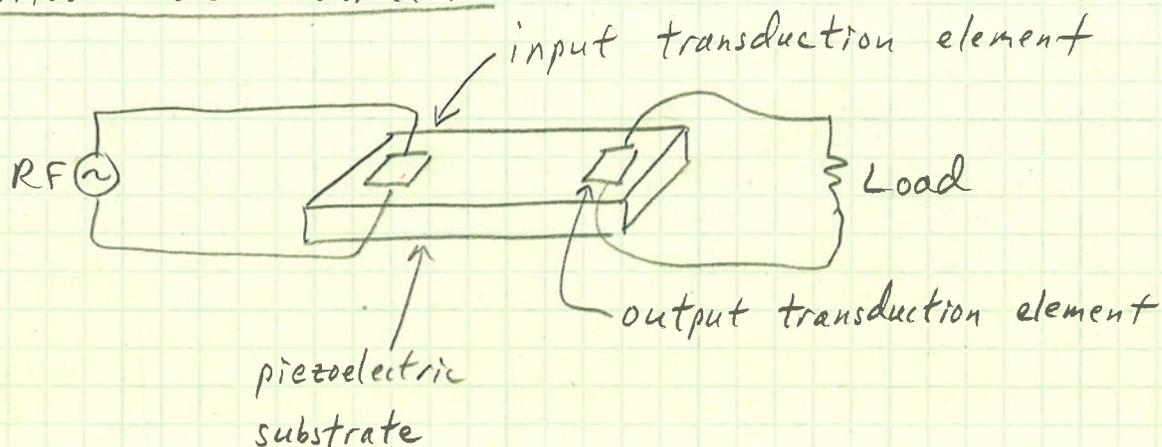
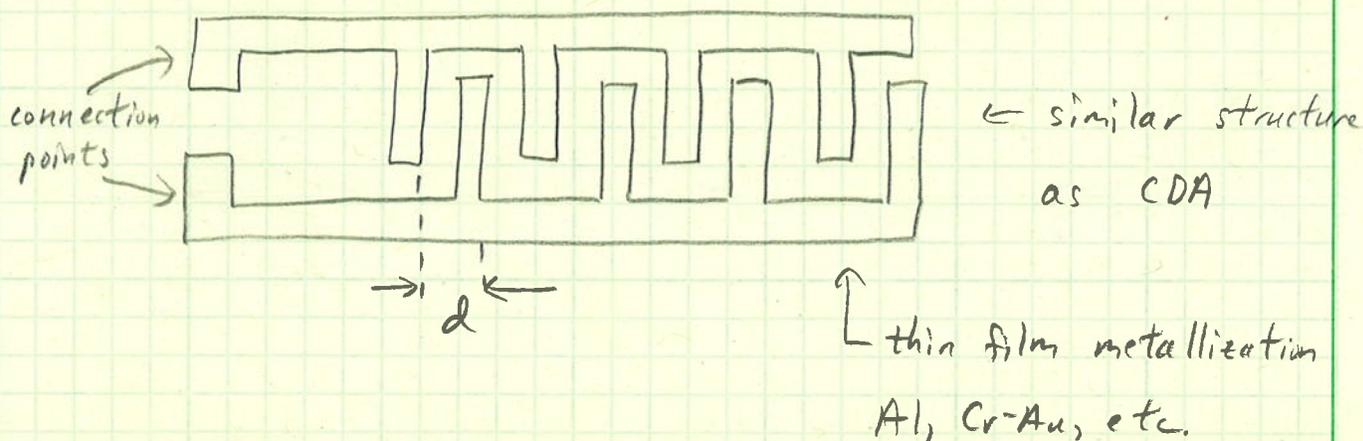


1. SAW Device Structure



Transduction elements are Interdigital Transducers (IDTs)



$f_0 \sim 16\text{MHz} \rightarrow$ determined by user = RF frequency

$$\therefore \lambda_c = \frac{c}{f_0} \sim 0.3\text{m}$$

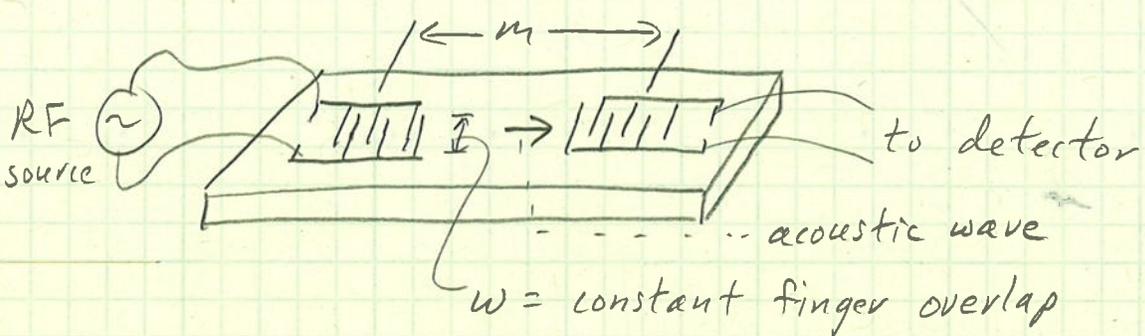
SAW wave velocity is piezoelectric material dependent
but is typically around $3490\text{ m/s} = v$

SAW wavelength, λ , is defined as $\lambda = \frac{v}{f_0} \approx 3.5\mu\text{m}$

$$\therefore d = \frac{\lambda}{2} = \frac{v}{2f_0} \approx 1.75\mu\text{m}$$

This value for d for the IDT structure allows for efficient converting of electrical energy into acoustic energy and vice versa

Typical Design



M: IDTs center-to-center separation

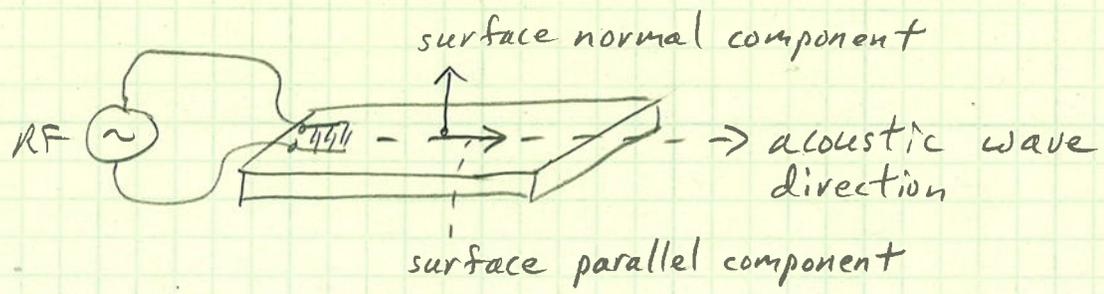
2. Acoustic Waves in SAW substrates

→ several different types of acoustic waves

a. The elastic Rayleigh SAW

→ the energy of the wave is confined near the substrate surface, a few wavelengths thick

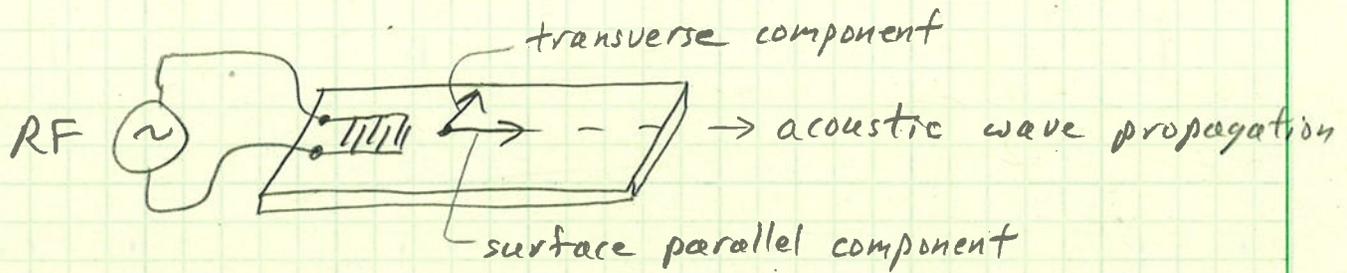
→ substrate particles in motion have two displacement components: a surface normal component and a surface parallel component



∴ surface particles move in elliptical paths as SAW propagates

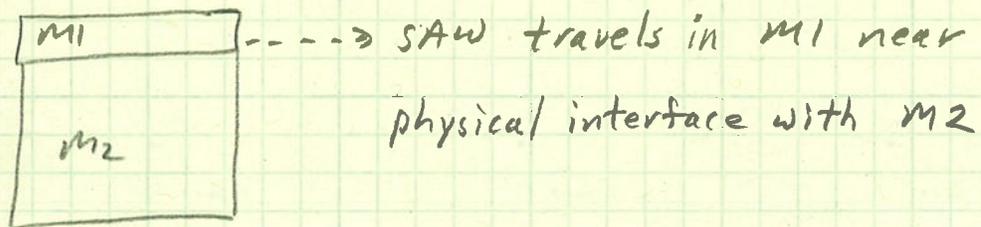
b. Shear Horizontal SAW (SH-waves)

→ particle displacements are transverse to wave propagation direction and parallel to the surface plane



c. Love SAW

- travel in a waveguide of material m_1 mounted on top of another material m_2
- particle displacement is transverse only



Love waves usually have lower noise than SH waves

d. Compressive or P-Wave

- a longitudinal wave, travels in the same way sound travels in air

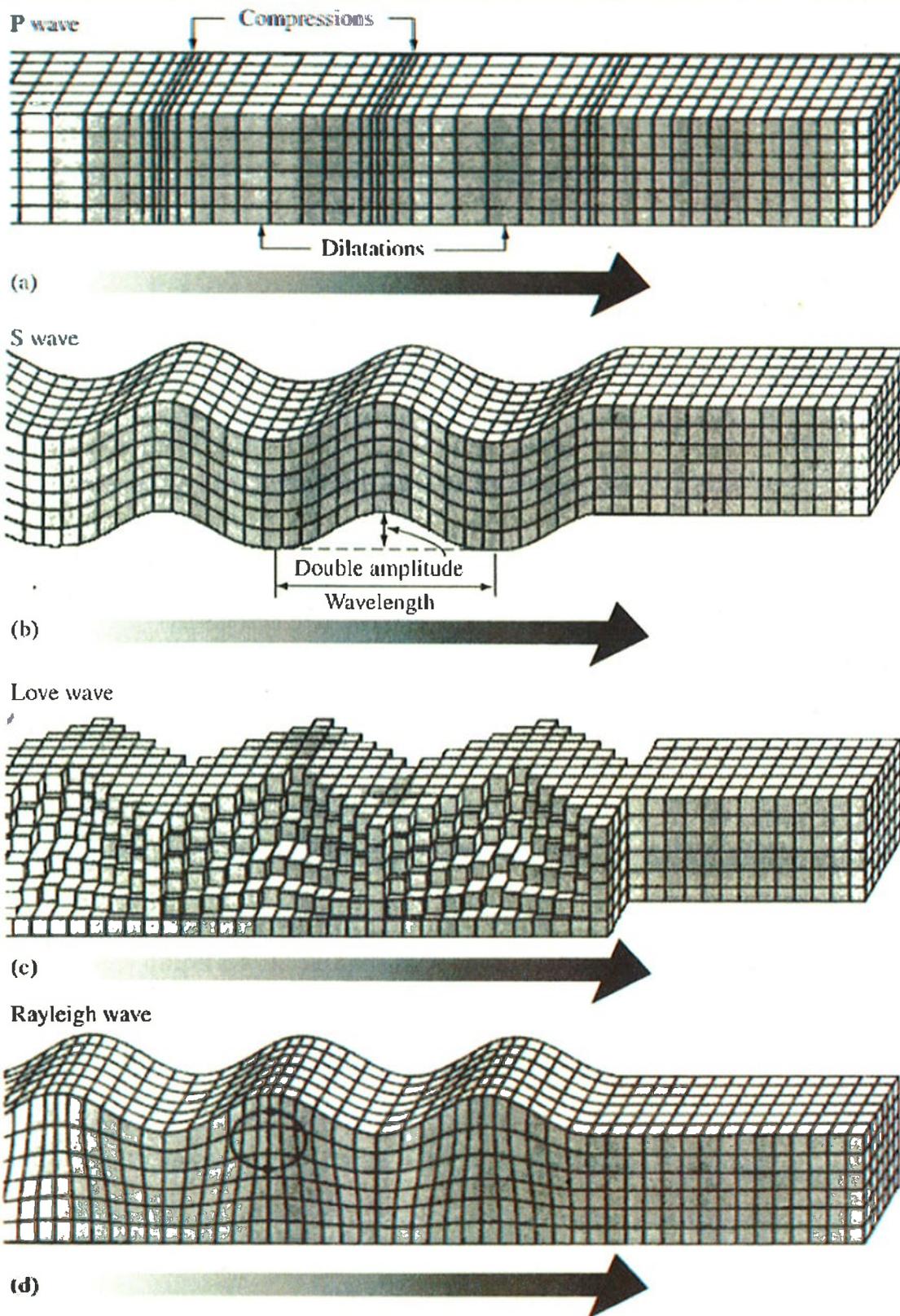


Figure 9.10 Pictorial representation of different waves