

2nd version

GMRT ANALOG BACKEND SYSTEM



GMRT ANALOG BACKEND GROUP
GIANT METREWAVE RADIO TELESCOPE,
KHODAD.

Objective

Analog Processing of the RF signals from antenna received at Central Electronics Building (CEB).

Contents

1	GMRT Analog Backend System (GAB SYSTEM)	
1.1	Introduction	6
1.2	Requirement of system	7
1.3	Basic block diagram of GAB System	8
1.4	Description	8
1.5	Circuit cascaded analysis of System	10
1.6	Detail Block Diagram of System	11
1.7	Input Spectrum of Analog Backend System	12
1.8	Output Spectrum of Analog Backend System	13
1.9	Photograph of Analog Backend System Rack	14
1.10	Details of Analog Backend System Rack	16
2	Analog Receiver (Arx) Plug in Unit (PIU)	
2.1	Block Diagram of Analog Receiver PIU	19
2.2	Description	19
2.3	Photograph of Analog Receiver PIU	20
2.4	Bill of Material of Analog Receiver PIU	21
2.5	Front & Rear Plate details of Analog Receiver PIU	22
2.6	Details of RF Cable used in Analog Receiver PIU	24
2.7	Details of Internal wiring in Analog Receiver PIU	25
2.8	Test setup for Analog Receiver PIU	27
2.9	Test results for Analog Receiver PIU	28
2.10	Variable Gain Amplifier (VGA) unit	
2.10.1	Schematic diagram of VGA Unit	31
2.10.2	Bill of Material of VGA PCB	32
2.10.3	PCB Layout of VGA unit	33
2.10.4	Chassis Drawing of VGA unit	34
2.10.5	Bill of Material of VGA Unit	35
2.11	Conversion (CNV) Unit	
2.11.1	Schematic diagram of CNV Unit	36
2.11.2	Bill of Material of CNV PCB	37
2.11.3	PCB Layout of CNV unit	38
2.11.4	Chassis Drawing of CNV unit	39
2.11.5	Bill of Material of CNV Unit	40
2.12	Buffer Amplifier (BUF) Unit	
2.12.1	Schematic diagram of BUF Unit	41
2.12.2	Bill of Material of BUF PCB	42
2.12.3	PCB Layout of BUF unit	43
2.12.4	Chassis Drawing of BUF unit	45
2.12.5	Bill of Material of BUF Unit	46

3	BB FILTER Plug in Unit (PIU)	
3.1	Block Diagram of BB Filter PIU	47
3.2	Description	47
3.3	Photograph of BB Filter PIU	48
3.4	Bill of Material of BB Filter PIU	49
3.5	Front & Rear Plate details of BB Filter PIU	50
3.6	Details of RF Cable used in BB Filter PIU	52
3.7	Details of Internal wiring in BB Filter PIU	53
3.8	Test setup for BB Filter PIU	54
3.9	Test results for BB Filter PIU	55
3.10	RF Switch (RSW) unit	
3.10.1	Schematic diagram of RSW Unit	58
3.10.2	Bill of Material of RSW PCB	59
3.10.3	PCB Layout of RSW unit	60
3.10.4	Chassis Drawing of RSW unit	61
3.10.5	Bill of Material of RSW Unit	62
3.11	Buffer Amplifier (BFR) unit	
3.11.1	Schematic diagram of BFR Unit	63
3.11.2	Bill of Material of BFR PCB	64
3.11.3	PCB Layout of BFR unit	65
3.11.4	Chassis Drawing of BFR unit	66
3.11.5	Bill of Material of BFR Unit	67
3.12	Low Pass Filter (LPF) unit	
3.12.1	Schematic diagram of 100MHz LPF Unit	68
3.12.2	Schematic diagram of 200MHz LPF Unit	69
3.12.3	Schematic diagram of 400MHz LPF Unit	70
3.12.4	Chassis Drawing of LPF unit	71
3.12.5	Performance plots of LPF Unit	72
3.13	Detector (DDD) Unit	
3.13.1	Schematic diagram of DDD Unit	73
3.13.2	Bill of Material of DDD PCB	74
3.13.3	Chassis Drawing of DDD unit	75
4	LO Synthesizer Plug in Unit (PIU)	
4.1	Block Diagram of LO Synthesizer PIU	76
4.2	Description	76
4.3	Photograph of LO Synthesizer PIU	77
4.4	Bill of Material of LO Synthesizer PIU	78
4.5	Front & Rear Plate details of LO Synthesizer PIU	79
4.6	Test setup for LO Synthesizer PIU	81
4.7	Test results for LO Synthesizer PIU	82
4.8	FSW unit	

4.8.1	Schematic diagram of FSW Unit	85
4.8.2	Bill of Material of FSW PCB	86
4.8.3	Chassis Drawing of FSW unit	87
4.8.4	Bill of Material of FSW PCB	88
4.9	Amplifier (SAAD) unit	
4.9.1	Schematic diagram of SAAD Unit	89
4.9.2	Bill of Material of SAAD PCB	90
4.9.3	Chassis Drawing of SAAD unit	91
4.9.4	Bill of Material of SAAD PCB	92
5	Noise Cal PIU	
5.1	Block Diagram of Noise Cal PIU	93
5.2	Description	93
5.3	Photograph of Noise Cal PIU	94
5.4	Bill of Material of Noise Cal PIU	95
5.5	Front & Rear Plate details of Noise Cal PIU	96
5.6	Test setup for Noise Cal PIU	98
5.7	Test results for Noise Cal PIU	99
5.8	Noise Cal unit	
5.8.1	Schematic diagram of Noise Cal Unit	100
5.8.2	Bill of Material of Noise Cal PCB	101
5.8.3	Chassis Drawing of Noise Cal unit	102
5.8.4	Bill of Material of Noise Cal PCB	103
6	Control & Monitor PIU	
6.1	Block Diagram of Control & Monitor PIU	104
6.2	Description	104
6.3	Photograph of Control & Monitor PIU	105
6.4	Bill of Material of Control & Monitor PIU	106
6.5	Front & Rear Plate details of Control & Monitor PIU	107
6.6	MCM Card No. and assigned IP Addressed	109
6.7	Details of Control & Monitor Connections.	110
7	Ref. Distribution PIU	
7.1	Details of Ref. Distribution	113
7.2	Photograph of Ref. Distribution PIU	114
7.3	Front & Rear Details of Ref. Distribution PIU	115
8	Team Member	116

1. GMRT ANALOG BACKEND SYSTEM

1.1 Introduction

The Backend Receiver of GMRT is being upgraded as part of the eleventh plan jobs. These modifications being implemented in the analog and digital backend receivers will improve the overall specifications of the Backend receiver. The major upgrade in specifications related to the analog section include complete processing of the RF signals at the Central station, seamless frequency coverage upto 1600 Mhz and an instantaneous bandwidth of 400 Mhz (max). The main function of the analog backend receiver is conversion of the signal at RF frequencies received from antennas through the optical fiber cables to Baseband frequencies in the range 0 to 400 MHz for digitization in high speed ADCs

1.2 Requirement of system

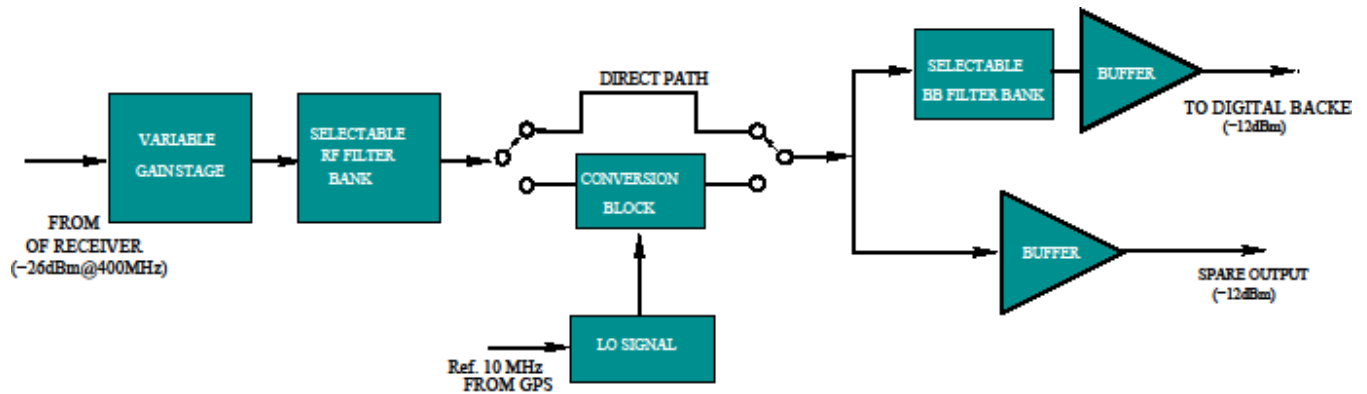
Input Frequency : 30 – 1600 Mhz
Input Power : -24 dBm
Max Bandwidth : 400 Mhz
Headroom : 27 db
Output power : -12 dBm
Noise Contribution to Front End < 0.01 K
Filter Bank – 7 Filter selection
3 BB converted signal

Power detector at input and output

Noise +CW cal signal at input

Noise (var corr) cal at ADC input

1.3 Basic Block Diagram of System:



1.4 Description

The main function of the analog backend section of GMRT receiver is to down convert the RF signals received from the antennas and process them so that the digitization and further digital processing is done conveniently. The basic block schematic is as shown in the figure.

The incoming RF signal is passed through a variable gain circuit whose gain can be adjusted in steps of 0.5 db so that any variation in signal levels between antennas can be corrected at this stage and the ADC will receive same power levels. The RF signals are then passed through a RF filter bank which will have same filter as the one used immediately after the feed being used. This filter is used to improve the out of band rejection and provide a clean signal to the later stages. Since the ADC is operating at 800 MHz sampling rate, we need to down convert all signals above 400 MHz to a lower frequency. So the frequency conversion stage is provided with a bypass stage so that whenever the observation frequency is lower than 400 Mhz, one can use the bypass path and the RF signal will be directly given to the ADC circuits. For Rf bands above 400 MHz a suitable LO signal is to be used to down convert the signal to 0 to 400 MHz range. The mixer unit is

followed by a 400 Mhz low pass section to attenuate the high frequency signals due to LO/RF leakage. The baseband signals thus generated are provided as two outputs, one directly as a 400 MHz signal (spare output) and the main output with a baseband filter bank which provides a facility for 100, 200, 400 MHz filter selection based on observation requirements. The power levels are adjusted for the ADC linear range.

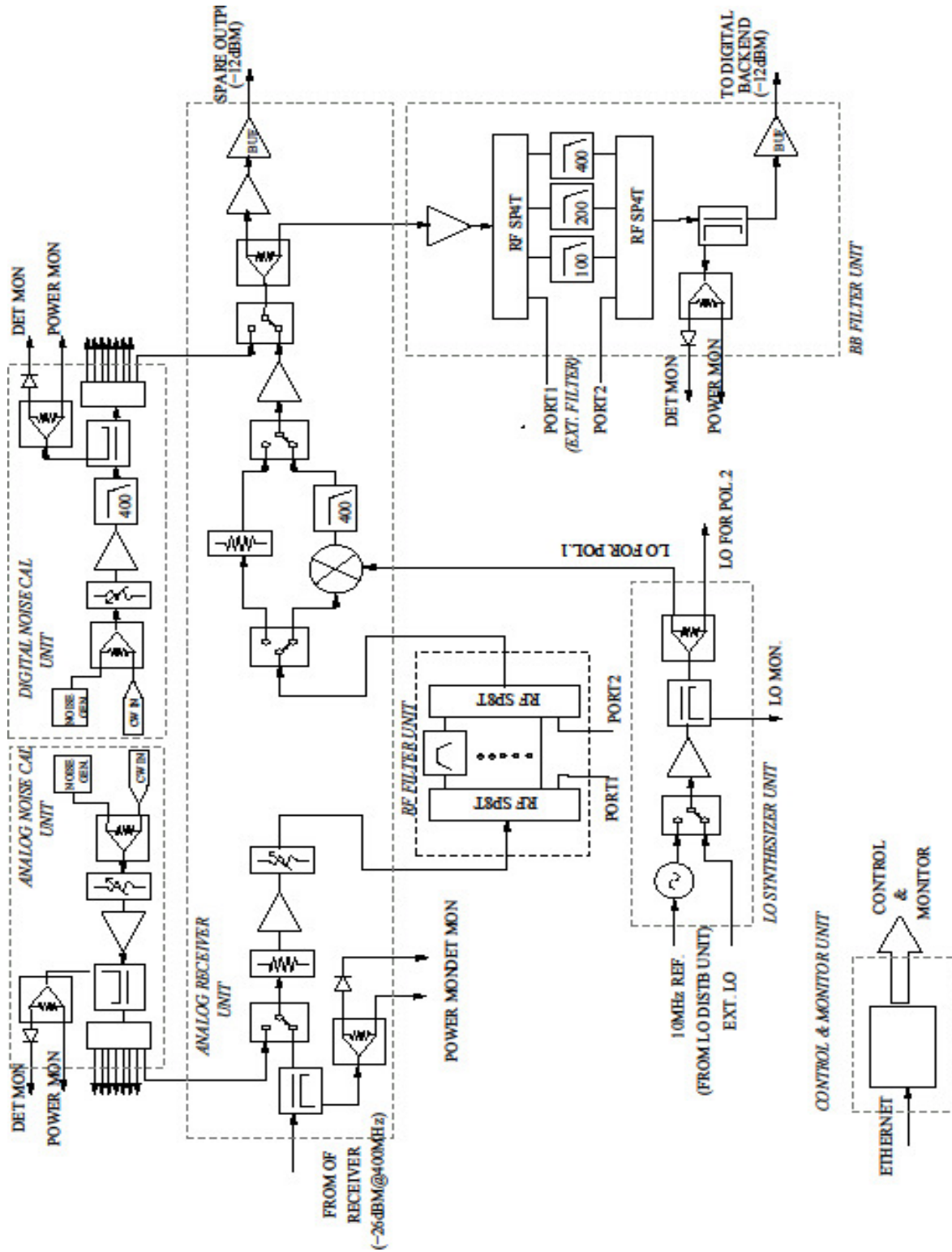
The Local oscillator for the mixer is generated from a 10 Mhz reference signal provided by the GPS disciplined Rubidium oscillator which is the T&F standard used at the observatory. There are two ways in which the LO signal is generated. A common Signal generator which covers the full frequency range is locked to this 10 Mhz reference. The output of this unit is amplified and distributed to down conversion units for all 30 antennas. This provides a facility for setting a common LO for all antennas, but provides facility to vary the set LO frequency in steps of 1 Hz. A second LO generation scheme uses individual Lo signals generated in the range 600 to 1700 Mhz in 0.5 Mhz steps. Here individual antennas can be set to different Lo frequencies as per requirement.

The system also provides complete control & monitor of the parameters and health of the system through online and also facilities to monitor the signal levels at various stages in the receiver. A facility also exists to inject a noise or CW to the circuits to check the gain and other system parameter without removing the units from the rack.

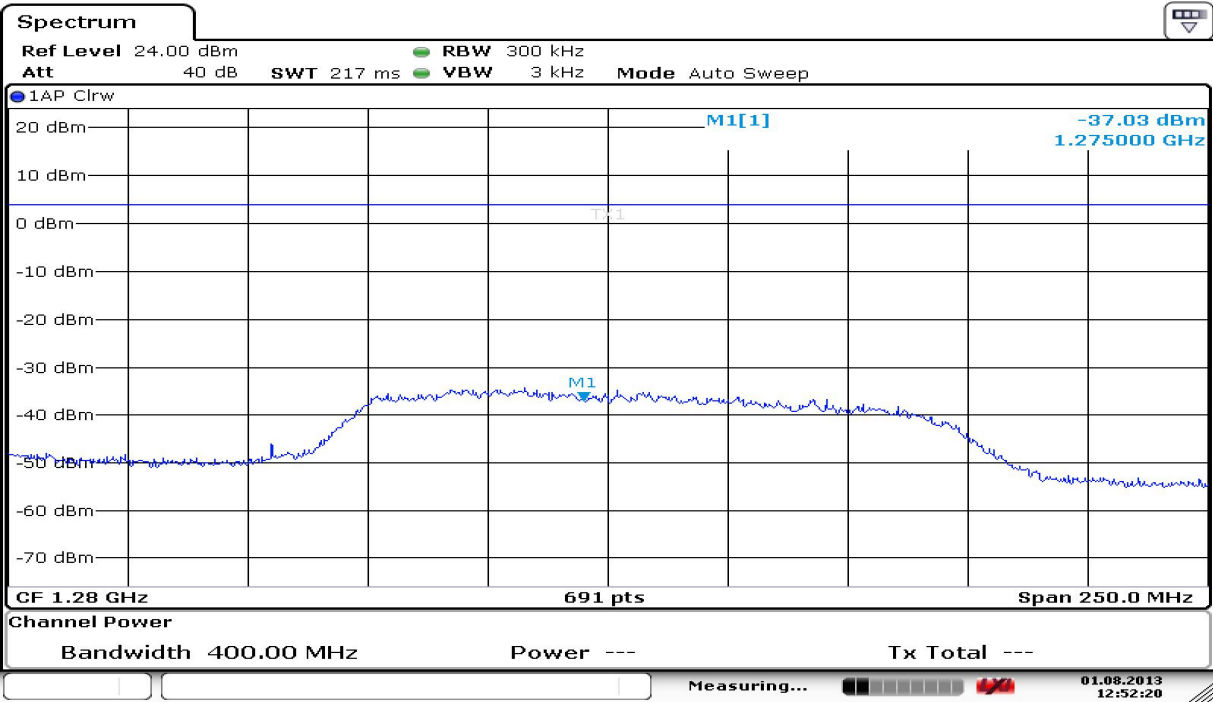
1.5 Circuit cascaded analysis of System

	@100 MHz RF	@1000 MHz RF	@1500 MHz RF
Input Power	-24 dBm	-24 dBm	-24 dBm
Output Power	-12.62 dBm	-12.75 dBm	-12.93 dBm
Power Gain	11.38 dB	11.25 dB	11.07 dB
Noise Figure	19.1 dB	19.91 dB	20.31 dB
Output P1 dB	14.9 dBm	14.9 dBm	14.9 dBm
Output IP3	27.09 dBm	29.6 dBm	30.06 dBm
CDR	72.29 dB	71.56 dB	71.36 dB
SFDR	56.32 dB	57.53 dB	57.69 dB
HeadRoom	27.52 dB	27.65 dB	27.83 dB
O/p Noise Density	-143.41dBm/Hz	-142.71dBm/Hz	-142.49dBm/Hz
Noise Temp @FE in	0.0096 K	0.0116 K	0.0127 K
Power Consumption	2.45 Watts	2.45 Watts	2.45 Watts

1.6 Detail Block Diagram of System

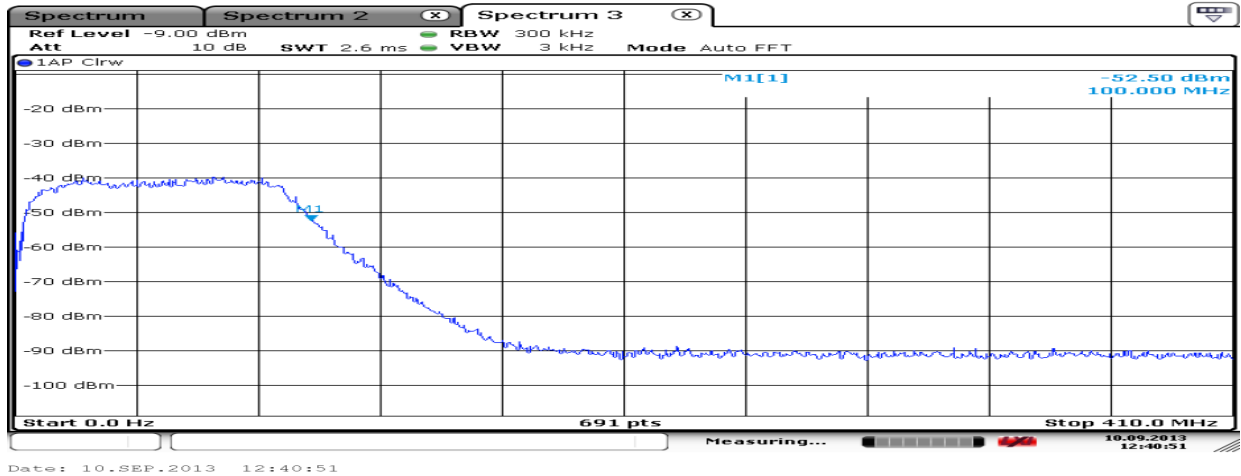


1.7 Input Spectrum of Analog Backend system

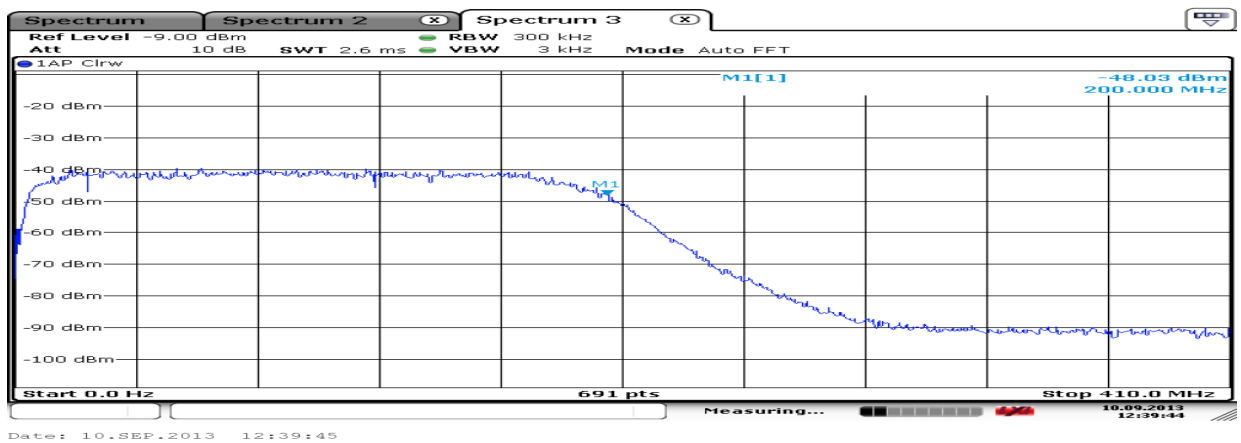


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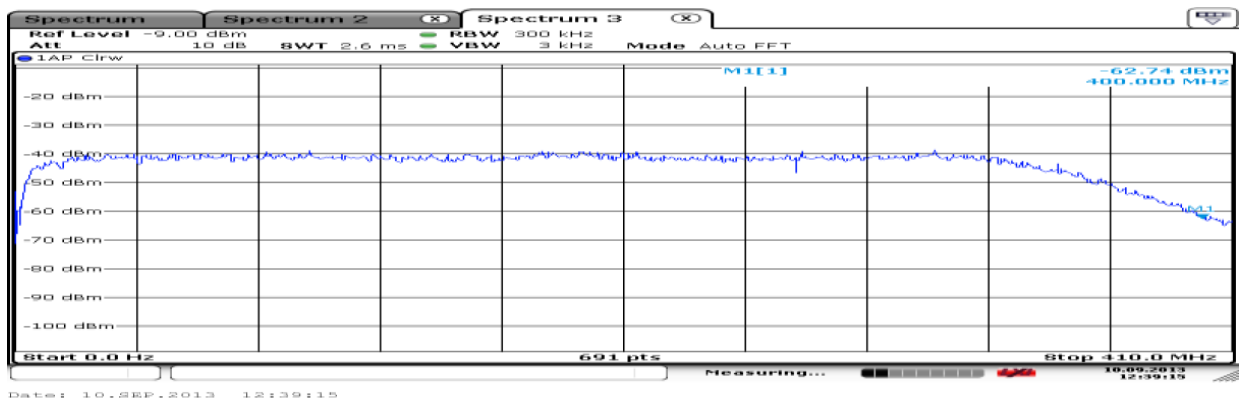
1.8 Output Spectrum of Analog Backend system



With 100 MHz Bandwidth



With 200 MHz Bandwidth

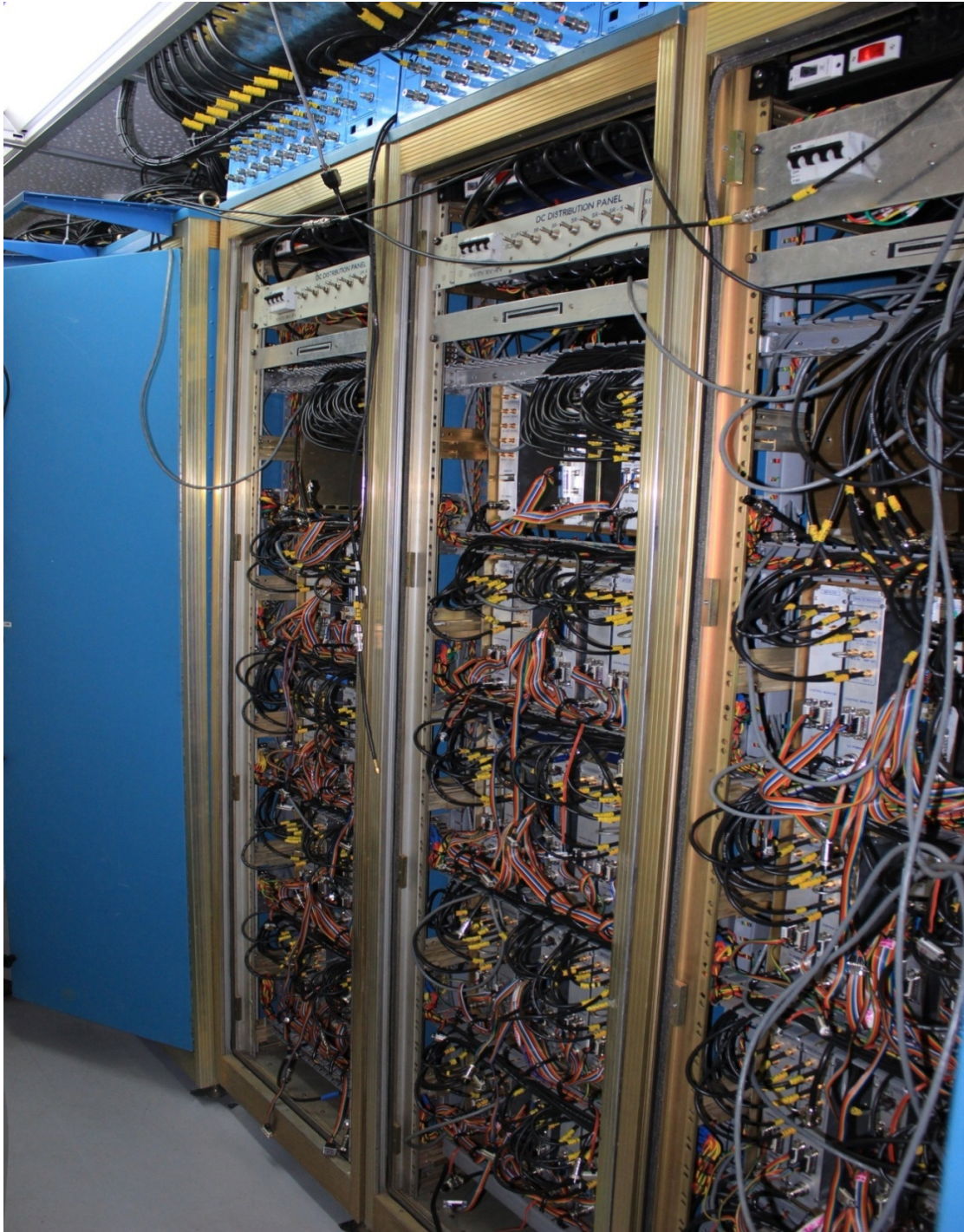


With 400 MHz Bandwidth

1.9 Photograph of Analog Backend System Rack

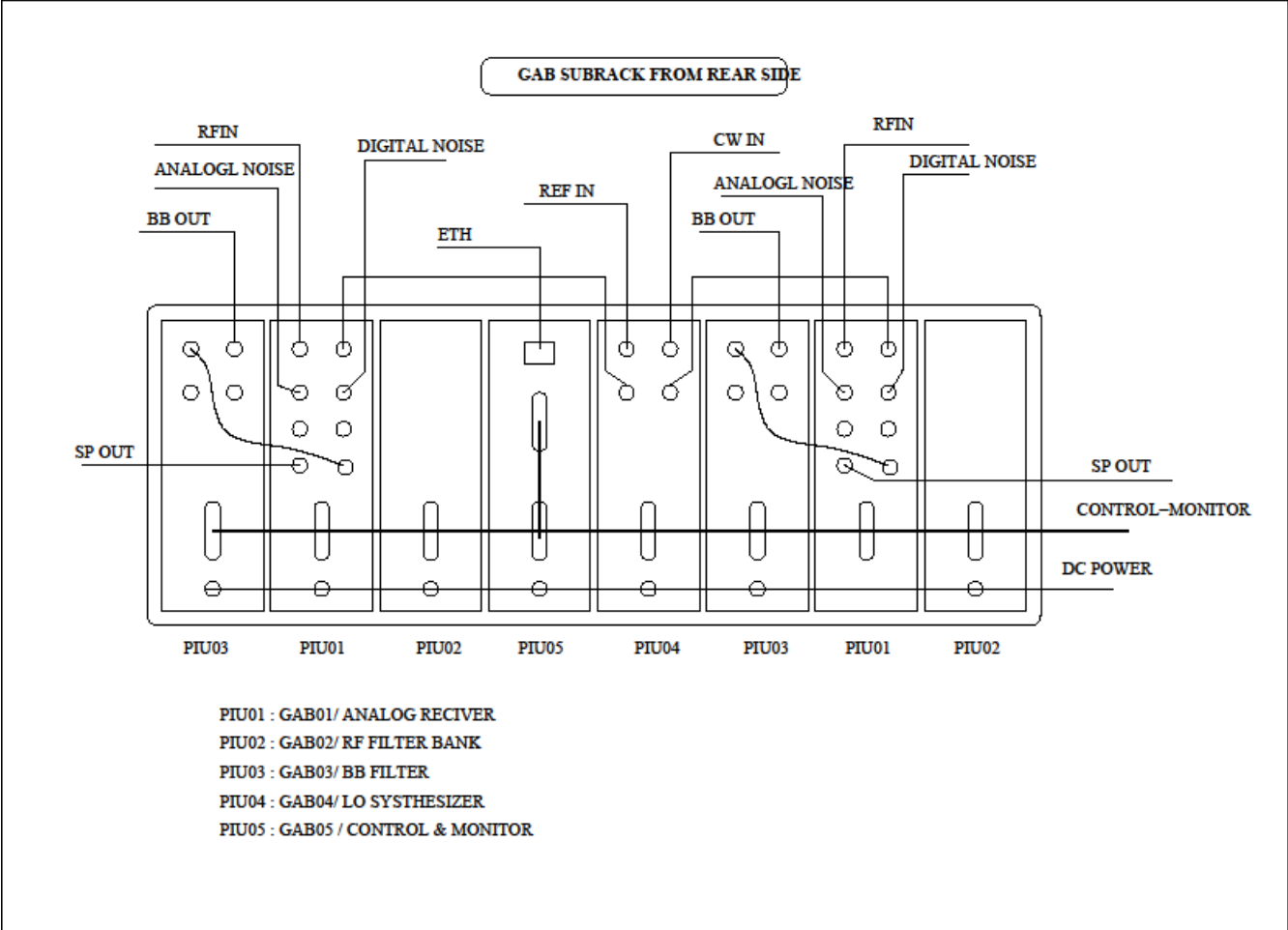


GAB System Rack – Front Side

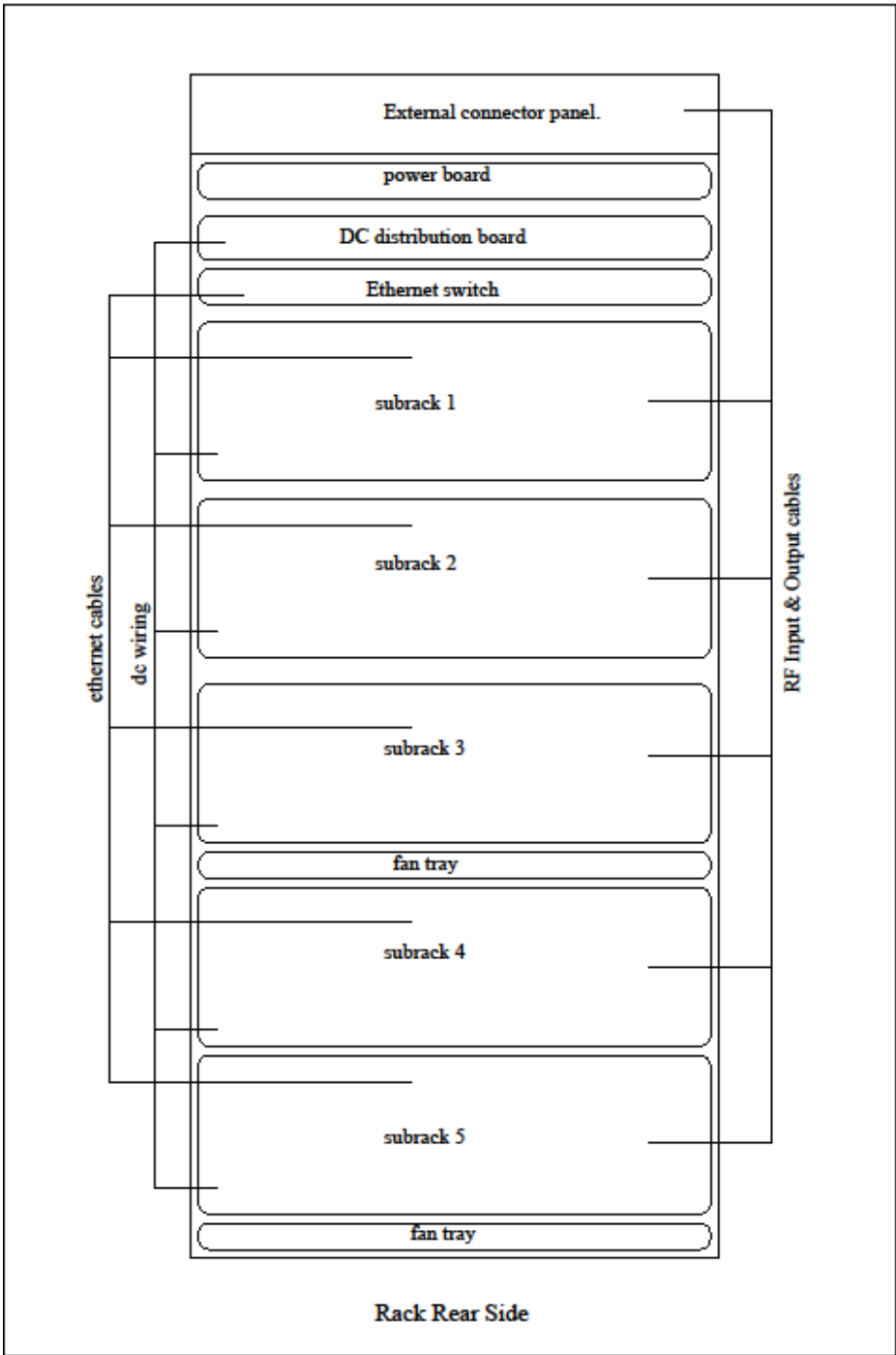


GAB System Rack – Rear Side

1.10 Details of Analog Backend System Rack

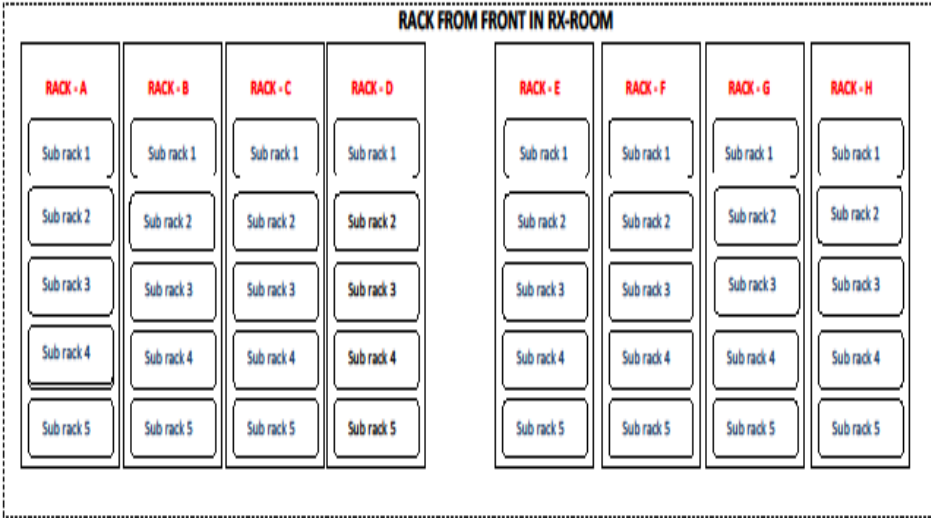
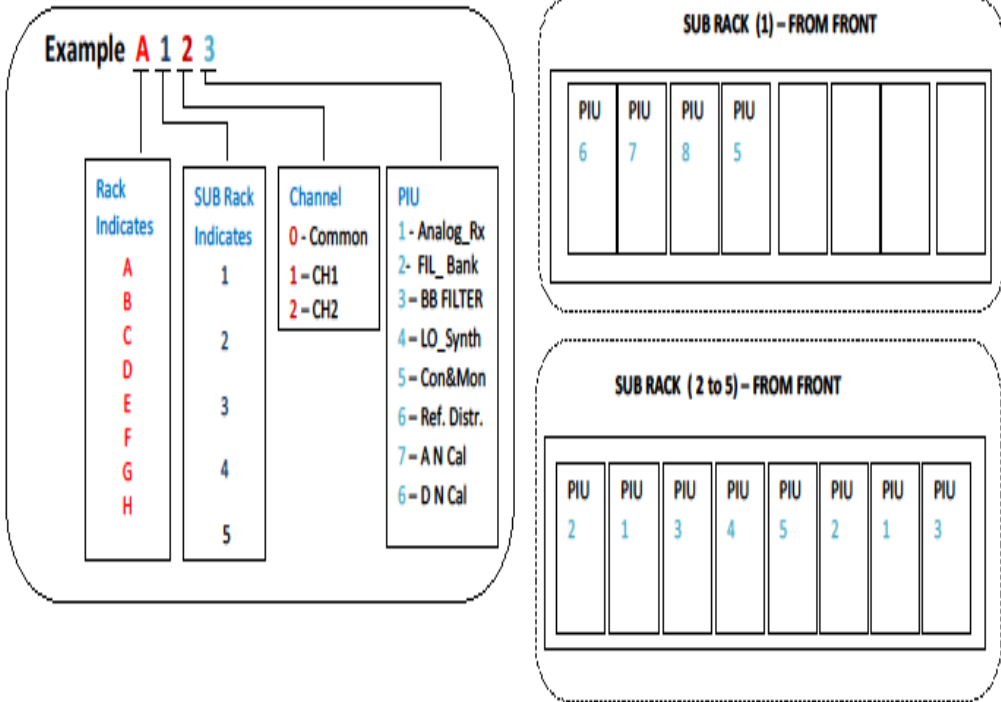


Subrack –system PIU Placement



Rack Details

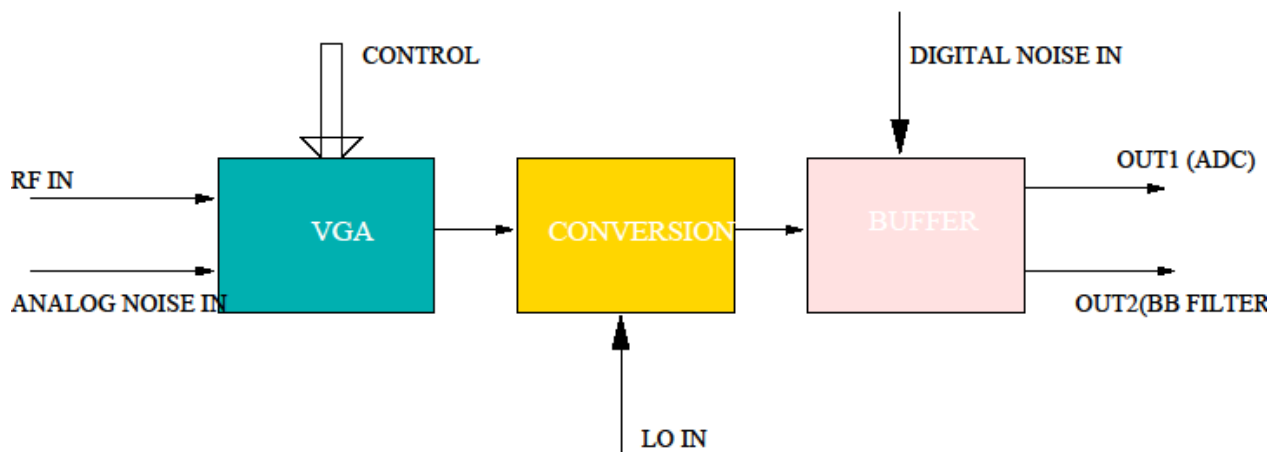
GMRT ANALOG SYSTEM EXPLANATION



GAB System Rack details in Receiver room

2 ANALOG RECIVER PIU

2.1 Block diagram of Analog Receiver PIU



2.2 DESCRIPTION

The incoming RF signal is passed through a variable gain circuit whose gain can be adjusted in steps of 0.5 db so that any variation in signal levels between antennas can be corrected at this stage. Since the ADC is operating at 800 MHz sampling rate, we need to down convert all signals above 400 MHz to a lower frequency. So the frequency conversion stage is provided with a bypass stage so that whenever the observation frequency is lower than 400 Mhz, one can use the bypass path and the RF signal will be directly given to the ADC circuits. For Rf bands above 400 MHz a suitable LO signal is to be used to down convert the signal to 0 to 400 MHz range. The mixer unit is followed by a 400 Mhz low pass section to attenuate the high frequency signals due to LO/RF leakage. Buffer is used for drive the signal through RF Cable upto ADC input.

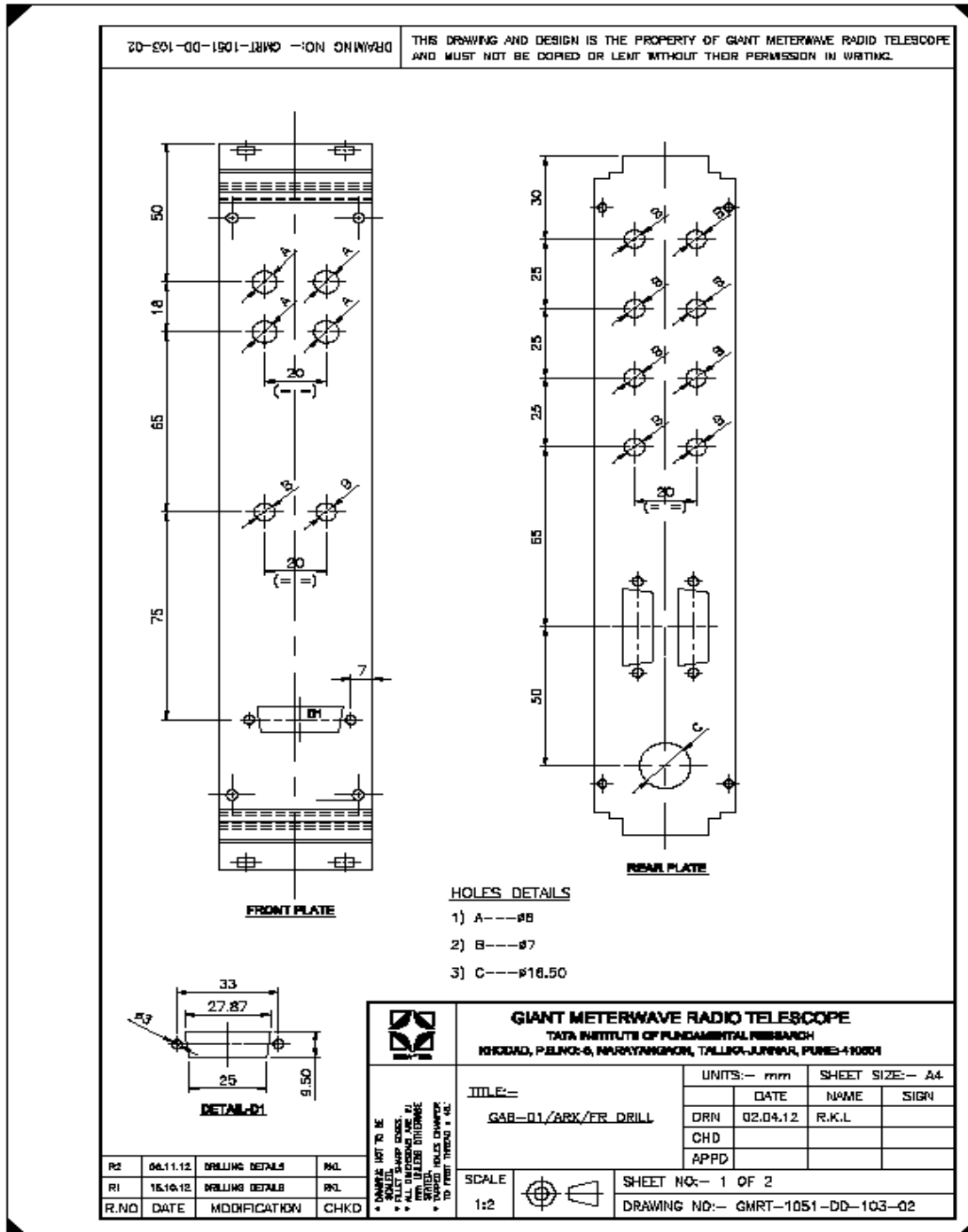
2.3 PHOTOGRAPH OF ANALOG RECEIVER PIU

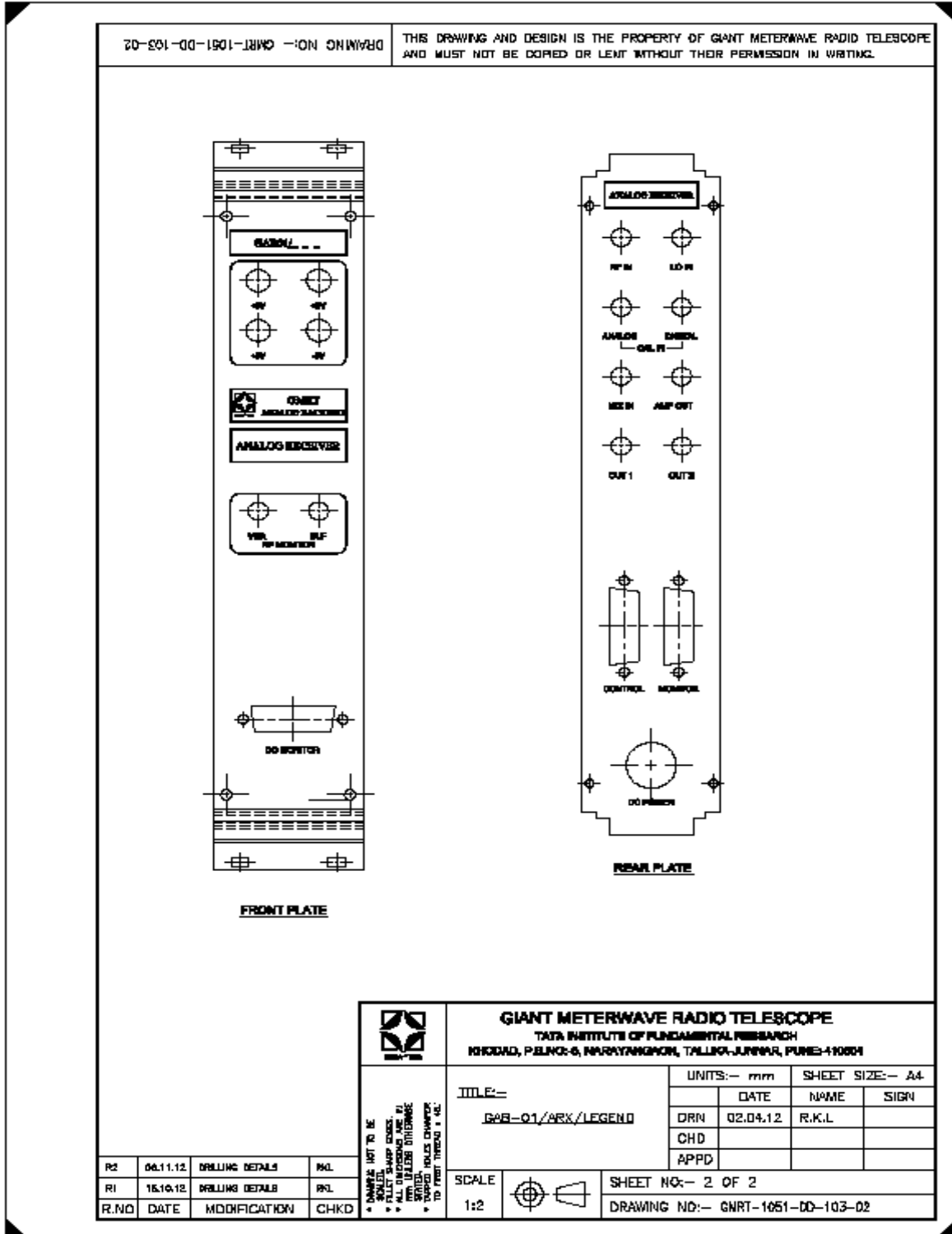


2.4 Bill material of Analog Receiver PIU

Item	Description	Qty/Unit
01	10T PIU (495 mm depth)	1
02	Assembled Unit GAB/VGA_XXX	1
03	Assembled Unit GAB/CNV_XXX	1
04	Assembled Unit GAB/BUF_XXX	1
05	Assembled Unit GAB/PWR_XXX	1
06	RF connector- SMA cable plug for Sucoform cable, (Huber-Suhner make) 11_SMA-50-3-39/111_Y	12
07	RF connector- SMA Straight Bulkhead Sucoform cable, (Huber-Suhner make) 24_SMA-50-3-15/111_NE	10
08	'D' Type Connector, 15 Pin (FeMale) Front panel for Monitor	1
09	'D' Type Connector, 15 Pin (Male) Rear Panel for Control	1
10	'D' Type Connector, 15 Pin (FeMale) Rear panel for Monitor	1
11	'D' Type Connector, 15 Pin (Male) For VGA Unit	1
12	'D' Type Connector, 9 Pin (Male) For CNV & BUF Unit	2
13	DC power Connector 5 Pin (female)	1
14	5 mm LED Holder	4
15	5 mm Round LED	4
16	Screw M2.5 x 6mm for Unit mounting	12
17	Screw M2.5 x 12 mm for power PCB Mounting	8
18	Spacers 5MM	4
19	Hex. Screws for 'D' Conn. Mounting M2.5 x 6mm with Nut	6
20	Sucoform Cable	3.5Mtr

2.5 Front & Rear Plate Details of Analog Receiver PIU





2.6 Details of RF cable used in Analog Receiver PIU

Sr. No	Connector	Cable detail	Length	Identification Mark
1	SMA (BH) - SMA (M)	RF IN (RP) - RF IN (VGA)	12 CM	A1
2	SMA (BH) - SMA (M)	LO IN (RP) - LO (CNV)	28 CM	A2
3	SMA (BH) - SMA (M)	ANALOG (RP) – CA L (VGA)	12 CM	A3
4	SMA (BH) - SMA (M)	DIGITAL (RP) - CAL (BUF)	55 CM	A4
5	SMA (BH) - SMA (M)	MIX IN (RP) - RF IN (CNV)	26 CM	A5
6	SMA (BH) - SMA (M)	AMP OUT (RP) – RF OUT (VGA)	31 CM	A6
7	SMA (BH) - SMA (M)	OUT1 (RP) - OUT (BUF)	30 CM	A7
8	SMA (BH) - SMA (M)	OUT 2 (RP) - SPARE (BUF)	33 CM	A8
9	SMA (M) - SMA (M)	IN (BUF) - OUT (CNV)	29 CM	A9
10	SMA (BH) - SMA (M)	MON (BUF) FP - MON (BUF)	17 CM	A10
11	SMA (BH) - SMA (M)	MON (VGA)FP - MON (VGA)	60 CM	A11

2.7 Details of Internal wiring in Analog Receiver PIU

Control Connection

#15 D Type (Male) (on rear of PIU)	other End	
1	9 (VGA Conn.)	V1 Attn
9	10 (VGA Conn.)	V2
2	11 (VGA Conn.)	V3
10	12 (VGA Conn.)	V4
3	13 (VGA Conn.)	V5
11	14 (VGA Conn.)	V6
4	7 (VGA Conn.)	CONTR. RF SW
12	7 &8 (CNV Conn.)	CONTR RF SW1 & RF SW2
5	7 (BUF Conn.)	CONTROL RF SW
13	-	
6	-	
14	-	
7	-	
15	-	
8	gnd (#15 OF VGA CONN.)	

Monitor Connection on rear

#15 D Type (FeMale) (On rear of PIU)	other End	
1	1 (Control Conn.)	V1 Attn
2	9 (Control Conn.)	V2
3	2 (Control Conn.)	V3
4	10 (Control Conn.)	V4
5	3 (Control Conn.)	V5
6	11 (Control Conn.)	V6
7	4 (Control Conn.)	CONT. RF SW
8	12 (Control Conn.)	CONT RF SW1 & RF SW2
9	5 (Control Conn.)	CONTROL RF SW
10		DET Voltage (VGA)
11		DET Voltage(BUF)
12	-	Power Supply Monitor point
13	-	Temp. Mon. Point
14	-	
15	Gnd	

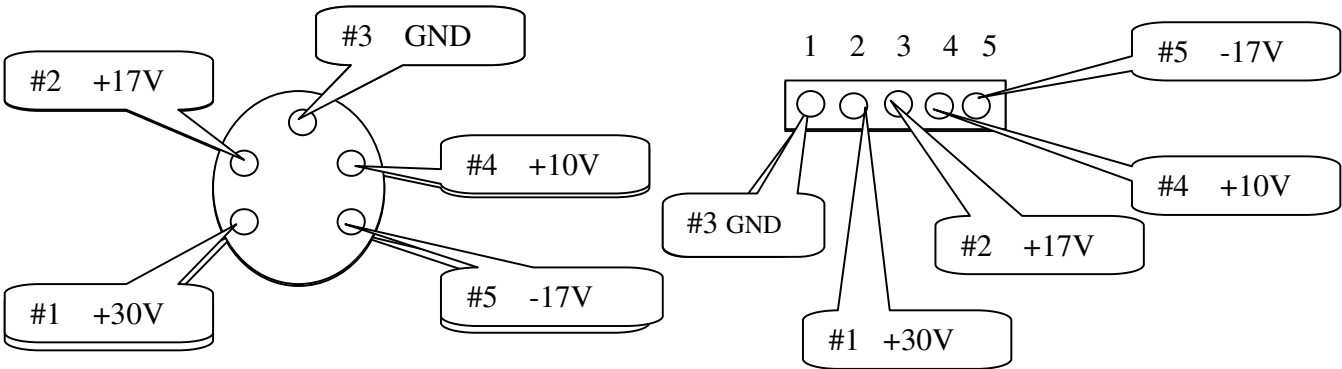
Monitor Connection on FRONT

#15 D Type (FeMale)
(On front of PIU)

other End

1	1 (VGA Conn.)	+9 volt VGA
2	2 (VGA Conn.)	+5 volt VGA
3	3 (VGA Conn.)	-5 volt VGA
4	6 (VGA Conn.)	Det Voltage(VGA)
5	2 (CNV Conn.)	+5 volt CNV
6	3 (CNV Conn.)	-5 volt CNV
7	1 (BUF Conn.)	+9 volt BUF
8	2 (BUF Conn.)	+5 volt BUF
9	3 (BUF Conn.)	-5 volt BUF
10	6 (BUF Conn.)	DET Voltage (BUF)
11		Temp Mon.
12		
13		
14		
15	Gnd	

Power supply Connection:

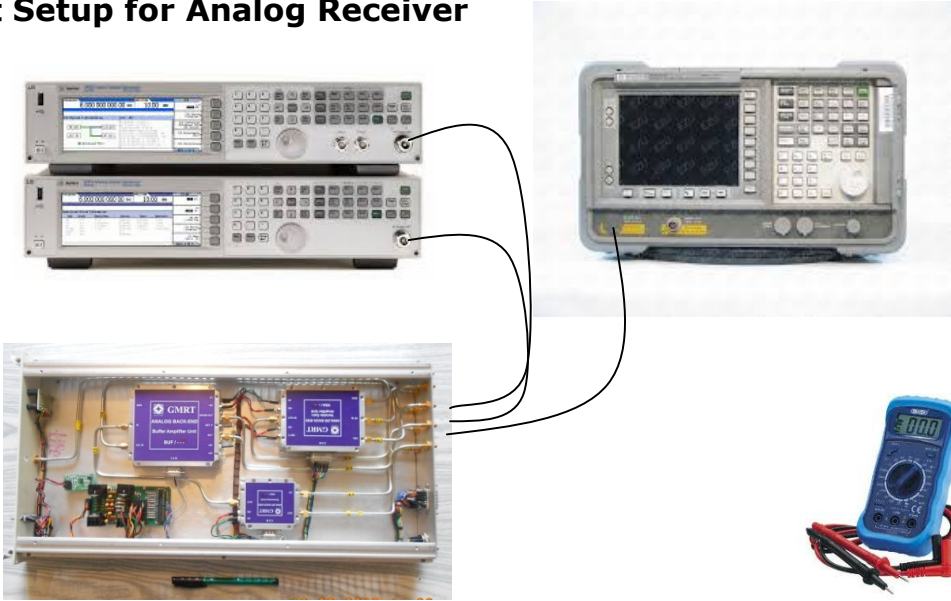


5 Pin Male Connector.

Relimate Connector.

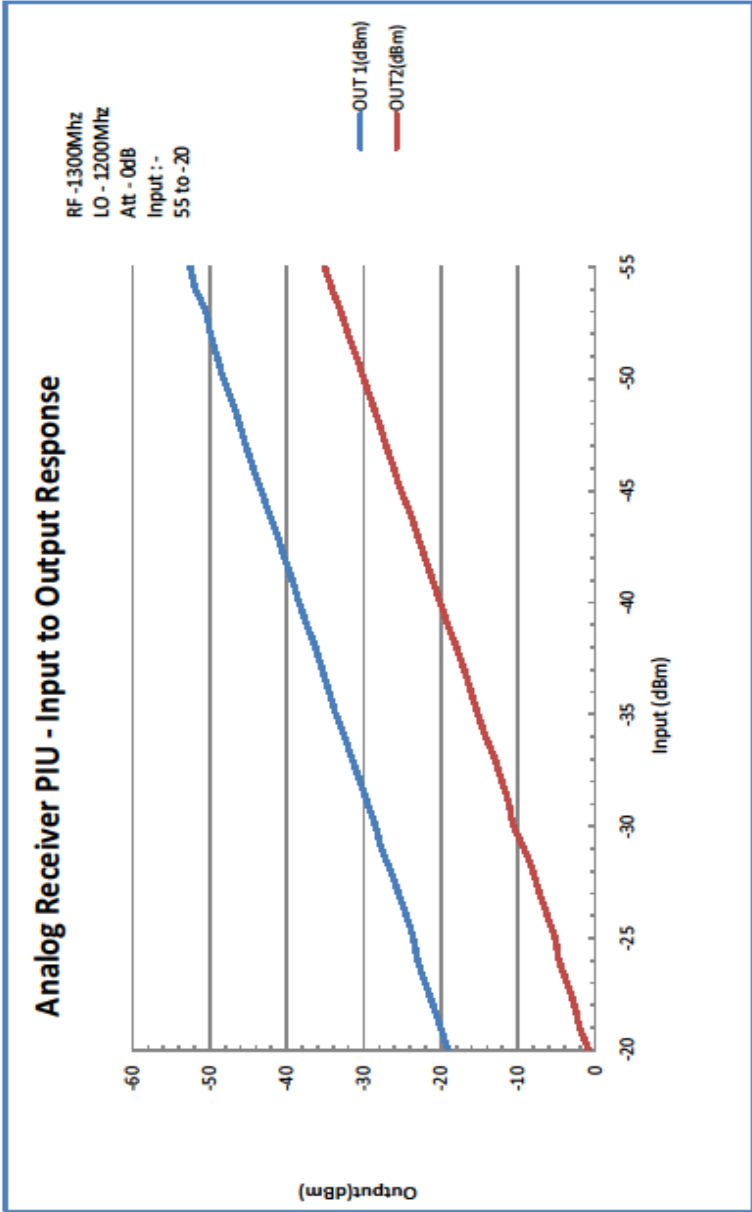
2.8 Test Setup for Analog Receiver

PIU:

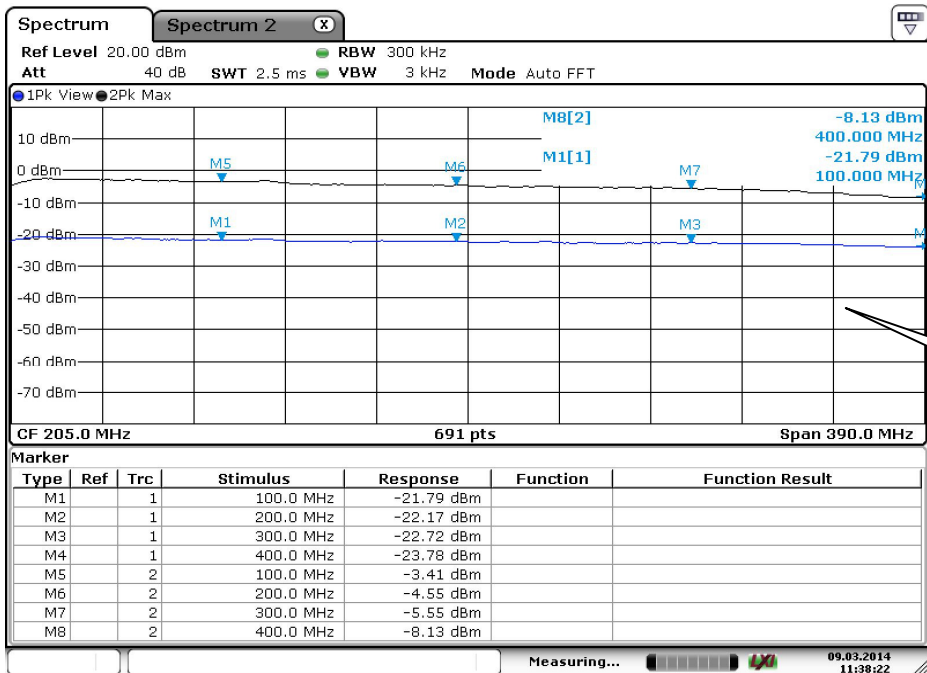


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2.9 Test Results for Analog Receiver PIU

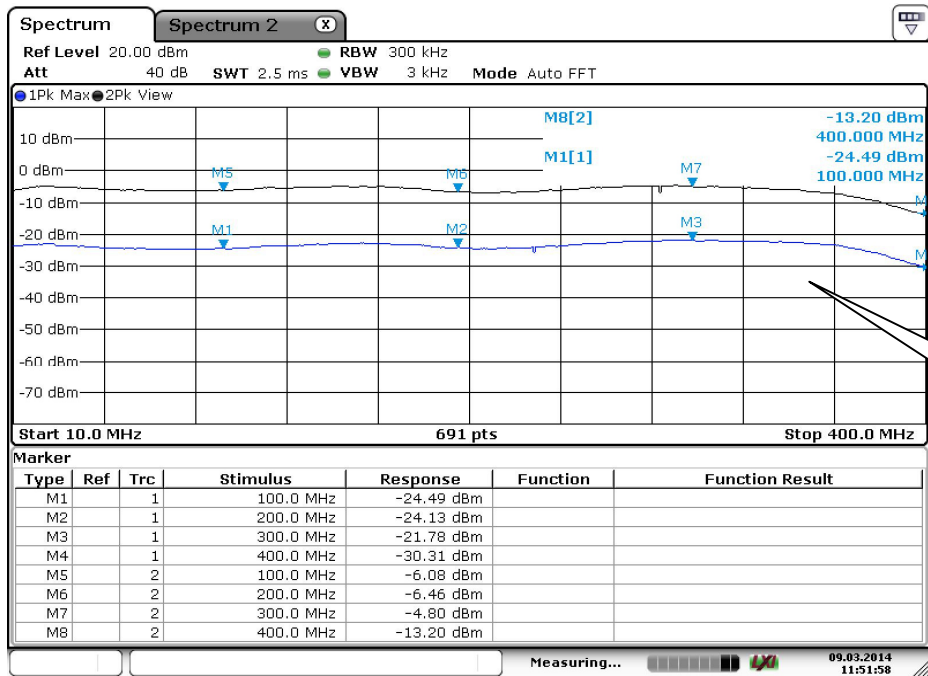


RF Input to OUT1 & OUT 2 Gain response plot



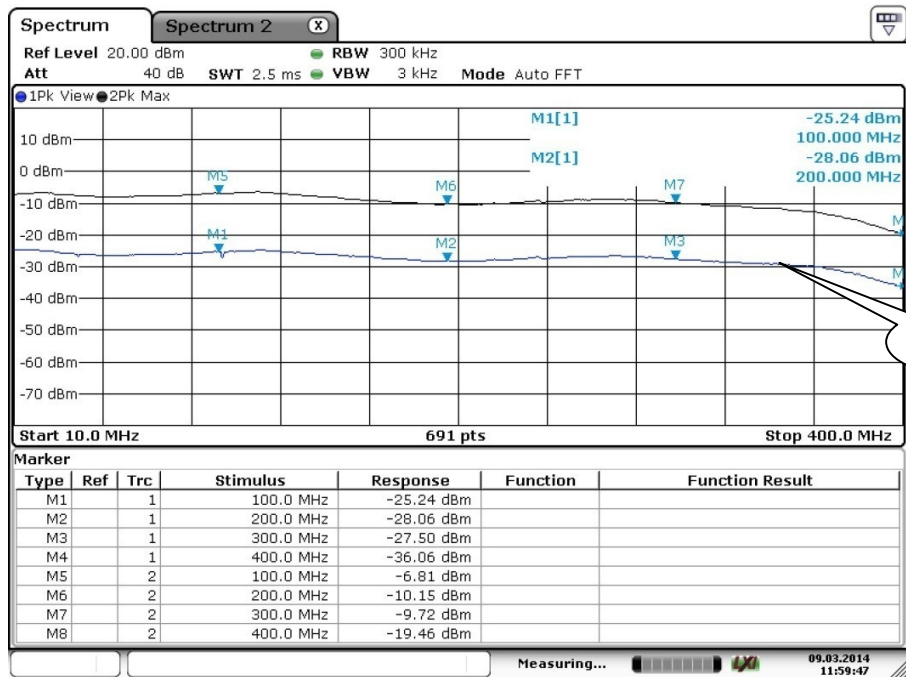
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RF Input to OUT1 & OUT 2 response plot (100 -400Mhz) Input@-30dBm



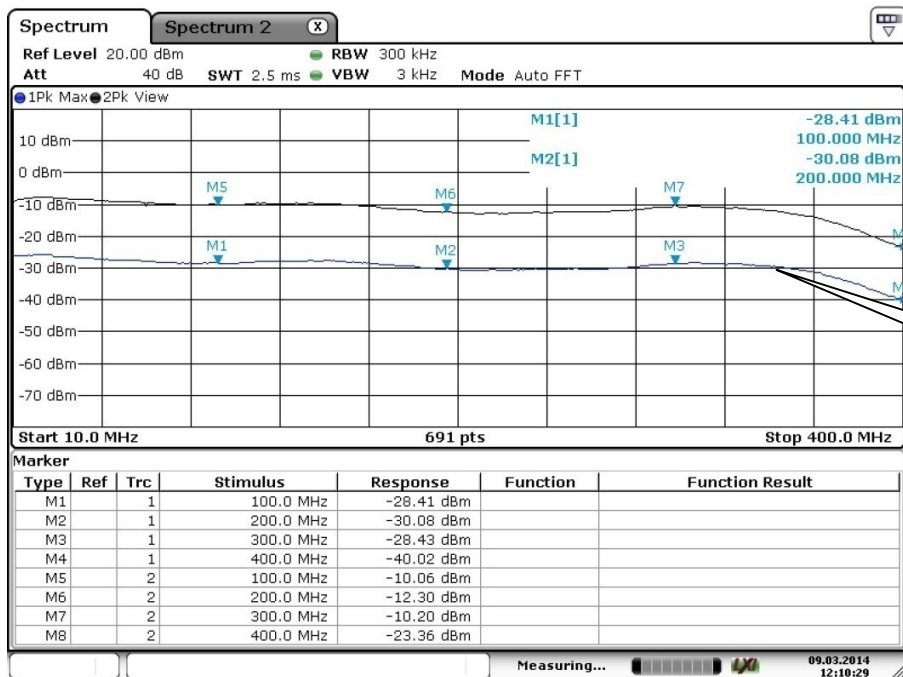
Date: 9.MAR.2014 11:51:58

RF Input to OUT1 & OUT 2 response plot (400 -800Mhz) Input@-30dBm/LO-800Mhz



Date: 9.MAR.2014 11:59:47

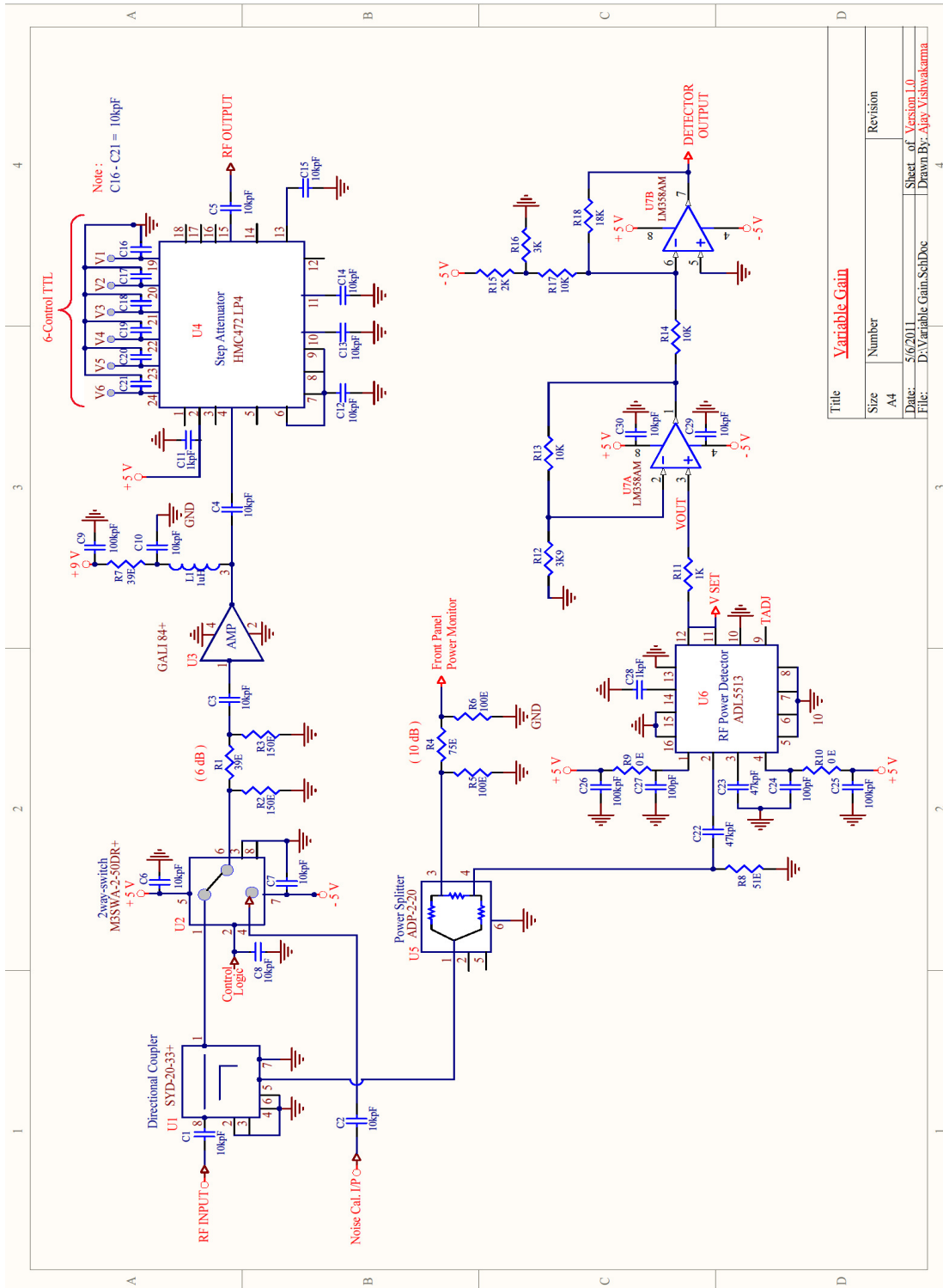
RF Input to OUT1 & OUT 2 response plot (800 -1200Mhz) Input@-30dBm/LO-800Mhz



Date: 9.MAR.2014 12:10:28

RF Input to OUT1 & OUT 2 response plot (1200 -1600Mhz) Input@-30dBm/LO-1200Mhz

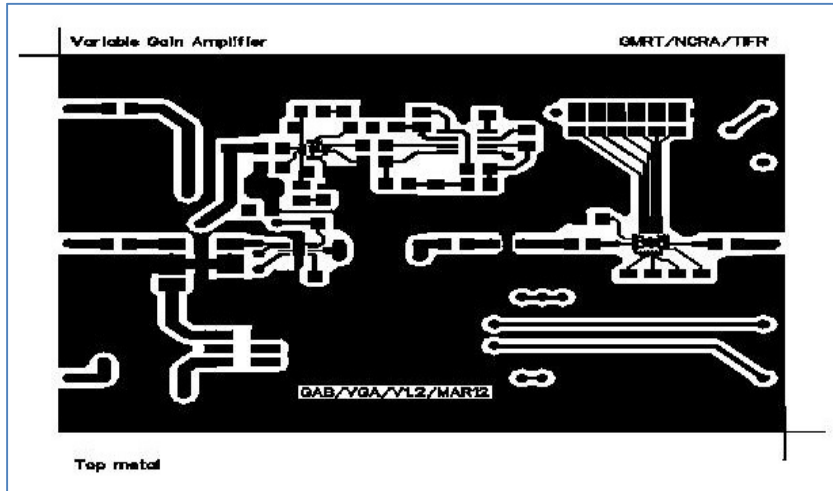
2.10 2.10.1 Schematic diagram of VGA unit



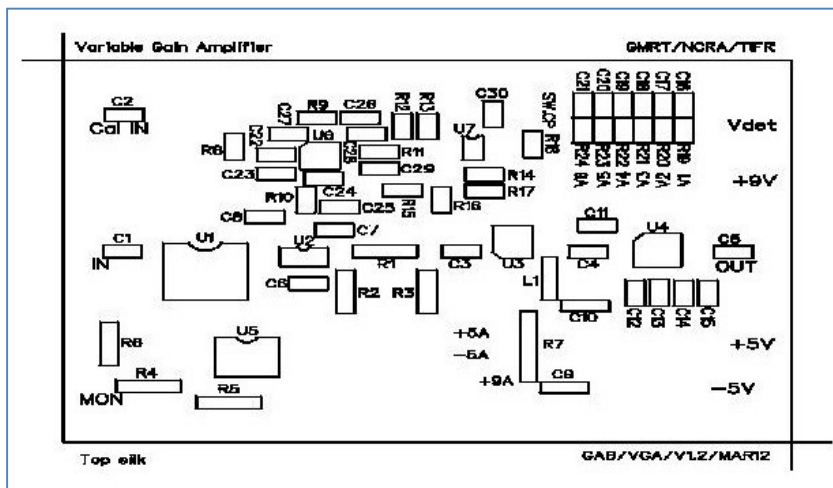
2.10.2 Bill of Material of VGA PCB

SR No.	Description	Type / Make	Designator	Value	Quantity
1	Capacitor	SMD	C1, C2, C3, C4, C5, C6, C7, C8, C12, C13, C14,	10kpF	20
			C15, C16, C17, C18, C19, C20, C21, C29, C30		
		Ceramic	C9, C10,	10kpF	2
		SMD	C25, C26,	100kpF	2
		SMD	C24, C27	100pF	2
		SMD	C22, C23	47kpF	2
		SMD	C11, C28	1kpF	2
2	Inductor	Moulded	L1	1uH	1
3	Resistor	SMD	R9, R10	0 E	2
		CFR	R1	39E, 1/4W	1
		CFR	R7	39E, 1W	1
		SMD	R8	51E	1
		CFR	R4,	75E, 1/4W	1
		CFR	R5, R6,	100E, 1/4W	2
		CFR	R2, R3,	150E, 1/4W	2
		SMD	R19	560E	1
		SMD	R11	1K	1
		SMD	R15	2K	1
		SMD	R16	3K	1
		SMD	R12	3K9	1
		SMD	R13, R14, R17	10K	3
		SMD	R18	18K	1
4	Directional Coupler	MCL	U1	SYD-20-33+	1
5	2 Way-switch	MCL	U2	M3SWA-2-50DR	1
6	RF Amplifier	MCL	U3	Gali 84+	1
7	Step Attenuator	Hittite	U4	HMC472LP4	1
8	Power Splitter	MCL	U5	ADP-2-20	1
9	RF Power Detector	Analog Devices	U6	ADL5513	1
10	Dual OP-Amplifier	Nsem	U7	LM358AM	1

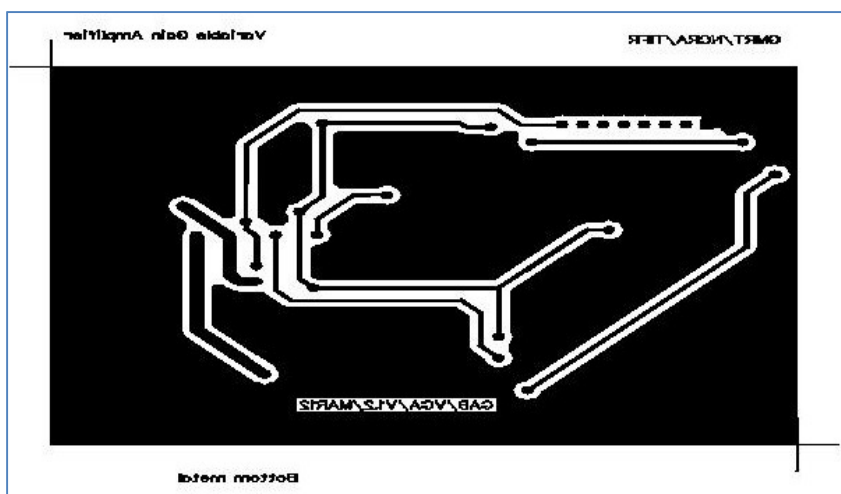
2.10.3 PCB layouts of VGA UNIT



Top Layer of PCB



Silk screen on Top Layer

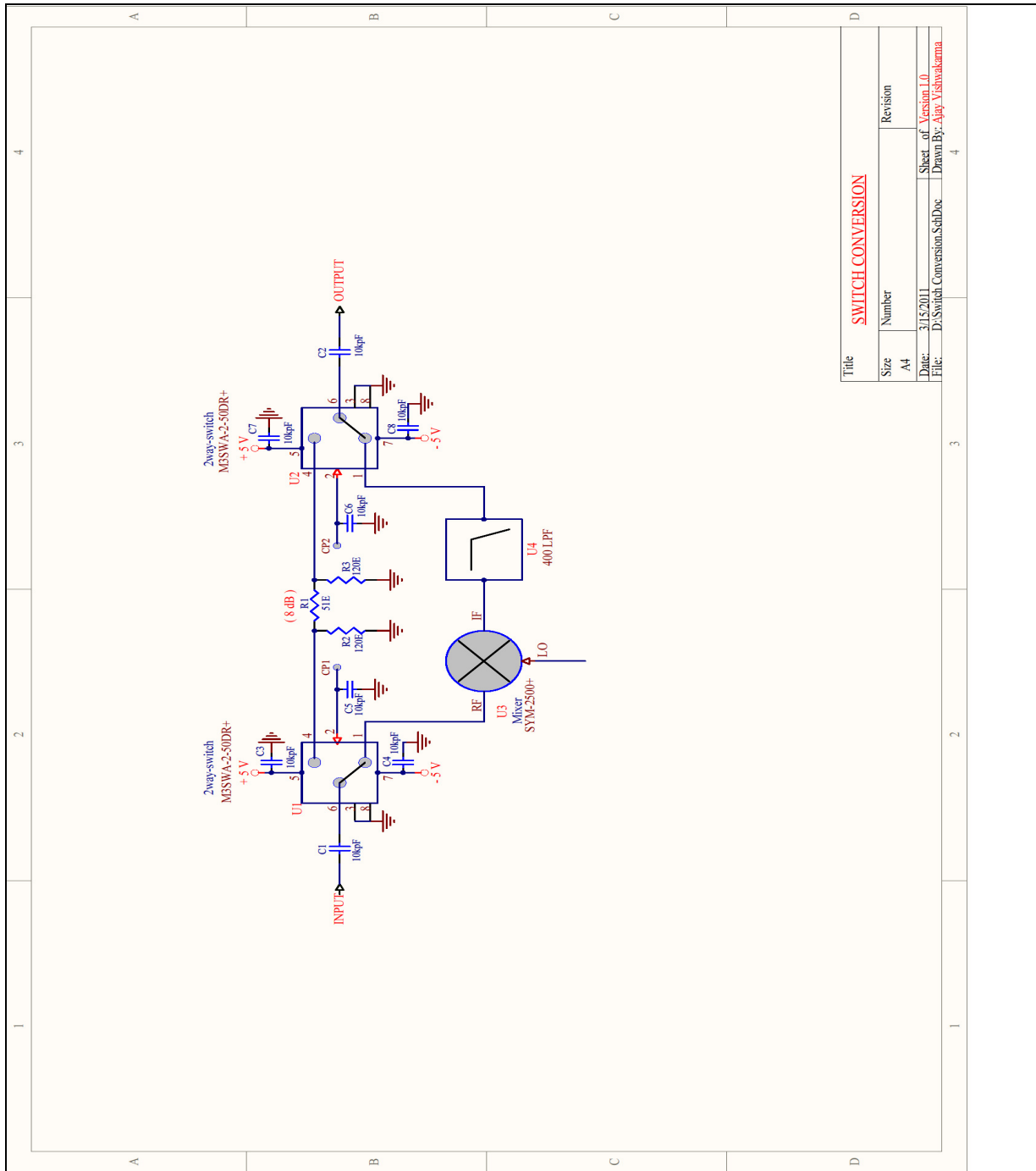


Bottom Layer of PCB

2.10.5 Bill of Material of VGA UNIT

Item	Description	Qty/Unit
01	Chassis ...90mm.... X ...70mm.....	1
02	Assembled GAB/VGA pcb	1
03	RF connector- SMA Straight panel Receptacle Jack, Flange Mount, (Huber-Suhner make) 23_SMA-50-0-3/111_NE	4
04	'D' Type Connector, 15 Pin (FeMale)	1
05	Feedthrough	4
06	Ground Tag	4
07	Screw M2.5 x ...4mm. for PCB& Conn. mounting	18
08	Screw M2.5 x 6 mm +Nut for Mounting Connector	8
09	Copper Clad	4
10	CSK Screw M2.5 x 3mm for cover	12

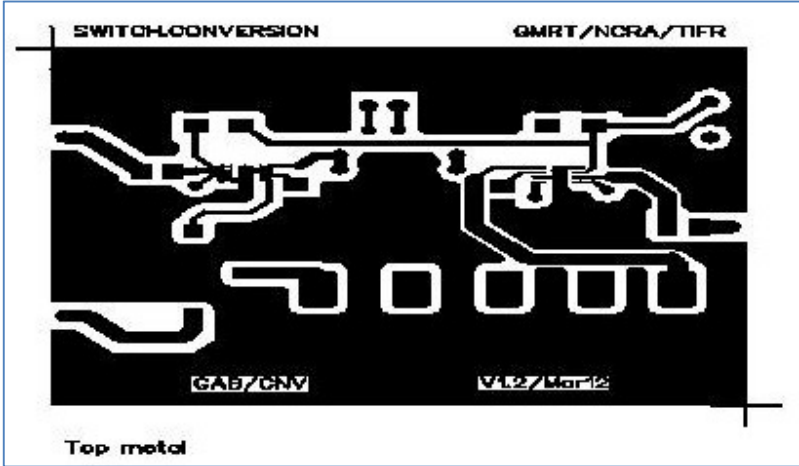
2.11 2.11.1 Schematic Drawing of CNV UNIT



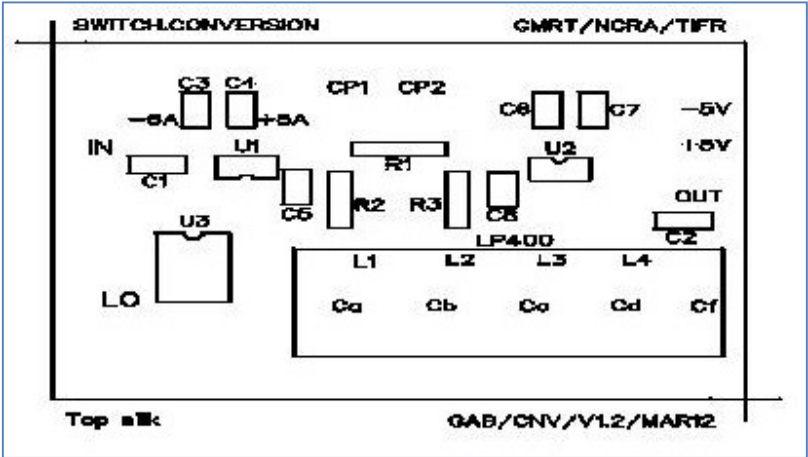
2.11.2 Bill of Material of CNV PCB

SR No.	Description	Type / Make	Designator	Value	Quantity
1	Capacitor	SMD	C1, C2, C3, C4, C5, C6, C7, C8	10kpF	8
2	Resistor	CFR	R1	51E, 1/4W	1
		CFR	R2, R3	120E, 1/4W	2
3	2 Way-switch	MCL	U1, U2	M3SWA-2-50DR	2
4	Mixer	MCL	U3	SYM-2500+	1
5	Inductor	Air core	L1, L4	35nH	2
6	Inductor	Air core	L2, L3	52nH	2
7	Trimmer		C1, C2, C3, C4, C5	2-18 pF	5

2.11.3 PCB Layouts of CNV UNIT



Top Layer of PCB

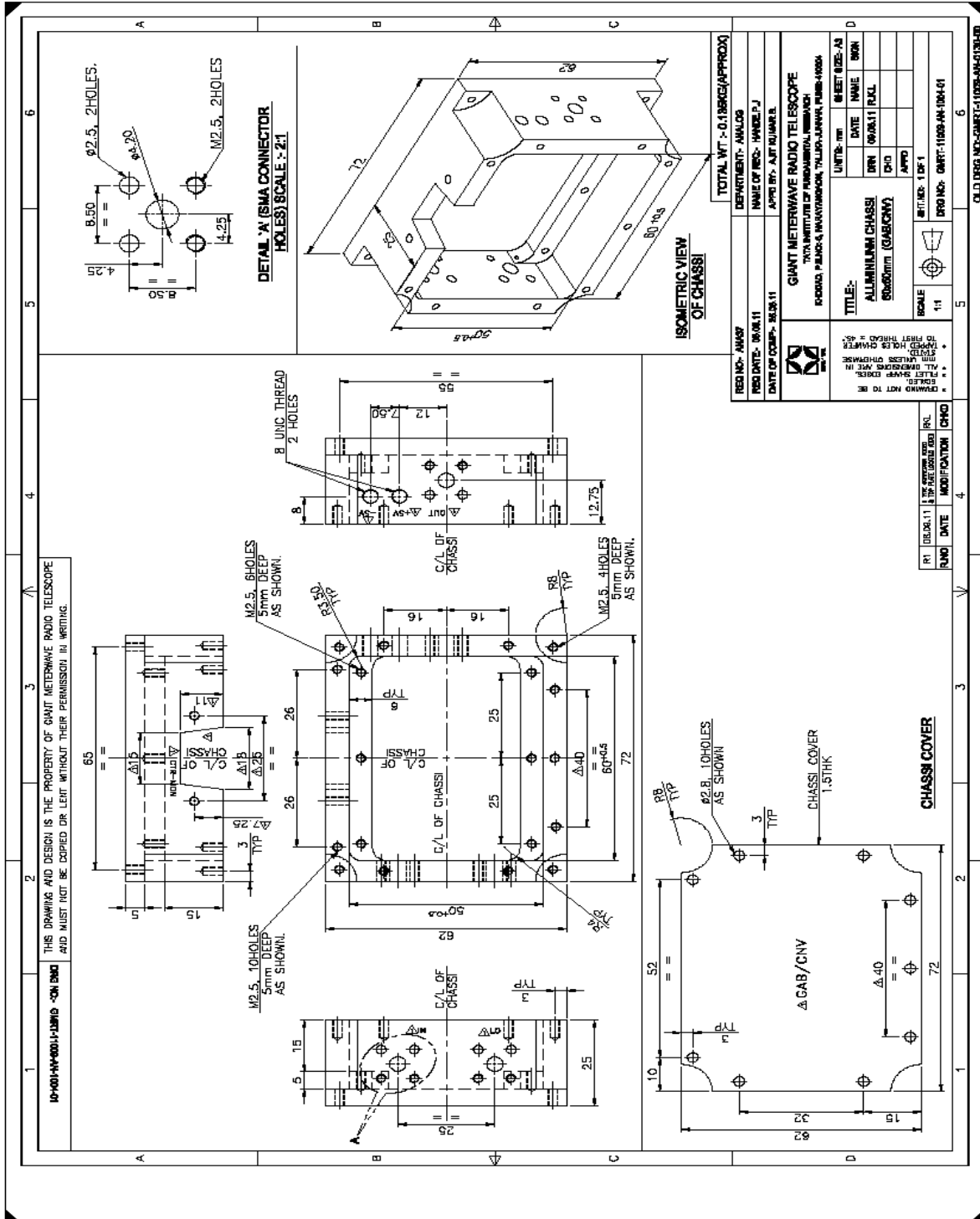


Silk Screen on Top Layer



Bottom Layer of PCB

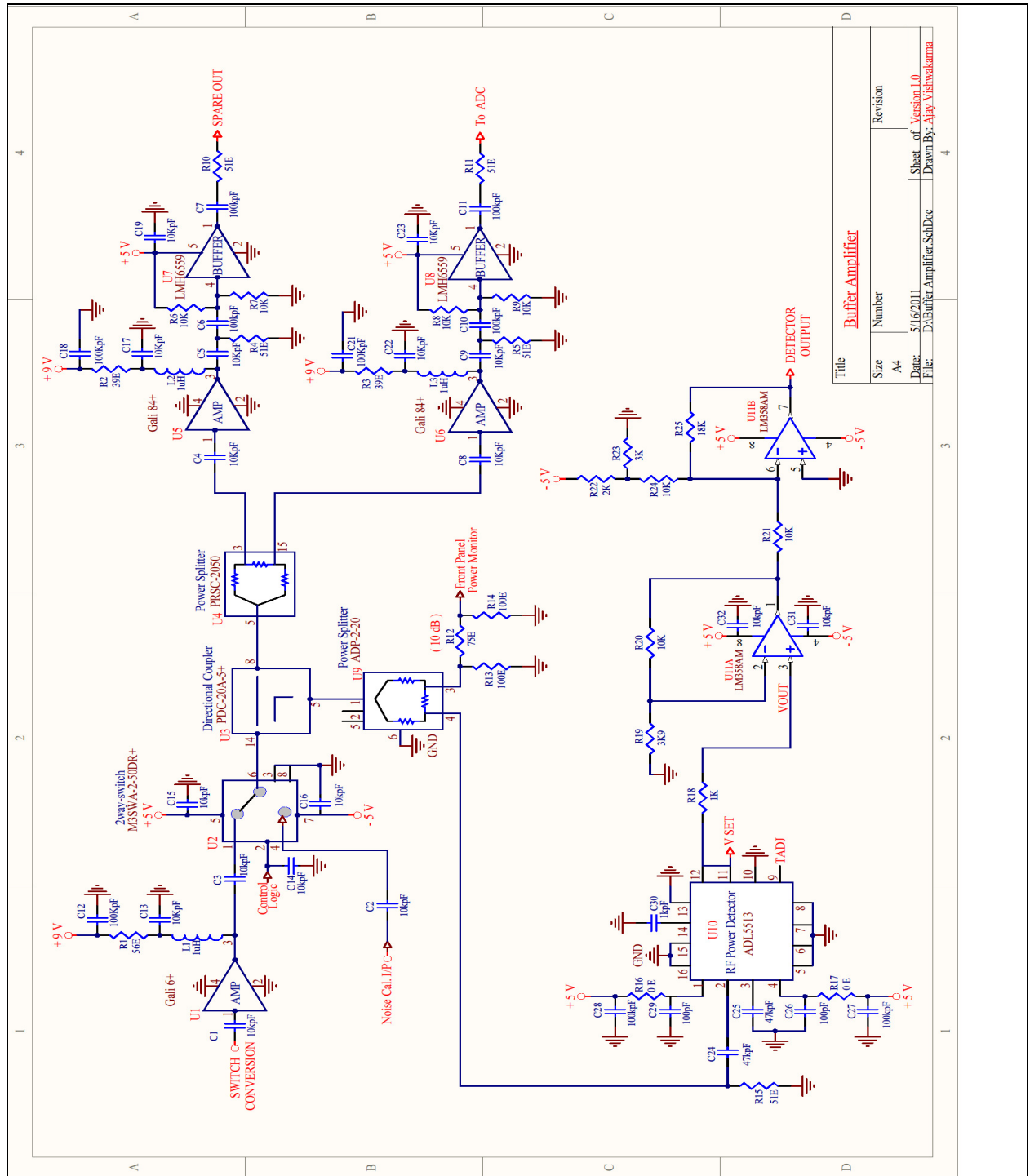
2.11.4 Chassis Drawing of CNV UNIT



2.11.5 Bill of Material of CNV UNIT:

Item	Description	Qty/Unit
01	Chassis ...60mm.... X ...50mm.....	1
02	Assembled GAB/CNV pcb	1
03	RF connector- SMA Straight panel Receptacle Jack, Flange Mount, (Huber-Suhner make) 23_SMA-50-0-3/111_NE	3
04	'D' Type Connector, 9 Pin (FeMale)	1
05	Feedthrough	2
06	Ground Tag	2
07	Screw M2.5 x 4mm.... for mounting	14
08	Screw M2.5 x 6 mm for Mounting Connector	6
09	Copper Clad	3
10	CSK Screw M2.5 x 3mm for cover	8

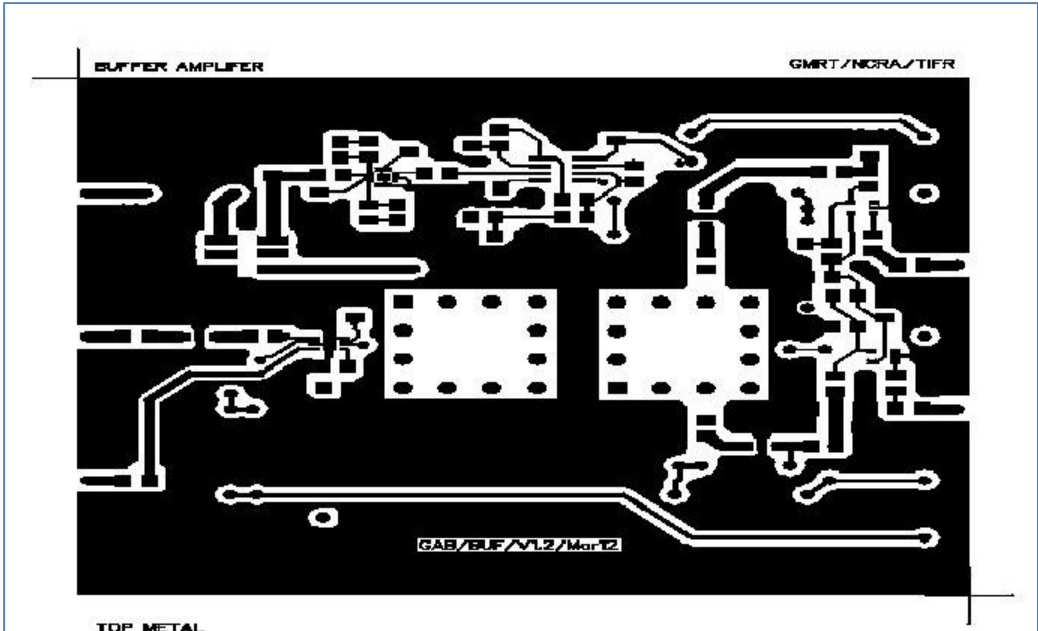
2.12 2.12.1 Schematic Drawing of BUF UNIT



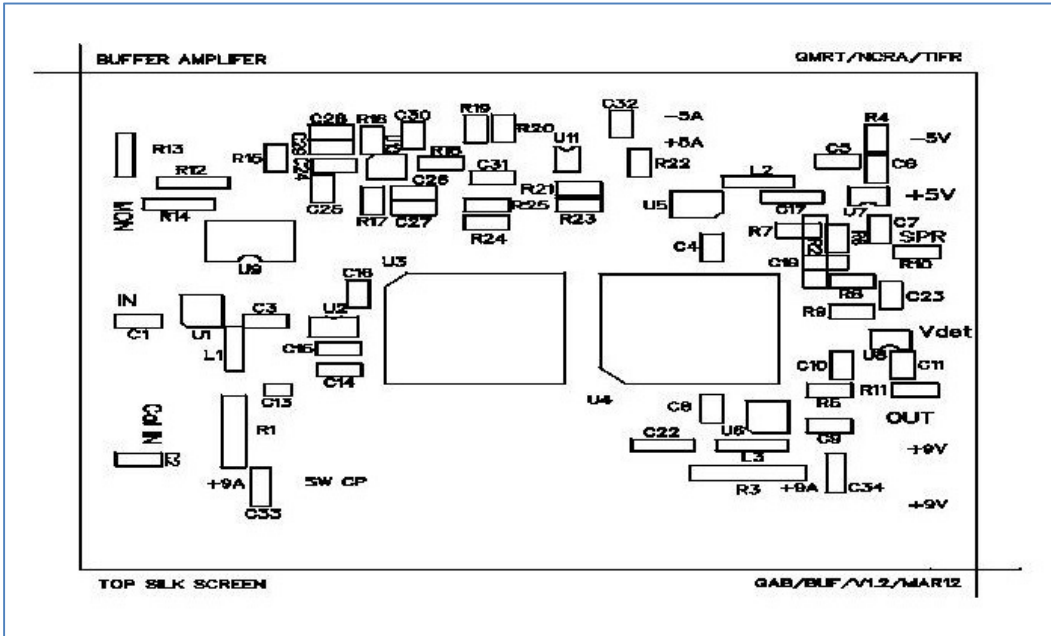
2.12.2 Bill of Material of BUF UNIT:

SR No.	Description	Type / Make	Designator	Value	Quantity
1	Capacitor	SMD	C1, C2, C3, C4, C5, C8, C9, C14,	10kpF	14
			C15, C16, C19, C23, C31, C32		
		Ceramic	C12, C13, C17, C18, C21, C22	10kpF	6
		SMD	C6, C7, C10, C11, C27, C28	100kpF	6
		SMD	C26, C29,	100pF	2
		SMD	C24, C25,	47kpF	2
		SMD	C30	1kpF	1
2	Inductor	Moulded	L1, L2, L3	1uH	3
3	Resistor	SMD	R16, R17,	0 E	2
		CFR	R2, R3,	39E, 1W	2
		SMD	R4, R5, R10, R11, R15	51E	5
		CFR	R1	56E, 1W	1
		CFR	R12	75E, 1/4W	1
		CFR	R13, R14	100E, 1/4W	2
		SMD	R22	560E	1
		SMD	R18	1K	1
		SMD	R22	2K	1
		SMD	R23	3K	1
		SMD	R19	3K9	1
		SMD	R6, R7, R8, R9, R20, R21, R24	10K	7
		SMD	R25	18K	1
3	RF Amplifier	MCL	U1	Gali 6+	1
4	2 Way-switch	MCL	U2	M3SWA-2-50DR+	1
5	Directional Coupler	MCL	U3	PDC-20A-5+	1
6	Power Splitter	MCL	U4	PRSC-2050	1
7	Power Splitter	MCL	U9	ADP-2-20+	1
8	RF Amplifier	MCL	U5, U6	Gali 84+	2
9	Buffer	Nsem	U7, U8	LMH6559	2
10	RF Power Detector	Analog Devices	U10	ADL5513	1
11	Dual OP-Amp	Nsem	U11	LM358AM	1

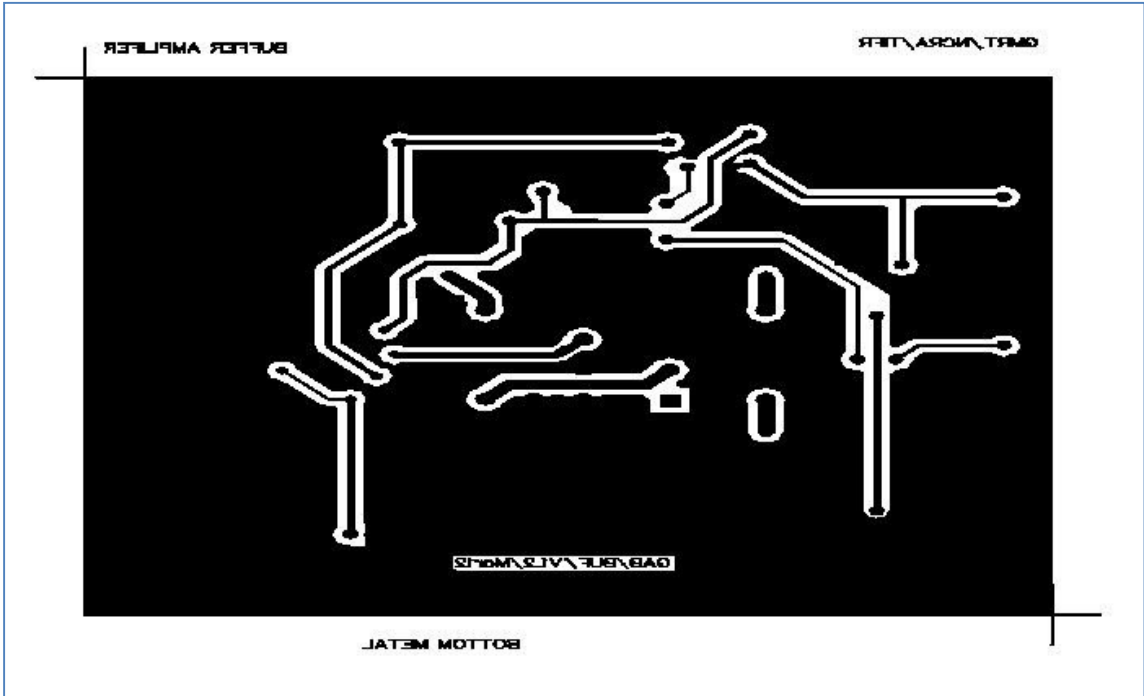
2.12.3 PCB Layouts of BUF UNIT:



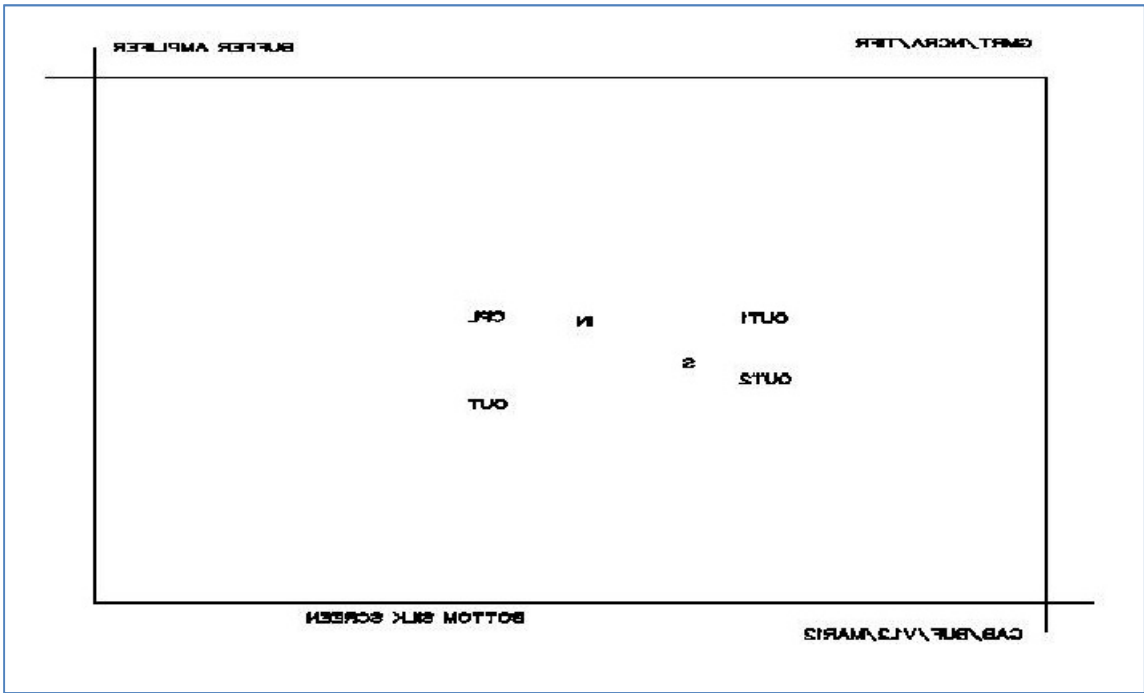
Top Layer of PCB



Silk Screen of Top Layer

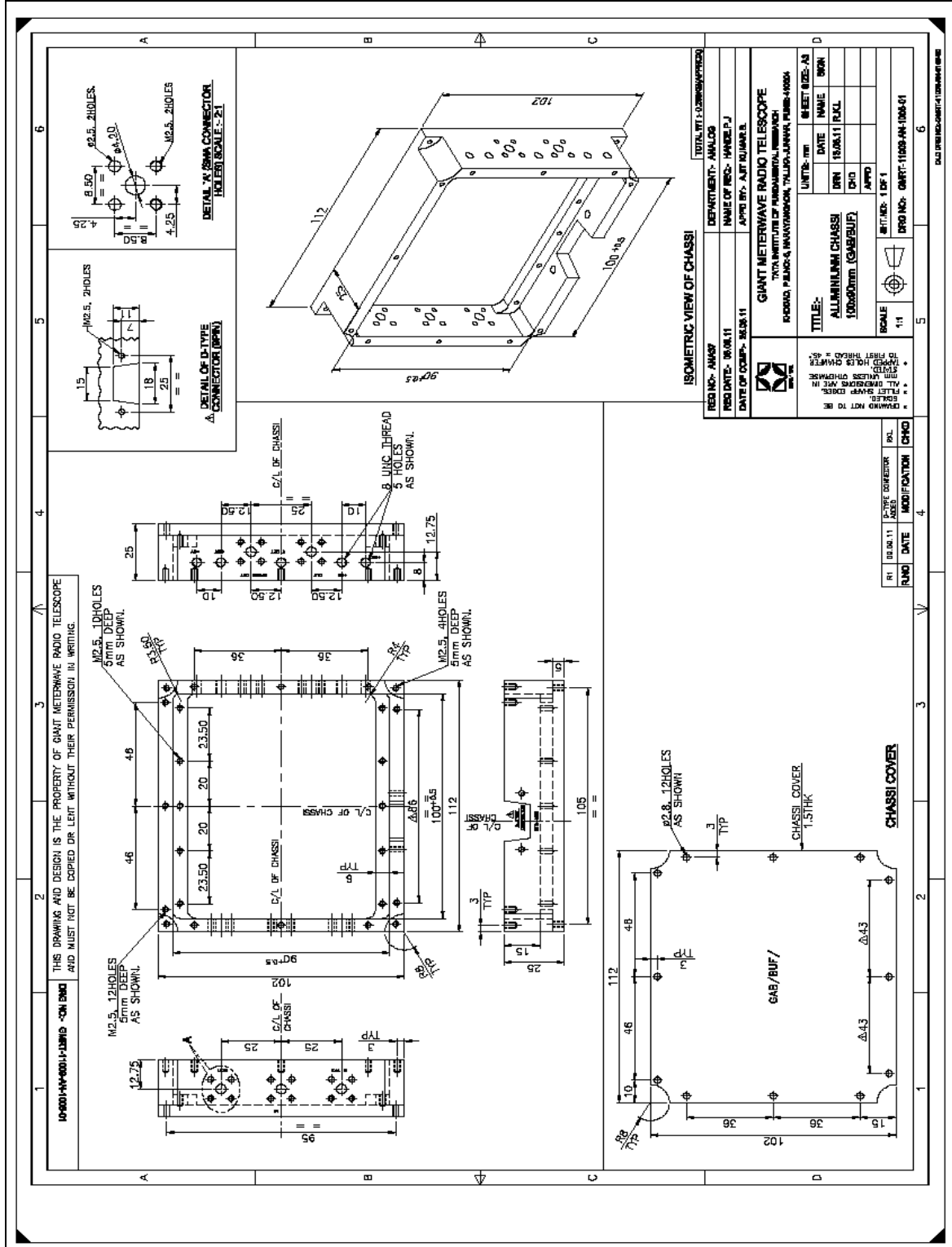


Bottom Layer of PCB



Silk Screen on Bottom Layer

2.12.4 Chassis Drawing of BUF UNIT:

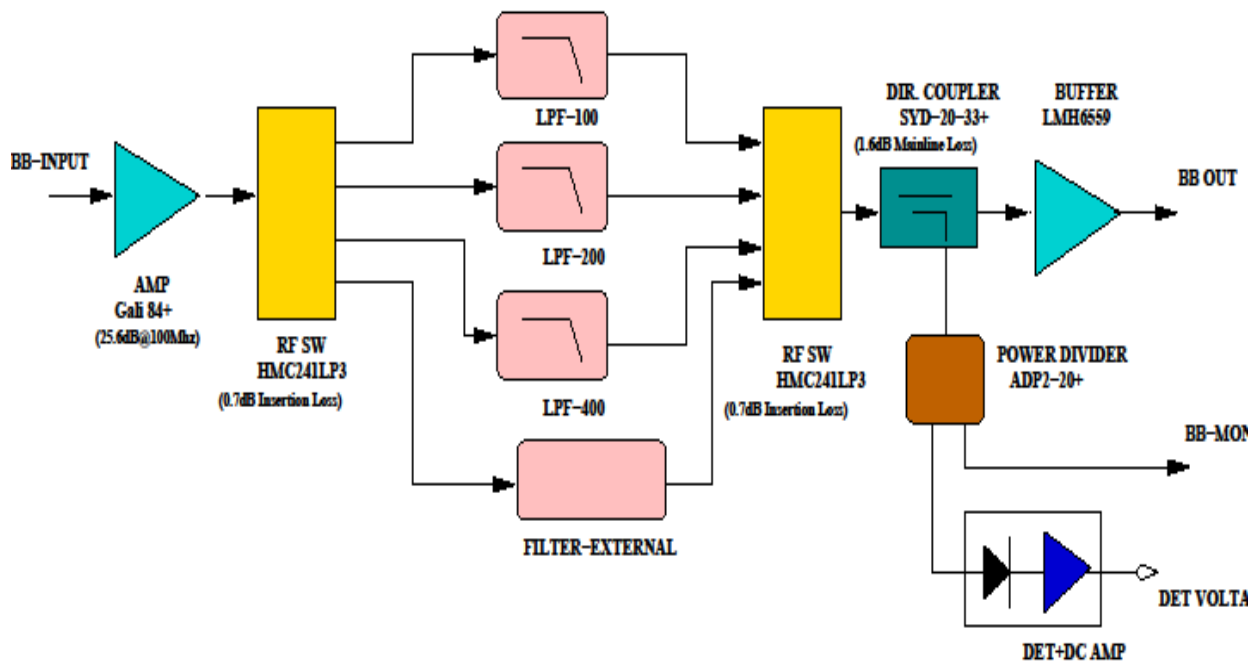


2.12.5 Bill of Material of BUF UNIT:

Item	Description	Qty/Unit
01	Chassis ...100mm.... X ...90mm.....	1
02	Assembled GAB/BUF pcb	1
03	RF connector- SMA Straight panel Receptacle Jack, Flange Mount, (Huber-Suhner make) 23_SMA-50-0-3/111_NE	5
04	'D' Type Connector,9 Pin (Male)	1
05	Feedthrough	5
06	Ground Tag	5
07	Screw M2.5 x 4mm for PCB mounting	22
08	Screw M2.5 x 6 mm for Mounting Connector	10
09	Copper Clad	5
10	CSK Screw M2.5 x 3mm for cover	12

3 BB FILTER UNIT

3.1 Block diagram of BB FILTER PIU



3.2 Description

BB filter unit is part of a GMRT Analog Backend System and is used for selecting the various low pass filters i.e. 100 MHz, 200 MHz, 400 MHz and it is also have a facility to connect external filter. Buffered output is taken out for connecting to digital backend. Also have front monitor point to check the final output.

Input signal are amplified and fed to Low pass filter bank through a 4 way RF Switch which is control through 2 control bits. Selectable output is connected to a Buffer amplifier. A coupled output is taken for Monitor purpose. All this blocks are divided into a four different RSW, BUF, LPF, DDD& PS units. Where RSW unit consist RF Amplifier followed by a RF Switch. BUF unit consist RF switch followed by Directional Coupler & a Buffer amplifier. DDD unit consist power divider & Detector IC and DC amplifier.

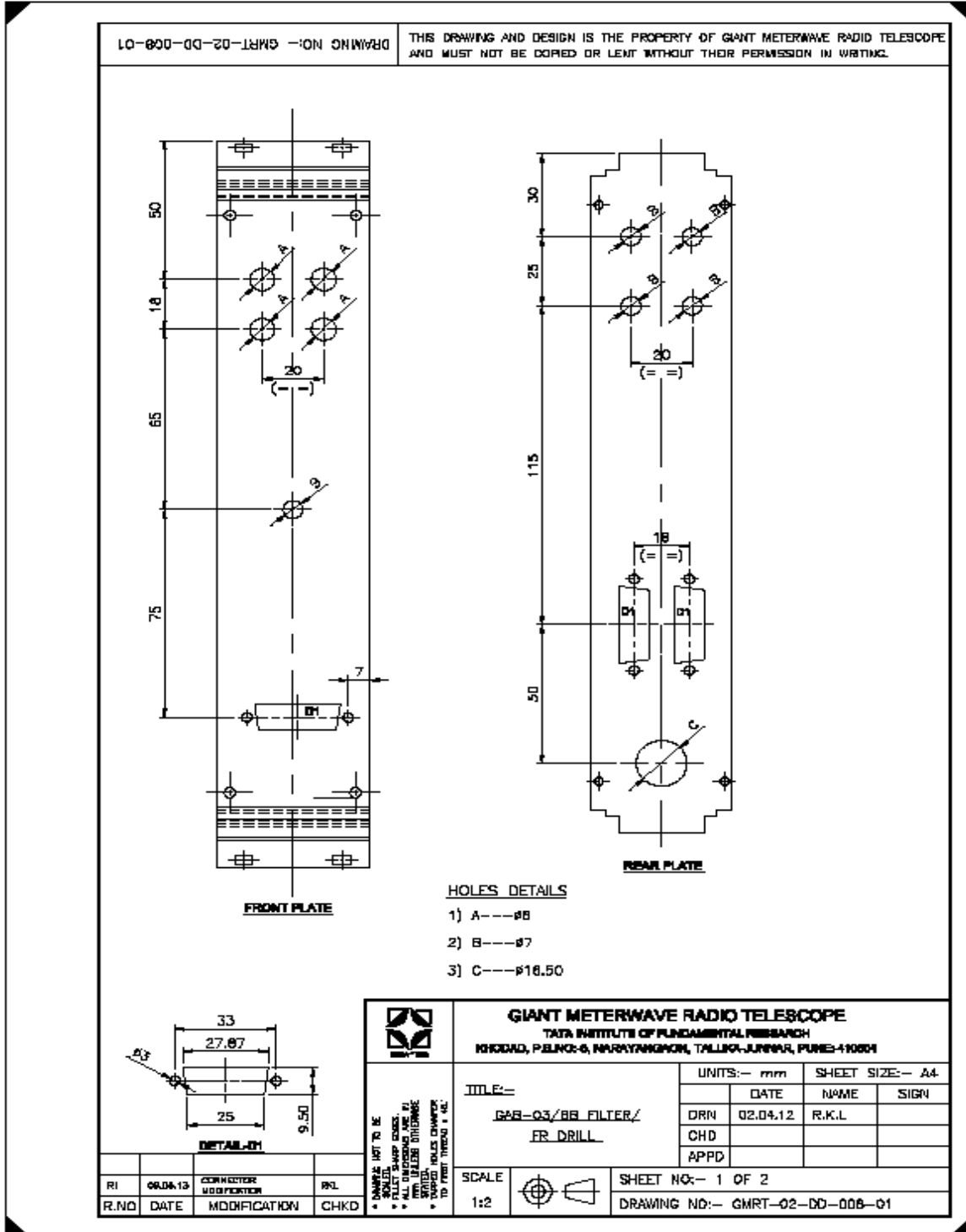
3.3 PHOTOGRAPH OF BB FILTER PIU:

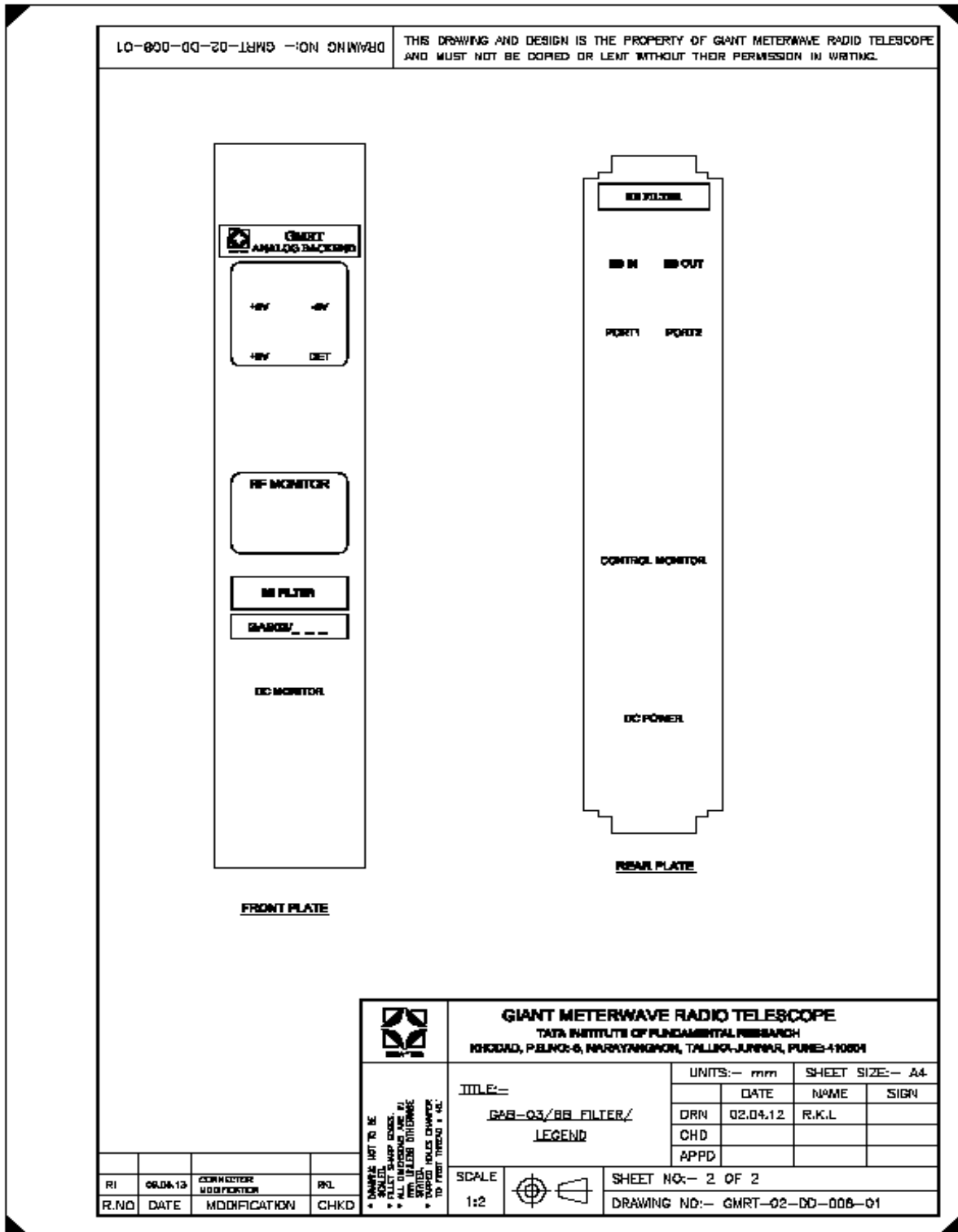


3.4 Bill material of BB FILTER PIU

Item	Description	Qty/Unit
01	10T PIU (495 mm depth)	1
02	Assembled Unit GAB/VGA_XXX	1
03	Assembled Unit GAB/CNV_XXX	1
04	Assembled Unit GAB/BUF_XXX	1
05	Assembled Unit GAB/PWR_XXX	1
06	RF connector- SMA cable plug for Sucoform cable, (Huber-Suhner make) 11_SMA-50-3-39/111_Y	12
07	RF connector- SMA Straight Bulkhead Sucoform cable, (Huber-Suhner make) 24_SMA-50-3-15/111_NE	10
08	'D' Type Connector, 15 Pin (FeMale) Front panel for Monitor	1
09	'D' Type Connector, 15 Pin (Male) Rear Panel for Control	1
10	'D' Type Connector, 15 Pin (FeMale) Rear panel for Monitor	1
11	'D' Type Connector, 15 Pin (Male) For VGA Unit	1
12	'D' Type Connector, 9 Pin (Male) For CNV & BUF Unit	2
13	DC power Connector 5 Pin (female)	1
14	5 mm LED Holder	4
15	5 mm Round LED	4
16	Screw M2.5 x 6mm for Unit mounting	12
17	Screw M2.5 x 12 mm for power PCB Mounting	8
18	Spacers 5MM	4
19	Hex. Screws for 'D' Conn. Mounting M2.5 x 6mm with Nut	6
20	Sucoform Cable	3.5Mtr

3.5 Front & Rear plate Details of BB FILTER PIU:





3.6 Details of RF cable used in BB FILTER PIU:

Sr. No	Connector	Cable detail	Length	Identification Mark
1	SMA (BH) - SMA (M)	BB IN (RP) - IN (RSW)	27 CM	B1
2	SMA (M) - SMA (M)	RF1 (RSW) - IN (100LPF)	15 CM	B2
3	SMA (M) - SMA (M)	RF2 (RSW) - IN (200LPF)	15 CM	B3
4	SMA (M) - SMA (M)	RF3 (RSW) - IN (400LPF)	15 CM	B4
5	SMA (M) - SMA (M)	OUT (100LPF) - RF3 (BFR)	14 CM	B5
6	SMA (M) - SMA (M)	OUT (200LPF) - RF2 (BFR)	14 CM	B6
7	SMA (M) - SMA (M)	OUT (400LPF) - RF1 (BFR)	15 CM	B7
8	SMA (M) - SMA (M)	CPLD (BFR) – IN(DDD)	15 CM	B8
9	SMA (BH) - SMA (M)	BB OUT (RP) - OUT (BFR)	55 CM	B9
10	SMA (BH) - SMA (M)	PORT1(RP) - RF4 (RSW)		B10
11	SMA (BH) - SMA (M)	MON (FP) - MON (DDD)	16 CM	B11
12	SMA (BH) - SMA (M)	PORT2 (RP) - RF4 (BFR)		B12

3.7 Details of Internal wiring in BB FILTER PIU

- Control connection on Rear Panel

# 15 'D' Type (Male) Connector	Other connection
1	'con A' of RSW & BFR Unit
9	'con B' of RSW & BFR Unit
15	Gnd

- Monitor connection on Rear Panel

# 15 'D' Type (FeMale) Connector	Other connection
1	#1 of Control connector
2	# 9 of Control Connector
3	Det. Voltage of DDD Unit
4	Temp. Monitor Point
5	Power Monitor point
15	Gnd

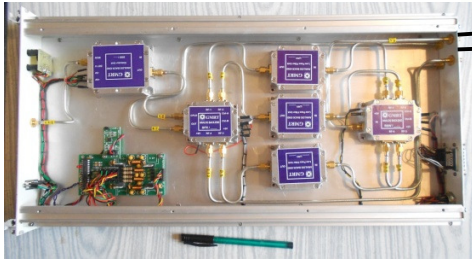
- Monitor connection on Front Panel

# 15 'D' Type (FeMale) Connector	Other connection
1	#1 of Monitor Connector
2	# 2 of Monitor Connector
3	# 3 of Monitor Connector
4	# 4 of Monitor Connector
5	# 5 of Monitor Connector
6	+9 V of power card (Connected to RSW unit)
7	+9V of power card (Connected to BFR unit)
8	+5 V of power card
9	-5 V of power card
15	Gnd.

- Input DC Power Connector Details :

#5 Relimate connector	#5 DC Power Connector(Male)
1	3
2	2
3	2
4	4
5	5

3.8 Test Setup for BB FILTER



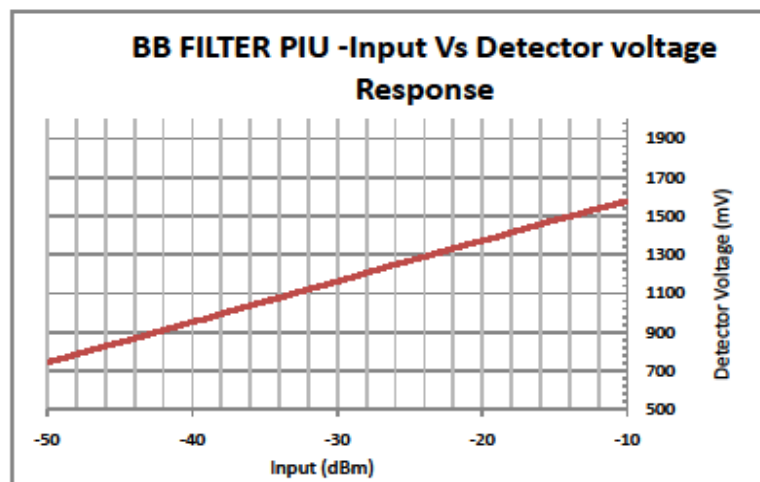
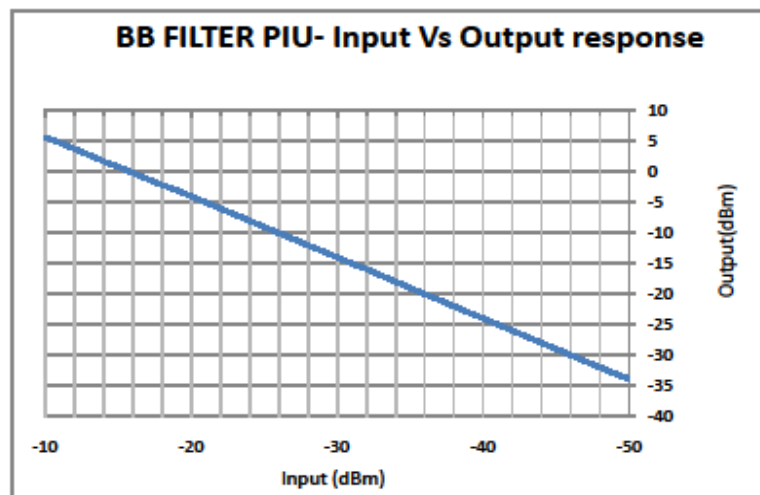
DUT

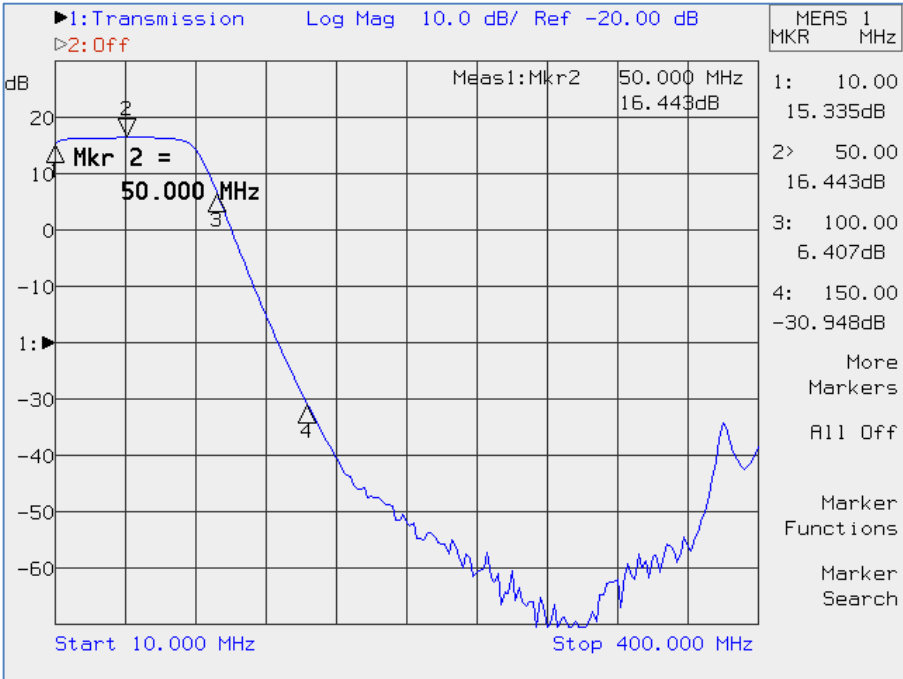


PIU:

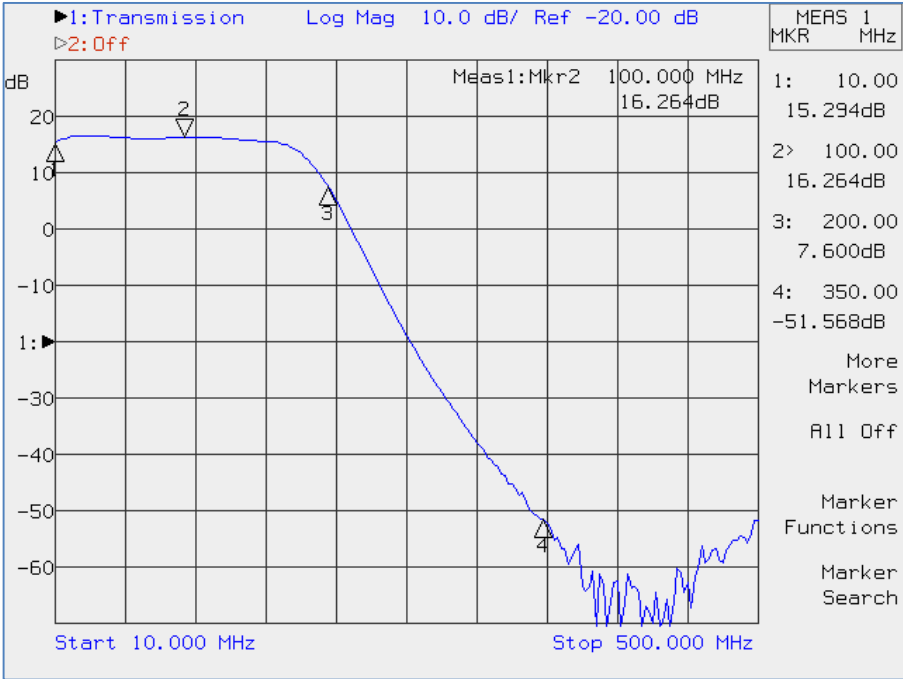


3.9 Test results for BB FILTER PIU

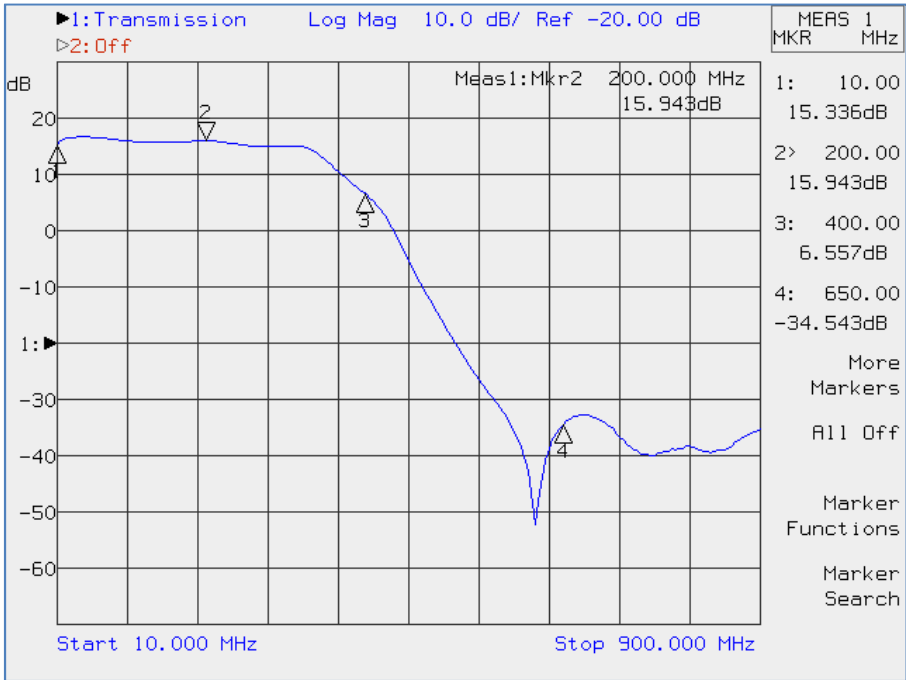




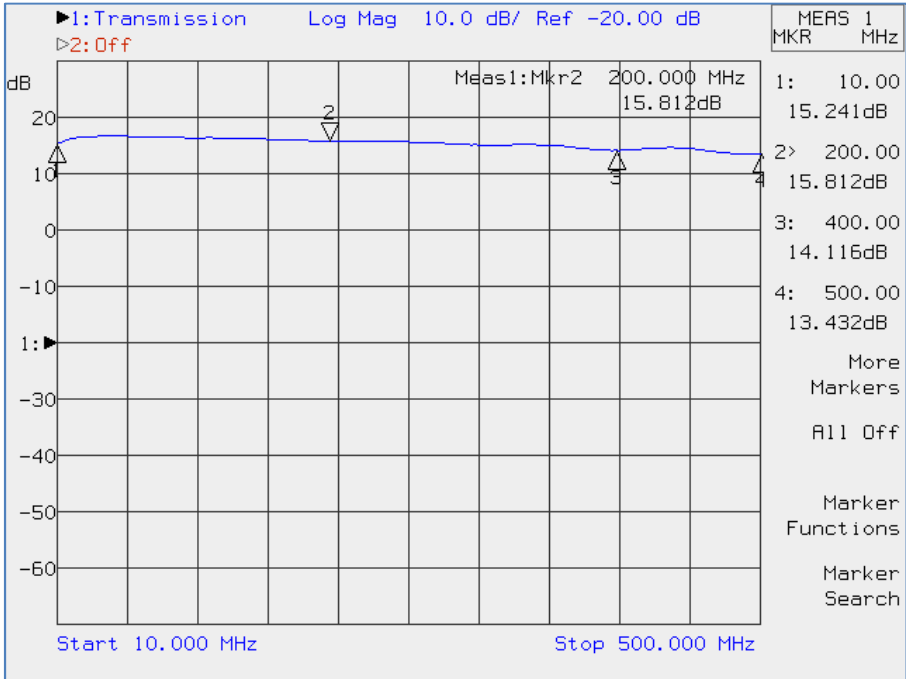
BB IN to BB OUT Frequency response @ 100Mhz Low Pass Filter Selection(Input:-30dBm)



BB IN to BB OUT Frequency response @ 200Mhz Low Pass Filter Selection

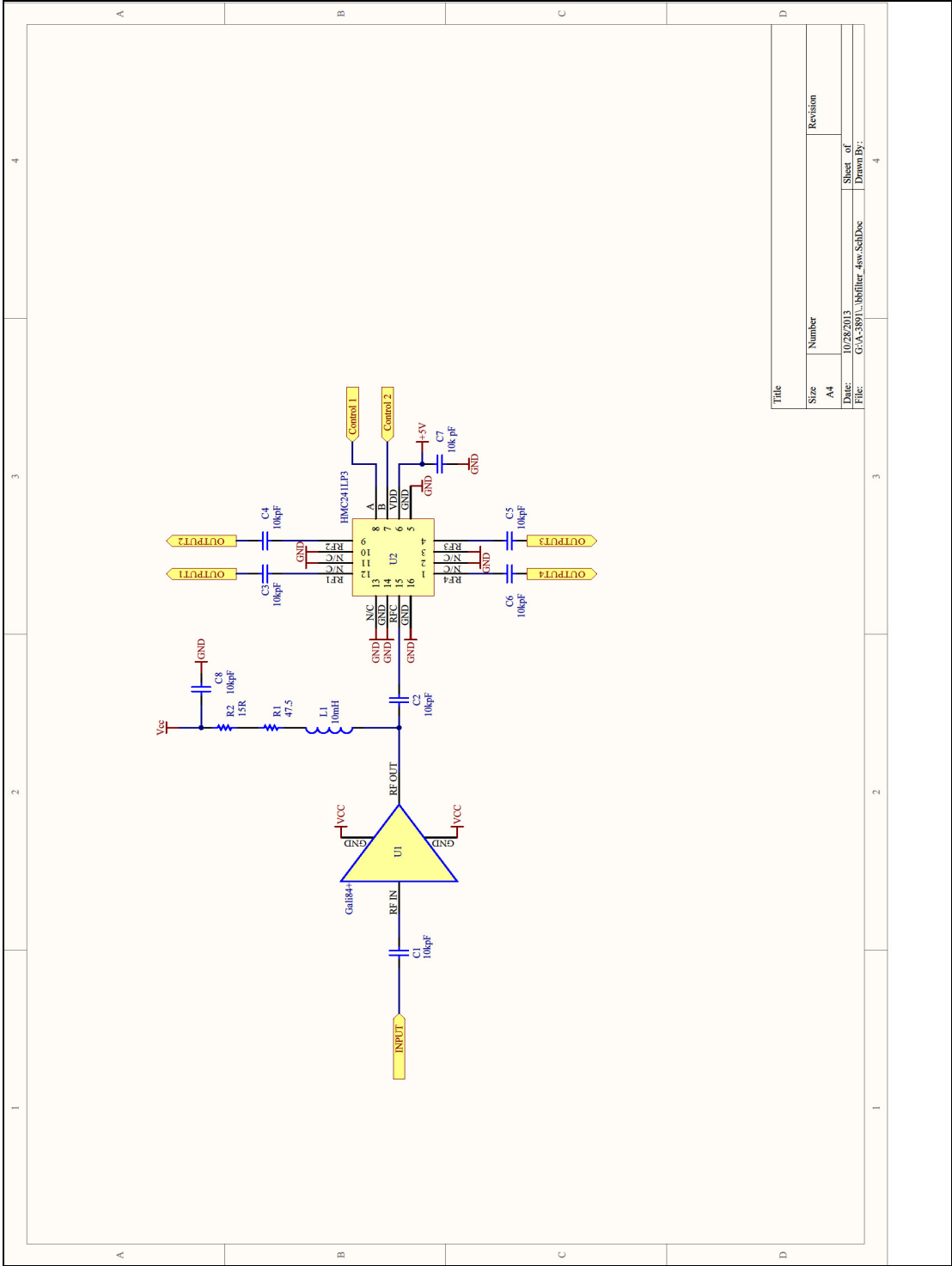


BB IN to BB OUT Frequency response @ 400Mhz Low Pass Filter Selection



BB IN to BB OUT Frequency response @ Direct Path selection

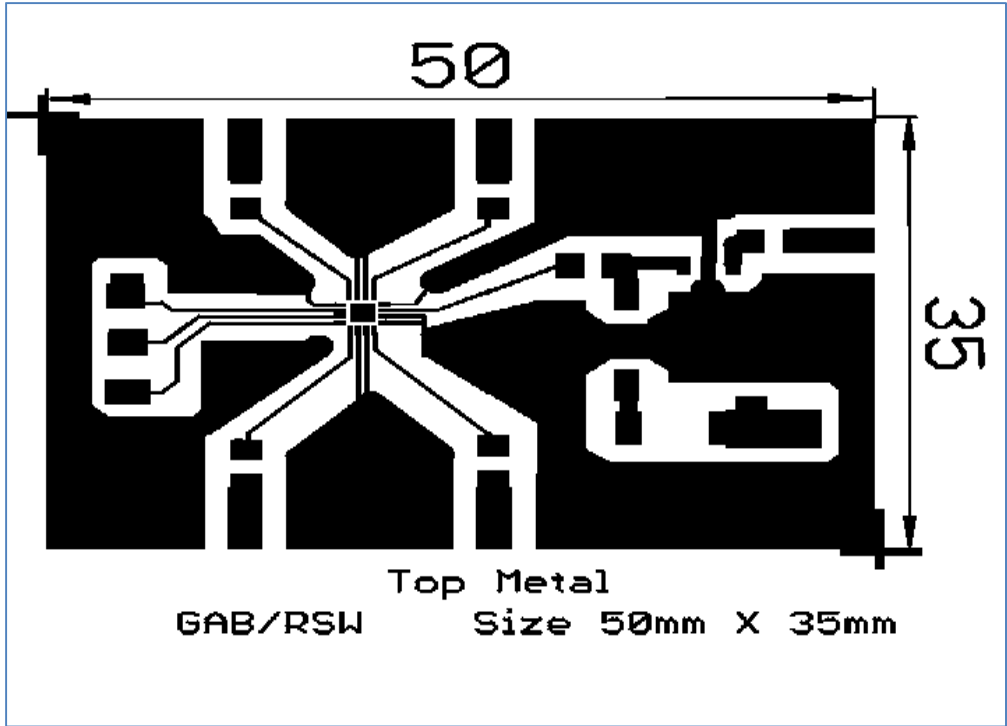
3.10 3.10.1 schematic diagram of RSW unit



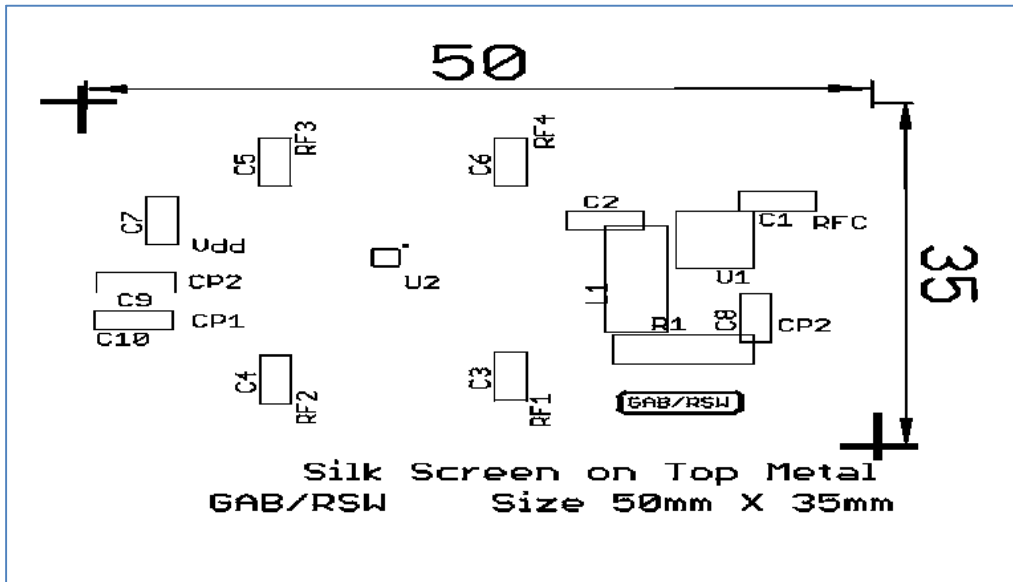
3.10.2 Bill of Material of RSW PCB

SR No.	Description	Type / Make	Designator	Value	Quantity
1	Capacitor	SMD	C1, C2, C3,C4,C5,C6,C7	100pF	7
		SMD	C8	10KpF	1
2	Resistor	CFR	R1	68R	1
3	Inductor		L1	10mH	1
4	Amplifier	Mini-Circuit	U1	Gali84+	1
5	4Way RF Switch	Hittite	U2	HMC241LP3	1

3.10.3 PCB Layouts of RSW UNIT



Top Layer of PCB

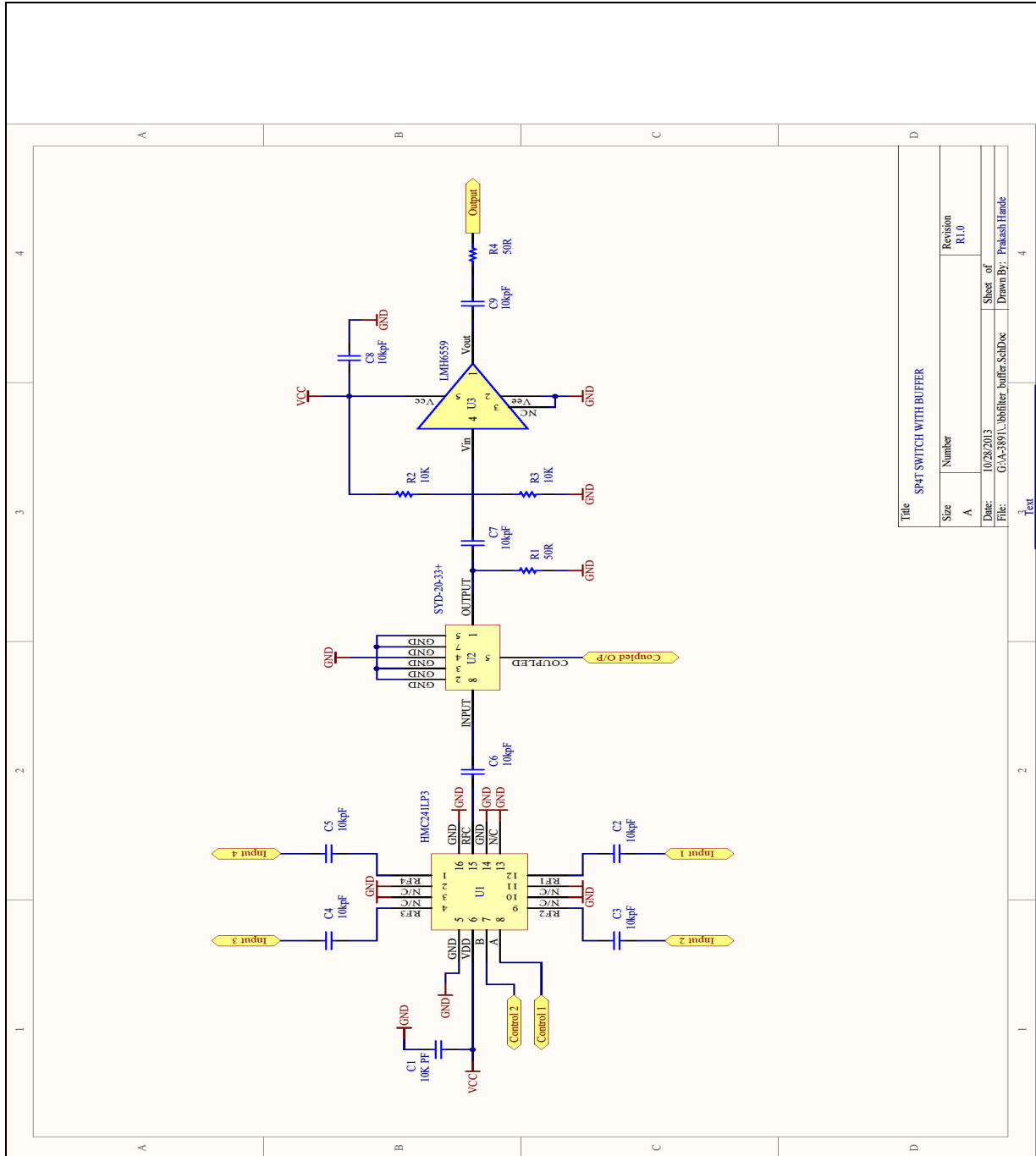


Silk Screen on Top Layer

3.10.5 Bill of Material of RSW UNIT

Item	Description	Qty/Unit
01	Chassis ...50mm.... X ...35mm.....	1
02	Assembled GAB/RSW pcb	1
03	RF connector- SMA Straight panel Receptacle Jack, Flange Mount, (Huber-Suhner make) 23_SMA-50-0-3/111_NE	5
04	Feed Through	4
05	Ground Tag	2
06	Screw M2.5 x for PCB mounting	6
07	Screw M2.5 x 6 mm for Mounting Connector	20

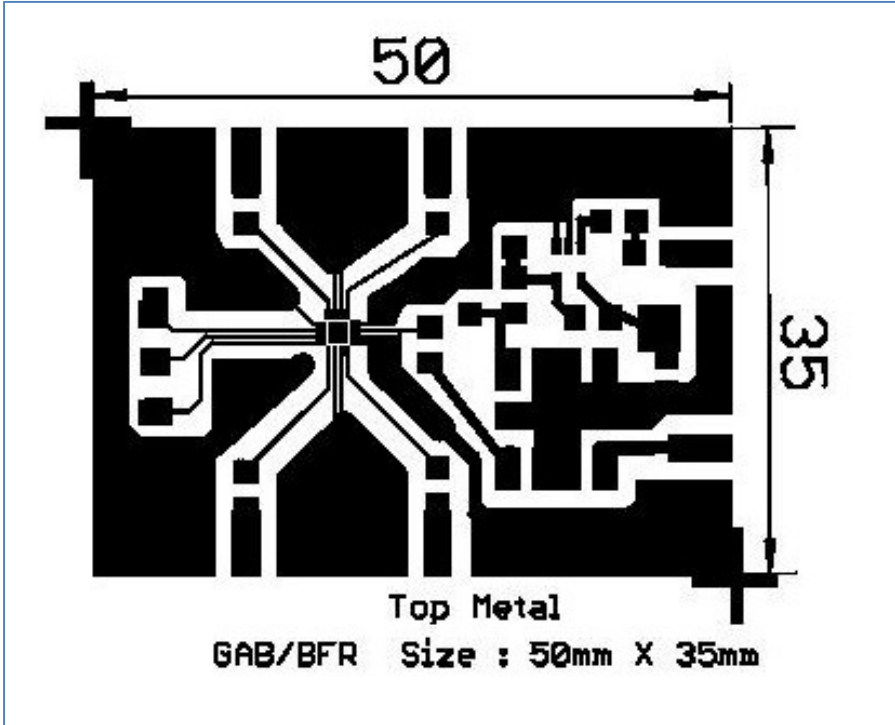
3.11 3.11.1 schematic diagram of BFR unit



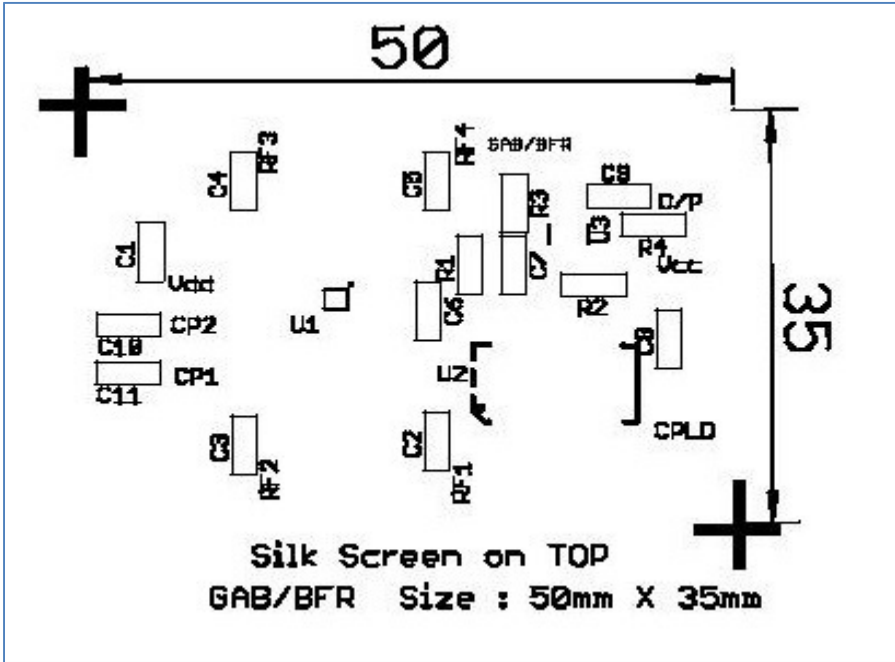
3.11.2 Bill of Material of BFR PCB

SR No.	Description	Type / Make	Designator	Value	Quantity
1	Capacitor	SMD	C1, C2, C3,C4,C5,C6	100pF	6
		SMD	C7,C8	10KpF	2
2	Resistor	SMD	R2,R3	10K	2
		SMD	R1,R4	50R	2
3	4Way RF Switch	Hittite	U1	HMC241LP3	1
4	Directional Coupler	Mini-Circuit	U2	SYD-20-33+	1
5	Buffer Amplifier	Texas	U3	LMH6559	1

3.11.3 PCB Layouts of BFR UNIT



Top Layer of PCB



Silk Screen on Top Layer

3.11.5 Bill of Material of BFR UNIT:

Item	Description	Qty/Unit
01	Chassis ...50mm.... X ...35mm.....	1
02	Assembled GAB/BFR pcb	1
03	RF connector- SMA Straight panel Receptacle Jack, Flange Mount, (Huber-Suhner make) 23_SMA-50-0-3/111_NE	6
04	Feed Through	4
05	Ground Tag	2
06	Screw M2.5 x for PCB mounting	6
07	Screw M2.5 x 6 mm for Mounting Connector	24

3.12 3.12.1 Schematic diagram of 100 MHz LPF unit

1	2	3	4																				
A	B	C	D																				
<table border="1" style="margin: auto;"> <thead> <tr> <th>Inductor</th> <th>Value</th> <th>No. of Turns</th> <th>Dia</th> </tr> </thead> <tbody> <tr> <td>L1</td> <td>144nH</td> <td>4</td> <td>6mm</td> </tr> <tr> <td>L2</td> <td>175nH</td> <td>5</td> <td>6mm</td> </tr> <tr> <td>L3</td> <td>175nH</td> <td>5</td> <td>6mm</td> </tr> <tr> <td>L4</td> <td>144nH</td> <td>4</td> <td>6mm</td> </tr> </tbody> </table>				Inductor	Value	No. of Turns	Dia	L1	144nH	4	6mm	L2	175nH	5	6mm	L3	175nH	5	6mm	L4	144nH	4	6mm
Inductor	Value	No. of Turns	Dia																				
L1	144nH	4	6mm																				
L2	175nH	5	6mm																				
L3	175nH	5	6mm																				
L4	144nH	4	6mm																				
<p>Specifications</p> <p>Cutoff freq = 100 MHz Impedance = 50 ohm freq. response ripple max = 0.3 dB Attenuation at cutoff = 10 dB SWR max = 1.5 Stopband attenuation min = 40 dB</p>																							
<p>C5 = 68pF C3 = C7 = 47pF C1 = C2 = C4 = C6 = C8 = 2 - 22pF</p>																							
<table border="1" style="margin: auto;"> <tr> <td colspan="2">Title</td> <td colspan="2">100MHz LPF (9th order Chebyshev)</td> </tr> <tr> <td>Size</td> <td>Number</td> <td colspan="2">Revision</td> </tr> <tr> <td>A4</td> <td></td> <td colspan="2"></td> </tr> <tr> <td>Date:</td> <td>4/8/2013</td> <td>Sheet of</td> <td></td> </tr> <tr> <td>File:</td> <td>C:\Users\...100MHz\SchDoc</td> <td>Drawn By:</td> <td>Abhijeet Dherde</td> </tr> </table>				Title		100MHz LPF (9th order Chebyshev)		Size	Number	Revision		A4				Date:	4/8/2013	Sheet of		File:	C:\Users\...100MHz\SchDoc	Drawn By:	Abhijeet Dherde
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A4																							
Date:	4/8/2013	Sheet of																					
File:	C:\Users\...100MHz\SchDoc	Drawn By:	Abhijeet Dherde																				
1	2	3	4																				
A	B	C	D																				

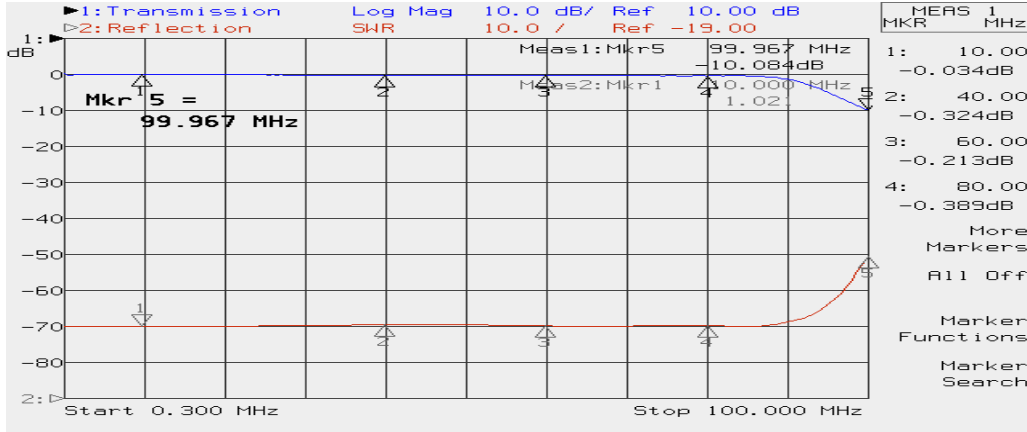
3.12.2 Schematic diagram of 200 MHz LPF unit

A	B	C	D																				
1	2	3	4																				
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Inductor	Value	No. of Turns	Dia																				
L1	75nH	4	4mm																				
L2	90nH	5	4mm																				
L3	90nH	5	4mm																				
L4	75nH	4	4mm																				
<p>Specifications</p> <p>Cutoff freq = 200 MHz Impedance = 50 ohm freq. response ripple max = 0.2 dB Attenuation at cutoff = 10 dB SWR max = 1.4 Stopband attenuation min = 50 dB</p>																							
<p>C5 = 33pF C3 = C7 = 22pF C1 = C2 = C4 = C6 = C8 = 2.2pF</p>																							
<table border="1" style="margin: auto;"> <tr> <td colspan="2">Title</td> <td colspan="2">200MHz LPF (9th order Chebyshev)</td> </tr> <tr> <td>Size</td> <td>Number</td> <td colspan="2">Revision</td> </tr> <tr> <td>A4</td> <td></td> <td colspan="2"></td> </tr> <tr> <td>Date:</td> <td>1/13/2013</td> <td colspan="2">Sheet of</td> </tr> <tr> <td>File:</td> <td>C:\Users\...200MHz LPF SchDoc</td> <td colspan="2">Drawn By: Abhijeet Dhende</td> </tr> </table>				Title		200MHz LPF (9th order Chebyshev)		Size	Number	Revision		A4				Date:	1/13/2013	Sheet of		File:	C:\Users\...200MHz LPF SchDoc	Drawn By: Abhijeet Dhende	
Title		200MHz LPF (9th order Chebyshev)																					
Size	Number	Revision																					
A4																							
Date:	1/13/2013	Sheet of																					
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A	B	C	D																				
1	2	3	4																				

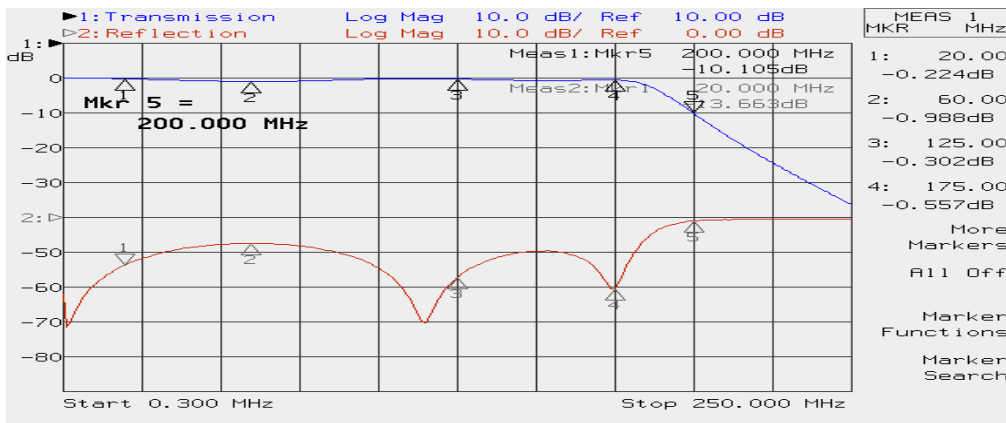
3.12.3 Schematic diagram of 400 MHz LPF unit

A	B	C	D																				
1	2	3	4																				
<table border="1" style="margin: auto;"> <thead> <tr> <th>Inductor</th> <th>Value</th> <th>No. of Turns</th> <th>Dia</th> </tr> </thead> <tbody> <tr> <td>L1</td> <td>35nH</td> <td>1</td> <td>3.15mm</td> </tr> <tr> <td>L2</td> <td>52nH</td> <td>2</td> <td>4mm</td> </tr> <tr> <td>L3</td> <td>52nH</td> <td>2</td> <td>4mm</td> </tr> <tr> <td>L4</td> <td>35nH</td> <td>1</td> <td>3.15mm</td> </tr> </tbody> </table>				Inductor	Value	No. of Turns	Dia	L1	35nH	1	3.15mm	L2	52nH	2	4mm	L3	52nH	2	4mm	L4	35nH	1	3.15mm
Inductor	Value	No. of Turns	Dia																				
L1	35nH	1	3.15mm																				
L2	52nH	2	4mm																				
L3	52nH	2	4mm																				
L4	35nH	1	3.15mm																				
<p>Specifications</p> <p>Cutoff freq = 400 MHz Impedance = 50 ohm freq. response ripple max = 0.35 dB Attenuation at cutoff = 10 dB SWR max = 1.4 Stopband attenuation min = 50 dB</p>																							
<p>$C1 = C2 = C3 = C4 = C5 = 2 - 22pF$</p>																							
<table border="1" style="margin: auto;"> <tr> <td colspan="2">Title</td> <td colspan="2">400MHz LPF (9th order Chebyshev)</td> </tr> <tr> <td>Size</td> <td>Number</td> <td colspan="2">Revision</td> </tr> <tr> <td>A4</td> <td></td> <td colspan="2"></td> </tr> <tr> <td>Date:</td> <td>11/13/2013</td> <td>Sheet of</td> <td></td> </tr> <tr> <td>File:</td> <td>C:\Users\...400MHz LPF.SchDoc</td> <td>Drawn By:</td> <td>Abhijeet Dhende</td> </tr> </table>				Title		400MHz LPF (9th order Chebyshev)		Size	Number	Revision		A4				Date:	11/13/2013	Sheet of		File:	C:\Users\...400MHz LPF.SchDoc	Drawn By:	Abhijeet Dhende
Title		400MHz LPF (9th order Chebyshev)																					
Size	Number	Revision																					
A4																							
Date:	11/13/2013	Sheet of																					
File:	C:\Users\...400MHz LPF.SchDoc	Drawn By:	Abhijeet Dhende																				
A	B	C	D																				
1	2	3	4																				

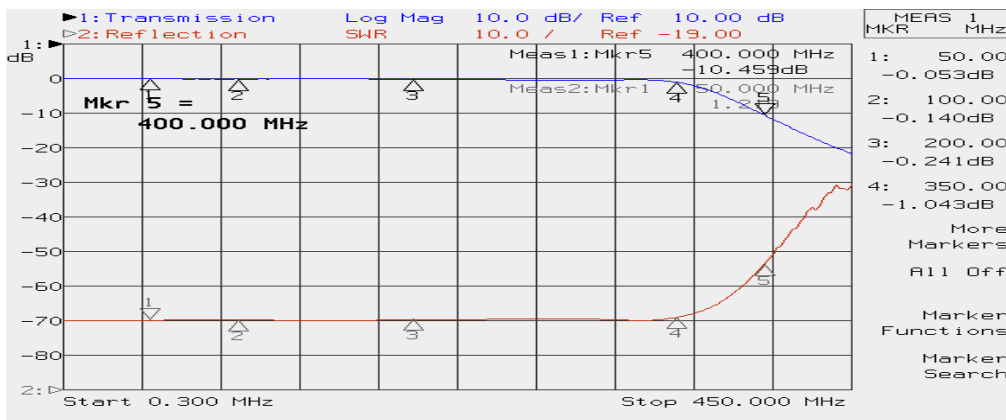
3.12.5 PERFORMANCE PLOTS OF LPF UNITS



100 Mhz Low Pass Filter

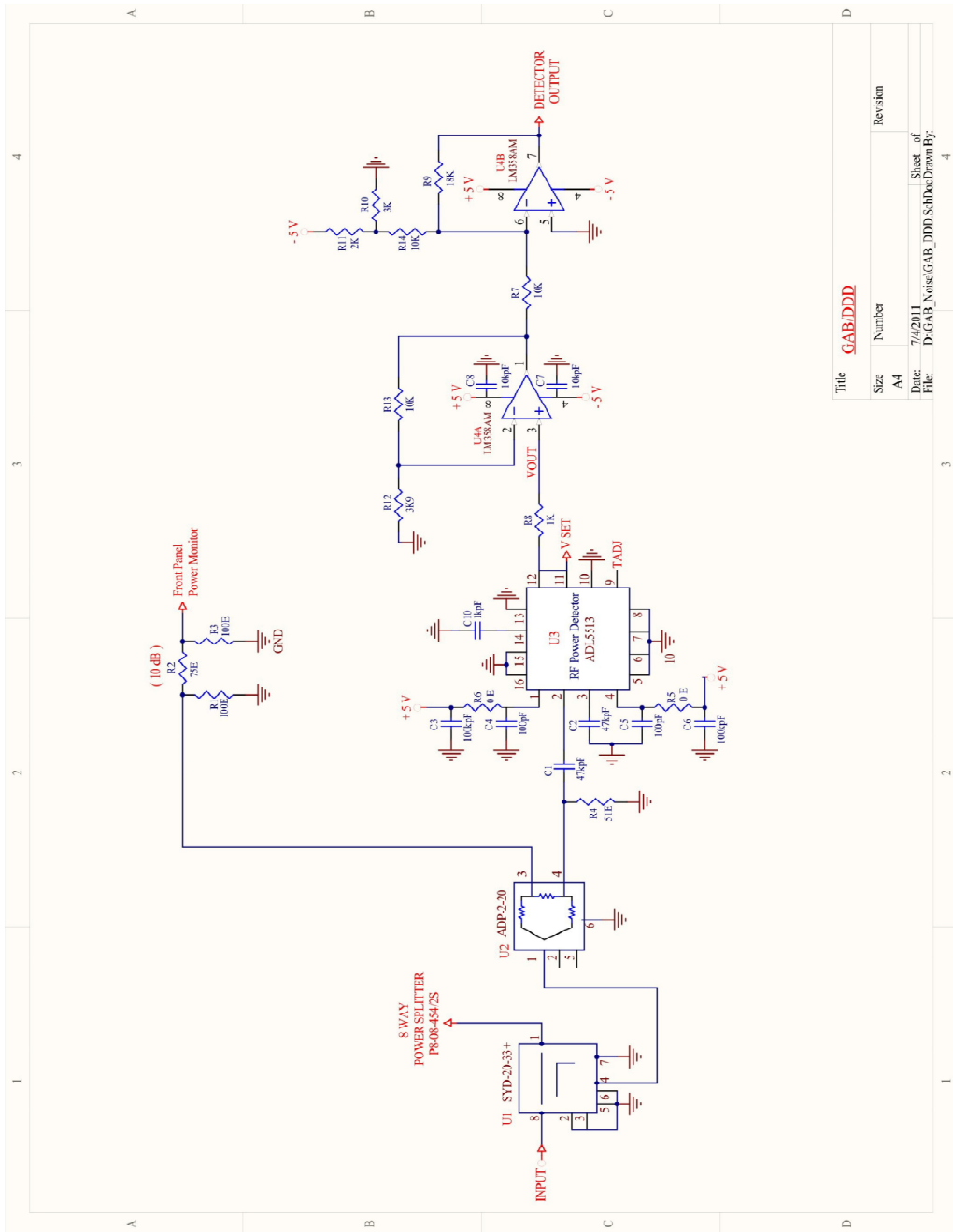


200 Mhz Low Pass Filter



400 Mhz Low Pass Filter

3.13 3.13.1 Schematic Diagram of DDD UNIT



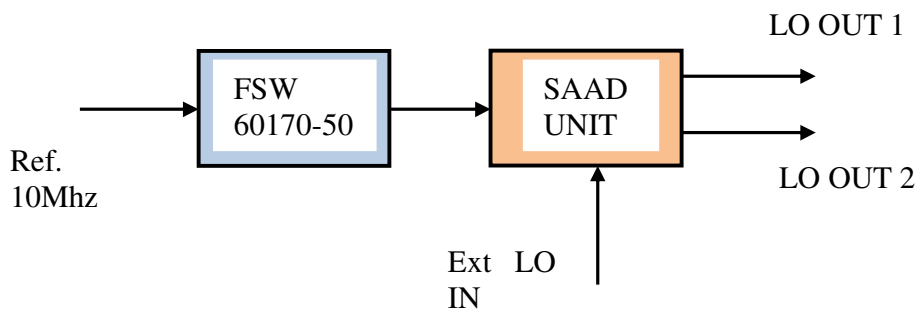
Title		Revision	
GAB/DDD	Number		
A4	7/4/2011	Sheet of	
D:\GAB_Noise\GAB_DDD.SchDoc	Drawn By:	Sheet of	
			4

3.13.2 Bill of Material of DDD PCB

SR No.	Description	Type / Make	Designator	Value	Quantity
1	Capacitor	SMD	C7,C8	10kpF	2
		SMD	C3,C4	100kpF	2
		SMD	C5	100pF	1
		SMD	C1,C2	47kpF	2
		SMD	C10	1kpF	1
2	Resistor	SMD	R9,R10	0 E	2
		SMD	R4	51E	1
		SMD	R2	75E	1
		SMD	R1,R3	100E	2
		SMD	R8	1K	1
		SMD	R11	2K	1
		SMD	R10	3K	1
		SMD	R12	3K9	1
		SMD	R7,R13	10K	2
		SMD	R9	18K	1
3	Directional Coupler	MCL	U1	PDC-20A-5+	1
4	Power Splitter	MCL	U2	ADP-2-20+	1
5	RF Power Detector	Analog Devices	U3	ADL5513	1
6	Dual OP-Amp	National semiconductor	U8	LM358AM	1

4. LO SYNTHESIZER PIU

4.1 Block diagram of LO SYNTHESIZER PIU



4.2 Description

The Local oscillator for the mixer is generated from a 10 Mhz reference signal provided by the GPS disciplined Rubidium oscillator which is the T&F standard used at the observatory. There are two ways in which the LO signal is generated. A common Signal generator which covers the full frequency range is locked to this 10 Mhz reference. The output of this unit is amplified and distributed to down conversion units for all 30 antennas. This provides a facility for setting a common LO for all antennas, but provides facility to vary the set LO frequency in steps of 1 Hz. A second LO generation scheme uses individual Lo signals generated in the range 600 to 1700 Mhz in 0.5 Mhz steps. Here individual antennas can be set to different Lo frequencies as per requirement.

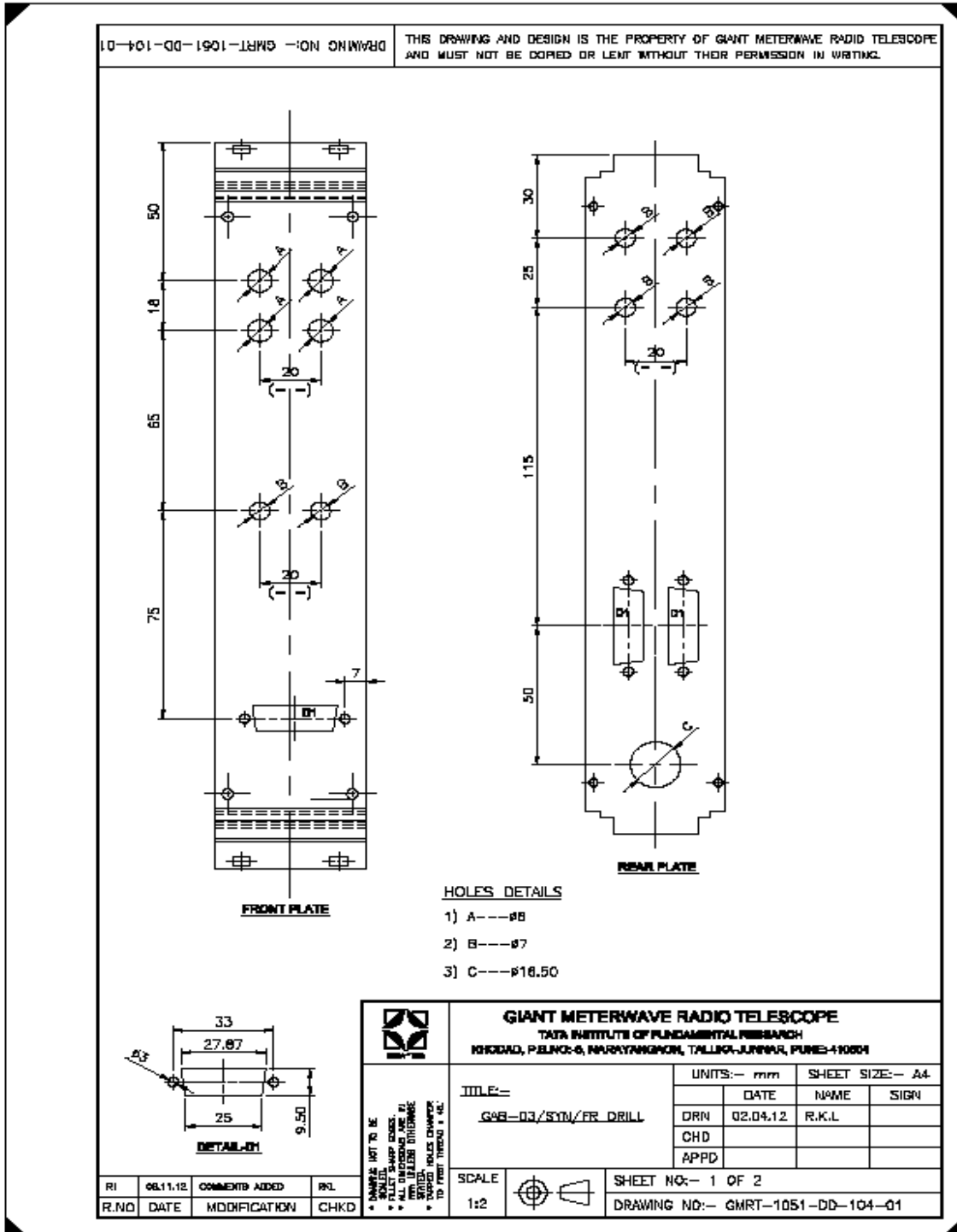
4.3 PHOTOGRAPH of LO SYNTHESIZER PIU



4.4 BILL OF MATERIAL OF LO SYNTHESIZER PIU

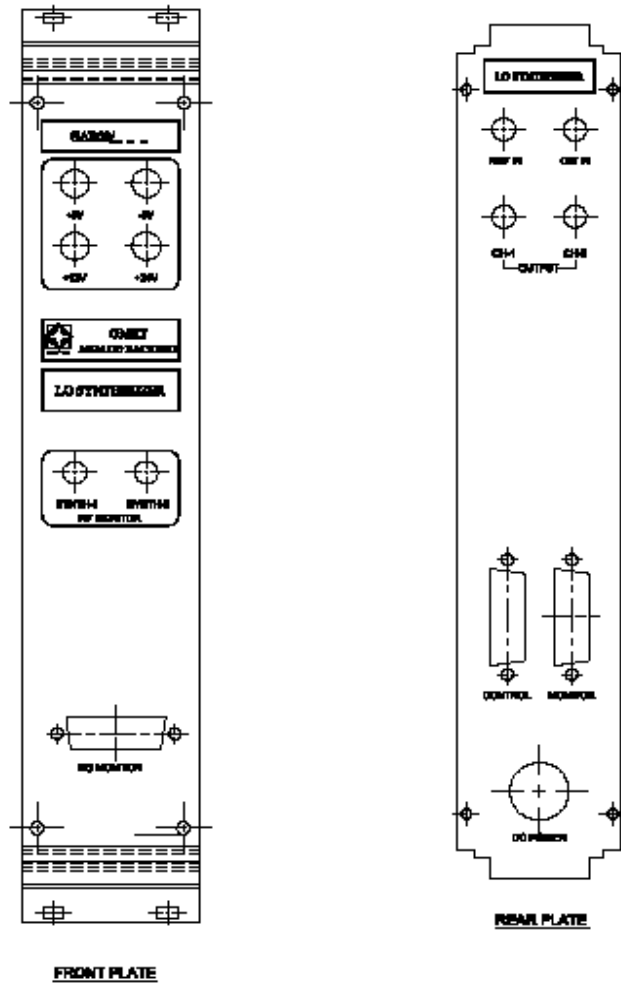
Item	Description	Qty/Unit
01	10T PIU (495 mm depth)	1
02	Assembled Unit GAB/FSW_XXX	1
03	Assembled Unit GAB/SAA_XXX	1
04	Assembled Unit GAB/PD4_XXX	1
05	Assembled Unit GAB/DET_XXX	1
06	Assembled Unit GAB/PWR_XXX	1
07	RF connector- SMA cable plug for Sucoform cable, (Huber-Suhner make)11_SMA-50-3-39/111_Y	11
08	RF connector- SMA Straight Bulkhead Sucoform cable, (Huber-Suhner make)24_SMA-50-3-15/111_NE	5
09	'D' Type Connector, 15 Pin (Male) Front panel for Monitor	1
10	'D' Type Connector, 9 Pin (Male) Rear Panel for Control	1
11	'D' Type Connector, 15 Pin (Male) Rear panel for Monitor	1
12	DC power Connector 5 Pin (female)	1
13	3 mm LED Holder	6
14	3 mm Round LED	6
15	Screw M3 x 8mm for Unit mounting	16
16	Screw M3 x 12 mm for PCB Mounting	4
17	Spacers	4
18	Hex. Screws for 'D' Conn. Mounting	6
19	Sucoform Cable	



4.5 Front & Rear Plate Details of LO Synthesizer PIU



DRAWING NO:- GMRT-1051-DD-104-01

THIS DRAWING AND DESIGN IS THE PROPERTY OF GIANT METERWAVE RADIO TELESCOPE AND MUST NOT BE COPIED OR LENT WITHOUT THEIR PERMISSION IN WRITING.



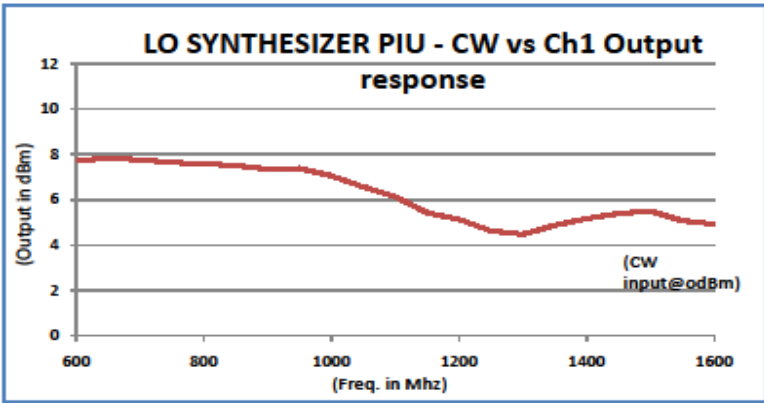
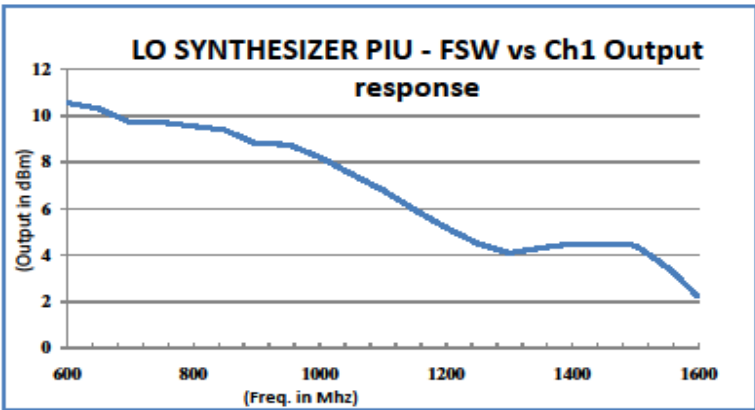
 <p style="text-align: center;">GIANT METERWAVE RADIO TELESCOPE TATA INSTITUTE OF FUNDAMENTAL RESEARCH MISIDAD, P.ELING-6, NARAYANGANJON, TALLIKAI-JUNNAR, PUNE-410004</p>				UNITS:- mm SHEET SIZE:- A4		
				TITLE:- GAR-03/SYN/LEGEND	DATE 02.04.12	NAME R.K.L
DRN	CHD	APPD				
SCALE 1:2		SHEET NO:- 2 OF 2	DRAWING NO:- GMRT-1051-DD-104-01			
RI R.NO	06.11.12 DATE	COMMENTS ADDED MODIFICATION	R/L CHKD	* DIMENSIONS NOT TO BE * FILLET & RAMP DIMENSIONS * ALL DIMENSIONS TO BE IN * UNLESS OTHERWISE * SPECIFIED DIMENSIONS * TAPPED HOLES DIMENSIONS * TO FRONT UNLESS OTHERWISE		

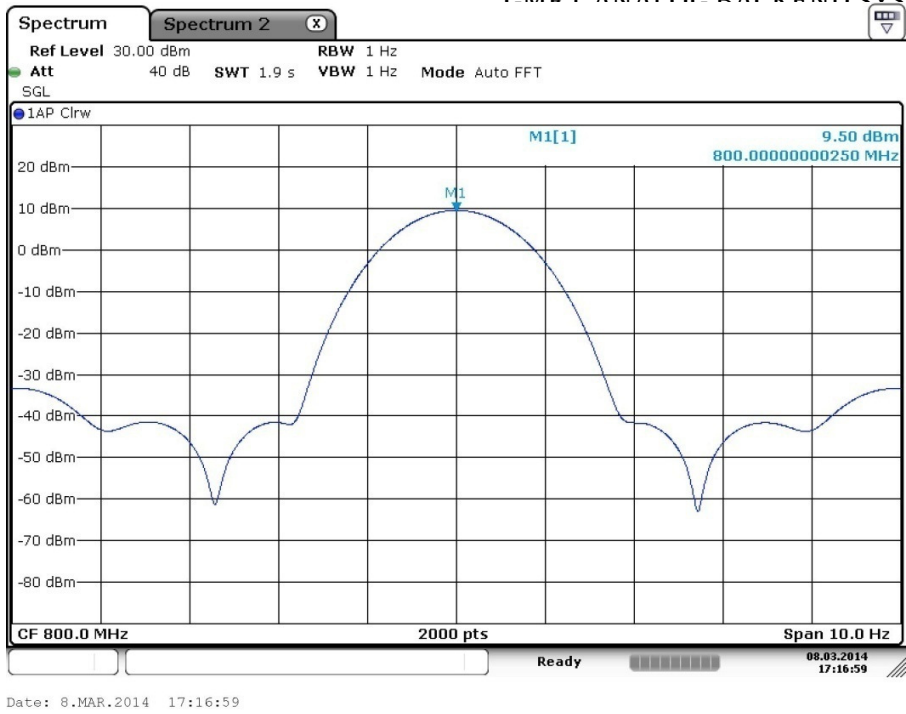
4.6 Test Setup for LO Synthesizer PIU:



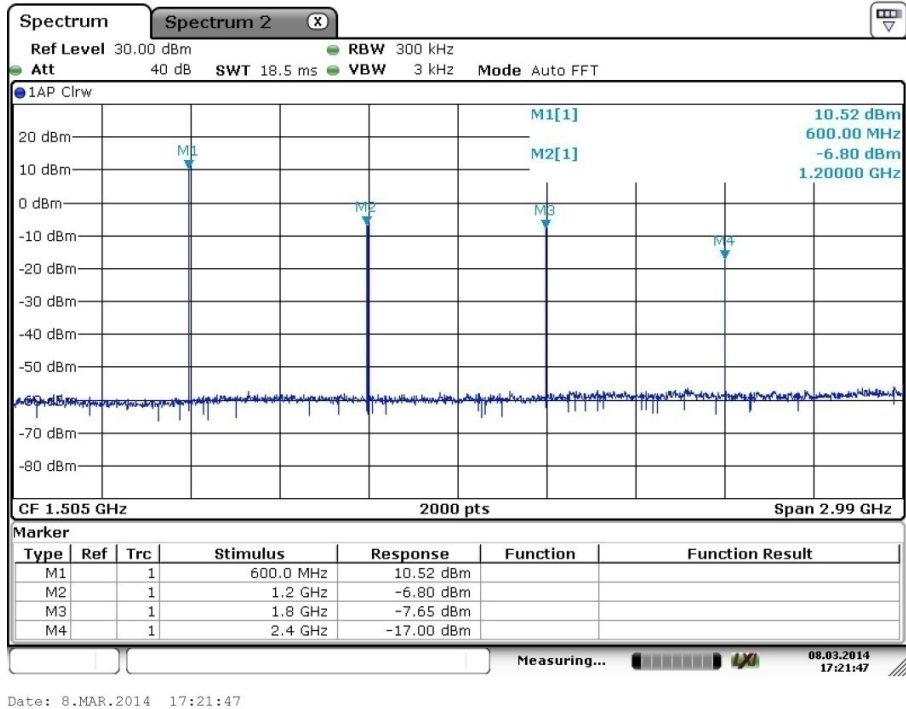
DUT

4.7 Test results for LO Synthesizer PIU

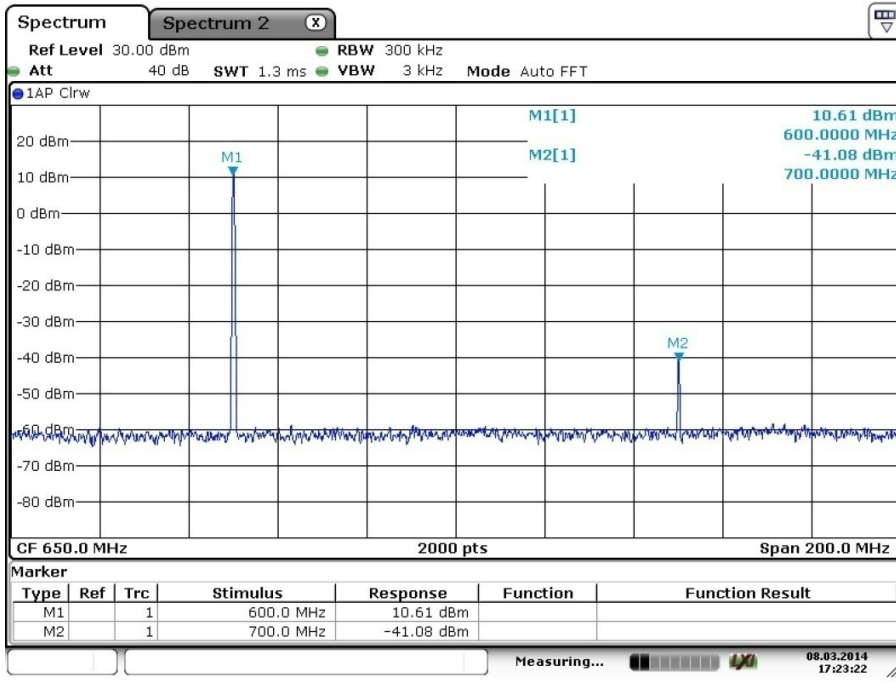




Response Plot of 800 MHz LO Selection@ Minimum Span

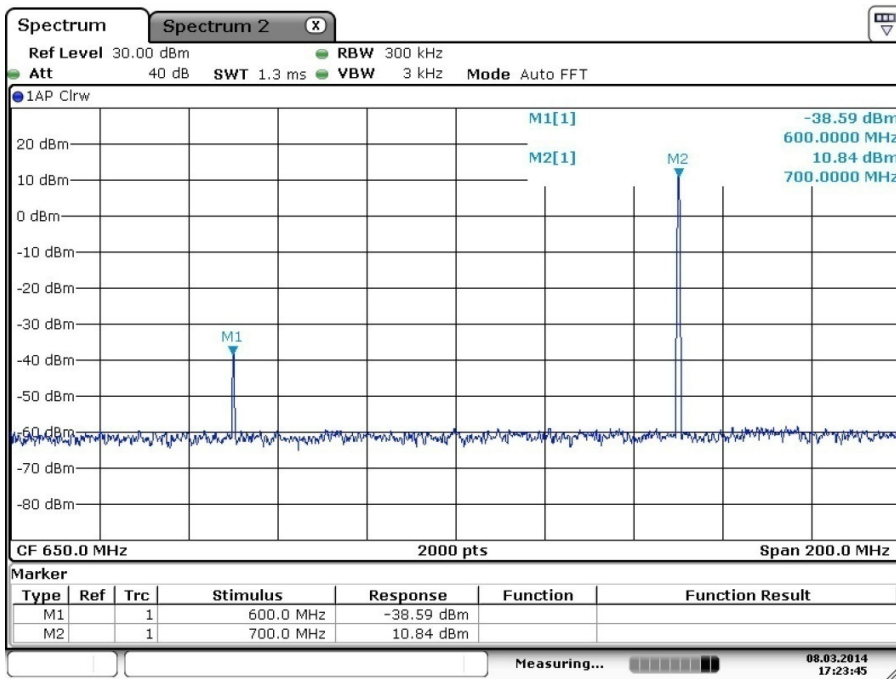


Response Plot of 800 MHz LO Selection@ Maximum Span



Date: 8.MAR.2014 17:23:22

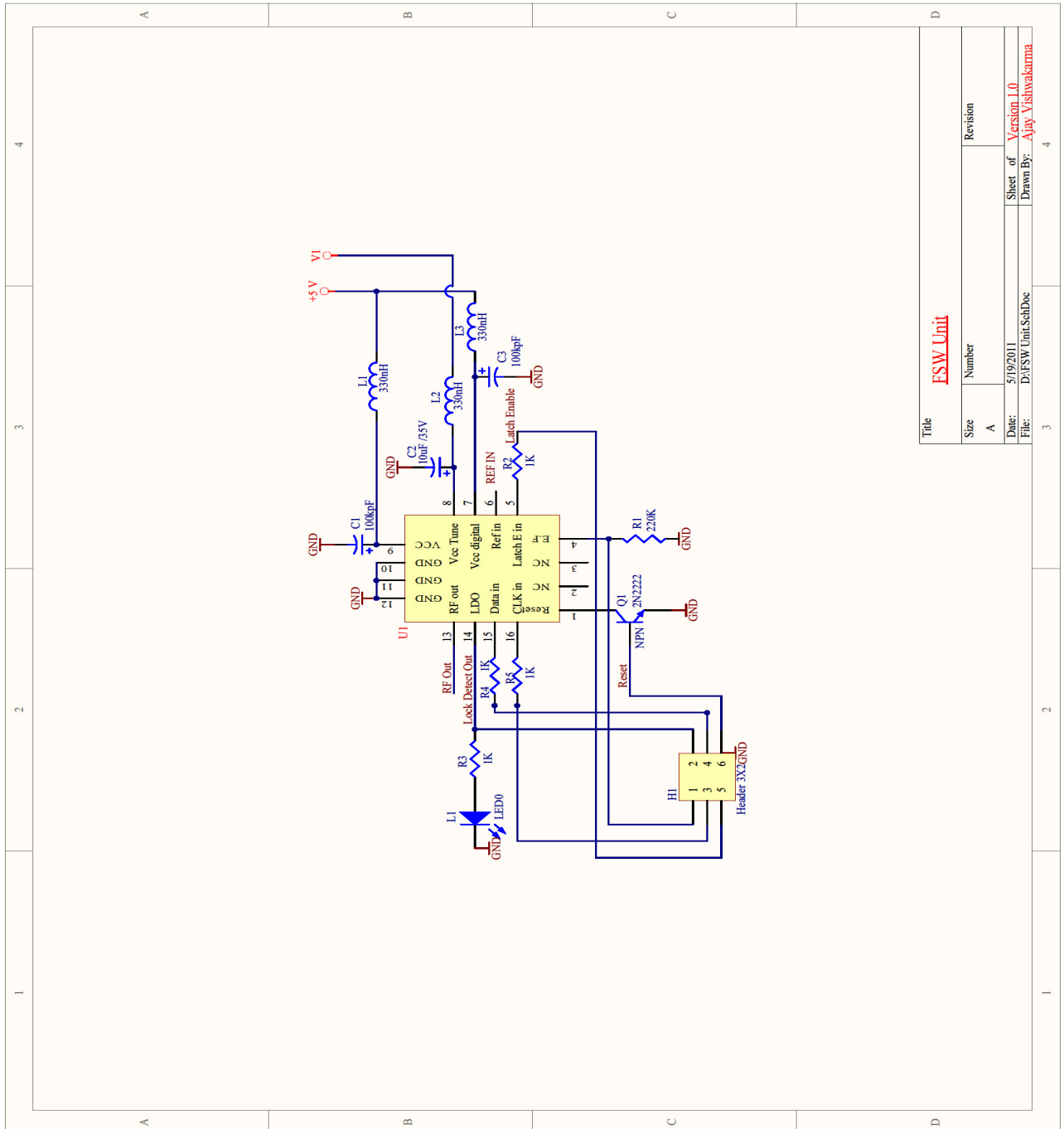
Isolation between CW & FSW with CW path ON.



Date: 8.MAR.2014 17:23:45

Isolation between CW & FSW with FSW Path ON

4.8 4.8.1 Schematic Diagram of FSW UNIT



Title		Revision	
Size	Number		
A			
Date:	5/19/2011	Sheet of	Version 1.0
File:	D:\FSW Unit\SchDoc	Drawn By:	Ajay Vishwakarma

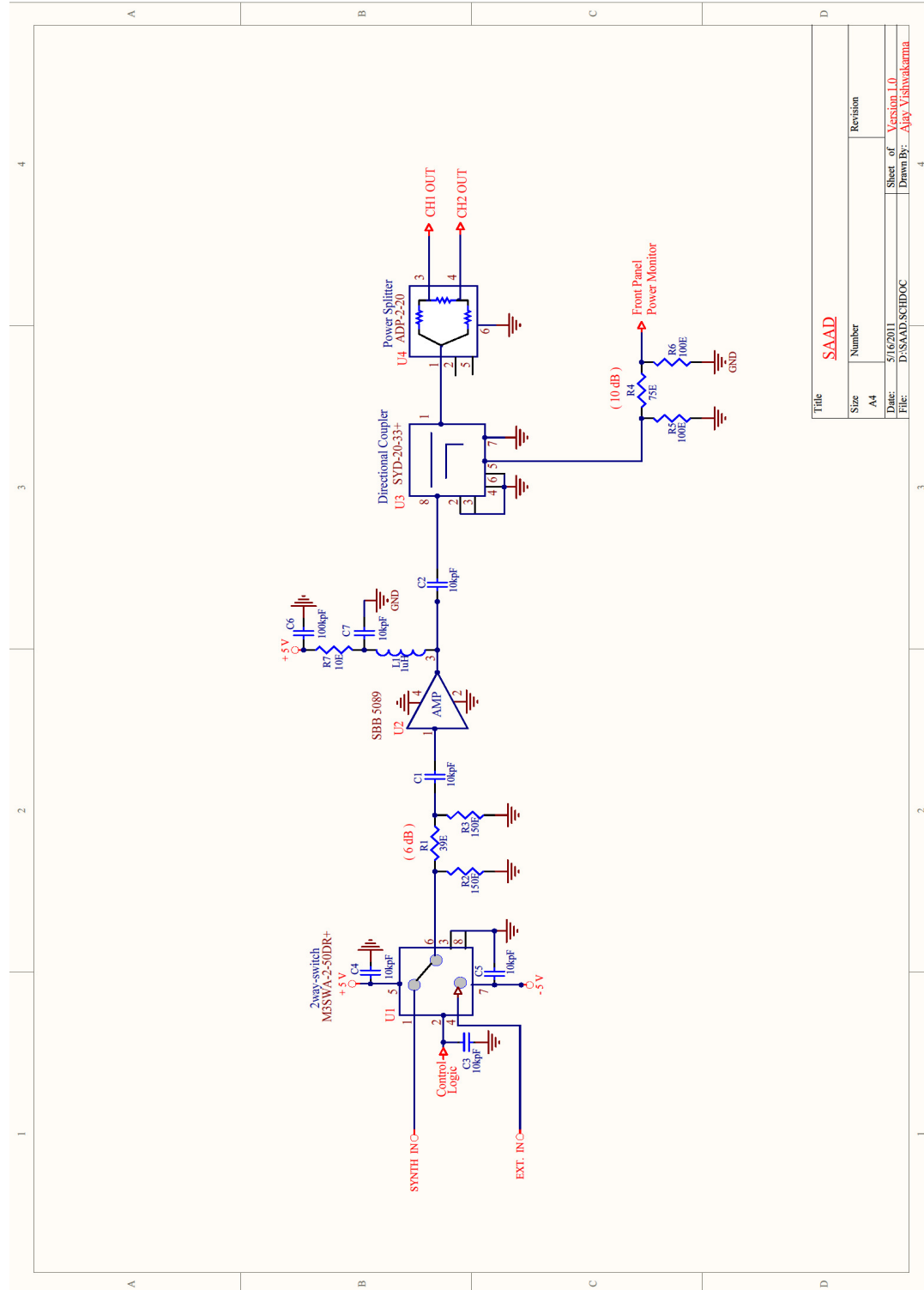
4.8.2 BILL OF MATERIAL OF FSW PCB

SR No.	Description	Type / Make	Designator	Value	Quantity
1	Capacitor	Tantalum	C2,	10uF /35V	2
		Tantalum	C1, C3	100kpF	1
2	LED		D1		1
3	Inductor	Moulded	L1, L2, L3	330nH	3
4	Resistor	CFR	R1	220K	1
		CFR	R2, R3, R4, R5	1K	4
5	NPN Transistor		Q1	2N2222	1
6	Freq Synthesiser	Module	U1		1

4.8.4 BILL OF MATERIAL OF FSW UNIT

Item	Description	Qty/Unit
01	Chassis ...75mm.... X ...50mm.....	1
02	Assembled GAB/FSW pcb	1
03	RF connector- SMA Straight panel Receptacle Jack, Flange Mount, (Huber-Suhner make) 23_SMA-50-0-3/111_NE	2
04	'D' Type Connector, 9 Pin (FeMale)	1
05	Feedthrough	2
06	Ground Tag	2
07	Screw M2.5 x 4mm.... for PCB mounting	12
08	Screw M2.5 x 6 mm for Mounting Connector	4
09	Hex. Screws for 'D' Conn. Mounting	2
10	Copper Clad	2

4.9 4.9.1 SCHEATIC OF SAAD PCB



Title	SAAD		
Size	Number	Revision	
A4			
Date:	5/16/2011	Sheet of	Version 1.0
File:	D:\SAAD\SCHDOC	Drawn By:	Ajay Vishwakarma

4.9.2 BILL OF MATERIAL OF SAAD PCB

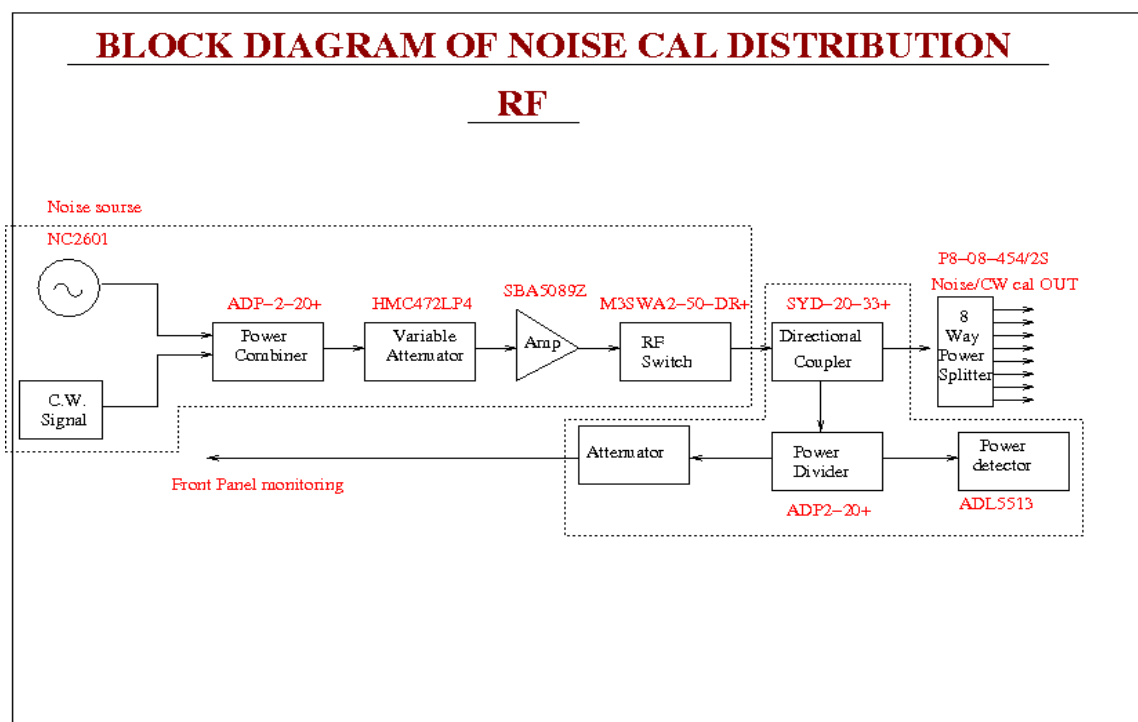
SR No.	Description	Type / Make	Designator	Value	Quantity
1	Capacitor	SMD	C1, C2, C3, C4, C5	10kpF	5
		Ceramic	C7	10kpF	1
		Ceramic	C6	100kpF	1
2	Inductor	Moulded	L1	1uH	1
3	Resistor	CFR	R1	39E, 1/4W	1
		CFR	R7	10E, 1W	1
		CFR	R4,	75E, 1/4W	1
		CFR	R5, R6,	100E, 1/4W	2
		CFR	R2, R3,	150E, 1/4W	2
4	2 Way-switch	MCL	U1	M3SWA-2-50DR	1
5	RF Amplifier	Sirenza	U2	SBB 5089Z	1
6	Directional Coupler	MCL	U3	SYD-20-33+	1
7	Power Splitter	MCL	U4	ADP-2-20	1

4.9.4 BILL OF MATERIAL OF SAAD UNIT

Item	Description	Qty/Unit
01	Chassis ...75mm.... X ...60mm.....	1
02	Assembled GAB/SAA pcb	1
03	RF connector- SMA Straight panel Receptacle Jack, Flange Mount, (Huber-Suhner make) 23_SMA-50-0-3/111_NE	5
04	Feedthrough	3
05	Ground Tag	3
06	Screw M2.5 x 4 mm for PCB mounting	18
07	Screw M2.5 x 6 mm for Mounting Connector	10
08	Copper Clad	5

5 NOISE CAL PIU

5.1 Block diagram of NOISE CAL PIU



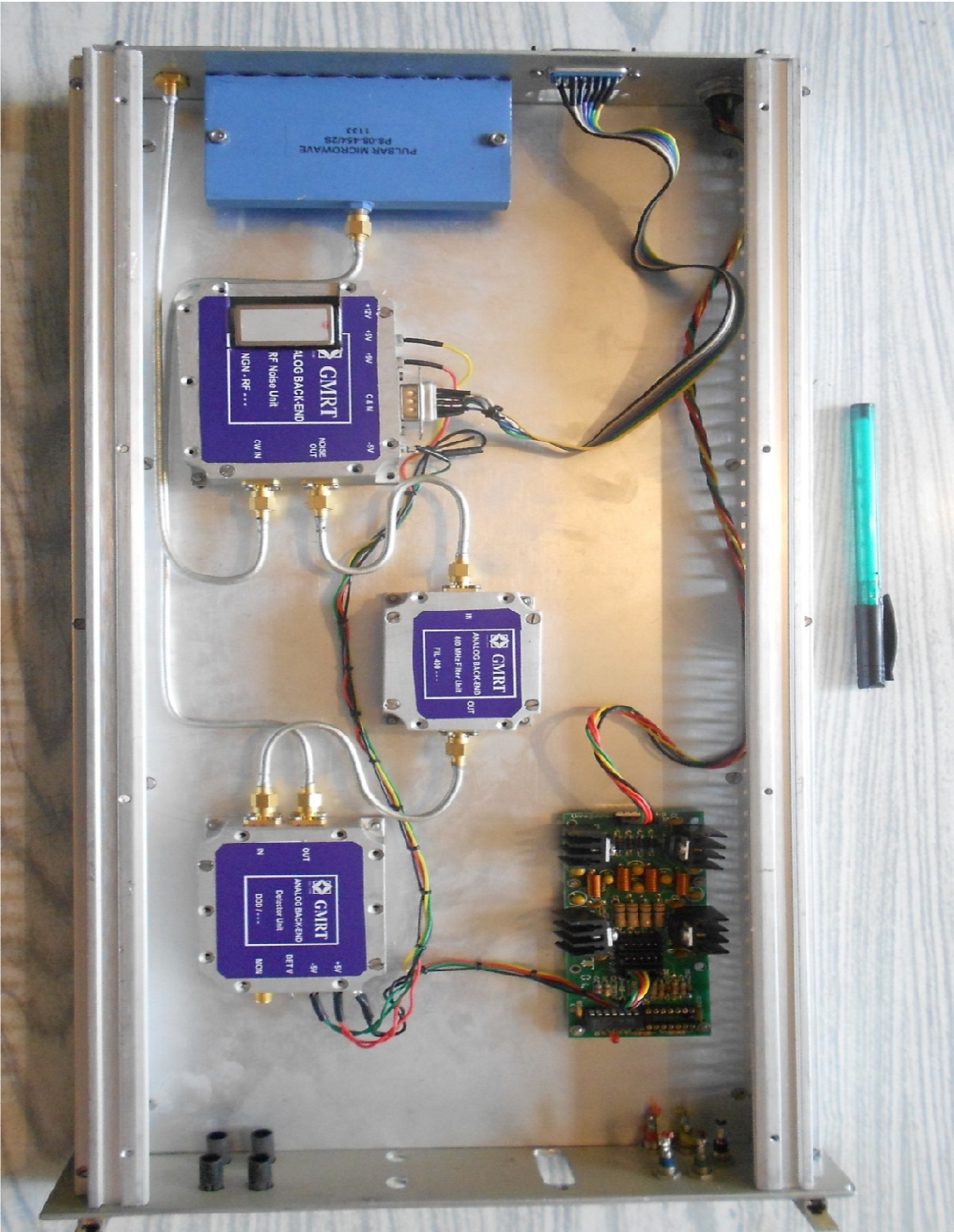
5.2 Description

Noisecom make source NC2601 is used as noise source followed by power combiner to mix C.W. Signal for checking signal to noise ratio of GAB after this variable attenuator is used to vary the out put power . After this the signal is fed to amplifier with 20 db gain output power can be monitor at front panel and remotely by using DDD (directional coupler, divider,detector)chassis

Specifications

- 1)Noise cal RF : Broad band noise 0 to 2Ghz max o/p power -10 dbm
- 2)Noise cal Digital : 0 to 400 Mhz max o/p power -17 dbm

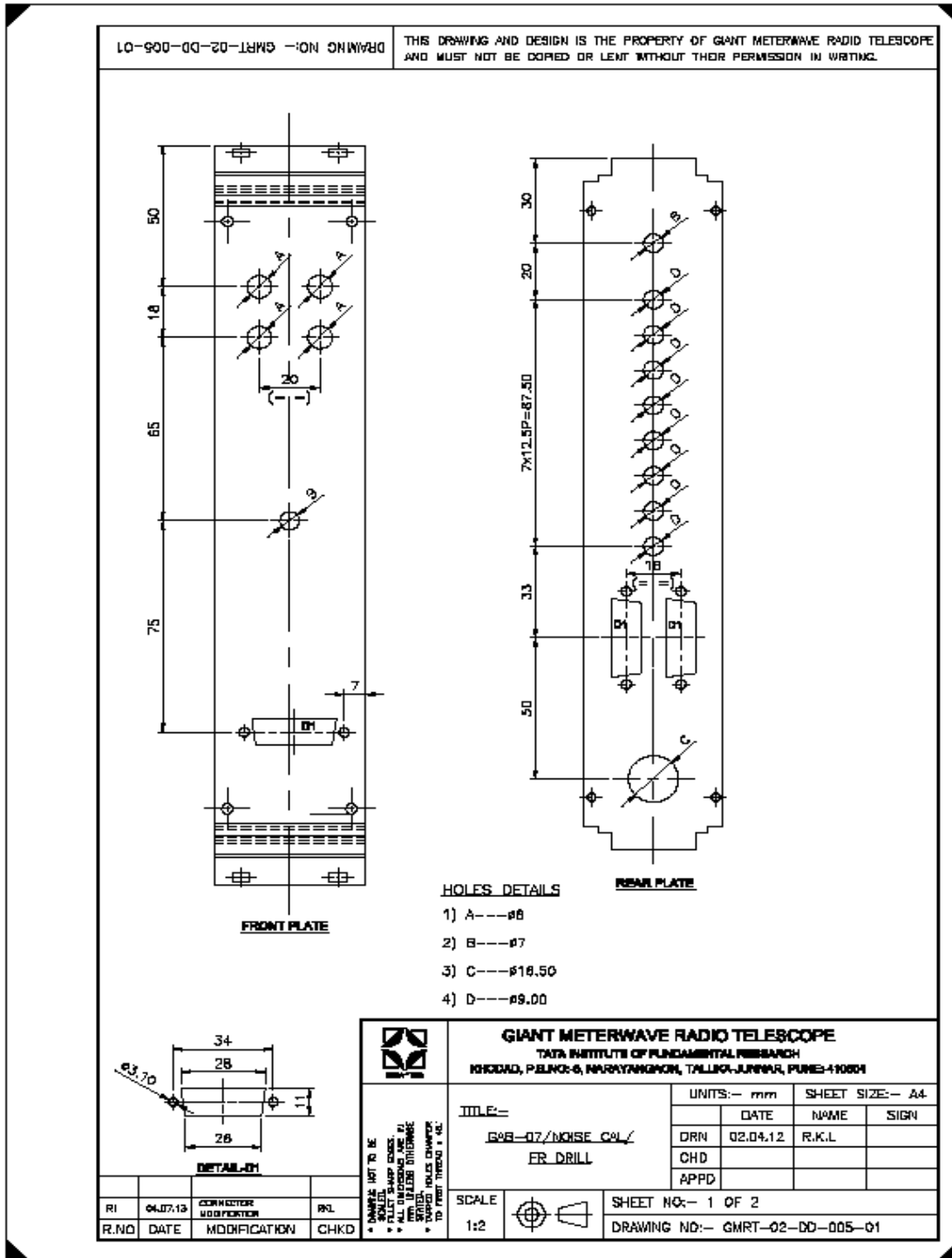
5.3 PHOTOGRAPH OF NOISE CAL PIU

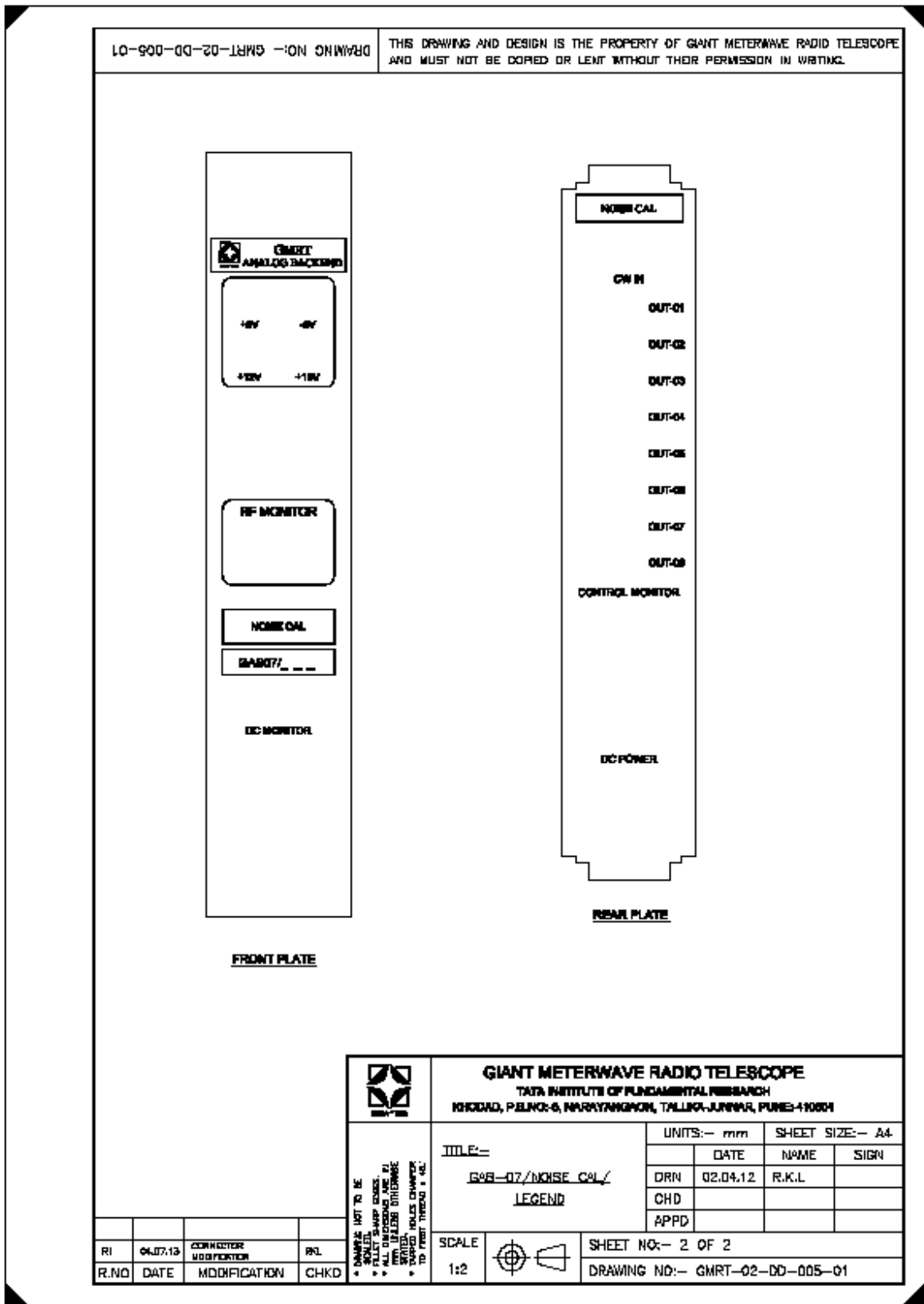


5.4 BILL OF MATERIAL of Noise Cal PIU

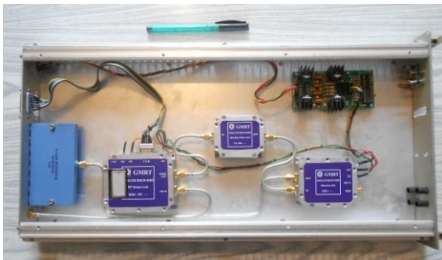
Item	Description	Qty/Unit
01	10T PIU (495 mm depth)	1
02	Assembled Unit GAB/NPA_XXX (GAB400 & GABRF)	2
03	Assembled Unit GAB/DDD_XXX	2
04	Assembled Unit GAB/PD8_XXX	2
05	Assembled Unit GAB/FIL04_XXX	1
04	Assembled Unit GAB/PWR_XXX	1
05	RF connector- SMA cable plug for Sucoform cable, (Huber-Suhner make) 11_SMA-50-3-39/111_Y	14
06	RF connector- SMA Straight Bulkhead Sucoform cable, (Huber-Suhner make) 24_SMA-50-3-15/111_NE	4
07	'D' Type Connector, 15 Pin (FeMale) Front panel for Monitor	1
08	'D' Type Connector, 15 Pin (FeMale) Rear panel for Monitor	1
09	'D' Type Connector, 15 Pin (Male) Front panel for Control	1
08	'D' Type Connector, 9 Pin (Male) For NPA Unit	2
09	DC power Connector 5 Pin (female)	1
10	5 mm LED Holder	4
11	5 mm Round LED	4
12	Screw M2.5 x 8mm for Unit mounting	20
13	Screw M2.5 x 12 mm for PCB Mounting	4
14	Spacers	4
15	Hex. Screws for 'D' Conn. Mounting	4
16	Sucoform Cable	

5.5 Front & Rear plate Details of Noise Cal PIU





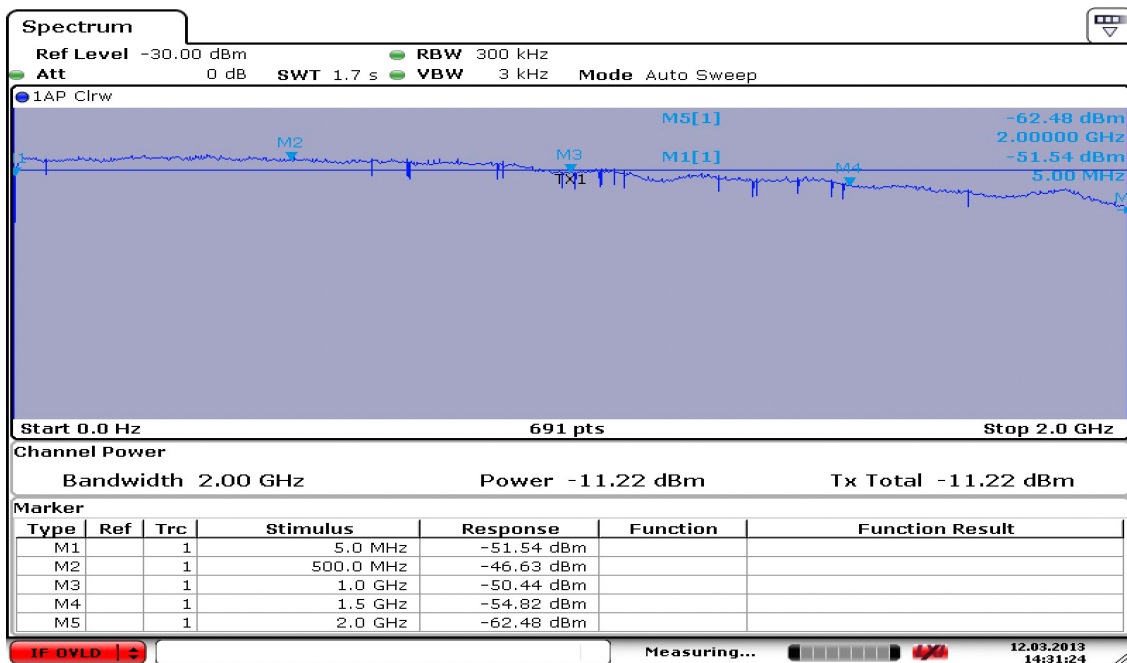
5.6 Test Setup for NOISE CAL PIU



DUT

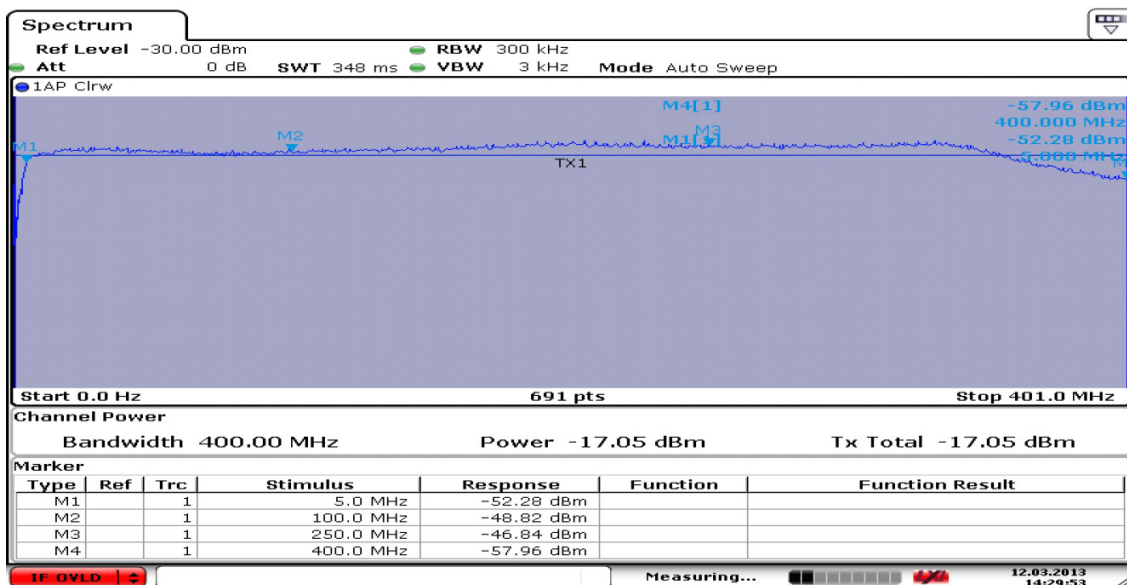


5.7 Test results for NOISE CAL PIU



Date: 12.MAR.2013 14:31:25

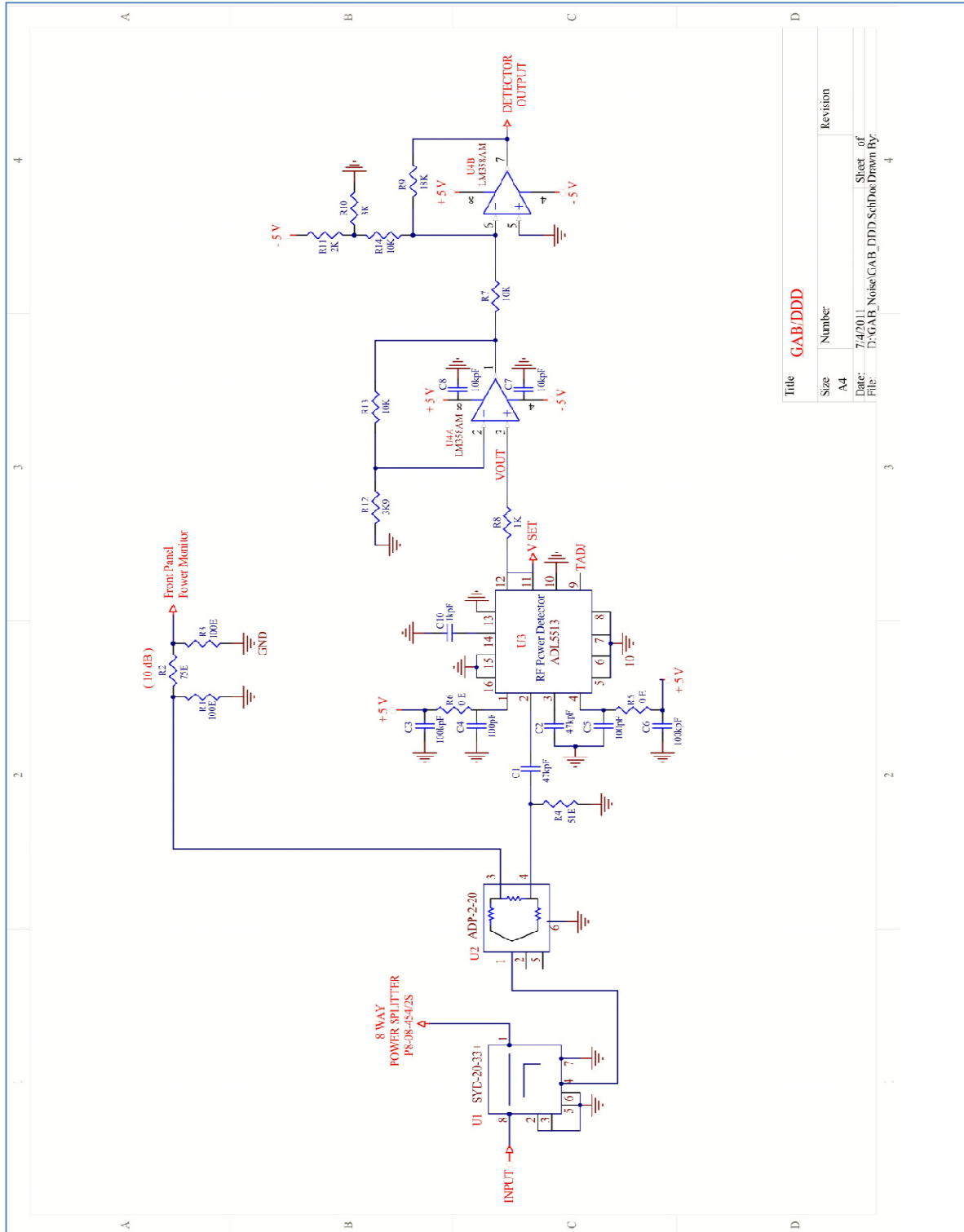
Frequency response of Analog Noise Cal



Date: 12.MAR.2013 14:29:53

Frequency response of Digital Noise Cal

5.8 5.8.1 Schematic diagram OF NOISE UNIT



Title	GAB/DDD		
Size	Number	Revision	
A4			
Date:	7/4/2011	Sheet of	
File:	D:\GAB_Noise\GAB_DDD\SchDoc	Drawn By:	4

5.8.2 Bill of Material OF NOISE PCB

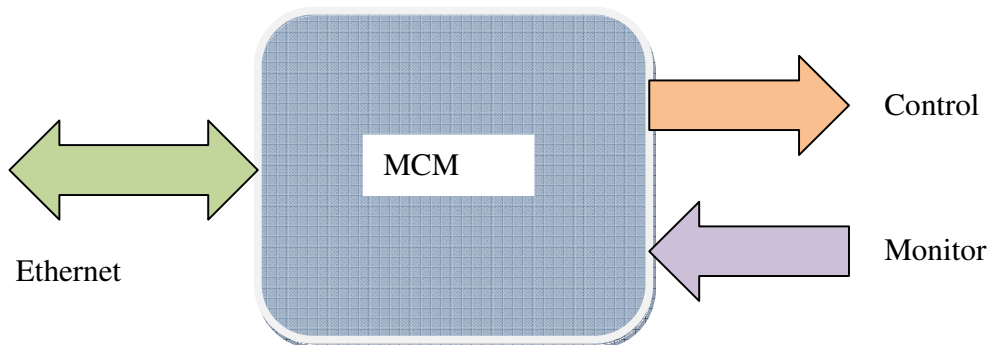
SR No.	Description	Type / Make	Designator	Value	Quantity		
1	Capacitor	SMD	C3,C4,C5,C6,C7,C8,C14,C15,	10kpF	15		
			C16,C17,C18,C19,C20,C21,C22				
			C9,C10			68pF	2
			C12			1000pF	1
			C13			22pF	1
			C11			1uF	1
		SMD	C1,C2	1kpF	2		
2	Inductor	Moulded	1uH	1uH	1		
3	Resistor	SMD	R3	30E	1		
		CFR	R1	56E, 1W	1		
		SMD	R2,R4	178E	2		
4	RF Amplifier	Serenza	U4	SBA5089Z	1		
5	2 Way-switch	MCL	U5	M3SWA-2-50DR+	1		
6	Power Splitter	MCL	U2	ADP-2-20+	1		
7	Noise module	Noisecom	U1	NC2601	1		
8	Step attenuator	Hittite	U3	HMC472LP4	1		
9	Power divider	Pulsar microwave		P8-08-454/2S	1		

5.8.4 Bill of Material of Noise UNIT

Item	Description	Qty/Unit
01	Chassis ...75mm.... X ...60mm.....	1
02	Assembled GAB/NPA pcb	1
03	RF connector- SMA Straight panel Receptacle Jack, Flange Mount, (Huber-Suhner make) 23_SMA-50-0-3/111_NE	2
04	'D' Type Connector, 9 Pin (Male)	1
05	Feedthrough	2
06	Ground Tag	2
07	Screw M3 x for PCB mounting	
08	Screw M2.5 x 6 mm for Mounting Connector	8
09	Hex. Screws for 'D' Conn. Mounting	2

6 CONTROL & MONITOR PIU

6.1 Block diagram of Control & Monitor PIU



6.2 Description

GAB control and monitoring does controlling of Analog Receiver system, Baseband Filter, RF filter and Local Oscillator system. To control these systems it use MCM card. MCM card has 32 Output Lines which are used to set GAB subsystems. Out of 32 Output lines 18 lines for set Analog Receiver system channel1 and Channel2. With these 18 lines we can set Attenuation, Input selection (Antenna input or Noise input), Mixer or Direct path. 6 lines for RF filter selection of channel1 and channel2and 4 lines for baseband filter selection of channel1 and channel2. 100 MHz,200MHz,400MHz and Direct path. 2 line for source of local oscillator i.e. external (signal generator for LO<500 MHz) /FSW. SPI bus is use to set Local Oscillator frequency.

64 input lines of MCM card are used to monitor various parameters like attenuations, selected path, Power supply and temperature.

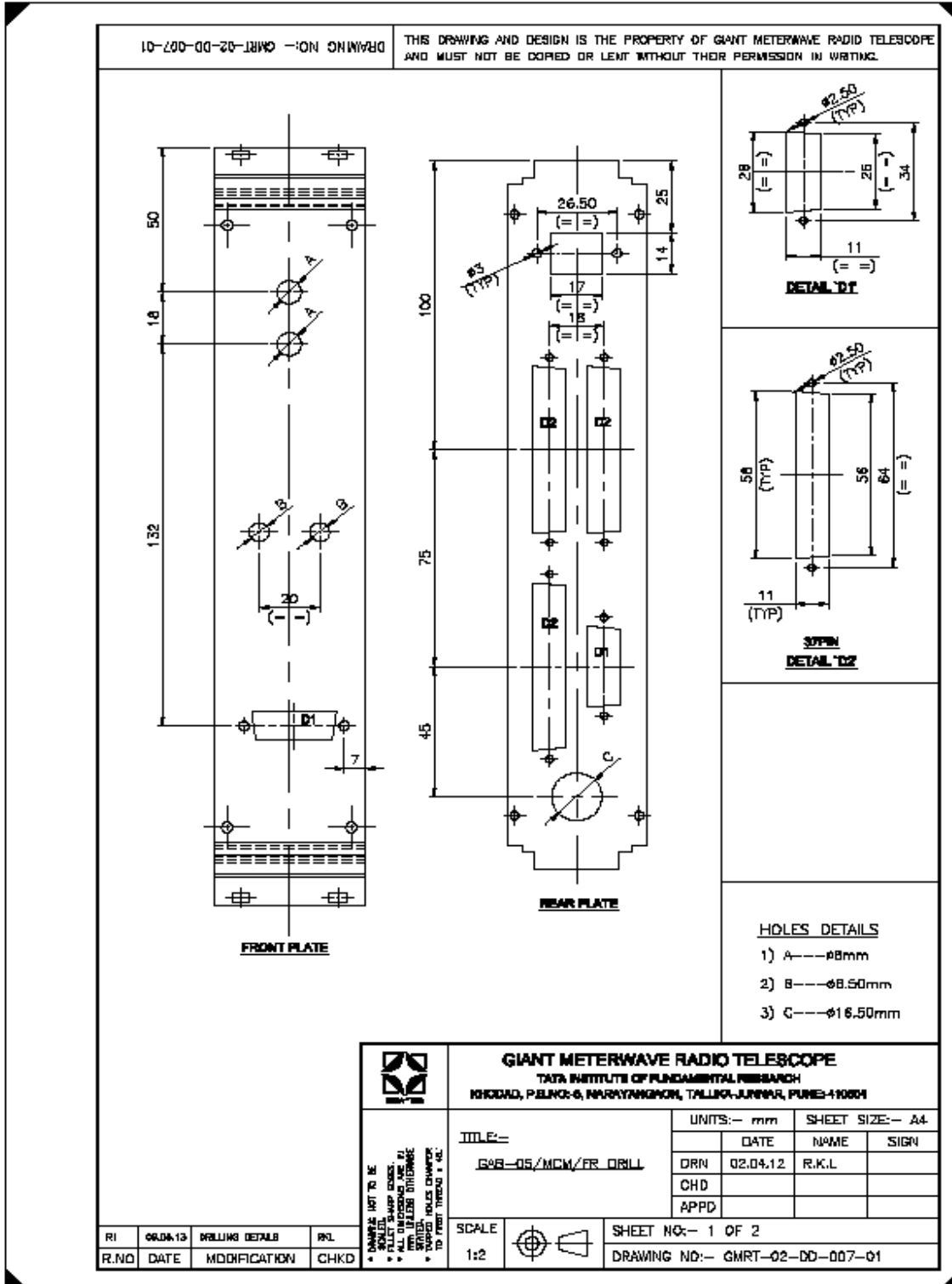
6.3 PHOTOGRAPH OF CONTROL & MONITOR PIU

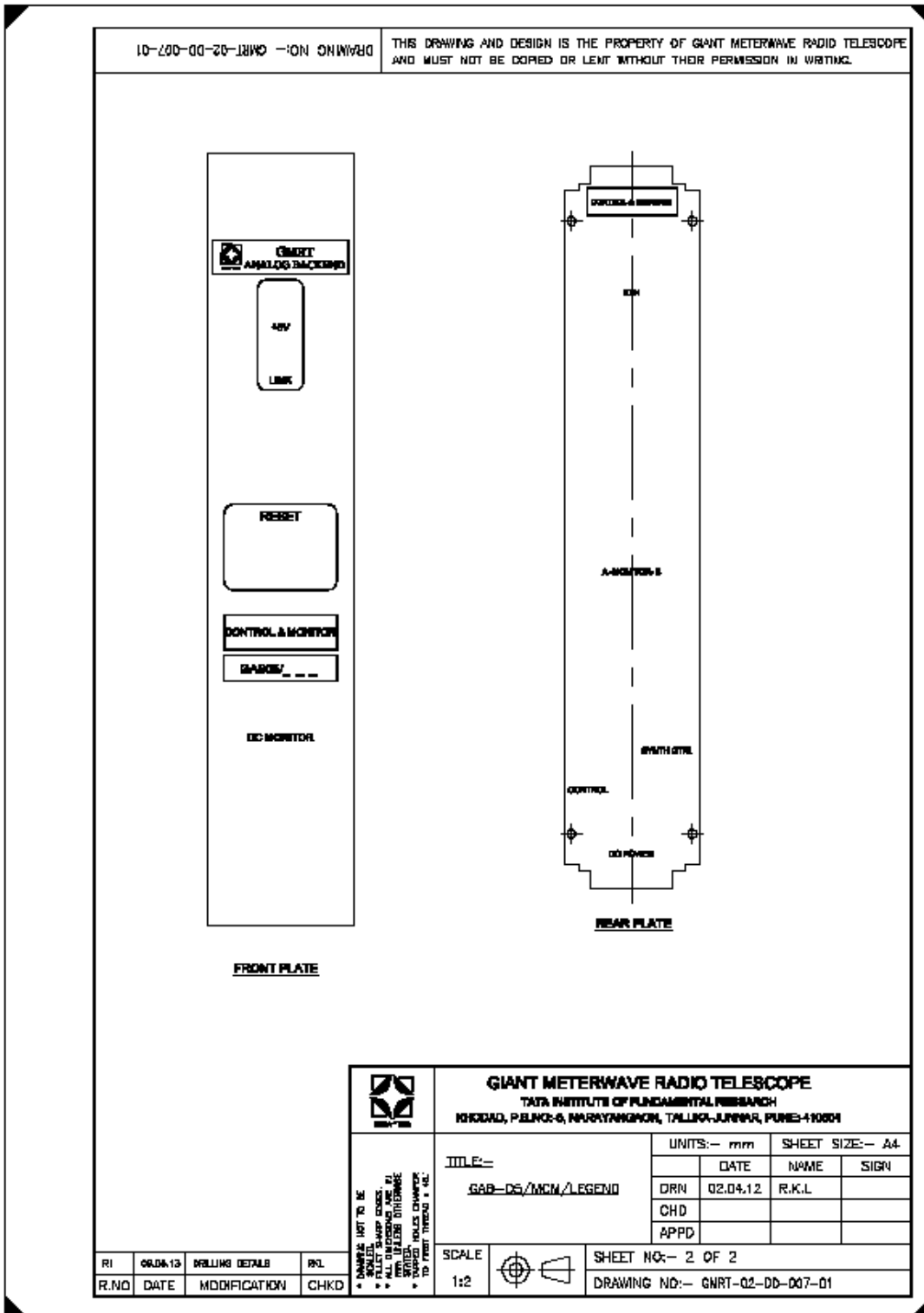


6.4 BILL OF MATERIAL OF CONTROL & MONITOR PIU

Item	Description	Qty/Unit
01	10T PIU (495 mm depth)	1
02	Assembled Unit GAB/MCM_xxx	1
03	Assembled Unit GAB/IFC_xxx	1
04	Assembled Unit GAB/PWR_xxx	1
05	'D' Type Connector, 15 Pin (FeMale) Front panel for Monitor	1
06	'D' Type Connector, 15 Pin (FeMale) Rear Panel for LO Control	1
07	'D' Type Connector, 37 Pin (FeMale) Rear panel for Control	1
08	'D' Type Connector, 37 Pin (FeMale) Rear panel for Monitor	2
09	32 Pin FRC (Female) Connector	1
10	10 Pin FRC (Female) Connector	1
11	DC power Connector 5 Pin (female)	1
12	5 mm LED Holder	4
13	5 mm Round LED	4
14	Screw M2.5 x 12 mm for PCB Mounting	12
15	Spacers	12

6.5 Front & Rear plate Details of Control & Monitor PIU





6.6 MCM card no and assigned IP number

Card no	IP Address	Card no	IP Address
1	192.168.30.26	32	192.168.30.28
2	192.168.30.27	33	192.168.30.20
3	192.168.30.3	34	192.168.30.23
5	192.168.30.5	35	192.168.30.19
6	192.168.30.6	36	192.168.30.21
7	192.168.30.7	37	192.168.30.11
8	192.168.30.8	38	192.168.30.10
11	192.168.30.12	39	192.168.30.18
12	192.168.30.22	40	192.168.30.25
13	192.168.30.13	44	192.168.30.33
14	192.168.30.14	45	192.168.30.9
15	192.168.30.15	46	192.168.30.26
16	192.168.30.16	47	192.168.30.34
17	192.168.30.17	48	192.168.30.35
19	192.168.30.24	49	192.168.30.36
20	192.168.30.9	50	192.168.30.37
21	192.168.4.132	51	192.168.30.38
29	192.168.30.29	52	192.168.30.39
30	192.168.30.2	54	192.168.30.41
31	192.168.30.31	55	192.168.30.42
		56	192.168.30.43

6.7 Details of Control & Monitor Connections

Monitor Connection Details

From Connector D37- I &II to D15 connector of Analog Receiver, RF filter ,Baseband and LO PIU's monitoring connector								
RX PIU MONITORING -1 CH-1 B (Female at Rear Panel of PIU)				RX PIU MONITORING -2 CH-2 A (Male at Rear Panel of PIU)				
FRC	D37B	D15-1	SIGNAL	FRC	D37A	D15-1	SIGNAL	<i>D-15 TO RX PIU MONITORING X 2</i>
1	1	1	0.5 dB	33	1	1	0.5 dB	
2	20	2	1.0 dB	34	20	2	1.0 dB	
3	2	3	2.0 dB	35	2	3	2.0 dB	
4	21	4	4.0 dB	36	21	4	4.0 dB	
5	3	5	8.0 dB	37	3	5	8.0 dB	
6	22	6	16 dB	38	22	6	16 dB	
7	4	7	VGA	39	4	7	VGA	
8	23	8	Buffer	40	23	8	Buffer	
9	5	9	Conversion	41	5	9	Conversion	
10	24	10	Det VGA	42	24	10	Det VGA	
11	6	11	Det Buffer	43	6	11	Det Buffer	
12	25	12	Power Supply	44	25	12	Power Supply	
13	7	13	RX Temperature	45	7	13	RX Temperature	
		14	NC			14	NC	
		15	GND			15	GND	
RF filter monitoring -1 CH-1				RF filter monitoring -2 CH-2				
FRC	D37B	D15-2	Signals	FRC	D37A	D15-2	Signals	<i>D-15 TO FILTER1 X 2</i>
14	26	1	RF Filter	46	26	1	RF Filter	
15	8	2	RF Filter	47	8	2	RF Filter	
16	27	3	RF Filter	48	27	3	RF Filter	
17	9	4	RF Filter MON1	49	9	4	RF Filter MON1	
18	28	5	RF Filter MON2	50	28	5	RF Filter MON2	
19	10	6	Power Supply	51	10	6	Power Supply	

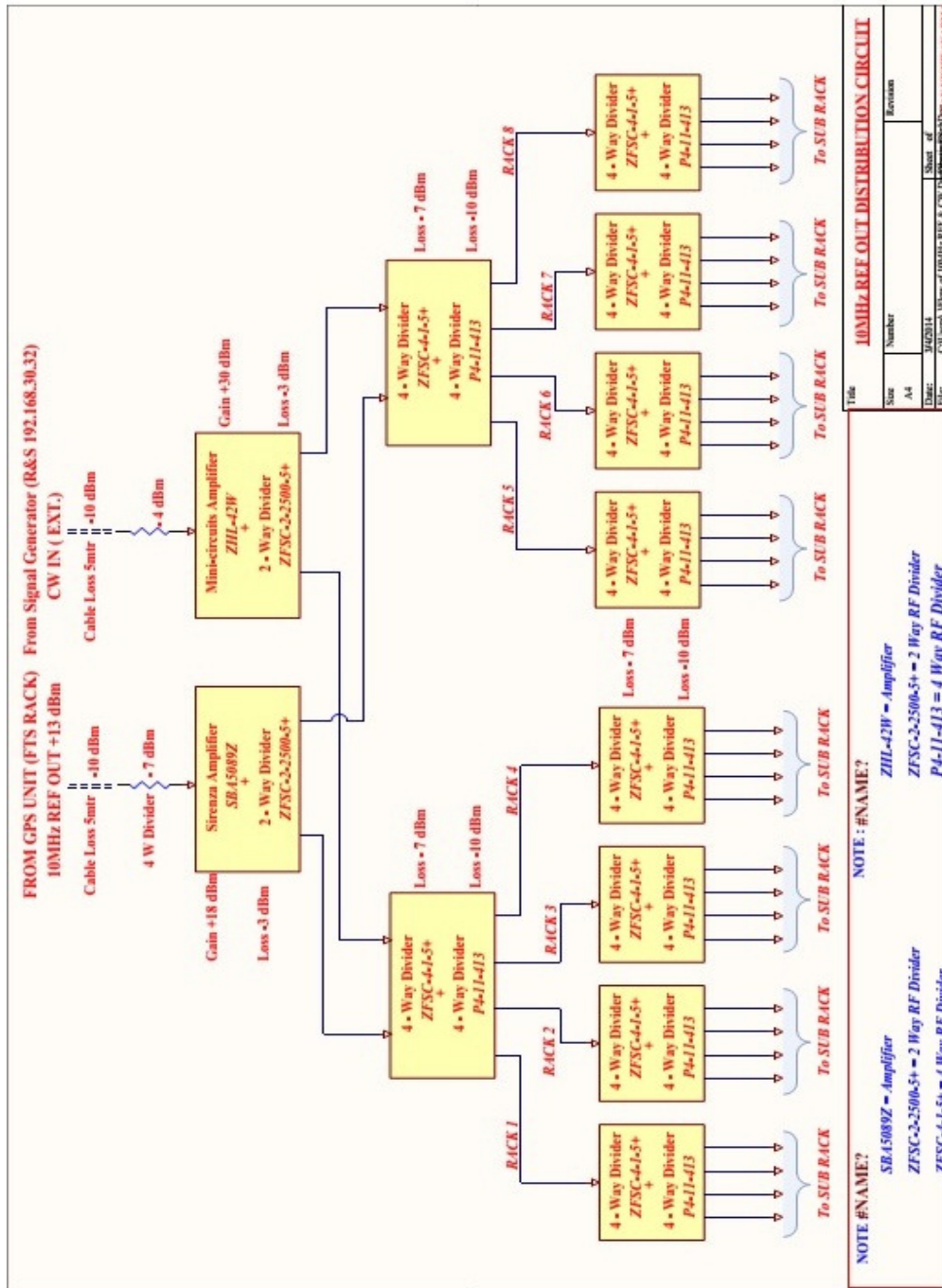
		15	GND			15	GND	
BASE BAND FILTER MONITORING-1				BASE BAND FILTER MONITORING-2				
FRC	D37-B	D15-3	Signals	FRC	D37-A	D15-3	Signals	<i>D-15 TO BB filter X 2</i>
20	29	1	BBF	52	29	1	BBF	
21	11	2	BBF	53	11	2	BBf	
22	30	3	GAB OUT	54	30	3	MON1	
23	12	4	BB Temperature	55	12	4	MON2	
24	31	5	Power Supply	56	31	5	Power Supply	
		15	GND			15	GND	
LO MONITORING- 1 &2				Not used				<i>D-15 TO LO PIU X 1</i>
FRC	D37-B	D15-4	Signals	FRC				
25	13	1	LO Select sw1	57				
26	32	2	LO Select sw2	58				
27	14	3	Lock Det. 1	59				
28	33	4	Lock Det. 2	60				
29	15	12	Power Supply	61				
30	34	13	LO Temperature	62				
		15	GND					
31			NC	63				
32			NC	64				

Control Connection Details

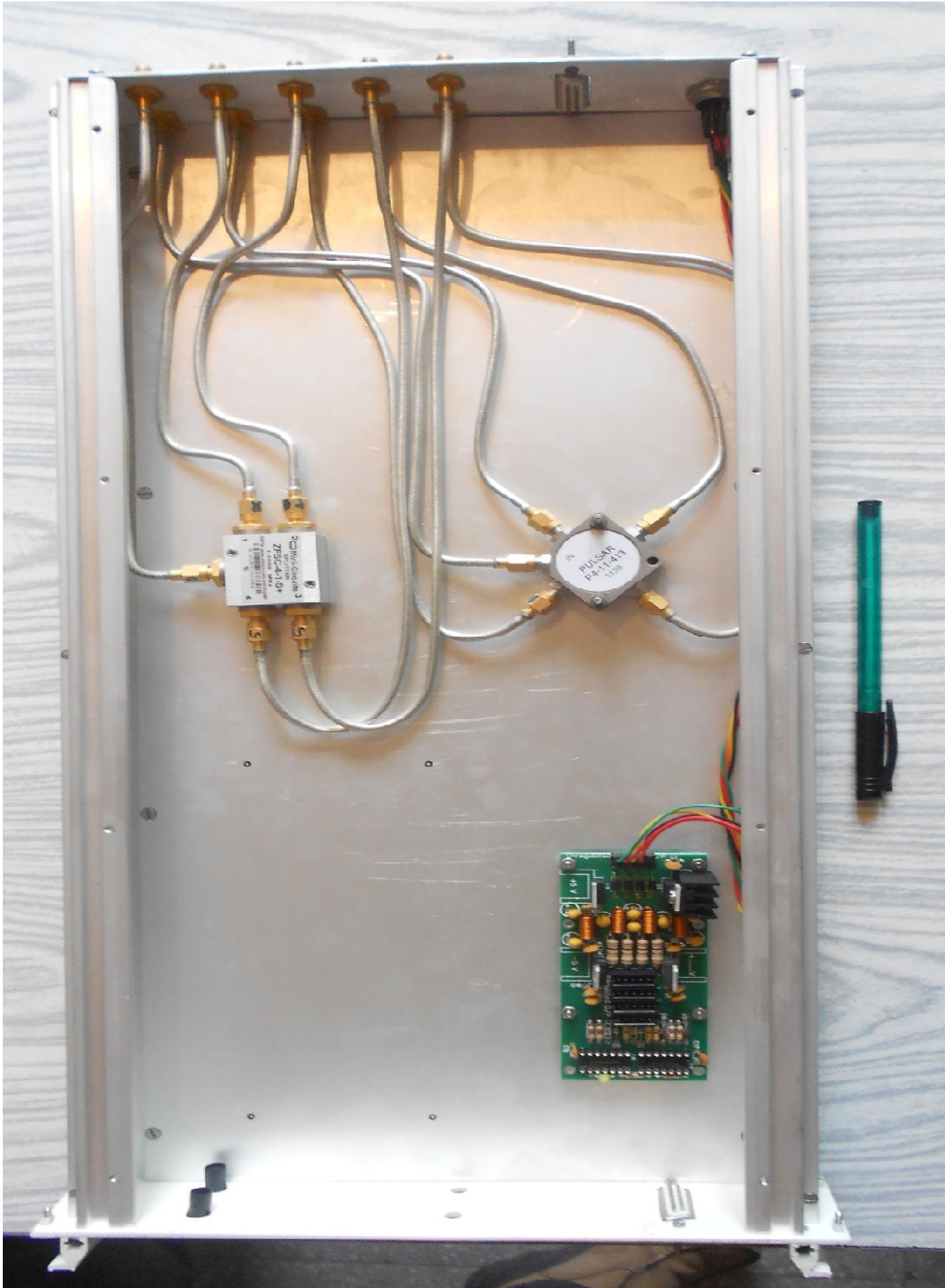
	D-37@Rare(Female)	D15-1	Signals	D-37@Rare (Female)	D15-1	Signals		
<i>Analog Receiver</i>	1	1	0.5 dB	27	1	0.5 dB		
	20	9	1.0 dB	9	9	1.0 dB		
	2	2	2.0 dB	28	2	2.0 dB		
	21	10	4.0 dB	10	10	4.0 dB		
	3	3	8.0 dB	29	3	8.0 dB		
	22	11	16 dB	11	11	16 dB		
	4	<i>RF Switch</i>	4	VGA	30	<i>RF Switch</i>	4	VGA
	23		12	Buffer	12		12	Buffer
5	5		Conversion	31	5		Conversion	
<i>RF Filter</i>	24	1	Filter1	13	1	Filter1		
	6	9	Filter2	32	9	Filter2		
	25	2	Fiter3	14	2	Fiter3		
<i>BB Filter</i>	7	1	BBF1	33	1	BBF1		
	26	9	BBF2	15	2	BBF2		
	8		SP1	34		SP2		
				16	6 of LO D15	FSW/Generator		
				35	14 of LO D15	FSW/Generator		
	1-9 =>Analog Rx 1		30 => SP2	17		GND		
	10-12 =>Rf filter		Flat cable INFO.	36		GND		
	13-14 =>BB filter		D37 (1-30) wires	18		GND		
	15 - =>SP1		are used .	37		GND		
	16-24 =>Analog Rx 2		<i>31-32 LO Select</i>	19		GND		
	25-27 =>Rf filter -2							
	28-29 =>BB filter -2							

7 Ref. Distribution PIU

7.1 Details of Ref. Distribution



7.2 Photograph of Ref. Distribution PIU



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