

*** Wireless* Audio Effects Processor**

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*April 30th, 2007
6.111 Project Presentation*

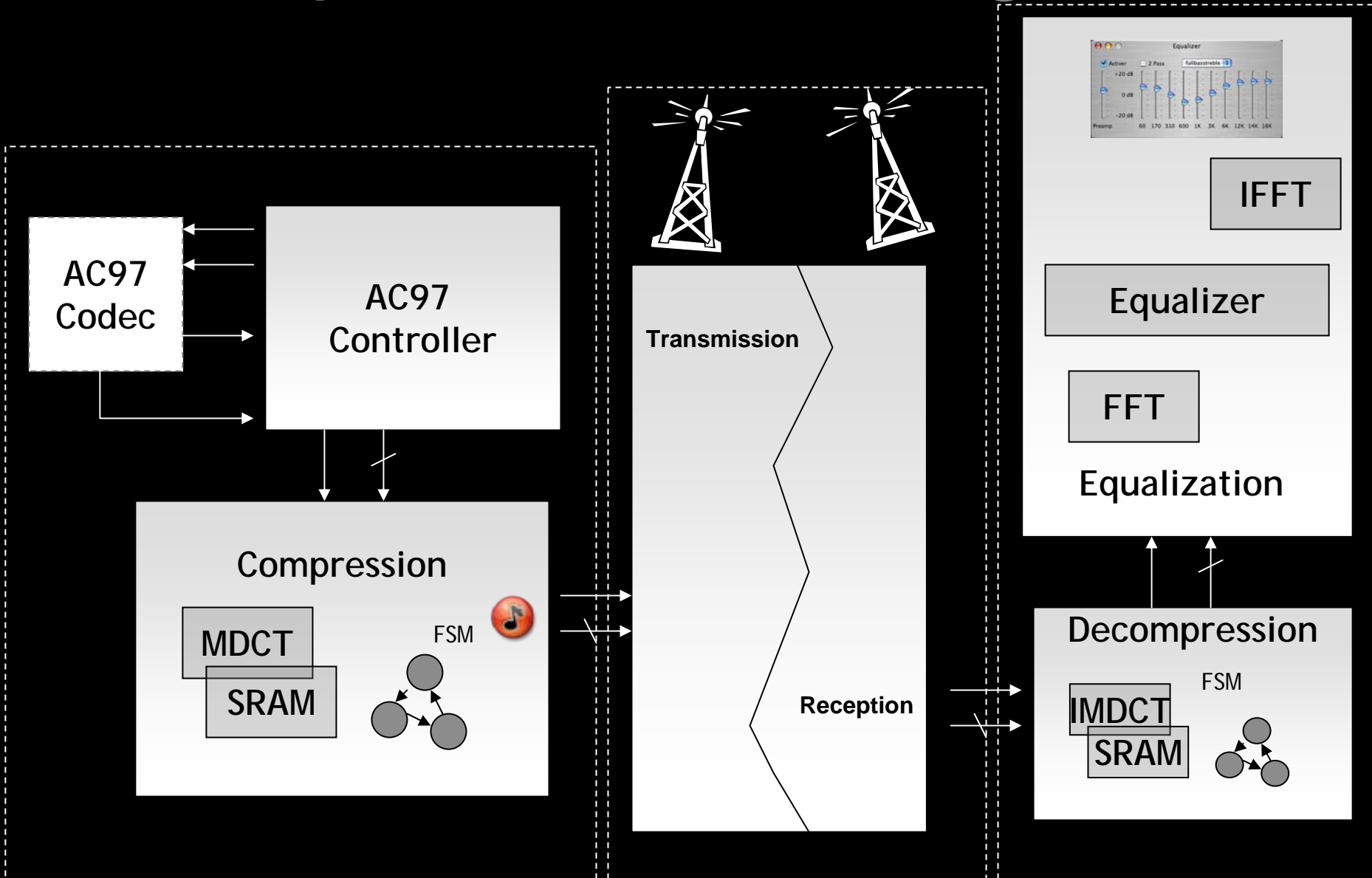
Our Model: AirTunes®

- Audio input from source
- Compressed
- Wirelessly transmitted
- Decompressed
- Equalizer & Audio Effects

WIRELESS
ZONE

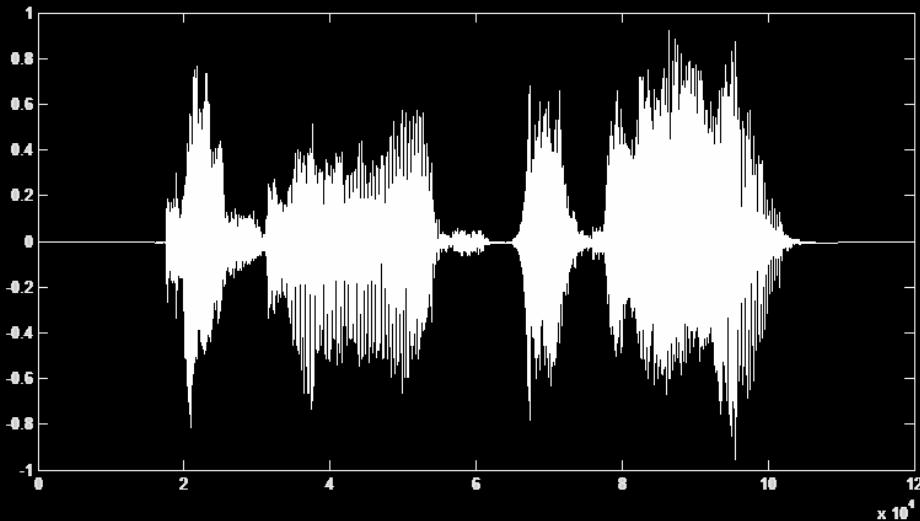


Top Level Block Diagram

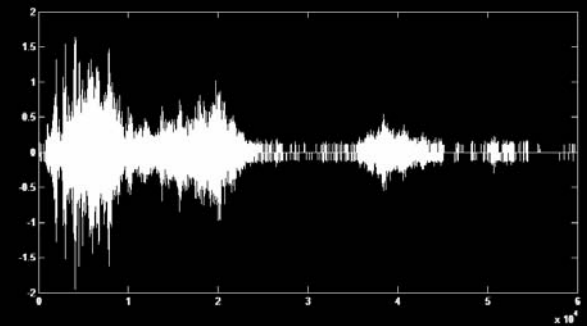


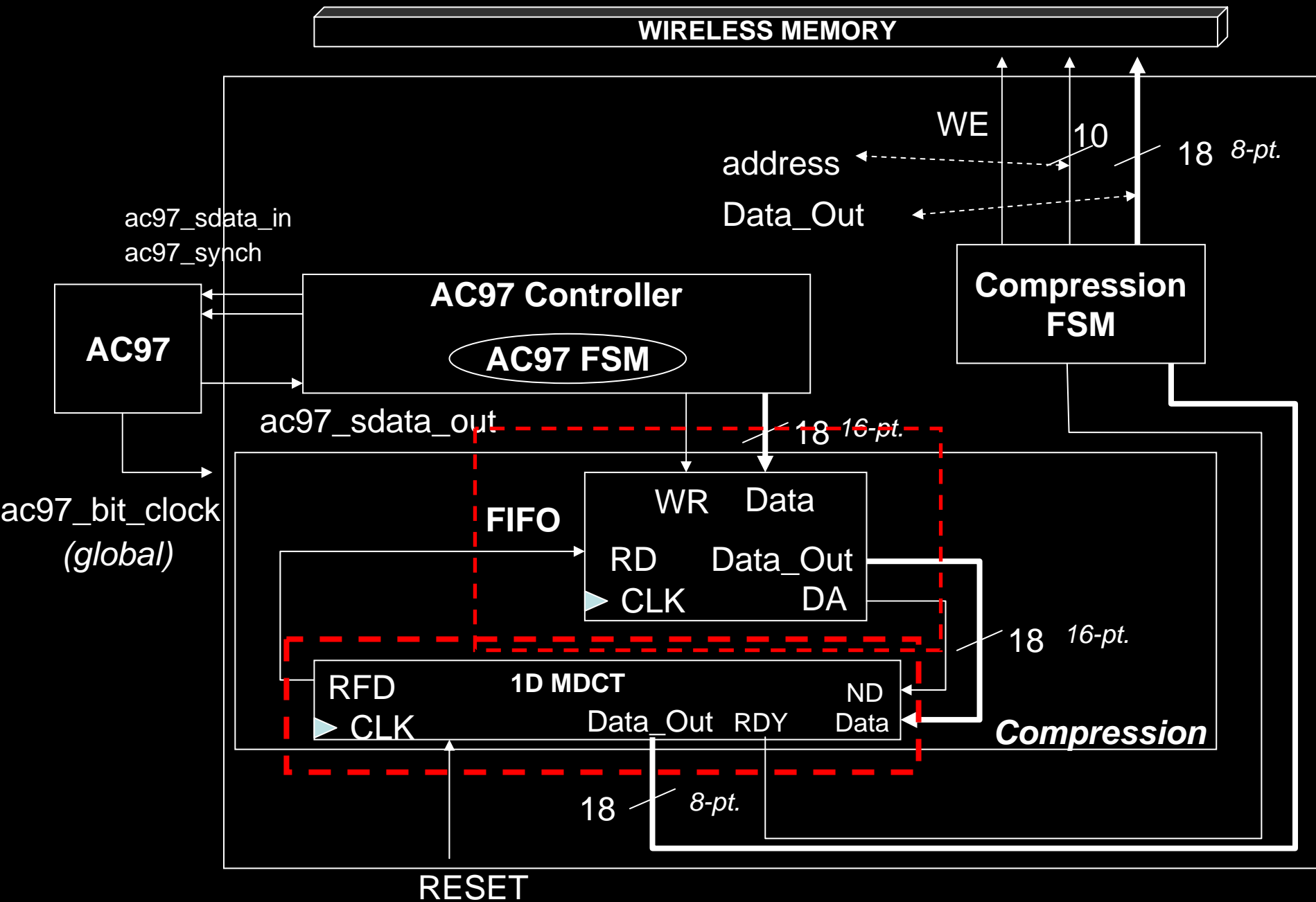
Compression of Audio

- MP3, MPEG-4, AAC
 - *Modified Discrete Cosine Transform*
 - *Lapped* : Map $2N$ discrete points into N discrete points

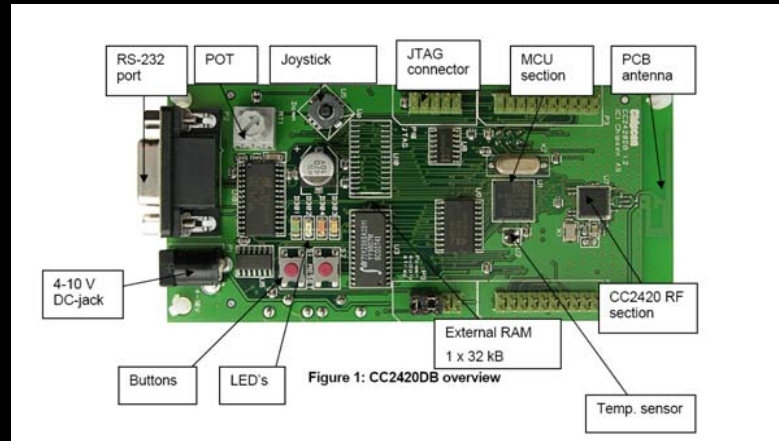


MDCT



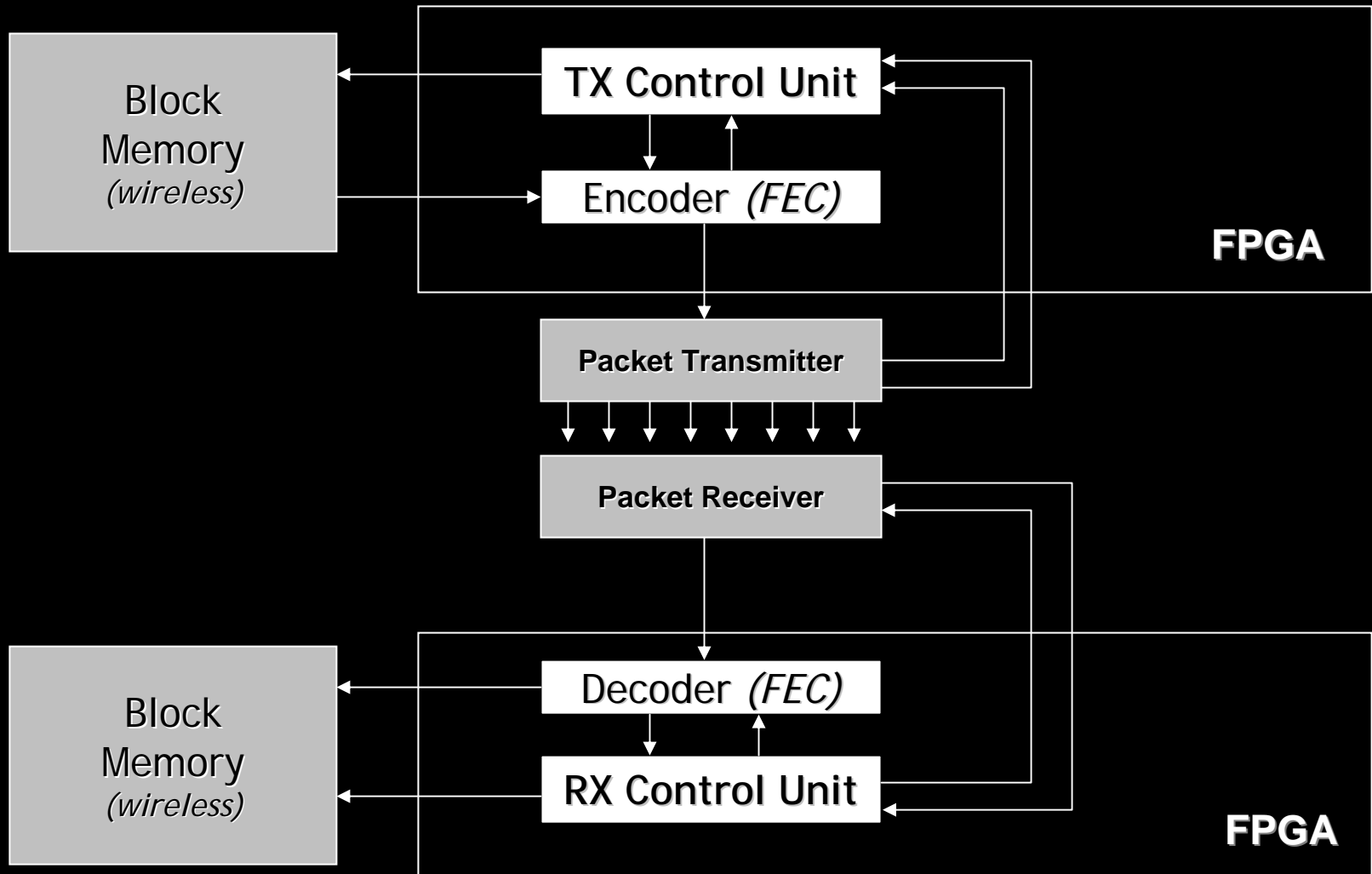


Wireless CC2420DBK RF Transceiver



- CC2420 radio
- 2.4 GHz frequency band
- Atmel Atmega128L AVR microcontroller
- 2x32 kBytes external RAM
- PCB antenna
- Joystick, buttons, LEDs (visual user application interface)

Wireless Big Picture

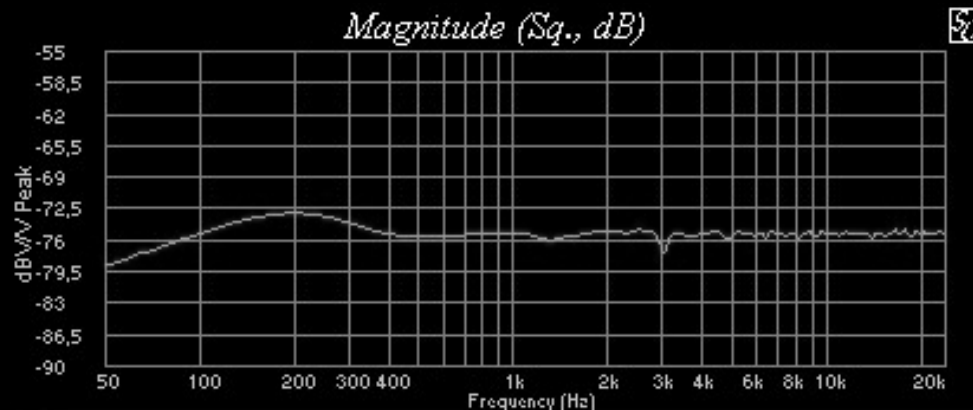


Wireless Transmission Algorithm

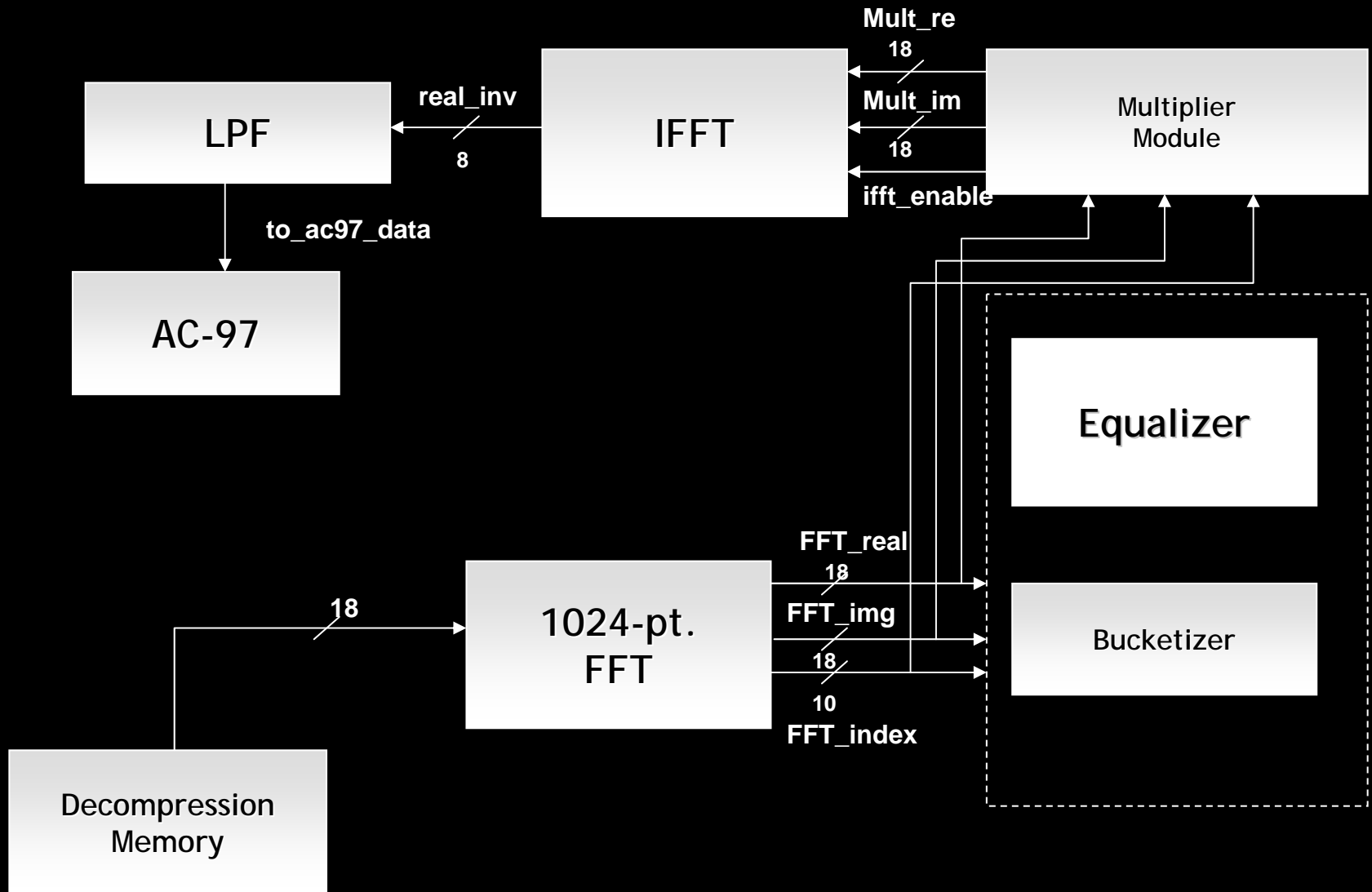
- Error Correction Algorithm
 - Forward Error Correction (FEC)
 - sender adds redundant data to its messages
 - allows receiver to detect errors
- Reed Solomon Code
 - Key idea:
 - data is encoded as a polynomial
 - any k distinct points *uniquely* determine a polynomial of degree at most $k-1$
 - Polynomial is then “encoded” by its evaluation at various points, and these values are what is actually sent
 - Transmission: some of these values may become corrupted
 - More than k points are actually sent
 - Receiver decodes the original data
 - Total number of m -bit symbols in the encoded block is $n = 2^m - 1$
- Example: $m = 8$, Code Rate 223/255
 - (In each block 223 symbols are formed from the encoder input and 32 parity symbols are added.)
 - Capable of correcting up to 16 symbols per block

Equalization

- Use FFT to convert audio signal into frequency spectrum
- Add desired effects as required by the user
- Take IFFT of resulting signal
- Transmit processed audio to AC-97 output line



Audio Effects: The BIG Picture



Questions?

