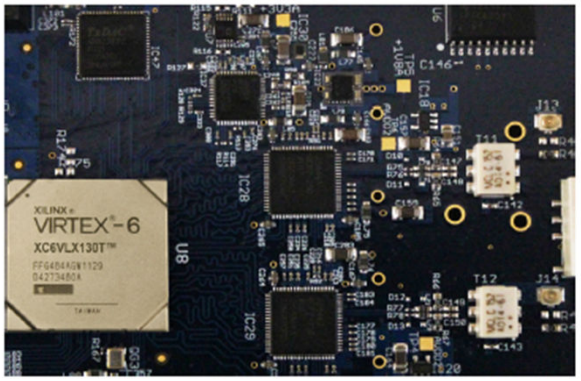
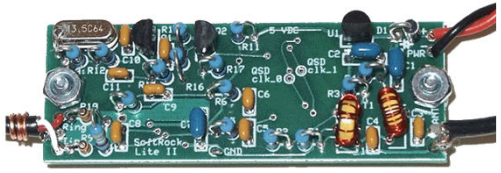




Contesting with the new SDR Radios

Stu Phillips K6TU

Today's presentation

- SDR – A brief introduction
- Different ways to include SDR in a station
- Contesting with a SDR
  - Station integration
  - Work flow management
  - The "visual" radio
  - Ease of S&P operation
  - UI Evolution
  - Monitoring multiple bands
  - Real world experience with SDR
- Conclusion

SDR – BRIEF INTRODUCTION

Software Defined Radio – defined!

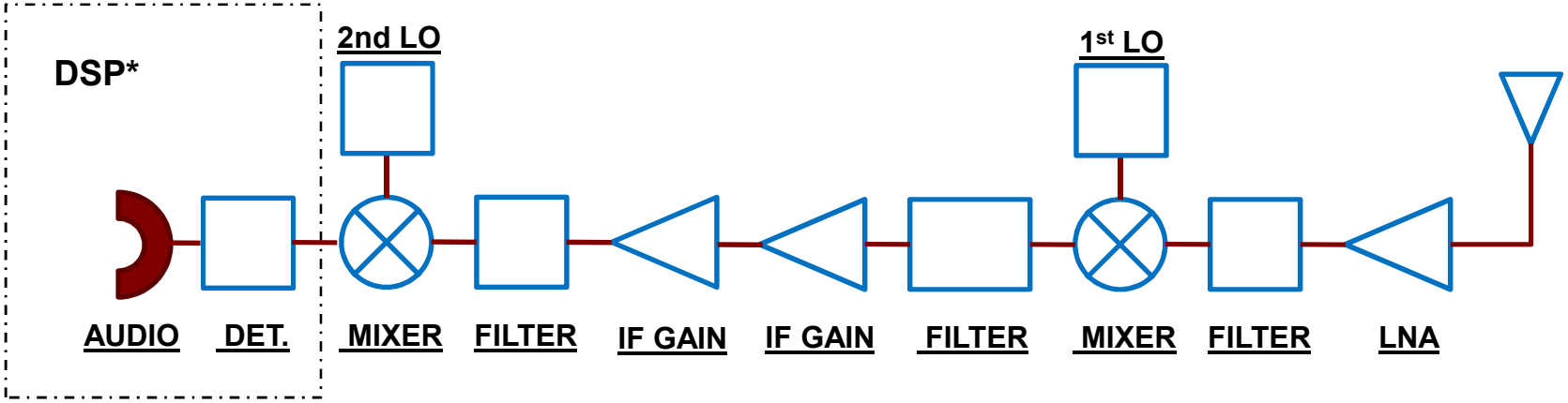
- A software-defined radio system, or SDR, is a radio communication system where components that have been **typically implemented in hardware** (e.g. mixers, filters, amplifiers, modulators/demodulators, detectors, etc.) **are instead implemented by means of software** on a personal computer or embedded system.[1]

[1] Software Defined Radio: Architectures, Systems and Functions (Markus Dillinger, Kambiz Madani, Nancy Alonistioti) Page xxxiii (Wiley & Sons, 2003, ISBN 0-470-85164-3)

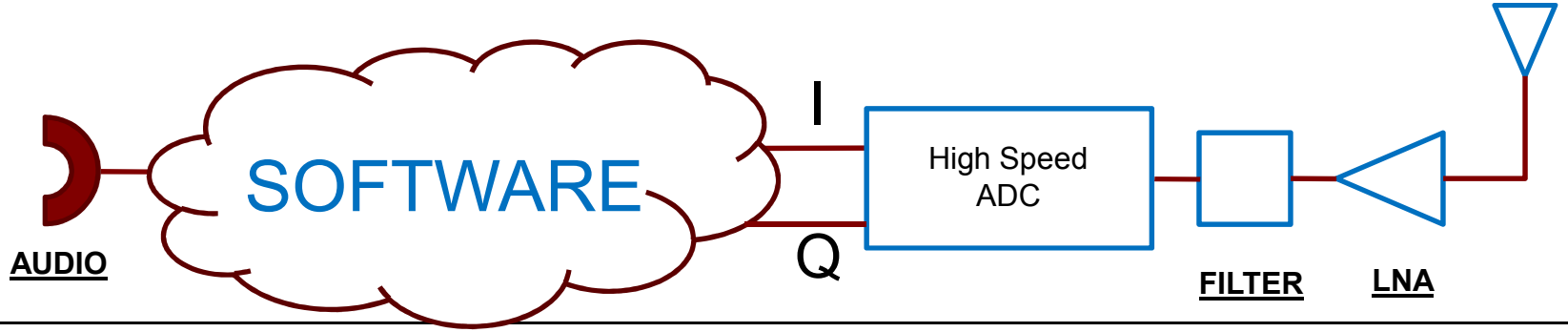
Source: http://en.wikipedia.org/wiki/Software-defined_radio

Conventional Radio

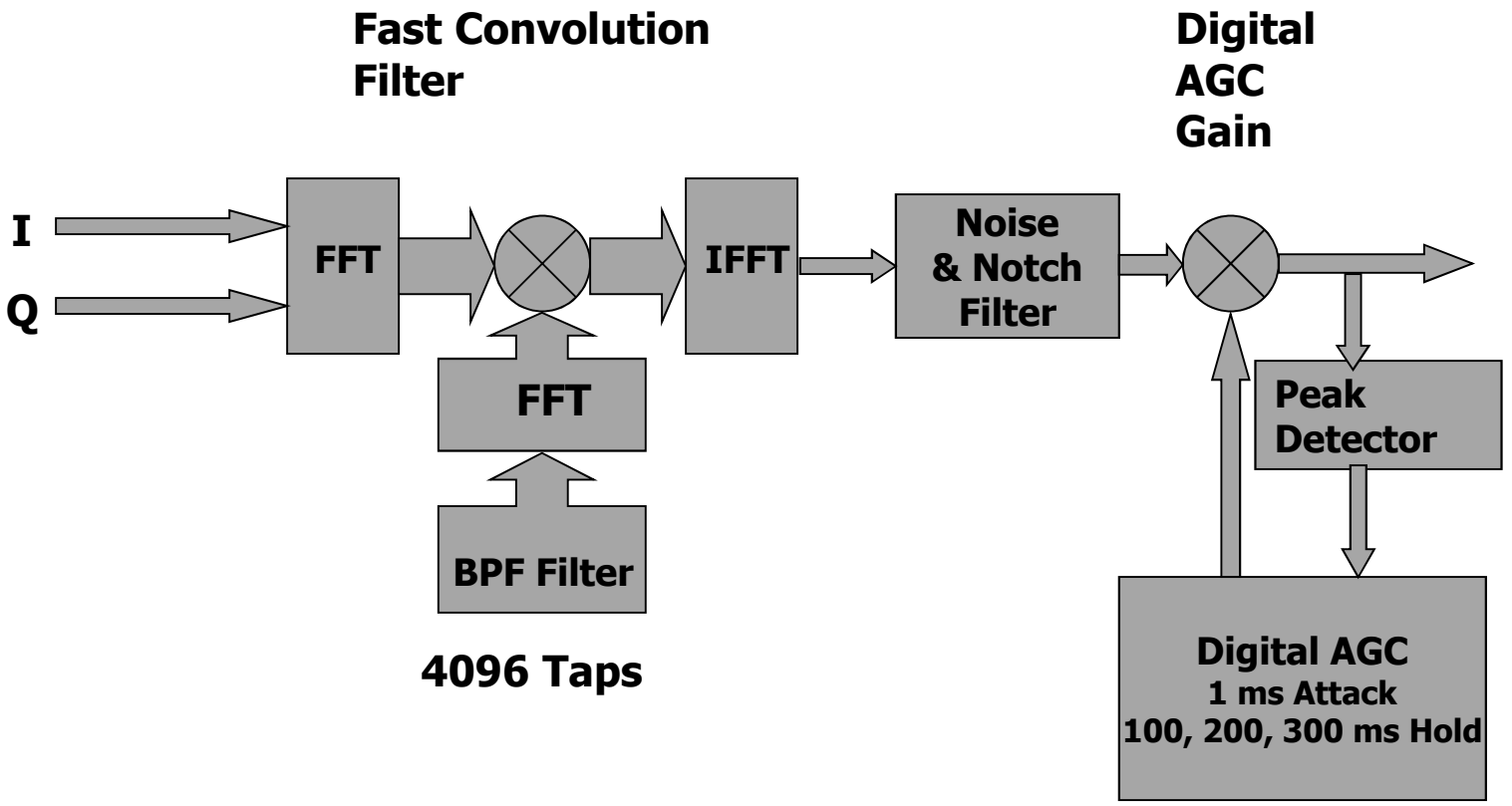
Multi-Stage Receiver Chain



Direct Digital Sampling



Basic Software Receiver



DSP and Software Defined Radio

- Most modern high-end radios are SDR at some level
  - Conventional analog RF chain converts to low frequency IF
    - Multi-stage RF conversion
    - Roofing filters
    - Final IF 15-40 KHz
  - Digital Signal Processing for final IF to audio…
    - Modulation, Demodulation
    - Noise reduction, filtering
    - Equalization
  - Embedded computer allows external PC control of radio
    - CAT for logging interfaces, radio control etc.
  - DSP functions upgradeable by new firmware

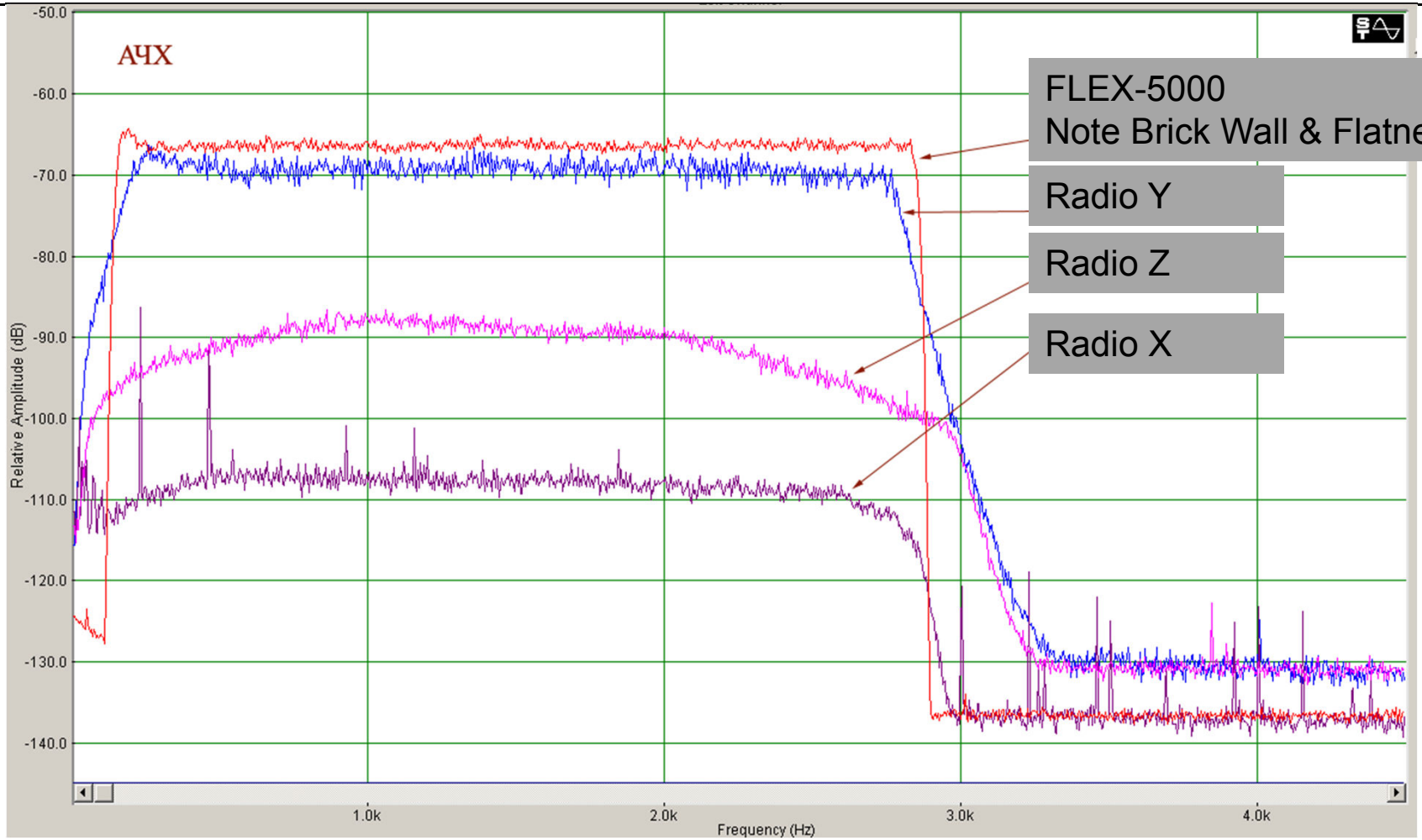
Software Defined Radio

- Direct digital sampling of RF to data
- Majority of RF chain is eliminated with exception of:
  - Band pass filters
  - Receiver pre-amplification

ADVANTAGES

- Less Analog => more linear
- Performance very expensive or not possible in analog
- Rig for each Mode or Style of Operation
- Continuous enhancement through software releases

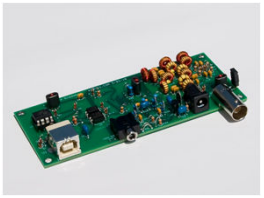
Brick wall filters



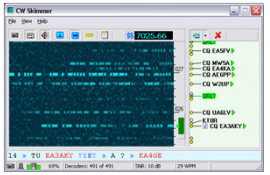
DIFFERENT WAYS TO INCLUDE SDR IN A STATION

SDR hybrid with Conventional Radio

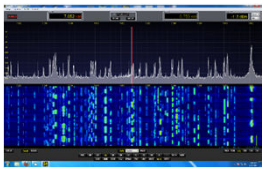
IF



Softrock RX



CW Skimmer

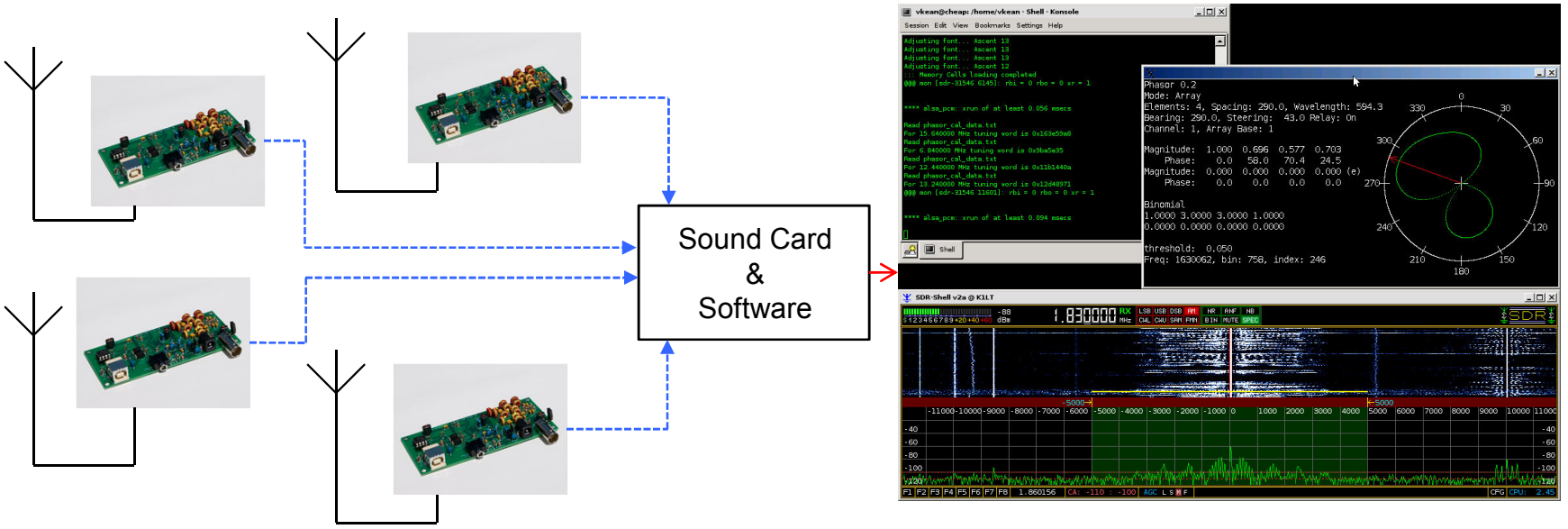


Band Scope

- Add SDR to monitor the IF output
- Many modern transceivers already have an IF output
- Use inexpensive SDR RX like SoftRock (~ $25)
- Use for wideband CW Skimmer operation
- 96 KHz wide band scope

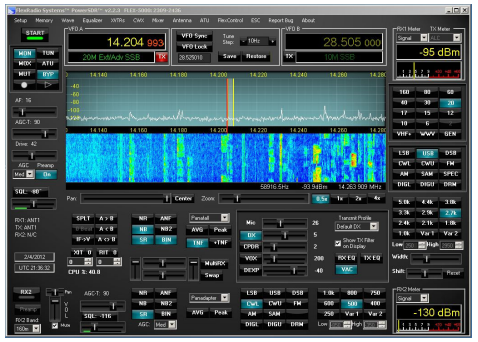
Electronic beam steering

- K1LT presentation at Dayton 2008 on 160m beam steering using multiple SDR
- Softrock receiver on each antenna – short verticals
- Beam steering in software with baseband signals
- http://www.k1lt.com/Beam Steering on 160 Meters.ppt



Use SDR as the primary radio

- FlexRadio Systems offers a range of SDR transceivers
- All use a computer for the UI
- Flex 1500, 3000, 5000 use computer for DSP
  - Connect to radio via USB or Firewire
- Flex 6000 has embedded computer
  - Handles all real time processing
  - Connects to radio via LAN
- All have excellent performance
  - Great contest or DX radios
- Like having a new radio every release
- Great support!

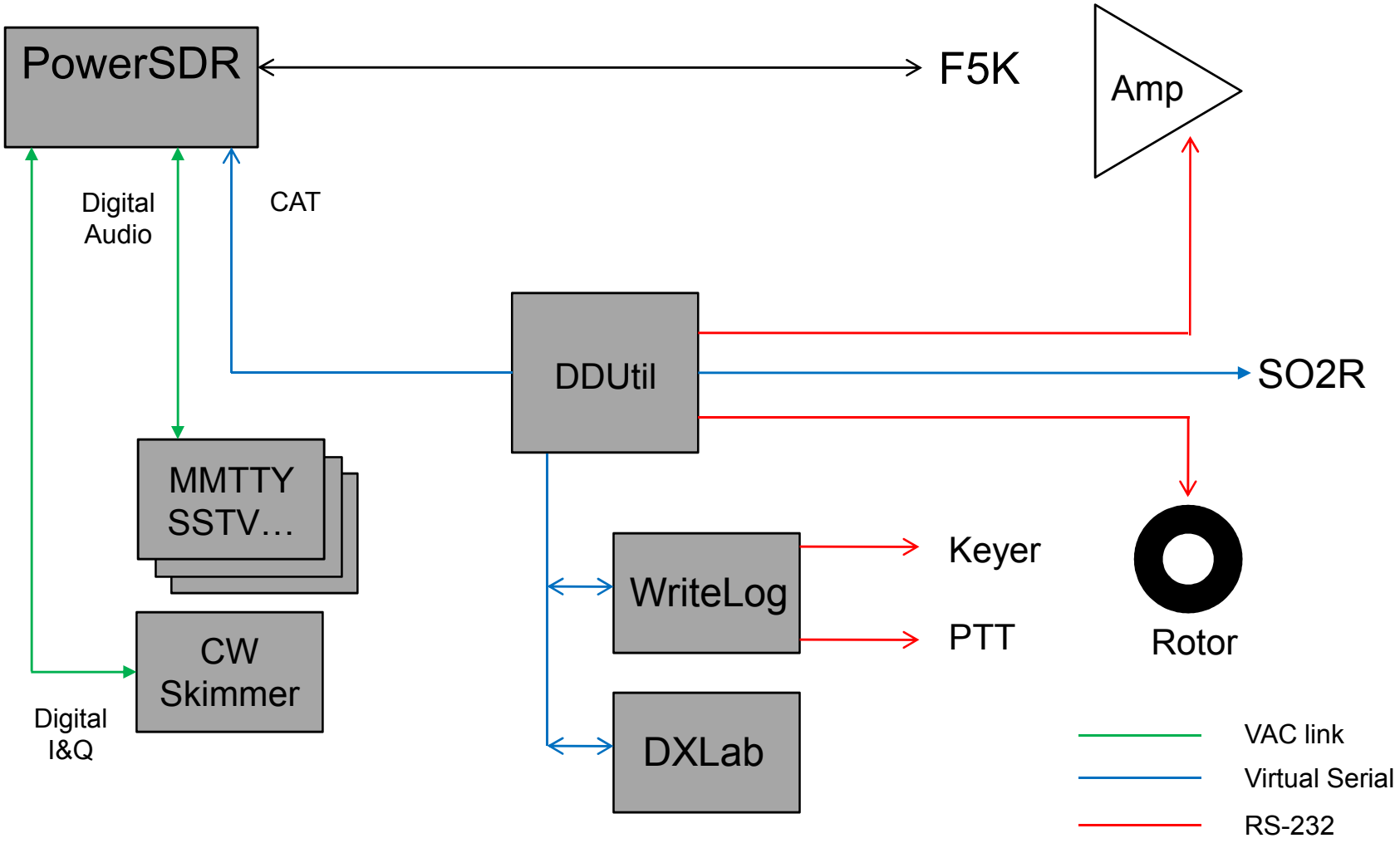


CONTESTING WITH A SDR

Station Integration - 1

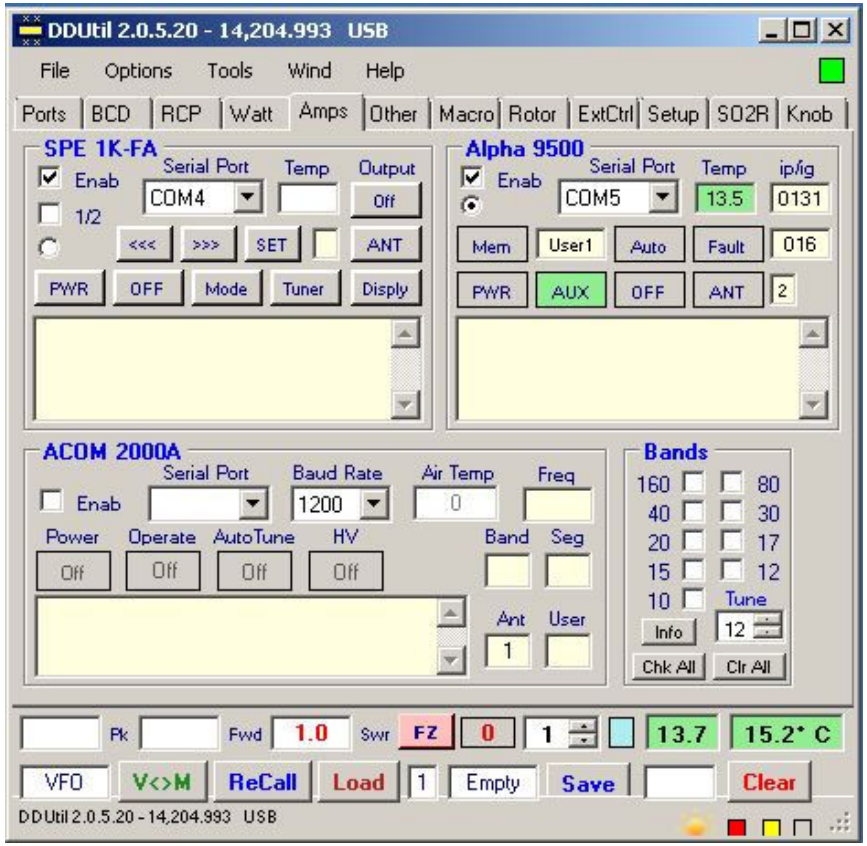
- SDR software provides CAT, PTT & CW control via physical or virtual COM ports
- Audio output via sound device interface & regular jacks
- Virtual COM ports come in pairs – like having two COM ports connected with a loop back cable but all done in software
- Signal output (Audio or Data) via Virtual Audio Cable
- Virtual Audio Cable is like two sound cards connected back to back but all done in software
- Allows two pieces of software to be interconnected together without physical ports or cables

Station Integration - 2



Station Integration - 3

- DDUTIL
- Written by Steve K5FR
- Integrates station control
  - Power meter
  - Amplifier
  - SteppIR control
  - SO2R
  - Filter selection
  - Rotor control
  - CAT multiplexor
- Awesome support
- Free

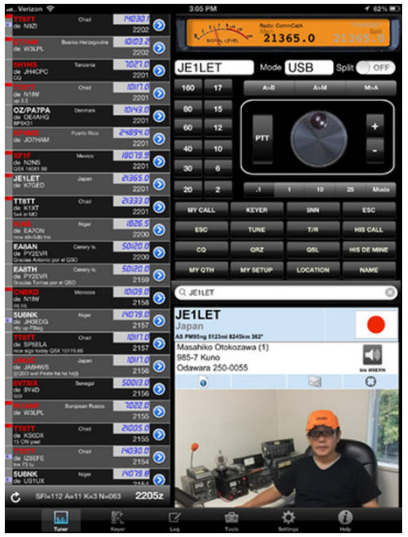


Workflow Management - 1

- For high rate in a contest, workflow management is critical
- Operator focus need to be on the logging program
- But the radio interface is now Software…
- Some external control is mandatory…

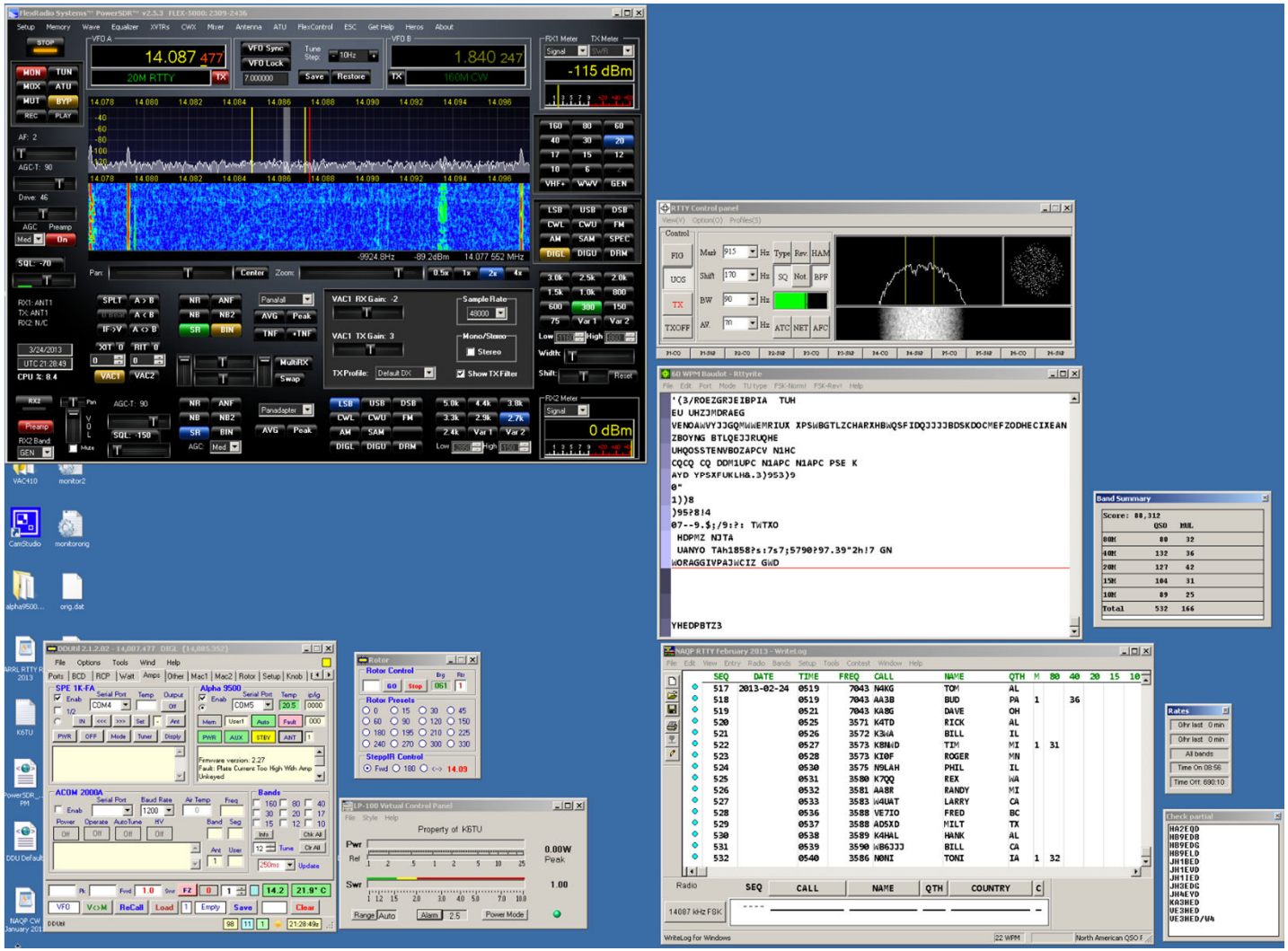
FlexControl

DJ Console



iPad/iPhone

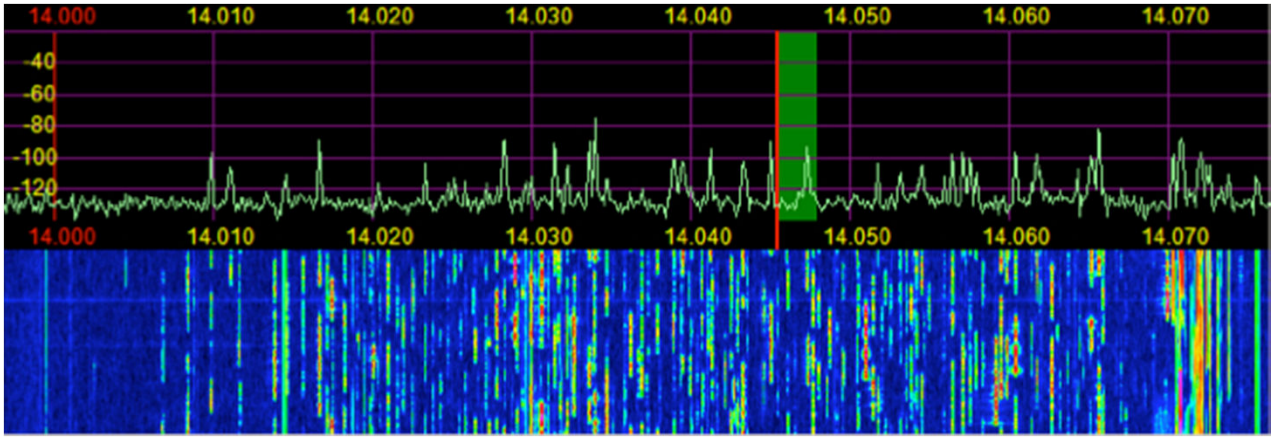
Workflow Management - 2



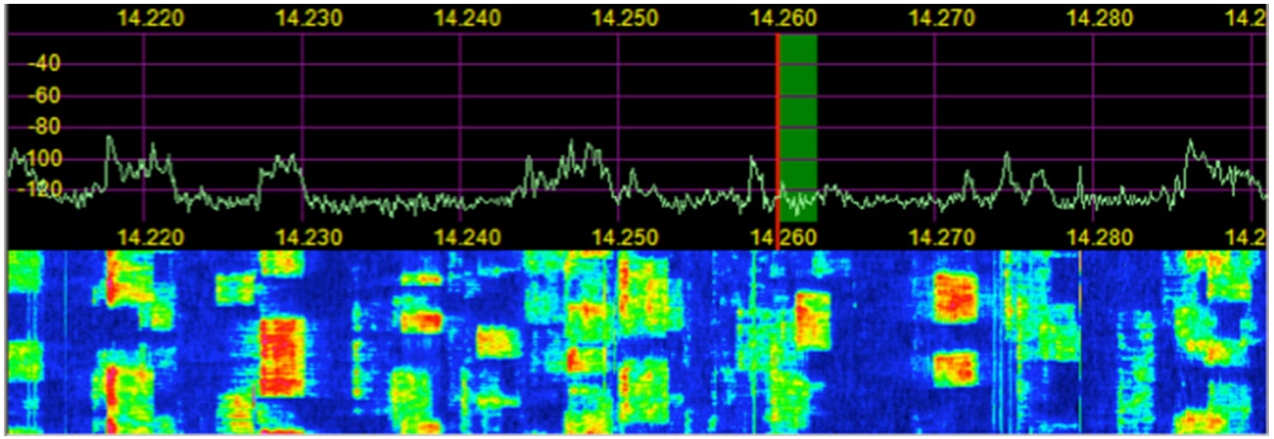
The Visual Radio - 1

- Having a panadaptor changes your life as it adds another sense (sight) to radio control
  - Real time display of the band
  - Ability to zoom in
  - Monitor multiple bands at once
  - Spot pile ups…
  - See the weak ones
  - Find “quiet spots” for CQ frequencies

The Visual Radio – some examples

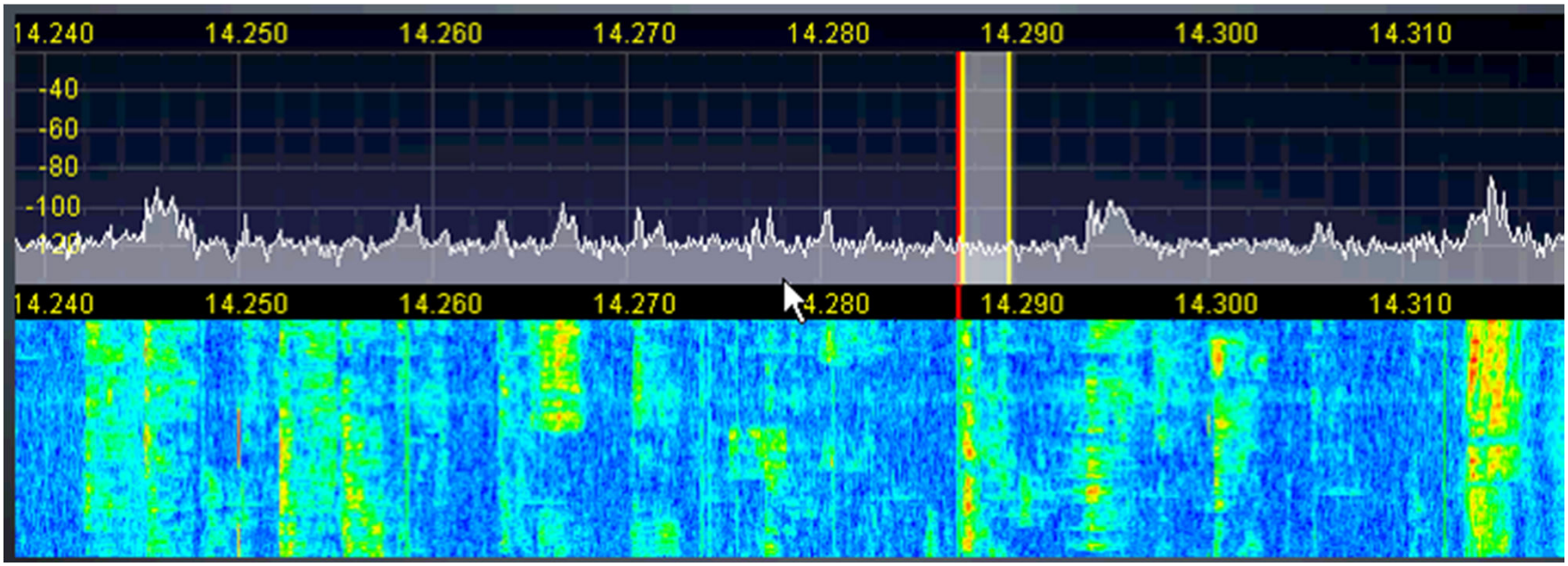


CQ WW 20m CW



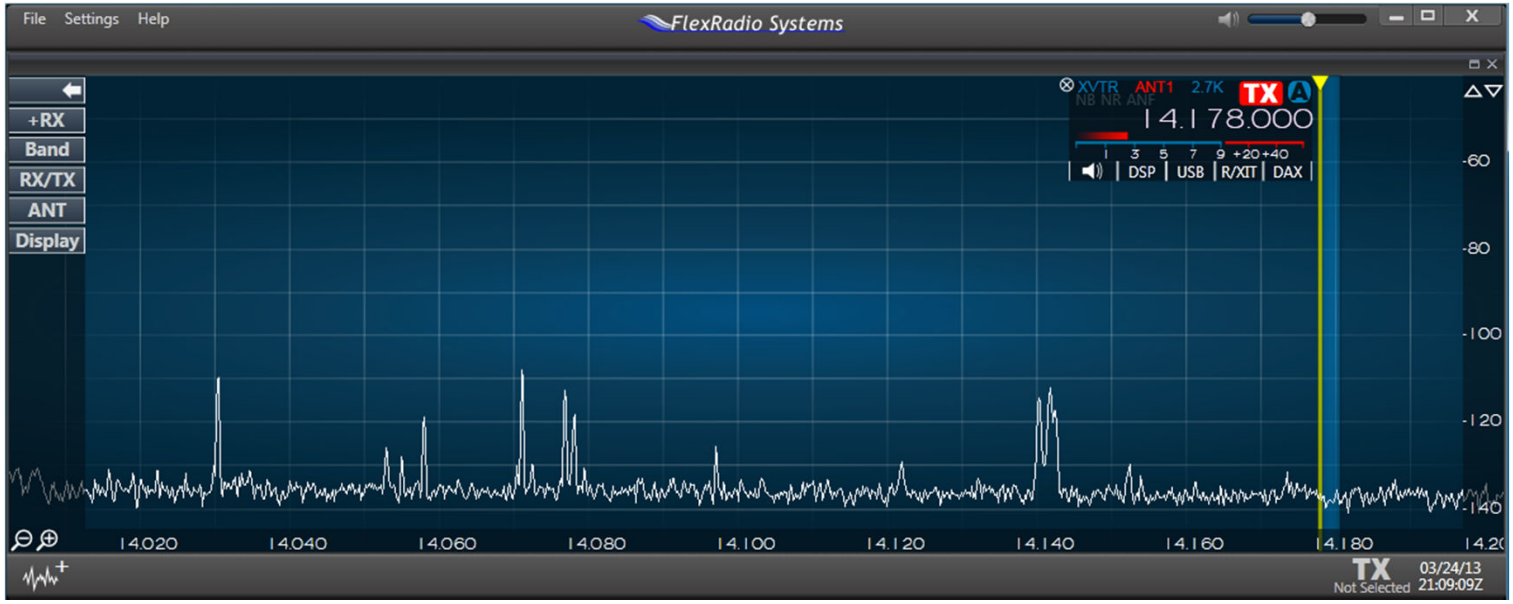
NAQP 20m Phone

Ease of S&P operation

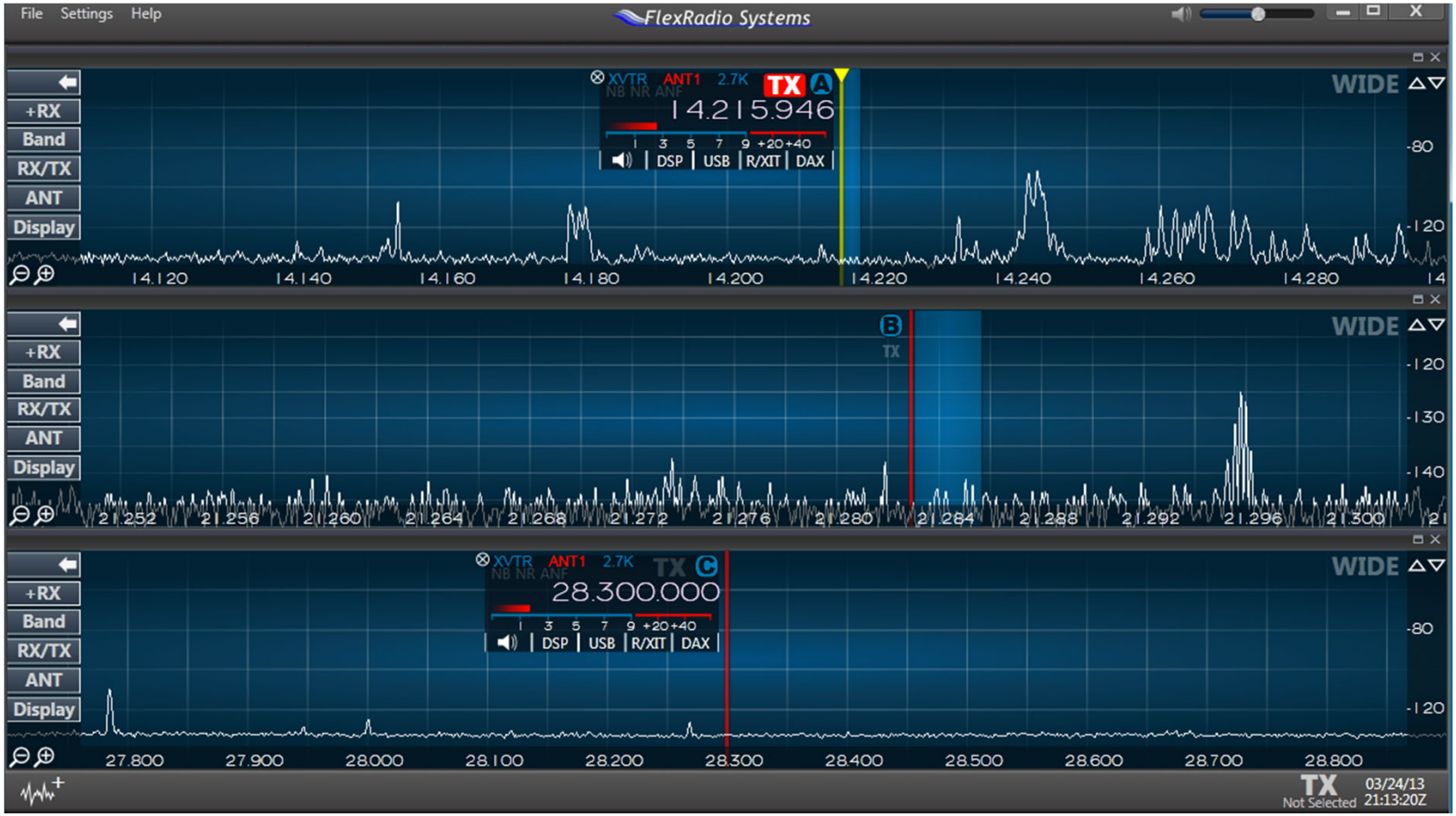


UI Evolution

- Next generation interface focused on spectrum display
  - NOT a radio front panel
- Complete ergonomic “re-think” of how to command a radio and group controls where they are needed



Monitor multiple bands at once



Real world experience with SDR

- Awesome contest radio!
  - Receiver performance is spectacular
  - Brick wall filters with custom configurations means you can work very close to strong stations
- DX operating is a dream
- Having a legal limit transceiver with fully automatic band change (transfer in < 0.25 seconds) is a riot
- SSB, CW or RTTY – very flexible
- Learnt early on you have to have…
  - At least ONE KNOB!

Conclusions

- The FlexRadio SDR family provides
  - Great flexibility
  - World class performance
  - Ease of computer integration & control
- Make the core of a great station
- Is a dream to operate!
- Computer independent control of the radio is a MUST
  - FlexControl makes all the difference in the world

QUESTIONS ?


CCCP

THANK YOU!