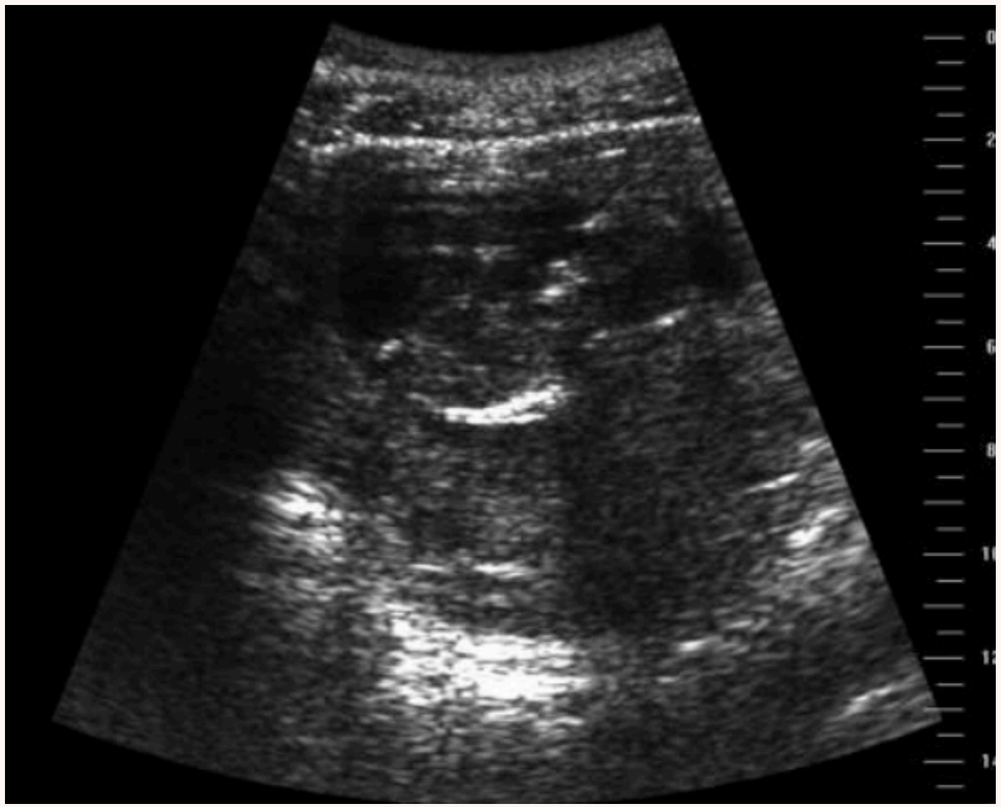
SCIENTIA • LABOR • LIBERTAS

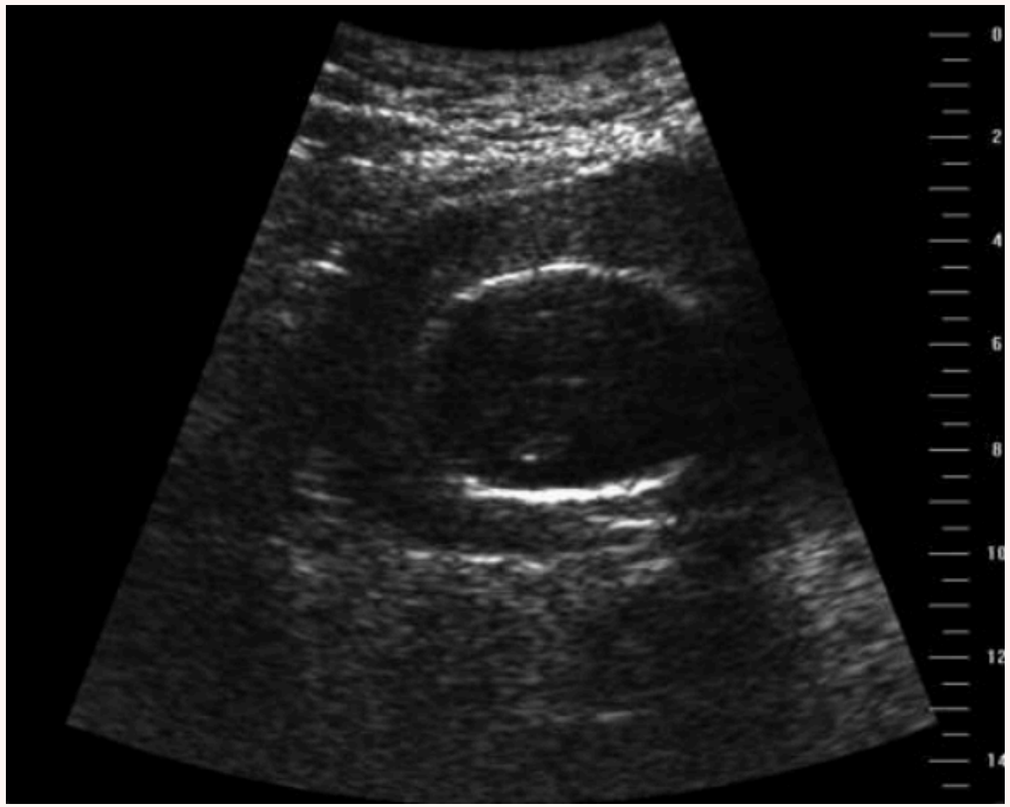
FREE
UNIVERSITY

Ultrasound Scanner

Nika Durishvili
Tengiz Gvelesiani

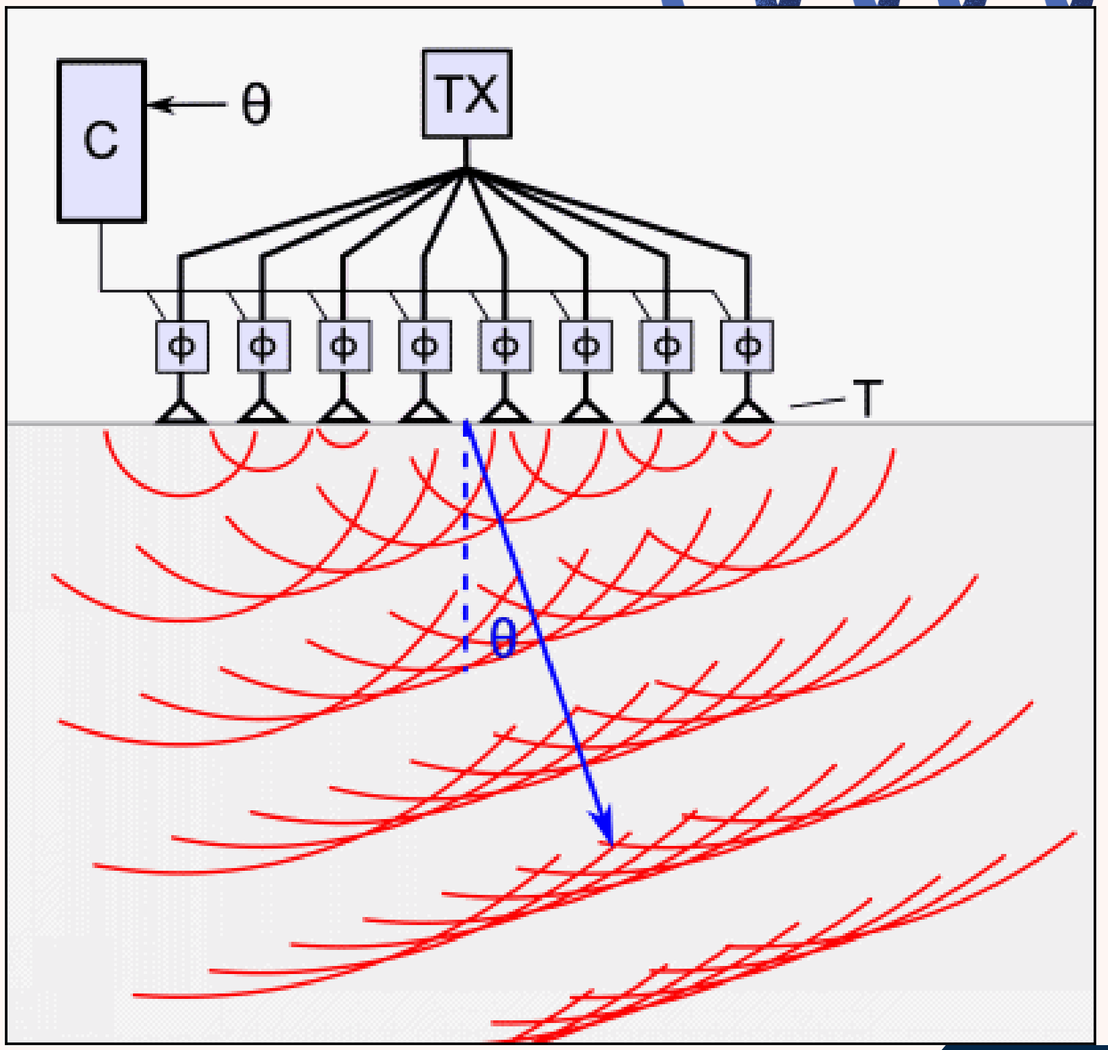
Idea of the Project





The Problem

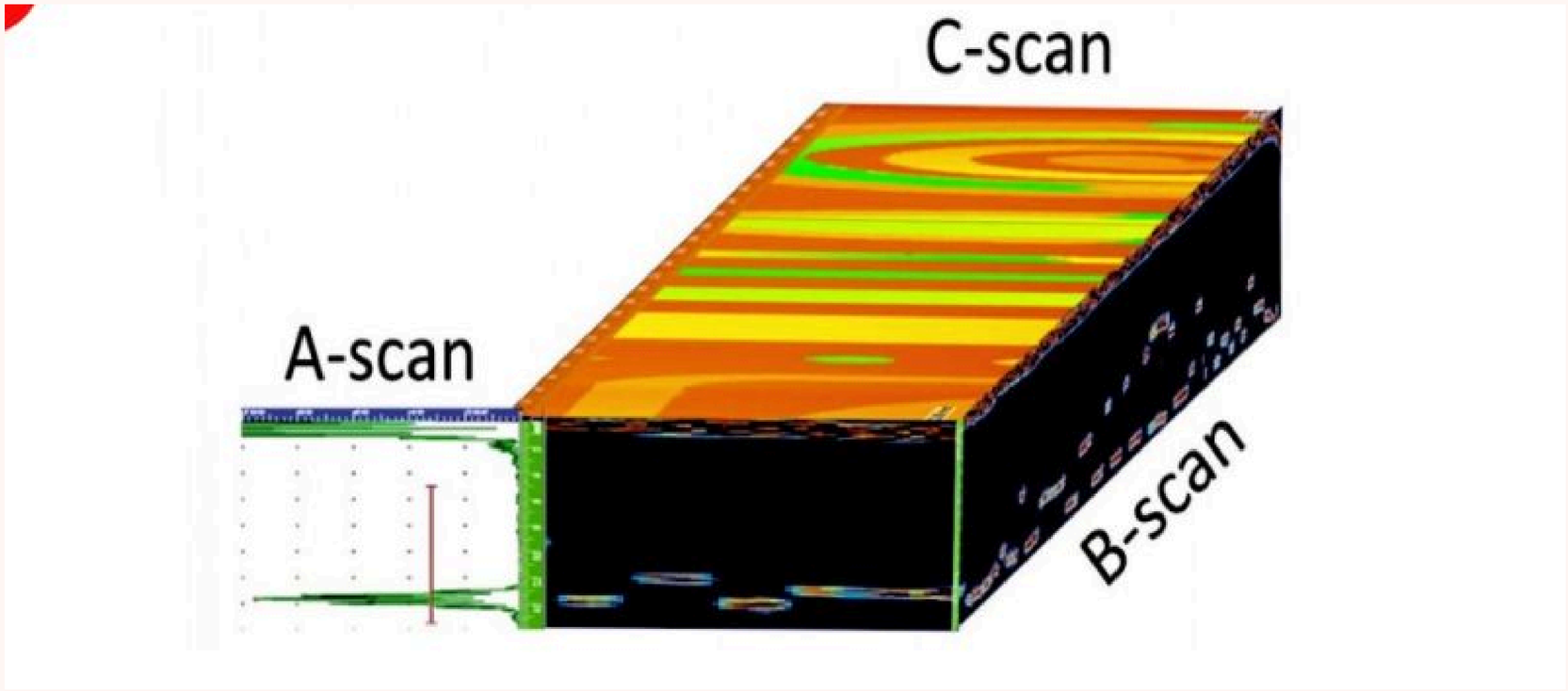




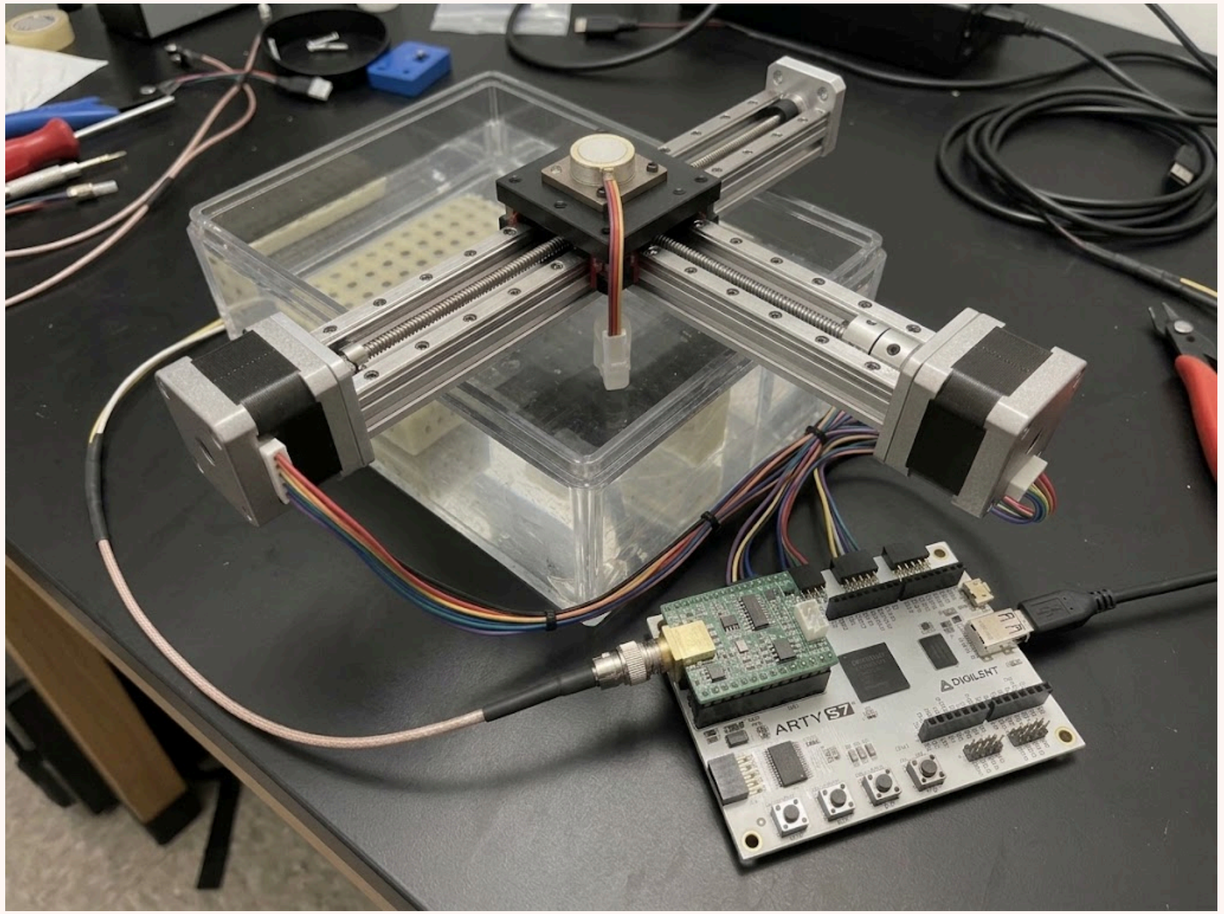
Transducer



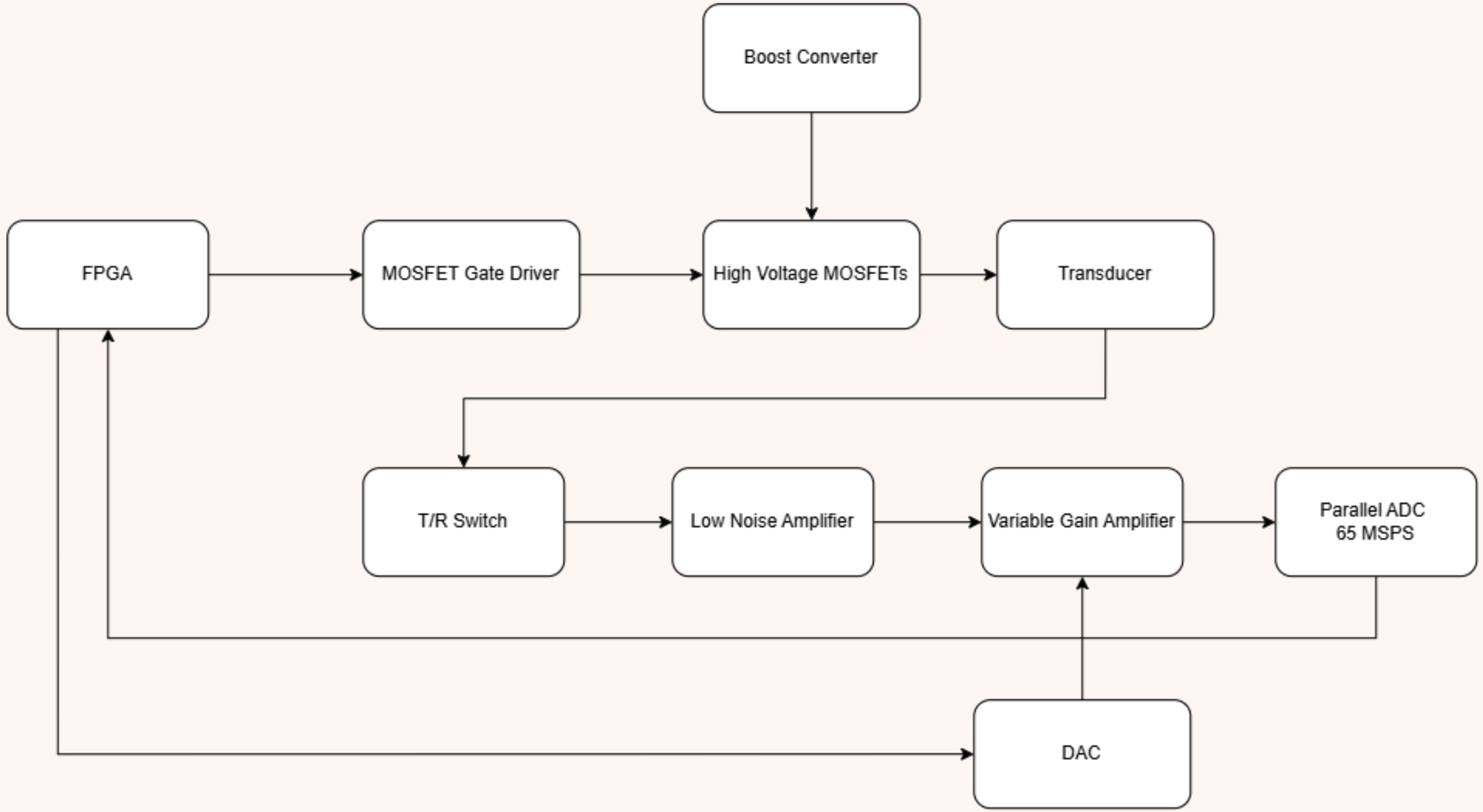
A Scan vs B Scan vs C Scan



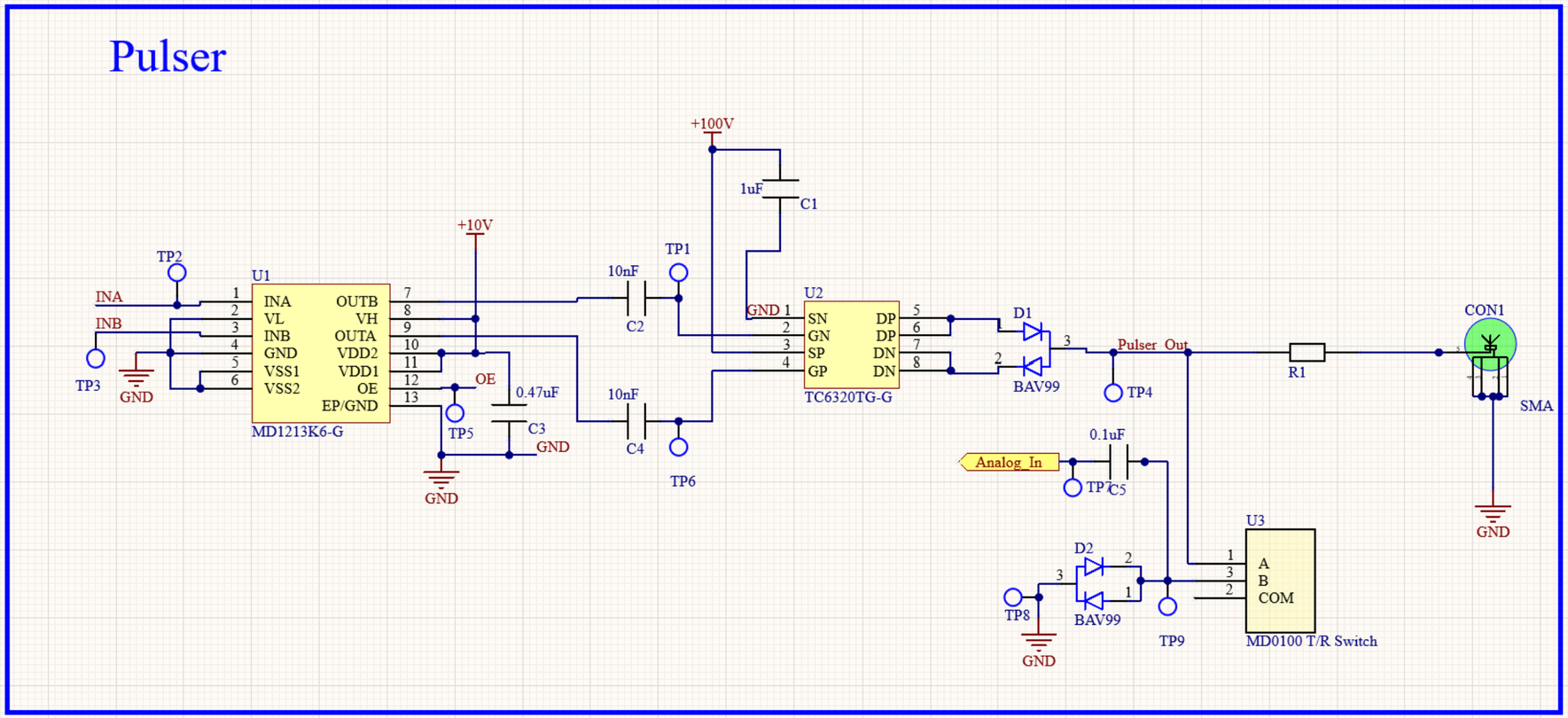
Our Version of the Ultrasound Scanner



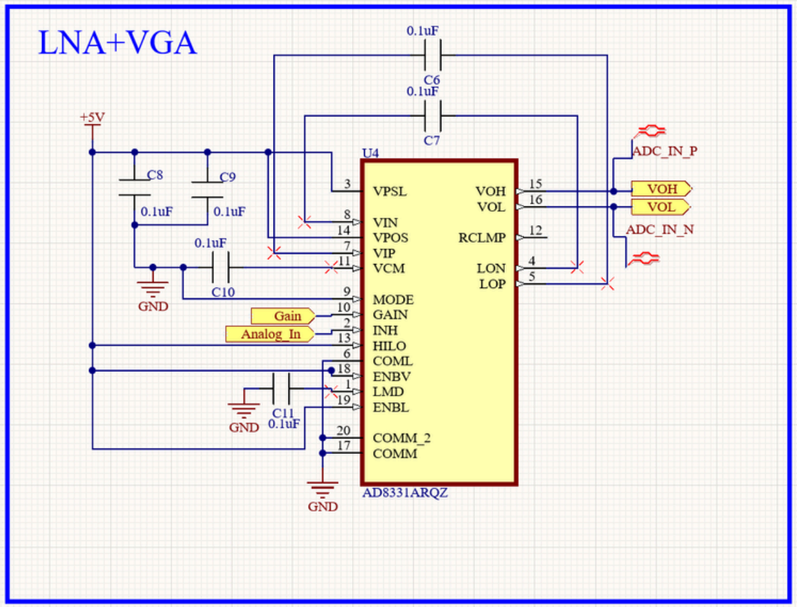
Simplified Diagram

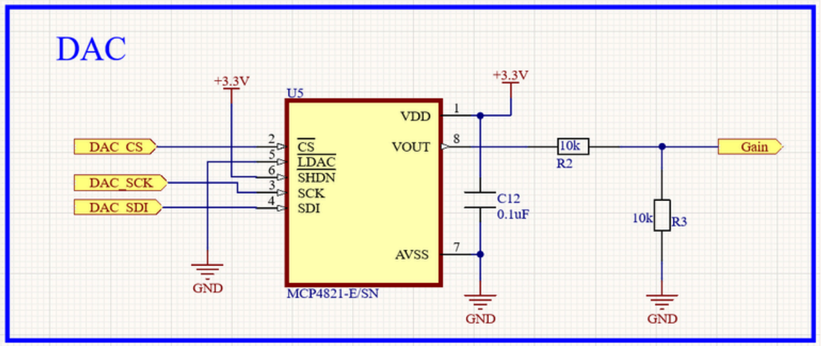


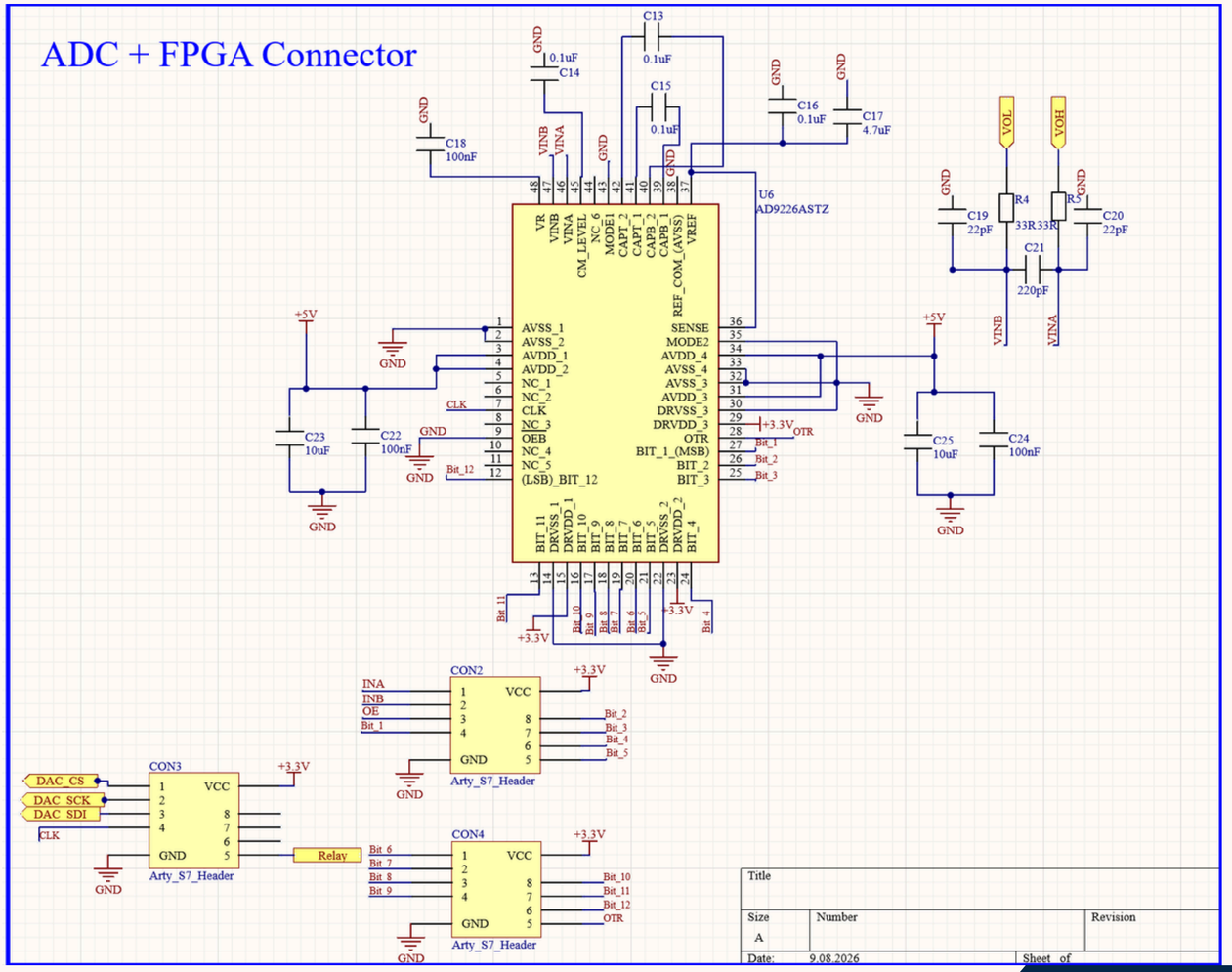
Schematic


Pulser
+100V
1uF
C1
+10V
TP2
INA
INB
TP3
GND
U1
INA
VL
INB
GND
VSS1
VSS2
OUTB
VH
OUTA
VDD2
VDD1
OE
EP/GND
MD1213K6-G
OE
0.47uF
C3
GND
TP5
GND
10nF
C2
TP1
10nF
C4
TP6
U2
GND
SN
GN
SP
GP
DP
DP
DN
DN
TC6320TG-G
D1
BAV99
Pulser_Out
TP4
R1
CON1
SMA
GND
Analog_In
0.1uF
TP7
C5
D2
BAV99
TP8
GND
TP9
U3
A
B
COM
MD0100 T/R Switch

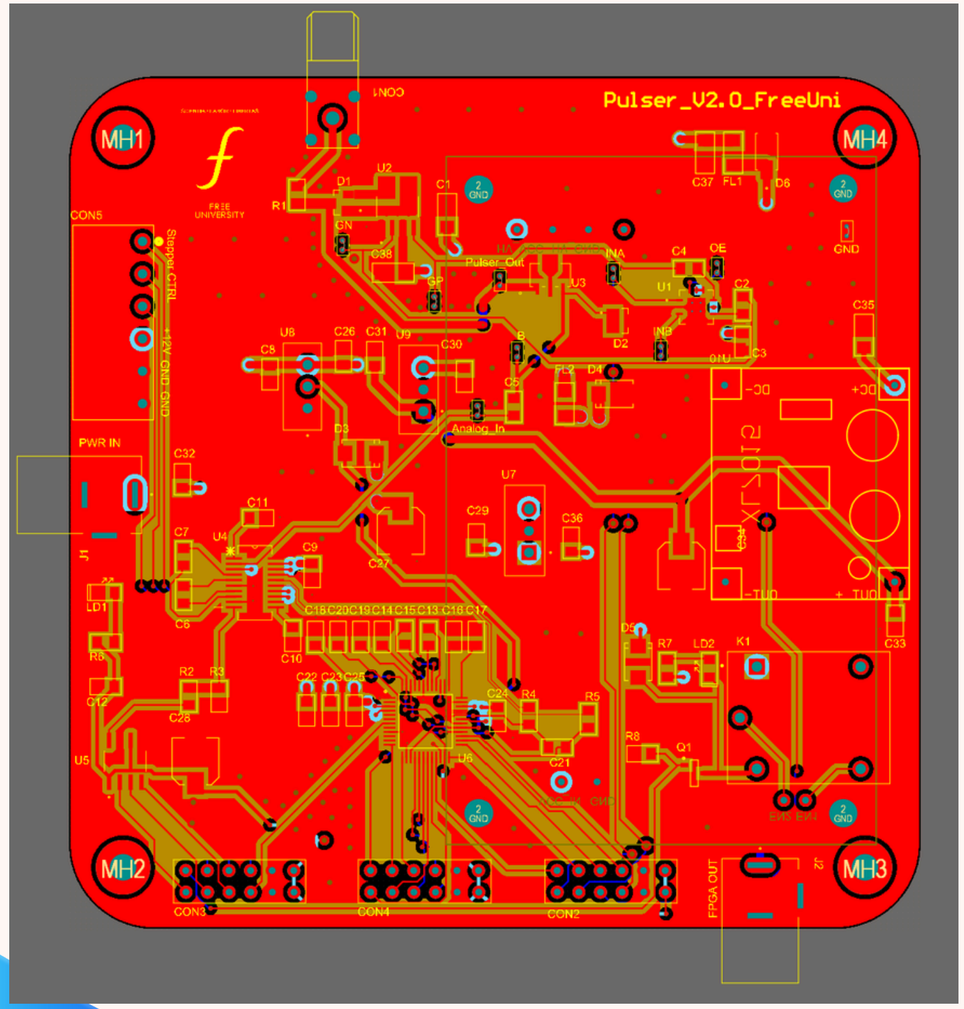
Schematic

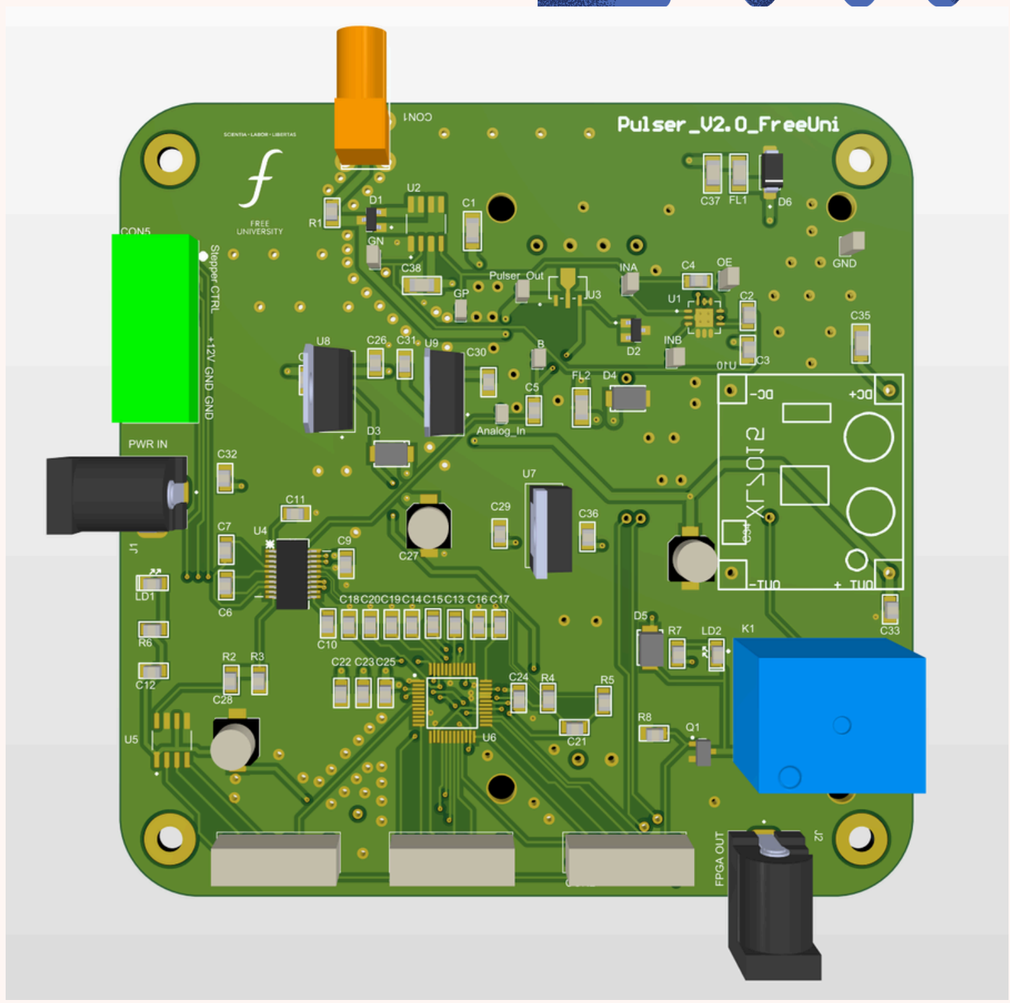

LNA+VGA
0.1uF
C6
0.1uF
C7
+5V
C8
0.1uF
C9
0.1uF
0.1uF
C10
GND
U4
VPSL
VIN
VPOS
VIP
VCM
MODE
GAIN
INH
HILO
COML
ENBV
LMD
ENBL
COMM_2
COMM
VOH
VOL
RCLMP
LON
LOP
ADC_IN_P
VOH
VOL
ADC_IN_N
Gain
Analog_In
C11
0.1uF
AD8331ARQZ


DAC
+3.3V
U5
DAC_CS
DAC_SCK
DAC_SDI
CS
LDAC
SHDN
SCK
SDI
VDD
VOUT
AVSS
MCP4821-E/SN
10k
R2
Gain
C12
0.1uF
10k
R3
GND

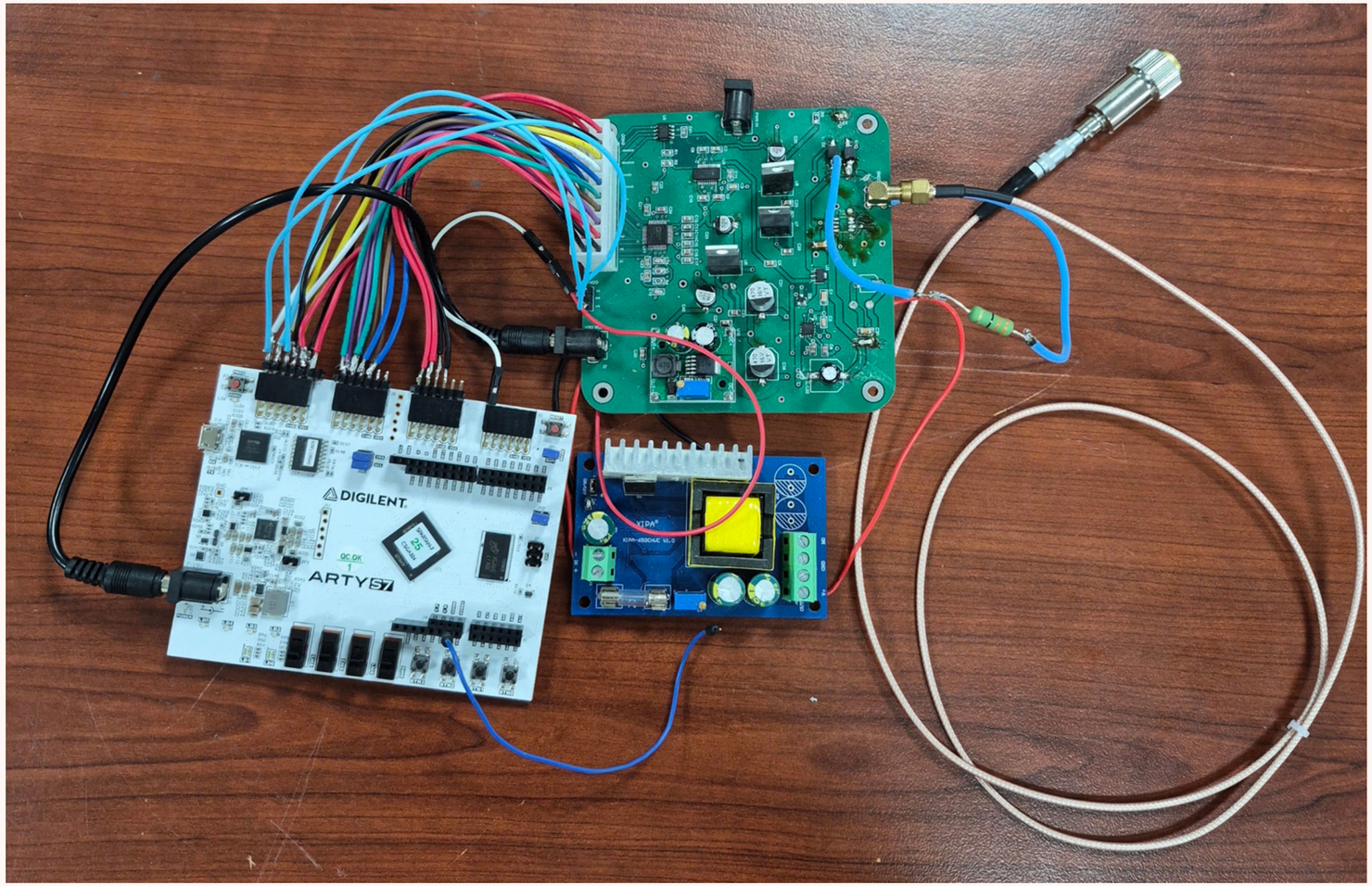

ADC + FPGA Connector
C13
0.1uF
C14
0.1uF
C15
0.1uF
C16
0.1uF
C17
4.7uF
C18
100nF
U6
AD9226ASTZ
AVSS_1
AVSS_2
AVDD_1
AVDD_2
NC_1
NC_2
CLK
NC_3
OEB
NC_4
NC_5
(LSB)_BIT_12
SENSE
MODE2
AVDD_4
AVSS_4
AVSS_3
AVDD_3
DRVSS_3
DRVDD_3
OTR
BIT_1_(MSB)
BIT_2
BIT_3
C23
10uF
C22
100nF
C25
10uF
C24
100nF
R4
33R
R5
33R
C19
22pF
C20
22pF
C21
220pF
VOL
VOH
VINB
VINA
+5V
+3.3V
GND
CON2
Arty_S7_Header
CON3
Arty_S7_Header
CON4
Arty_S7_Header
Relay
DAC_CS
DAC_SCK
DAC_SDI
CLK
INA
INB
OE
Bit_1
Bit_2
Bit_3
Bit_4
Bit_5
Bit_6
Bit_7
Bit_8
Bit_9
Bit_10
Bit_11
Bit_12
OTR
Title
Size
A
Number
Revision
Date:
9.08.2026
Sheet of

PCB

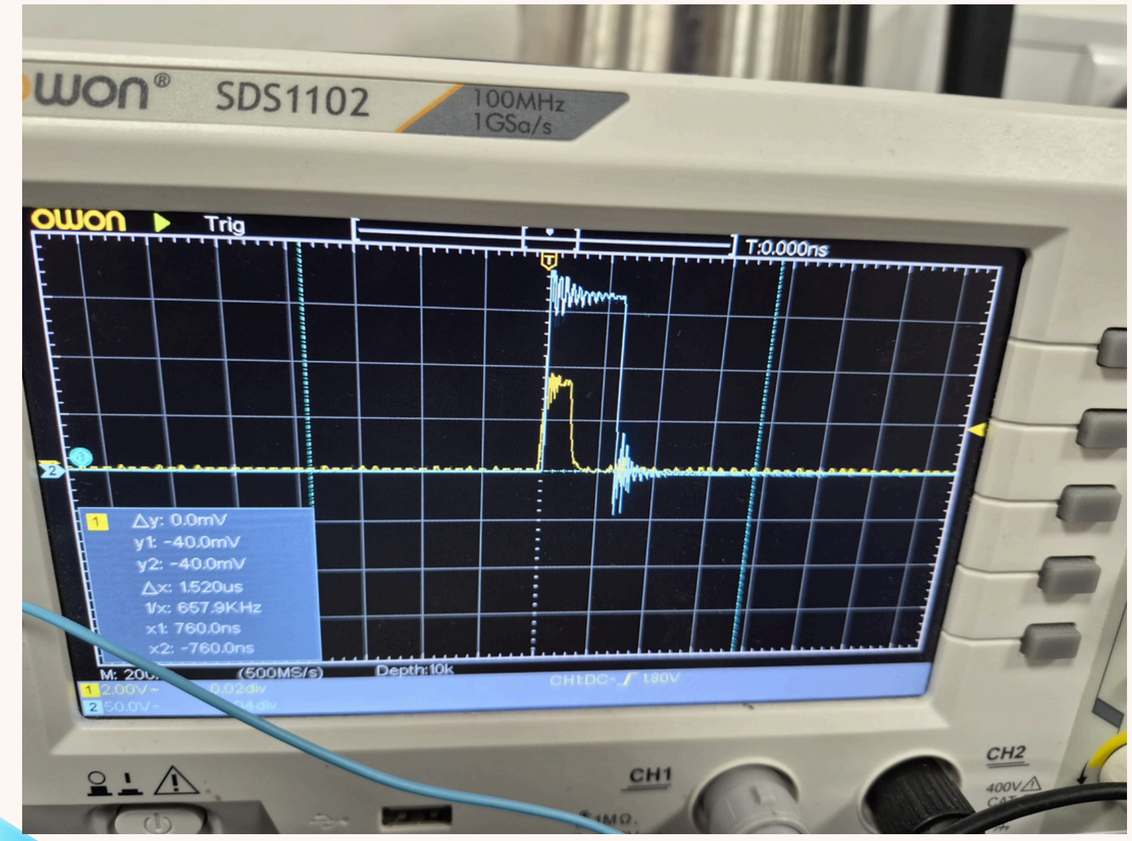

Pulser_V2.0_FreeUni
MH1
MH2
MH3
MH4
CON1
CON2
CON3
CON4
CON5
PWR IN
FPGA OUT
Pulser_Out
Analog_In
Stepper CTRL
+12V GND GND

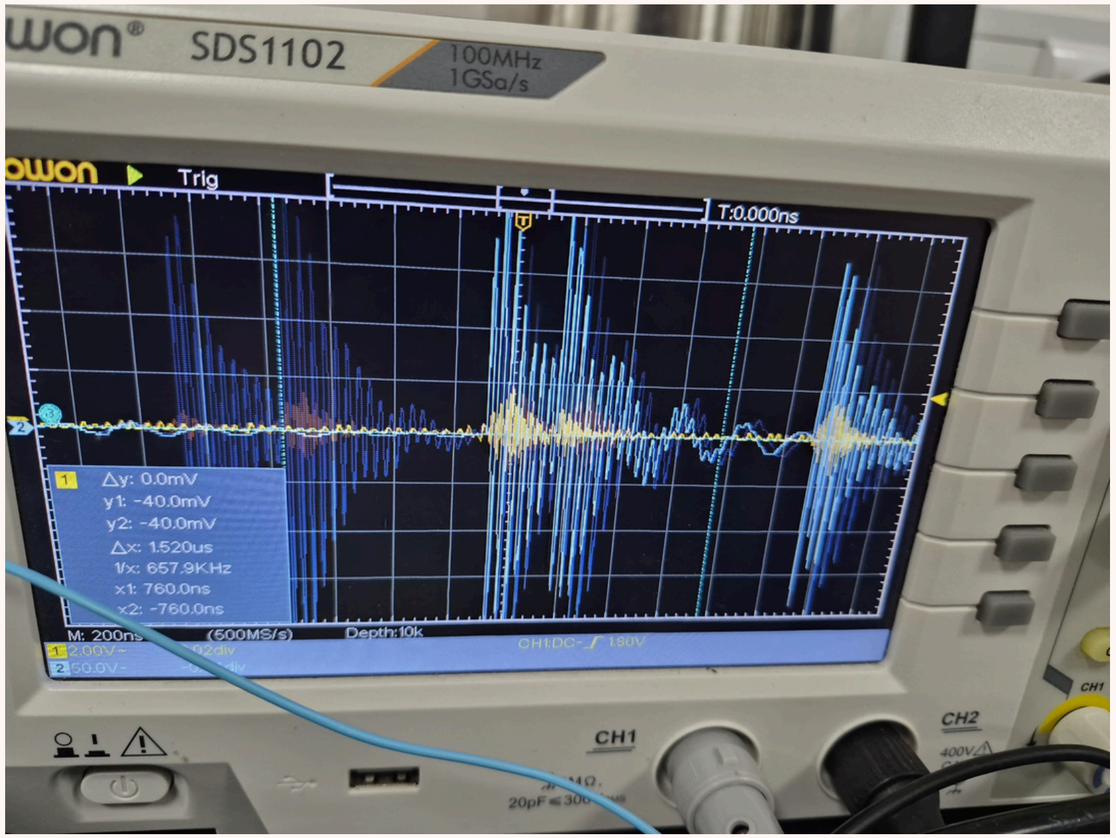

Pulser_V2.0_FreeUni
CON1
CON5
PWR IN
FPGA OUT
Pulser_Out
Analog_In
Stepper CTRL
+12V GND GND

First Version

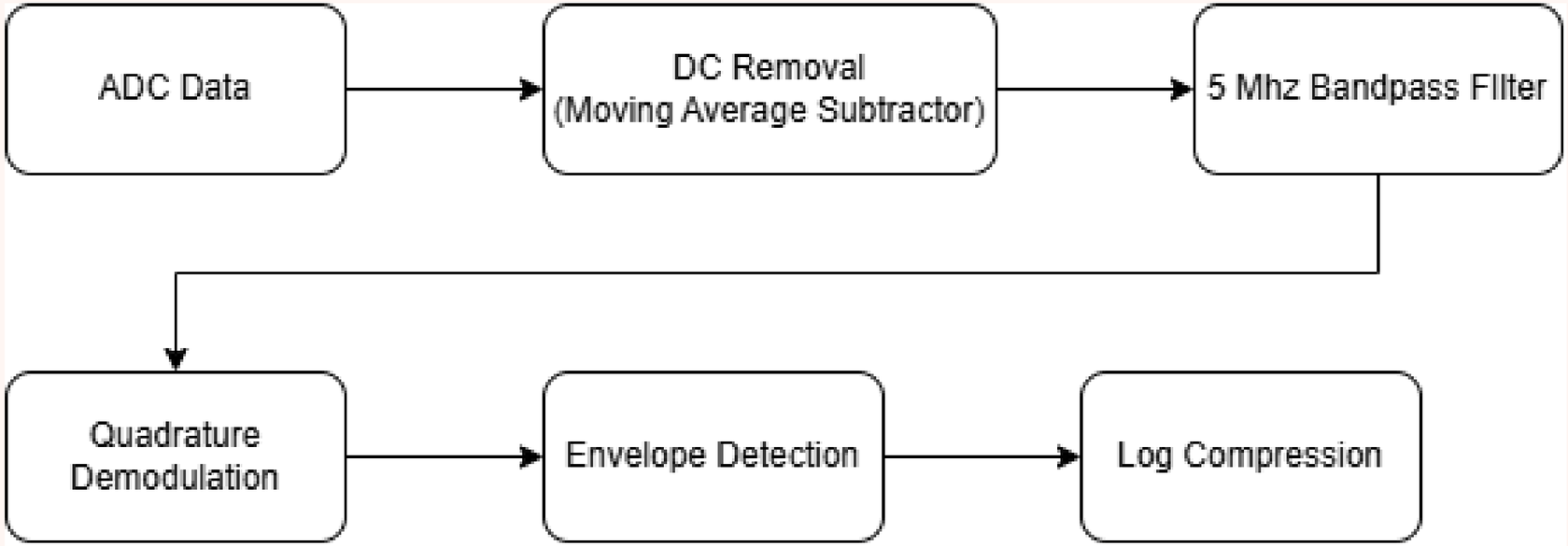


Problems with v1.0

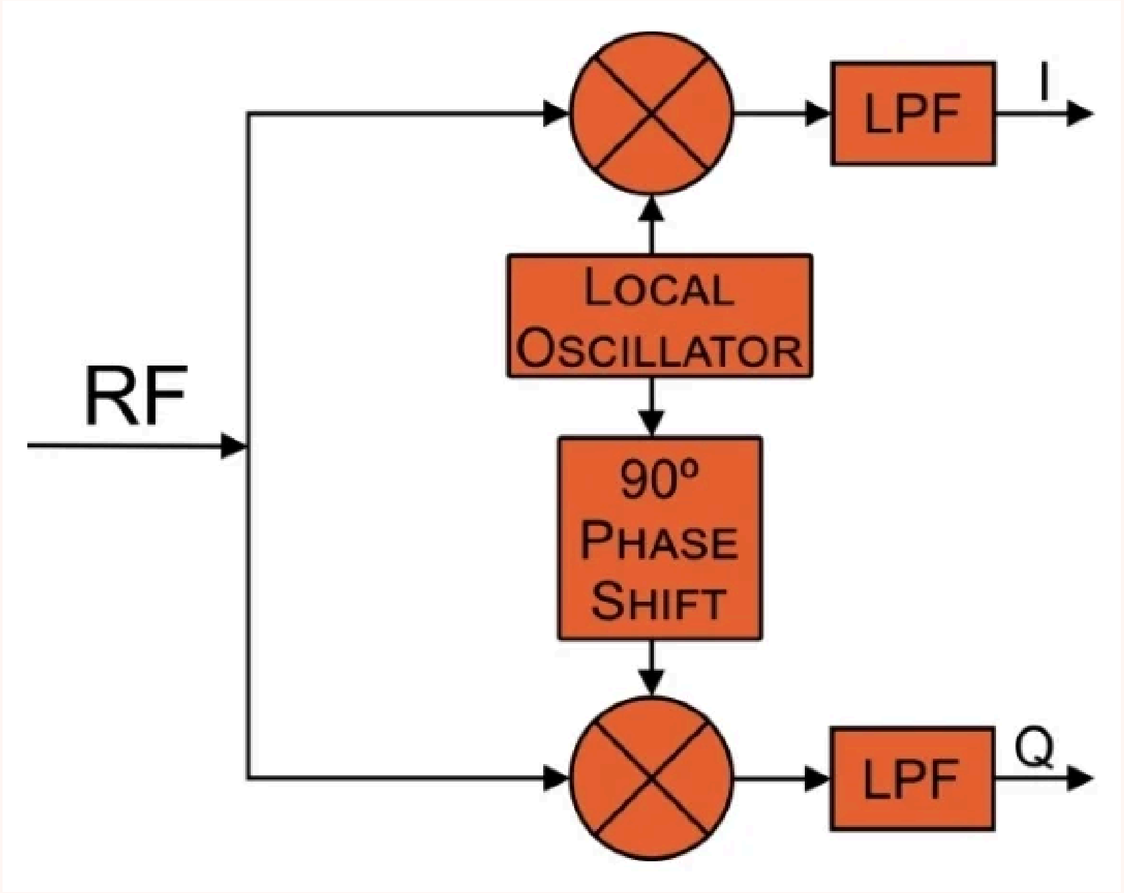




DSP


ADC Data
DC Removal
(Moving Average Subtractor)
5 Mhz Bandpass FIlter
Quadrature
Demodulation
Envelope Detection
Log Compression

Quadrature Demodulation



Thank You

