whitebox
Handheld Software Radio Kit

Chris Testa, KD2BMH
TAPR DCC 2013
Project Goals

Software Radio
Small & Low Power
Covers 2m / 440MHz
Open Source Hardware

Whitebox Bravo

<table>
<thead>
<tr>
<th>Microcontroller</th>
<th>Actel SmartFusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processor</td>
<td>ARM Cortex M3</td>
</tr>
<tr>
<td>Speed</td>
<td>80MHz</td>
</tr>
<tr>
<td>RAM</td>
<td>16 Mbytes</td>
</tr>
<tr>
<td>Flash</td>
<td>16 Mbytes</td>
</tr>
<tr>
<td>OS</td>
<td>uClinux 2.6, BusyBox</td>
</tr>
<tr>
<td>FPGA Gates</td>
<td>500k</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Power</th>
<th>USB or 3.7V+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standby Power</td>
<td>150mW</td>
</tr>
<tr>
<td>Transceiving Power</td>
<td>3W</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>50MHz – 1000MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bandwidth</td>
<td>1MHz</td>
</tr>
<tr>
<td>Ports (SMA)</td>
<td>RX, TX, REF IN</td>
</tr>
</tbody>
</table>

W x D x H: 100x70x33 (mm)
Smart Software Radio Device

- Vibrator
- Flash
- Camera
- Gyro
- WiFi
- Application SoC
- ARM Cortex-A
- Android
- FPU
- OpenGL ES
- WebKit
- Codec
- Speaker
- 3x Mic
- Screen
- Digitizer
- USB
- SD Card

Baseband FPGA SoC
  - DDC
  - DUC

ADC
DAC
Quadrature Mod
Demod Mixers LO
Amp
Amp

Alpha Prototype
First Transmit Rig

First Successful CW Test!
Receiver Simulations

Code & Schematics Released
http://github.com/testaco/whitebox

Change Log:
* Kernel Drivers
* 10MHz REFIN Option
* 50MHz – 1000 MHz
* IF SAW Filter
* 10-bit ADC/DAC
* DAC Low Pass
* ADC/DAC DC Offset
* Impedance Match
* USB Power Option
* Plug Compatible w/ SmartFusion2
Thank You!

TAPR (Steve & John)  http://tapr.org/
Emcraft Systems    http://emcraft.com/
Golledge           http://golledge.com/

University of Michigan – Prabal Dutta, Ye-Sheng Kuo
University of Utah – Thomas Schmid
University of Maryland – Aaron Schulman

Bruce Perens, John Klingelhoeffer, Pat Ryan, Justin Kuhn,
Eric Pinson, Bob McDonough Jr.

EEVBlog, Signal Path Blog, The Artists Way

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