

# IK3VIG Giuseppe Campana



# Differenza tra Radio Gestita e Radio Definita dal software

## ◆ Gestita

- Controllo da PC di hardware definito (un pannello frontale virtuale)

## ◆ Definita

- Demodulazione, Modulazione e il controllo dell'hardware per mezzo del software, quindi le caratteristiche della radio in costante evoluzione

# Massimizzare il Software.... Minimizzare l' Hardware

- ◆ Continua evoluzione del Sistema
- ◆ Performance Non Possibili in Analogico
- ◆ Meno Analogico → Più Linearità
- ◆ Radio per qualsiasi Modo o Stile operativo
- ◆ Open Source GPL → Molti sviluppatori

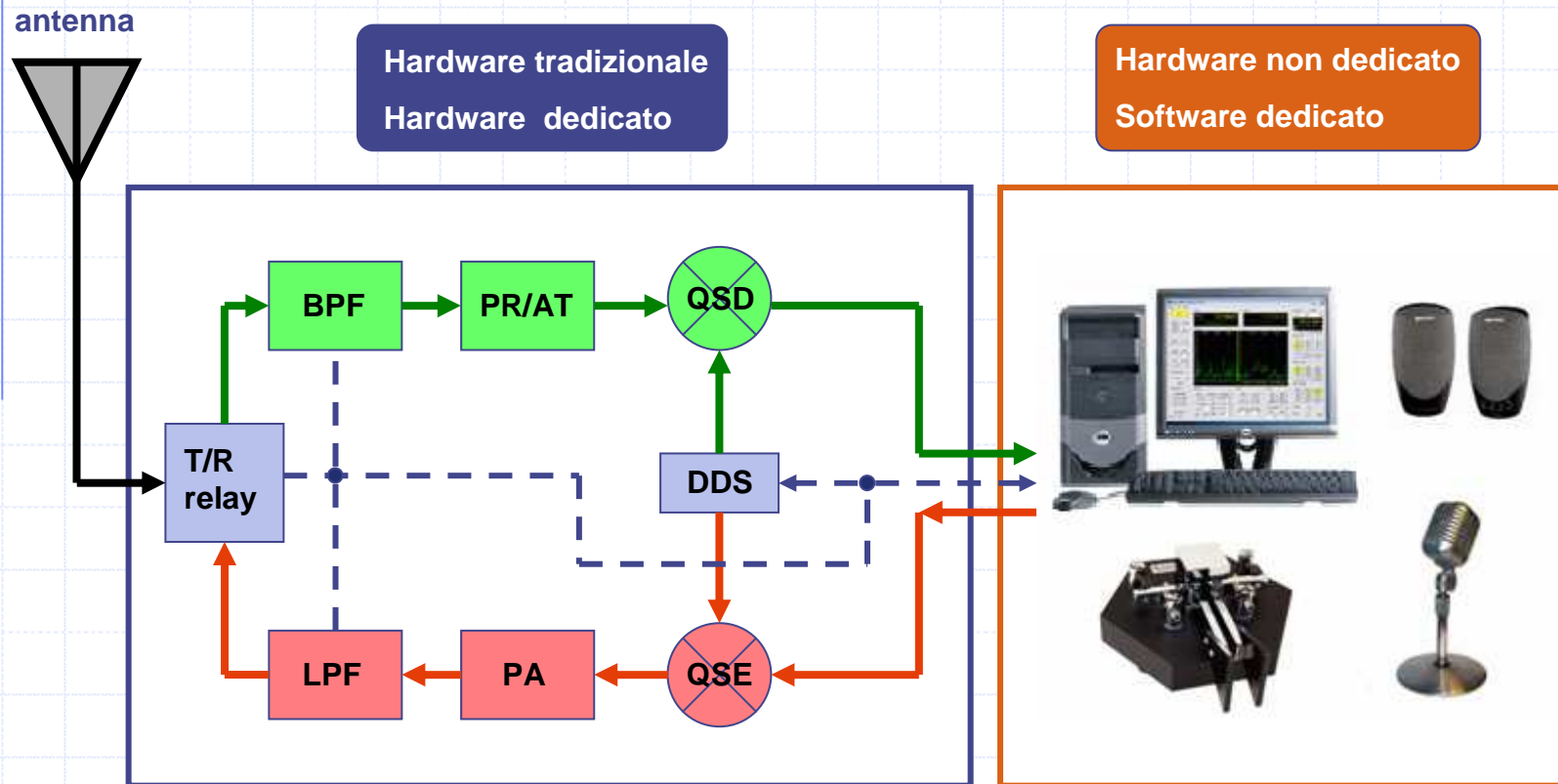
**SDR-1000 è il primo e unico**

**OPEN SOURCE**

**Software Defined Transceiver**

**“Un SDR-1000 vecchio non esiste.  
Abbiamo una radio nuova ad ogni  
nuova versione del software.”**

# Composizione di un transceiver SOFTWARE DEFINED RADIO





# SDR-1000 Modulo RF



# SDR-1000 caratteristiche gen.

- ◆ 11KHz – 65MHz a copertura continua
- ◆ AM SAM FM SSB DSB CWL/U DRM\*
- ◆ 160M – 6M TX (2M XVTR IF Opt)
- ◆ Stack memorie di banda
- ◆ TX 100W HF opzionale, 500mW 6m
- ◆ Accordatore automatico opzionale



# Il ricevitore dell'SDR-1000

- ◆ 98dB 2KHz Two Tone Dynamic Range!
- ◆ 27dBm IP3 2KHz Two Tone Spacing
- ◆ Filtri a fattore di forma 1.05:1 @ 500Hz
- ◆ Ricevitore secondario (nello spettro)
- ◆ N/Blanker a sottrazione di impulsi
- ◆ Autonotch – NR – PBT – Spur Reducer
- ◆ Sintonia “Drag or Point and Click”

# Il test dell'ARRL

I risultati del test pubblicato su QST 10/2005 sono stati ottenuti con un SDR-1000 collegato ad una scheda audio supportata dalla FlexRadio Systems, in questo caso una **M-Audio Delta-44** installata su un PC Pentium 4 / 3.0Ghz.

Le caratteristiche della radio sono direttamente proporzionali all'hardware del PC, e soprattutto alla qualità AD / DA della scheda audio

## FlexRadio SDR-1000

### Manufacturer's Specifications

Frequency coverage: Receive, 0.01-65 MHz; transmit, 1.8-2, 3.5-4, 5.33-5.4, 7-7.3, 10.1-10.15, 14-14.35, 18.068-18.168, 21-21.45, 24.89-24.99, 28-29.7, 50-54 MHz.<sup>1</sup>

Power requirement: Receive, 1.0 A max; transmit, 25 A (max).

Modes of operation: SSB, CW, AM, FM.

### Receiver

CW sensitivity, 500 Hz bandwidth, 26 dB INA setting: -141 dBm.<sup>3</sup>

AM sensitivity, 10 dB S/N: Not specified.

FM sensitivity, 12 dB SINAD: Not specified.

Blocking dynamic range: Not specified.

Two-tone, third-order IMD dynamic range 500 Hz filter, 90 dB.

Third-order intercept: Not specified.

Second-order intercept: Not specified.

FM adjacent channel rejection: Not specified.

FM two-tone, third-order IMD dynamic range: Not specified.

### Measured in the ARRL Lab

Receive and transmit, as specified.

Receive, 0.9 A; transmit, 15 A. Tested at 13.8 V.

As specified.

### Receiver Dynamic Testing

Noise floor (mds), 500 Hz filter:

Preamp	off	low	med	high <sup>2</sup>
1.0 MHz	-99	-110	-122	-132 dBm
3.5 MHz	-97	-109	-122	-132 dBm
14 MHz	-98	-109	-121	-130 dBm

1 kHz tone, 30% modulation:

Preamp	off	low	med	high <sup>2</sup>
1.0 MHz	51	18	4.4	1.5 $\mu$ V
3.8 MHz	65	20	4.8	1.7 $\mu$ V

For 12 dB SINAD:

Preamp	off	low	med	high
29 MHz	31	9.6	3.2	1.0 $\mu$ V

500 Hz filter: Spacing 20 kHz (5 and 2 kHz data identical)

Preamp	off	low	med	high
3.5 MHz	105	105	111 <sup>6</sup>	111 <sup>6</sup> dB
14 MHz	108	109	111 <sup>6</sup>	110 <sup>6</sup> dB

Spacing 20 kHz (5 and 2 kHz identical)

Preamp	off	low	med	high
3.5 MHz	81	83	97	96 dB
14 MHz	86	85	99	98 dB

Spacing 20 kHz (5 and 2 kHz identical)

Preamp	off	low	med	high
3.5 MHz	+24	+14	+24	+15 dBm
14 MHz	+31	+20	+26	+17 dBm

Preamp	off	low	med	high
	+70	+73	+75	+74 dBm

20 kHz channel spacing, preamp high: 29 MHz, 36 dB.

20 kHz channel spacing, preamp high: 29 MHz, 37 dB.

# 2KHz IMD Dynamic Range

<b>Radio</b>	<b>MDS</b>	<b>IMD DR3</b>
SDR-1000	-130 dBm	98 dB
TenTech Orion	-127 dBm	93 dB
Icom IC-7800	-126 dBm	80 dB
Elecraft K2	-129 dBm	80 dB

**SDR-1000, preamp/high con M-Audio Delta 44 sound card. Gli altri dati sono dichiarati sul sito della Sherwood Engineering.**

# MDS – Medium Preamp

PowerSDR Console Beta v1.2.0c

Setup CW Wave

Power

MON TUN  
MOX  
MUT BIN

PWR AF  
50 10

SQL MIC  
150 50

AGC Preamp  
Med Med

Display Mode  
Panadapter

AVG

Date/Time  
4/13/2005  
LOC 14:37:21  
UTC 19:37:21

CPU %: 7.8

VFO A  
1KHz 14.000000  
20M Extra CW

VFO B  
7.000000  
40M Extra CW

Display  
-7500 -5000 -2500 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150  
2500 5000 7500  
-219.3Hz, -126.6dBm, 13.999181MHz

RX Meter TX Meter  
Sig Avg ALC  
-131.5 dBm  
1 3 5 7 9 +20 +40 +60

Band  
160 80 60  
40 30 20  
17 15 12  
10 6 2  
wwv GEN

Mode - CWU  
LSB USB DSB  
CWL CWU FMN  
AM SAM SPEC  
RTTY PSK DRM

Filter - 500Hz  
6.0K 4.0K 2.6K  
2.1K 1.0K 500  
250 100 50  
25 Var 1 Var 2  
Low High  
350 850  
Shift: Res

Memory  
Save... Recall... Scanner

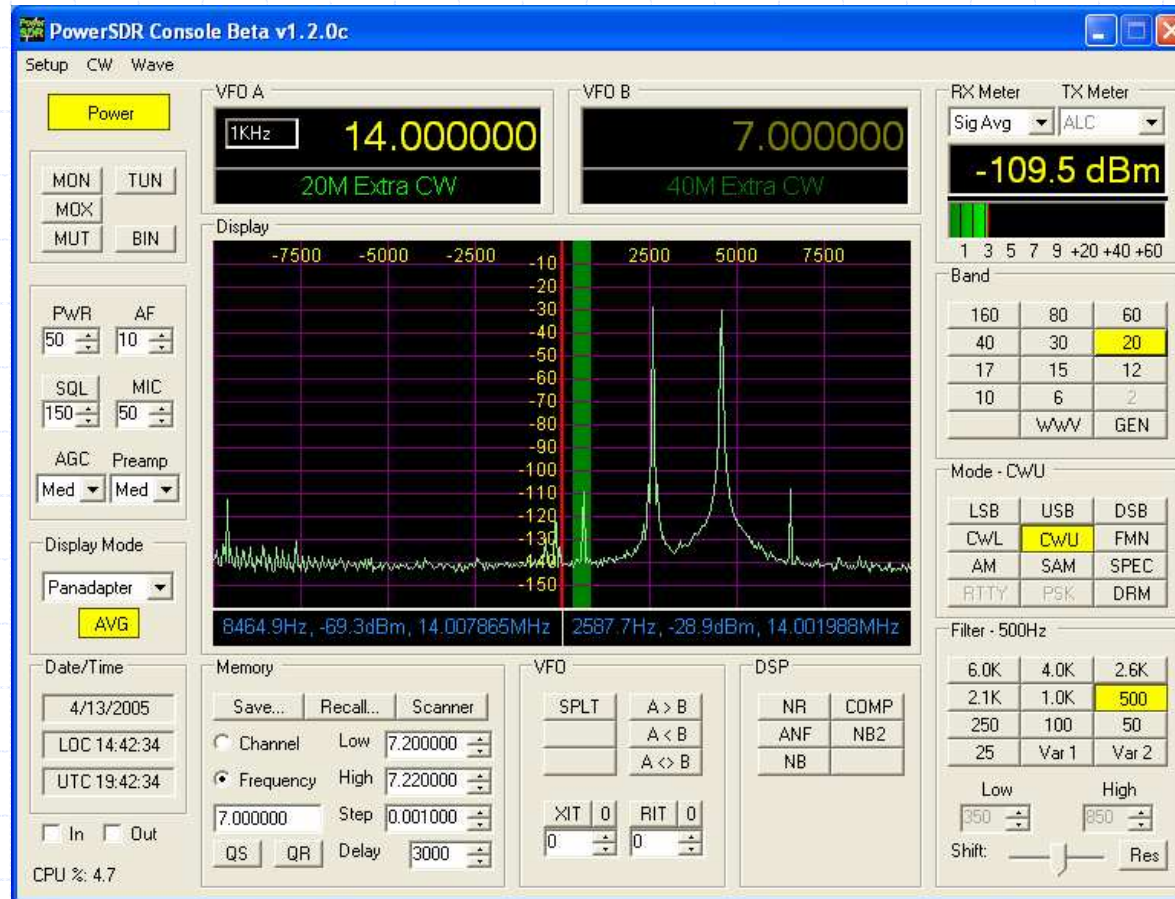
Channel Low 7.200000  
Frequency High 7.220000  
7.000000 Step 0.001000  
QS QR Delay 3000

VFO  
SPLT A > B  
A < B  
A <> B  
XIT 0 RIT 0  
0 0

DSP  
NR COMP  
ANF NB2  
NB



# 2KHz Spacing 3<sup>rd</sup> Order IMD



# SDR-1000 test dei filtri (DK7XL)

## 2.6 kHz Filter

**-3 dB BW**  
2587 Hz

**-60dB BW**  
2756 Hz

**shape factor**  
1.06

## 500 Hz Filter

**-3 dB BW**  
487 Hz

**-60dB BW**  
660 Hz

**shape factor**  
1.35

## 50 Hz Filter

**-3 dB BW**  
65 Hz

**-60dB BW**  
223 Hz

**shape factor**  
3.43

## 25 Hz Filter

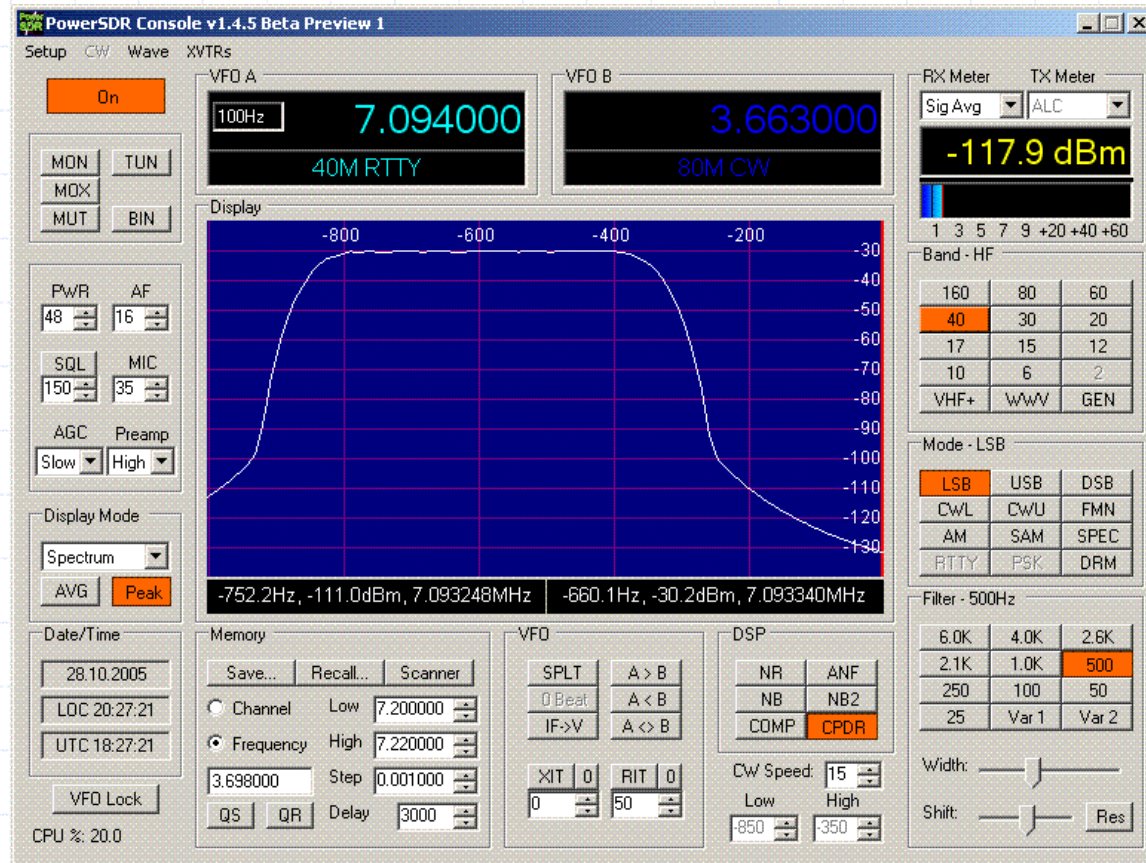
**-3 dB BW**  
58 Hz

**-60dB BW**  
204 Hz

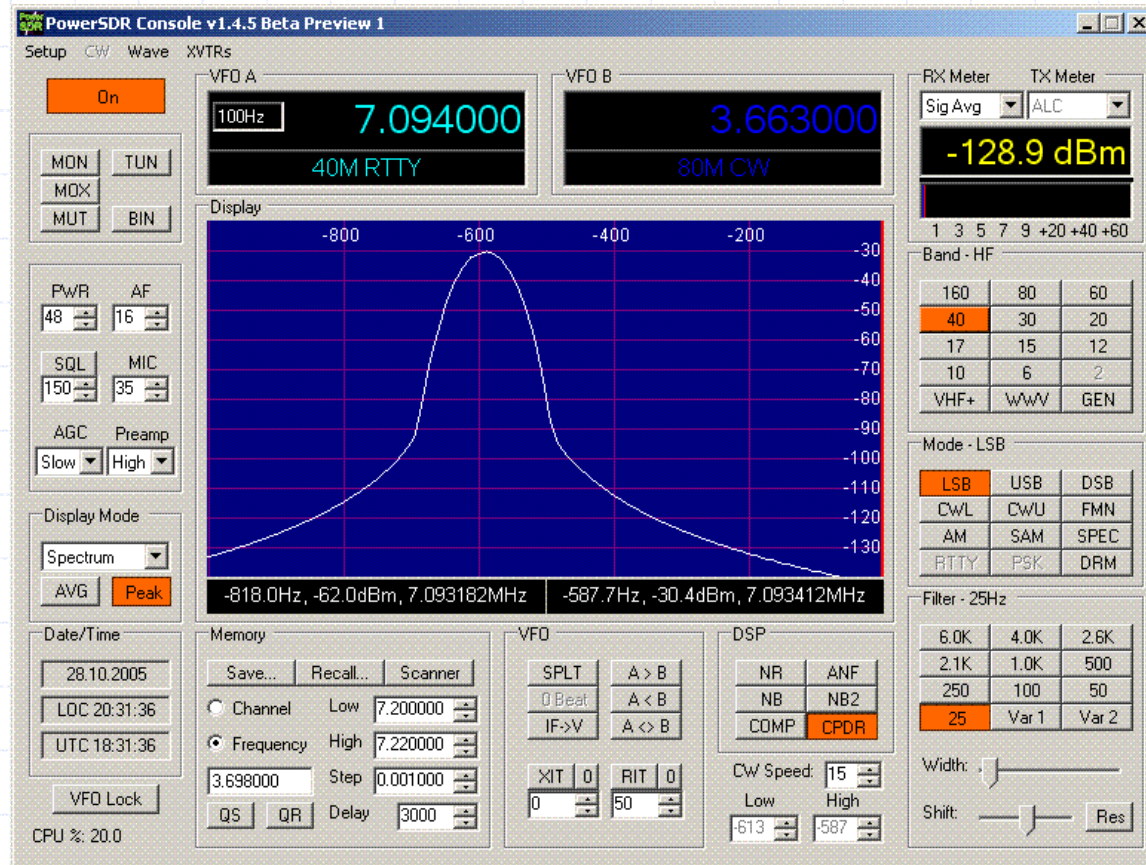
**shape factor**  
3.51



# 500 Hz Filter SF= $\sim$ 1.05!



# 25Hz Filter Spectrum



# Modo CW

- ◆ Variabile Pass Band Tuning
- ◆ Sintonia OFFSET > VFO
- ◆ Auto tuning sulla nota
- ◆ Filtri a 25, 50, 100, 250, 500, 1KHz
- ◆ 2 filtri variabili a piacere
- ◆ Keyer da Memorie, Tastiera, Paddle o da altro software

# Modo SSB

- ◆ Equalizzatore grafico
- ◆ Filtro di TX variabile in tempo reale
- ◆ ALC e Compressore NO SPLATTER
- ◆ Compander a bassa distorsione
- ◆ Filtri preimpostati o personalizzabili
- ◆ Comando per Amplificatore Lineare



## Trasmissione: l'equalizzatore e il filtro variabile

The screenshot displays the FlexRadio Systems PowerSDR v1.9.0 software interface. The main window shows two VFOs: VFO A at 7,052 719 MHz and VFO B at 7,087 972 MHz, both in 40M RTTY mode. The central display shows a spectrum plot with a signal centered at 7,049 801 MHz. The interface includes various control panels for AF, RF, Drive, AGC, and SQL. A secondary window titled 'Equalizer Settings' is open, showing 'Receive Equalizer' and 'Transmit Equalizer' sections. The 'Transmit Equalizer' is enabled and shows a bell-shaped curve. The 'Filter - 2.7k' section is also visible, with the 2.7k filter selected. The bottom of the screen shows the Windows taskbar with the FlexRadio Systems logo and the Equalizer Settings window title.

# Trasmissione: il Keyer e CAT per amplificatore

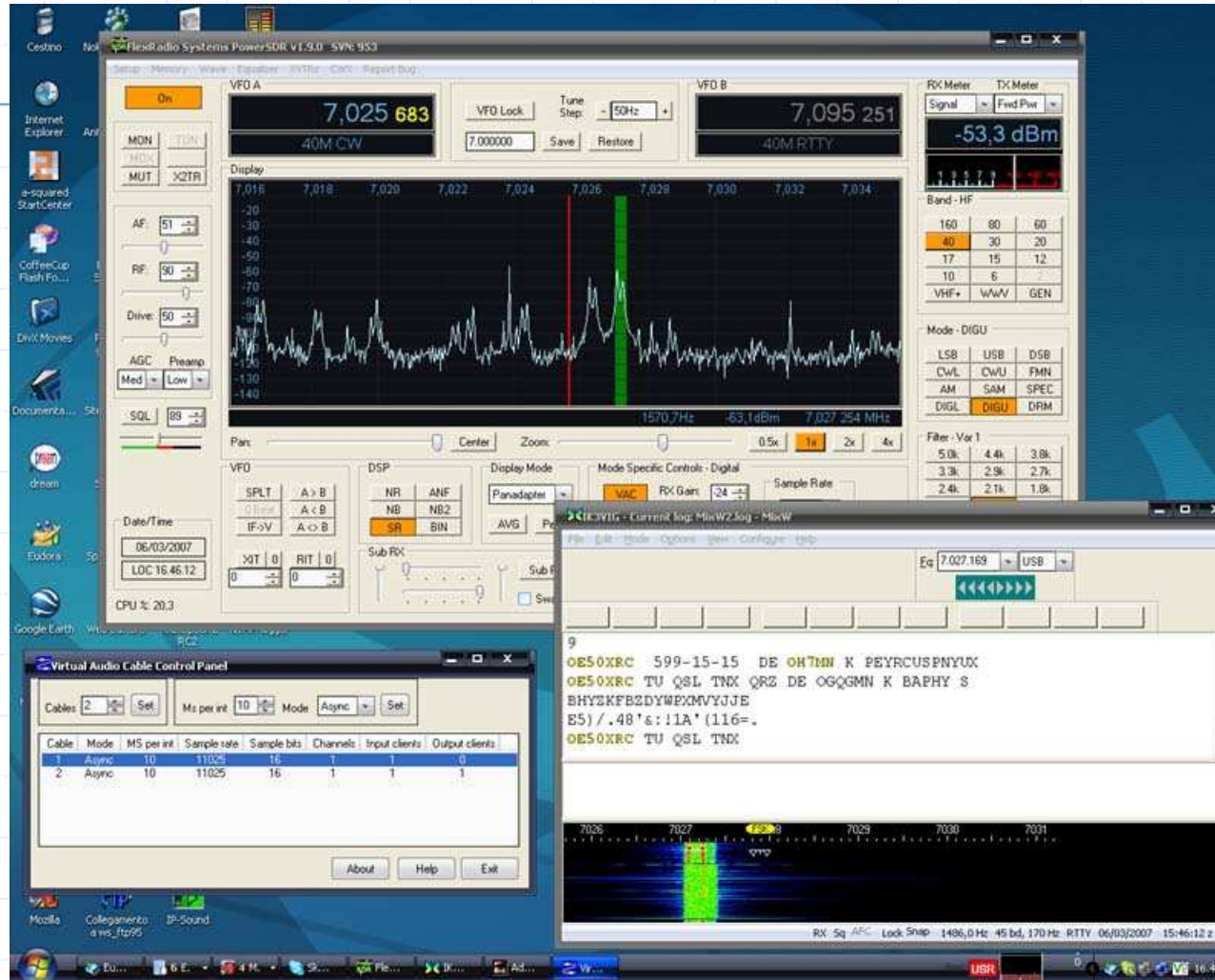
The screenshot displays the FlexRadio Systems PowerSDR v1.9.0 software interface. The main window shows two VFOs: VFO A is tuned to 3,547 049 MHz (80M CW) and VFO B is tuned to 7,067 716 MHz (40M RTTY). The interface includes various control panels for modulation, tuning, and display. A 'CW Memories and Keyboard...' window is open in the foreground, showing a list of memory slots with call signs and notes. The 'EXPERT Console Rel.11\_12\_06\_A' window is also visible, displaying the 'EXPERT 1K-FA Fully Automatic Solid State Linear Amplifier' in 'OPERATE MODE'. This window shows real-time power and temperature readings: PA OUT (1116.7 W pep), PW REV (43.2 W pep), V PA (42.7 V), and I PA (29.6 A). It also displays CAT (KENWOOD) and PA GAIN (FULL) settings, along with temperature (27 °C) and power (17.0 dB) indicators.



# Modi DIGITALI

- ◆ Elevata selettività
- ◆ Assenza effetto "AGC"
- ◆ Visualizzazione e sintonia "Waterfall"
- ◆ CAT RTX tramite Virtual Serial Cable
- ◆ Uso scheda audio dedicata
- ◆ Supporto per Virtual Audio Card (VAC)

# Modi DIGITALI con VAC e N8VB serial cable



# DX/Contesting

- ◆ Elevata selettività
- ◆ Alta dinamica
- ◆ CAT & Logging con Virtual Serial Cable
- ◆ Sintonia "Point and Click" sullo spettro

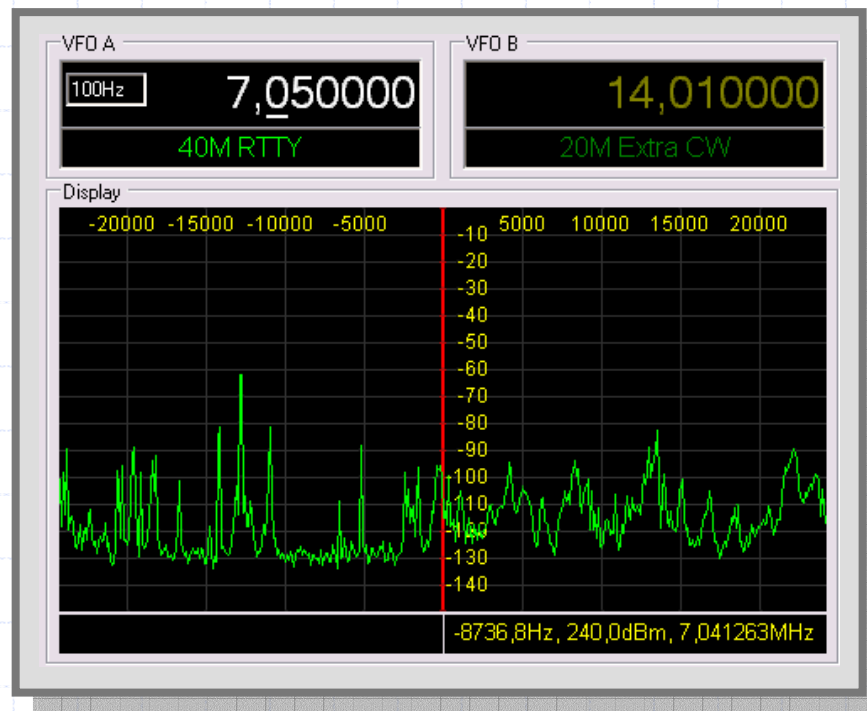
# CONTEST: esempio con N1MM

The screenshot displays the FlexRadio Systems PowerSDR V1.3.0 software interface during a contest. The main window shows VFO A at 14,085.683 MHz and VFO B at 7,095.251 MHz. A spectrum display shows a signal at 14,085.683 MHz. A smaller window shows a waterfall plot of the signal. Another window shows a list of call signs and a 'Grab' button. A logging window shows a table of call signs and frequencies.

TS	Call	Freq	Mode	SNT	RCV	Prefix	Name	Comment
06/12/2005 08:54	DL1FX	14076.20	RTTY	599	599	DL	KJ	
06/12/2005 09:02	I/N3HYD	14077.90	RTTY	599	599	I	PN	
06/12/2005 09:04	I/D44AC	14077.90	RTTY	599	599	D4	NO	
06/12/2005 17:42	RUGAKA	14067.40	PSK3	599	599	UA	bo	



# Funzioni speciali dell'SDR-1000



- ◆ Registrazione su HD dello spettro e trasformazione dominio FREQ / TEMPO
- ◆ Registrazione del segnale processato e ritrasmissione

# Alcuni sviluppi programmati del software

- ◆ 160 KHz Real Time Panadapter
- ◆ Overlaid Panadapter Spots DX
- ◆ "N" ricevitori contemporanei
- ◆ Versioni del software "su misura"
- ◆ Controllo remoto integrato
- ◆ Supporto per operazioni SO2R
- ◆ Modi digitali integrati
- ◆ Supporto Virtual Sound Card proprietario
- ◆ Supporto Universal Controller Board



# Prossima versione del software



# Stazione tipica SDR-1000



# La "Black Box" SDR-1000





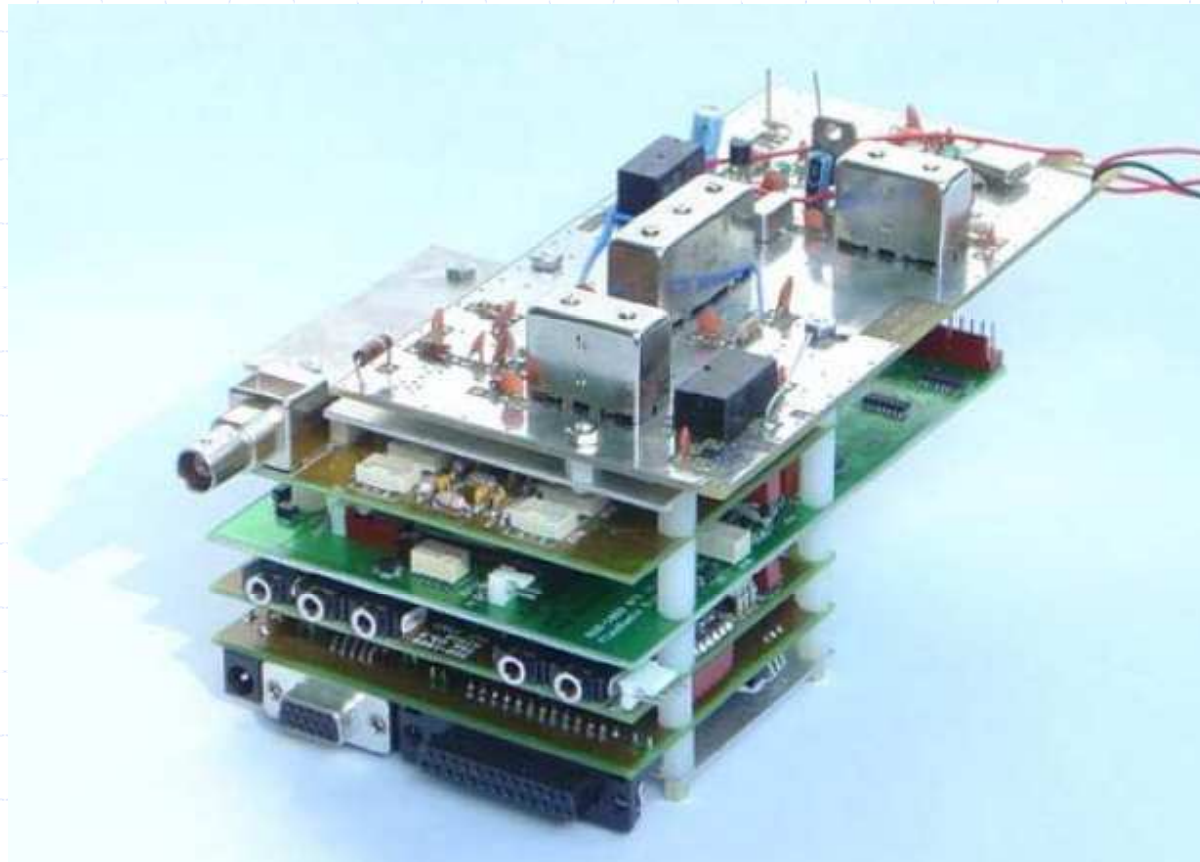
# SDR-1000 layout interno



# SDR-1000 upgrade hardware: 100W PA & ATU

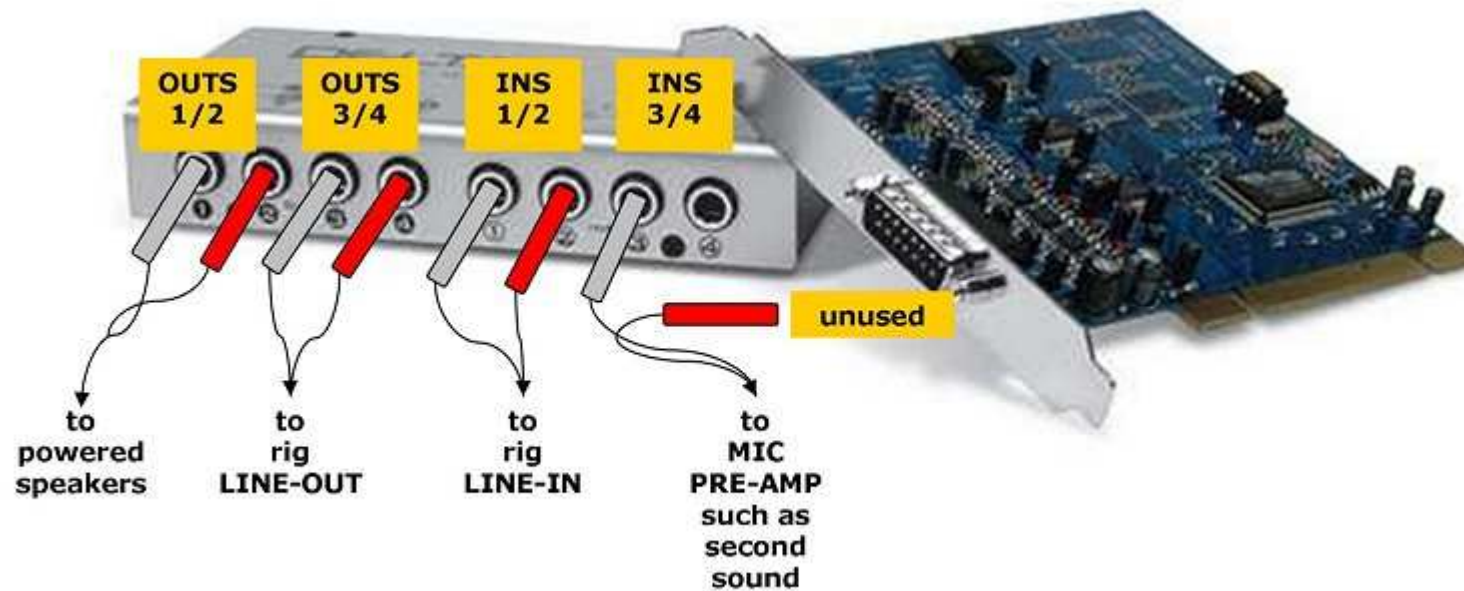


# SDR-1000 upgrade hardware: transverter 2M



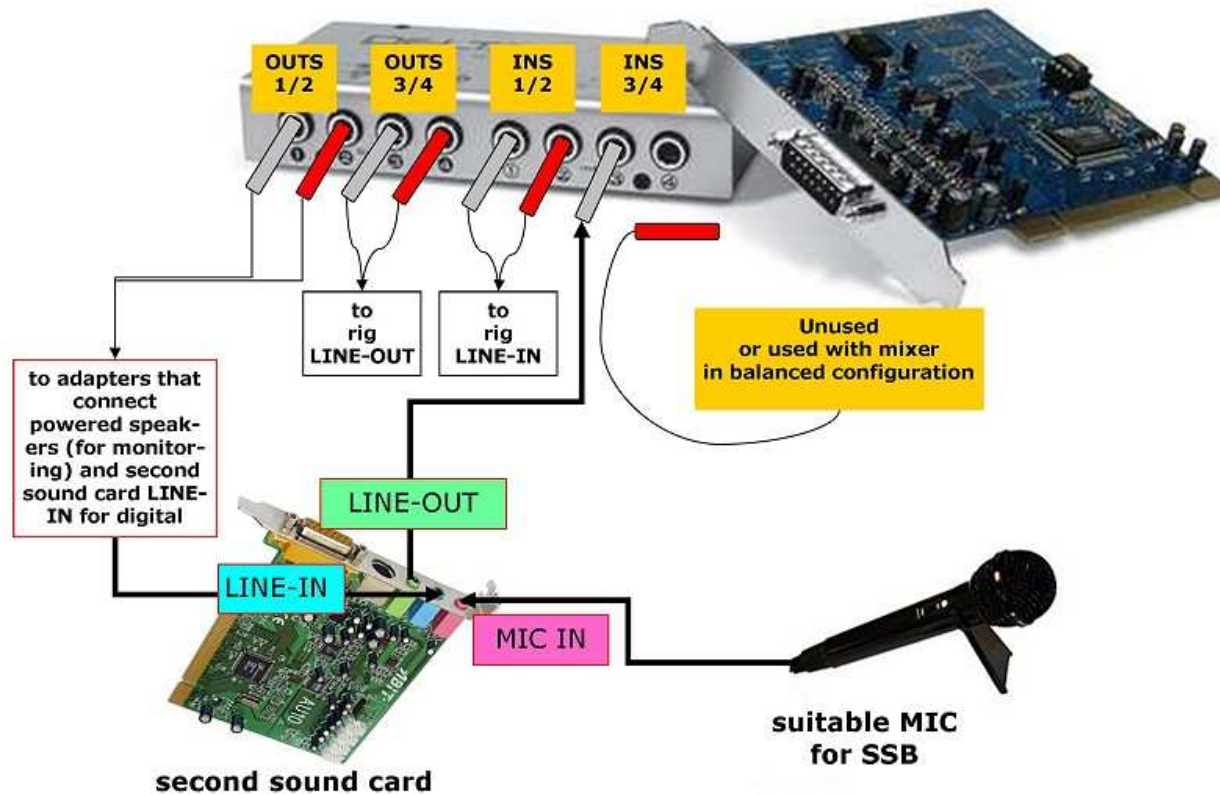


# SDR-1000 audio card M-AUDIO DELTA 44



# SDR-1000

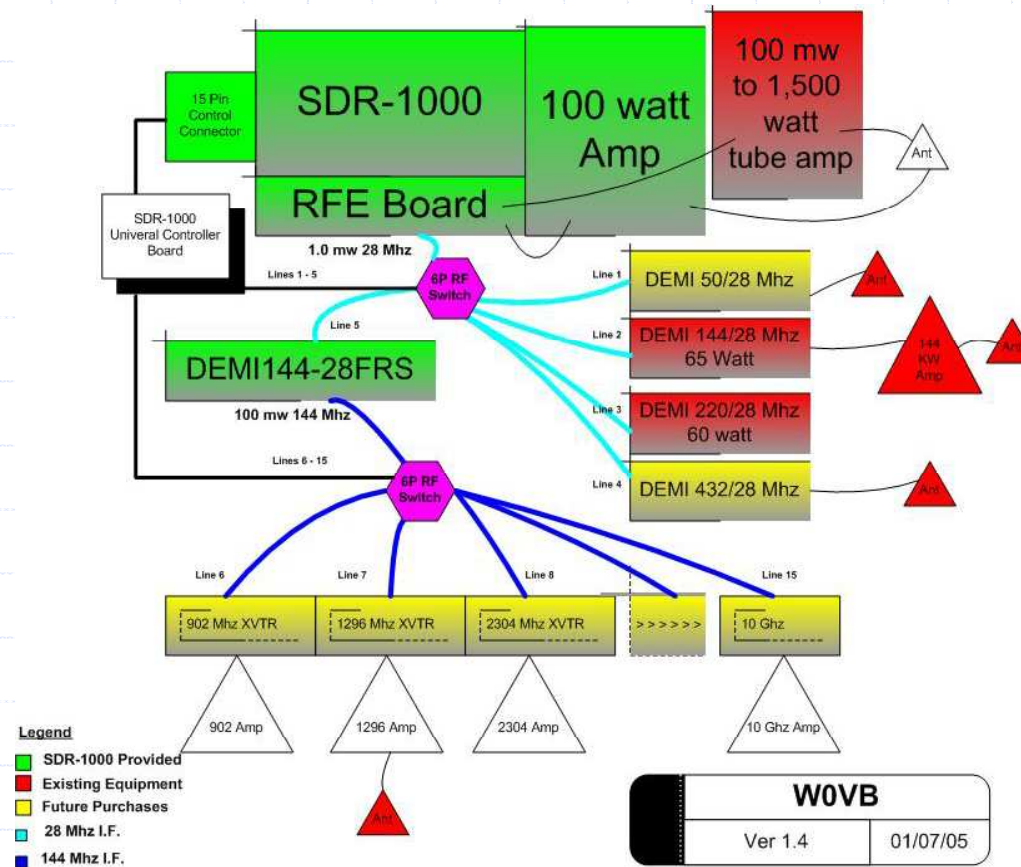
## configurazione 2 schede audio



# SDR-1000 accessori: Powermate & ShuttlePro

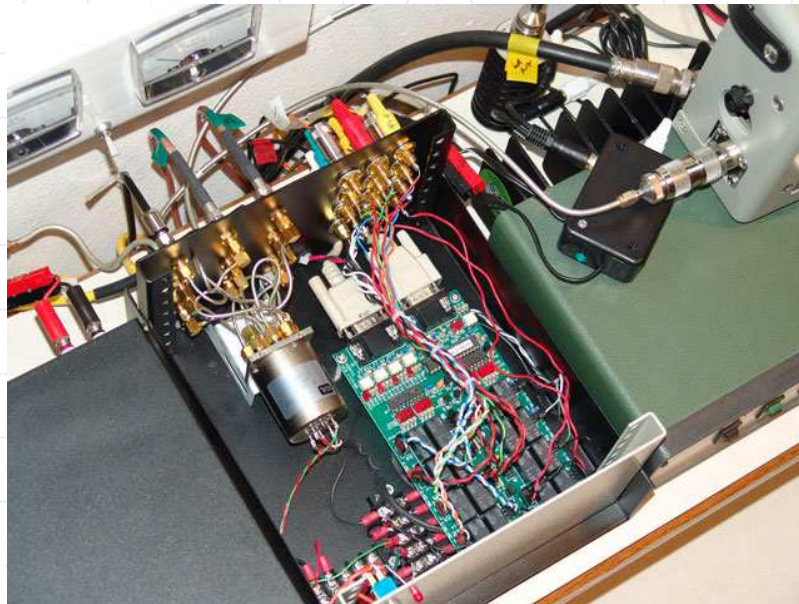


# SDR-1000 accessori: Universal Controller Board





# SDR-1000 accessori: Universal Controller Board KM0T setup





# Supporto Tecnico

- ◆ [www.flex-radio.com](http://www.flex-radio.com)
- ◆ Forum (anche in Italiano)
- ◆ Documentazione sul sito
- ◆ Teamspeak (VOI)
- ◆ Newsgroup