SDR

Software **D**efined **R**adio:s

No more analog radio ?

Tilman D. Thulesius
SM0JZT
Sektionsledare radioteknik SSA
radio.thulesius.se

Syfte med presentation

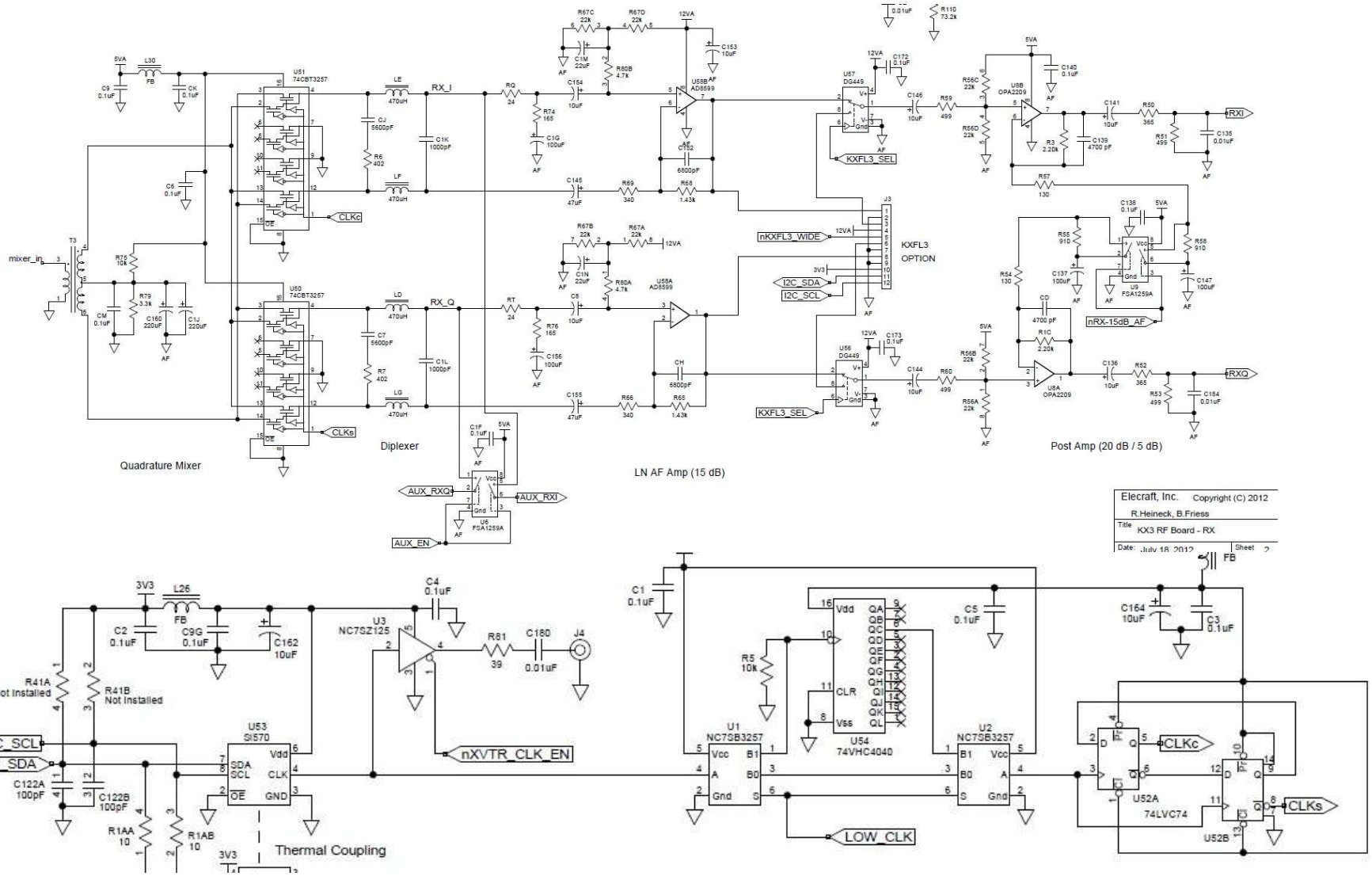
- Vi skriver 2026 i kalendern
- Mjukvara i allt
- Skalbart
- Kraftfullt
- Skära i kostnader

- Vi jämför olika SDR med fokus på mottagaren
- Digitalisera sändaren?
  - Förra året pratade vi om effektiv AM-sändare

ELECRAFT KX3

“Under luppen”
QTC November 2012…

radio.thulesius.se


Quadrature Mixer
Diplexer
LN AF Amp (15 dB)
Post Amp (20 dB / 5 dB)
KXFL3 OPTION
Thermal Coupling
Elecraft, Inc. Copyright (C) 2012
R.Heineck, B.Friess
KX3 RF Board - RX
Date: July 18, 2012
Sheet 2

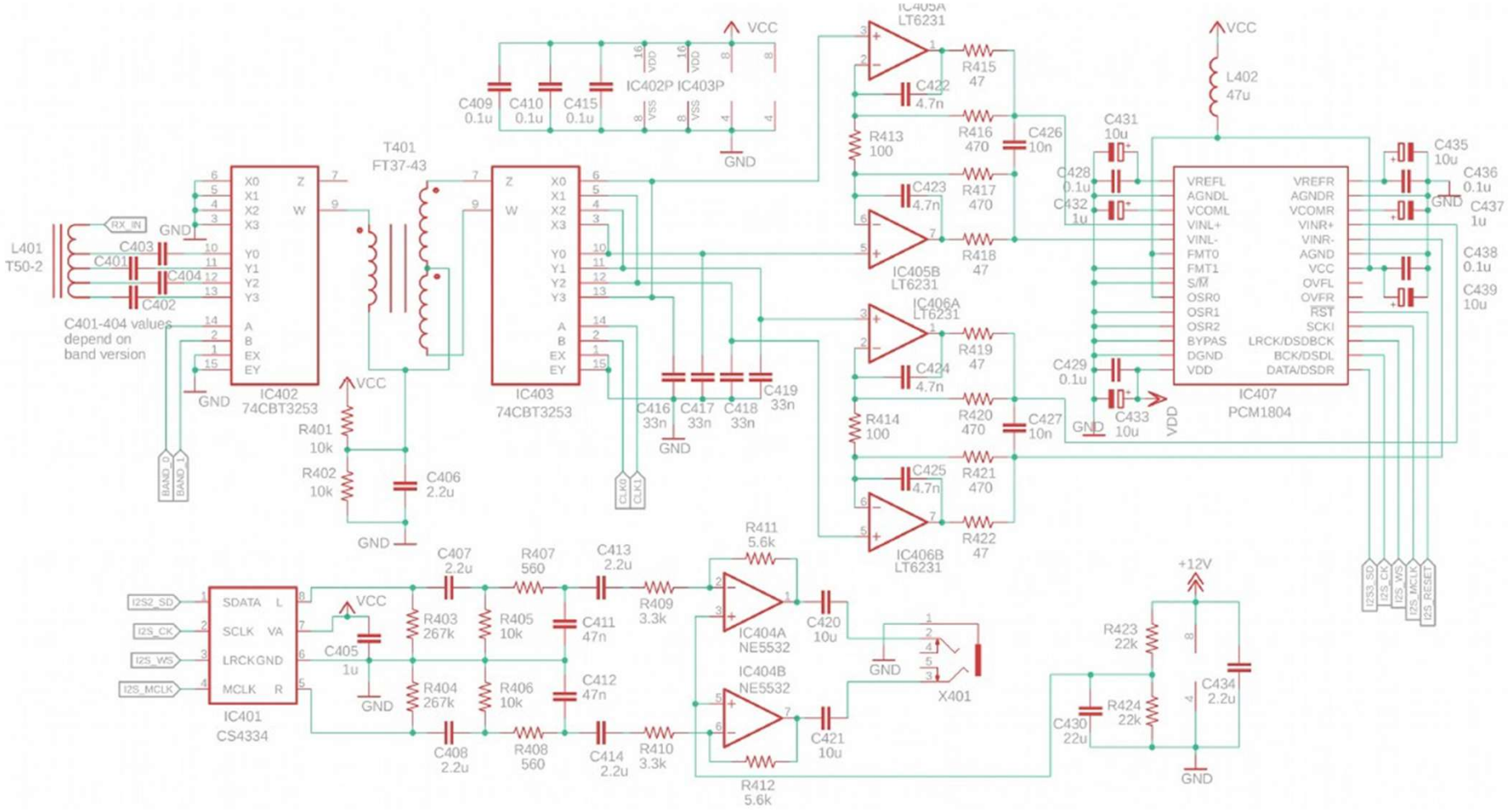
QRP-labs - QMX

Hans Summers – G0UPL

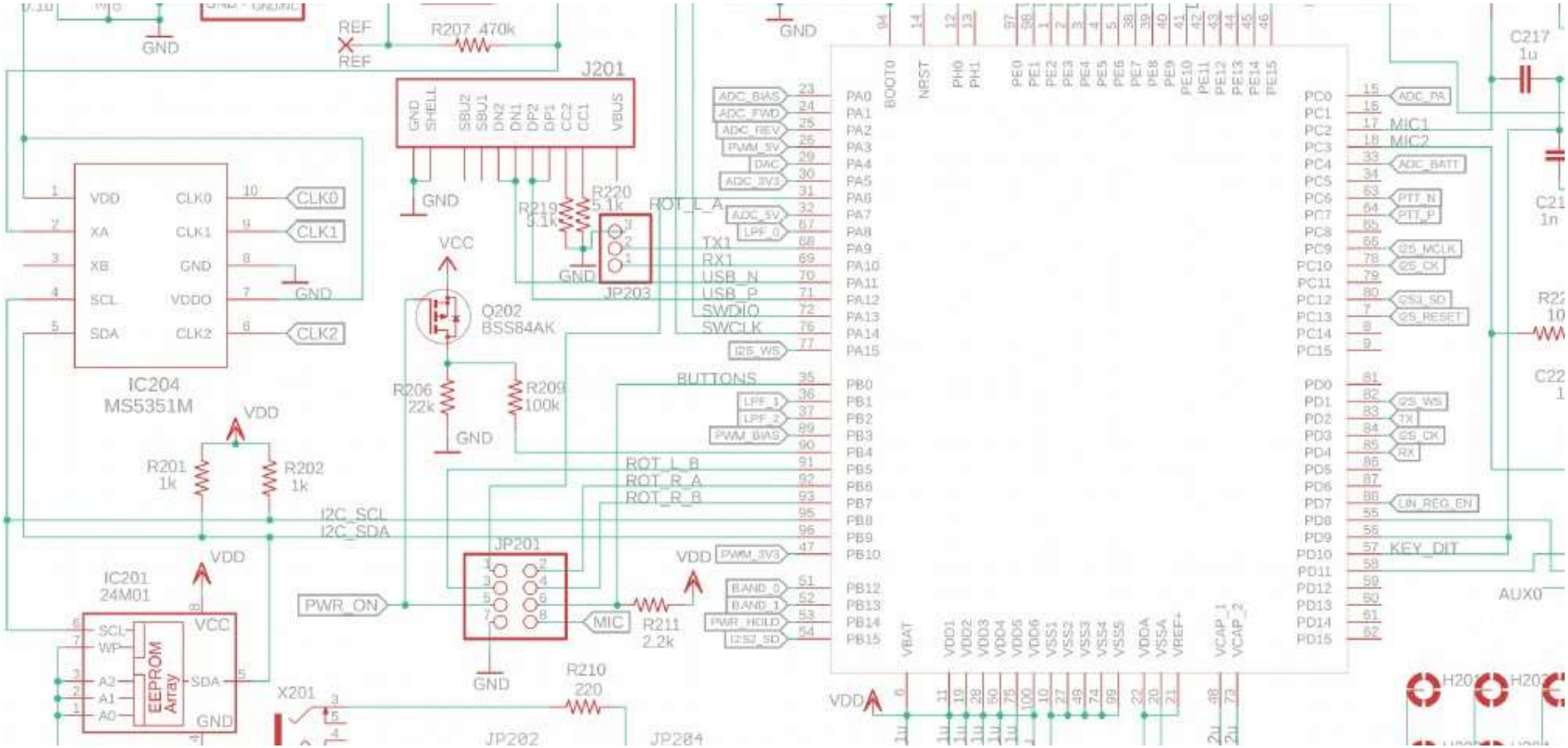
- CW-passionerad radioamatör
- Programmerare
- Hårdvaruutvecklare

Vill få flera att lära sig tekniken, bygga och använda QRP-radios.

qrp-labs.com

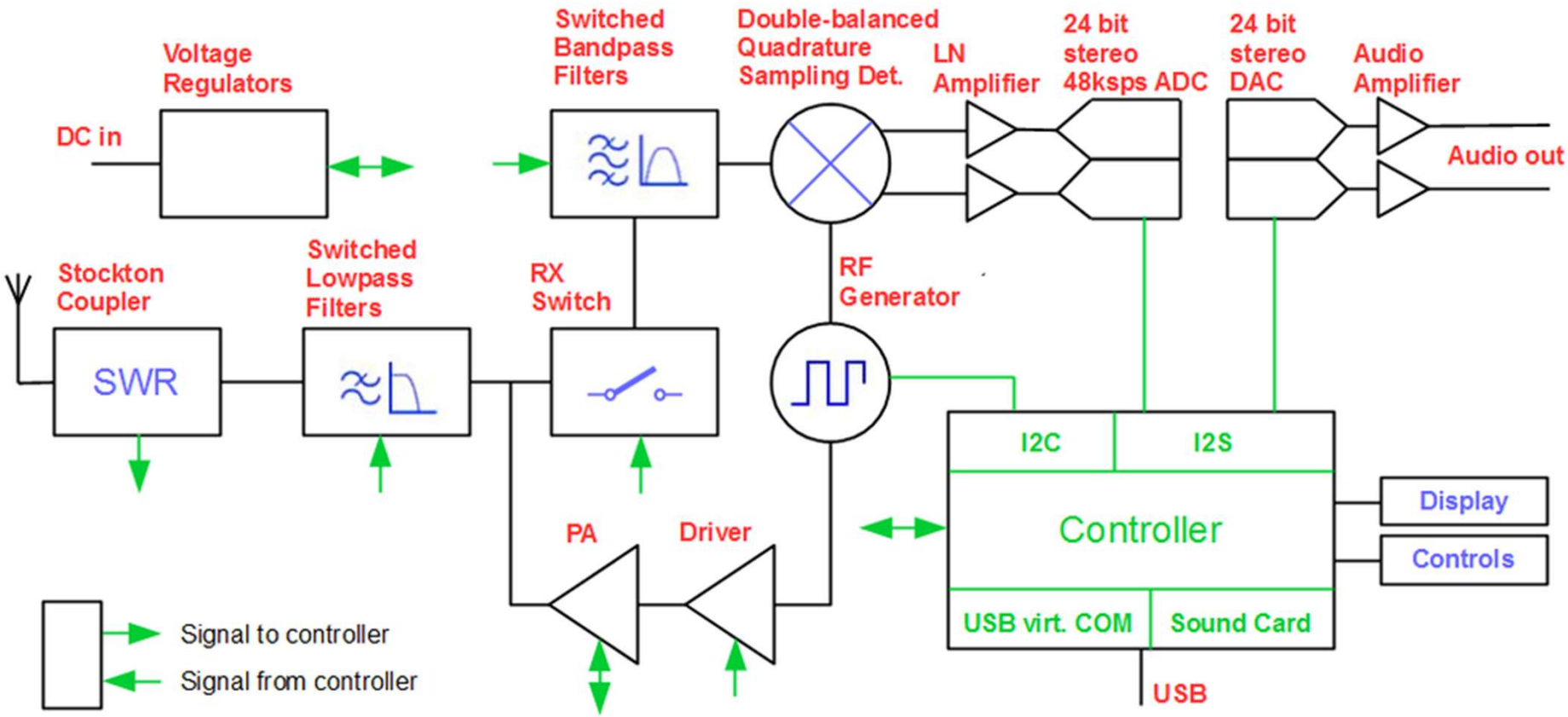


- x3253 Quadrature detector, PCM1804 A/D, CS4334 D/A

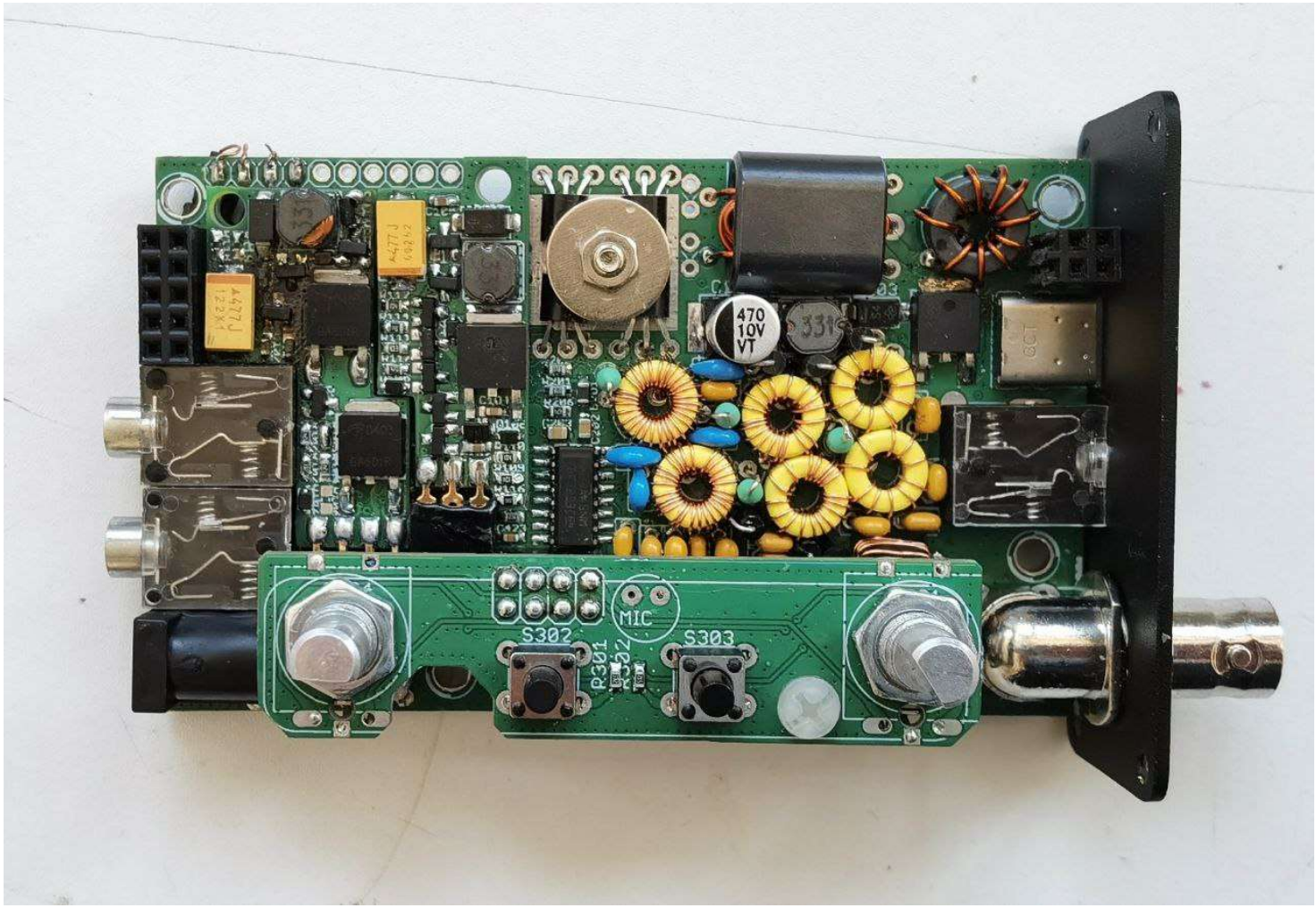


QMX CPU: **STM32F446** - 168MHz 32-bit ARM Cortex M4 with floating point unit, DSP instructions, 512K Flash and 128K RAM, I/O

MS5351M - I2C configurable, 3-channel output clock generator chip



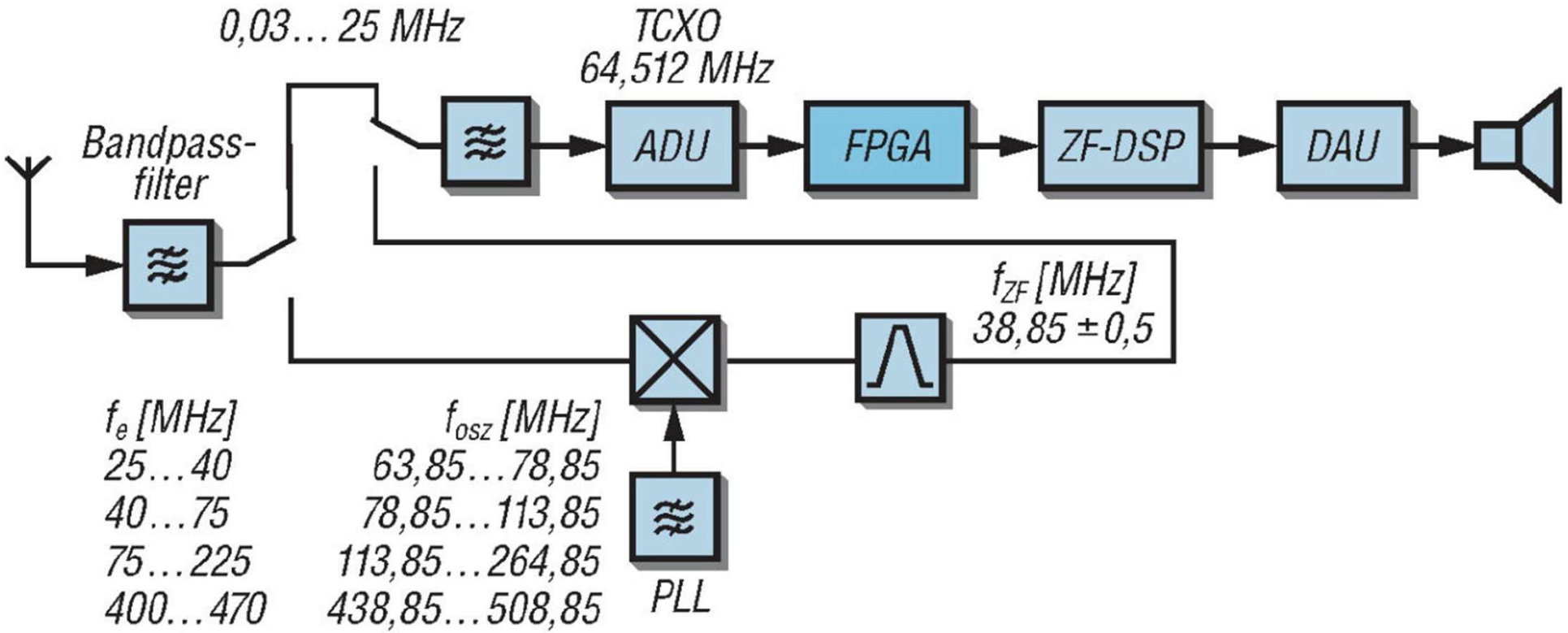
I2C = Inter Integrated Circuit, I2S = Inter IC Sound



“G0UPL on Polar modulation” – Mycket läsvärd artikel om tekniken för SSB i QMX

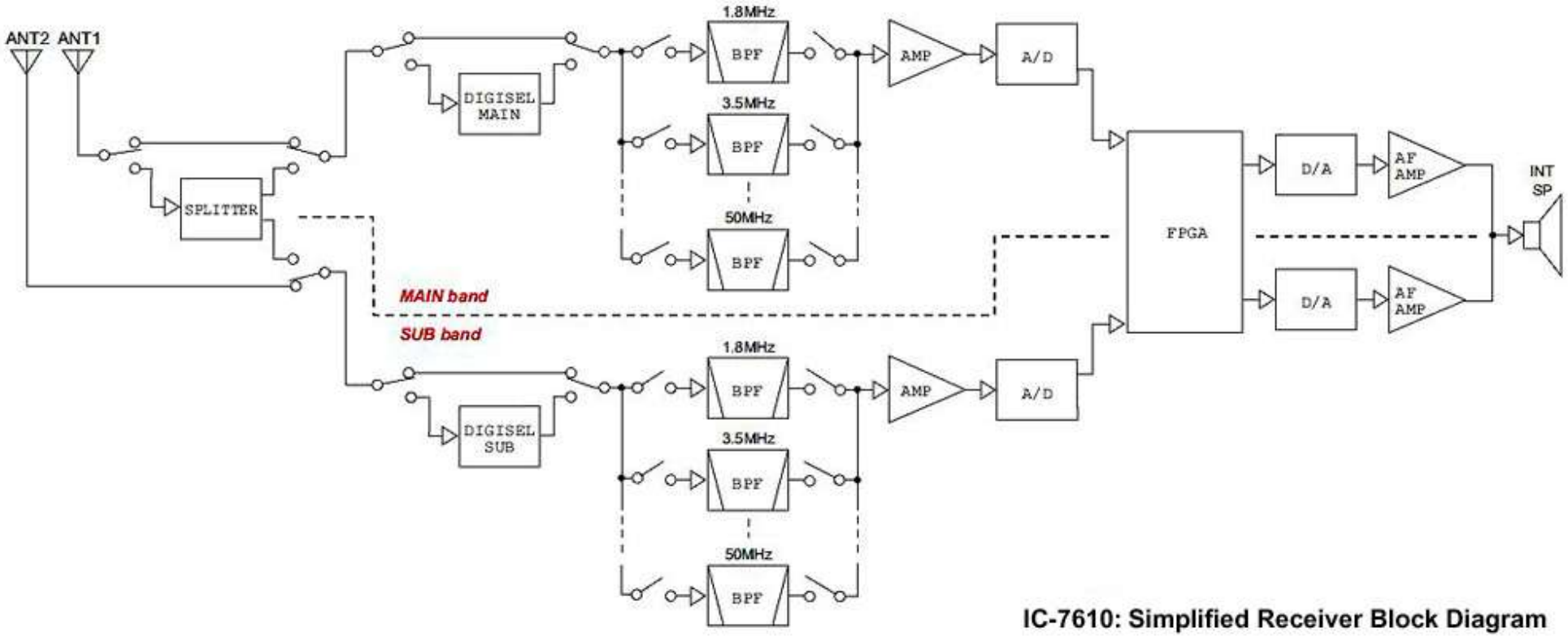
ICOM IC-705

160m – 70cm, 10W output, CW, SSB, AM, D-star
Inbyggd GPS, WiFi, Blåtand, Batteri


0,03… 25 MHz
TCXO
64,512 MHz
Bandpass-
filter
ADU
FPGA
ZF-DSP
DAU
f_{ZF} [MHz]
38,85 ± 0,5
f_e [MHz]
25…40
40…75
75…225
400…470
f_{osz} [MHz]
63,85…78,85
78,85…113,85
113,85…264,85
438,85…508,85
PLL

ICOM IC-7610

160m – 6m, CW, SSB, AM, separata mottagare med följande preselektor
RX antenningång, Ethernet

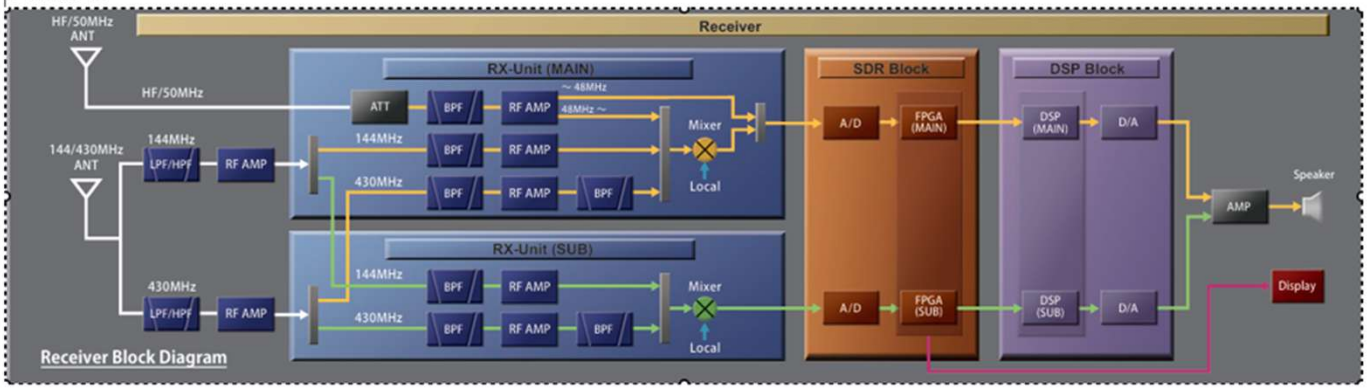


IC-7610: Simplified Receiver Block Diagram

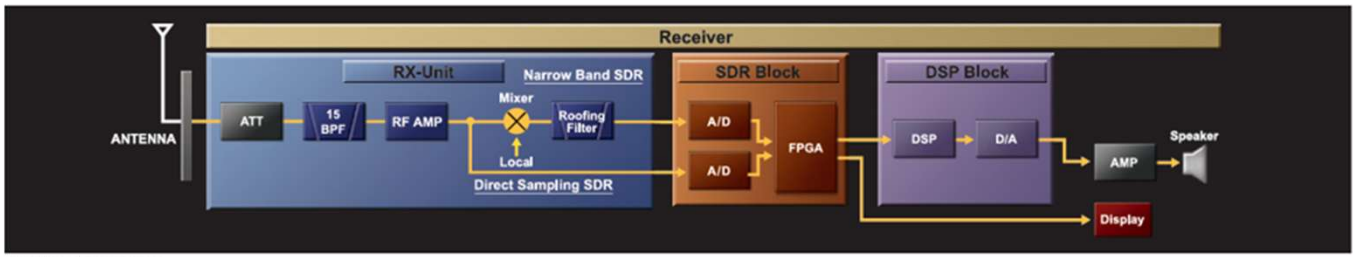
YAESU FT-DX10

160m – 6m, CW, SSB, AM. Hybrid SDR
YAESU FT-DX101 “lillebror”

FTX-1

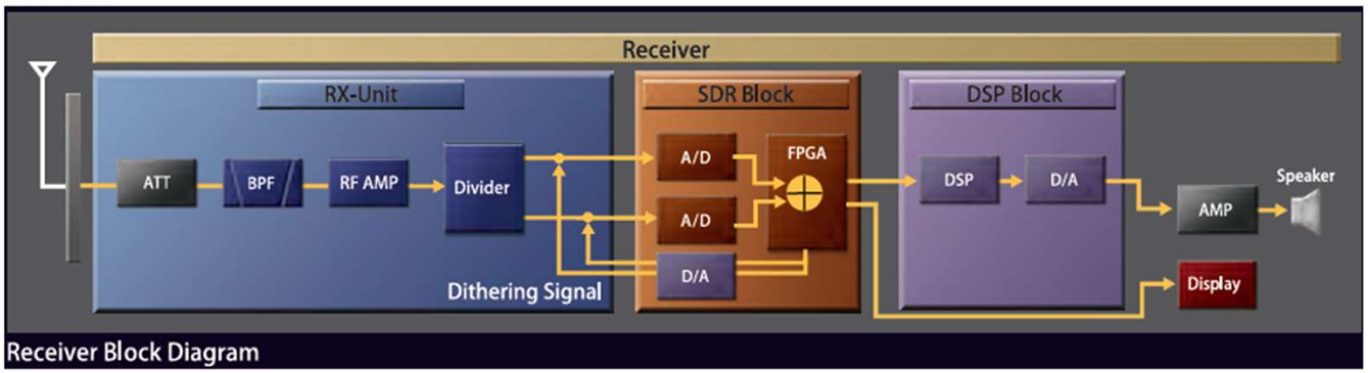


FTDX-10



Receiver Block Diagram

FT-710



FLEXRADIO

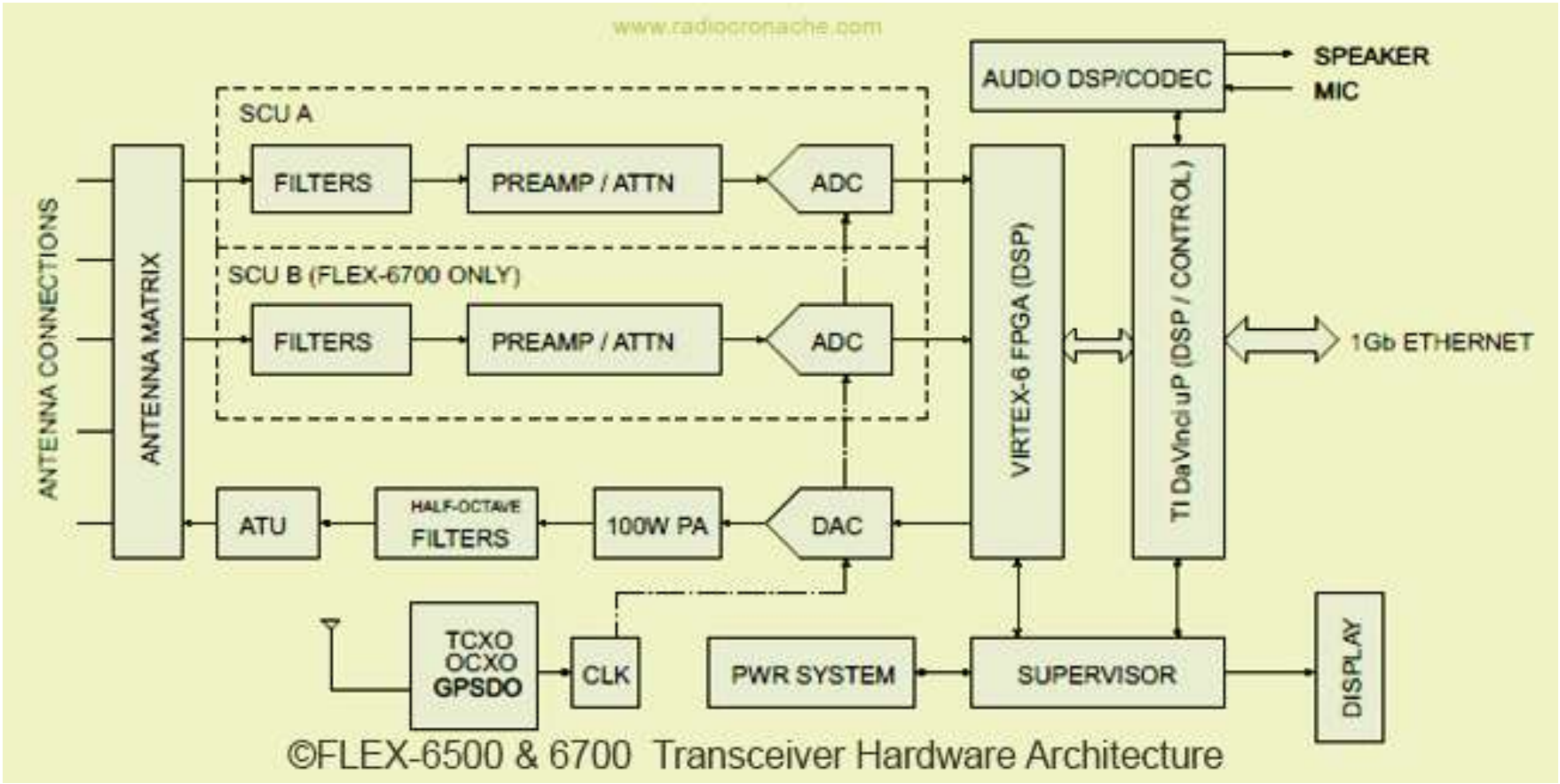
- A Software defined radio for the masses… QEX 2002
- Gerald Youngblood

- QTC November 2006

radio.thulesius.se

Signature Series – 6x/8x

- SmartSDR mjukvara


www.radiocronache.com
AUDIO DSP/CODEC
SPEAKER
MIC
SCU A
FILTERS
PREAMP / ATTN
ADC
SCU B (FLEX-6700 ONLY)
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PREAMP / ATTN
ADC
ANTENNA CONNECTIONS
ANTENNA MATRIX
VIRTEX-6 FPGA (DSP)
TI DaVinci uP (DSP / CONTROL)
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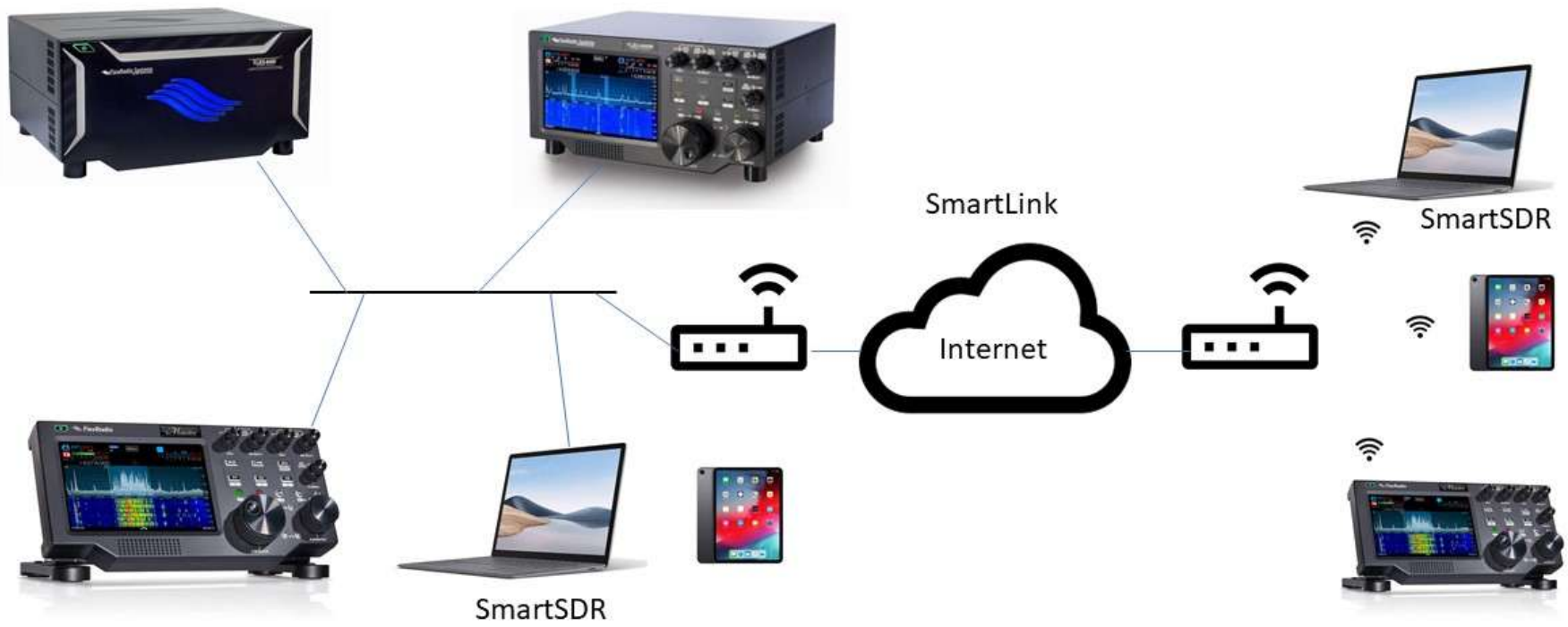
100W PA
DAC
TCXO
OCXO
GPSDO
CLK
PWR SYSTEM
SUPERVISOR
DISPLAY
©FLEX-6500 & 6700 Transceiver Hardware Architecture


SmartLink
SmartSDR
Internet
SmartSDR

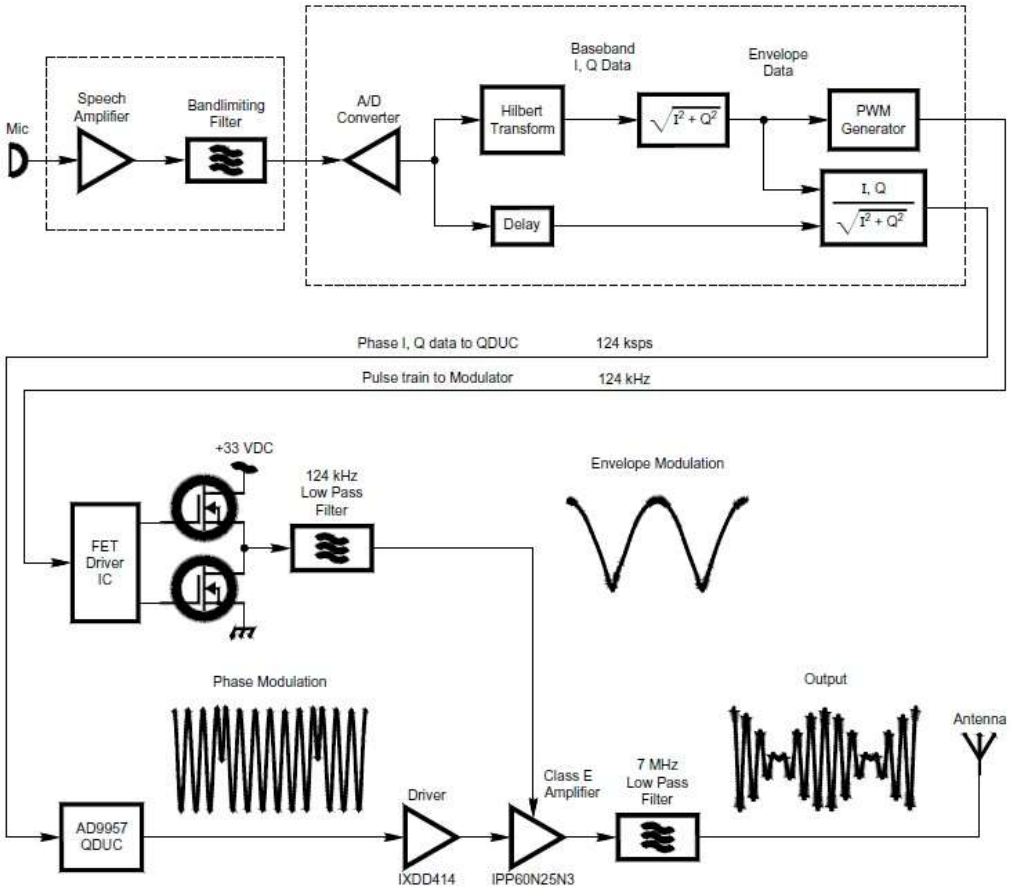
FlexRadio Aurora series !!

- Design av Tony K1KP
- 500W uteffekt
- +90% verkningsgrad
- Inbyggd nätaggregat, ATU….
- Polar modulation och effektivt Class E PA
- SmartSDR software

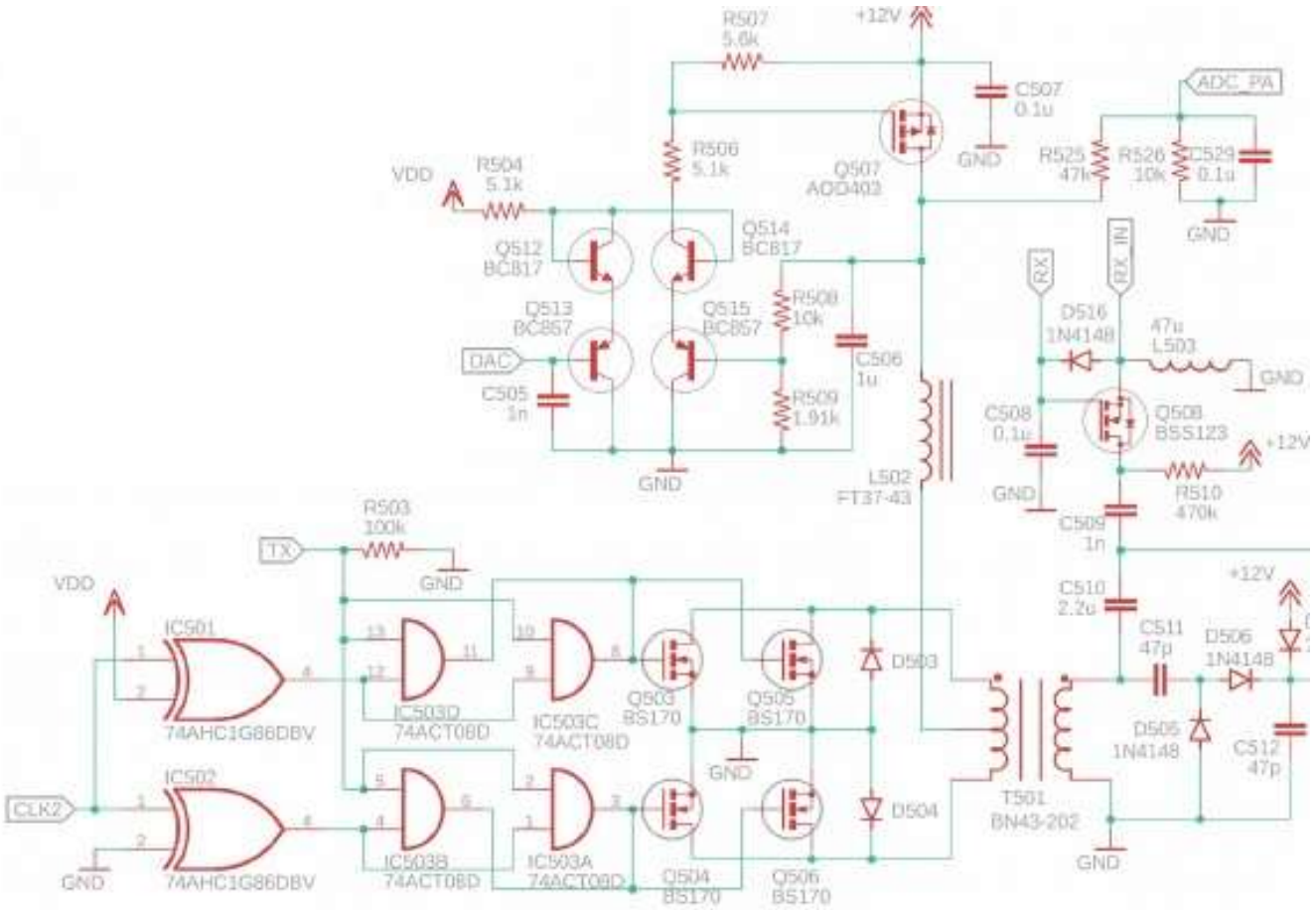
“G0UPL on Polar modulation” – Mycket läsvärd artikel om tekniken för SSB i QMX

AURORA
A NEW DAY FOR THE U ED
FlexRadio
AURORA+
LP-100A
FlexRadio
Tony Brock-Fisher
DAYTON HAMVENTION

Polar modulation（TX） - K1KP



Polar modulation（TX） - G0UPL



Tack så mycket – Vad nu?

QTC artiklar sedan 25+ år

radio.thulesius.se

QEX Polar modulation – K1KP

qrp-labs.com - QMX

sm0jzt@ssa.se

Finns i utställningen för frågor och diskussion