Introduction

The following waveforms measure 'insertion loss' and 'isolation' on two (randomly chosen) headend TVRO L-band 4 port splitters. All measurements were taken with a Rohde & Schwarz FSH818 Spectrum analyzer & tracking generator, with test lead and adaptor losses 'normalized' to the 0 dB reference line, therefore the *loss values* shown on the diagrams are the precise (accuracy better than .1 dB) insertion loss and/or isolation values. The horizontal (frequency) axis is from 0 to 2 GHz.

The following waveforms demonstrate that not all L band splitters are created equal, as the first splitter tested (name brand) had measurably better response, lower insertion loss, and greater port-to-port isolation than the second splitter (also a well known brand, but without the manufacturing quality of the first).

| Transm(P | 2▶1) S | calar | | | | | | 05/18/ | /10 | 08:45 =>- |
|--------------|-----------|-----------|-----------|--------------|------|---------|------|-----------------|---------|-------------|
| Ref | f: 0.0 dE | 3 | RBW: | 10 kH | z SW | T: 250 | ms | Tra | ice: | Clear/Write |
| V • Att | :: 10 dB | | | | Triç | g: Free | Ru | n Det | tect: | Sample |
| M1 | 950 N | IHz -6.5 | 0 dB | | M2 | 1.45 | i GH | z -6 | 5.99 dl | 8 |
| | | | | | | | | | S12 (| interp) Mag |
| 0.0 | | | | (| /1 | | + | | | |
| -5.0 | | | | | | | | M2 | | |
| | | | | | | ┼─── | | | | |
| -10.0 | | | | | | | + | | | |
| -15.0 | | | | | | | + | | | |
| -20.0 | | | | | | | + | | | |
| -25.0 | | | | | | | _ | | | |
| -30.0 | | | | | | | _ | | | |
| -35.0 | | | | | | | _ | | | |
| -40 0 | | | | | | | | | | |
| | | | | | | | | | | |
| Center:1 | .0005 G | Hz | | | | Span: | 1 | .999 G | Hz | |
| Meas Mode | | Calibrate | Re Dis | sult play | Form | nat | | Select Trace | | Option |

Insertion loss from (Brand A) coupler input to one of the four output legs. Unused ports were terminated. Insertion loss at 950 MHz is 6.5 dB and 7 dB at 1450 MHz.

| Transm(P2 | ►1) S | calar | | | | | (|)5/18/ | /10 | 08:45 = |
|--------------|------------------------------------|-----------|----------|----------------|------|----------|-----|-----------------|---------|-------------|
| Ref: | 0.0 dE | В | RBW | : 10 kH | z SV | /T: 250 | ms | Tra | ice: | Clear/Write |
| • Att: | 10 dE | | 00.15 | | Tri | g: Free | Rur | n Det | tect: | Sample |
| M1 | 950 N | /IHz -6. | 96 dB | | M12 | 1.48 | GH | z -t | 5.89 dl | 8 |
| | | | | | | | | | S12 (| interp) Mag |
| 0.0 | | | | | M1 | | _ | | | |
| 50 | | | | | | | | M2 | | |
| -5.0 | \sim | | | | | _ | +- | ~ | | |
| -10.0 | +- | \sim | | | | | _ | | | |
| -15.0 | \downarrow | | | | | | | | | |
| | N - | | | | | | | | | |
| -20.0 | ¥ | | | | | | + | | | |
| -25.0 | | | | | | | | | | |
| 20.0 | | | | | | | | | | |
| -30.0 | | | | | | | | | | |
| -35.0 | | | | | | | + | | | |
| -40 0 | | | | | | | | | | |
| | | | | | | | | | | |
| Center: 1. | Center: 1.0005 GHz Span: 1.999 GHz | | | | | | | | | |
| Meas Mode | | Calibrate | Re Di | esult splay | For | mat | | Select Trace | | Option |

Insertion loss from coupler (Brand A) input to one of the four output legs. Unused ports were <u>poorly terminated</u>. Insertion loss values remain close to those measured with the unused legs properly terminated, although out-of-band response is clearly affected.

| Transm(P2 | 2▶1) S | Scalar | | | | | (|)5/18/ | /10 | 08:5 | j4 ː▶− |
|--------------|----------|-----------|-----------|----------------|------|--------|------|-----------------|--------|------|----------|
| Ref | : 0.0 dl | В | RBW: | 10 kH: | z SW | T: 250 | ms | Tra | ce: | Clea | ar/Write |
| V • Att | : 10 dE | 3 | | | Trig | : Free | Rur | n Det | tect: | San | nple |
| M1 | 950 N | /IHz -8. | 34 dB | | M2 | 1.4 | 5 GH | z -8 |).47 d | В | |
| | | | | | | | | | S12 | (nor | m) Mag |
| 0.0 | | | | N | 1 | | | | | | |
| -5.0 | | | | | | | | M2 | | | |
| -3.0 | ~~~ | | | | | | | | | | |
| -10.0 | | | | | | | | | | | |
| -15.0 | | | | | | | | | | | |
| | | | | | | | | | | | |
| -20.0 | | | | | | | | | | | |
| -25.0 | | | | | | | | | | | |
| 20.0 | | | | | | | | | | | |
| -30.0 | | | | | | | | | | | |
| -35.0 | | | | | | | | | | | |
| -40.0 | | | | | | | | | | | |
| | | | | | | | | | | | |
| Center: 1 | .0005 0 | Hz | | | | Span: | 1. | 999 G | Hz | | |
| Meas Mode | | Calibrate | Re Dis | esult splay | Form | nat | | Select Trace | | 0 | ption |

Insertion loss from (Brand B) coupler input to one of the four output legs. Unused ports were terminated. The insertion loss runs 2 to 2.5 dB higher than that measured on Brand A!

| Transm(P | 2►1) S | calar | | | | | 0 | 5/18/ | /10 | 08:5 | 54 ⊑⋑− |
|----------|-----------|-----------|--------|-----------------|-----------|--------|-----|-------|------------|------|----------|
| Re Re | f: 0.0 dl | 3 | RBW: | : 10 kH; | z SW | T: 250 | ms | Tra | ice: | Clea | ar/Write |
| 💙 • At | t: 10 dE | } | | | Trig | : Free | Run | Det | tect: | Sar | nple |
| M1 | 950 N | /IHz -9. | .15 dB | | M2 | 1.45 | GH | z -8 |).98 d | В | |
| | | | | ~ | | | | | S12 | (nor | m) Mag |
| 0.0 | | | | V | 1 | | | - | | | |
| -50 | | | | | | | | M2 | | | |
| | \wedge | | | $ \rightarrow $ | | | | | | | |
| -10.0 | | | | | | | | | | | |
| -15.0 | ₩ | | | | | | | | | | |
| -20.0 | ¥ | | | | | | | | | | |
| 25.0 | Ŷ | | | | | | | | | | |
| -25.0 | | | | | | | | | | | |
| -30.0 | | | | | | | + | | | | |
| -35.0 | | | | | | | | | | | |
| | | | | | | | | | | | |
| -40.0 | | | | | | | | | | | |
| 0 | | | | | | 0 | 1 | 000 0 | | | |
| Center: | 1.0005 G | HZ | | | | Span: | | 999 G | HZ | | |
| Mode | | Calibrate | Dis | splay | Form | lat | | Frace | | 0 | ption |

Insertion loss from (Brand B) coupler input to one of the four output legs. Unused ports were <u>poorly terminated</u>. The insertion loss values on this coupler are affected to a greater degree (than Brand A), and it was also determined (during testing) that the splitter (Brand B) had a loose internal connection affecting it's performance.

| Trans | sm(P2 | 2▶1) S | calar | | | | | | (| 05/19/ | /10 0 | 9:11 = |
|--------|----------------|--------|-----------|--------|-----------------|----|-------|-------|----|-----------------|----------|------------|
| | Ref: | 0.0 dE | 3 | RBW | ': 10 kł | Ηz | SWT | : 250 | ms | Tra | ce: C | lear/Write |
| V | Att: | 10 dB | | | | | Trig: | Free | Ru | n Det | tect: S | ample |
| M1 | | 950 N | 1Hz -23 | .92 dB | | M2 | | 1.45 | GH | lz -24 | .01 dB | |
| | | | | | | | | | | | \$12 (in | iterp) Mag |
| 0.0 — | | | | | | M1 | | | + | | | |
| EO | | | | | | | | | | M2 | | |
| -5.0- | | | | | | | | | | | | |
| -10.0 | | | | | | | | | _ | | | |
| 15.0 | | | | | | | | | | | | |
| - 15.0 | | | | \sim | | | | | | | | |
| -20.0 | | | | | | | | | _ | | | |
| 25.0 | | | | | | _ | | | _ | ~ | | |
| -25.0 | | | | | | | | | | | / | |
| -30.0 | | | | | | | | | _ | | | |
| 25.0 | | | | | | | | | | | | |
| -35.0 | | | | | | | | | | | | |
| -40.0 | | | | | | | | | _ | | | |
| | | | | | | | | | | | | |
| Cen | ter:1 | GHz | | | | | | Span: | 1 | .999 G | Hz | |
| N | /leas /lode | | Calibrate | R | esult isplay | | Form | at | | Select Trace | | Option |

Isolation loss on (Brand B) coupler between two output legs, with the unused ports terminated.

| Transm(| P2▶1) S | calar | | | | | 0 | 5/19/ | /10 09 | :11 =D- |
|--------------|------------|---------------|--------|----------------|------|--------|-----|---------------|----------|-----------|
| Re Re | ef: 0.0 dE | 3 | RBW | : 10 kH | z SW | T: 250 | ms | Tra | ce: Cle | ear/Write |
| V • A | tt: 10 dB | | | | Trig | : Free | Run | Det | ect: Sa | mple |
| M1 | 950 N | 1Hz -22. | .95 dB | | M2 | 1.45 | GHz | : -23 | .96 dB | |
| | | | | | | | | | S12 (int | erp) Mag |
| 0.0 | | | | N | 11 | | ++ | | | |
| 50 | | | | | | | | M2 | | |
| -5.0 | | | | | | | | | | |
| -10.0 | | | | | | | | | | |
| -15.0 | | | | | | | | | | |
| -20.0 | | | / | ***** | | | + | | | |
| -25.0 | | \rightarrow | | | | | | ~ | | \sim |
| -30 0 | | | | | | | | \rightarrow | | |
| | | | | | | | | | | |
| -35.0 | | | | | | | | | | |
| -40.0 | | | | | | | | | | |
| | | | | | | | | | | |
| Center: | 1 GHz | | | | | Span: | 1.9 | 99 GI | Hz | |
| Mea Mod | s e | Calibrate | R | esult splay | Form | nat | S | elect race | | Option |

Isolation loss on (Brand B) coupler between two output legs, with the unused ports <u>un-terminated</u>. In this case, the *in-band* response and isolation values are not adversely affected by poor Z on the other ports.