Optical Resonators

APPH E4901/3 Applied Physics Seminar

Assignment from Last Week

- What are the resonant optical frequencies of a cube? Numbers please.
- What are the resonant frequencies of an "optical fiber ring"?
- What is a Fabry-Pérot interferometer? And other types of interferometers, … ?

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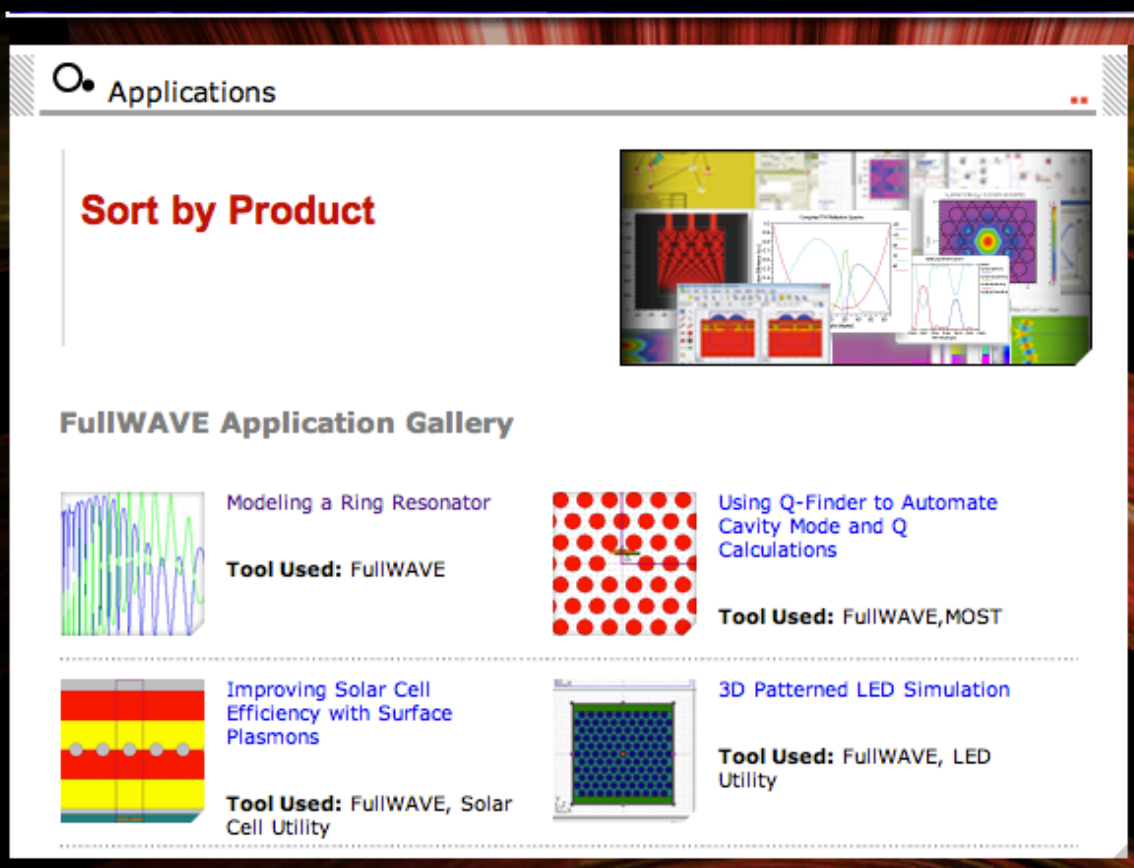

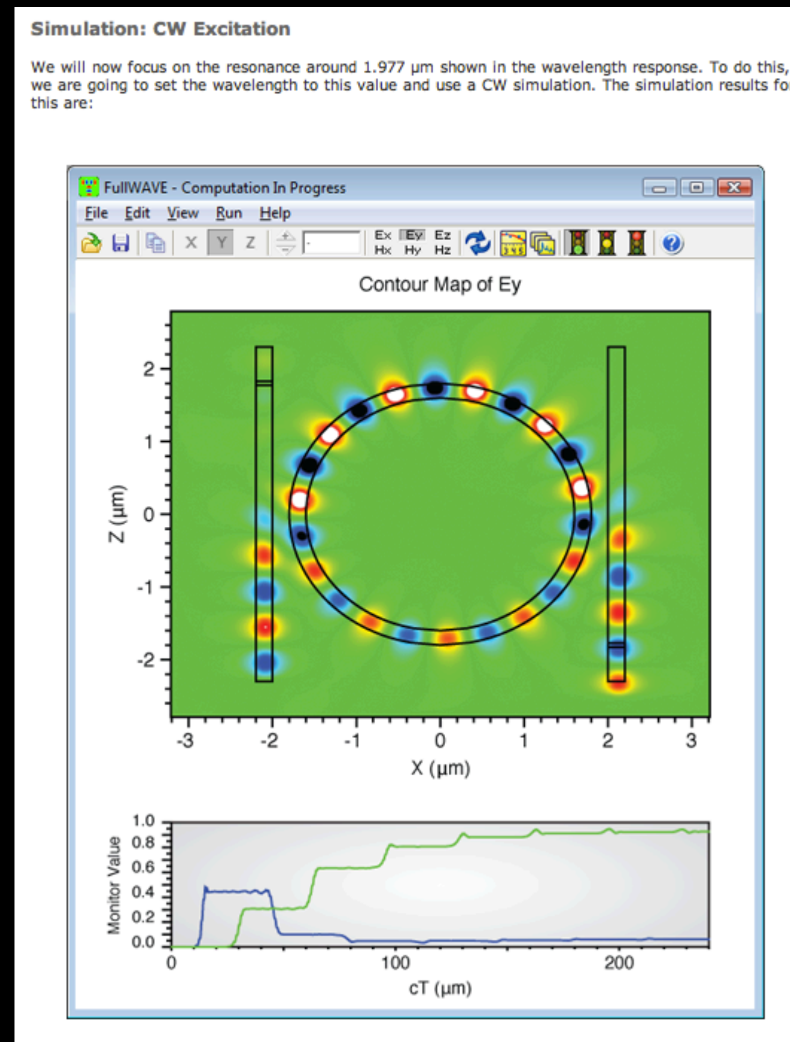

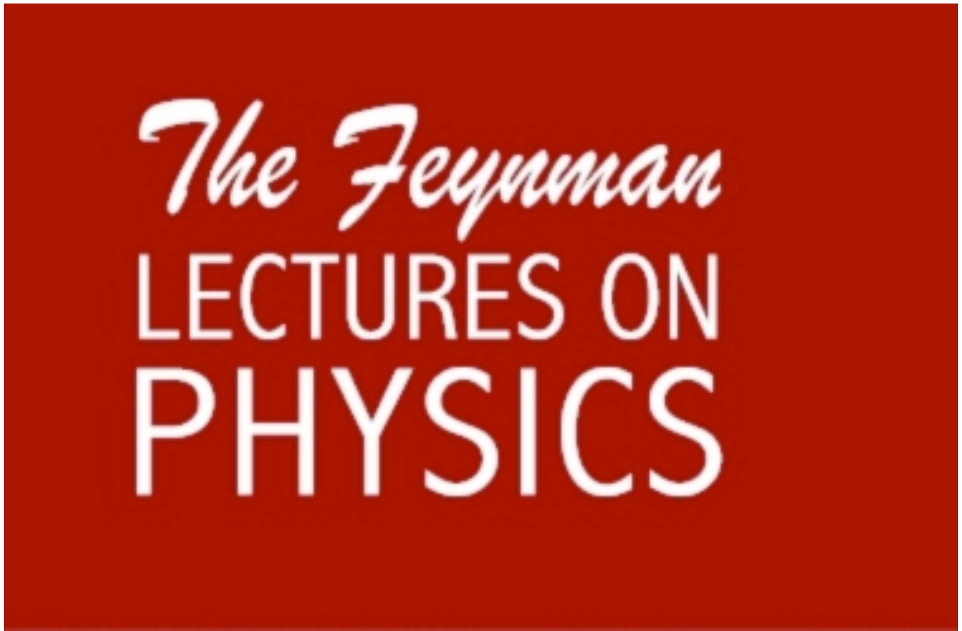

Resonators

http://www.feynmanlectures.info

http://www.youtube.com/watch?v=j3mhkYbznBk

http://www.youtube.com/watch?v=kd0xTfdt6qw&feature=relmfu

- Richard Feynman's "Cavity Resonators" lecture
- Next week: "The Great Seal Bug Story"

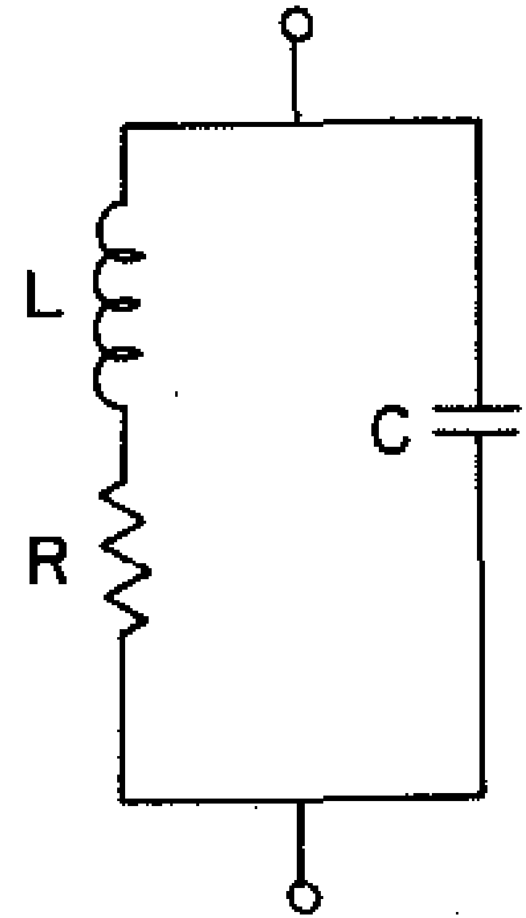

Fig. 23–1. Equivalent circuit of a real resistor.

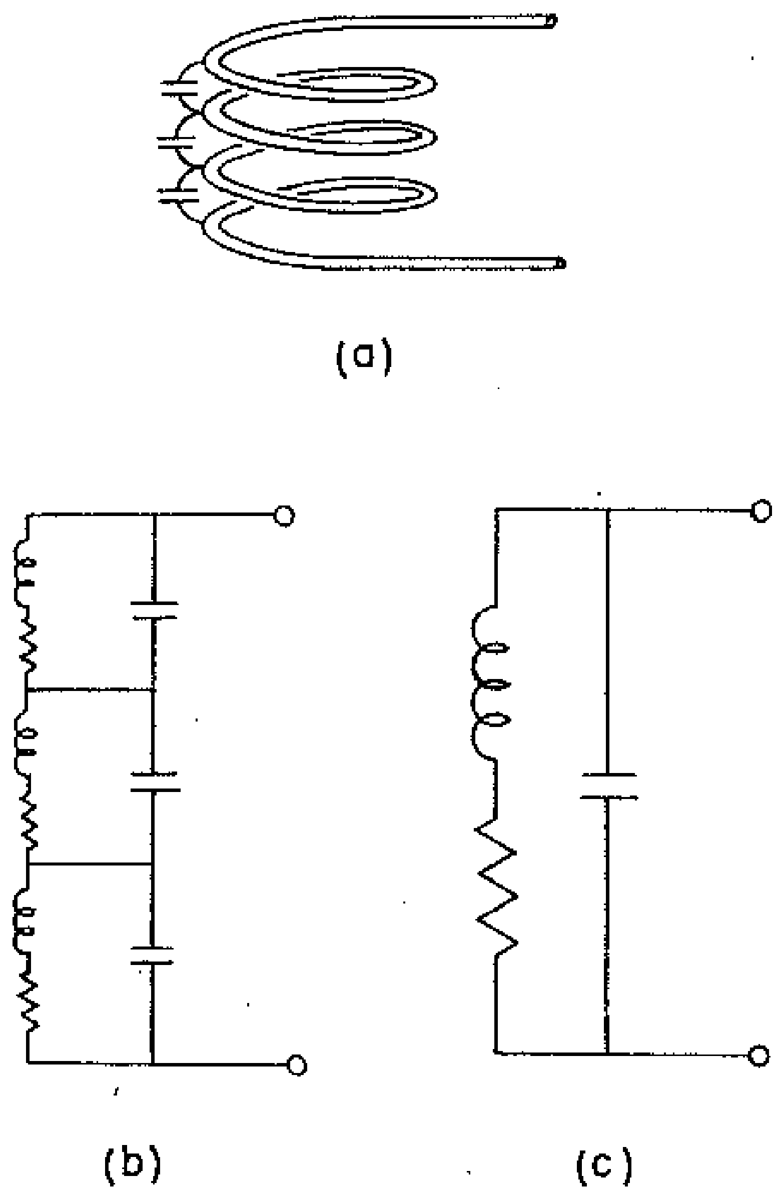

Fig. 23–3. The equivalent circuit of a real inductance at higher frequencies.

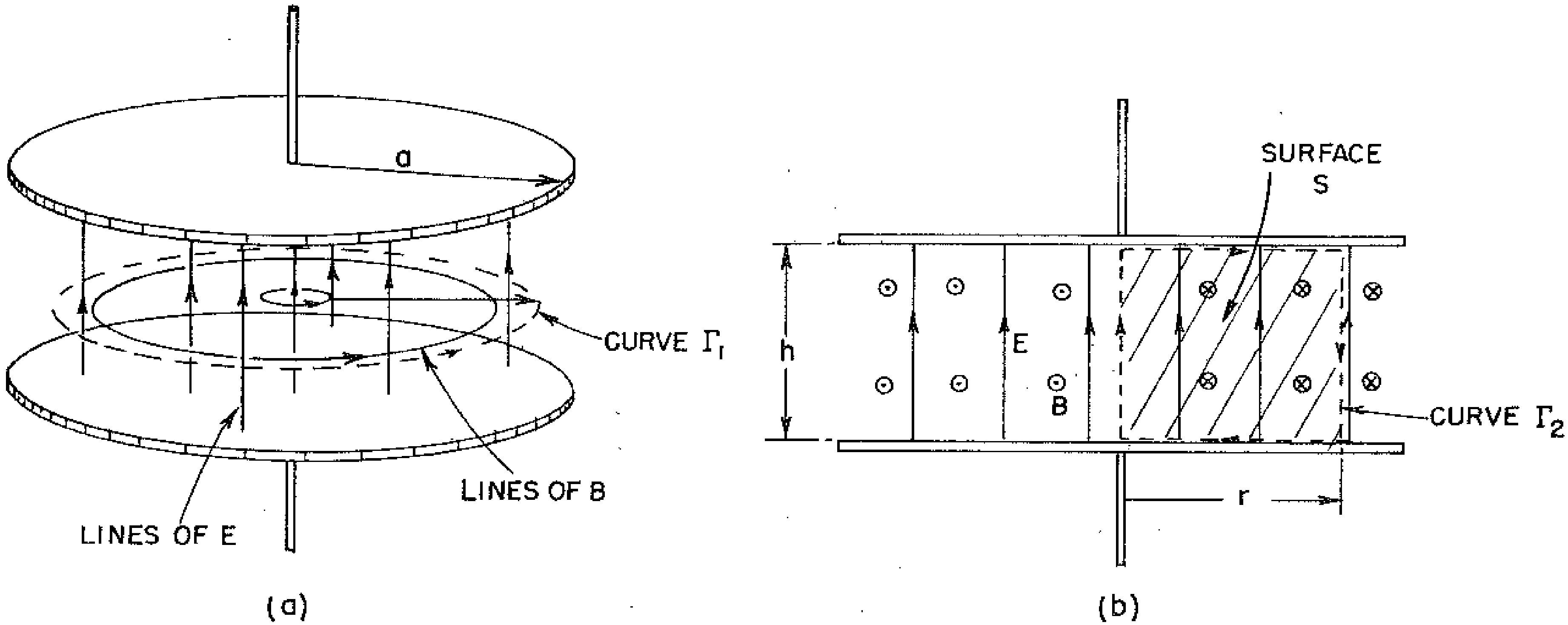

Fig. 23–4. The electric and magnetic fields between the plates of a capacitor.

$$E = E_1 + E_2 = \left(1 - \frac{1}{4}\frac{\omega^2 r^2}{c^2}\right) E_0 e^{i\omega t}. \tag{23.8}$$

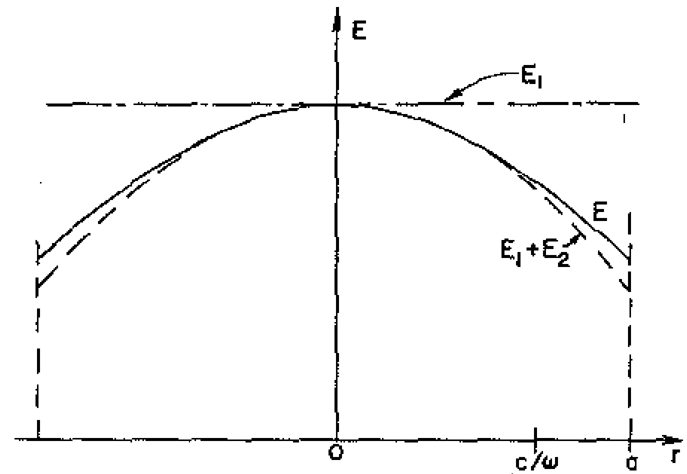

Fig. 23–5. The electric field between the capacitor plates at high frequency. (Edge effects are neglected.)

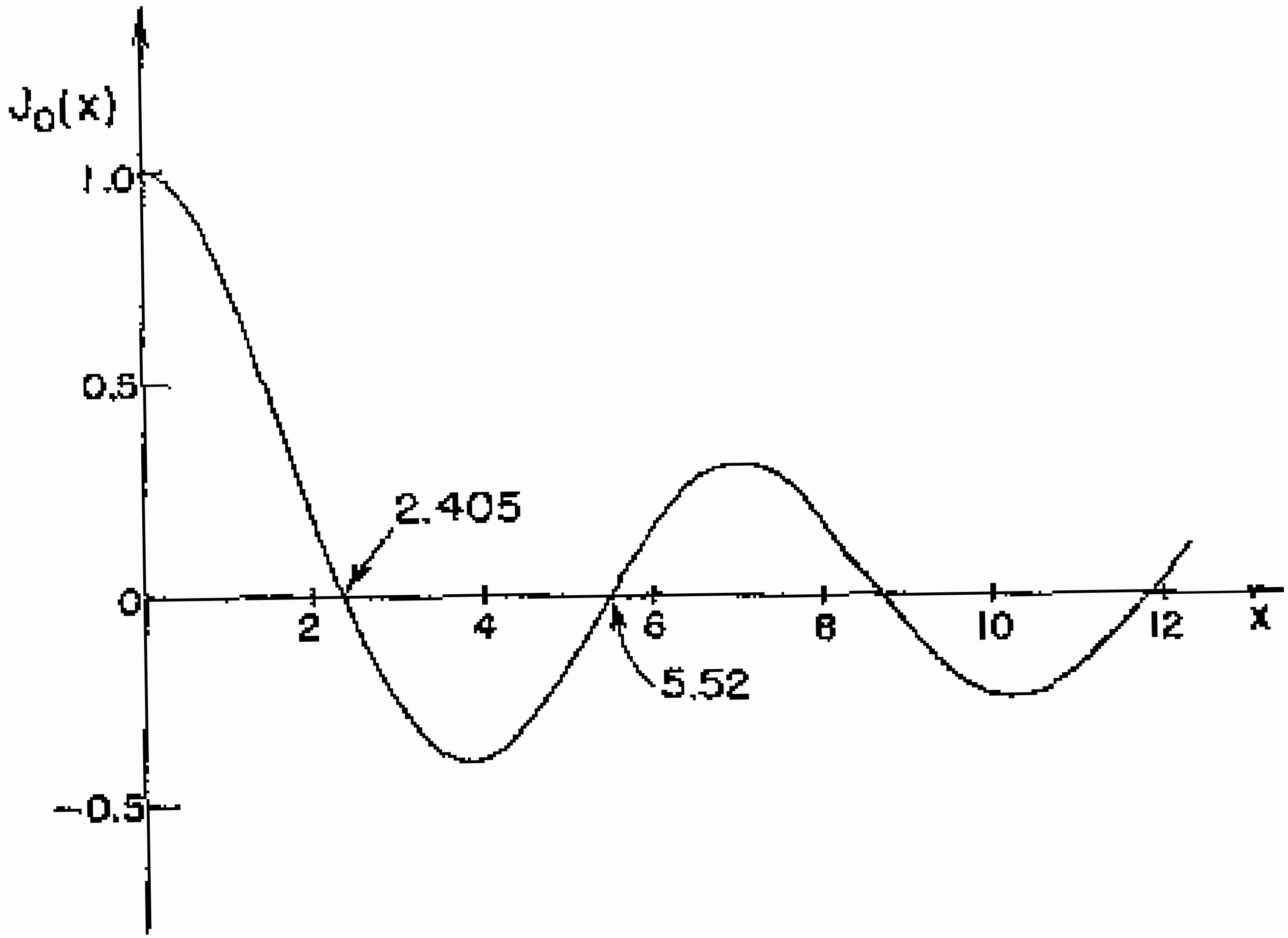

Fig. 23–6. The Bessel function $J_0(x)$.

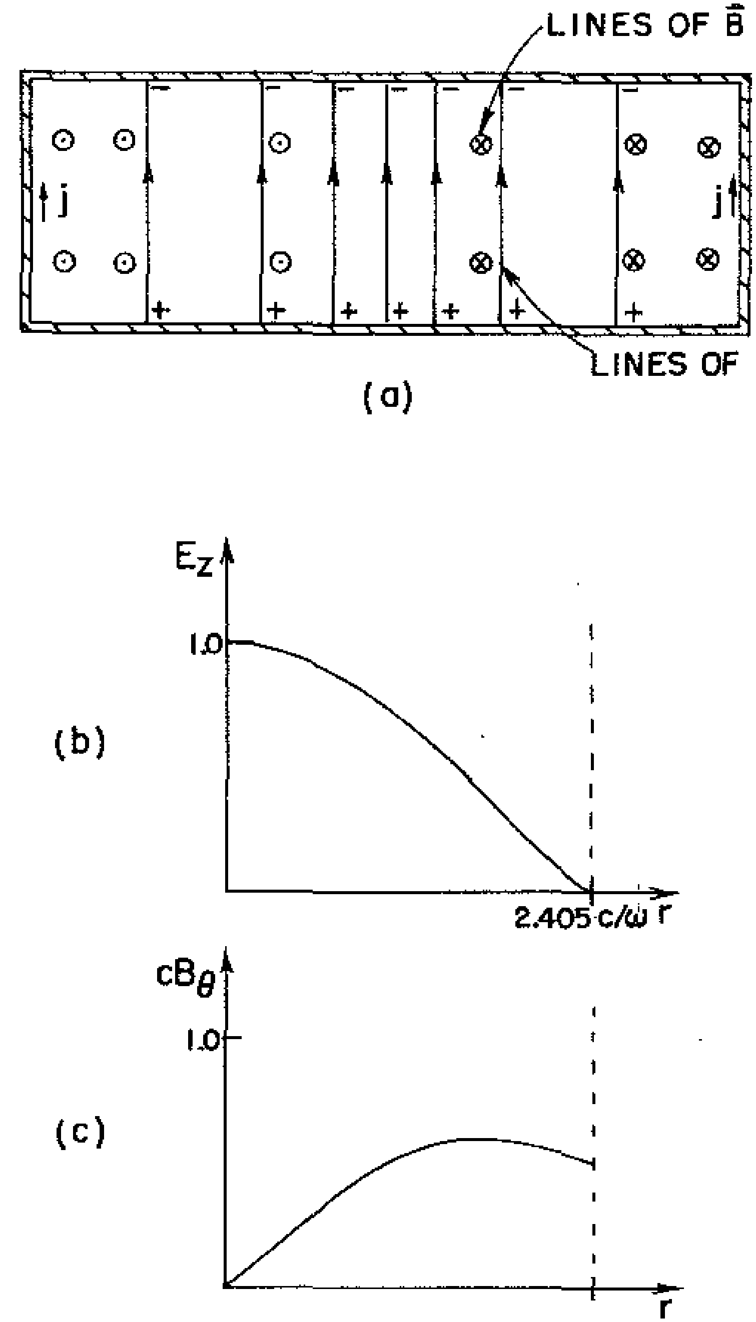

Fig. 23–7. The electric and magnetic fields in an enclosed cylindrical can.

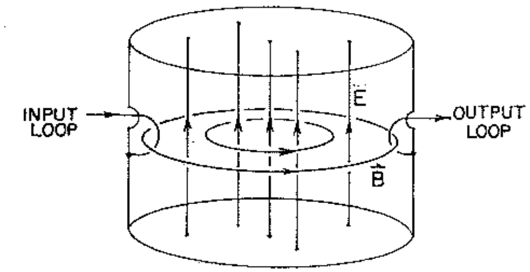

Fig. 23–8. Coupling into and out of a resonant cavity.

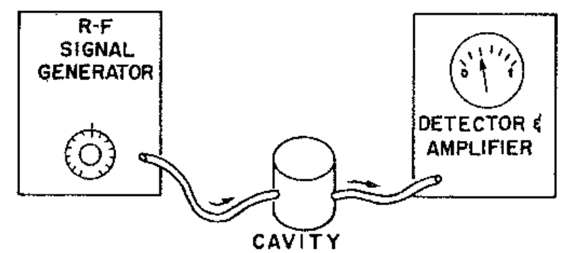

Fig. 23–9. A setup for observing the cavity resonance.

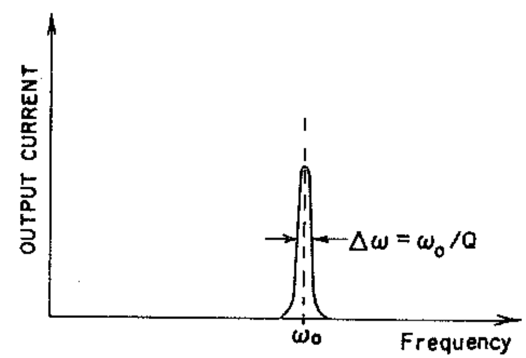

Fig. 23–10. The frequency response curve of a resonant cavity.

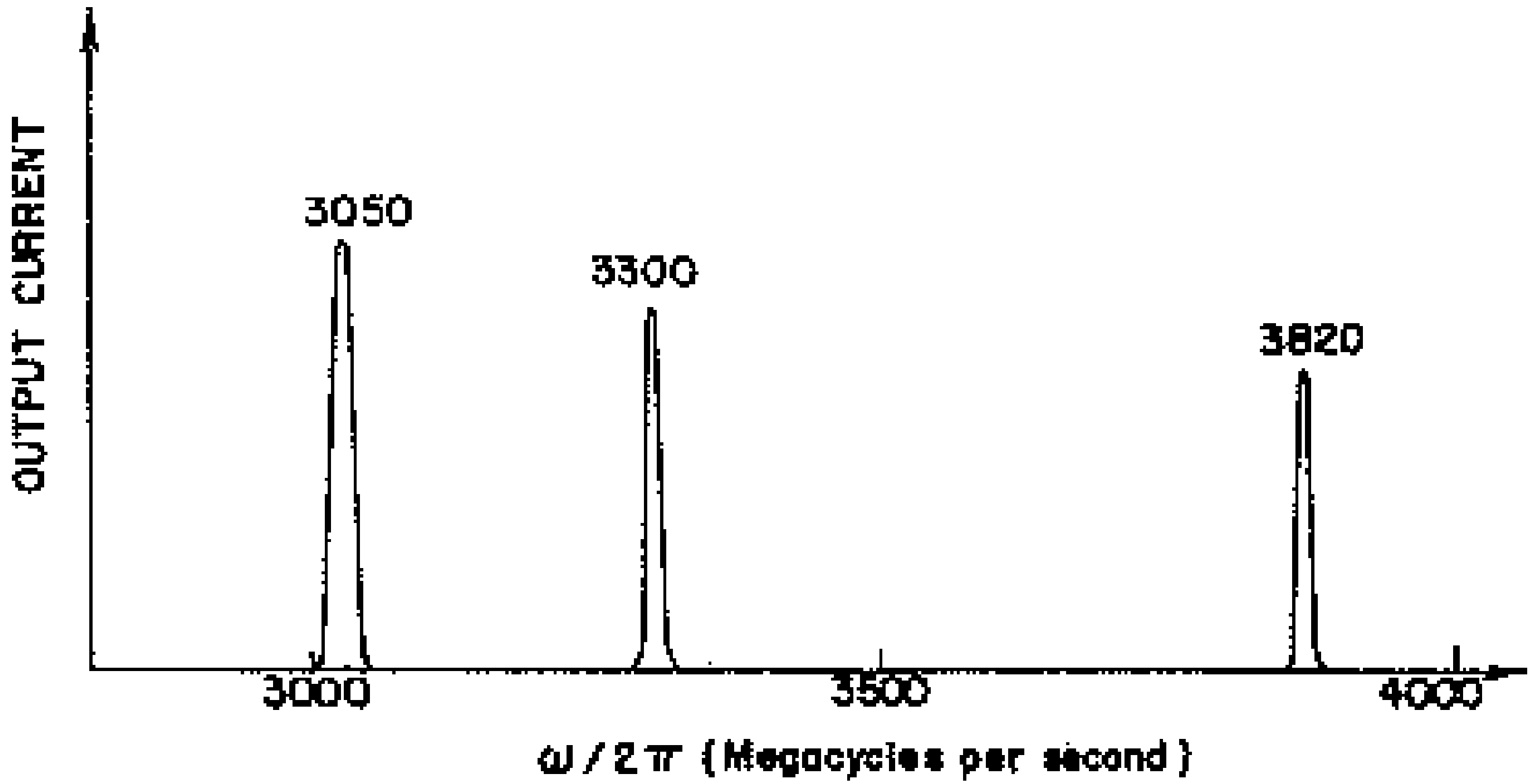

Fig. 23–11. Observed resonant frequencies of a cylindrical cavity.

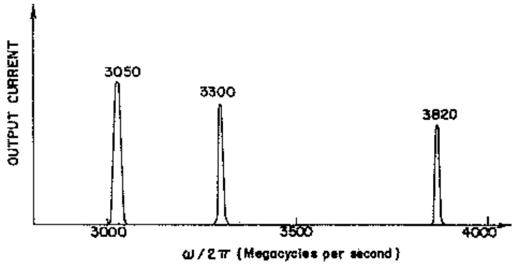

Fig. 23–11. Observed resonant frequencies of a cylindrical cavity.

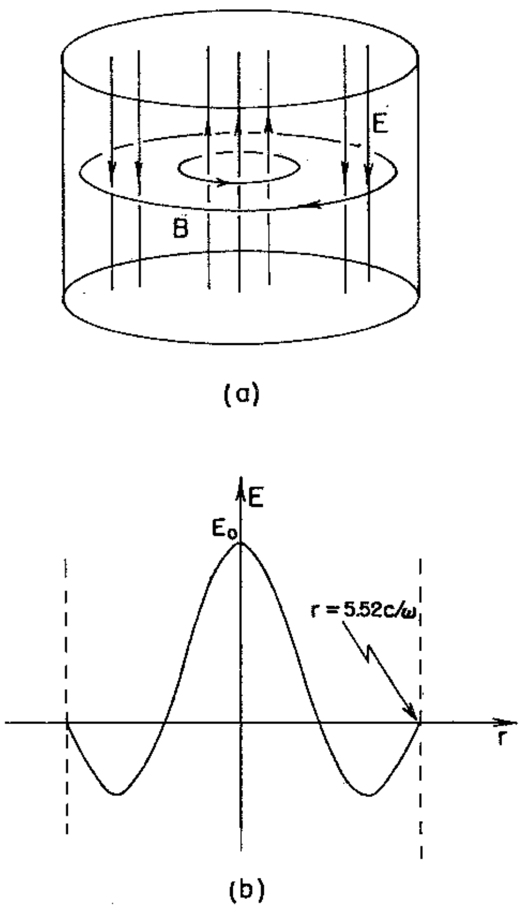

Fig. 23–12. A higher-frequency mode.

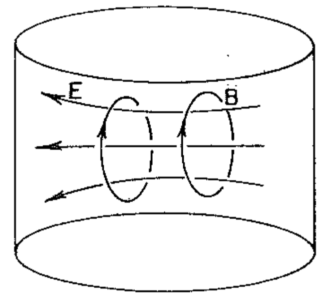

Fig. 23–13. A transverse mode of the cylindrical cavity.

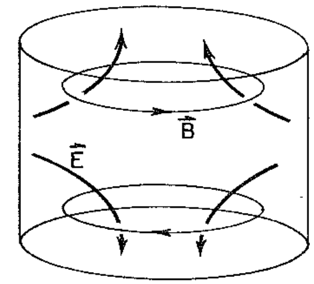

Fig. 23–14. Another mode of a cylindrical cavity.

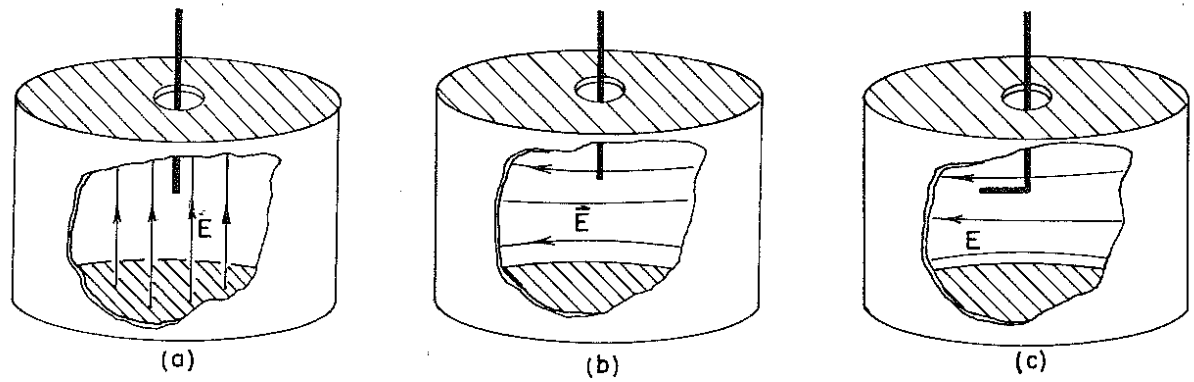

Fig. 23–15. A short metal wire inserted into a cavity will disturb the resonance much more when it is parallel to ***E*** than when it is at right angles.

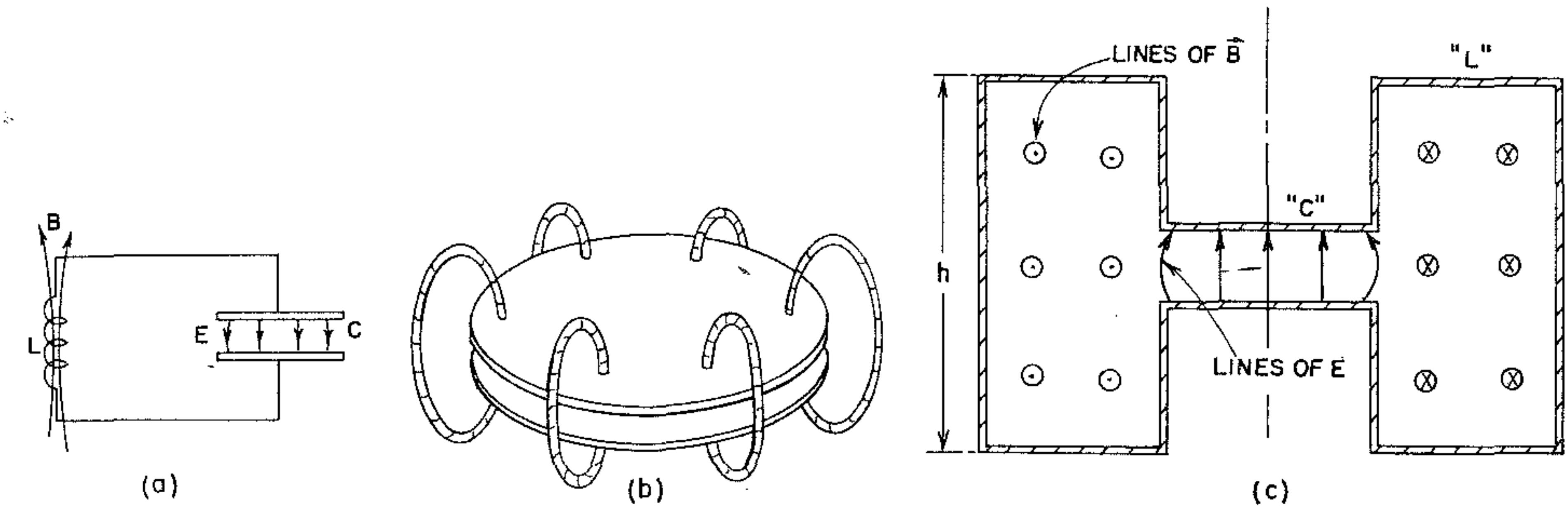

Fig. 23–16. Resonators of progressively higher resonant frequencies.

Next Week

On May 26, 1960, U.S. Ambassador to the United Nations Henry Cabot Lodge, Jr. unveiled the Great Seal Bug before the UN Security Council to counter Soviet denunciations of American U-2 espionage. The Soviets had presented a replica of the Great Seal of the United States as a gift to Ambassador Averell Harriman in 1946. The gift hung in the U.S. Embassy for many years, until in 1952, during George F. Kennan's ambassadorship, U.S. security personnel discovered the listening device embedded inside the Great Seal. Lodge's unveiling of this Great Seal before the Security Council in 1960 provided proof that the Soviets also spied on the Americans, and undercut a Soviet resolution before the Security Council denouncing the United States for its U-2 espionage missions