Contest University 2026

Architectural, Performance & Feature Differences of top tier rigs today

Rob Sherwood
NCØB

Recent new rigs are all direct sampling.
No new IF ADC sampling since FTdx10

Are you considering a new HF rig?

Subjects to emphasize today

You can Contest & DX with all six of the top brands.

Prices range from $1000 to $9600!

Each OEM* has chosen to emphasize different feature sets.

Order importance: Location, Antenna, Skill, Radio Model

* OEM = Original Equipment Manufacturer

Rig evaluations the past 18 years 50 miles east WWV

Upgrade your antenna if you can !

What has changed recently?

- While receiver lab numbers for most current transceivers are excellent, the architectures have changed.
- The last flagship pure superhet with roofing filters was the now discontinued IC-7851.
- Everything new is now an IF sampling superhet or a pure direct sampling transceiver.

Does the architecture matter?

- Most of the time for general operating it doesn't matter.
- "IF Sampling" has roofing filters & an ADC at the IF.
- Pure Direct Sampling has no roofing filters and samples the RF with an ADC at the antenna.
- If signals are S9+60 dB a roofing filter can help.
- (ADC = Analog to Digital Converter)

Icom, Flex, Yaesu & Apache ANAN

- Icom IC-7760 200 watt direct sampling
- Flex 500 watt Aurora direct sampling
- Yaesu FTX-1 direct sampling
- Apache G2 direct sampling
- See the current pattern?

Direct sampling strong signal limit

- Typical ADC over range 125 dB above MDS
- Blocking of superhet up to 150 dB above MDS
- Cannot likely be realized real blocking signals.
- Most of the time this isn’t an issue unless local (line of sight) signals are S9+60 dB.

A new clever feature from Yaesu

- ADC chips have a maximum RF voltage limit.
- The FT-710 and FTX-1 have an out-of-passband AGC that limits the signal feeding the ADC chip.
- The trade-off is the audio output drops like it does when a superhet begins to block and goes into gain compression.

ARRL Clean Signal Initiative

With receivers performing so well, the next challenge is improving the transmitters.

OEMs could reduce QRM by:

Reducing CW key clicks

Reducing SSB IMD splatter

Reducing transmit broadband noise

CSI product reviews are just getting started

- Are OEMs responding?
- Very little has happened to improve key clicks.
- Progress has been made in reducing splatter
- Transmit composite noise has been ignored.
- Total TX noise is the issue, not just phase noise.

CW Key Click Improvements

- Flex & Elecraft have fixed rise & fall times, don't currently meet CSI.
- Bandwidths could meet CSI CW mask with new firmware.

- Icom, Kenwood & Yaesu have CW menu adjustable rise & fall times.
- None meet CSI key click mask regardless of menu setting.

- Rise and Fall times menus should never have options of 1 or 2ms.
- Menu settings are often 2X faster than claimed.

- If menu adjustable, pick the slowest rise and fall time option.
- Typically 6 or 8ms

(Icom DPD = digital predistortion)

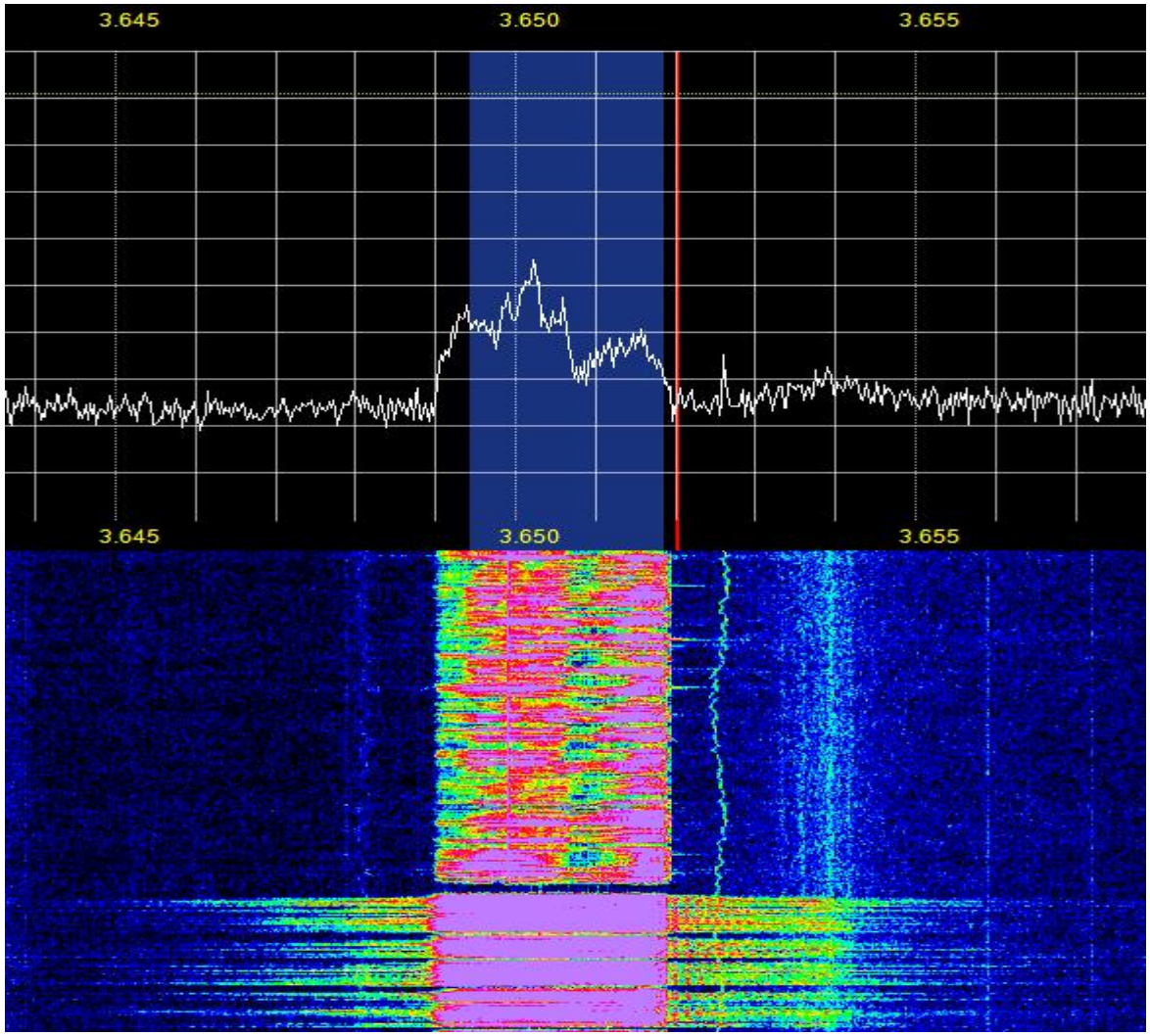
Predistortion cleans up SSB splatter

- Currently 3 of 6 OEMs are now offering cleaner SSB signals, at least barefoot.
- Apache ANAN PureSignal since 2013
- Icom DPD since November 2023
- Flex SmartSignal is now in production as of May of 2026 supporting an external amp.

Screen shot W0IVJ

Both stations running legal limit amplifiers

PureSignal Adaptive Pre-Distortion vs. Typical SSB Splatter



Class A is gone with current rigs

Icom now offers DPD predistortion

K4 ?

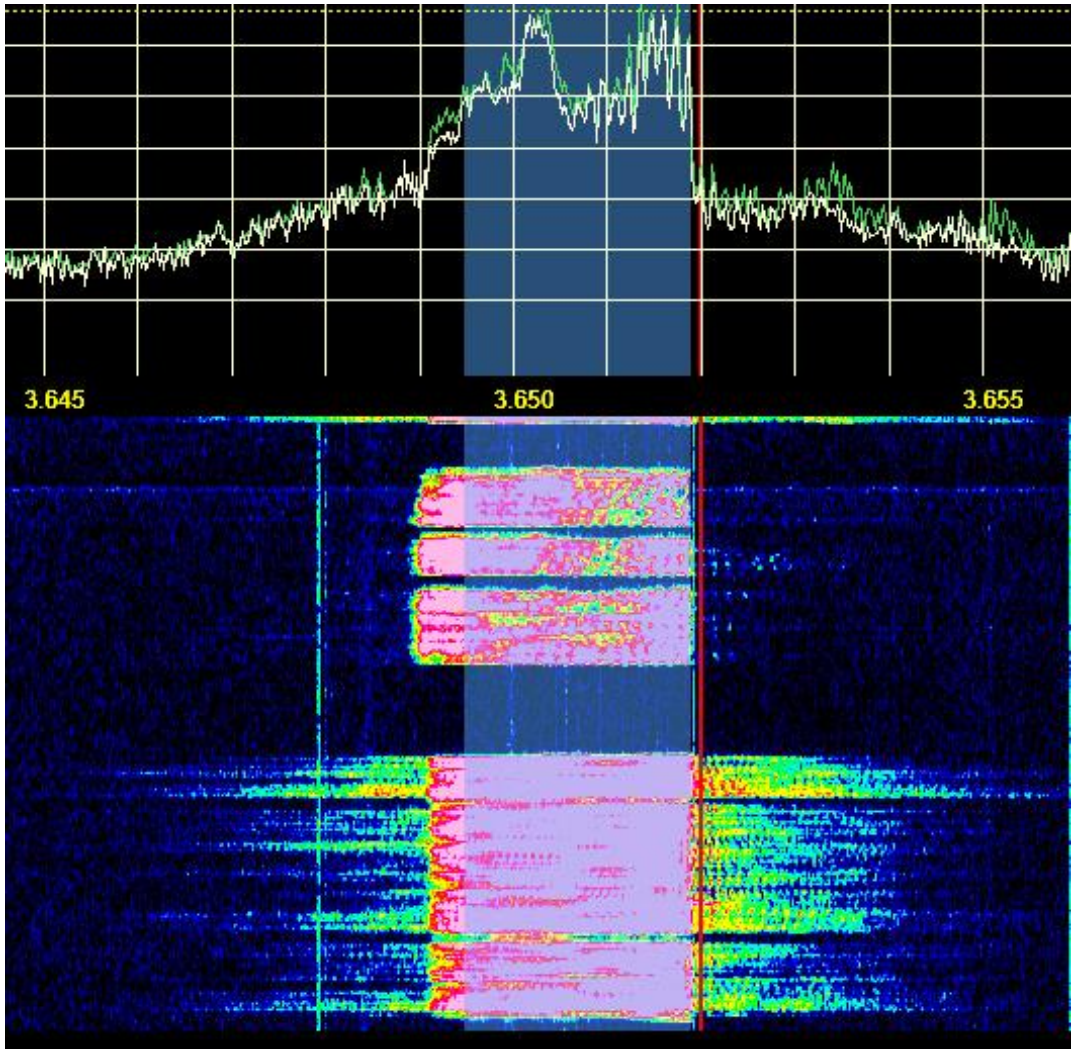
Apache 200D & PureSignal APD & Amp

Kenwood TS-890S & Alpha 89

Screen shot W0IVJ

Both stations 75 meters S9+30 dB

Icom Digital Pre-Distortion (DPD) vs. Typical SSB Splatter



Display 10 kHz span
Apache 7000DLE RX

Blue shading is the
2.4 kHz RX bandwidth

Icom 7610 with DPD
driving an Acom 1000
Amp not in DPD loop
NC0B

Flex 6600M driving a
PowerGenius XL
W5AP

Lab data from my web site

Dynamic Range of Top 26 HF Transceivers

Yaesu FTdx-101D	110 dB	
Yaesu FTdx10	107 dB	
Yaesu FT-710	107 dB	
Elecraft K3S	106 dB	
Icom 7851	105 dB	
Kenwood TS-890S	105 dB	
Hilberling PT-8000A	105 dB	
Elecraft KX3	104 dB	
Apache 7000DLE	103 dB	
Elecraft K4	101 dB	
Yaesu FTdx-5000D	101 dB	
Flex 6400	100 dB	
Flex 6600	99 dB	(16 dB preamp ON)
Flex 6700 (2017)	99 dB	(Preamp OFF)
Icom 7760	99 dB	
Icom 7610	98 dB	(IP+ ON)
Icom 7300	97 dB	(IP+ ON, S/N around 10,000 and up)
Yaesu FTX-1	97 dB	
Flex 5000	96 dB	
Ten-Tec Orion II	95 dB	
Ten-Tec Orion I	93 dB	
Kenwood TS-590SG	92 dB	
Ten-Tec Eagle	90 dB	
Flex 6300	89 dB	
Icom 705	88 dB	(No IP+ ADC linearization button)
TS-990S	87 dB	(RMDR limited close-in)

You can effectively work DX and Contests with any of these fine transceivers.

New price range $1000 to $12,000+

Used market price even lower !

100 dB radios unheard of 20 years ago !

I have run contests with 21 of these rigs

How do you select a new radio?

- Do you pick one of those top 26 models?
- That would be a good start.
- Married to one brand? Pick price that fits your budget.
- Price range for current new rigs today $1000 to $9600
- Let’s look at new features by brand in no particular order.

Brand Feature Differences

- Remote options hardware and software
- Reducing wide transmit signal bandwidth
- Architecture differences harsh RF environments

  (Roofing filters & tracking preselectors)

You need to know your radio

Model	Noise floor no preamp	Dynamic Range
Flex 6600	-111 dBm	99 dB
Flex 6400	-112 dBm	100 dB
Elecraft K4	-121 dBm	101 dB
Yaesu FTX-1	-124 dBm	97 dB
Yaesu FT-710	-127 dBm	106 dB
Apache 7000	-131 dBm	103 dB
Icom 7610	-132 dBm	98 dB
Icom 7300	-133 dBm	97 dB

Up to 22 dB gain differences with no preamp or attenuation.

With Flex in a quiet location you may need preamp gain 20m and up.
(Note Flex maximum preamp gain is 32 dB!)
Elecraft is in the middle as to net gain.
With Icom you likely need attenuation on 40m and down.

None of the designs are right or wrong, but they are VERY different.

Comments on Flex

- New 8000 series replaces the 6000 series but few new software features yet.
- Predistortion feature only for 8000 series
- 500W Aurora is an 8000 with a high-efficiency built-in power supply & power amp using Polar Modulation.
- Also known as EER = Envelops Elimination & Restoration.
- Aurora supports SmartSignal predistortion

Comments on Icom

- DPD digital predistortion hardware built into the first IC-7610s purchased in 2017.
- DPD supported by the new 200 watt IC-7760
- Only supports the PW2 in the correction loop
- DPD works very well with tube linears not in the correction loop as displayed earlier.

Comments on Apache G2

- 1 of 3 brands with predistortion splatter reduction.
- Supports any external amp with PureSignal
- Don’t consider an Apache “plug and play”.
- Passes all 3 CSI TX masks at my lab.
- (CW key click, SSB IMD & TX composite noise)

Comments on Yaesu

- Offers IF sampling FTdx-101D/MP & FTdx10
- Roofing filters for super strong out of passband signals.

- Yaesu's FTX-1 & FT-710 direct sampling transceivers
- (No roofing filters by definition)

- Yaesu offers both IF sampling & direct sampling architectures at different price points, the only OEM to support both types of ADC sampling.

Comments on the Elecraft K4

- K4HD was announced May of 2019 at Hamvention
- Promised IF sampling with roofing filters as an option beyond pure direct sampling
- Roofing filters for super strong out of passband signals.
- 7-year delayed K4HD did not ship at 2026 Hamvention
- Will compete with $1500 FTdx10 & $3700 FTdx-101D

Comments on Kenwood

- The most recent HF offering is the TS-890S in 2018
- This is a superhet follow-on to the TS-990S with a direct sampling band scope.
- I have owned both of these fine transceivers, but will Kenwood jump into the direct sampling fray?
- 8+ years is a long time to wait for a new model.
- Virtually every competing model is direct sampling now.

Don’t choose a radio by one number

- Today: more than 20 transceivers have a DR3 > 90 dB.
- Other important issues are not noise floor or sensitivity!
- **Compare:**
  - User Interface (knobs, buttons, display, computer or standalone)
  - Ergonomics (Is the radio easy to use?)
  - Menus, and is it necessary to access them regularly?
- Become friends with members of a ham club near you.
- Try out a potential new radio at a friend’s QTH.
- If you have a ham store near you, make use of it.

More factors to consider

- Bad ergonomics are frustrating.
- Is speech processor adequate?
- Standalone or Computer Operated?
- Is firmware regularly updated?
- Is warranty service done well and quickly?
- Is the radio supported with parts and service after it is out of production?

- Bottom Line: Do you enjoy using your radio?

Sherwood Engineering

Q&A on any subject

Ask for a PDF of this presentation via email.

Email: rob@nc0b.com

Feel free to email questions !