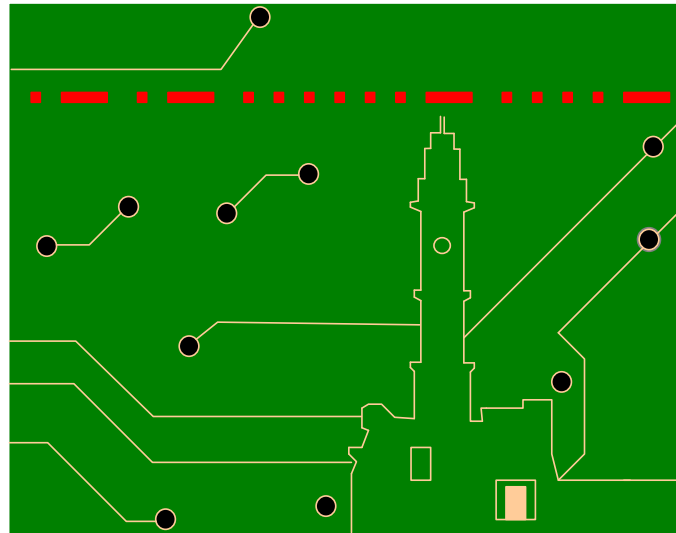# ΤΗΛ412 Ανάλυση & Σχεδίαση (Σύνθεση) Τηλεπικοινωνιακών Διατάξεων
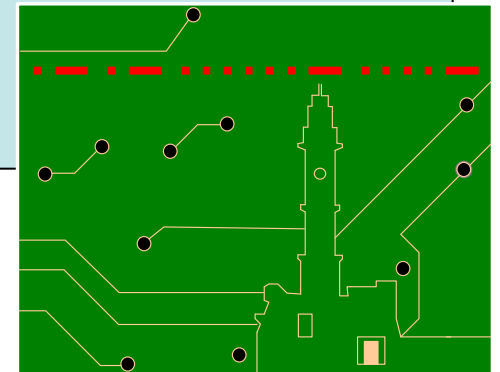
Διαλέξεις 12-13

Άγγελος Μπλέτσας

ΗΜΜΥ Πολυτεχνείου Κρήτης, Χειμερινό Εξάμηνο
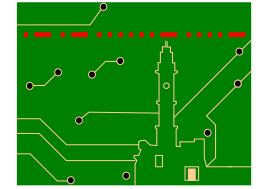2014-2015

Διαλέξεις 12-13 – Synthesis

- The adventure of a signal inside a receiver!

- Modules of super-het receiver.

- Synthesis of modules

Για την σημερινή διάλεξη έχει χρησιμοποιηθεί υλικό από το βιβλίο «Σύνθεση τηλεπικοινωνιακών διατάξεων, Σεργιάδης Γεώργιος Δ., University Studio Press A.E.»

Can you read this inside the receiver (you are an electronics engineer, right)?

Example of Super-Het Receiver

- ➢ Notice the symmetry at the attenuation resistor network (why?)

- ➢ Notice the BPF doubling of center frequency and BW (why?)
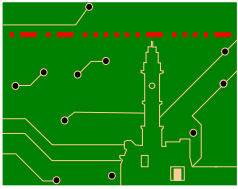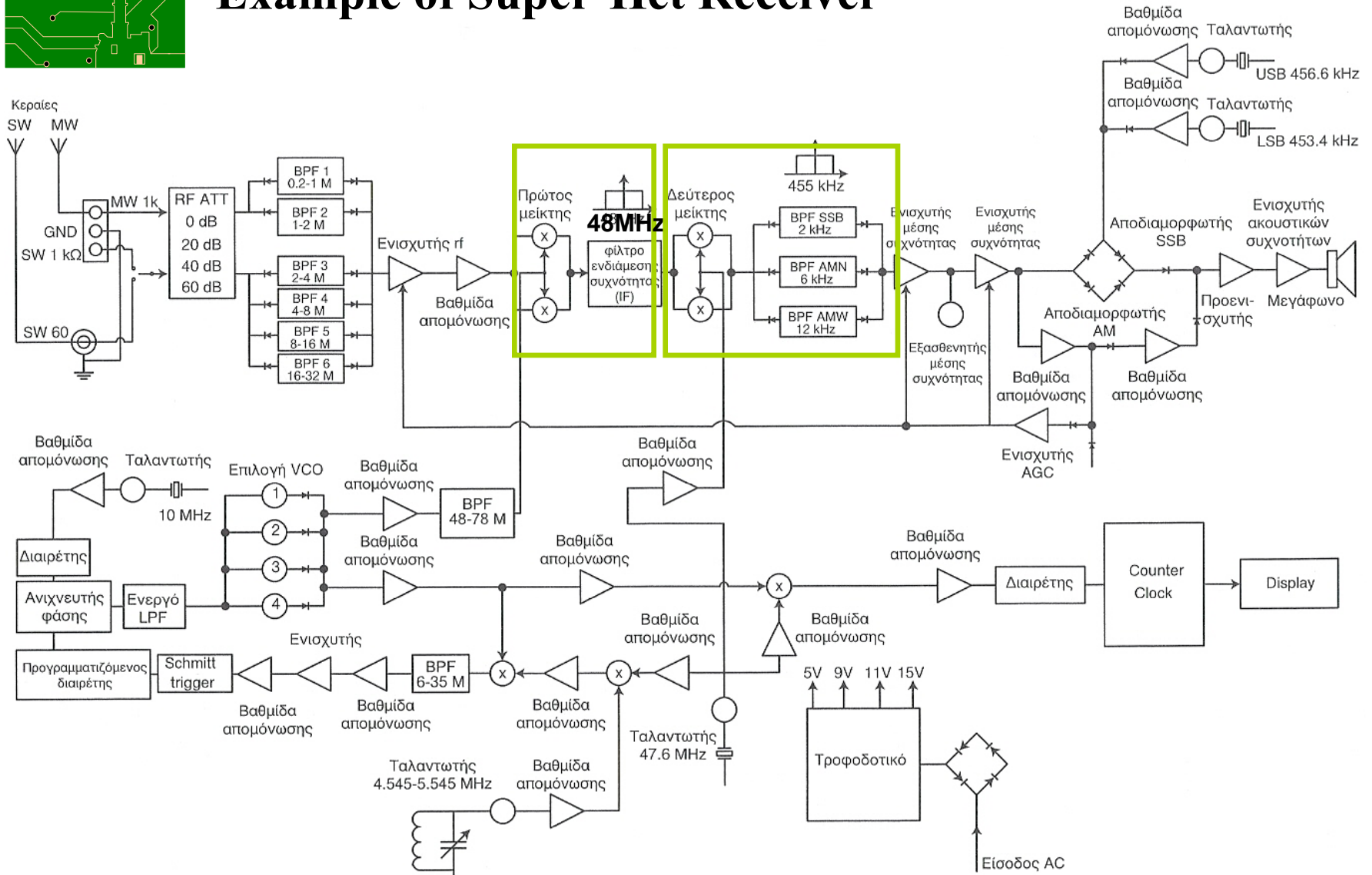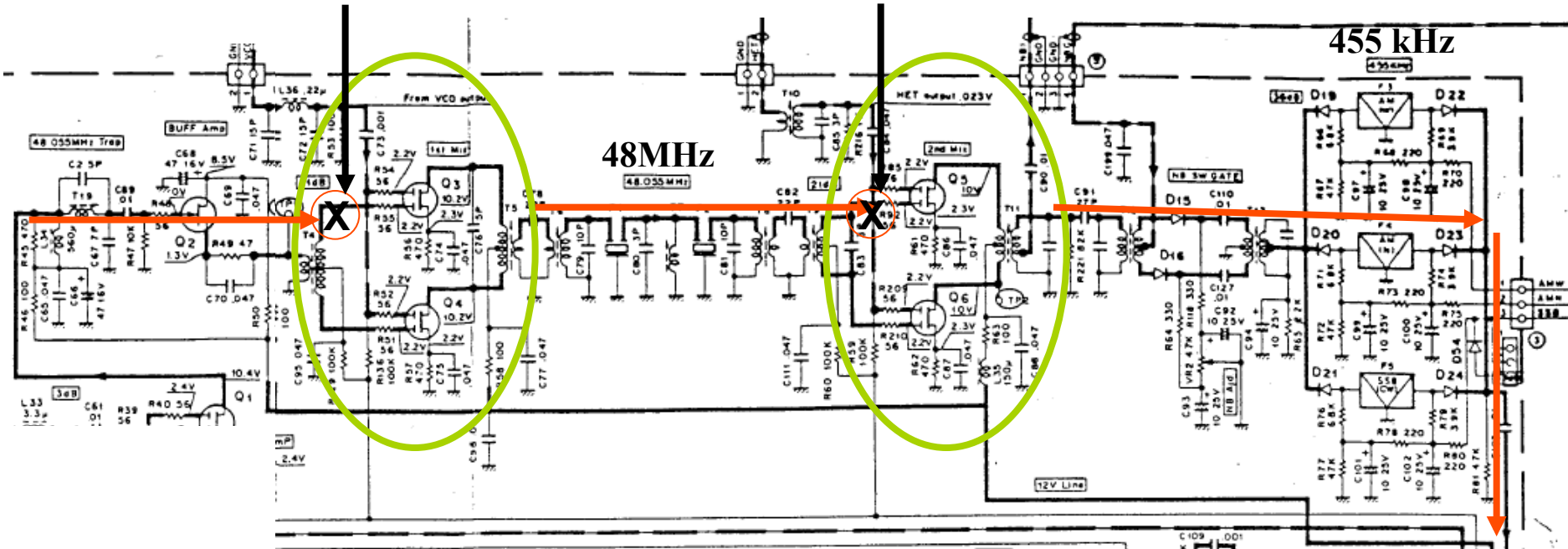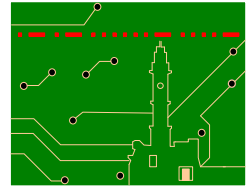
Example of Super-Het Receiver

➢ Why doesn't 2nd mixing suffer from image?
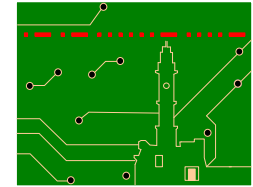
Upconversion (super-heterodyne mixing)

48-78MHz from PLL

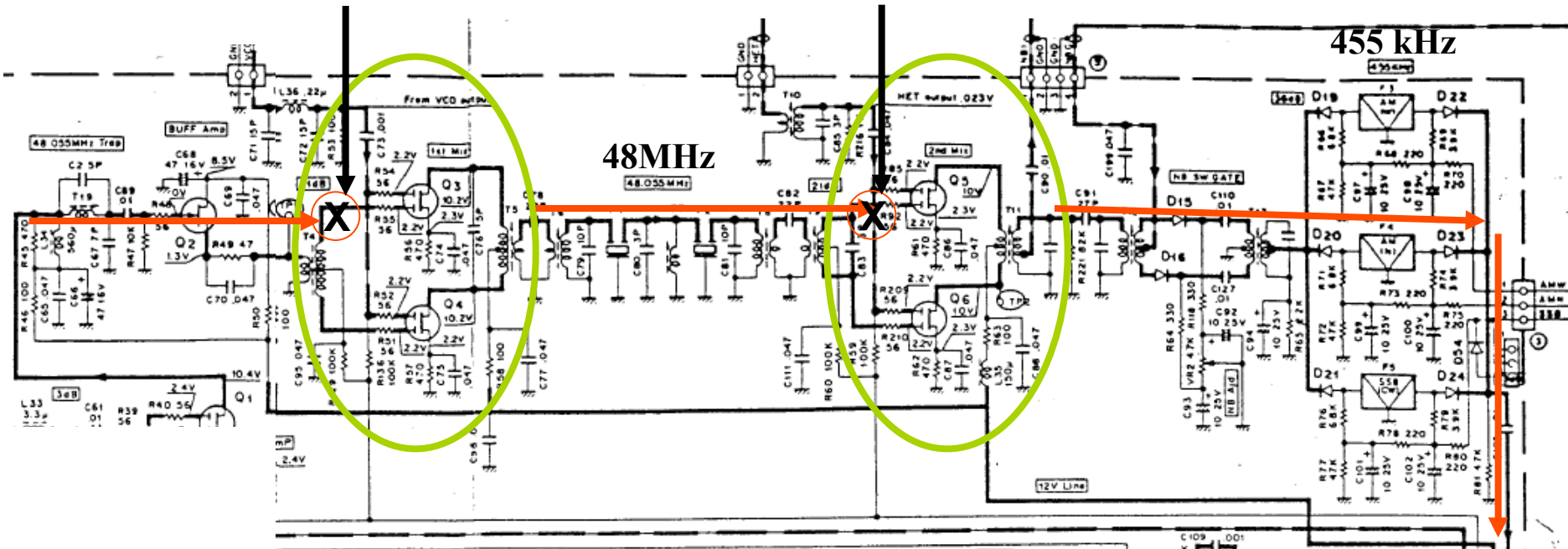**47.6MHz from PLL**

455 kHz

48MHz

➢ Notice the SAW architecture of the first image reject filter (why?).

➢ Remember the advantage of upconversion!

Upconversion (super-heterodyne mixing)
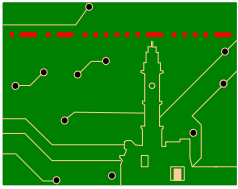
48-78MHz from PLL
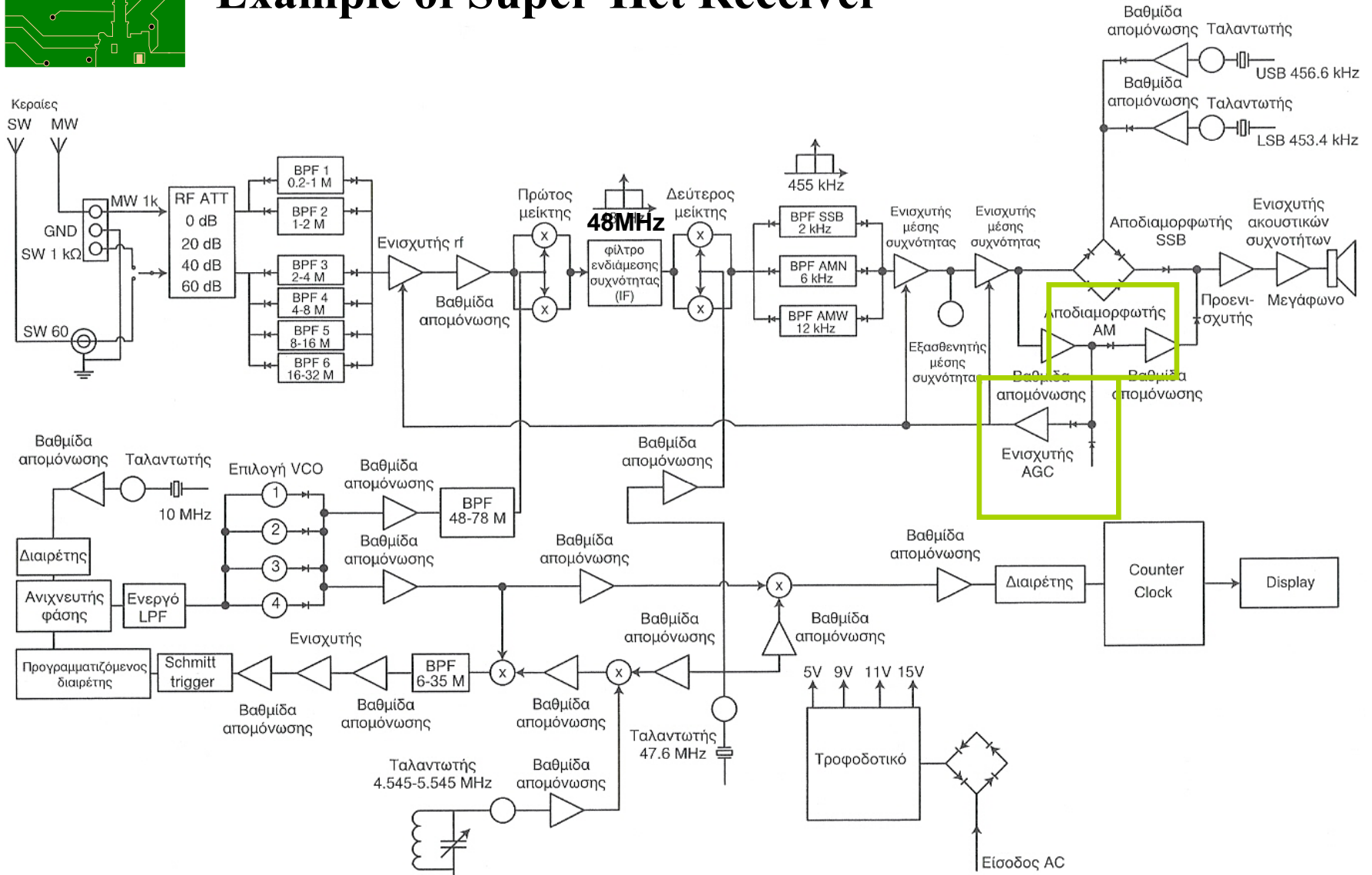
47.6MHz from PLL

455 kHz

48MHz

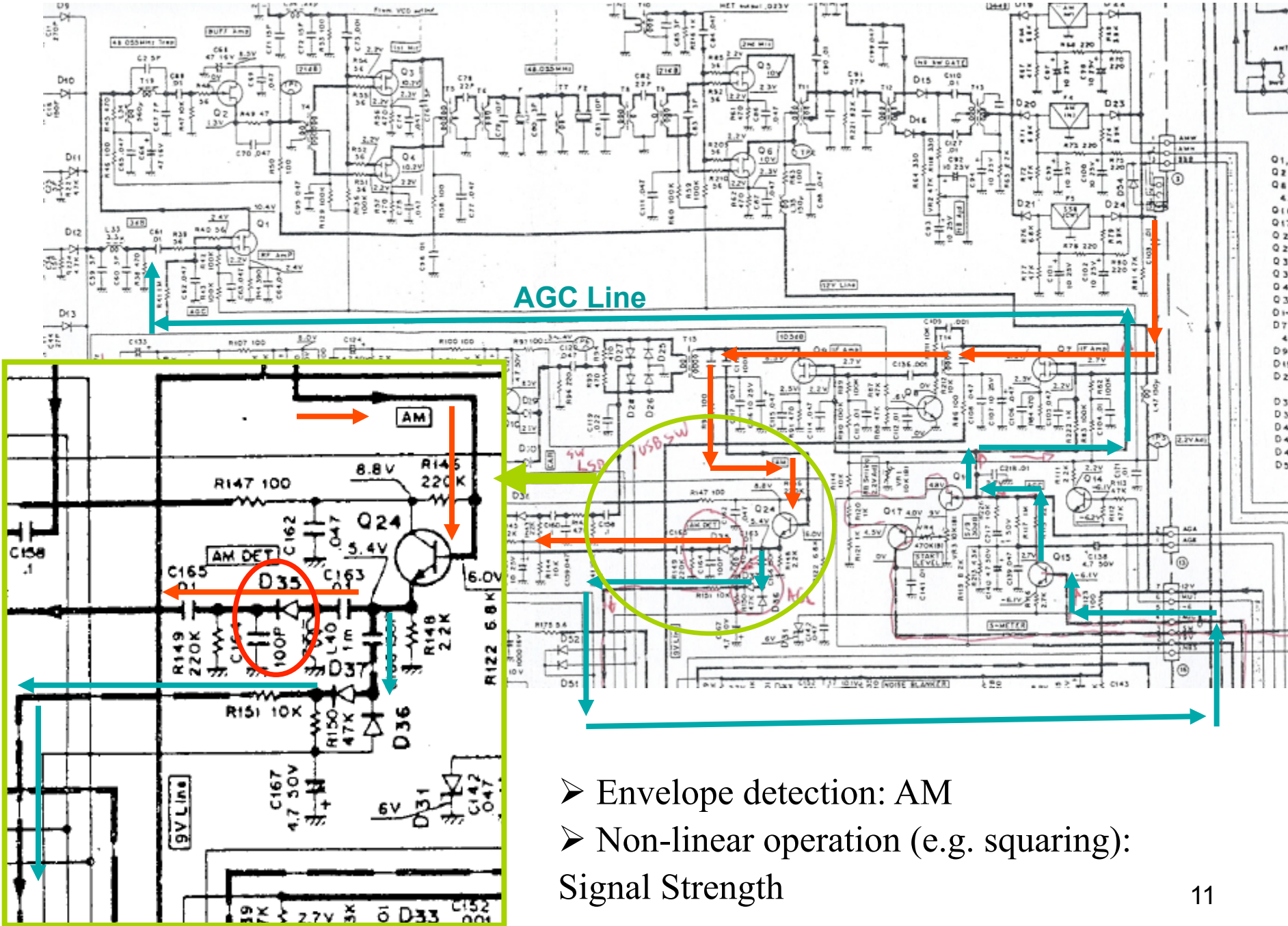> Notice the balanced architecture of each mixer (why?).

[mixer = switch at mixing frequency => output could potentially include mixing frequency due to non-idealities]

> Balanced architecture: mixing frequency adds with opposite sign at the output (and cancels out).
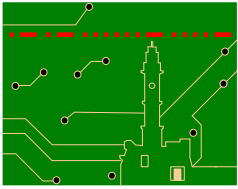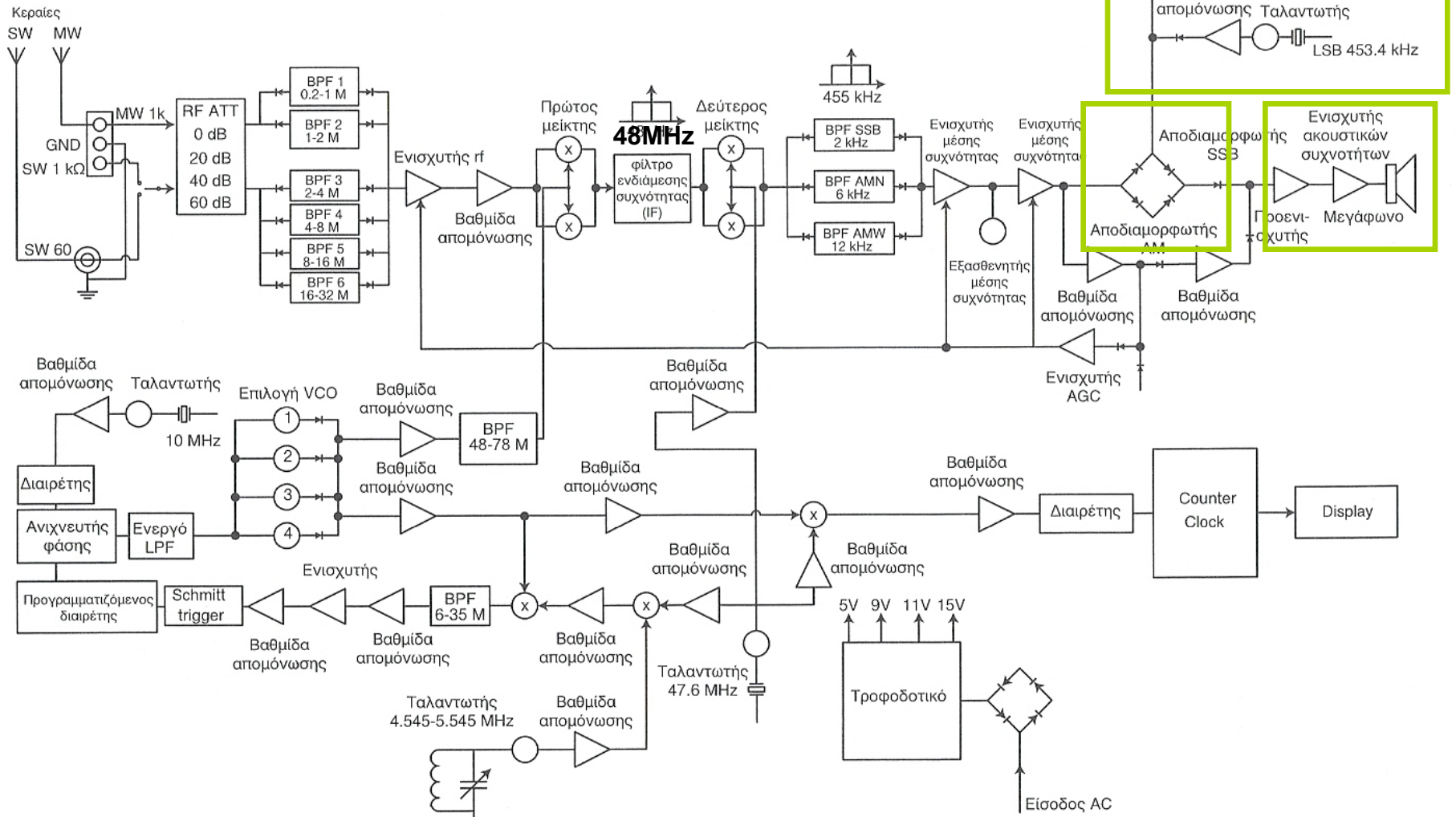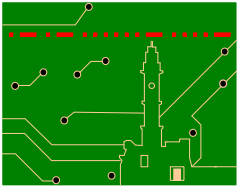
Example of Super-Het Receiver

AGC Line

➢ Envelope detection: AM

➢ Non-linear operation (e.g. squaring):
Signal Strength

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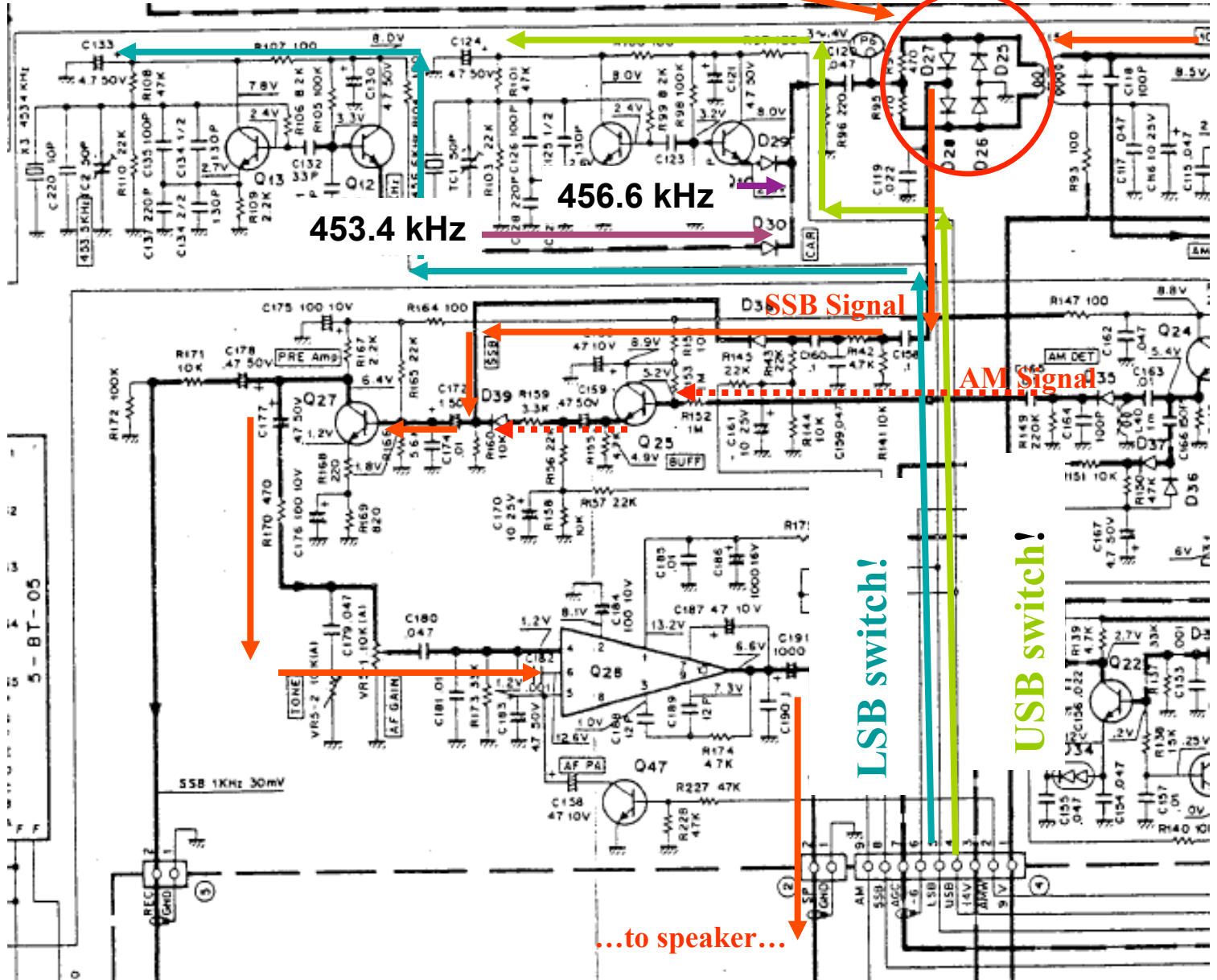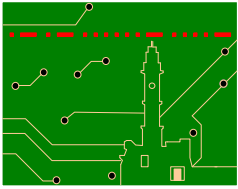# Example of Super-Het Receiver

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➢ Notice the double-balanced mixer!

456.6 kHz

453.4 kHz

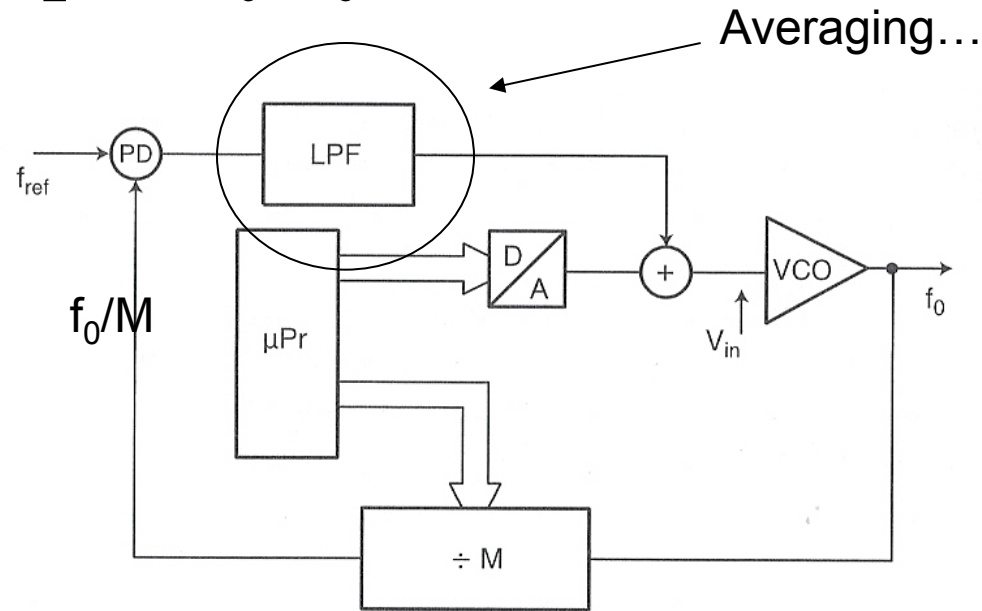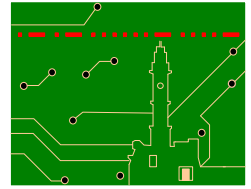SSB Signal

AM Signal

LSB switch!

USB switch!

…to speaker…
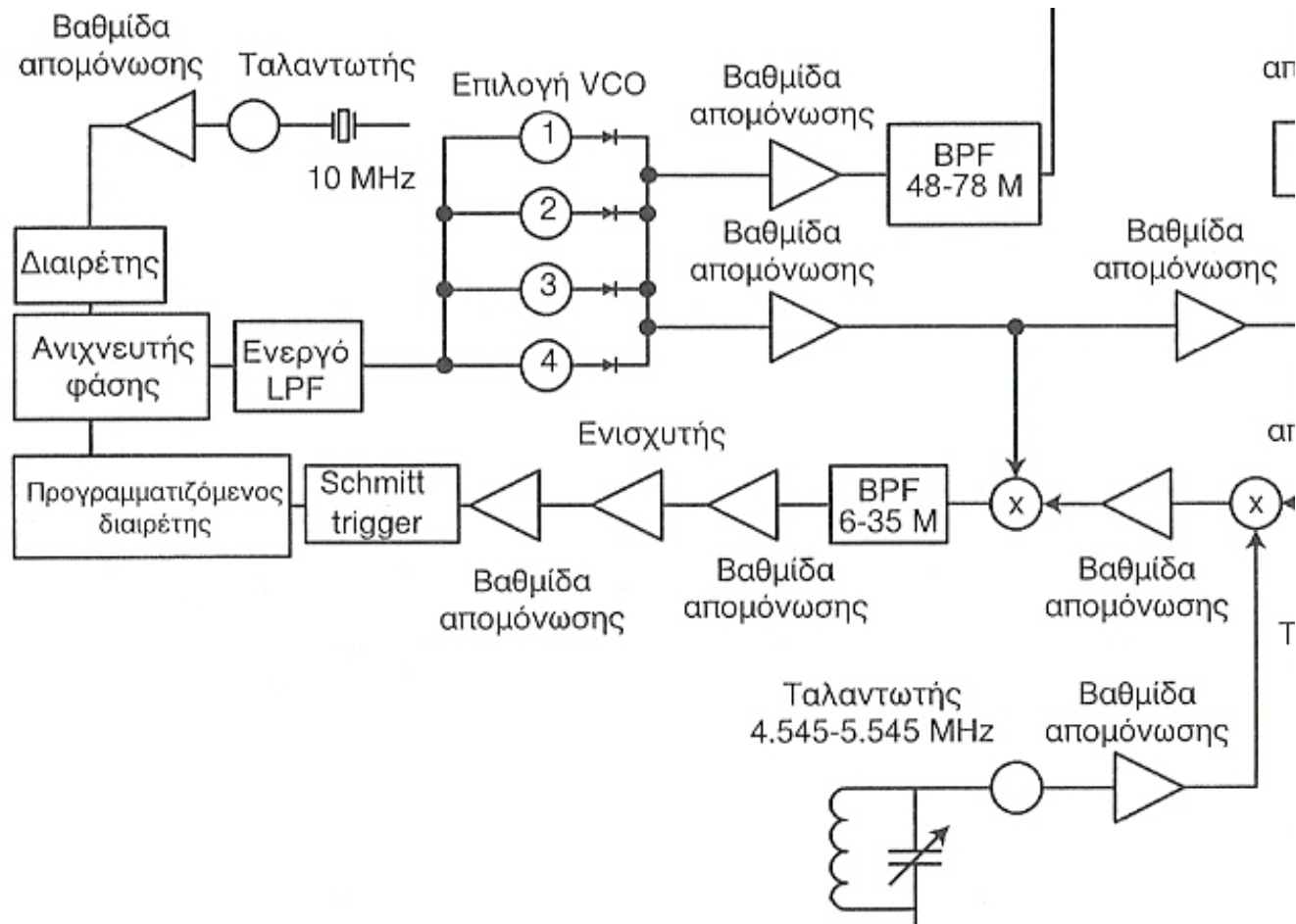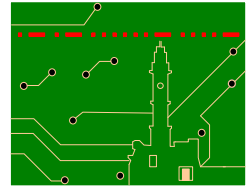
13

Example of Super-Het Receiver

PLL as frequency synthesizer

Averaging…
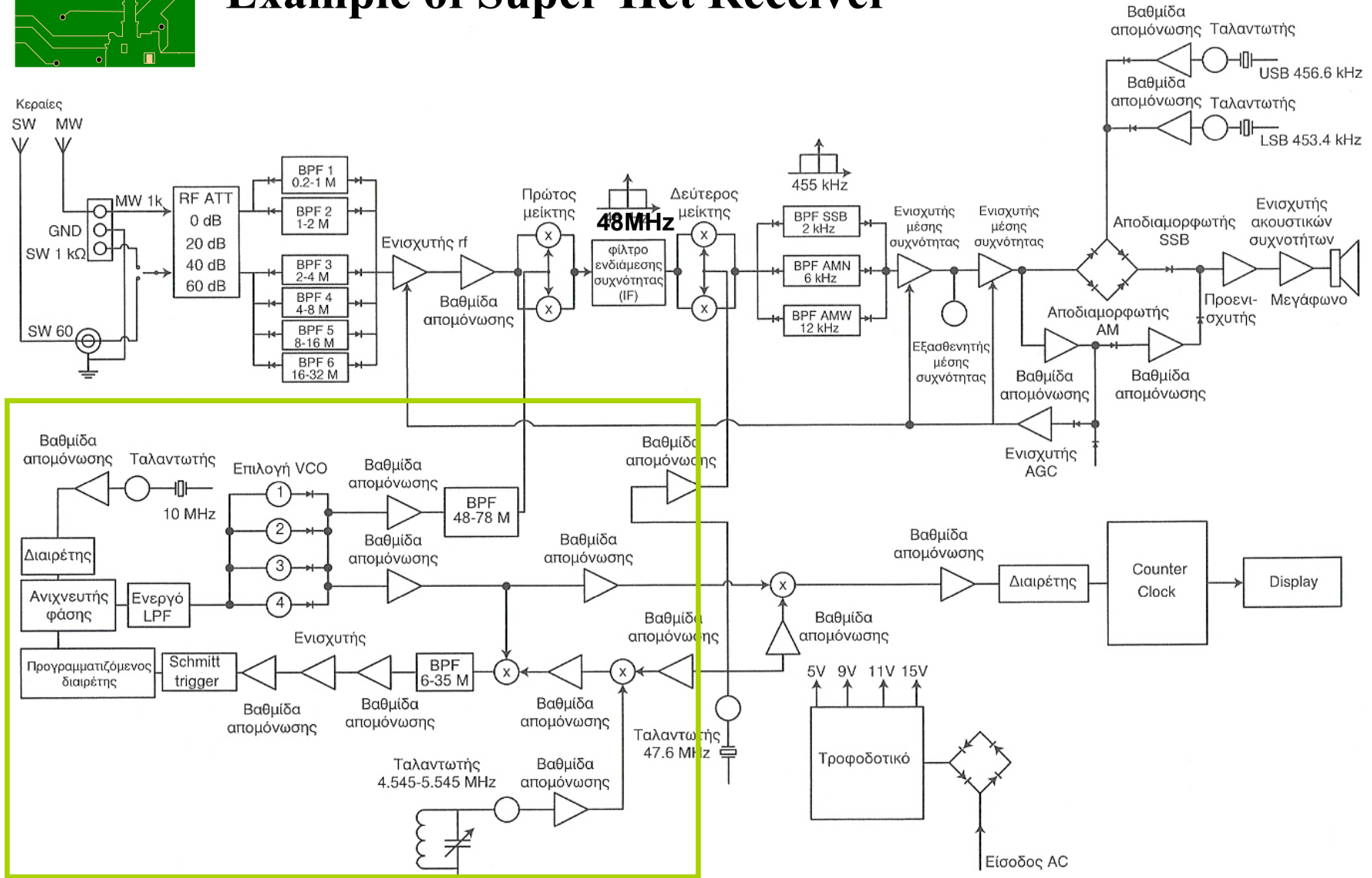
> Voltage control oscillator (VCO): multiple frequencies but temperature-unstable.

> Crystal: (relatively) temperature-stable but single frequency.

> PLL: multiple, temperature-stable frequencies.

> PLL range of frequencies: discrete steps, depends on divisor M.

PLL as frequency synthesizer

Questions?