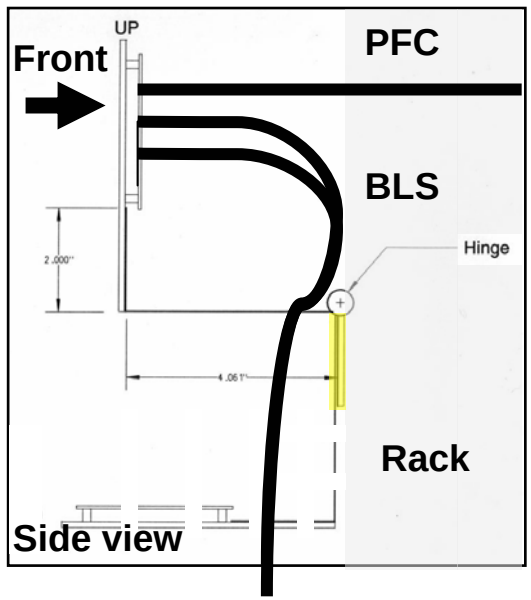


We decided to do not move the cables

PPC layout Design

- Patch Panel Card shift 4’’ out to the rack to keep the cables coming from the front.





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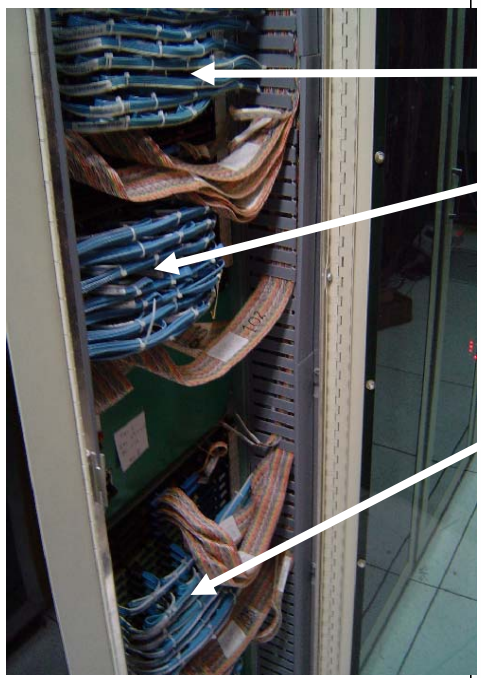
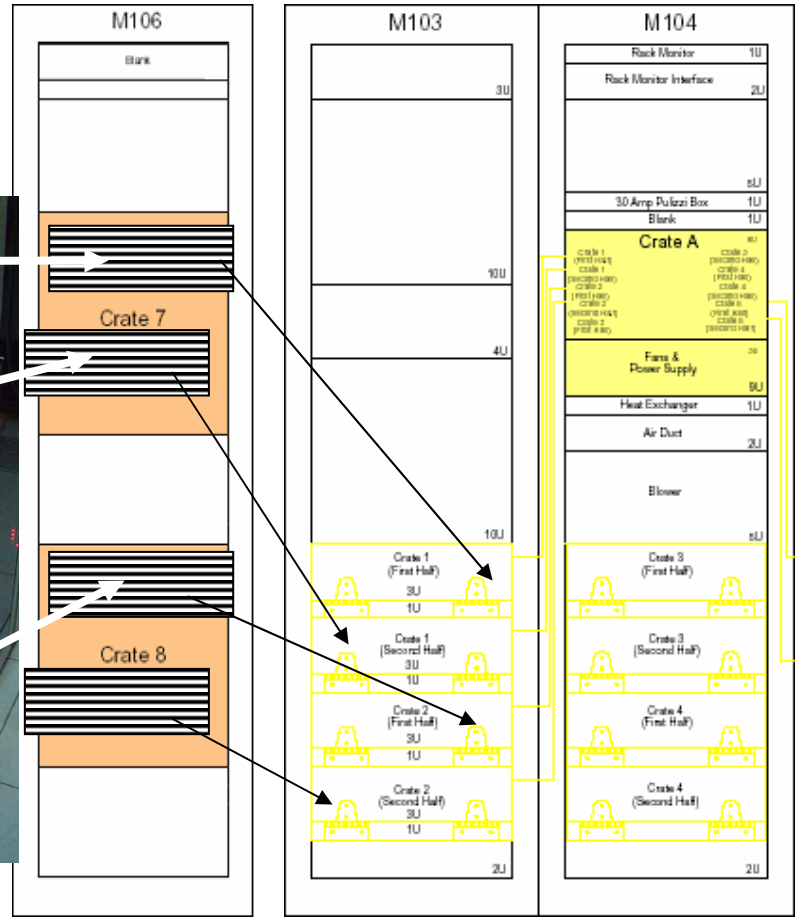
by John Foglesong

BLS Cables layout

We are looked for the best Patch Panel location considering we need enough space to feet the ADF crates on racks M104 M106 M109 M111 and also TAB/GAB on crate M107 and Control on rack M108. We estimate around 17U





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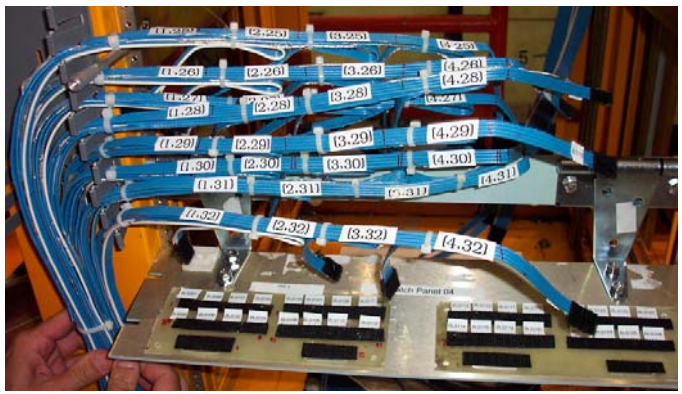
Mock-up

We reproduce the current BLS cable layout for 128 BLS cables to test the design and to optimize the procedure to connect the cables



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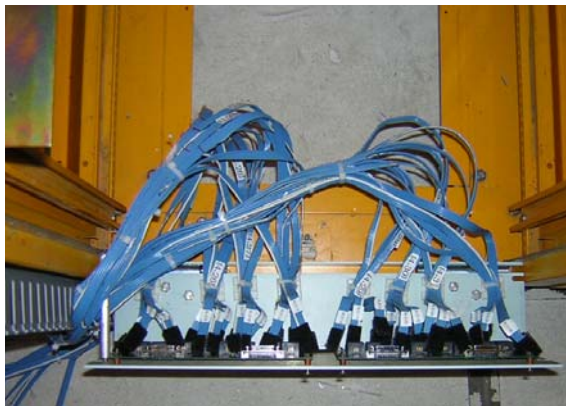
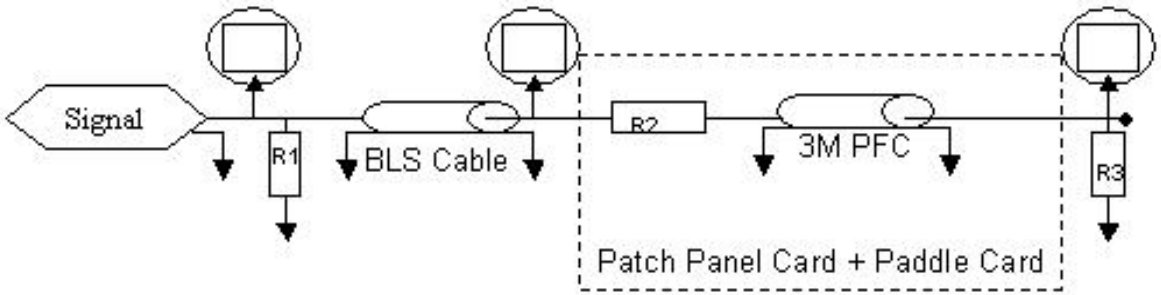
Mock-up

32 BLS cables rearranged
For the bottom Patch Panel
Crate.



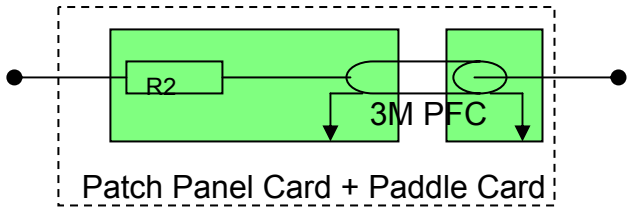
Signal and Impedance Matching Tests

A pulse was sent trough a BLS spare cable + Patch Panel Card + Pleated Foil Cable + Paddle Card.



BLS Cable Zo ~ 80 Ω
3M Pleated Foil Cable Zo ~ 72 Ω
R1 = 120.5 +/- 0.3 Ω
R2 = 0
R3 = 72.0 +/- 0.3 Ω

Signal test

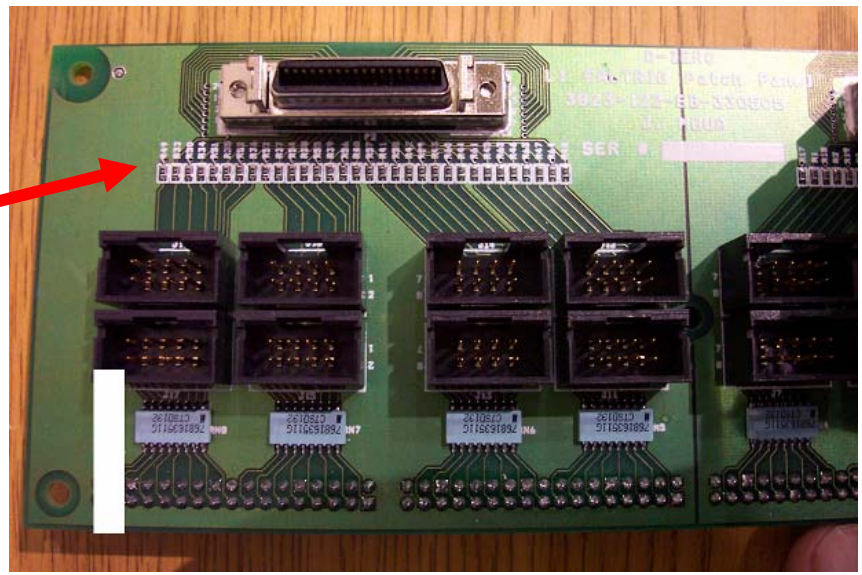


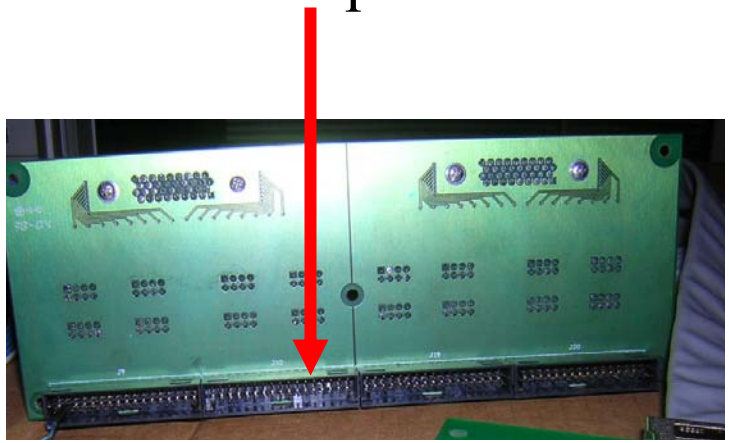
Today
R2 = 0

R3 = 500 Ohm

Pick-Off pins

R2





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Signal Test

Connections:

BLS Cable, Patch Panel Card,

Pleated Foil Cable, Paddle Card

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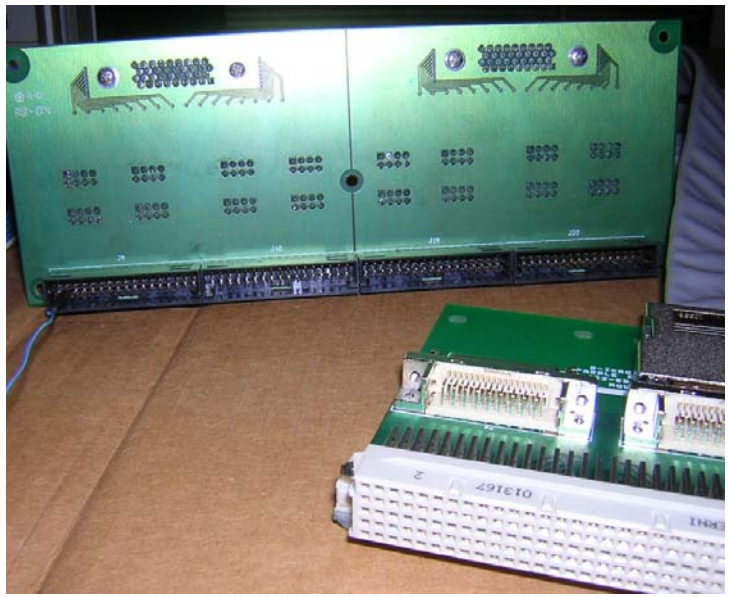
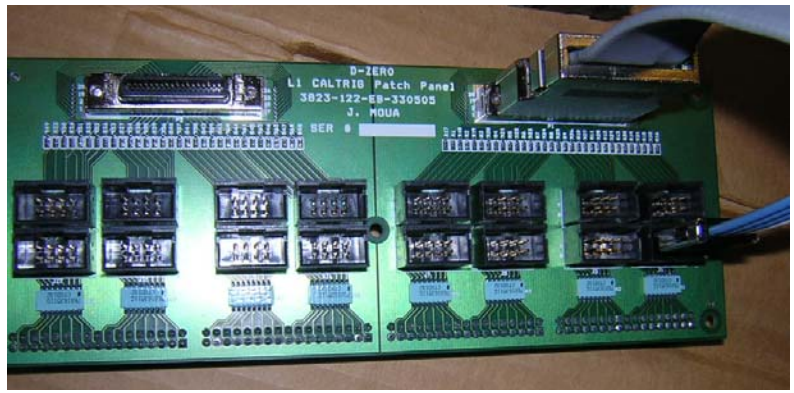
Signal Test

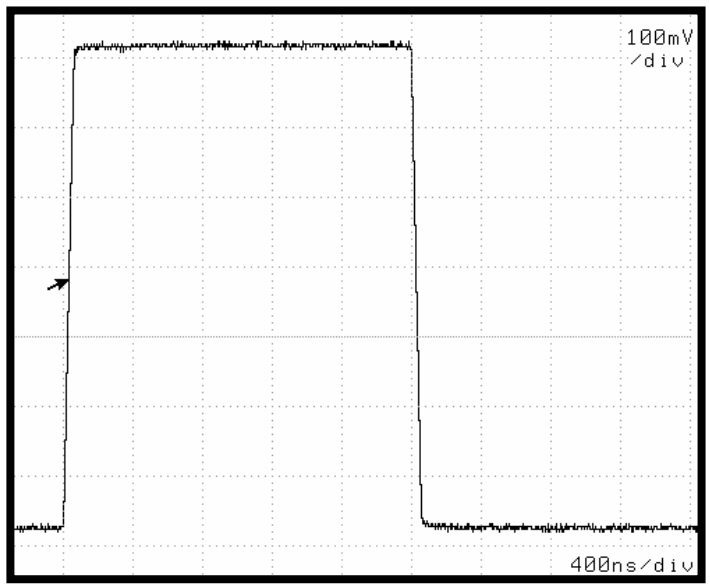
- Connections:

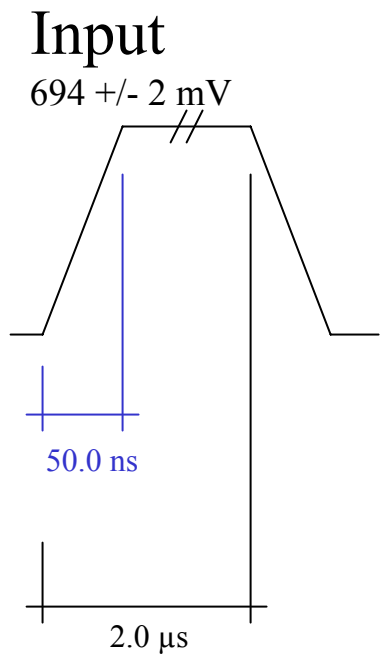




Signal Test

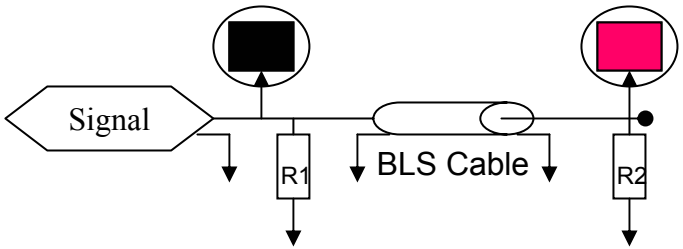
Input of the BLS cables bare signal





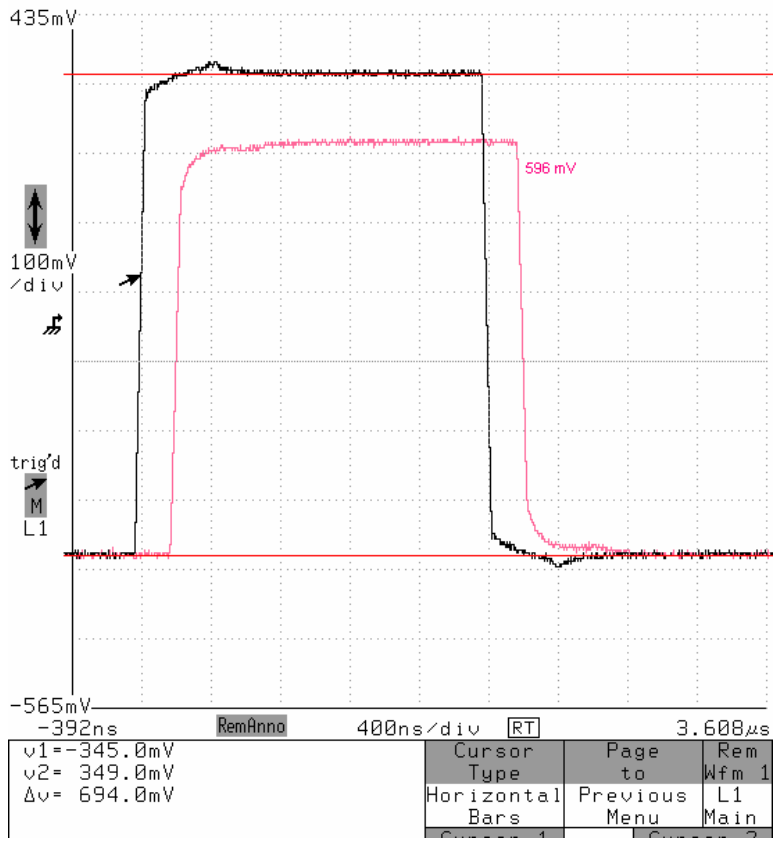
Signal Test

BLS Cable:



R1 = 112.9 +/- 0.3 Ω
R2 = 76.6 +/- 0.3 Ω

To match the signal generator 50 Ω then BLS DC Resistance ~ 13 Ω



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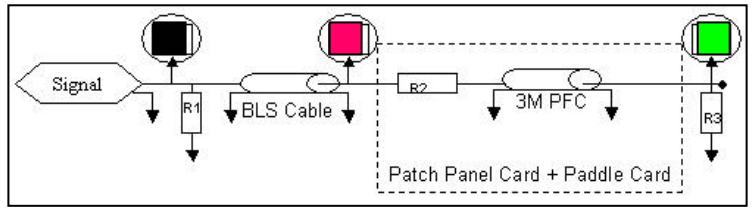
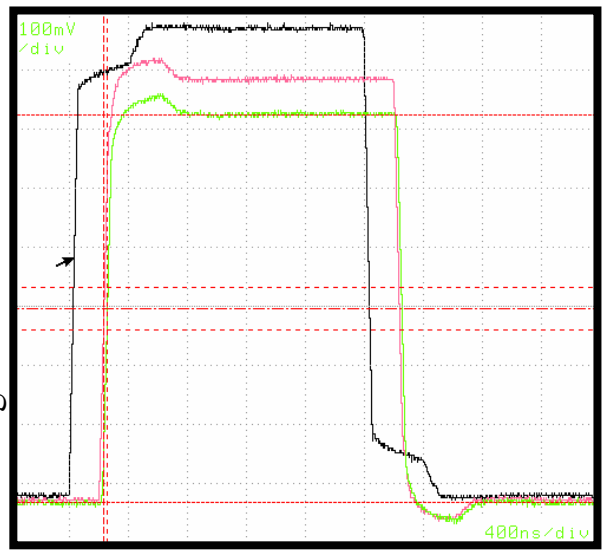
Signal Test

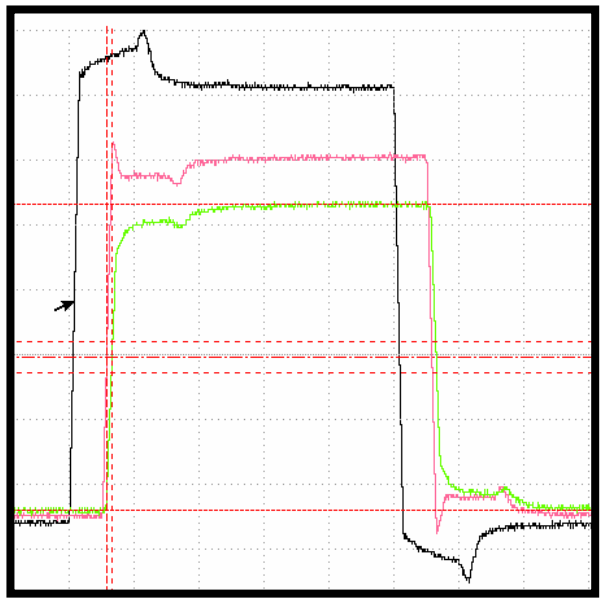
R1 = 107.5 +/- 0.3 Ω
R2 = 7.4 +/- 0.3 Ω



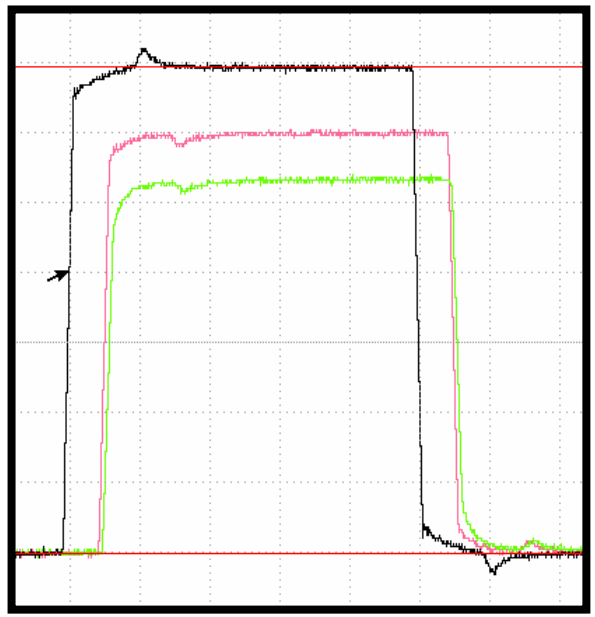
R3 = 106 +/- 1 Ω



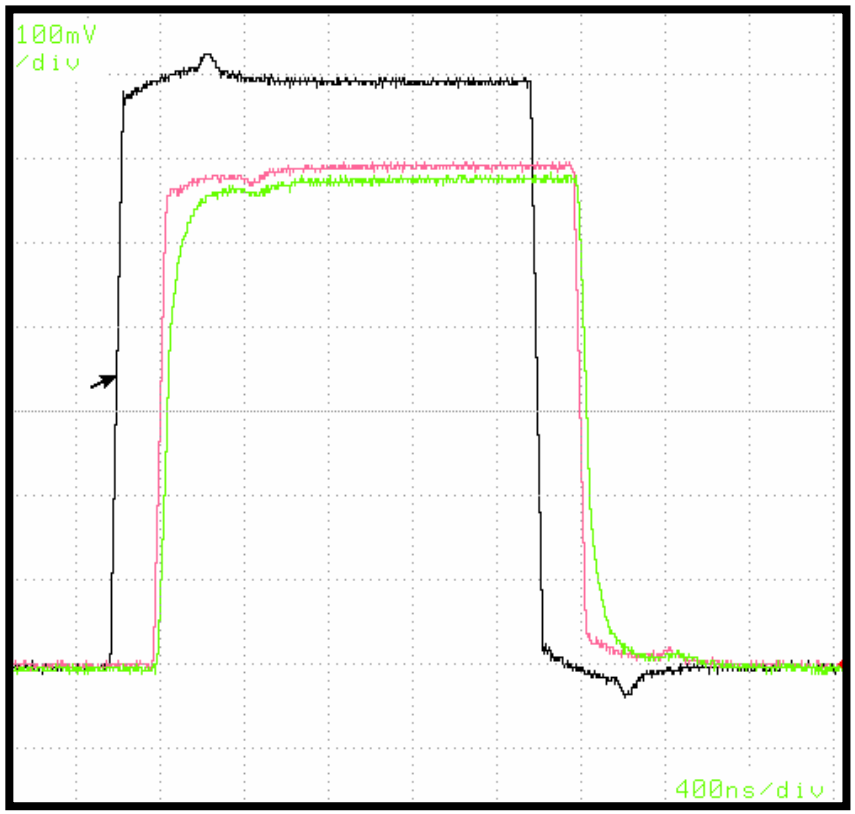
R3 = 51 +/- 1 Ω



R3 = 71.0 +/- 0.3 Ω



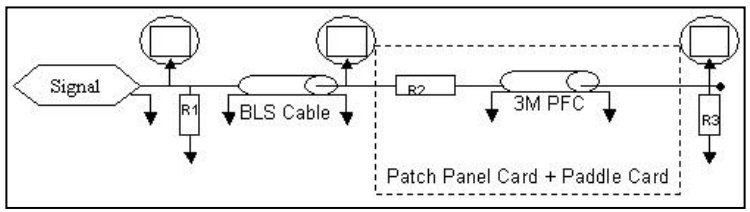
Signal Test



R1 = 119.8 +/- 0.3 Ω

R3 = 71.5 +/- 0.3 Ω

R2 = 0 Ω



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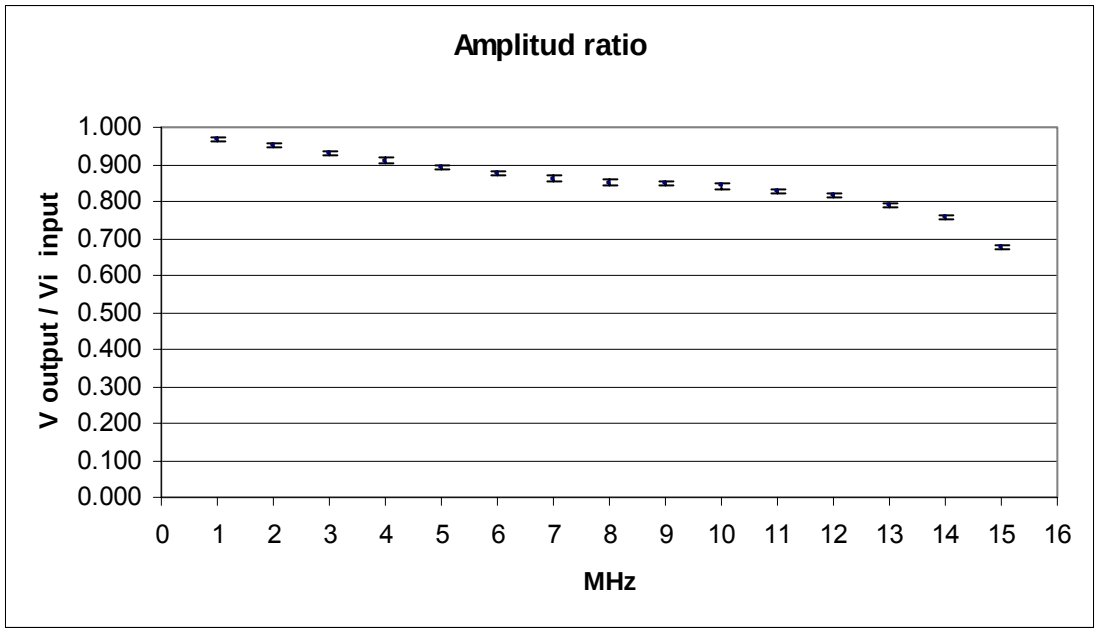
Signal Test

R2 = 0 Attenuation:



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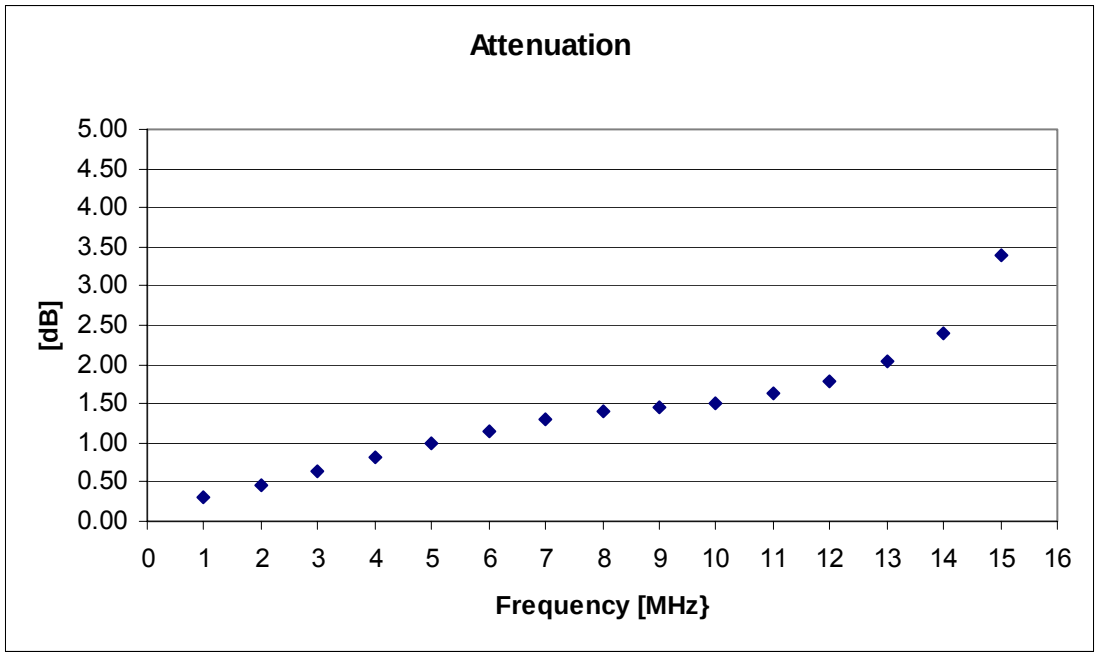
Signal Test

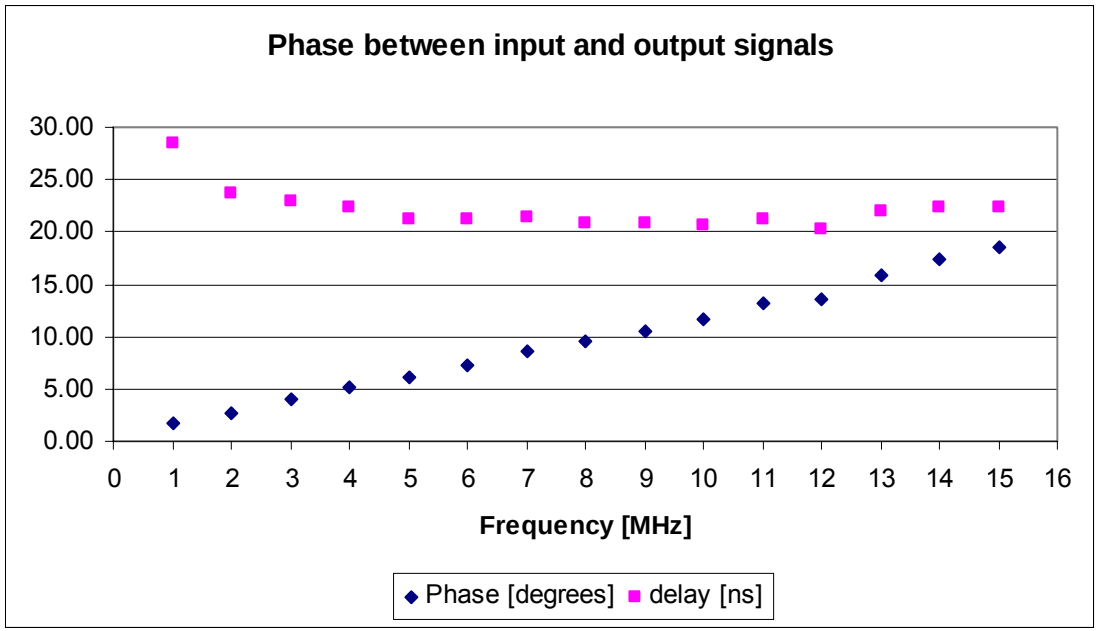
R2 = 0

Attenuation:



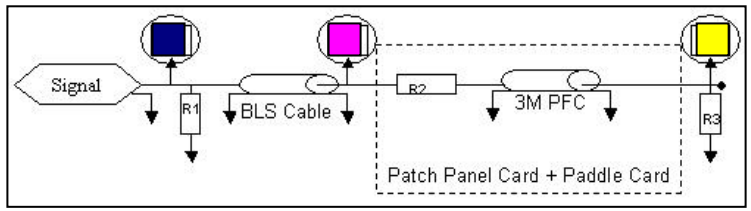
Signal Test

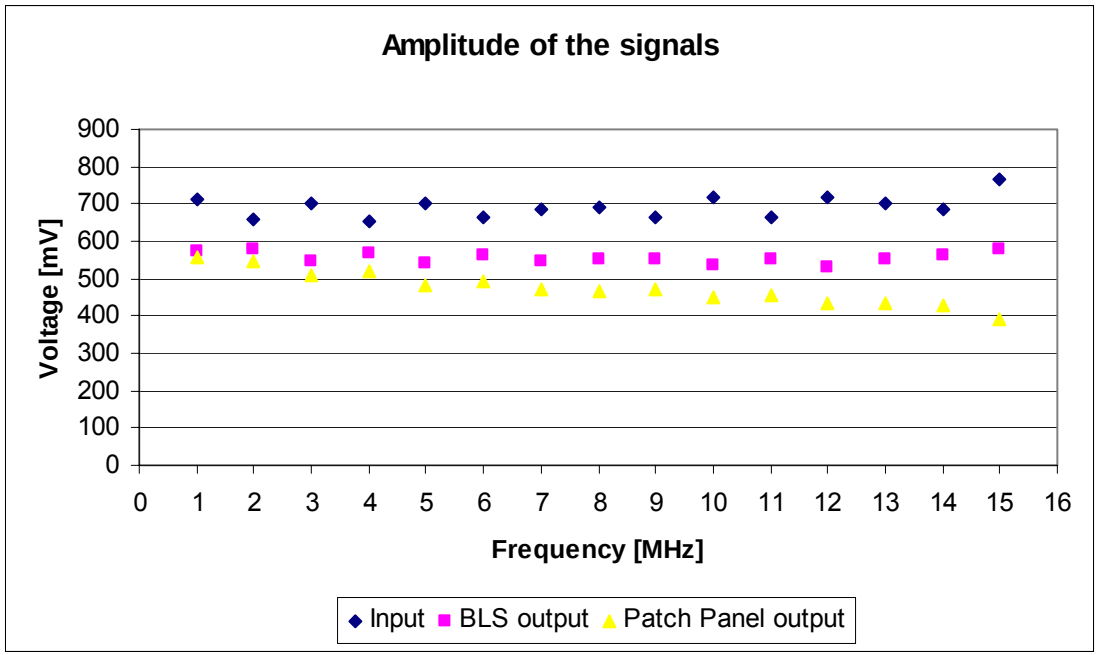
R2 = 0



Signal Test

R2 = 0





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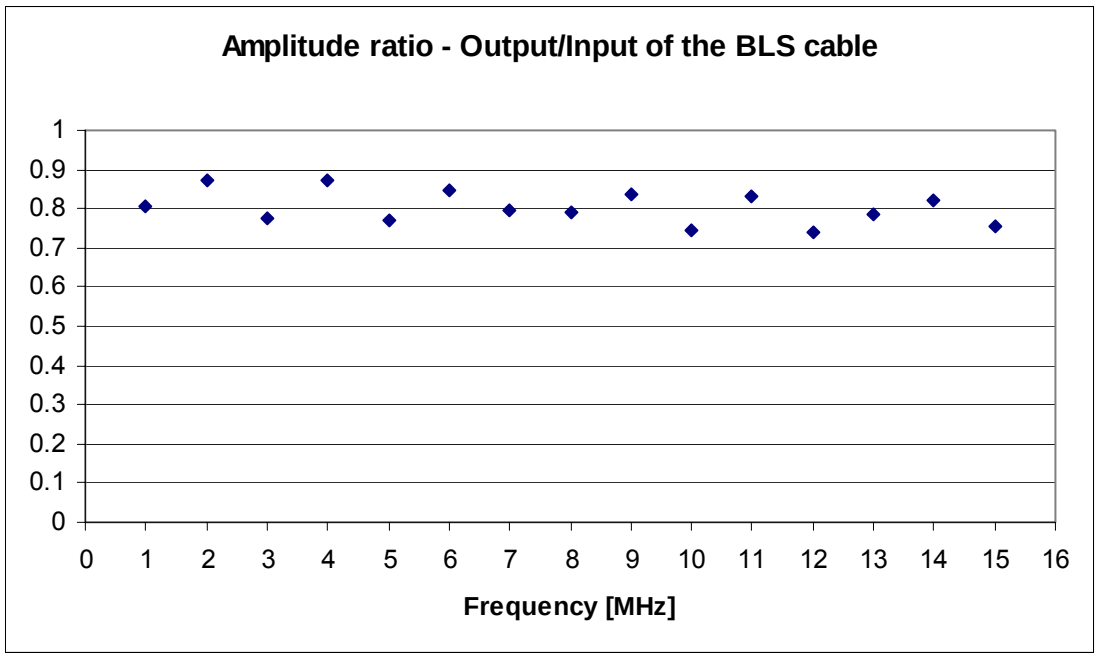
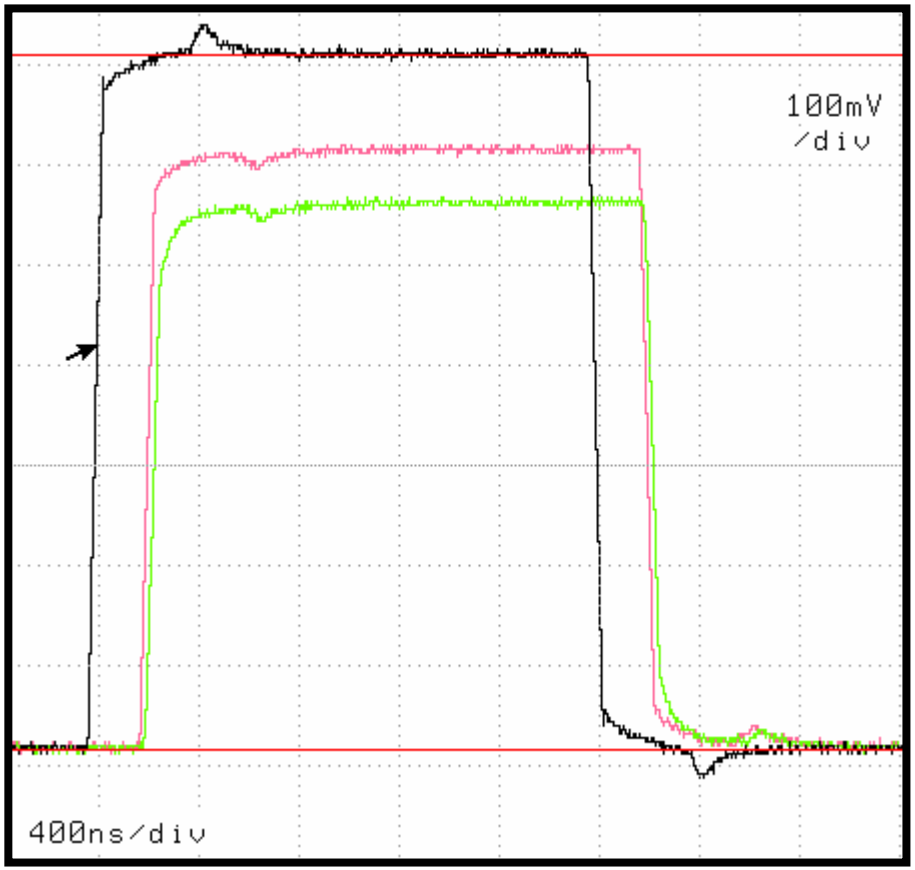
Signal Test

R2 = 0



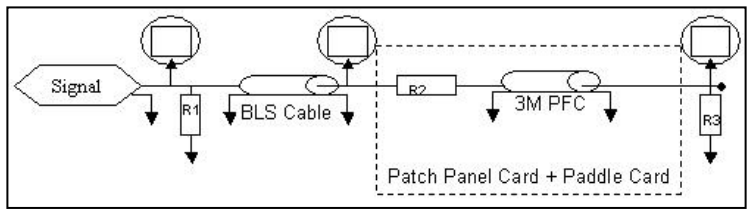
Signal Test



R1 = 110.3 +/- 0.3 Ω

R3 = 71.1 +/- 0.3 Ω

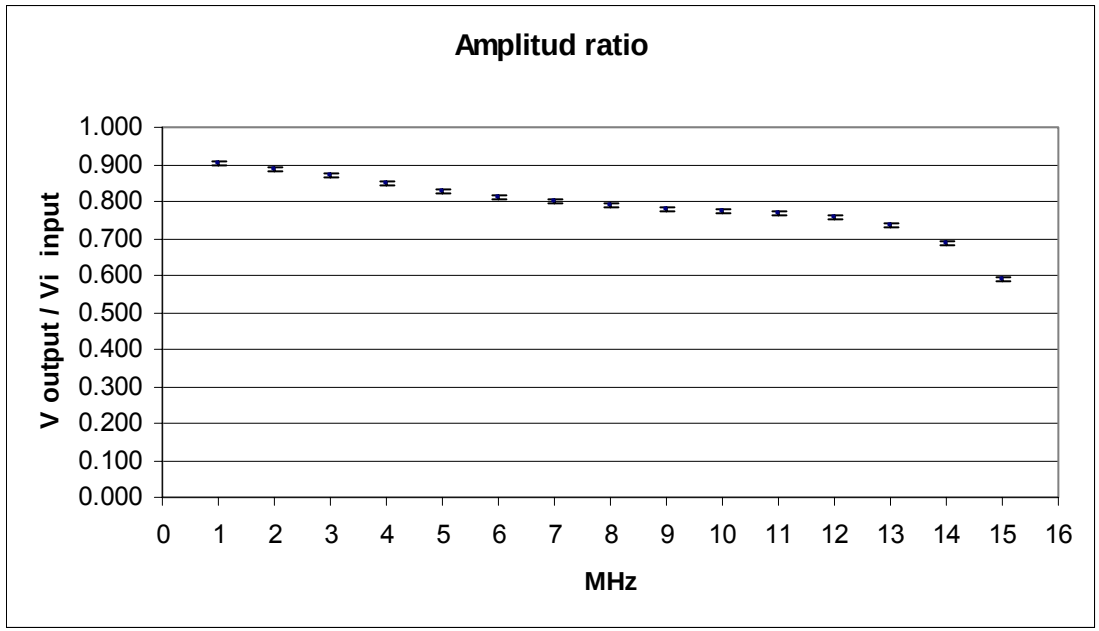
R2 = 5.0 +/- 0.3 Ω



Signal Test

R2 = 5.0 +/- 0.3 Ω

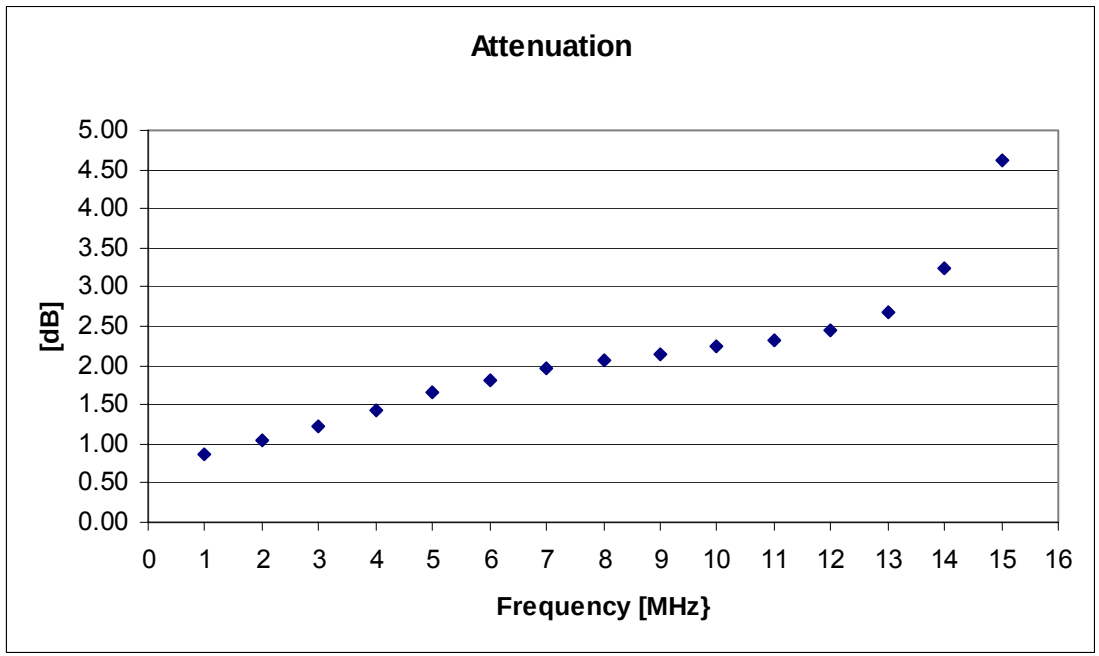
Attenuation



Signal Test

R2 = 5.0 +/- 0.3 Ω

Attenuation



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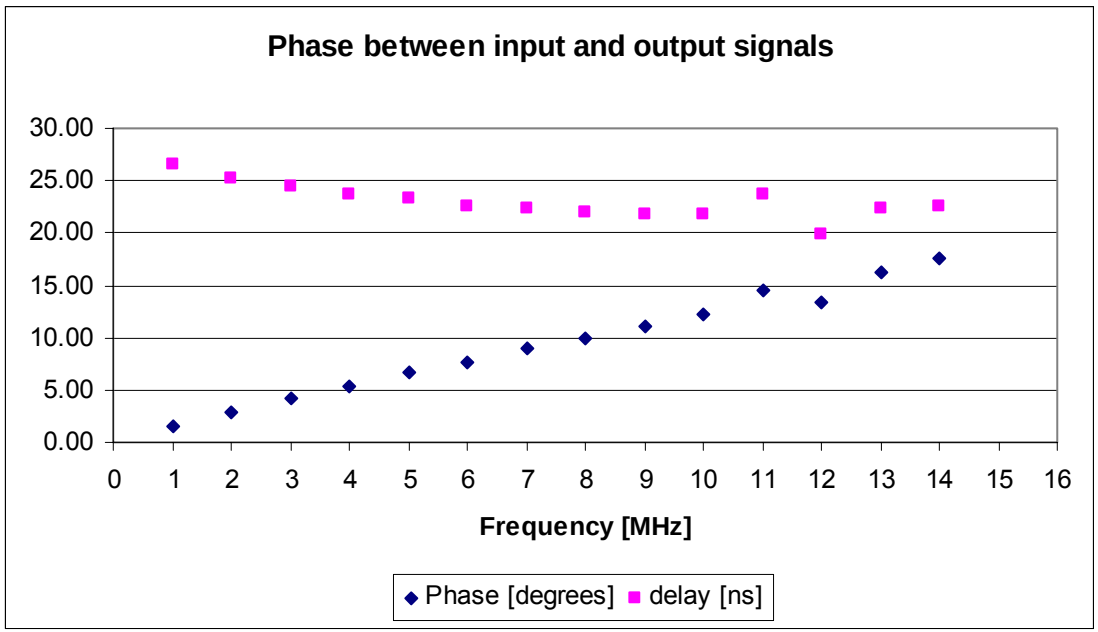
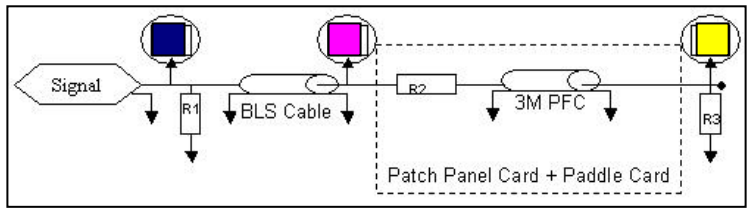
Signal Test

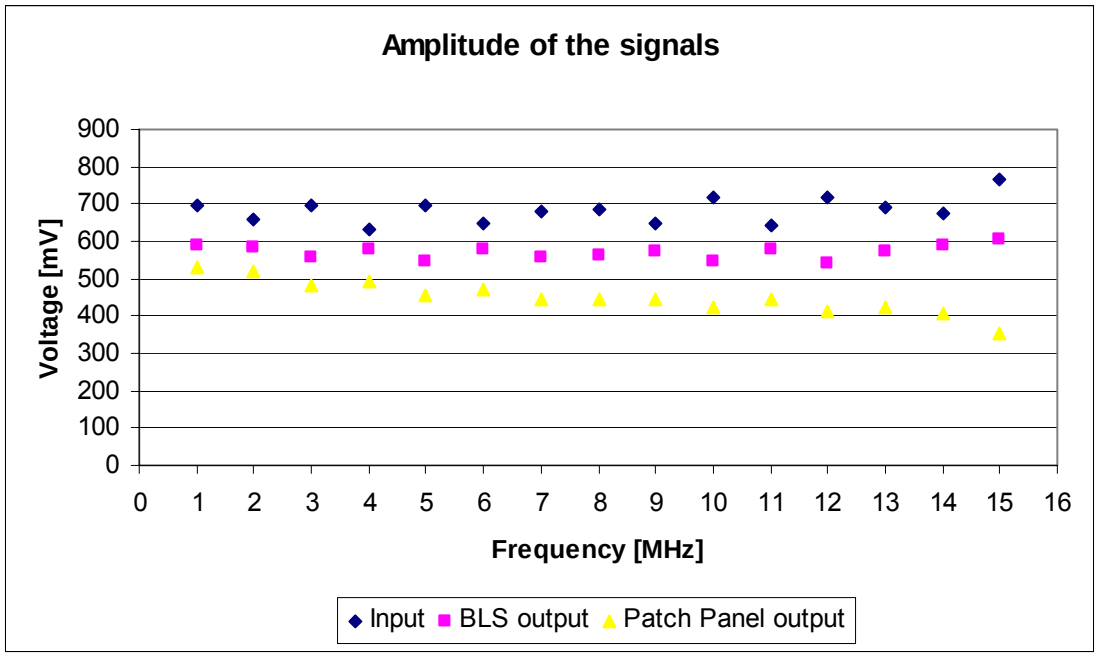
R2 = 5.0 +/- 0.3 Ω



Signal Test

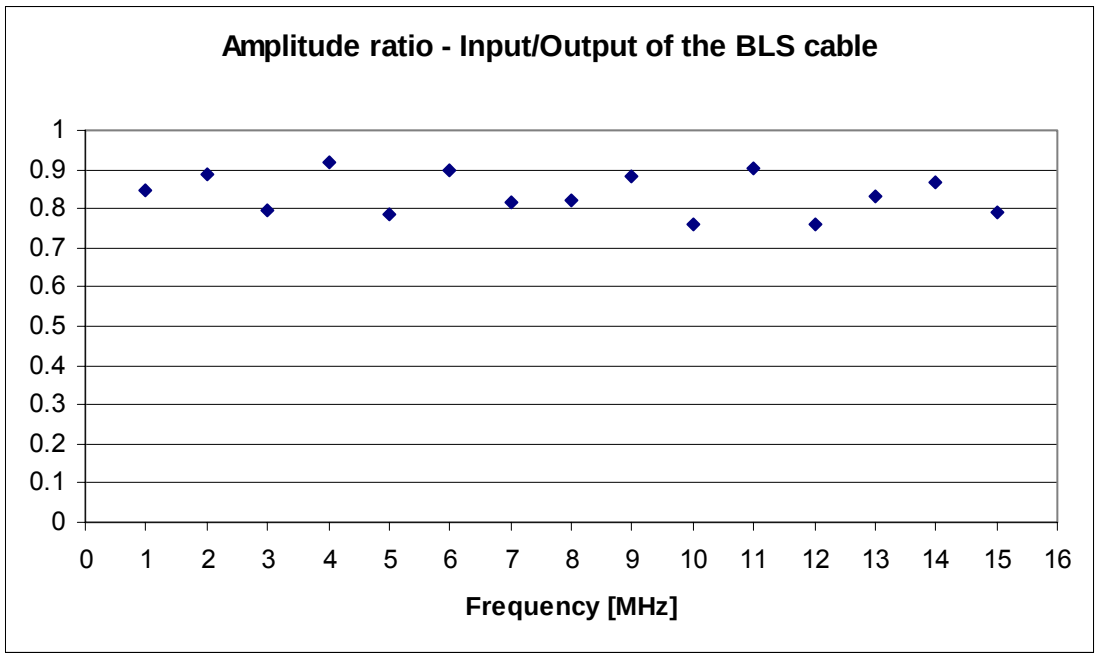
$R2 = 5.0 +/- 0.3\ \Omega$



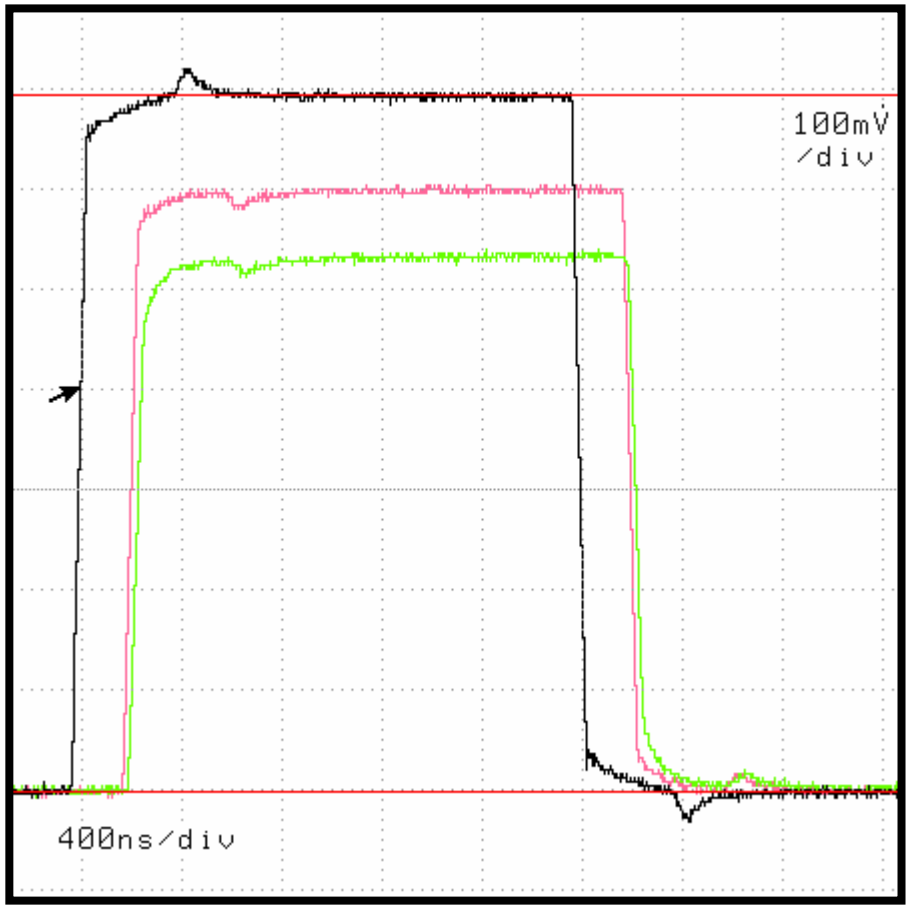


Signal Test

R2 = 5.0 +/- 0.3 Ω

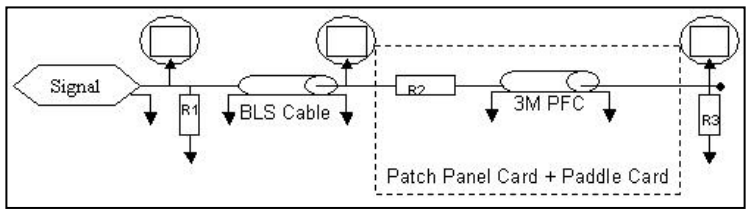


Signal Test



R1 = 107.5 +/- 0.3 Ω
R2 = 7.4 +/- 0.3 Ω

R2 = 7.4 +/- 0.3 Ω



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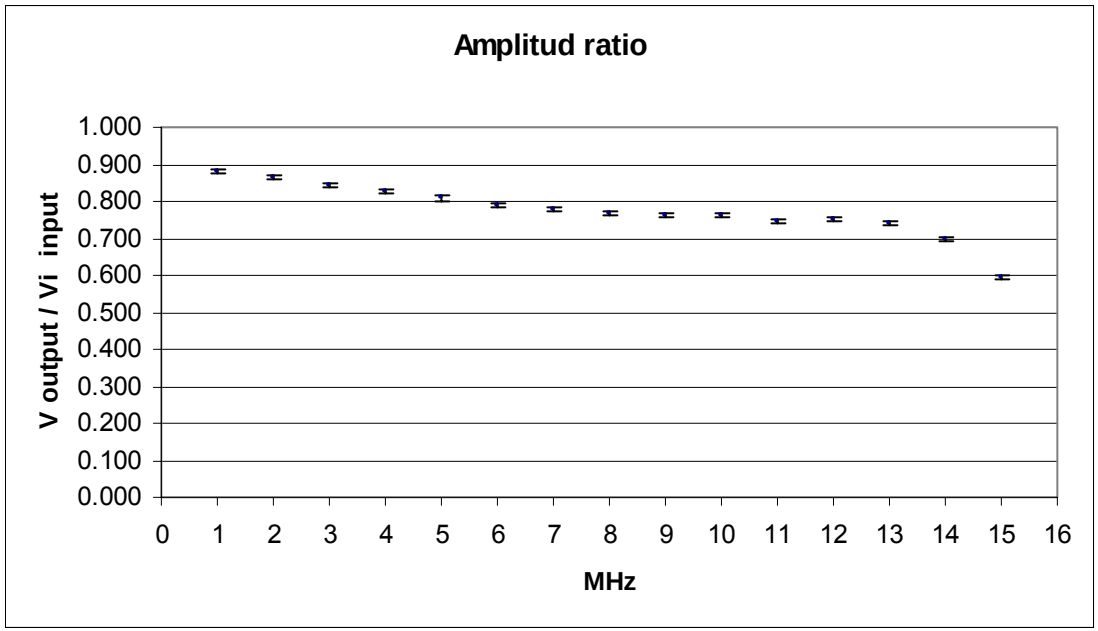
Signal Test

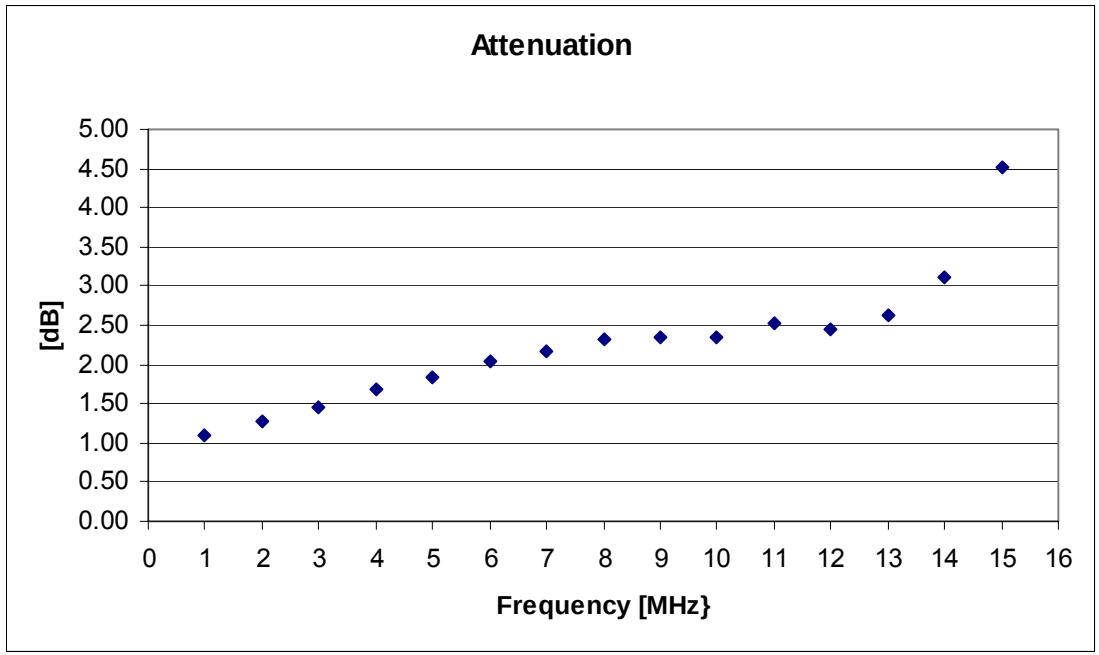
R2 = 7.4 +/- 0.3 Ω Attenuation



Signal Test

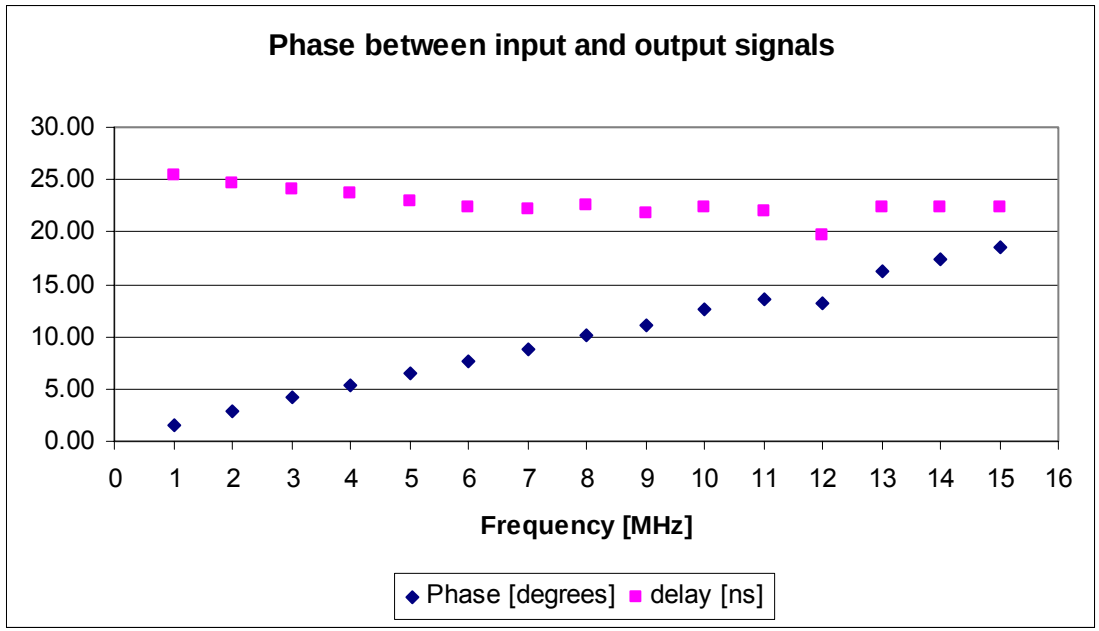
R2 = 7.4 +/- 0.3 Ω

Attenuation



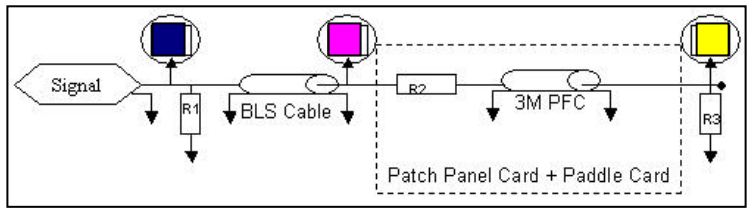
Signal Test

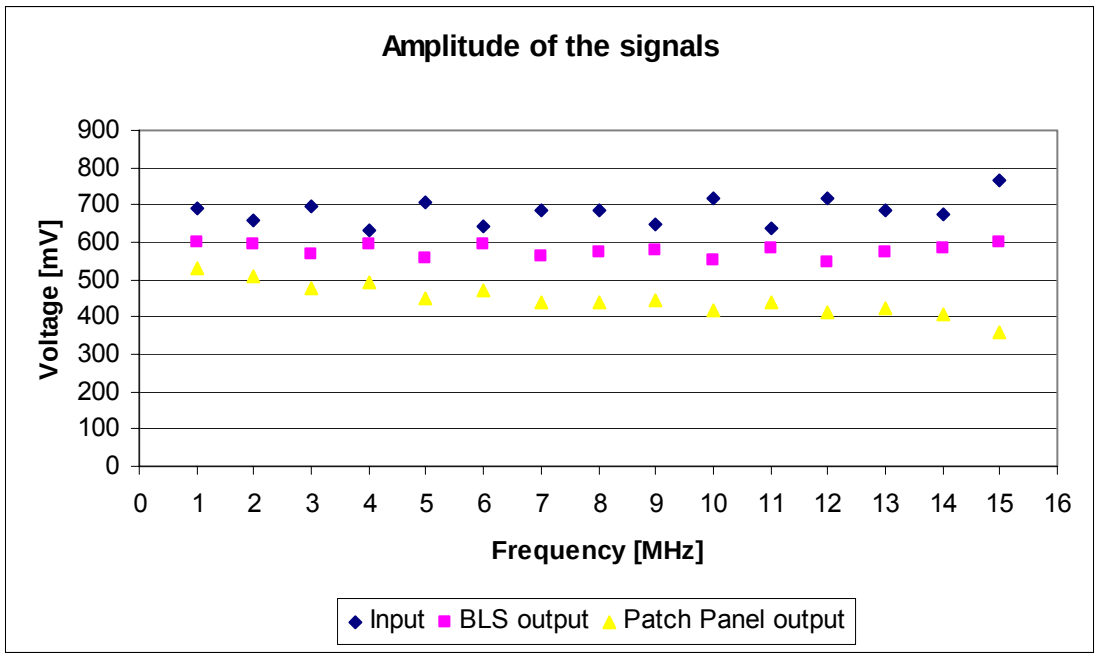
R2 = 7.4 +/- 0.3 Ω



Signal Test

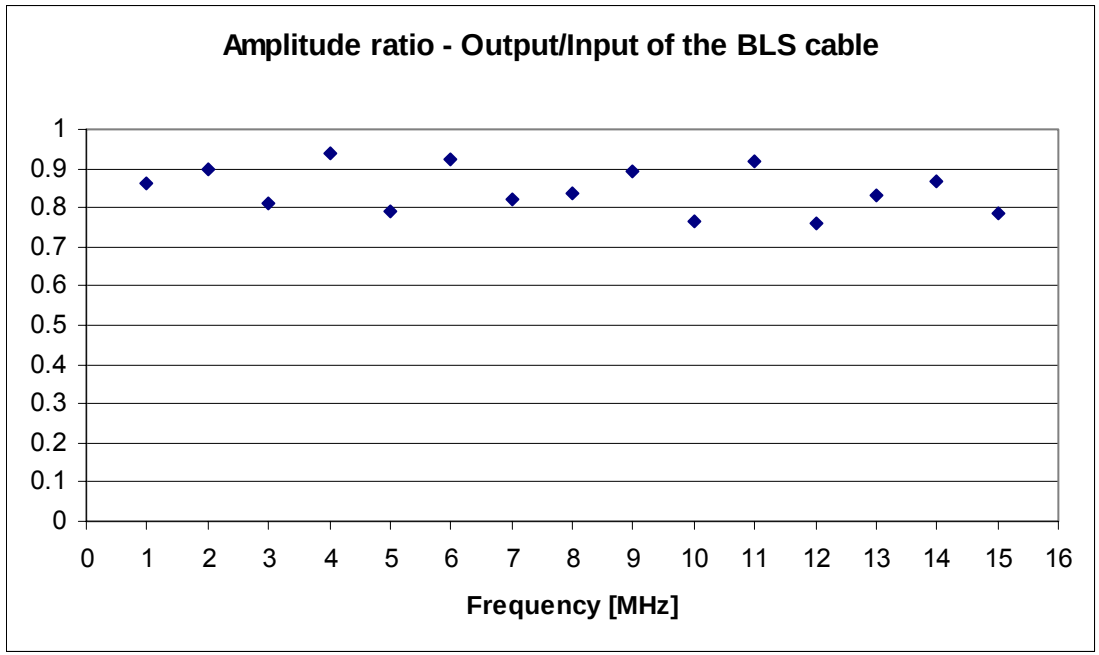
$R2 = 7.4 +/- 0.3\ \Omega$





Signal Test

R2 = 7.4 +/- 0.3 Ω



Summary

- Mock-up
  - The cable flow worked.
  - A procedure to handle the cables is being writing down.
- Signal integrity coming out of the Patch Panel
  - There is a small difference on the impedance of the Pleated Foil Cable and the BLS Cable (order of magnitude 10 Ω)
  - If we add a resistance of this value in the Patch Panel the output decrease ~10% but it gets a little bit “cleaner”.

3M™ Pleated Foil Cable Selection Guide

Typical Cable Properties*	Pleated Foil Cables			Ground Plane Cables	Flat Shielded Jacketed	Round Shielded Jacketed
Cable Part Number	90101 90201 93101 Series	90104 90204 Series	90111 90211 Series	3469 Series	3517 Series	3750 Series
Impedance Ohms						
Unbalanced (GSG)	53	53	72	65	70	51
Balanced (SS)	104	110	129	—	119	100
Capacitance pF/ft. (pF/m)						
Unbalanced (GSG)	28.4 (93.2)	28.1 (92.2)	21.0 (68.9)	25.1 (82.3)	21.5 (70.5)	35.6 (116.8)
Balanced (SS)	14.5 (47.6)	13.4 (44.0)	11.6 (38.1)	—	12.7 (41.7)	18.1 (59.4)
Inductance μH/ft. (μH/m)						
Unbalanced (GSG)	.08 (0.26)	.08 (0.26)	.11 (0.36)	.11 (0.36)	.11 (0.36)	.09 (0.30)
Balanced (SS)	.16 (0.52)	.16 (0.52)	.19 (0.62)	—	.19 (0.62)	.18 (0.59)
Signal Speed						
Propagation Delay ns/ft. (ns/m)						
Unbalanced (GSG)	1.52 (4.99)	1.49 (4.89)	1.51 (4.95)	1.64 (5.38)	1.51 (4.95)	1.82 (5.97)
Balanced (SS)	1.51 (4.95)	1.48 (4.86)	1.50 (4.92)	—	1.51 (4.95)	1.81 (5.94)
Velocity of Propagation (%)						
Unbalanced (GSG)	67	68	67	62	67	56
Balanced (SS)	67	69	68	—	67	56
Attenuation						
dB/100 ft. @ 10MHz	4.9	3.8	4.9	10.0	6.5	5.0
dB/100 ft. @ 100 MHz	14.1	11.1	14.1	37.0	21.0	20.0
Rise time degradation (ns/10 ft.)	0.11	0.10	0.11	1.2	0.5	1.1