FUNcube Dongle Pro+

DC-to-daylight software-defined radio
This wasn’t meant to happen!

• The original FCD was still selling well
• Working on SDR for mobile devices
• Then a chip supply problem
• In July 2012, we ran out of parts
• But we have a satellite to launch...
• ...and no groundstation!
Take a step back: the FUNcube project

• The FUNcube project is a satellite designed to enthuse young people in Science, Technology, Engineering and Maths

• First and foremost, the FUNcube Dongle is the ground receiver for the FUNcube satellite.

• Everything else is secondary!
FUNcube-1 satellite status

• Flight model completed
• Includes a 70cm/2m linear transponder
• Shake & vac tests imminent, October 2012
• Launch delayed until March/April 2013
• DNEPR launch from Yasny
FUNcube-2 satellite status

- We’re also on-board the UK Space Agency’s UKube-1 project
- Same payloads as FUNcube-1
- Soyuz-2 March 2013 Launch from Baikonur
Aims of the FUNcube Dongle

- Groundstation receiver for FUNcube
- Primary design requirements:
  - Accessible, not intimidating
    - For everyone, amateur and non-amateur
  - A true turnkey solution
    - Zero hardware setup
    - Plug in and go
  - Reasonable cost
FUNcube Dongle status

• FCD Pro still selling well, until mid-July 2012 when stock exhausted
• Difficulties in supply of the tuner chip
• Stock definitely exists, and in some quantity!
• Small quantities are available but too expensive to make a viable production run
• Tuner chip will become available soon, but still little indication of exactly when
FUNcube Dongle next steps

• We have a satellite launch very soon, but possibly no ground segment
• To mitigate risk, we decide to develop a replacement FCD
• We also decide to improve the FCD
  – Better performance
  – More features
FCD Pro+ development timeline

• Mid June 2012
  – Decision taken to build new FCD
  – Parts evaluation starts

• July 2012
  – Principal parts chosen
  – Extensive unit testing
  – Breadboarded prototype

• August 2012
  – Further unit testing continues
  – Two PCB spins
  – Final design accomplished

• September 2012
  – Production run starts
  – Online shop developed: *** pre-ordering now taken! ***

• October 2012
  – CE/FCC conformance testing
  – First units available
FUNcube Dongle Pro+

Performance Improvements

• Improved dynamic range
  – 3.3v tuner RF section instead of 1.5v
  – LNA OIP3 30dBm (was 10dBm)
  – Better tuner/ADC noise floor

• Excellent frequency stability and accuracy
  – 0.5ppm TCXO

• 24 bit internal ADC depth

• 11 front end hardware filters
  – Including SAW filters for 145MHz and 435 MHz

• Improved LO phase noise
FUNcube Dongle Pro+
Functionality Improvements

- 192kHz sample rate
- Tuner PLL steps <0.5Hz
- Frequency coverage
  - 4m, 2m, 1.25m, 70cm, 33cm, 23cm
  - 6m
  - 160m-10m
  - LF, MF
- 150kHz-250MHz & 420MHz-2GHz
FUNcube Dongle Pro+

- Extensively unit tested: about 20 different PCBs for LNAs, filters and band switches
  - Careful attention paid to parts
  - eg, inductors WW or multilayer, Q, size
- 2 full breadboard prototypes built
- Now 240 components, was 100
- Parts on top and bottom of board
- Six-layer board
FUNcube Dongle Pro+

• Manufactured in UK!
• Continues to help to fund the FUNcube satellite
• Pricing for your DC-daylight FCD Pro+
  • £124.99+VAT
    – USD $199
    – EUR €156+VAT
    – CAD $195
    – AUD $194
    – JPY ¥15660
FUNcube Dongle Pro+

- Thank you!
  - Howard G6LVB, g6lvb@amsat.org
  - Pre-order here:
    - http://www.funcubedongle.com