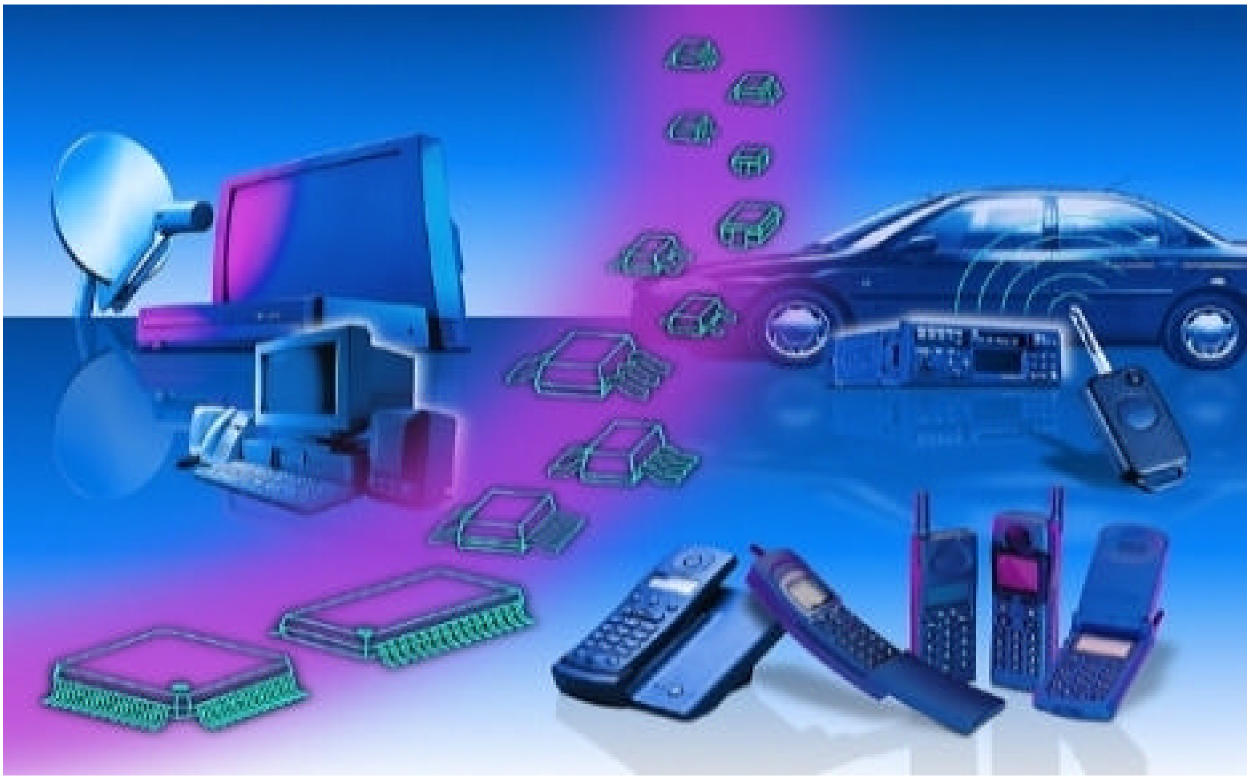


Wireless Components & Tailored System Solutions

Application Note of ATSC Tuner with TUA6034T

Version 1.0
The 3rd part of Application notes for TUA6034.

Applications of IC, TUA6034 :

Specially Suitable for Digital Broadcasting Standards

DVB-T, DVB-C, ISDB-T, ATSC, etc.

Overview of the ATSC Tuner

Single Conversion Tuner
For ATSC application

With Infineon Components of

TUA6034 Single Chip Mixer-Oscillator-PLL IC

BG3130, BF 2030W self biasing MOSFETs

BB565, BB659C and BB 689 Varactor Diodes

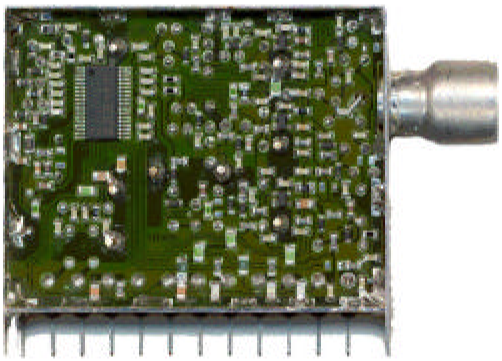
This small sized single conversion tuner is designed for ATSC(8-VSB) front-end in the frequency range from 57 to 861MHz. The tuner is developed as a real 3 band tuner concept, designed without switching diodes based on the Infineon 3 band tuner IC, **TUA6034** which has 3 mixer, 3 oscillators, separated SAW driver input, PLL and balanced crystal oscillator for optimum digital front-end performance. The IC is particularly suitable for digital tuner applications that require a high performance front-end block. The IC provides a balanced SAW filter driver output that is designed to drive a SAW filter directly.

The tuner is optimized for IF bandwidth = 6MHz and IF center frequency = 44MHz.
The frequency ranges of the tuner is as follows :

VHF I :	**57**	**-**	**159 MHz**
VHF II:	**165**	**-**	**453 MHz**
UHF :	**459**	**-**	**861 MHz**

All the passive and active components except air coils, 1 choke coil are SMD components. The PCB is single-clad and the dimensions are 49.5 x 38.5 mm. The pin layout and the outline dimensions are designed according to the world standard tuner description, which is the current standard size of analog tuners in the market.

Semiconductors:



1 X TUA 6034T

1 X BG3130

1 X BF 2030W

7 X BB 565

4 X BB 659C

4 X BB 689

Contents

1. Introduction of the ATSC Tuner with TUA6034

This reference tuner is developed for ATSC (Advanced Television Systems Committee) 8-VSB (Vestigial Side-band Modulation) receiver. The TV tuner is the key block to recover the original video and sound data with minimum impairments, and any of worse conversion characteristics than certain threshold level will immediately degrade the digital receiver performance. In fact the tuner block decides the most important receiver characteristics, sensitivity and selectivity.

Fig.1 shows a typical 8-VSB air-signal from the transmitter. Instead of the Picture/Color/Audio signal (with three peaks) the DTV signal will show as a 6 MHz Raised Noise Floor with a spike on the lower or left side of the waveform. DTV signal will appear almost like a spread spectrum signal with a raised noise floor, but is actually a pseudo spread spectrum type of signal. The spike on the lower side of the waveform is called the ATSC Pilot which provides one of three timing signals within the data stream. The signal includes 19.39 Mb/s MPEG data.

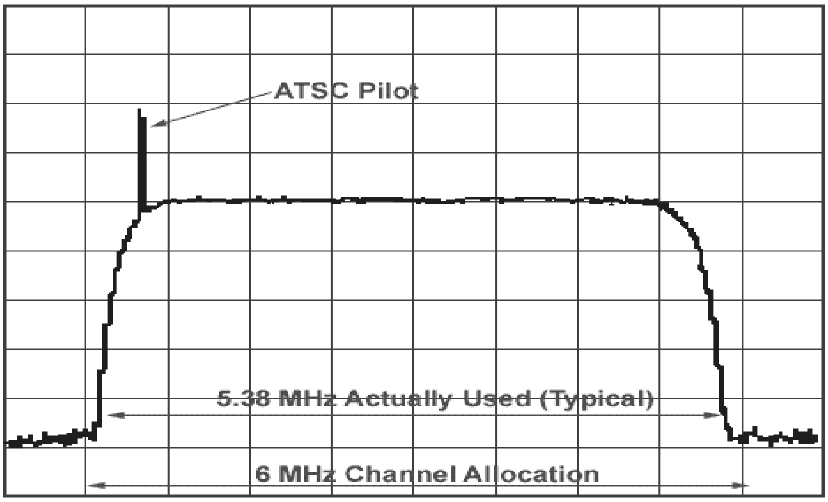


Fig. 1 An example of a typical ATSC (8-VSB) signal

In a practical system, various system distortions, noise and interference will impair the signal. The overall effect of these impairments is to degrade the carrier-to-noise ration, C/N, and this will be C/(N+I) in the presence of strong Interference. The tuner as the first block in the digital TV receiver must guarantee a certain level of SNR, and in U.S., the FCC Advisory Committee on Advanced Television Service has recommended standard values for receiver noise figure, the loss of the receiving antenna transmission line, and antenna gain for different frequency bands. These planning factors are shown in Table.1

	VHFL	VHFH	UHF
Receiver Antenna Gain (dB)	4	6	10
Line Loss (dB)	1	2	4
Noise Figure (dB)	10	10	7
Threshold C/N (dB)	15.2	15.2	15.2
Threshold Power at Receiver (dBm)	-81	-81	-84

Table 1 FCC Planning Factors and Threshold Power[1]

Satisfactory reception in ATSC standard is defined in terms of TOV (Threshold of Visibility) which was actually derived subjectively, and this C/N threshold values for trellis-coded 8-VSB is about 15.2dB as in the Table.1. With the current technology, the implementation loss of ATSC system is only 0.4dB, and that of DVB-T is over 2 dB. The tuner in this report is optimized to satisfy the noise figure requirement with some margins. It is verified in a lot field-tests that noise figure of the tuner should be lower than 10dB in the whole frequency range.

[1] *FCC Sixth Report and Order, April 3, 1997, Appendix A.*

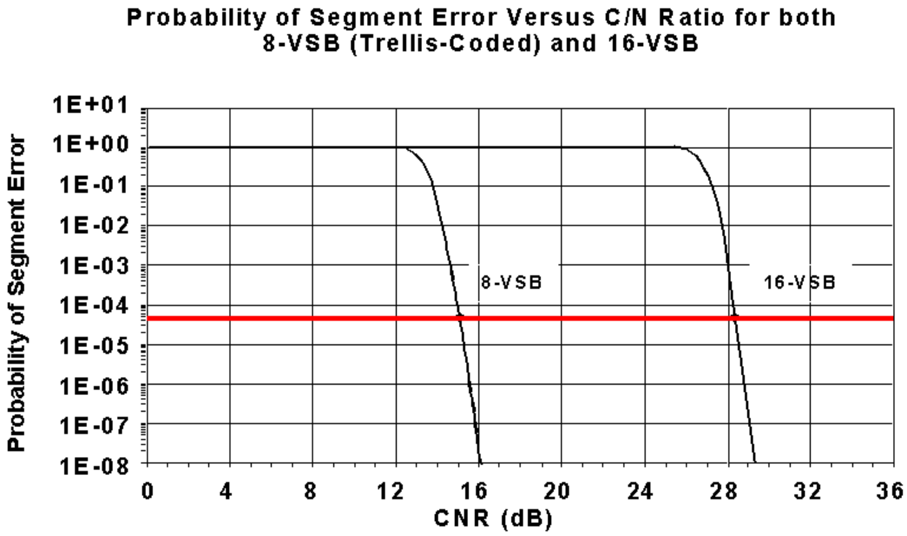


Fig. 2 Probability of Segment Error for 8VSB-T and 16VSB[2]

Fig. 2 contains graphs of the segment error probabilities for both trellis-coded 8-VSB (ATSC) and 16-VSB modes. SER=2x10^{-4} (or BER=3x10^{-6}) is the points where the S/N is such that one segment error per second occurs. The threshold of visibility (TOV) has been determined (for no video error masking in the receiver) to be at 2.5 segment errors/second. Fig.3 shows how 8-VSB constellation is difference between high and low SNR.

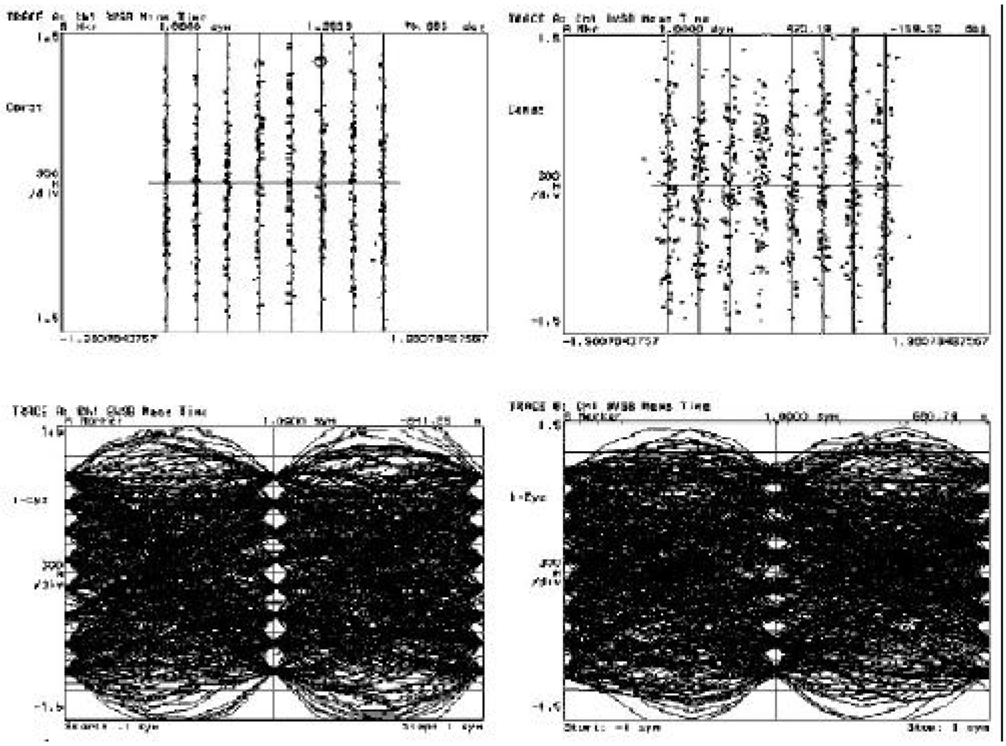


Fig. 3 8-VSB Constellations and Eye Diagram: Left = Low Noise, Right = High Noise

[2] *ATSC/VSB Tutorial – Receiver Technology Compiled by Wayne E. Bretl Zenith Electronics Corp.*

8-VSB signal constellation diagram is series eight vertical lines that correspond to the eight transmitted amplitude levels. In 8-VSB, the digital information is transmitted exclusively in the amplitude of the RF envelope and not in the phase. The useful information is recovered only by sampling an In-phase synchronous detector, and no useful information in a Quadrature channel.

Although the noise floor is a useful concept for estimating the coverage, in the real world interference like harmonics, intermodulation products is often present, and affects the receiver performance badly. Part of this report is devoted to an intermodulation test by strong analog adjacent channel, and also a solution is proposed to minimize the intermodulation terms from the strong adjacent NTSC signals with the internal wide-band detection AGC of TUA6034.

The tuner block diagram is shown in Fig.4

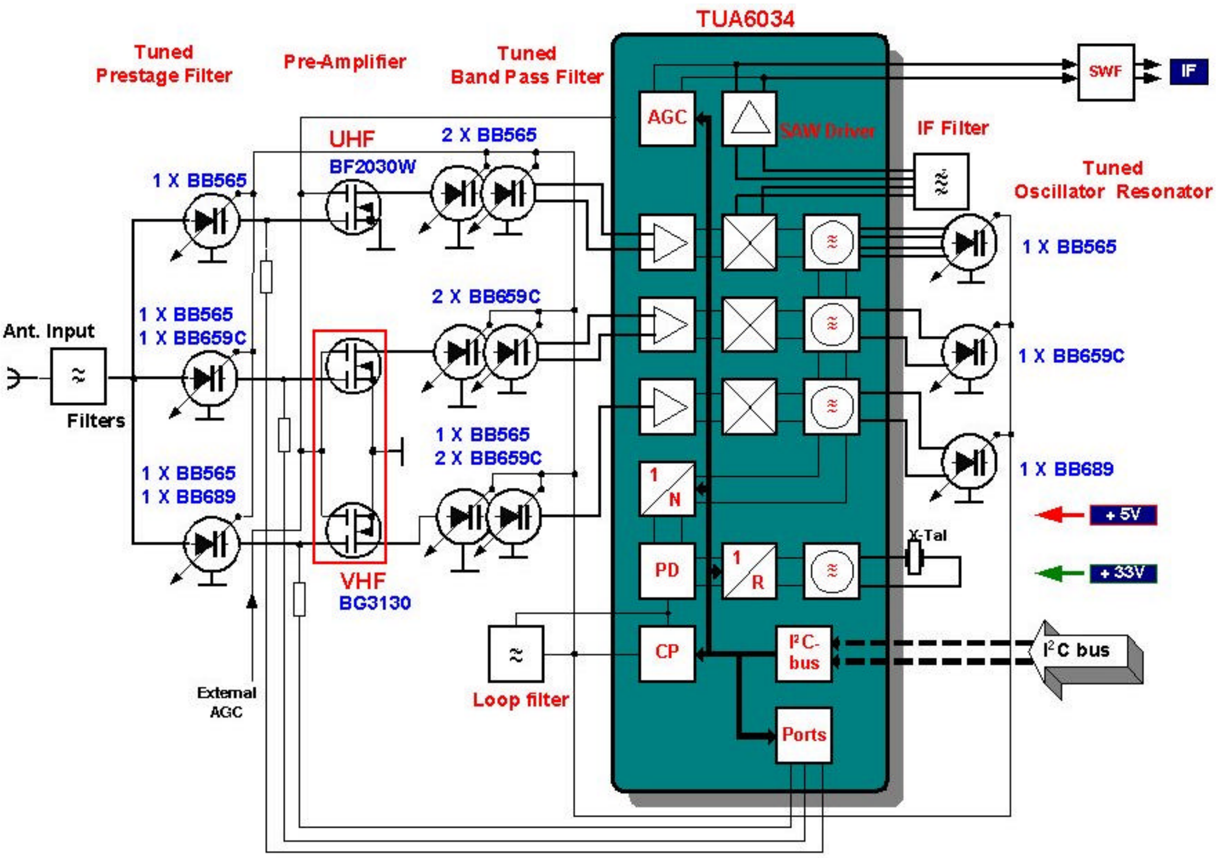


Fig. 4 Block Diagram of the ATSC Tuner with TUA6034

The ATSC tuner consists of 3 different band blocks to obtain optimal RF performance for the digital receiver. The first filter block contains a CB (Citizen Band) trap, IF trap and a simple power divider to separate the input signal from the antenna to each band. The following LNA blocks contain tracking filters and image traps to tune the chosen channel and to reject undesired adjacent signals. It is feasible to put a two-pole or several pole IF filters in the tuner thanks to the separate mixer output and the IF amplifier input. In the current reference design 6MHz bandwidth 2-pole IF filter is installed. The loop filter is optimized for optimal phase noise and reference spur suppression. We can achieve much better phase noise than the required threshold of -76dBc/Hz at 20KHz offset.

As in NTSC television receivers, it is customary to employ delayed AGC in digital TV receivers. This technique must be carefully implemented for optimum receiver performance. In a DTV receiver, linearity of the data modulation is critical to accurate data recovery. As long as the SNR is maintained above threshold, the SNR requirements are less stringent than for an NTSC receiver. Accordingly it is preferred in a digital DTV to begin reduction of RF amplifier gain at a lower input signal level than in an analog receiver.

2. PCB Layout of the Tuner

A single-clad 1.5mm FR4 PCB is adopted for the tuner. The sensitive blocks in the tuner like xtal oscillator, VCO, PLL and tuning voltage lines should be well-decoupled particularly from IF output lines. Some printed parts need to be optimized again depending on the PCB material and the tolerance of matched components.

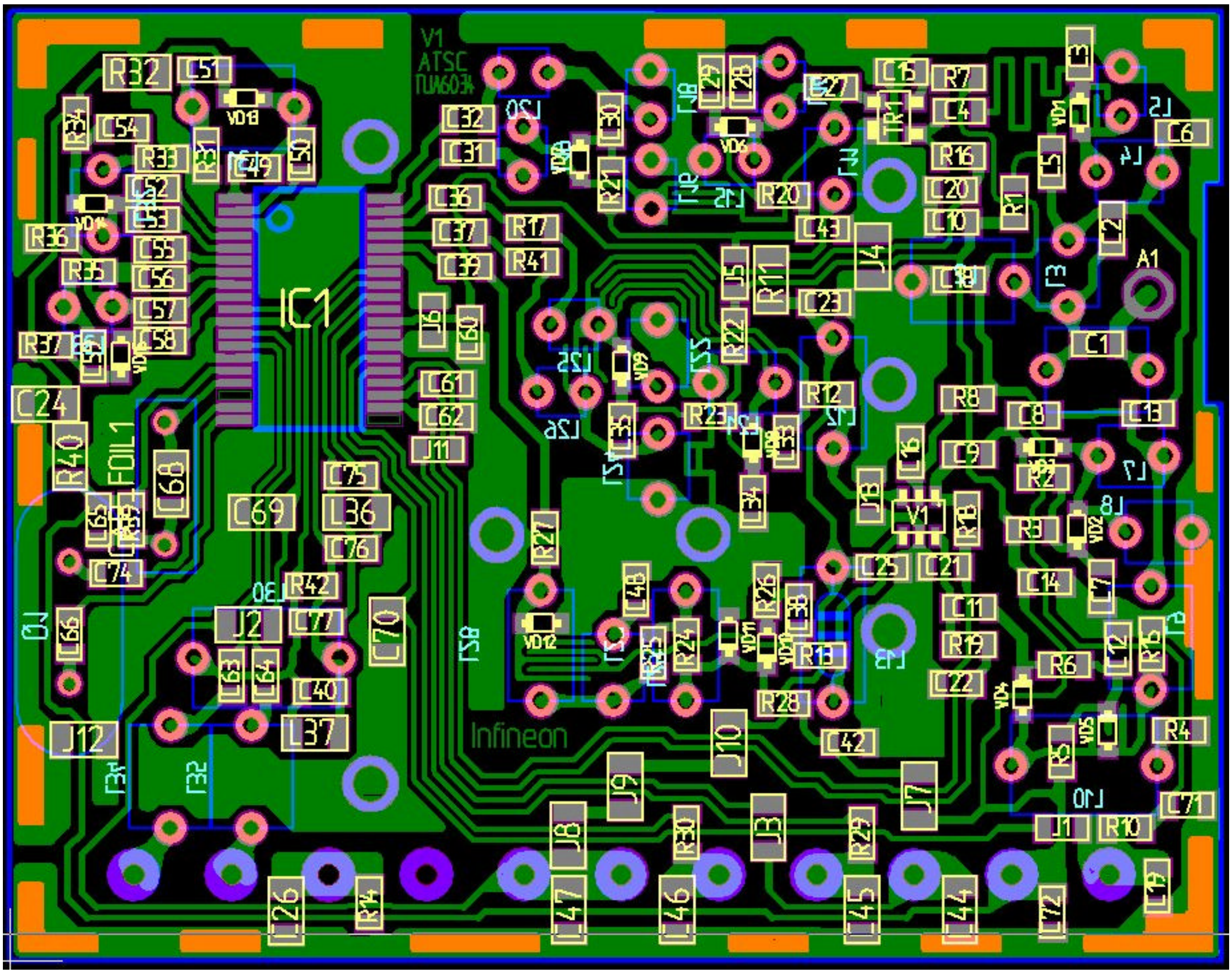


Fig. 5 PCB Layout of the ATSC Reference Tuner with TUA6034-T

3. Measurement Results

3.1 Overall Electrical Characteristics of the Tuner

Unless otherwise specified all data were measured in conditions of supply voltage of 5 V ± 5%, AGC voltage of 4.5 V ± 5%, ambient temperature of 25 ° C ± 5%, f_{ref} of 62.5KHz and Icp=50uA.

Parameter		Min	Typ	Max	Unit
Frequency range					
VHFL	**57 ~ 159 MHz**				
VHFH	**165 ~ 453 MHz**				
UHF	**459 ~ 861 MHz**				
IF center frequency			44		MHz
IF bandwidth			6		
Frequency margin at low and high ends of each band		1.5			
Supply voltages and currents					
Supply voltage +5 V Pin		4.5	5	5.5	V
Supply voltage VD Pin (with PLL)		30	33	35	
Supply current +5 V Pin			85		mA
Supply current Pin VD Pin (with PLL)				1,8	
RF Characteristics					
Input impedance Output impedance with IF dummy			75 75		Ω
VSWR at nominal gain and during AGC				4	
External AGC voltage for max gain External AGC voltage for min gain **Internal AGC voltage (I_{AGC} = 9uA)**		4.0 0.5 	4.5 3.8	5.0	V
AGC range VHFL AGC range VHFH AGC range UHF		60 60 50			dB
Tuning sensitivity VHFL Tuning sensitivity VHFH Tuning sensitivity UHF		1 5 3		10 23 35	MHz/V
Power gain measured with 10:2 IF Dummy (Dummy loss = 15dB)		30			dB
Gain taper in each band				5	dB
Noise figure VHFL Noise figure VHFH Noise figure UHF				7 7 7	dB

Parameter	Min	Typ	Max	Unit
RF bandwidth (3 dB) VHFL RF bandwidth (3 dB) VHFH RF bandwidth (3 dB) UHF		10 10 10	20 20 20	MHz
Image rejection VHFL Image rejection VHFH Image rejection UHF	60 60 60			dB
IF rejection VHFL VHFH, UHF	70 80			dB
Input 1 dB compression Point by maximum tuner gain		75		dBuV
Input IP3 (two tone) by maximum tuner gain	85			
Input level producing 50 kHz of oscillator detuning (PLL open loop)	80			
Oscillator shift with supply voltage variation of ± 10 % (open loop)			± 250	kHz
Oscillator temperature drift 25...40 °C(open loop)			1	MHz
Antenna Leakage up to 1GHz			30	dBuV
Phase Noise[3] 10 KH offset 20 KHz offset 100 KHz offset **(fref=62.5KHz, Icp=50~250uA)**	85 95 105			dBc/Hz

[3] *detailed measurement results in '3.2 Phase Noise'*

3.2 Phase Noise

- Overall Phase Noise at 10KHz offset

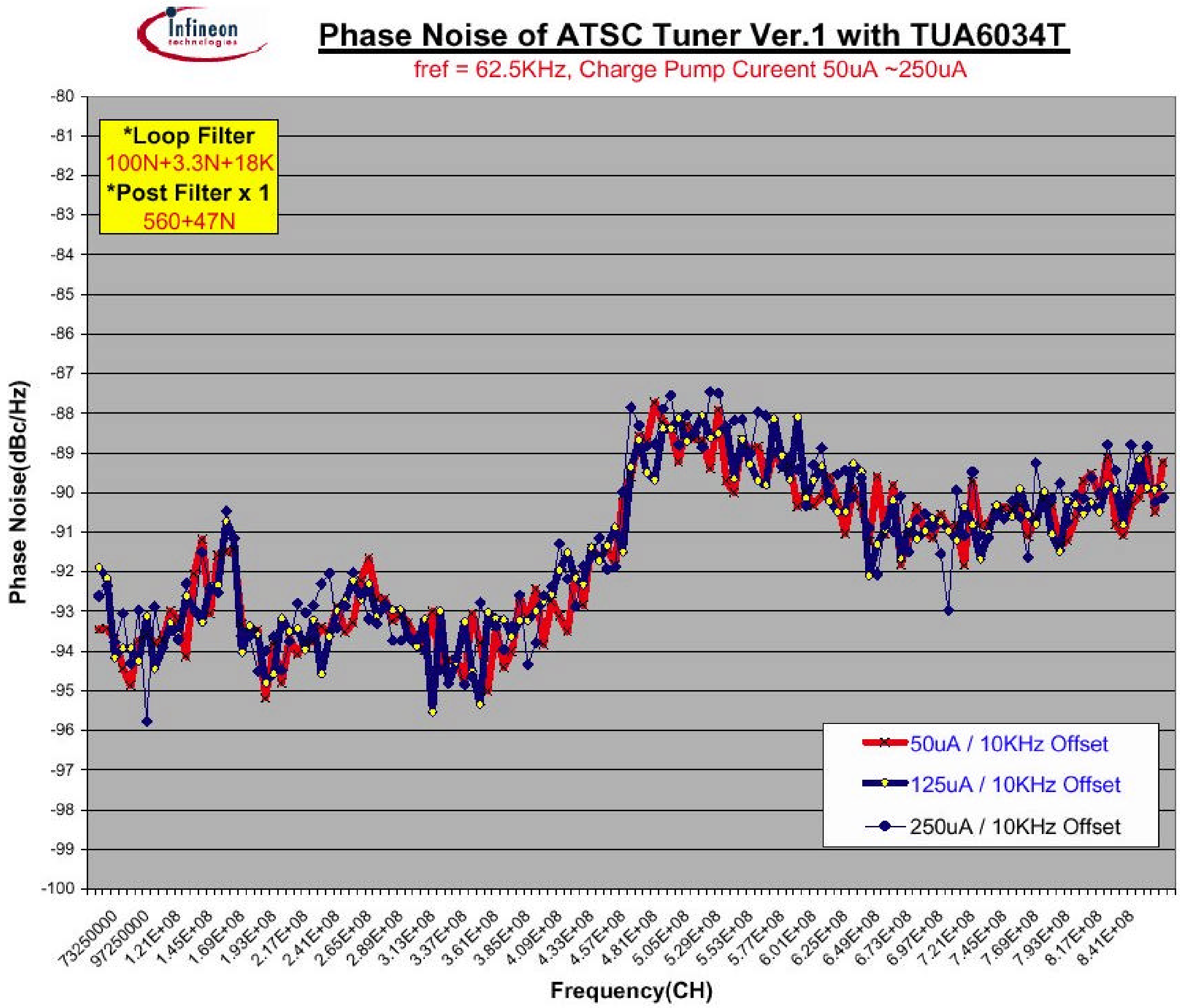


Fig. 6 Phase Noise in the whole frequency range at 10KHz offset

For the normal operation, charge pump current of 50~125uA is recommended in the whole frequency range. 250uA and 650uA will make rather high peak between 1~10KHz in some channels. The worst range in UHF low-end is caused by the relatively higher Kvco of UHF low-end. As in the following phase noise log plots, we can observe very minimum level of reference spurs at 62.5KHz offset. 8-VSB system is less sensitive in terms of phase noise than multi-carrier COFDM systems like DVB-T and ISDB-T. However, when the phase noise performance of a tuner is very bad and close the threshold level, we have to use a optimum charge pump current for different frequency range to minimize the integrated phase noise, but it is not the case of this reference tuner with TUA6034.

Fig.7~ 24 are the phase noise log plots of sampled channels with using different Icp.

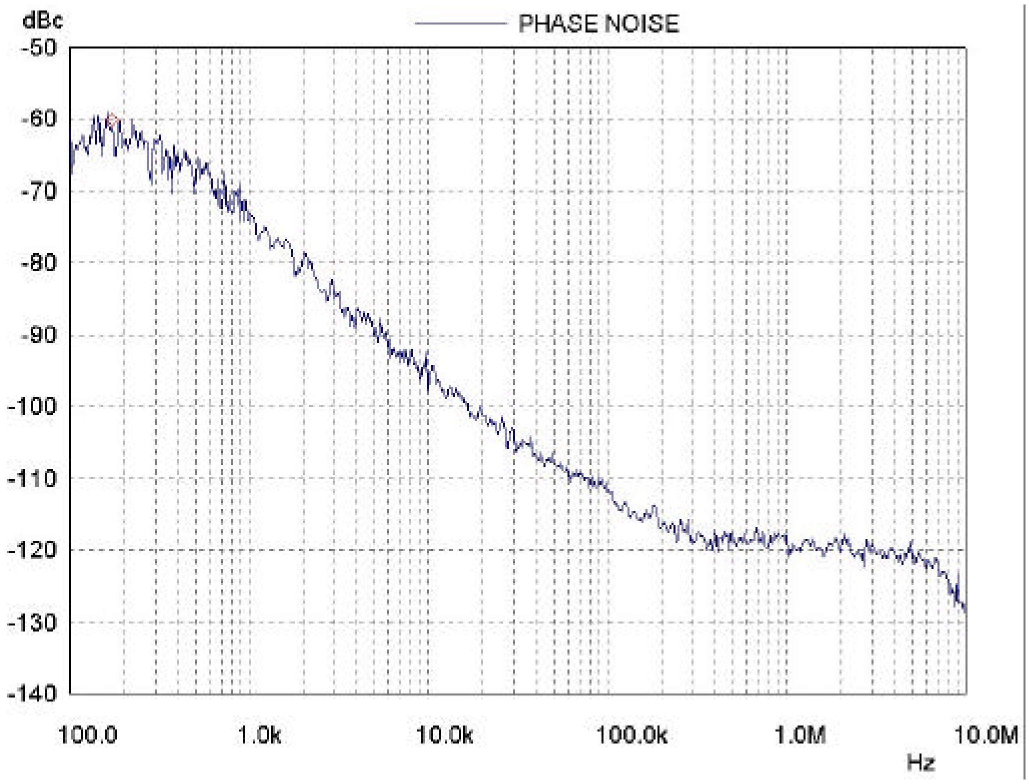


Fig. 7 VHFL, RF=57MHz, Icp=50uA, fref=62.5KHz

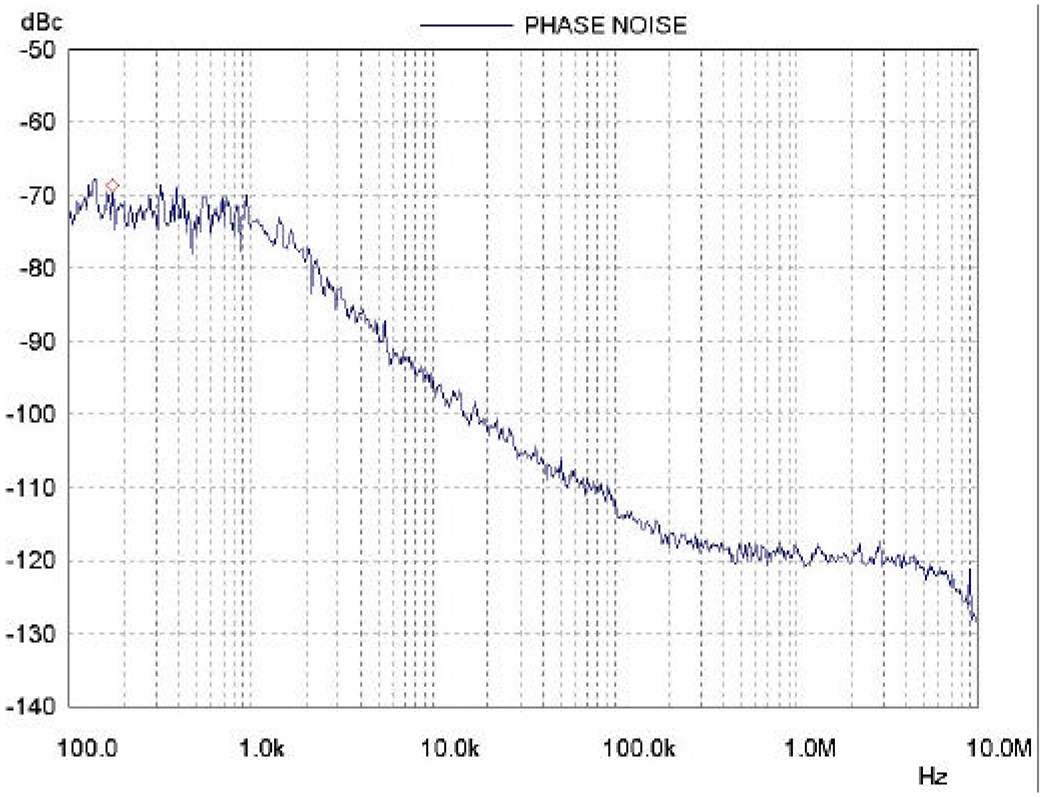


Fig. 8 VHFL, RF=57MHz, Icp=125uA, fref=62.5KHz

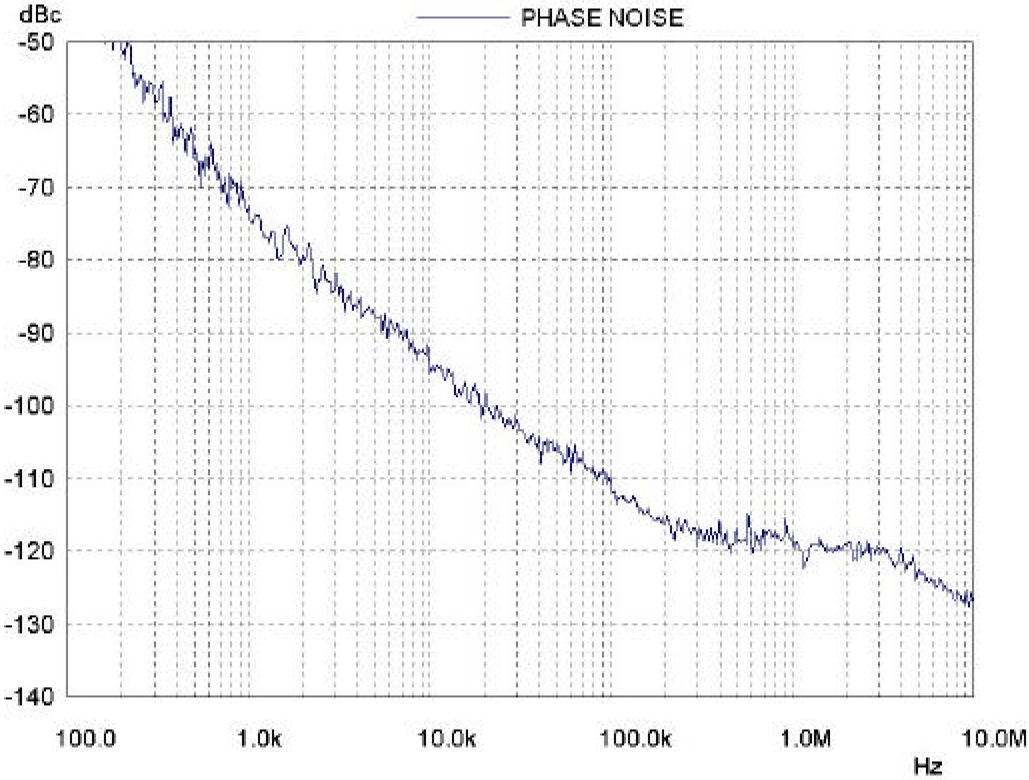


Fig. 9 VHFL, RF=159MHz, Icp=50uA, fref=62.5KHz

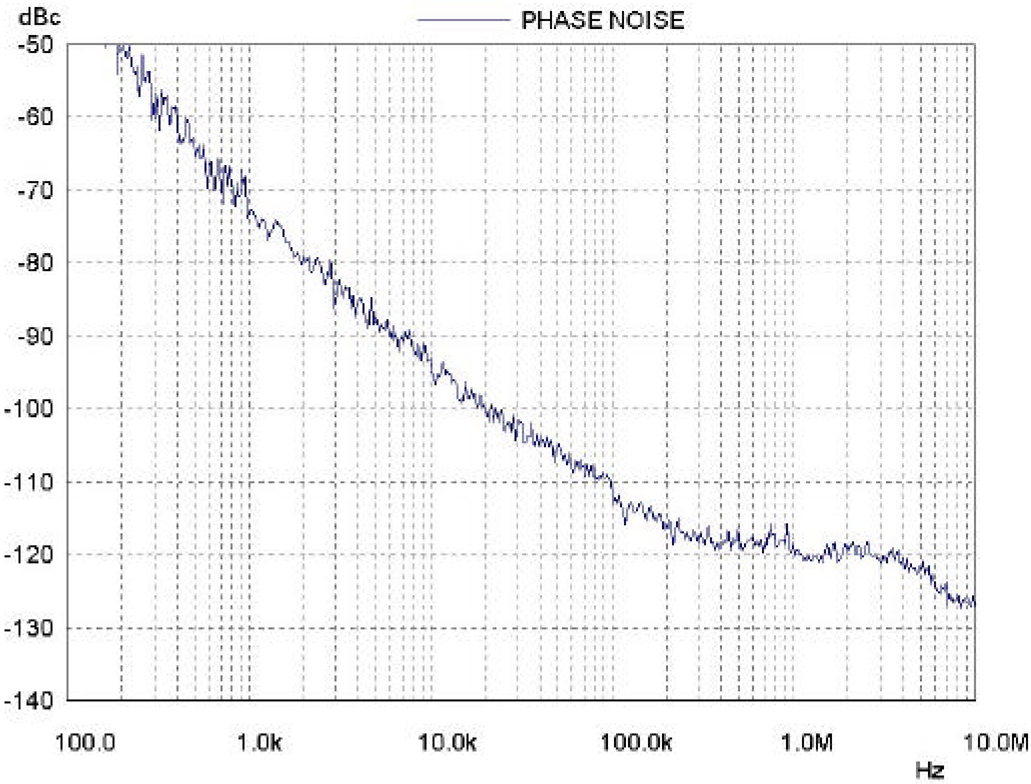


Fig. 10 VHFL, RF=159MHz, Icp=125uA, fref=62.5KHz

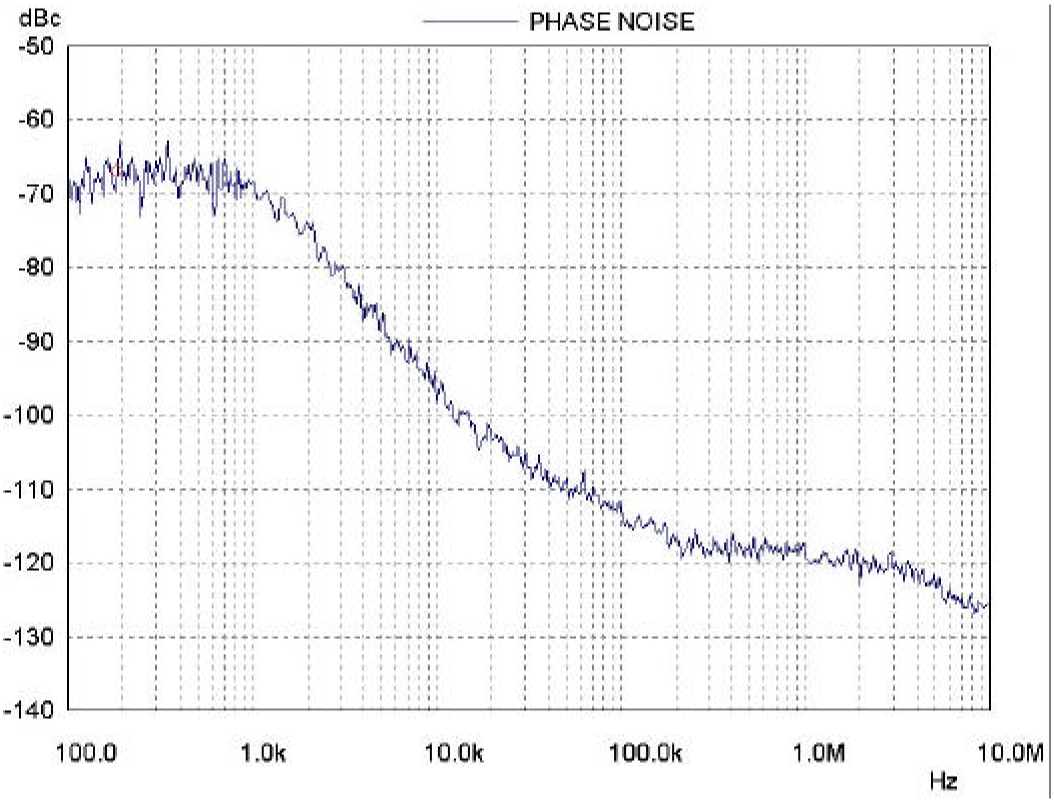


Fig. 11 VHFH, RF=165MHz, Icp=50uA, fref=62.5KHz

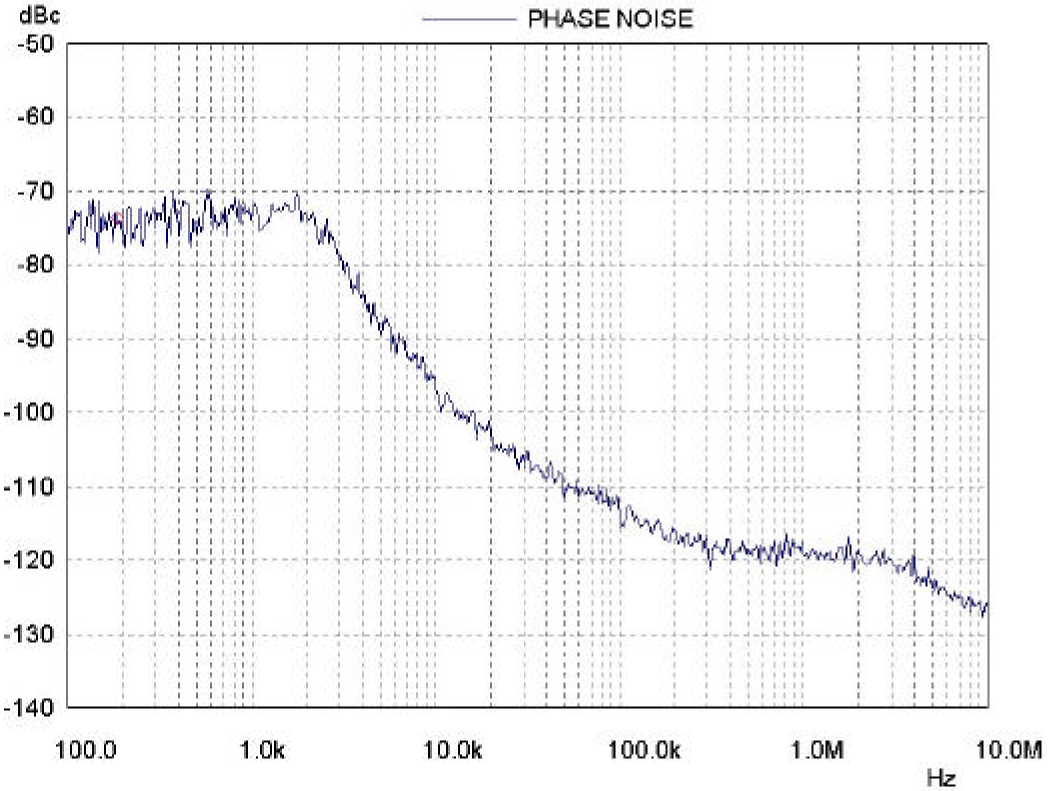


Fig. 12 VHFH, RF=165MHz, Icp=125uA, fref=62.5KHz

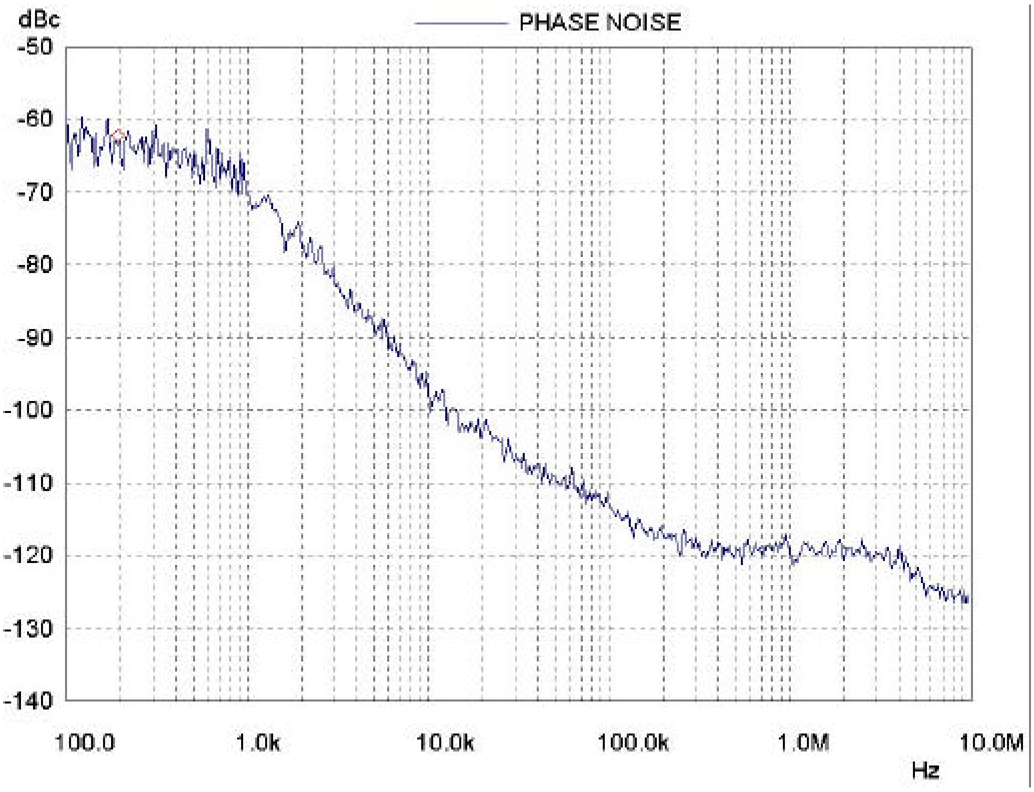


Fig. 13 VHFH, RF=303MHz, Icp=50uA, fref=62.5KHz

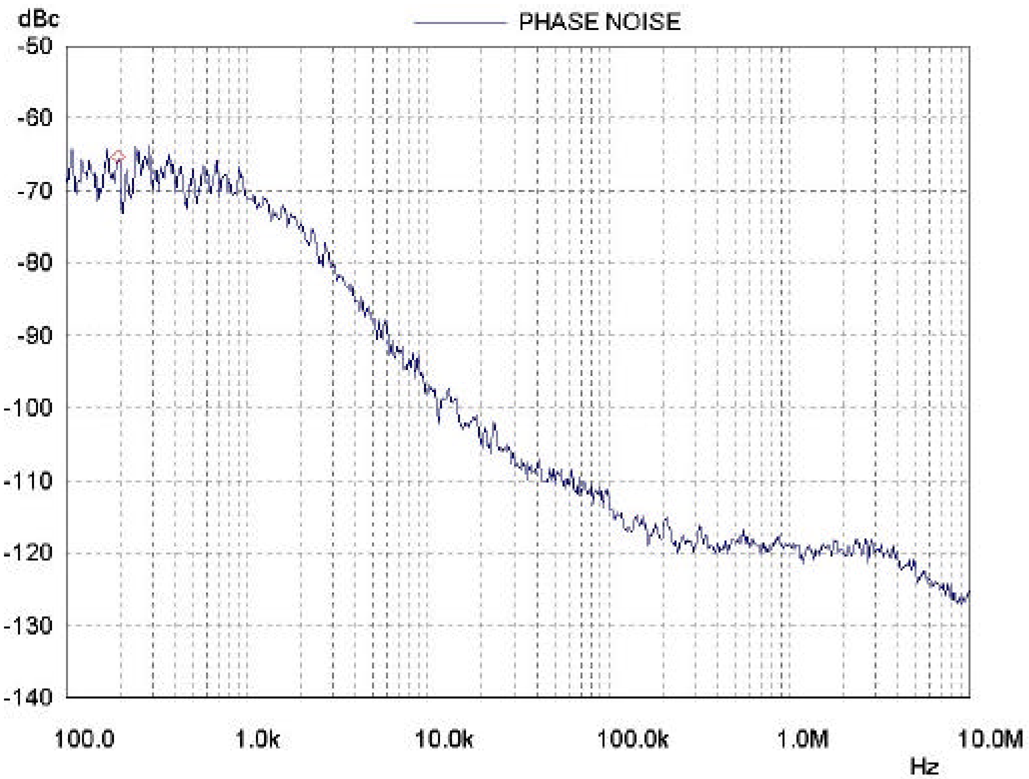


Fig. 14 VHFH, RF=303MHz, Icp=125uA, fref=62.5KHz

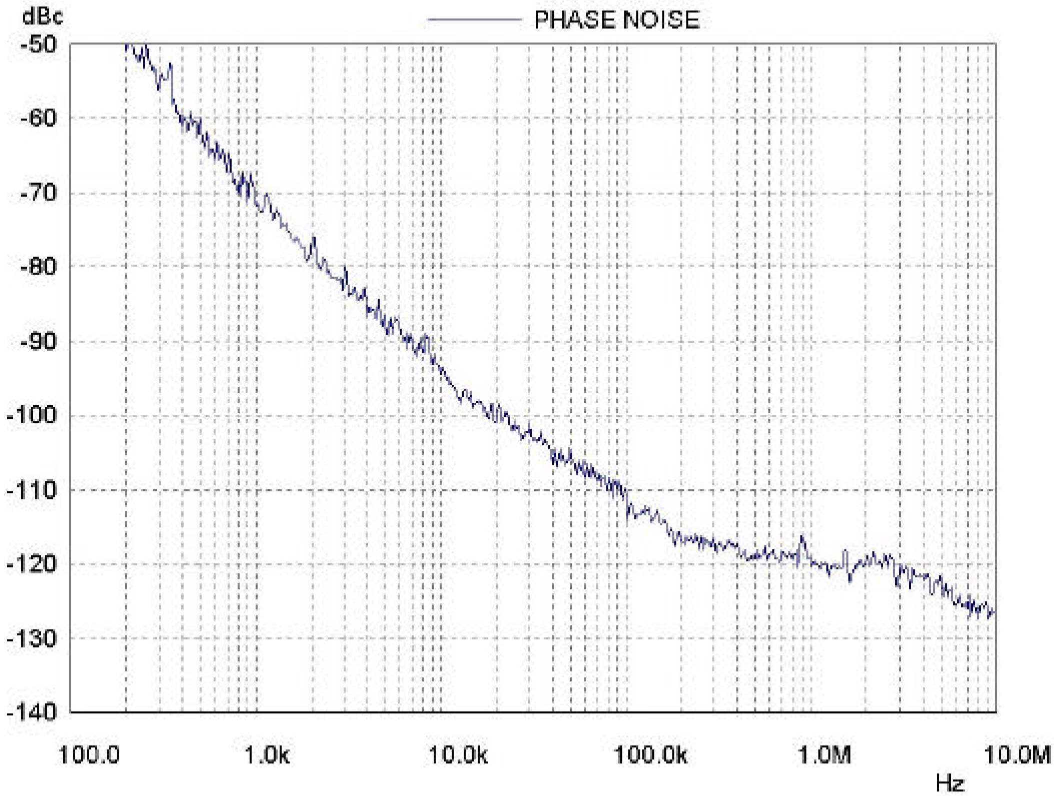


Fig. 15 VHFH, RF=453MHz, Icp=50uA, fref=62.5KHz

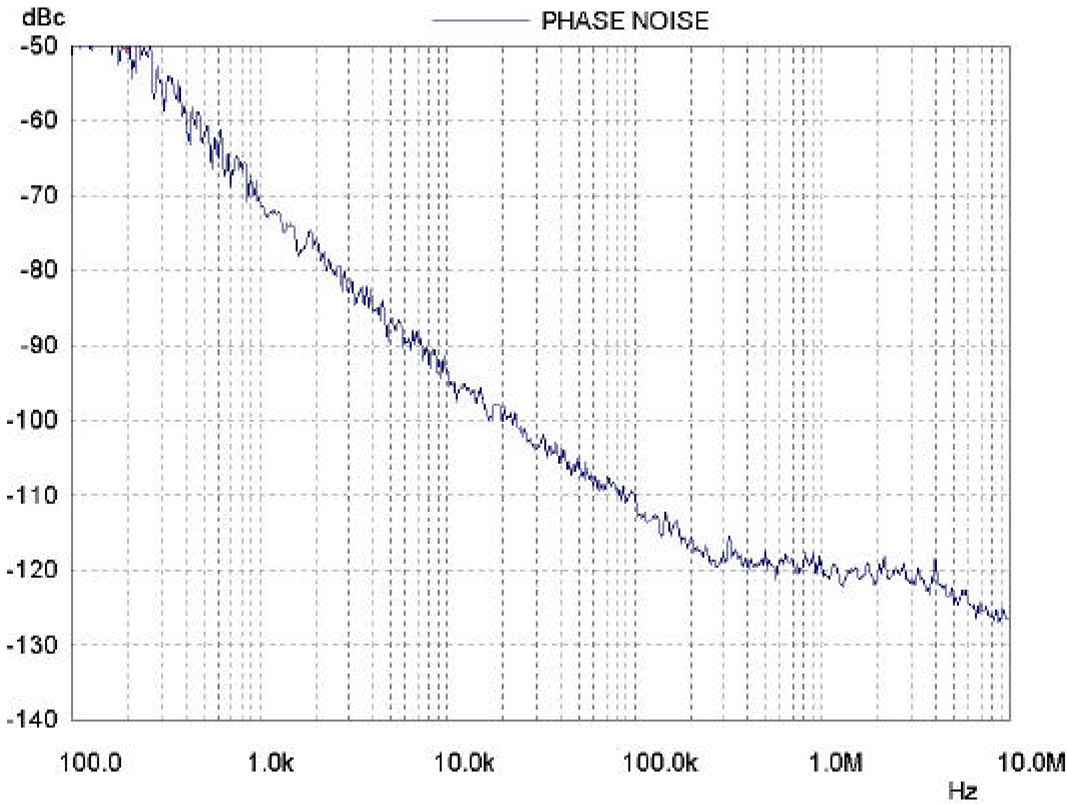


Fig. 16 VHFH, RF=453MHz, Icp=125uA, fref=62.5KHz

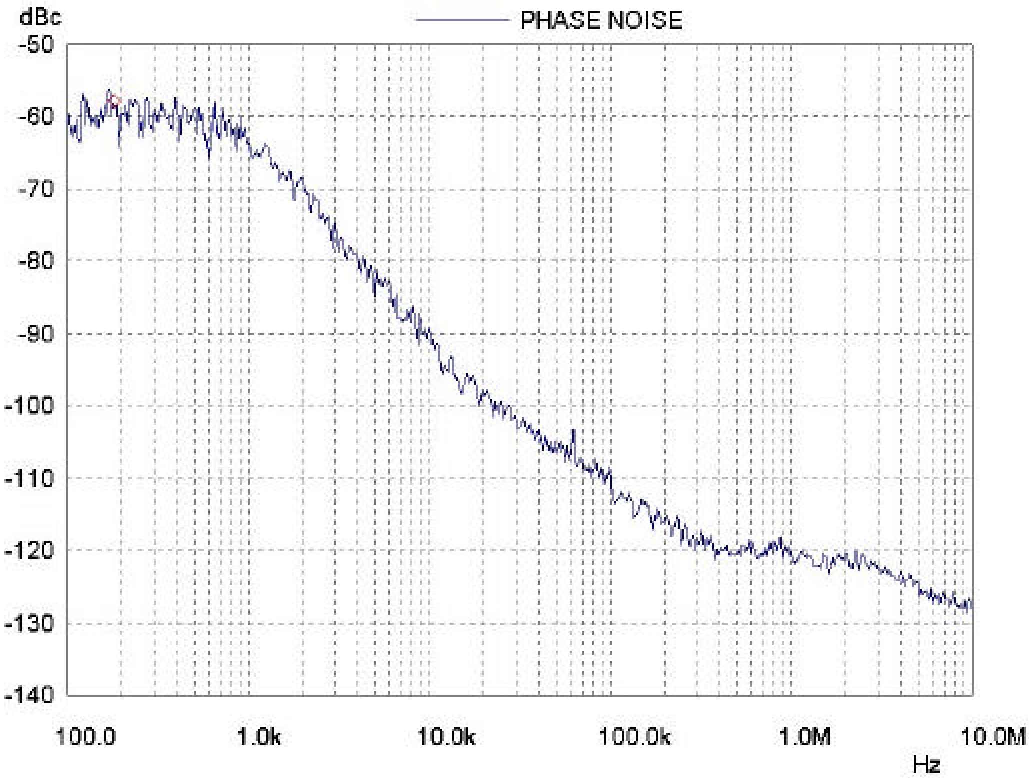


Fig. 17 UHF, RF=459MHz, Icp=50uA, fref=62.5KHz

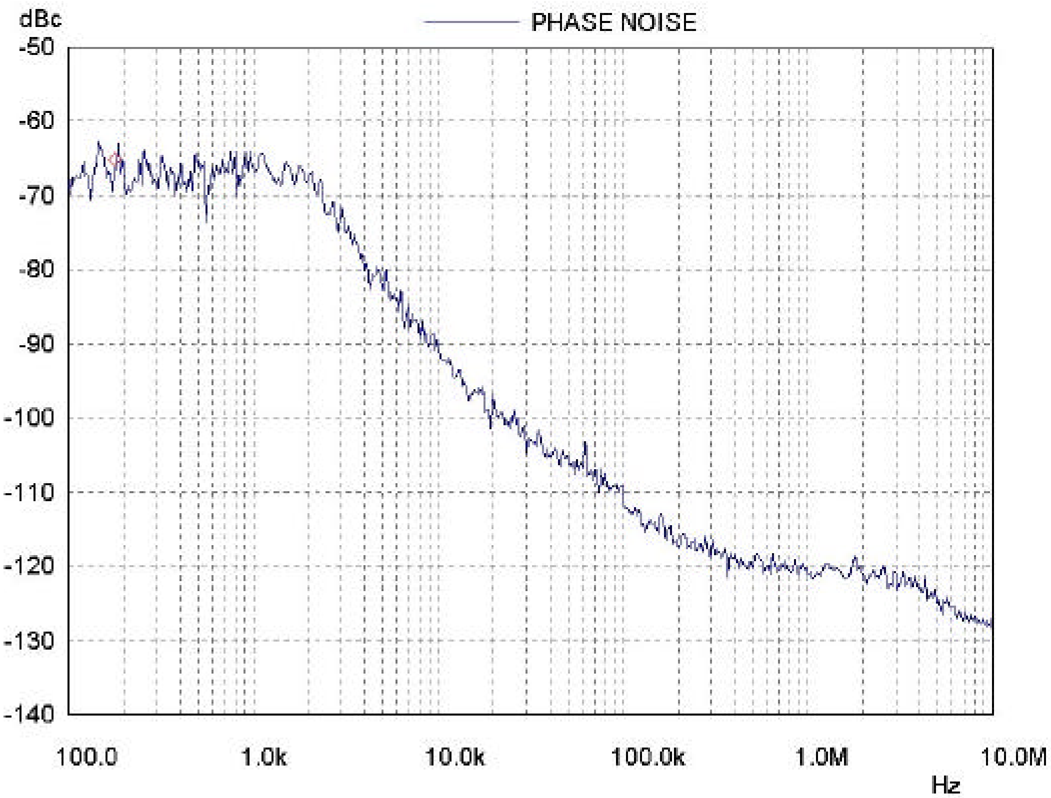


Fig. 18 UHF, RF=459MHz, Icp=125uA, fref=62.5KHz

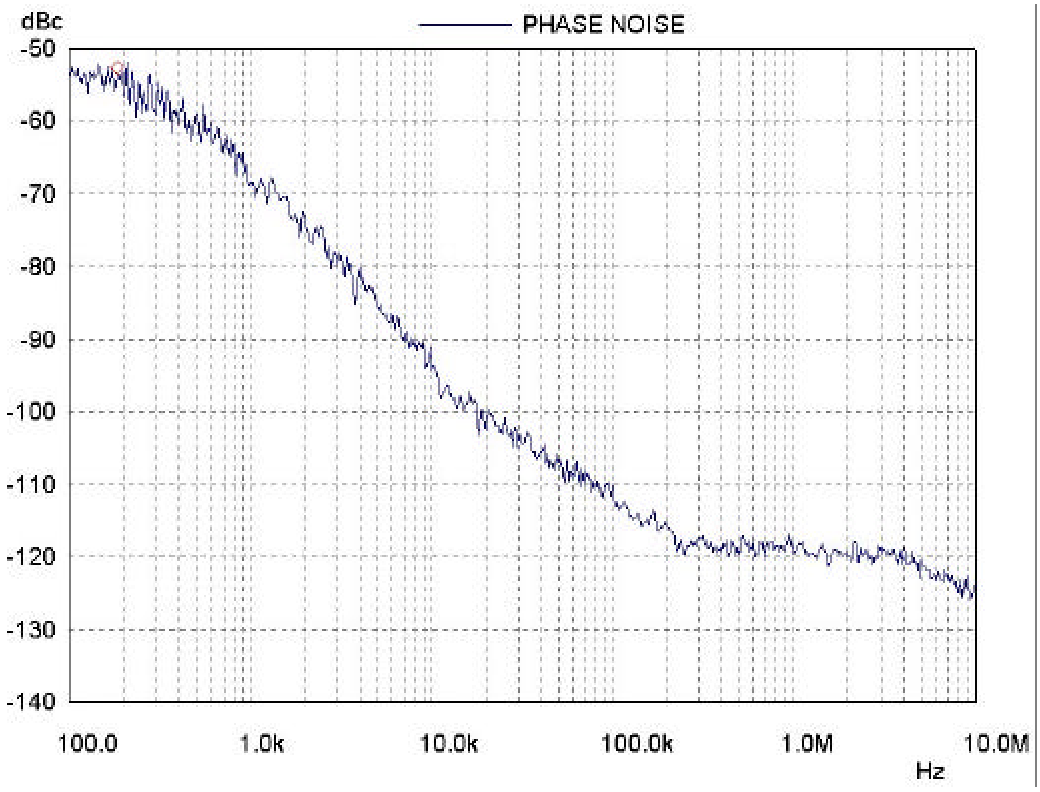


Fig. 19 UHF, RF=651MHz, Icp=50uA, fref=62.5KHz

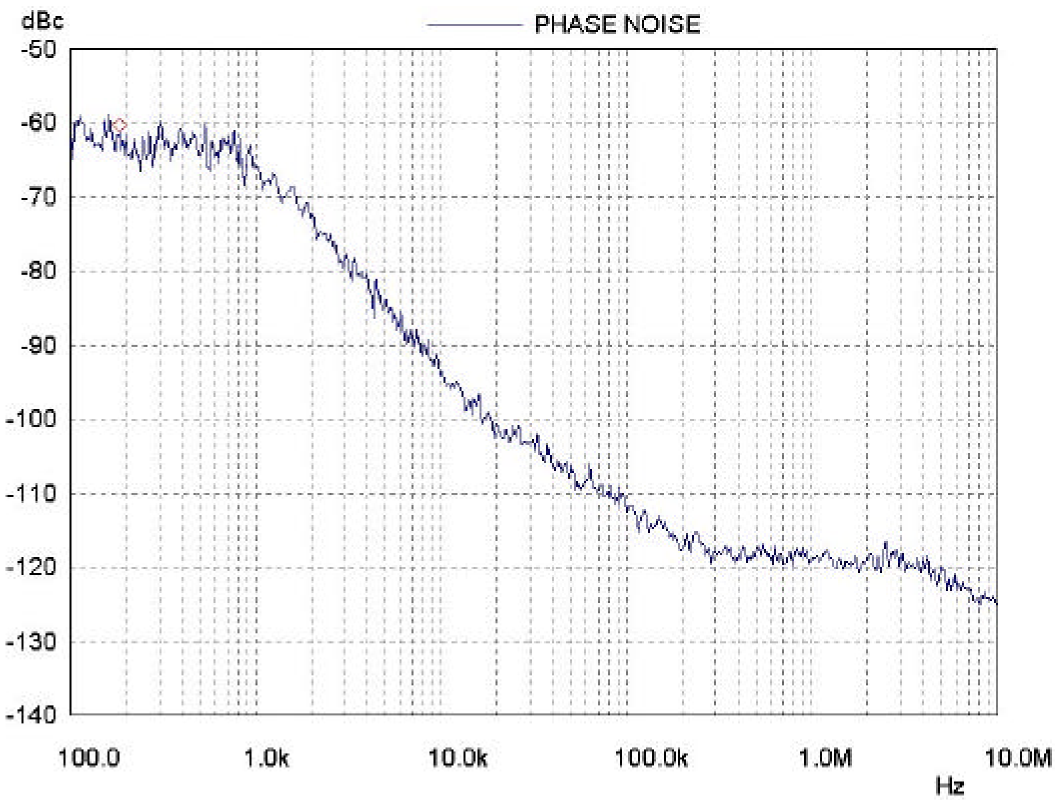


Fig. 20 UHF, RF=651MHz, Icp=125uA, fref=62.5KHz

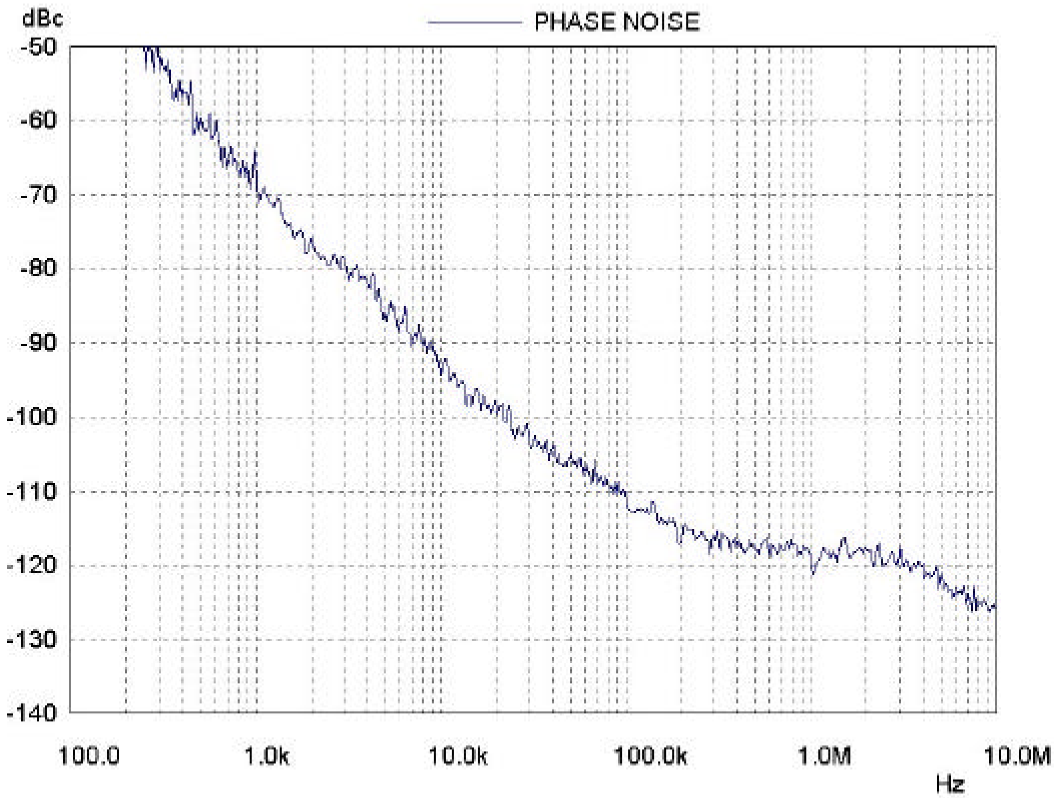


Fig. 21 UHF, RF=861MHz, Icp=50uA, fref=62.5KHz

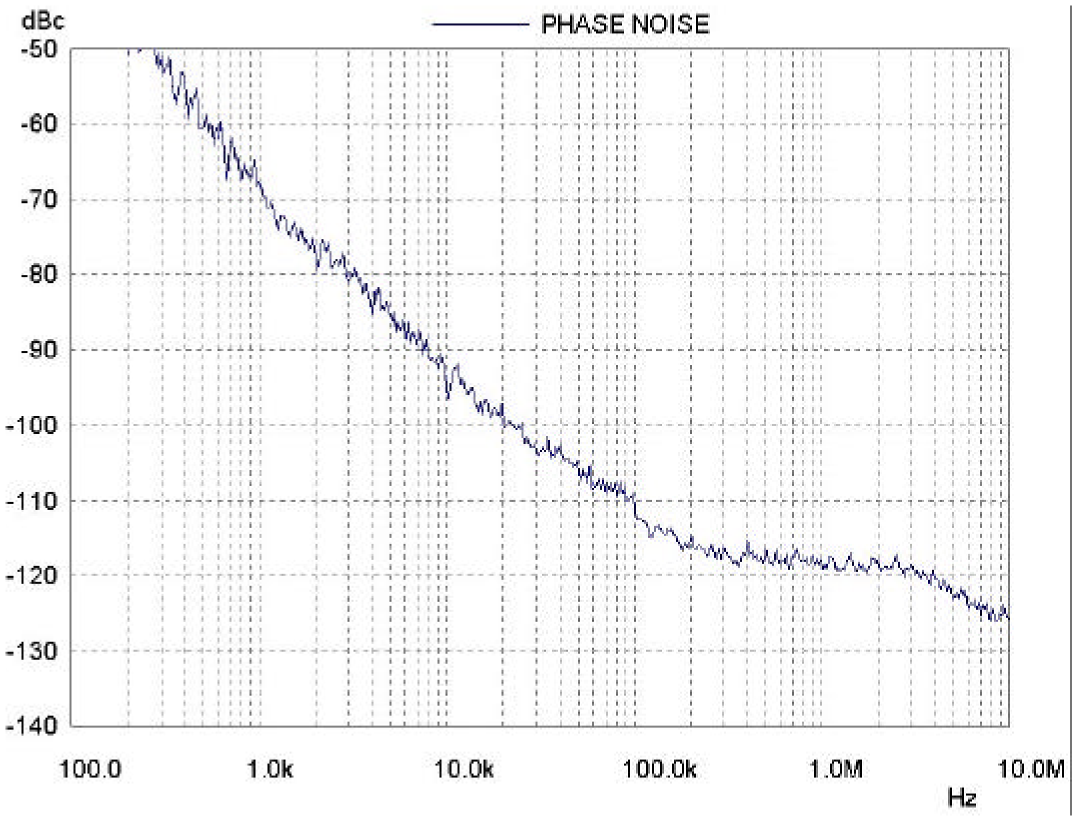


Fig. 22 UHF, RF=861MHz, Icp=125uA, fref=62.5KHz

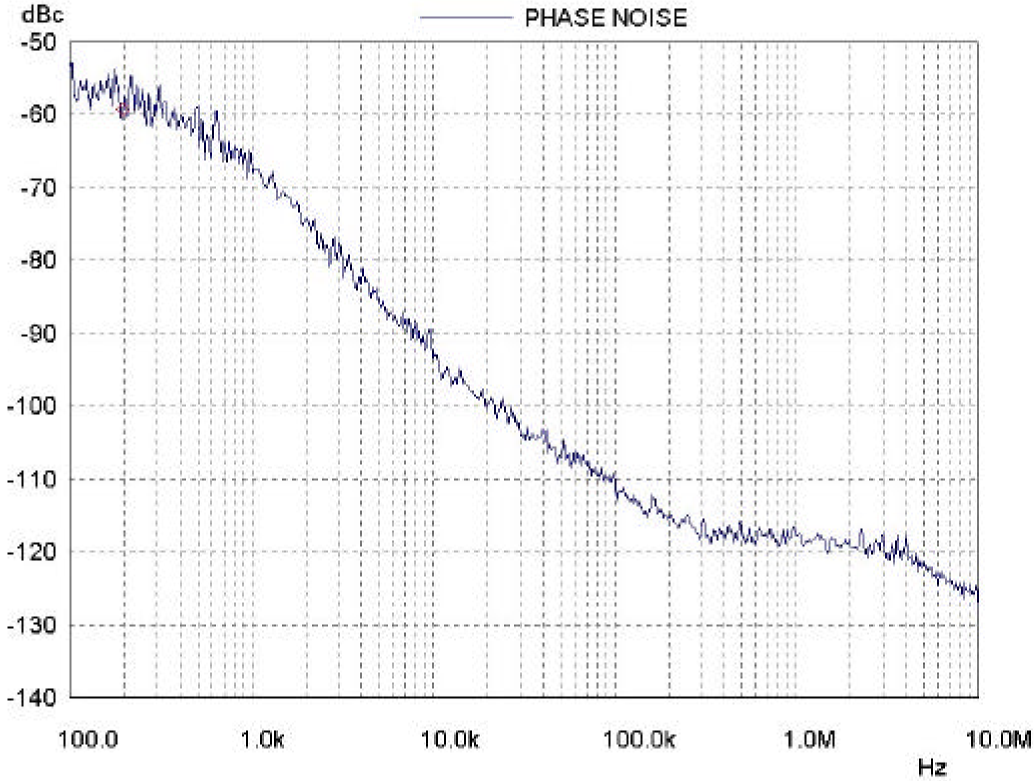


Fig. 23 UHF, RF=861MHz, Icp=650uA, fref=62.5KHz
Better than Icp=50uA in terms of integrated phase noise.

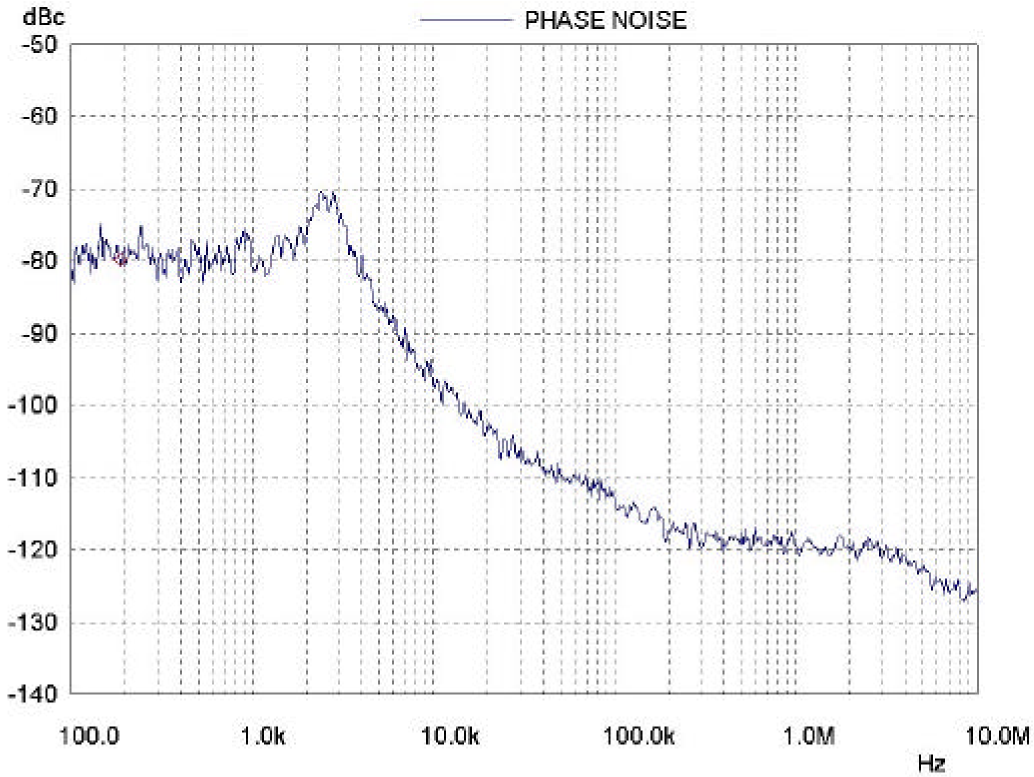


Fig. 24 VHFH, RF=165MHz, Icp=250uA, fref=62.5KHz
Rather high peak between 1~10KHz, but in-phase noise better than Icp=125uA in Fig. 12

3.3 RF to IF Conversion Characteristic

The dummy loss of 15dB is not compensated in the whole graphs.
Mkr1 is the center frequency, and Bandwidth=6MHz from Mkr2~Mkr3

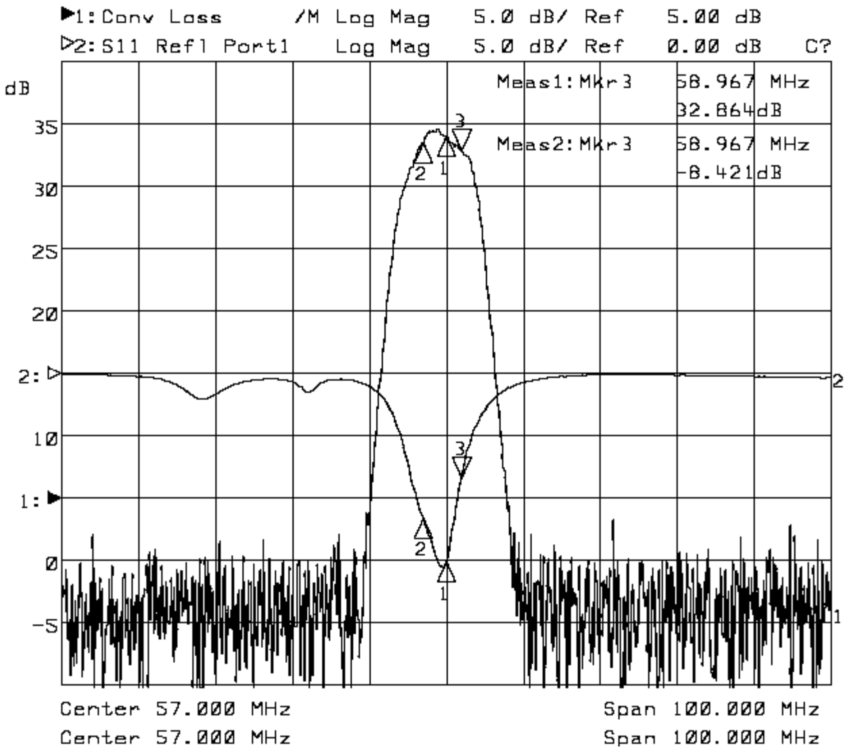


Fig. 25 VHFL, RF_Center=57MHz

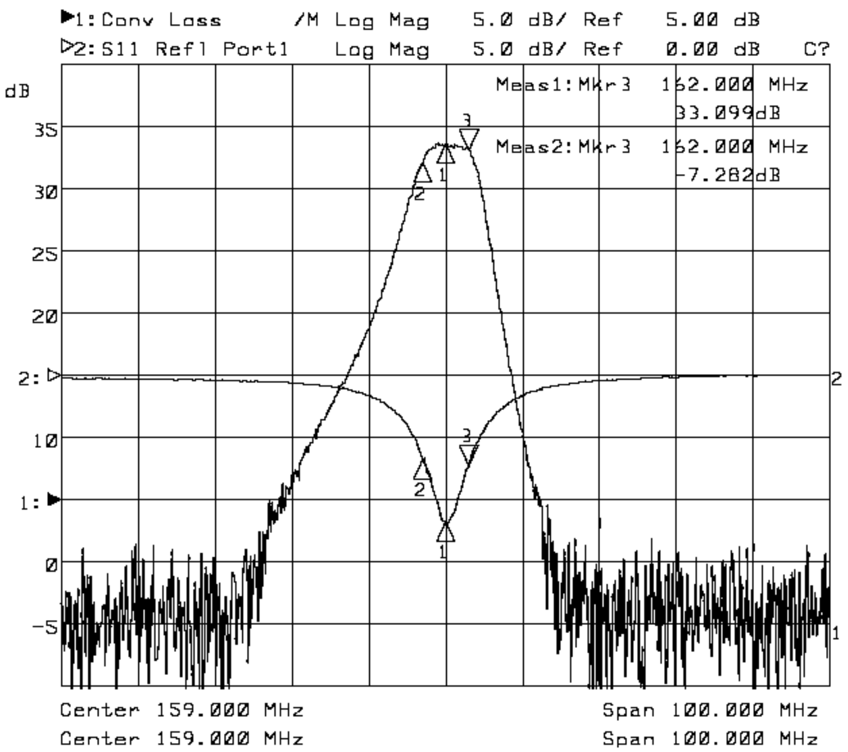


Fig. 26 VHFL, RF_Center=159MHz

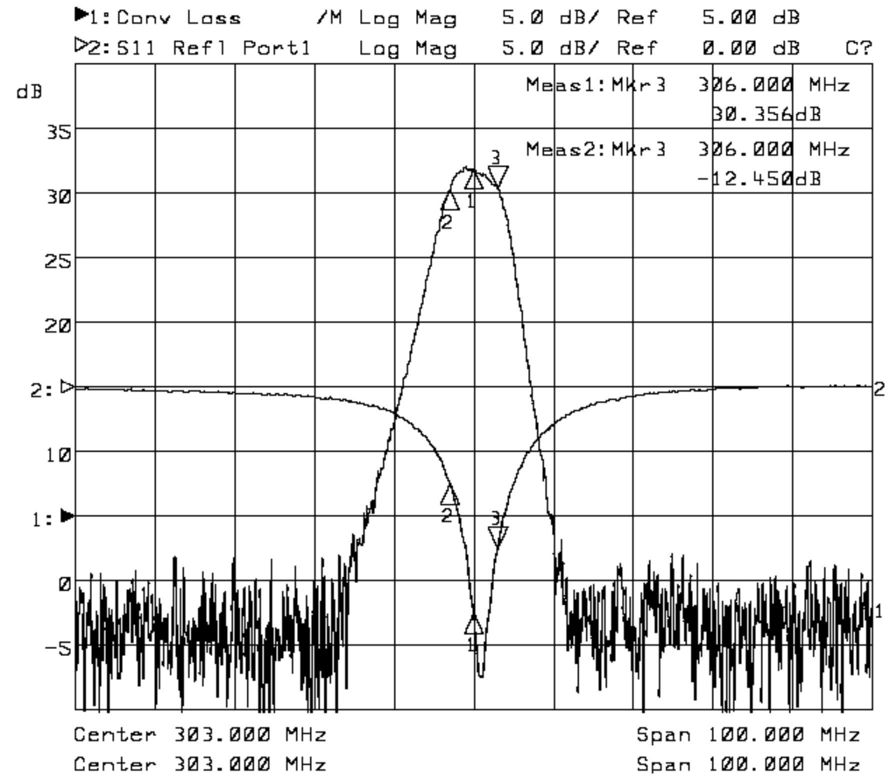


Fig. 27 VHFH, RF_Center=303MHz

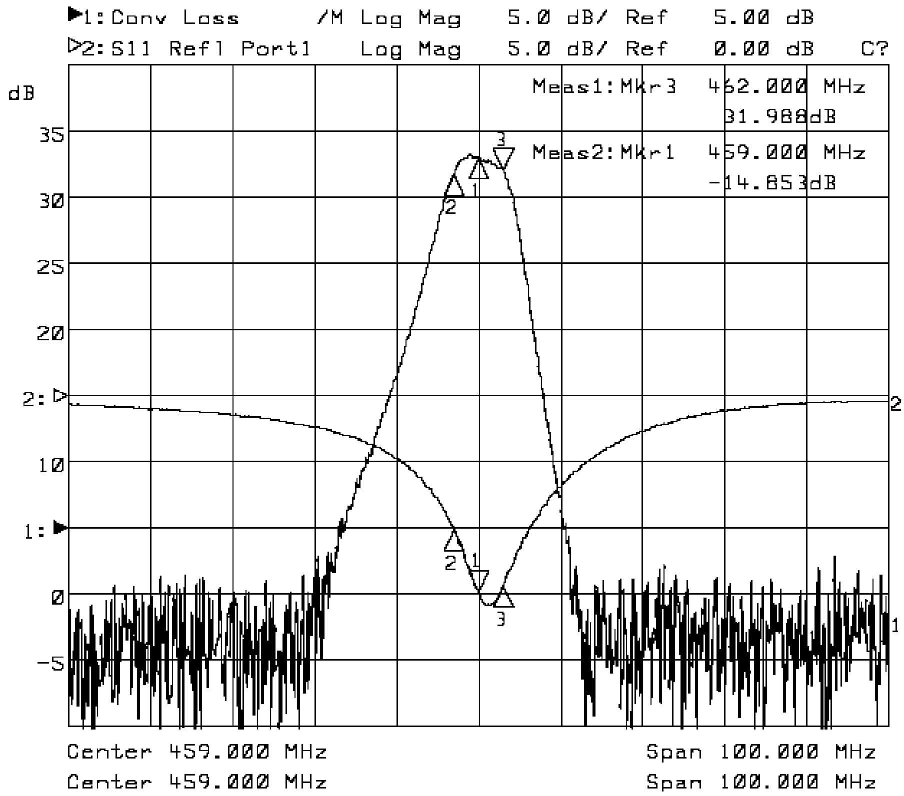


Fig. 28 UHF, RF_Center=459MHz

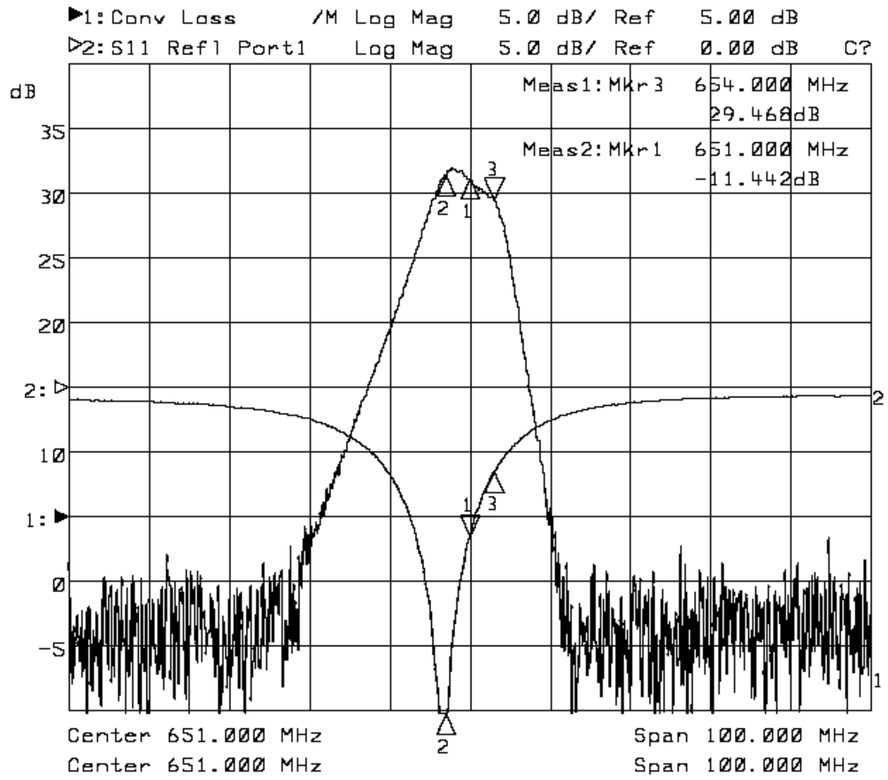


Fig. 29 UHF, RF_Center=651MHz

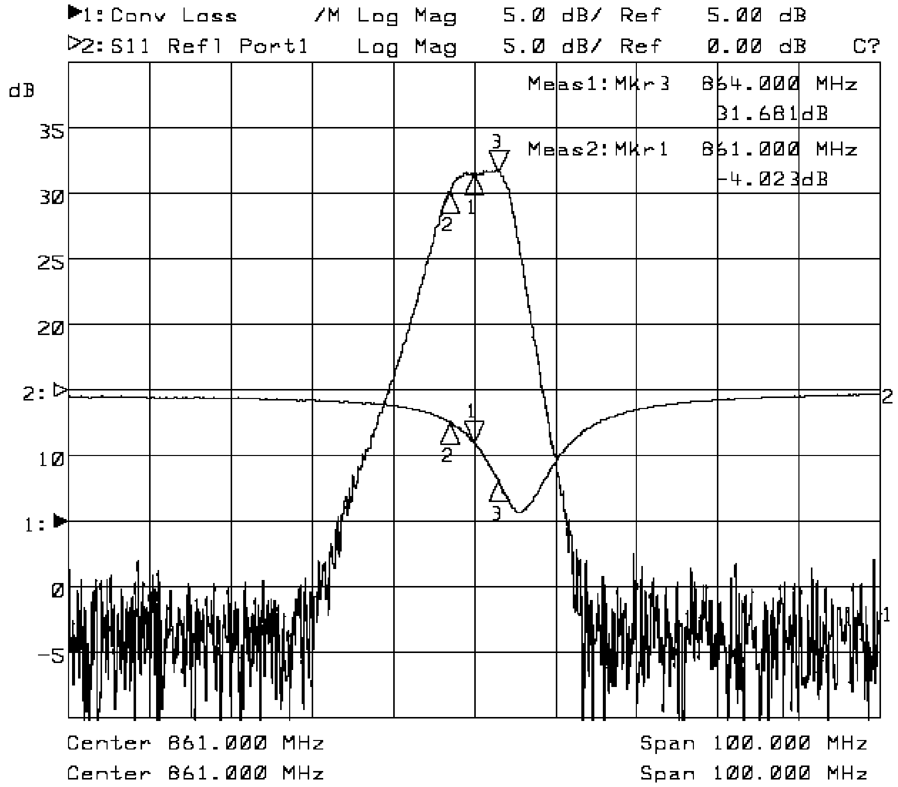


Fig. 30 UHF, RF_Center=861MHz

3.4 Analog-to-Digital Interference and Internal AGC of TUA6034

This part of the report contains an example of how a strong adjacent analog signal affects a desired digital signal by generating an IM3 terms inside the channel bandwidth.

- **f1, Desired Signal = 171MHz, -56dBm(50ohm), f_osc = 215MHz, f_IF = 44MHz.**
- **f2, Analog NTSC Picture Carrier = 175.25MHz, -21dBm(50ohm)**
- **f3, Analog NTSC Sound Carrier = 179.75MHz, -27dBm(50ohm)**
- **Beat, IM3 term inside the bandwidth = 215MHz - (2 x 175.25MHz - 179.25MHz) = 44.25MHz.**

Fig.31 shows the tuner input signals for the test.

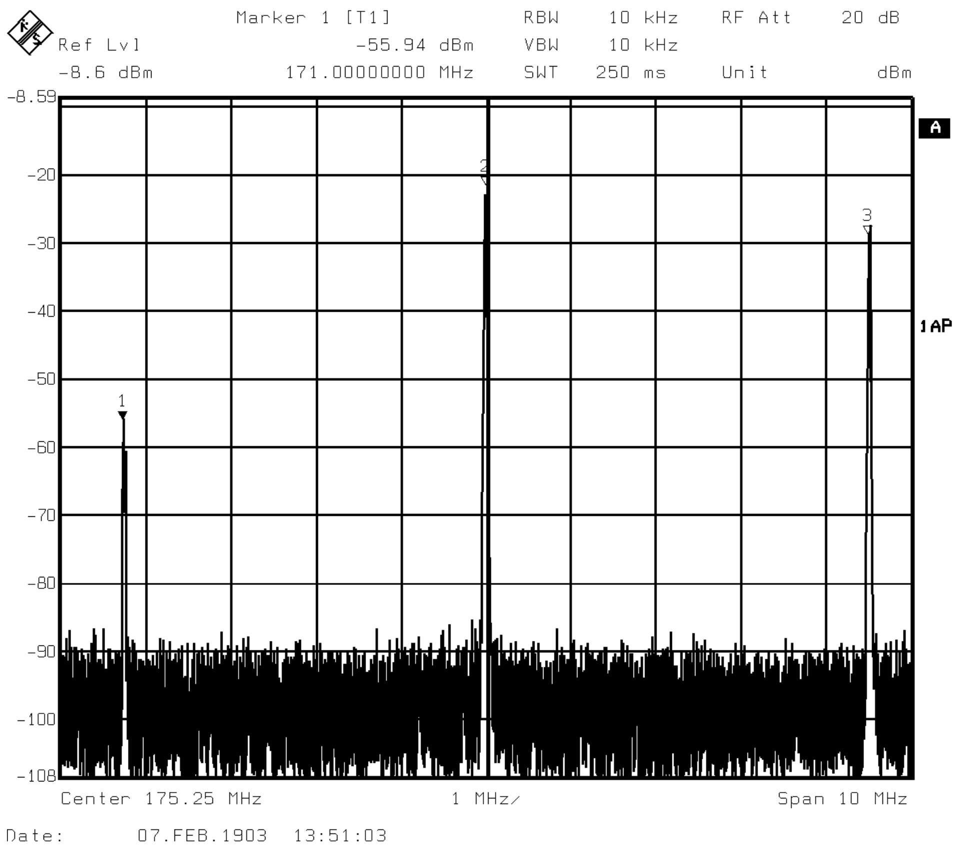


Fig. 31 Tuner Input Signals for Intermodulation test;
M1=Desired Digital Carrier, M2=Analog Picture Carrier, M3=Analog Sound Carrier

Fig.32 shows the output signals from the tuner via the input signals in Fig.31 when the tuner gain is full, no gain reduction. IM3 term at 44.25MHz is higher that the desired 44MHz. In the real situation this IM3 product will degrade the receiver performance seriously. This intermodulation product is generated by the mixer in the tuner because it has normally the worst linear characteristic.

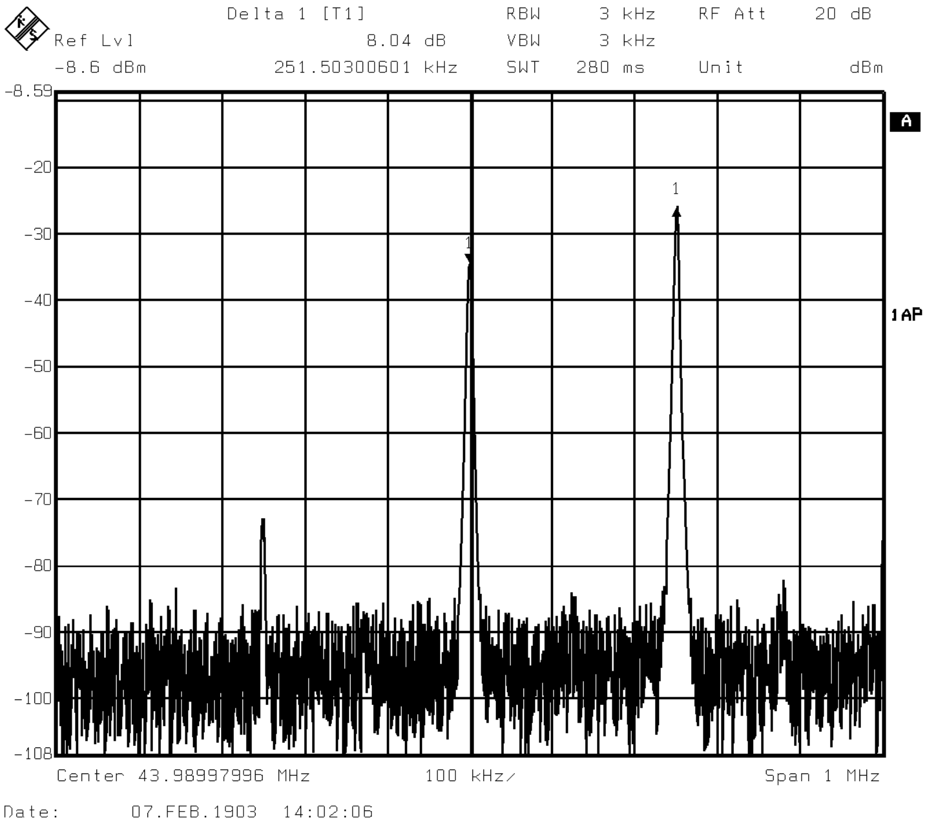


Fig. 32 Tuner Output Signals by Input Signals in Fig.31;
M1=Desired IF of 44MHz , M2=Undesired IM3 Product of 44.25MHz

In this kind of situation, internal wide-band detection AGC function of TUA6034 really helps not overdrive the mixer and immediately suppress such IM3 product caused by adjacent channels. Because of the low SNR requirement of 15.2dB, we still can maintain the SNR required by the demodulator although the desired signal is also lowered. 106 ~112 dBuV internal AGC take-over point were taken to test this internal AGC functioning.

Table 2 contains the results by each internal AGC take-over point. $V_{\_AGC}$ voltages were measured when the internal AGC was working loaded with the input signals in Fig.31. NF (Noise Figure) was measured after the test with supplying the measured AGC voltage and the SNR at the tuner output were calculated using the equation below:

$$F = (S/N)_{input} / (S/N)_{output}, \quad NF\,[dB] = 10\log F$$

$$NF\,dB = S_{input} - 10\log(kTB) - (S/N)_{output} \rightarrow (S/N)_{output}\,dB = S_{input} - 10\log(kTB) - NF$$

AGC Take-Over Point (dBuV)	$V_{\_AGC}$ (Volts)	Delta = 44MHz - Beat Level (dB)	NF (dB)	SNR (dB)
106	1.65	31[4]	23	27.2
109	1.68	27[5]	20	30.2
112	1.72	25	18	32.2

Table 2. Interal AGC Test to Suppress Intermodulation

If we use the wide-band detection AGC function of TUA6034 for digital receivers, we can protect the first mixer from overdriving and still maintain the required SNR for demodulation process even considering the following stages after the tuner like SAW filters and the SAW drivers. Fig.33 and Fig.34 show the result by using the internal

[4] *Fig.33*
[5] *Fig.34*

AGC function. However, this wide-band detection internal AGC cannot be adopted for analog receivers which require more than 55dB SNR for a quality picture.

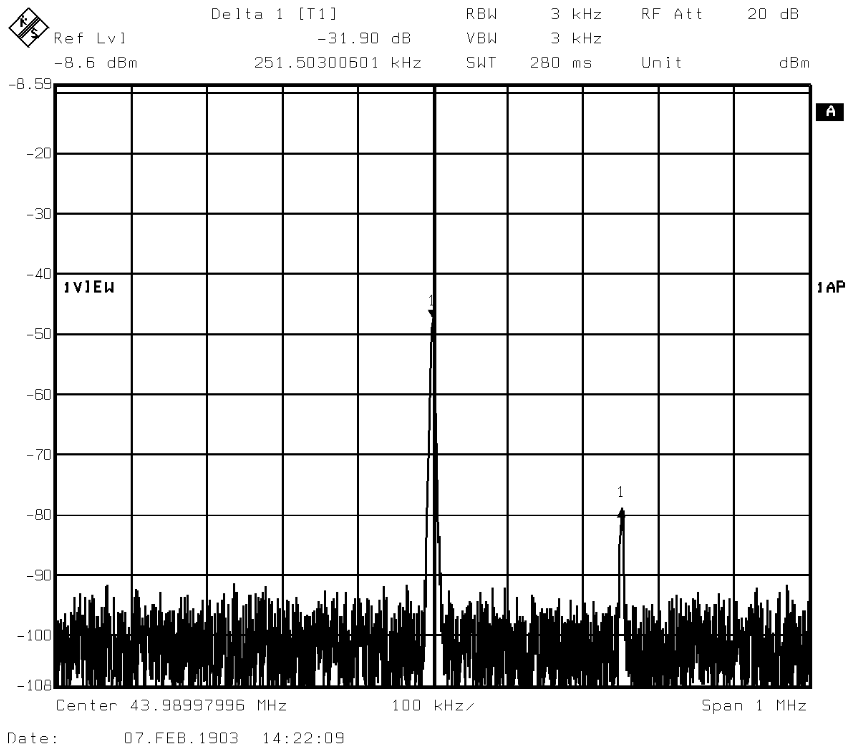


Fig. 33 Tuner Output Signals, Internal AGC take-over point=106dBuV

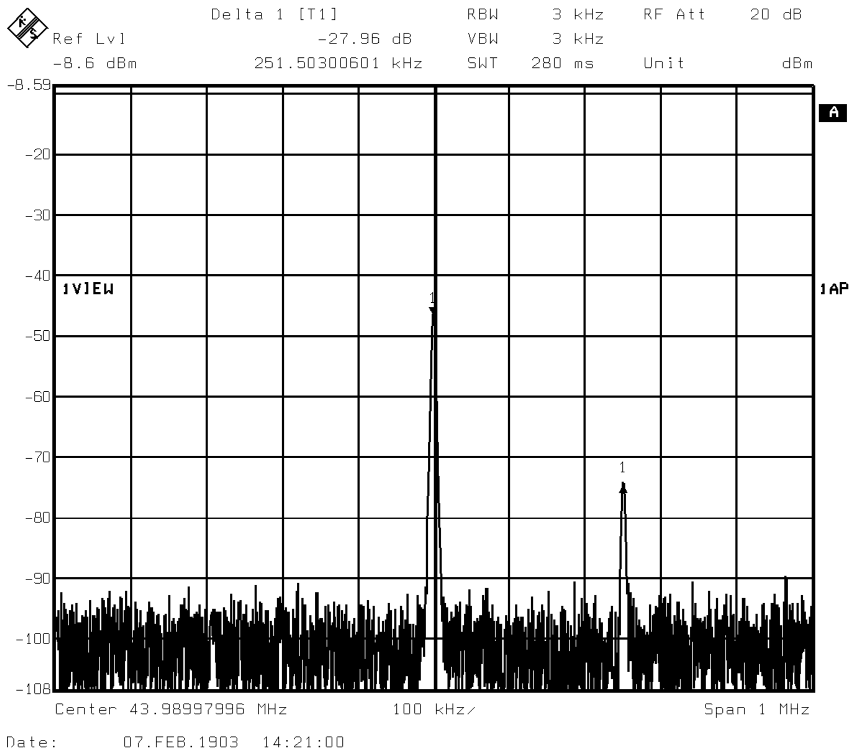


Fig. 34 Tuner Output Signals, Internal AGC take-over point=109dBuV

4. Component List & Ordering Information

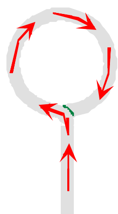
(units : Farad, Ohm)

Part	Value	Size	Tolerance	Material	Part	Value	Size	Tolerance	Material
C1	330p	O6O3	10%	NPO	**C51**	27p	O6O3	5%	N750
C2	150p	O6O3	10%	NPO	**C52**	1.5p	O6O3	5%	N750
C3	9.1p	O6O3	5%	NPO	**C53**	1.2p	O6O3	5%	N750
C4	1n	O6O3	10%	X7R	**C54**	82p	O6O3	5%	N750
C5	2.4p	O6O3	5%	NPO	**C55**	1.2p	O6O3	5%	N750
C6	**OPEN**	O6O3	5%	NPO	**C56**	1.2p	O6O3	5%	N750
C7	4.7n	O6O3	10%	X7R	**C57**	1.2p	O6O3	5%	N750
C8	0.5p	O6O3	5%	NPO	**C58**	1.2p	O6O3	5%	N750
C9	1n	O6O3	10%	X7R	**C59**	16p	O6O3	5%	N750
C10	4.7n	O6O3	10%	X7R	**C60**	4.7n	O6O3	10%	X7R
C11	10n	O8O5	10%	X7R	**C61**	4.7n	O6O3	10%	X7R
C12	10n	O6O3	10%	X7R	**C62**	4.7n	O6O3	10%	X7R
C13	91p	O6O3	5%	NPO	**C63**	4.7n	O6O3	10%	X7R
C14	4.7n	O6O3	10%	X7R	**C64**	4.7n	O6O3	10%	X7R
C15	470p	O6O3	10%	X7R	**C65**	3.3n	O6O3	10%	X7R
C16	4.7n	O6O3	10%	X7R	**C66**	18p	O6O3	5%	NPO
C17					**C67**	**OPEN**			
C18	4.7n	O6O3	10%	X7R	**C68**	**100nF Foil Capacitor**			
C19	4.7n	O6O3	10%	X7R	**C69**	100n	O8O5	10%	X7R
C20	4.7n	O6O3	10%	X7R	**C70**	160n	O8O5	10%	X7R
C21	4.7n	O6O3	10%	X7R	**C71**	4.7n	O6O3	10%	X7R
C22	4.7n	O6O3	10%	X7R	**C72**	4.7n	O6O3	10%	X7R
C23	4.7n	O6O3	10%	X7R	**C75**	56p	O6O3	5%	NPO
C24	47n	O8O5	10%	X7R	**C76,C77**	18p	O6O3	5%	NPO
C25	4.7n	O6O3	10%	X7R	**R1**	33K	O6O3	5%	
C26	4.7n	O8O5	10%	X7R	**R2**	33K	O6O3	5%	
C27	1.2p	O6O3	5%	NPO	**R3**	33K	O6O3	5%	
C28	100p	O6O3	5%	NPO	**R4**	22	O6O3	5%	
C29	13p	O6O3	5%	NPO	**R5**	33K	O6O3	5%	
C30	13p	O6O3	5%	NPO	**R6**	33K	O6O3	5%	
C31	27p	O6O3	10%	X7R	**R7**	10K	O6O3	5%	
C32	27p	O6O3	10%	X7R	**R8**	10K	O6O3	5%	
C33	1.8p	O6O3	5%	NPO	**R9**				
C34	120p	O6O3	5%	NPO	**R10**	33K	O6O3	5%	
C35	120p	O6O3	5%	NPO	**R11**	5.6	O8O5	5%	
C36	470p	O6O3	10%	X7R	**R12**	22	O6O3	5%	
C37	470p	O6O3	10%	X7R	**R13**	22	O6O3	5%	
C38	120p	O6O3	5%	NPO	**R14**	33k	O6O3	5%	
C39	470p	O6O3	10%	X7R	**R16**	100K	O6O3	5%	
C40	47p	O6O3	5%	NPO	**R18**	150K	O6O3	5%	
C41	**OPEN**				**R19**	150K	O6O3	5%	
C42	4.7n	O6O3	10%	X7R	**R20**	33K	O6O3	5%	
C43	4.7n	O6O3	10%	X7R	**R21**	33K	O6O3	5%	
C44	4.7n	O8O5	10%	X7R	**R22**	33K	O6O3	5%	
C45	100p	O8O5	5%	NPO	**R23**	33K	O6O3	5%	
C46	100p	O8O5	5%	NPO	**R24**	**OPEN**	O6O3		
C47	4.7n	O8O5	10%	X7R	**R25**	2.7	O6O3	5%	
C48	560p	O6O3	10%	X7R	**R26**	0	O6O3		
C49	2.7p	O6O3	5%	N750	**R27**	**OPEN**	O6O3	5%	
C50	2.2p	O6O3	5%	N750	**R28**	33K	O6O3	5%	

Part	Value	Size	Tolerance	Part	Turns	D.of Wire	D. of Coil	Direction	Pre-form.
R29	330	O6O3	5%	**L1**	12	0.4	2.2	CW	
R30	330	O6O3	5%	**L2**	12	0.4	2.4	CW	
R31	12	O6O3	5%	**L3**	9	0.3	2	CW	
R32	2.2k	O8O5	5%	**L4**	6	0.3	1.6	CCW	
R33	8.2	O6O3	5%	**L5**	3	0.4	2.2	CW	
R34	2.7k	O6O3	5%	**L6**	**Printed**				
R35	5.6	O6O3	5%	**L7**	9	0.3	2	CCW	
R36	1.8k	O6O3	5%	**L8**	5	0.4	1.8	CW	
R37	1.8k	O6O3	5%	**L9**	13	0.3	3	CW	
R38	**OPEN**			**L10**	18	0.3	3.2	CW	
R39	18K	O6O3	5%	**L11**	8	0.3	1.8	CW	
R40	560	O8O5	5%	**L12**	15	0.3	1.9	CW	
R42	1.2K	O6O3	5%	**L13**	**Choke Coil=3.9uH**				
J1	0	O6O3		**L14**	5	0.3	1.7	CCW	
J2	0	O8O5		**L15**	3	0.4	1.9	CCW	**0.5mm**
J3	0	O8O5		**L16**	2	0.5	1.6	CW	**0.5mm**
J4	0	O8O5		**L17**	**Printed**				
J5	0	O6O3		**L18**	2	0.5	1.6	CCW	
J6	0	O6O3		**L19**	4	0.4	1.7	CW	
J7	0	O8O5		**L20**	4	0.4	1.7	CW	
J8	0	O8O5		**L21**	4	0.4	2	CW	**0.5mm**
J9	0	O8O5		**L22**	4	0.4	1.6	CW	**0.5mm**
J10	0	O8O5		**L23**	**Printed**				
R15	10k	O6O3	5%	**L24**	4	0.4	1.6	CCW	**0.5mm**
R17	15	O6O3	5%	**L25**	8	0.3	2	CCW	
R41	15	O6O3	5%	**L26**	8	0.3	2	CW	
J12	0	O6O3		**L27**	14	0.3	2	CW	
				L28	14	0.3	2	CW	
				L29	8	0.3	1.6	CCW	
				L30,L36		**220nH**	**SMD 0805**		
				L31	14	0.3	2	CW	
				L32	4	0.4	1.9	CW	**0.5mm**
				L33	2	0.4	1.9	CW	**0.5mm**
				L34	12	0.3	2.3	CW	
				L35	12	0.3	2.3	CW	

Note1) All the coils are full-turn types. The Unit of the Diameter of Coil & Wire is 'mm'.

Full-Turn, CCW



Note2) J1 & C70 are only for internal Tuner AGC.

Note3) Pre-form. value is the distance between each turn of the coils. The pre-formation of coils should be done before alignment by a coil manufacturer or by line workers.

Part	Semiconductor	Package		Company	Ordering Code
IC1	TUA6034-T	TSSOP-38		Infineon Technologies AG	Q67034-H0006
TR1	BF2030W	SOT343		Infineon Technologies AG	Q62702-F1774
TR2	BG3130	SOT363		Infineon Technologies AG	Q62702-A3850
VD1	BB565	SCD80	SC79	Infineon Technologies AG	Q62702-B873
VD2	BB659C	SCD-80	SC79	Infineon Technologies AG	Q62702-B884
VD3	BB565	SCD-80	SC79	Infineon Technologies AG	Q62702-B873
VD4	BB565	SCD-80	SC79	Infineon Technologies AG	Q62702-B873
VD5	BB689	SOD-80	SC79	Infineon Technologies AG	Q62702-B890
VD6	BB565	SCD-80	SC79	Infineon Technologies AG	Q62702-B873
VD7	BB565	SCD-80	SC79	Infineon Technologies AG	Q62702-B873
VD8	BB659C	SCD-80	SC79	Infineon Technologies AG	Q62702-B884
VD9	BB659C	SCD-80	SC79	Infineon Technologies AG	Q62702-B884
VD10	BB565	SCD-80	SC79	Infineon Technologies AG	Q62702-B873
VD11	BB689	SOD-80	SC79	Infineon Technologies AG	Q62702-B890
VD12	BB689	SCD-80	SC79	Infineon Technologies AG	Q62702-B890
VD13	BB689	SOD-80	SC79	Infineon Technologies AG	Q62702-B890
VD14	BB659C	SOD-80	SC79	Infineon Technologies AG	Q62702-B884
VD15	BB565	SCD-80	SC79	Infineon Technologies AG	Q62702-B873

Q1	4MHz
PCB	FR4 / 1.5mm
Jack	75 W IEC or F- type
Pin-Head	Standard Pin

Ordering & Contact Information

Please visit our website at

http://www.infineon.com

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Kastenbauerstr 2,
81677 München

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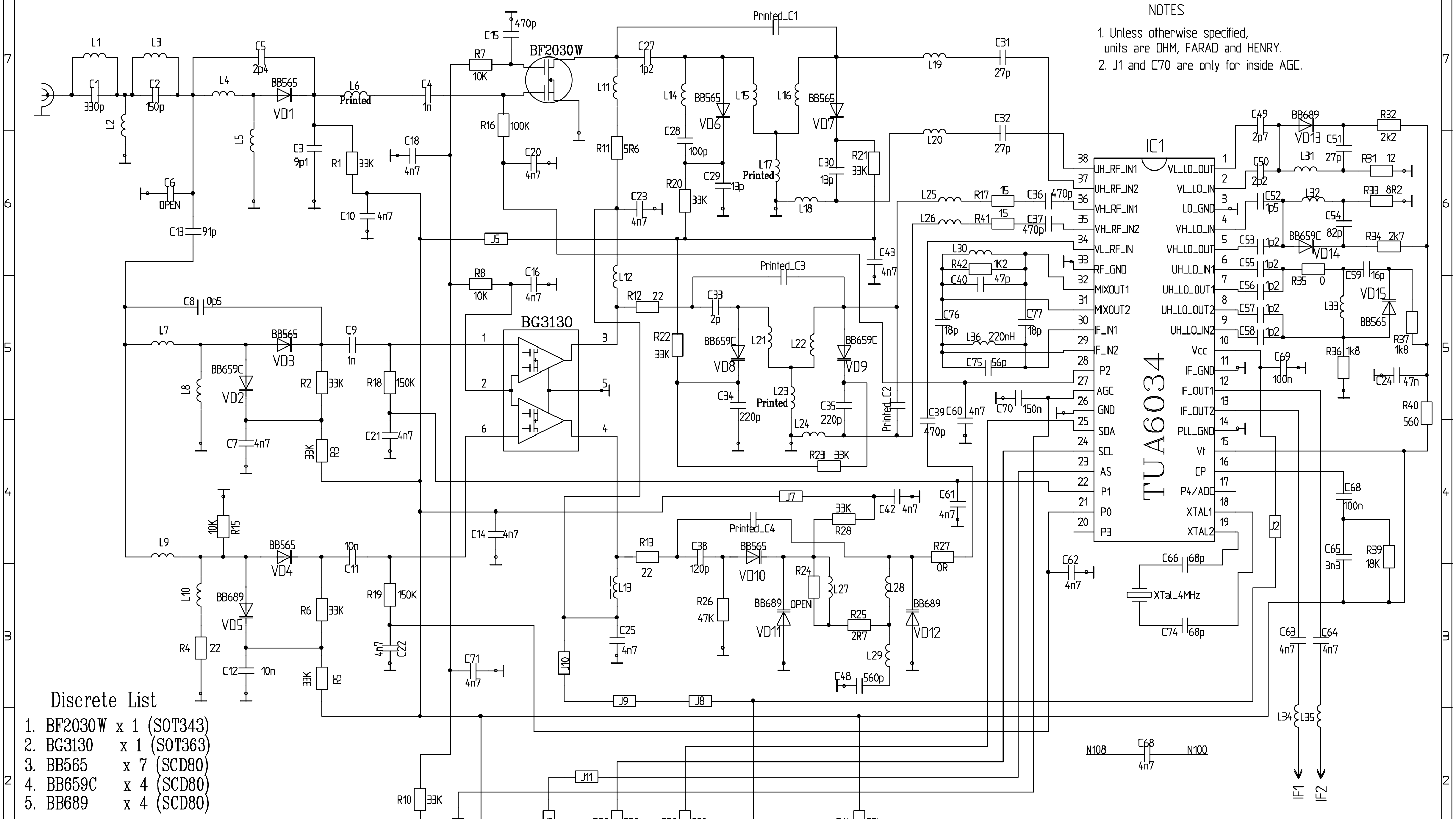
NOTES

1. Unless otherwise specified, units are OHM, FARAD and HENRY.
2. J1 and C70 are only for inside AGC.



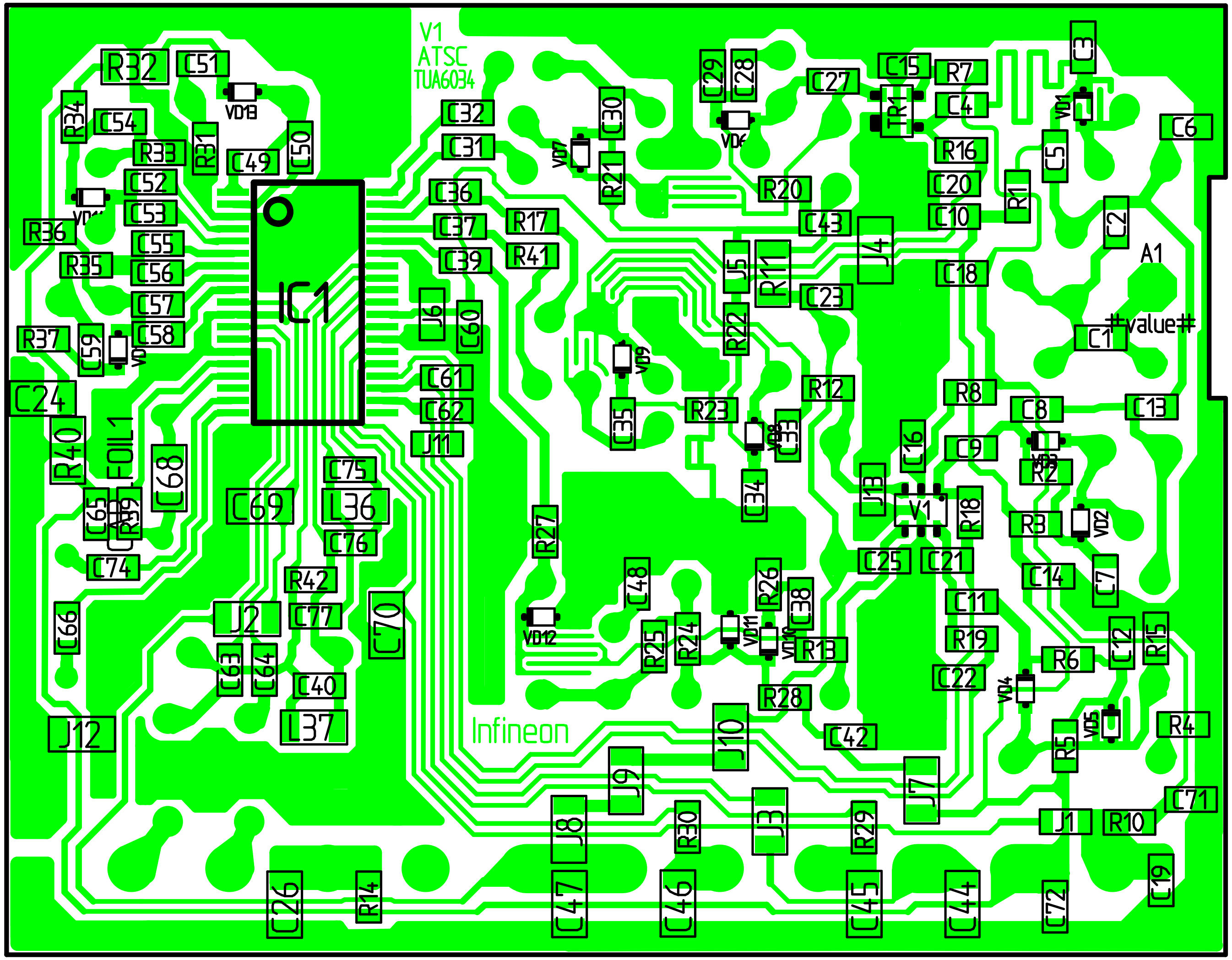
Discrete List

1. BF2030W x 1 (SOT343)
2. BG3130 x 1 (SOT363)
3. BB565 x 7 (SCD80)
4. BB659C x 4 (SCD80)
5. BB689 x 4 (SCD80)

Application of the Circuit	
ATSC (8-VSB) Tuner	
Band Ranges (Picture Carrier)	VHFL : 57 - 159 MHz VHFH : 165 - 453 MHz UHF : 459 - 861 MHz IF_center = 44 MHz

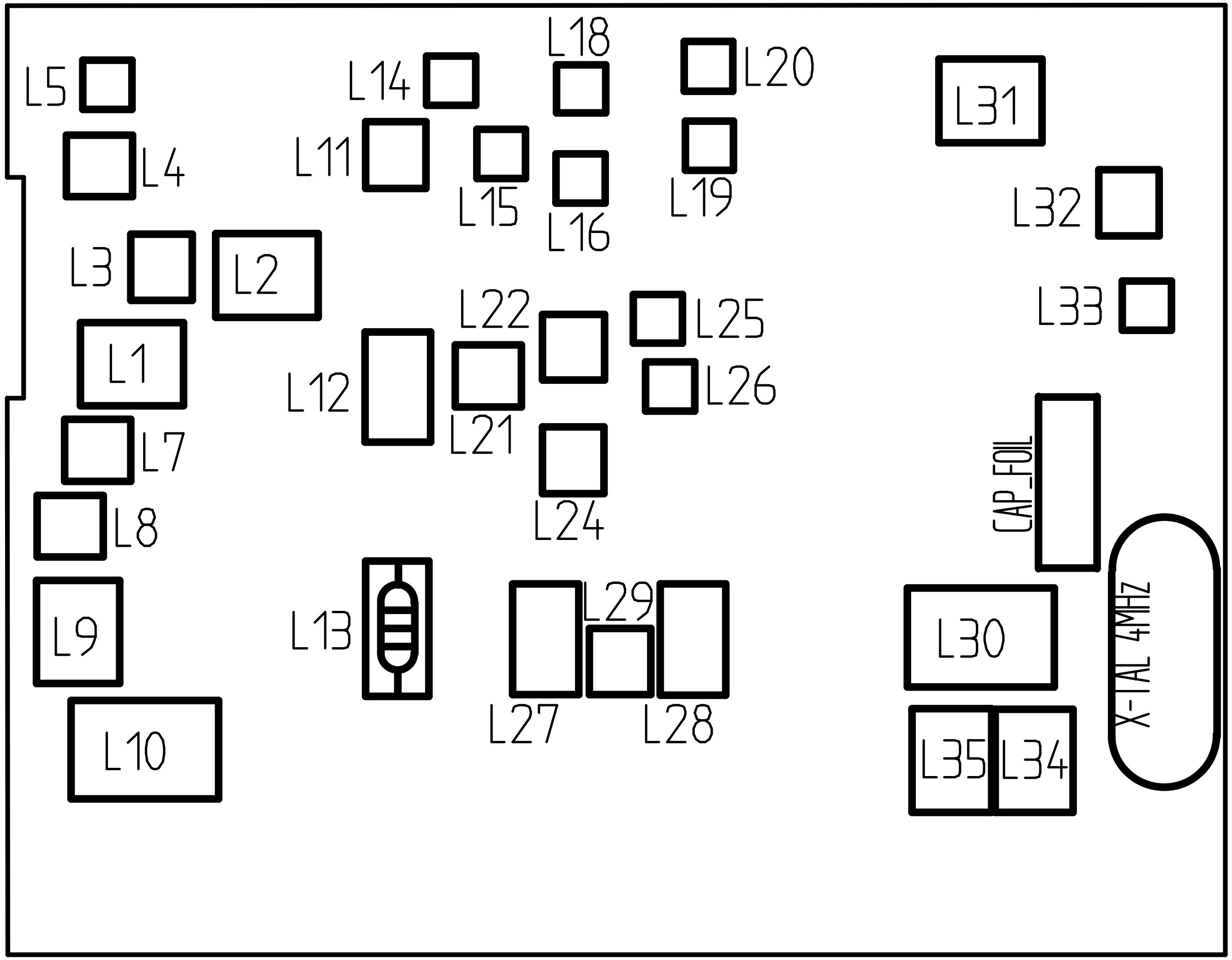
Infineon Technologies / SMS M AE DS			
Project	ATSC Tuner Solution for TUA6034		
Revision	Version 1	Date	February 7th, 2003
Tel. of Marketing	IC : 49-89-234-25363 / Discrete : 49-89-234-28593		
Application Team	Kastenbauerstr.2 81677 Munich Germany		

Infineon ATSC Tuner Ver.1 with TUA6034T, BG3130



Component Side (3.54 02/12/103 atsc_tua6034_v1.tc)

Infineon ATSC Tuner Ver.1 with TUA6034T, BG3130



Coil Side (3.54 02/12/103 atsc_tua6034_v1.tc)