

General.

The filter can be driven in an unbalanced and balanced ways. It is matched to **50 W**

The matching element values given below are theoretical calculations based on measured values for termination impedance for unbalanced matching, given in the specification and S-parameters of the filters on PCB. If there are parasitics on the customer PCB, the matching elements have to be optimised regarding the circuit and PCB design.

We have tested on the PCB (tft041) two different versions of matching network:

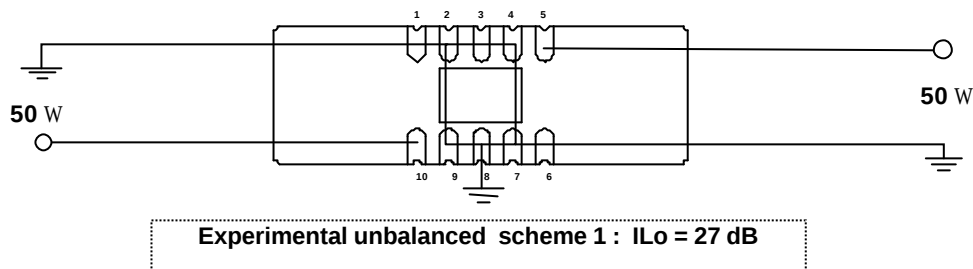
- unbalanced scheme 1 from filter specification : $50\Omega \times 50\Omega$;
- unbalanced scheme 2.

Unbalanced matching.

The calculation was made with consideration of parasitics and Q-values of matching elements. The capacities of C_{1par} and C_{2par} are parasitic capacities on PCB and ones are used for simulation of parasitics effect of our PCB (tft041) only.

1. Unbalanced matching on the PCB. Scheme 1.

The balanced matching network on the test board (PCB – tft041) was tested.



Filter has next typical values with unbalanced scheme 1 :

I _{Lo} (typ.) :	27 dB,
Passband ripple :	< 0,25 dB;
Group delay ripple:	55 ... 65 ns;
Phase ripple:	2°;
TTS:	- 60 dB;
Selection in $f_c - 20 \text{ MHz} \dots f_c - 10 \text{ MHz}$:	> 48 dB;
Selection in $f_c + 10 \text{ MHz} \dots f_c + 30 \text{ MHz}$:	> 37 dB;
Selection in $f_c \pm 30 \text{ MHz} \dots f_c \pm 36 \text{ MHz}$:	> 45 dB;
Third harmonic (108 MHz) :	0 dB.

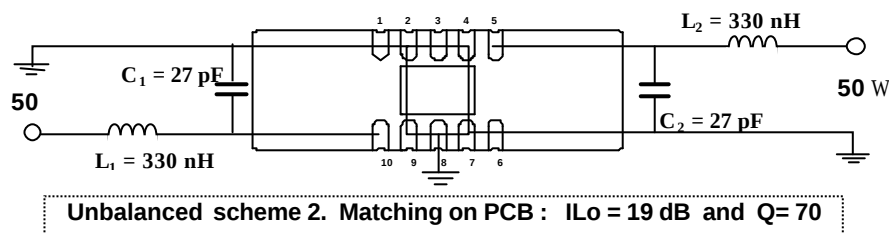
Typical filter responses see you, please, in Appendix 1.

To improve insertion loss and ultimate rejection we must use LC-matching networks.

2. Unbalanced matching on the PCB. Scheme 2.

The values of the matching elements, which are given on the diagram below, are calculated for $I_{Lo} \approx 19$ dB with consideration of the Q -values = 70 and parasitics capacities $C_{1par} = C_{2par} = 0...2$ pF and based on measured S-parameters of the filter TFH 36A.

The balanced matching networks on the test board (PCB – tft041) was tested with SMD-components with Q -value of ≈ 70 . Matching elements values, which are given below, were found on our PCB: tft041.



Elements C_1 and C_2 have to be adjusted on your board design (PCB).

Filter has next typical values with unbalanced scheme 2 :

Termination impedance (if $Q = 50$) :

for input:	124,5 Ω - 15,56 pF.
for output:	160,4 Ω - 13,15 pF.

I_{Lo} (typ.) :	19 dB,
Passband ripple :	< 0,50 dB;
Group delay ripple:	65 ... 90 ns;
Phase ripple:	3°;
TTS:	- 44...-46 dB;

Selection in $f_c - 35$ MHz ... $f_c - 6$ MHz :	> 50 dB;
Selection in $f_c + 10$ MHz ... $f_c + 15$ MHz :	> 45 dB;
Selection in $f_c + 15$ MHz ... $f_c + 60$ MHz :	> 55 dB;

Third harmonic (108 MHz) : 30...32 dB.

Typical filter responses see you, please, in Appendix 2.

Commentary.

If the parasitics on the customer board (mentioned parasitics, additional parasitics of active parts) are different to this PCB (tft041), the matching elements will have to be slightly adjusted. Both in line and shunt elements will change both pass band shape (tilt, concave, convex) and insertion loss ILo.

Details.

TTS, group delay ripple etc. depend on insertion loss, which depends on parallel matching elements.

Pass band shape characteristic [S_{21} , S_{11} , S_{22}] depends much on series elements for all schemes.

Comparison of matching schemes:

Electrical characteristics of the filter TFH 36A in pass band are not much different for both matching networks, expect insertion loss.

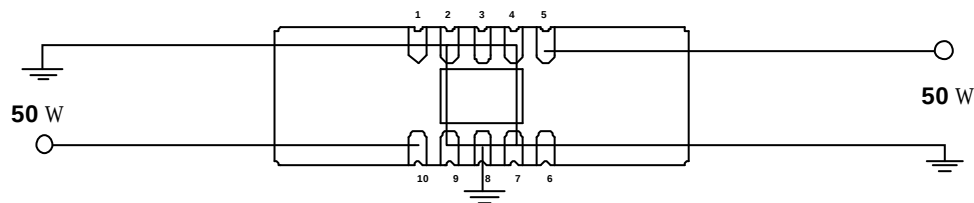
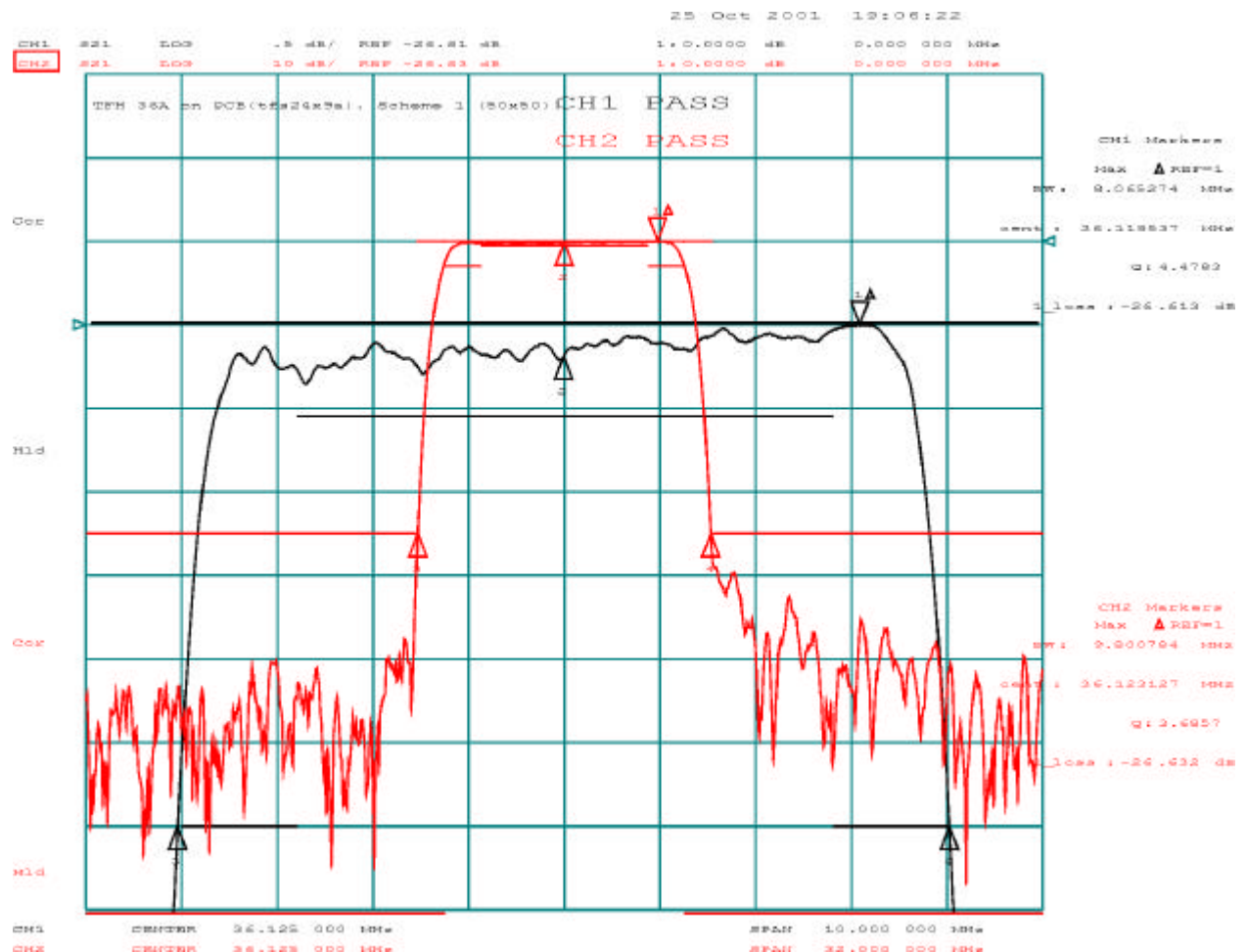
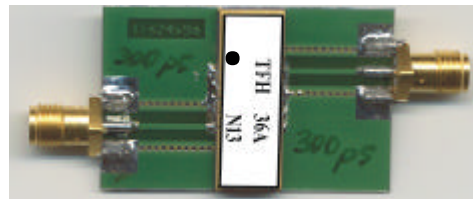
Unbalanced schemes 2 has better selection in ultimate regions ($f_c \pm 10$ MHz ... $f_c \pm 40$ MHz) as compared with scheme 1.

All schemes are stable for filter characteristic in the pass band.

For final test we use scheme 1.

Additional note.

We can send to you filter sample TFH 36A on our PCB (tft041) according to your requirements.

Appendix 1 : Measured data of TFH 36A with scheme 1.Experimental unbalanced scheme 1 : IL₀ = 20 dB

VI TELEFILTER

Potsdamer Straße 18

D 14 513 TELTOW / Germany

Tel: (+49) 3328 4784-0 / Fax: (+49) 3328 4784-30

E-mail: tft@telefilter.com

Vectron International, Inc.

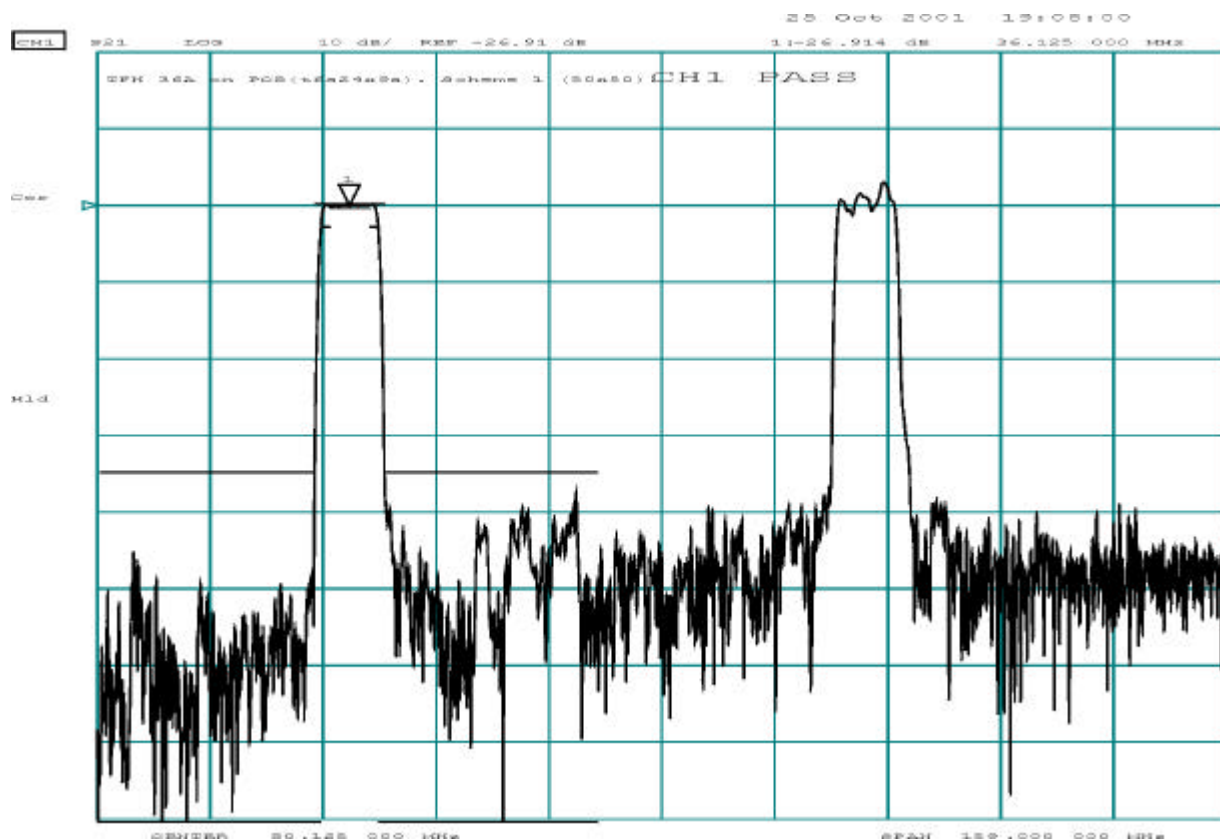
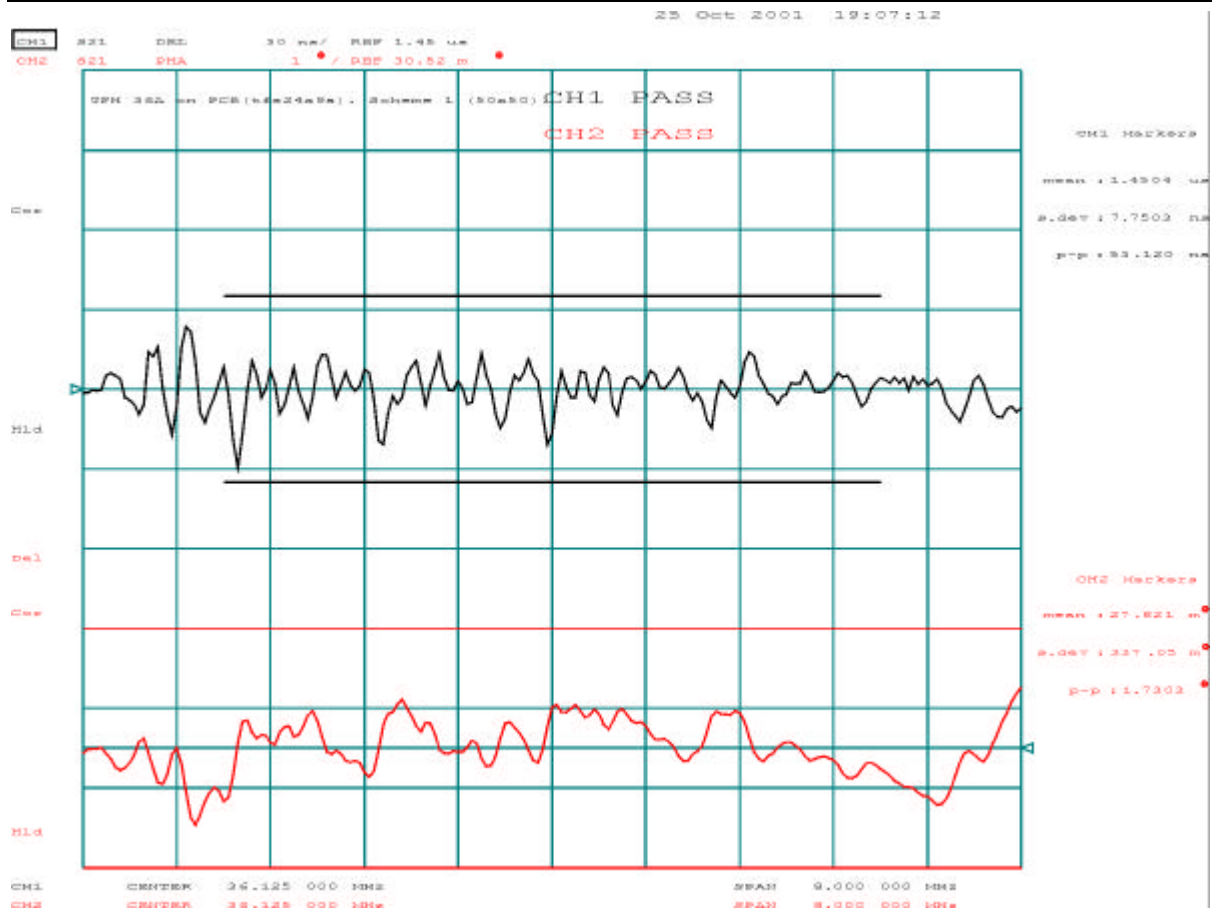
267 Lowell Road

Hudson, NH 03051 / USA

phone: (603) 598-0070 Fax: (603) 598-0075

e-mail: vti@vtinh.com

VI TELEFILTER reserves the right to make changes to the product(s) and/or information contained herein without notice. No liability is assumed as a result of their use or application. No rights under any patent accompany the sale of any such product(s) or information.

VI TELEFILTER**Application Note****TFH 36A****5/10****VI TELEFILTER**

Potsdamer Straße 18

D 14 513 TELTOW / Germany

Tel: (+49) 3328 4784-0 / Fax: (+49) 3328 4784-30

E-mail: tft@telefilter.com

Vectron International, Inc.

267 Lowell Road

Hudson, NH 03051 / USA

phone: (603) 598-0070 Fax: (603) 598-0075

e-mail: vti@vtinh.com

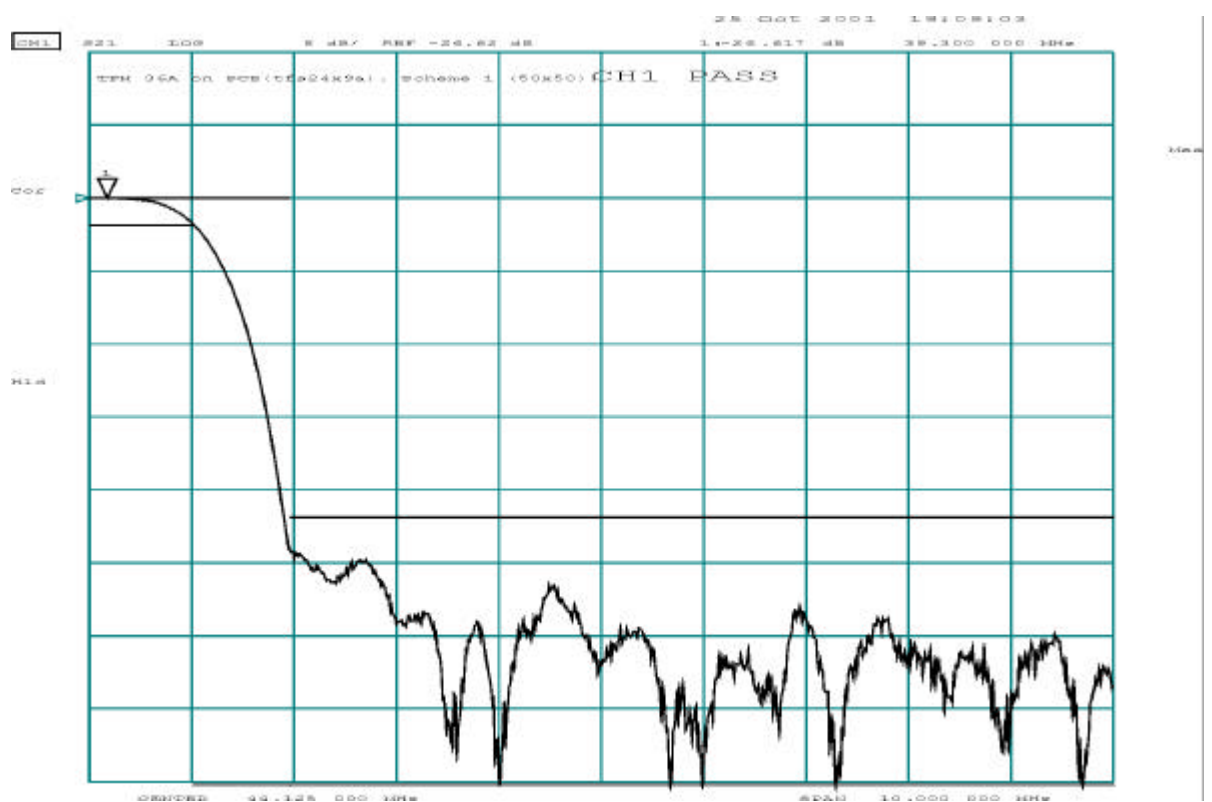
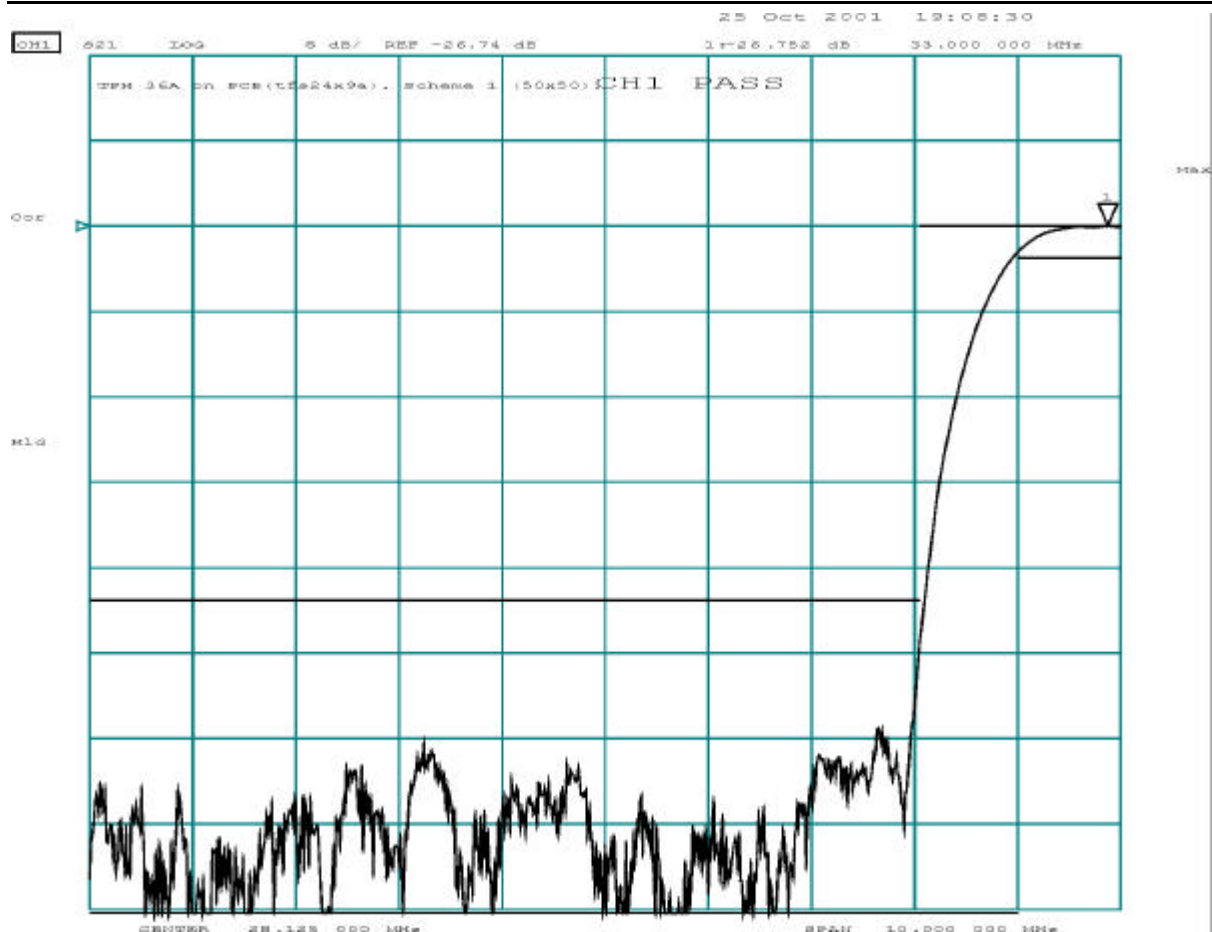
VI TELEFILTER reserves the right to make changes to the product(s) and/or information contained herein without notice. No liability is assumed as a result of their use or application. No rights under any patent accompany the sale of any such product(s) or information.

VI TELEFILTER

Application Note

TFH 36A

6/10



VI TELEFILTER

Potsdamer Straße 18

D 14 513 TELTOW / Germany

Tel: (+49) 3328 4784-0 / Fax: (+49) 3328 4784-30

E-mail: tft@telefilter.com

Vectron International, Inc.

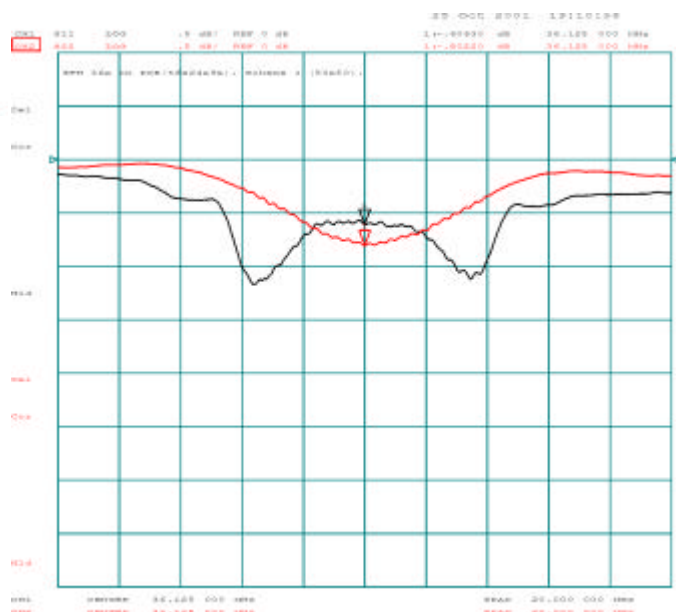
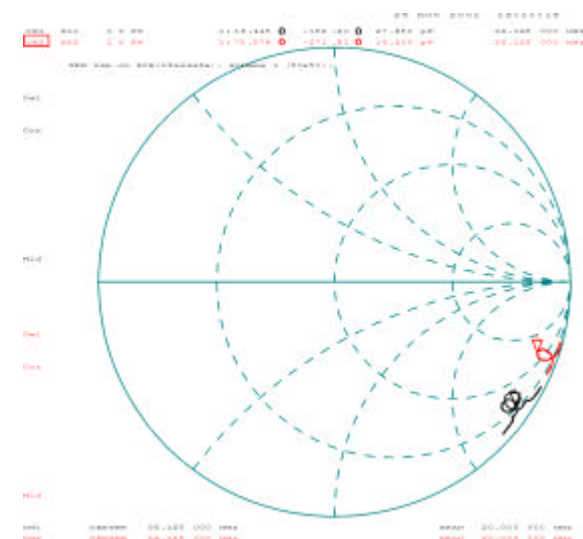
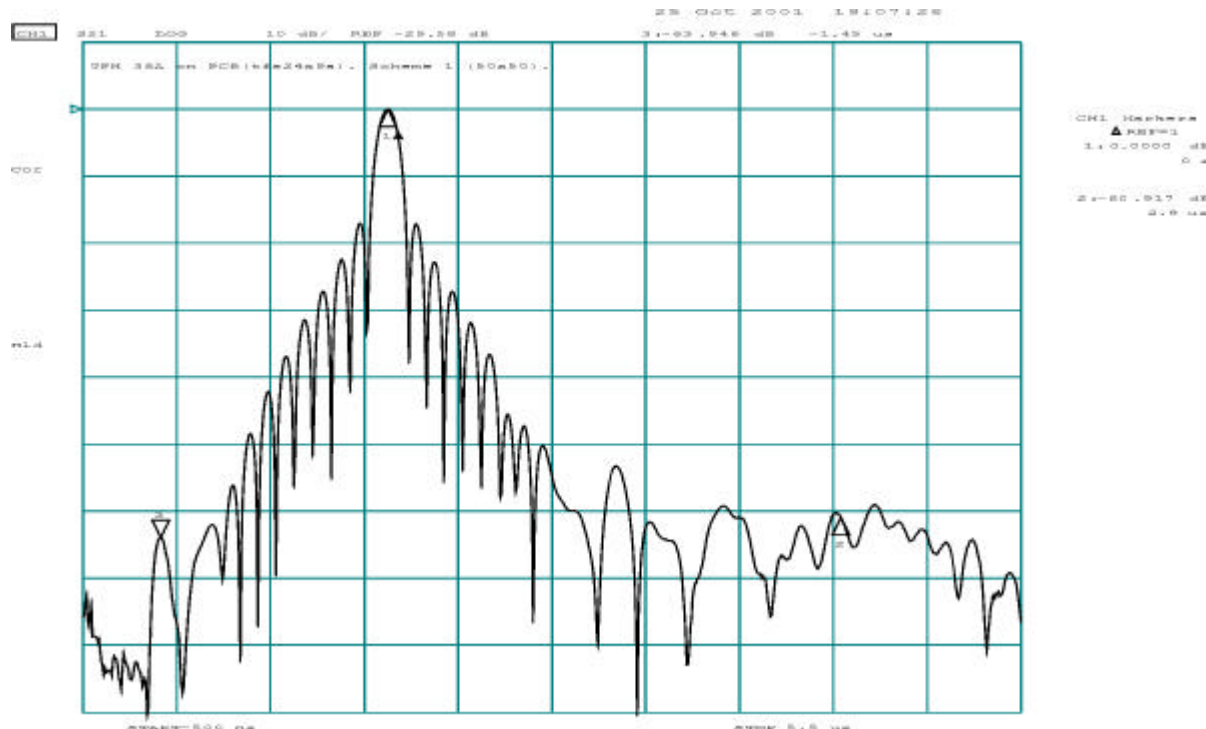
267 Lowell Road

Hudson, NH 03051 / USA

phone: (603) 598-0070 Fax: (603) 598-0075

e-mail: vti@vtinh.com

VI TELEFILTER reserves the right to make changes to the product(s) and/or information contained herein without notice. No liability is assumed as a result of their use or application. No rights under any patent accompany the sale of any such product(s) or information.



VI TELEFILTER

Potsdamer Straße 18

D 14 513 TELTOW / Germany

Tel: (+49) 3328 4784-0 / Fax: (+49) 3328 4784-30

E-mail: tft@telefilter.com

Vectron International, Inc.

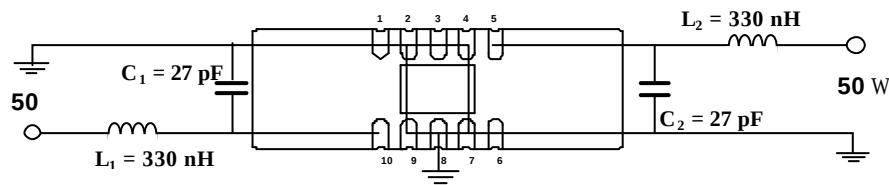
267 Lowell Road

Hudson, NH 03051 / USA

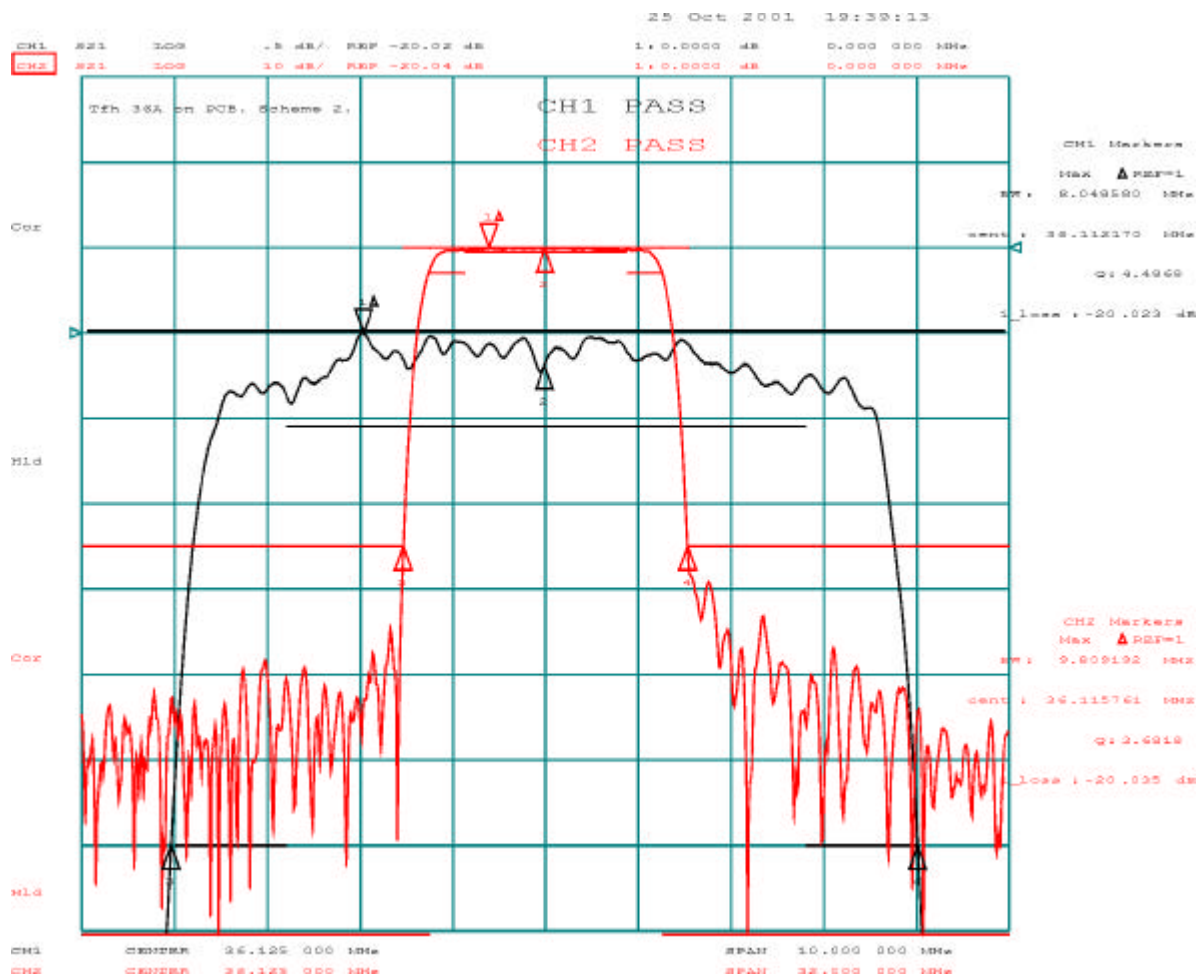
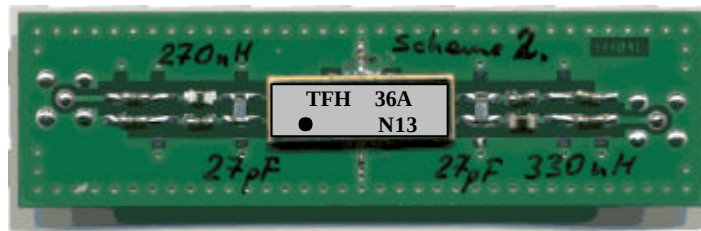
phone: (603) 598-0070 Fax: (603) 598-0075

e-mail: vti@vtinh.com

VI TELEFILTER reserves the right to make changes to the product(s) and/or information contained herein without notice. No liability is assumed as a result of their use or application. No rights under any patent accompany the sale of any such product(s) or information.

Appendix 2 : Measured data of TFH 36A with scheme 2.

Unbalanced scheme 2. Matching on PCB : $ILo = 19$ dB and $Q = 70$



VI TELEFILTER

Potsdamer Straße 18

D 14 513 TELTOW / Germany

Tel: (+49) 3328 4784-0 / Fax: (+49) 3328 4784-30

E-mail: tft@telefilter.com

Vectron International, Inc.

267 Lowell Road

Hudson, NH 03051 / USA

phone: (603) 598-0070 Fax: (603) 598-0075

e-mail: vti@vtinh.com

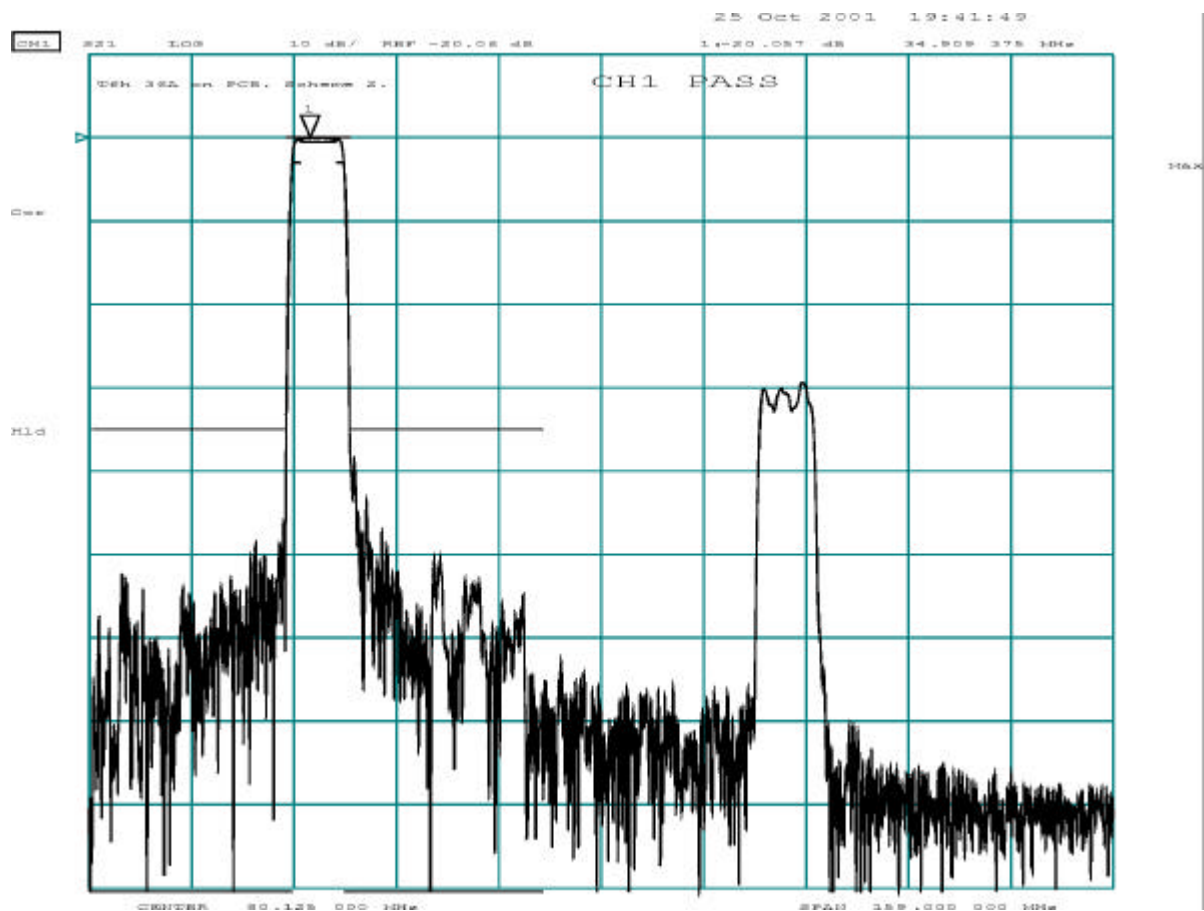
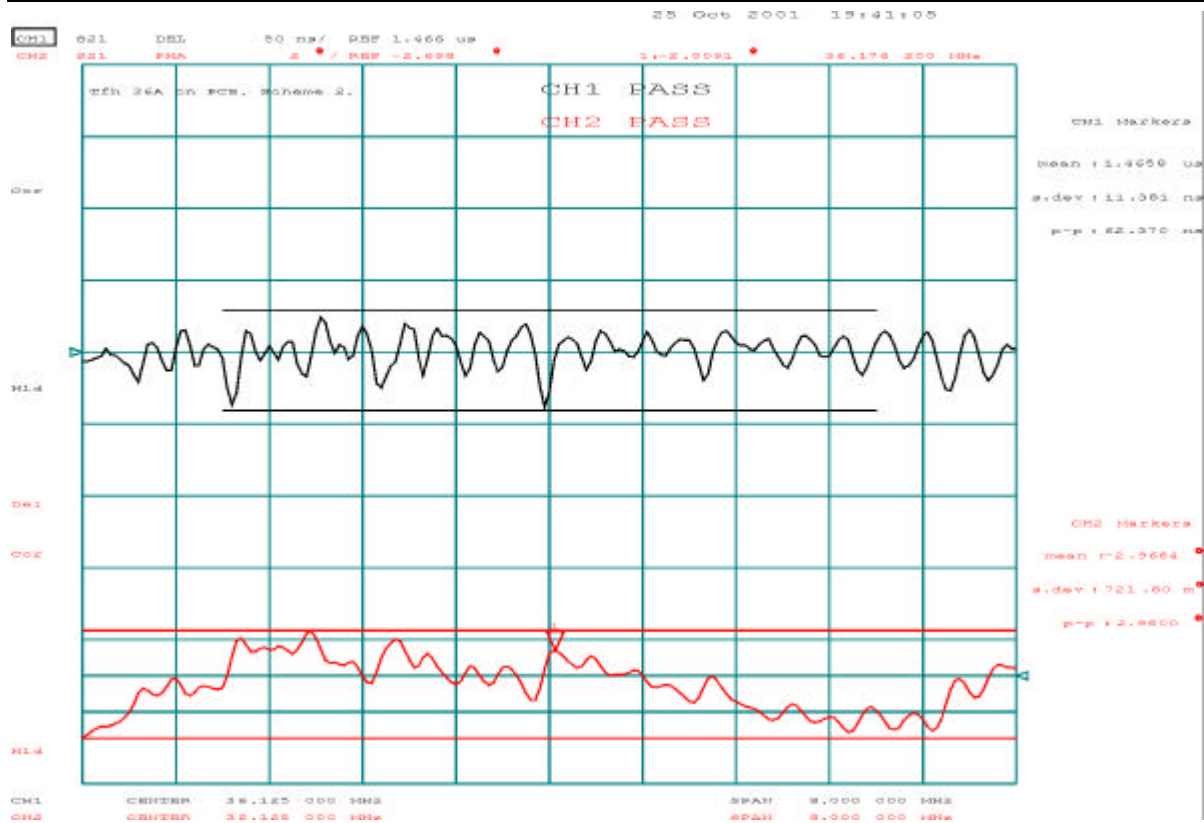
VI TELEFILTER reserves the right to make changes to the product(s) and/or information contained herein without notice. No liability is assumed as a result of their use or application. No rights under any patent accompany the sale of any such product(s) or information.

VI TELEFILTER

Application Note

TFH 36A

9/10



VI TELEFILTER

Potsdamer Straße 18

D 14 513 TELTOW / Germany

Tel: (+49) 3328 4784-0 / Fax: (+49) 3328 4784-30

E-mail: tft@telefilter.com

Vectron International, Inc.

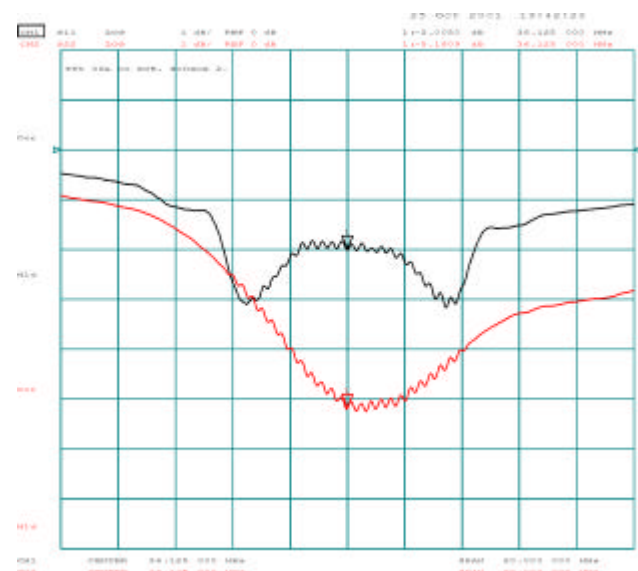
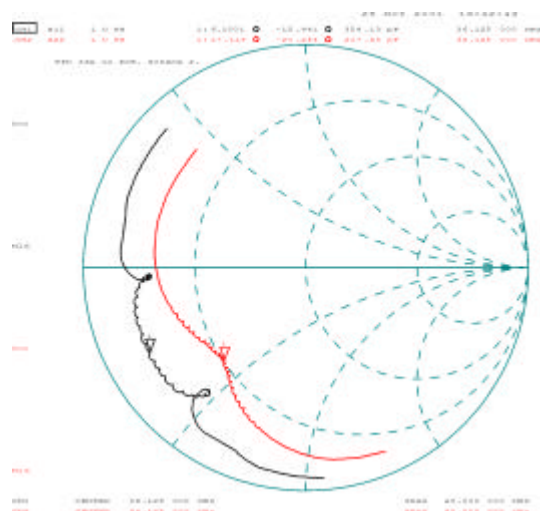
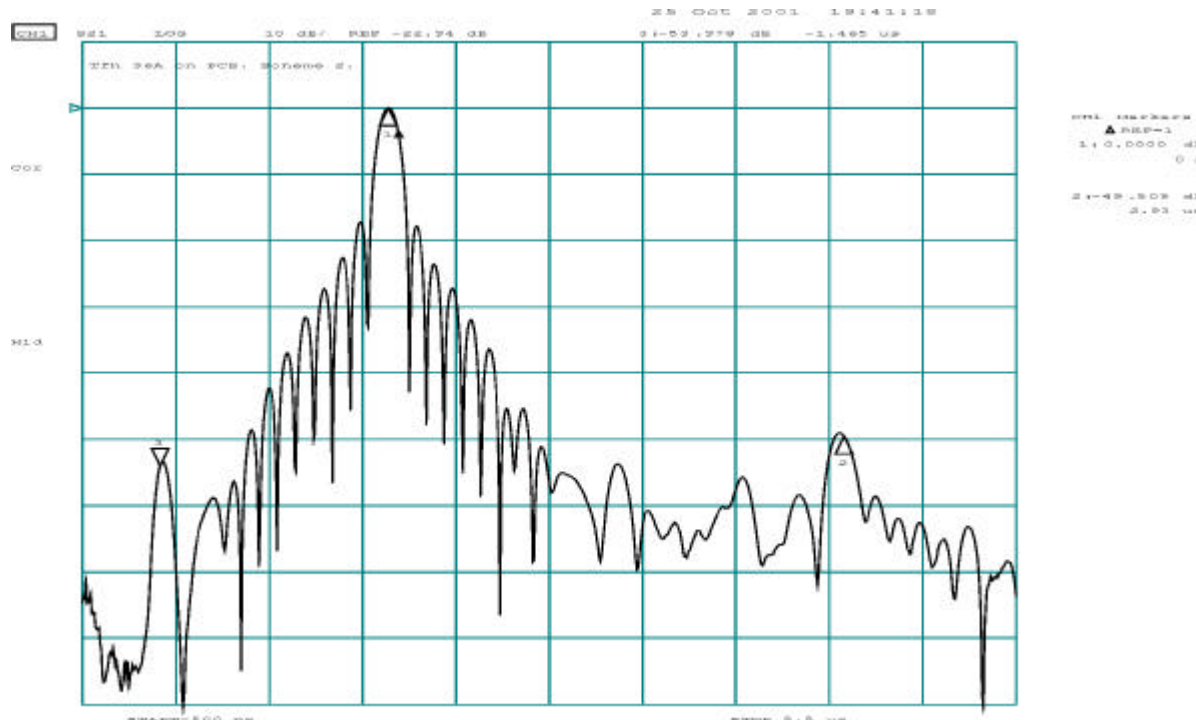
267 Lowell Road

Hudson, NH 03051 / USA

phone: (603) 598-0070 Fax: (603) 598-0075

e-mail: vti@vtinh.com

VI TELEFILTER reserves the right to make changes to the product(s) and/or information contained herein without notice. No liability is assumed as a result of their use or application. No rights under any patent accompany the sale of any such product(s) or information.



VI TELEFILTER
 Potsdamer Straße 18
 D 14 513 TELTOW / Germany
 Tel: (+49) 3328 4784-0 / Fax: (+49) 3328 4784-30
 E-mail: tft@telefilter.com

Vectron International, Inc.
 267 Lowell Road
 Hudson, NH 03051 / USA
 phone: (603) 598-0070 Fax: (603) 598-0075
 e-mail: vti@vtinh.com

VI TELEFILTER reserves the right to make changes to the product(s) and/or information contained herein without notice. No liability is assumed as a result of their use or application. No rights under any patent accompany the sale of any such product(s) or information.