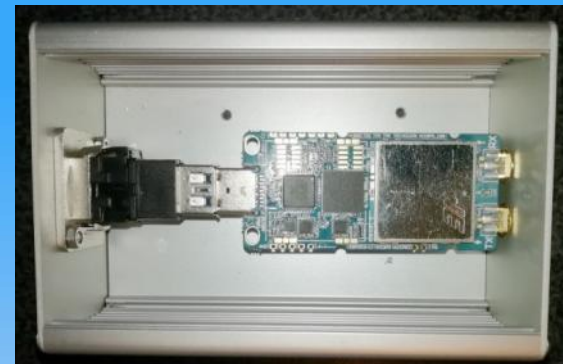




Using the LimeSDR on the Microwave Bands

Dave G8GKQ

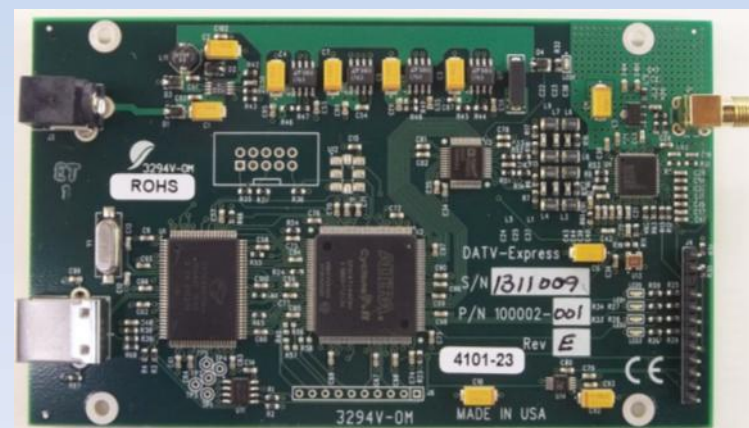


Topics

-  Available SDRs
-  Why the LimeSDR?
-  Transmit Basics
-  Microwave-specific Problems
-  Transmit Systems
-  Receive Systems
-  LimeSDR Options
-  Questions

Available SDRs

 Pluto	12 bit, 6 GHz
 LimeSDR	12 bit, 3.5 GHz
 HackRF	8 bit, 6 GHz
 Ettus family	12 bit, 6 GHz
 DATV Express	14 bit, 2.45 GHz
 Airspy	12 bit, 1.7 GHz
 RTL-SDR	8 bit, 1.7 GHz
 SDR Play	14 bit, 2 GHz



Transmit Basics



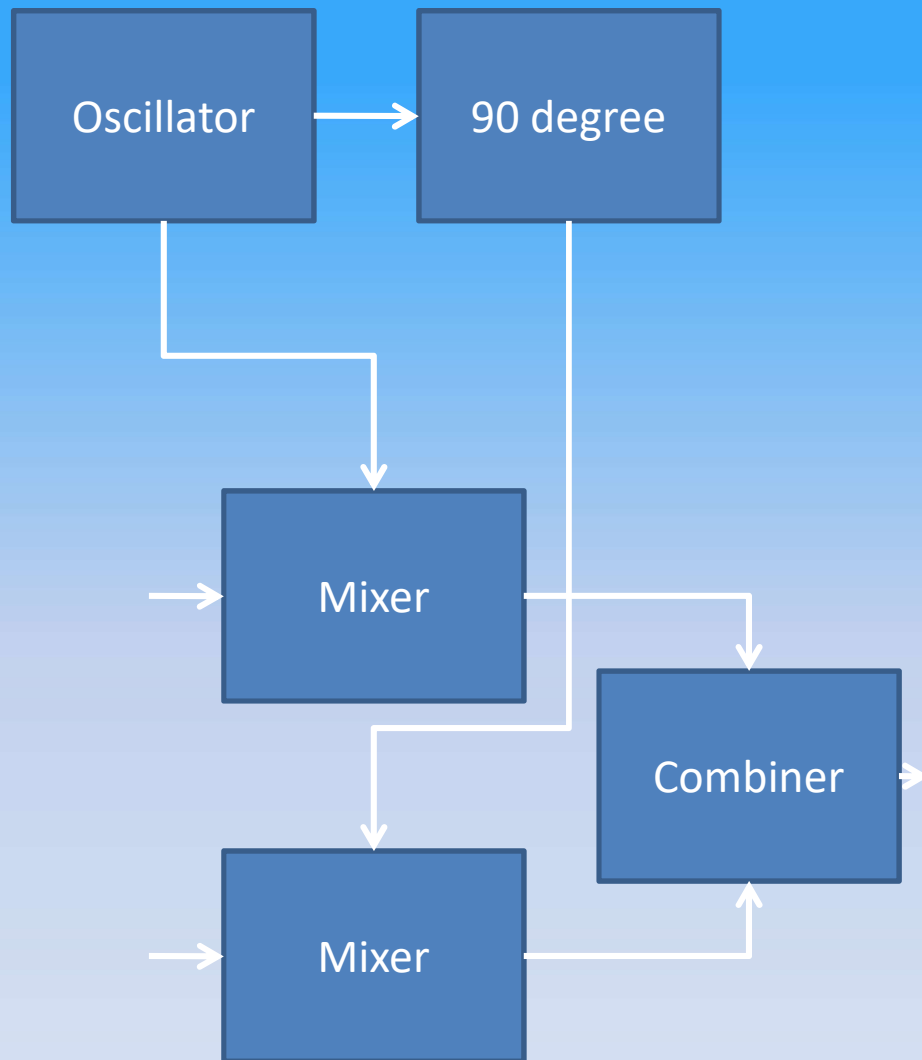
Oscillator



90 degree phase shift

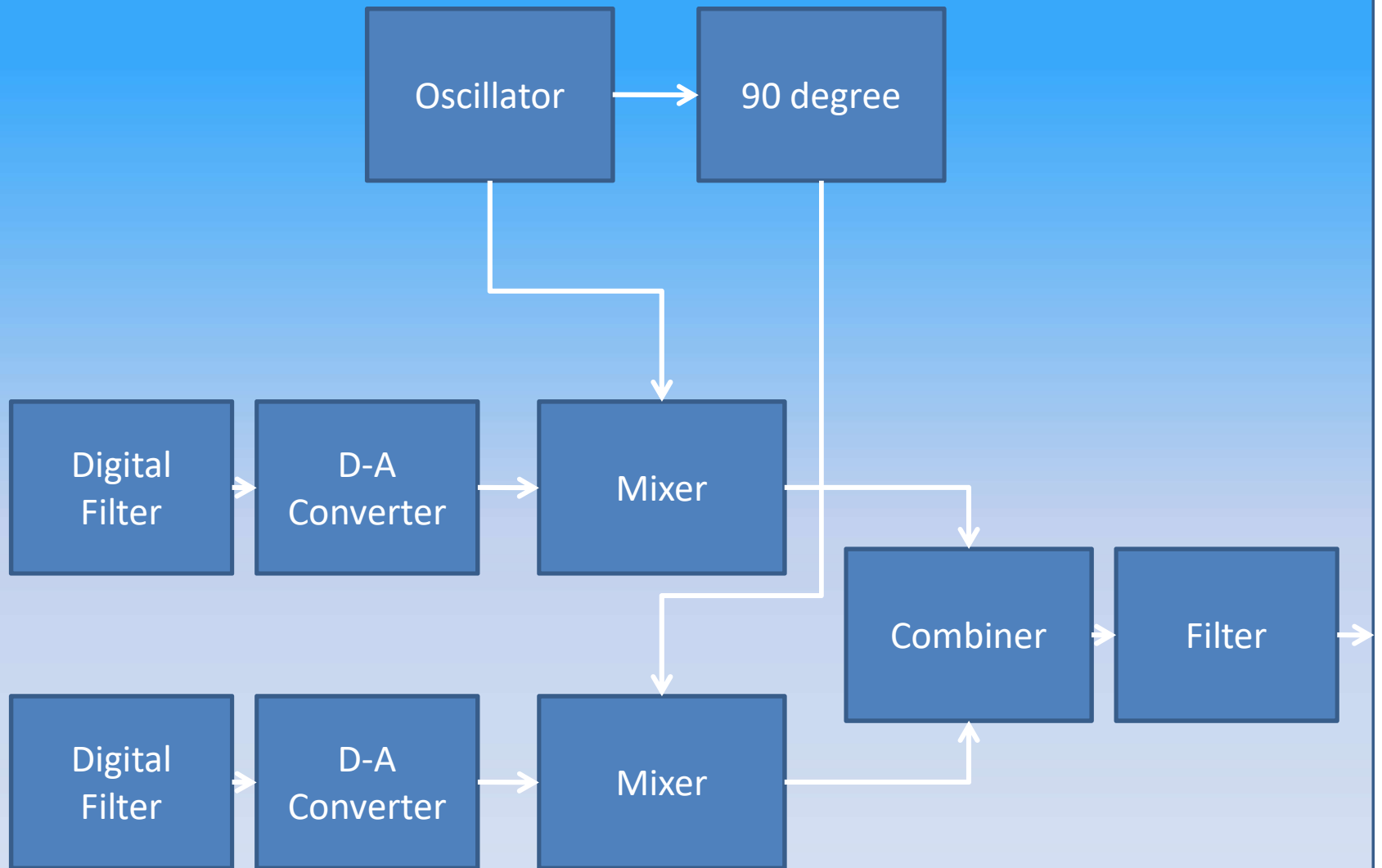


Two mixers



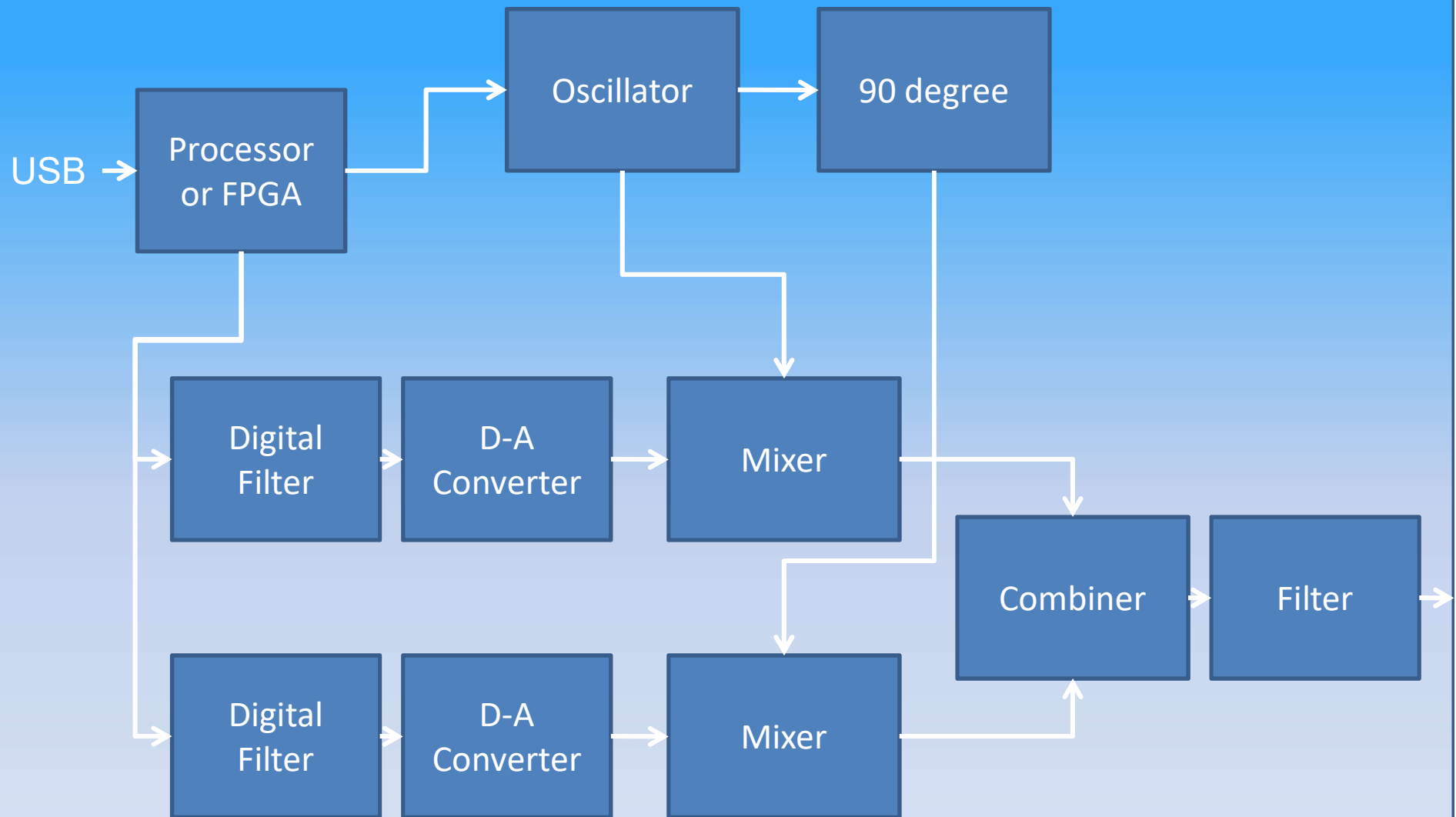
Transmit Basics

-  Oscillator
-  90 degree phase shift
-  Two mixers
-  2 Digital to analogue converters
-  Digital input filtering
-  Output filtering



Transmit Basics

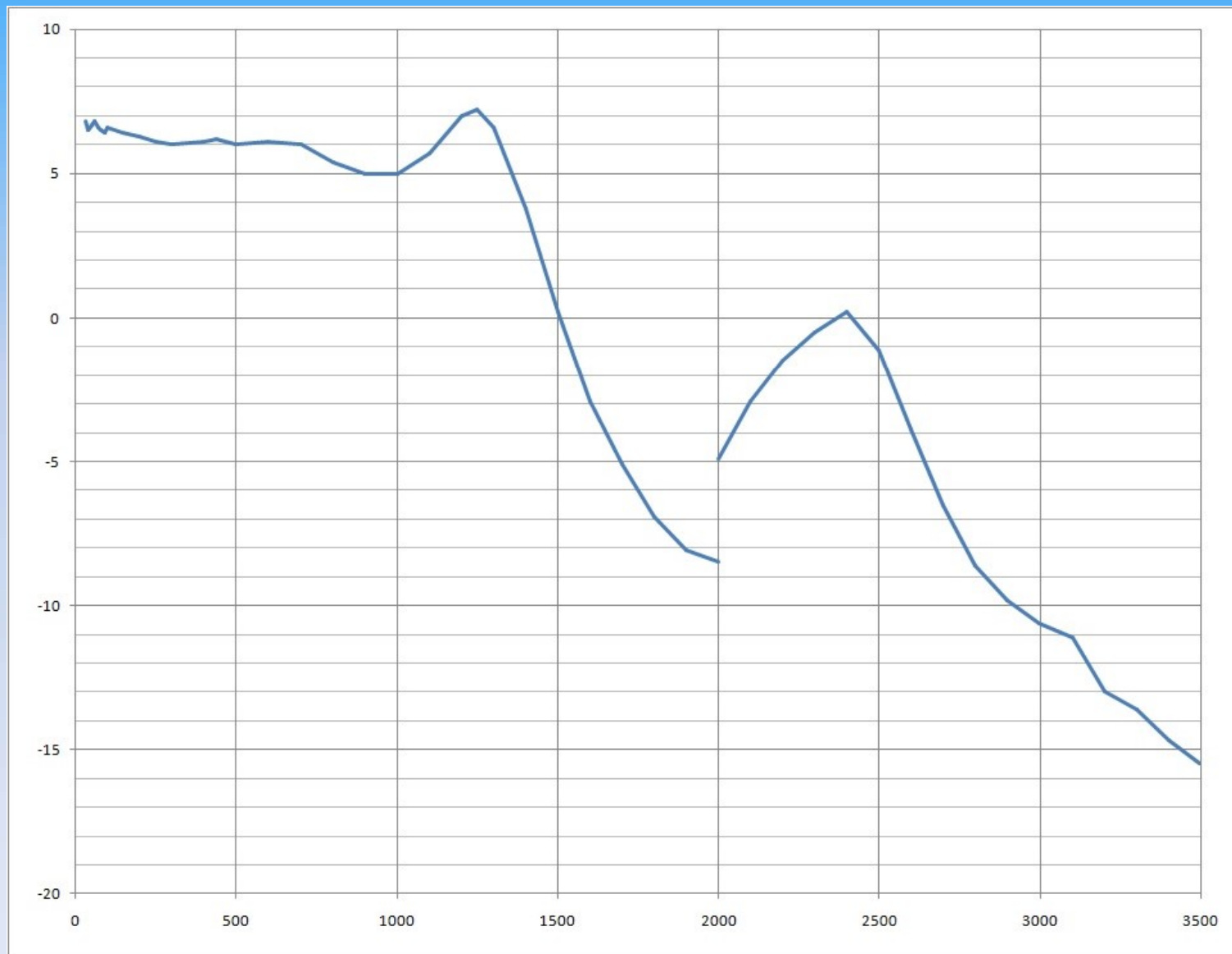
-  Oscillator
-  90 degree phase shift
-  Two mixers
-  2 Digital to analogue converters
-  Digital input filtering
-  Output filtering
-  Programmable input logic



Microwave-specific Problems

-  Oscillator Phase Noise
-  Reference Oscillator drift
-  Modulation-induced Noise
-  Mixer balance and calibration
-  Calibration spike
-  Reduced Output Power

Lime Mini Output Levels



Transmit Systems (DATV)



Portsdown

- LimeSDR
- DATV Express



DATV Express

- DATV Express Hardware
- LimeSDR
- Pluto



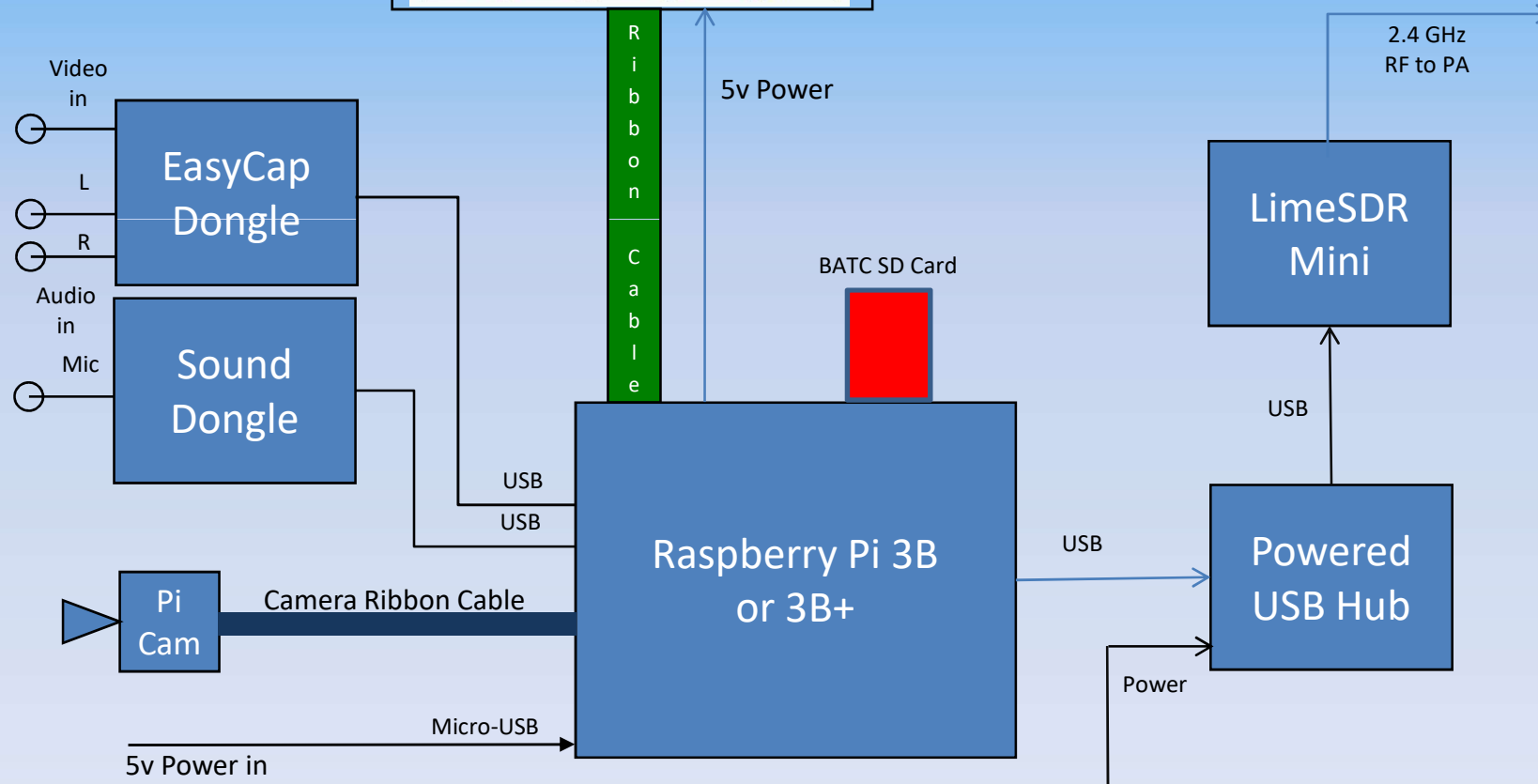
GNURadio

- LimeSDR
- Pluto
- Ettus



7 inch Touchscreen

BATC Portsdown Transmitter Main Menu				
TX		RX	M2	M3
Modulation	Encoder	Output to	Format	Source
DVB-S	H264	Ugly	4:3	PiScreen
Freq	Sym Rate	FEC	Band/Tvtr	Att Level
437 MHz	333	7/8	70_cm	-10.00
EasyCap	Caption	Audio	Atten	
Comp Vid	On	Auto	NONE	
Preset 1	Preset 2	Preset 3	Preset 4	Store
146.5_333	437_1MS	1255_HD	437-Ugly	Preset



Portsdown 2019

Transmit Systems (FM/SSB/CW)



SDRConsole

- Nearly Everything!



SDRangel

- LimeSDR, Pluto, HackRF



DATV Express Server

- DATV Express



GNU Radio

- LimeSDR, Pluto, Ettus



Bare Metal using CSDR

Bare Metal Transmit



Take the BATC Portsdown build



Install csdr:

- `git clone https://github.com/simonyisk/cskr`
`cd csdr`
`make`
`sudo make install`
`cd ~`



and run:

- `arecord -c1 -r48000 -D default -fS16_LE -B 20 -`
`| csdr convert_i16_f \ | csdr dsb_fc \`
`| csdr bandpass_fir_fft_cc 0.002 0.06 0.005 | csdr fastagc_ff`
`| csdr fir_interpolate_cc 8| csdr convert_f_i16`
`| sudo rpidatv/bin/limesdr_toolbox/limesdr_send`
`-s 384e3 -f 145.5e6 -b 2.5e6 -g 0.75 -a BAND2 -q 0 -l 1000`

Receive Systems

 SDR Console

 SDR Sharp

 SDRangel

 DVB-S2 GUI

 GQRX

 GNU Radio

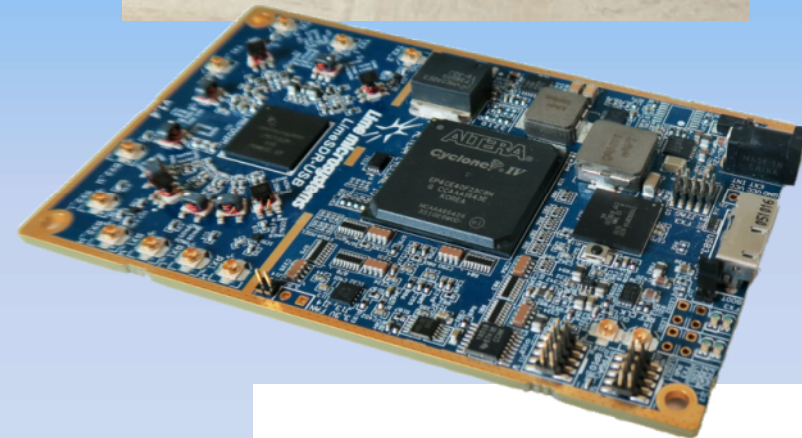
 RTL-FM

Why LimeSDR?

-  Open-source c/c++ codebase
-  Reasonable Output Power
-  Good resolution
-  Wide adoption
-  Overcame early teething troubles

LimeSDR Options

-  LimeSDR Mini
-  LimeSDR USB
-  LimeNET Micro
-  (LimeRFE)



Portsdown on LimeNet Micro

-  All-in-One SDR TX
-  LimeSDR Mini-like
-  Integrated GPS
-  RPi Compute Module CM3+
-  RPi 7" Touchscreen and Camera
-  RJ45 Ethernet (POE) or 5 v DC Power
-  Single-board Portsdown



Decisions

-  SDR for Receive only?
-  SDR for Spectrum viewer?
-  SDR for TX?
-  TX at IF or at final frequency?
-  Do you want a PC for portable ops?
-  Is there an “appliance” solution?

Summary/Advice

-  Lots of SDRs out there
-  Many SDR software applications
-  Decide what you want to do
-  Buy the SDR for your needs/budget
-  Try some of the software
-  Pick software that suits you and dive deep

Questions

Questions



Portsdown: https://wiki.batc.org.uk/Portsdown_2019



DVB-S2 GUI: <https://forum.amsat-dl.org/index.php?thread/101-software-dvb-s-demodulator/>



SDRAngel: <https://github.com/f4exb/sdrangel/releases>