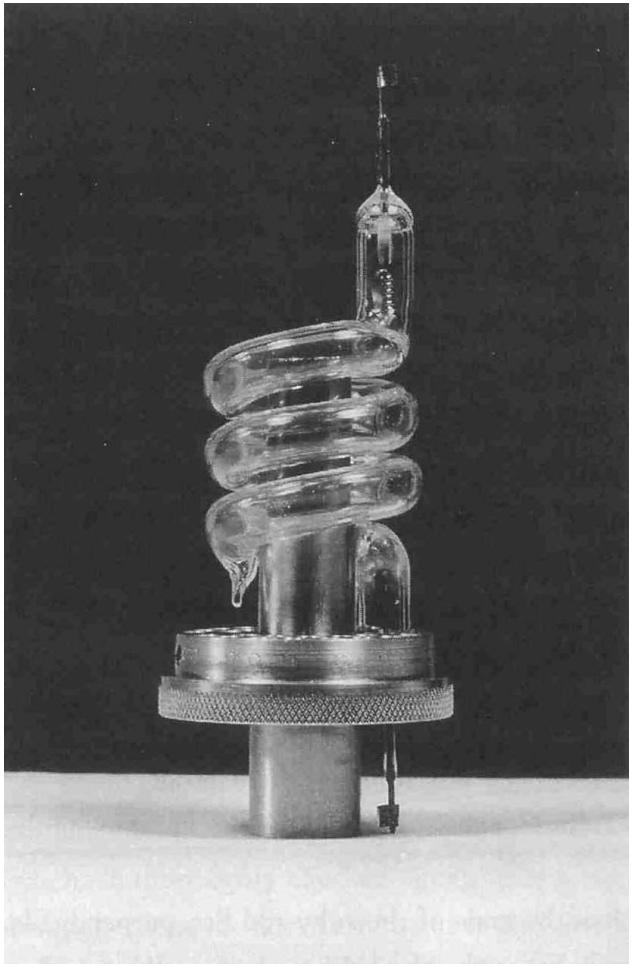
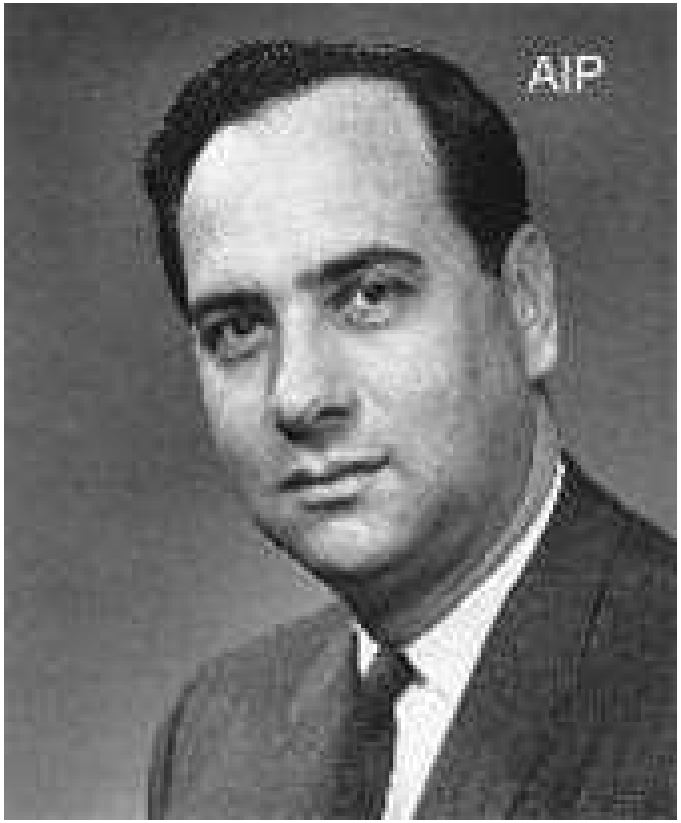
First light: from the ruby laser to nonlinear optics 1960 - 1962

J. A. Giordmaine

Formerly Columbia University, AT&T Bell Laboratories,
NEC Laboratories America, Princeton University

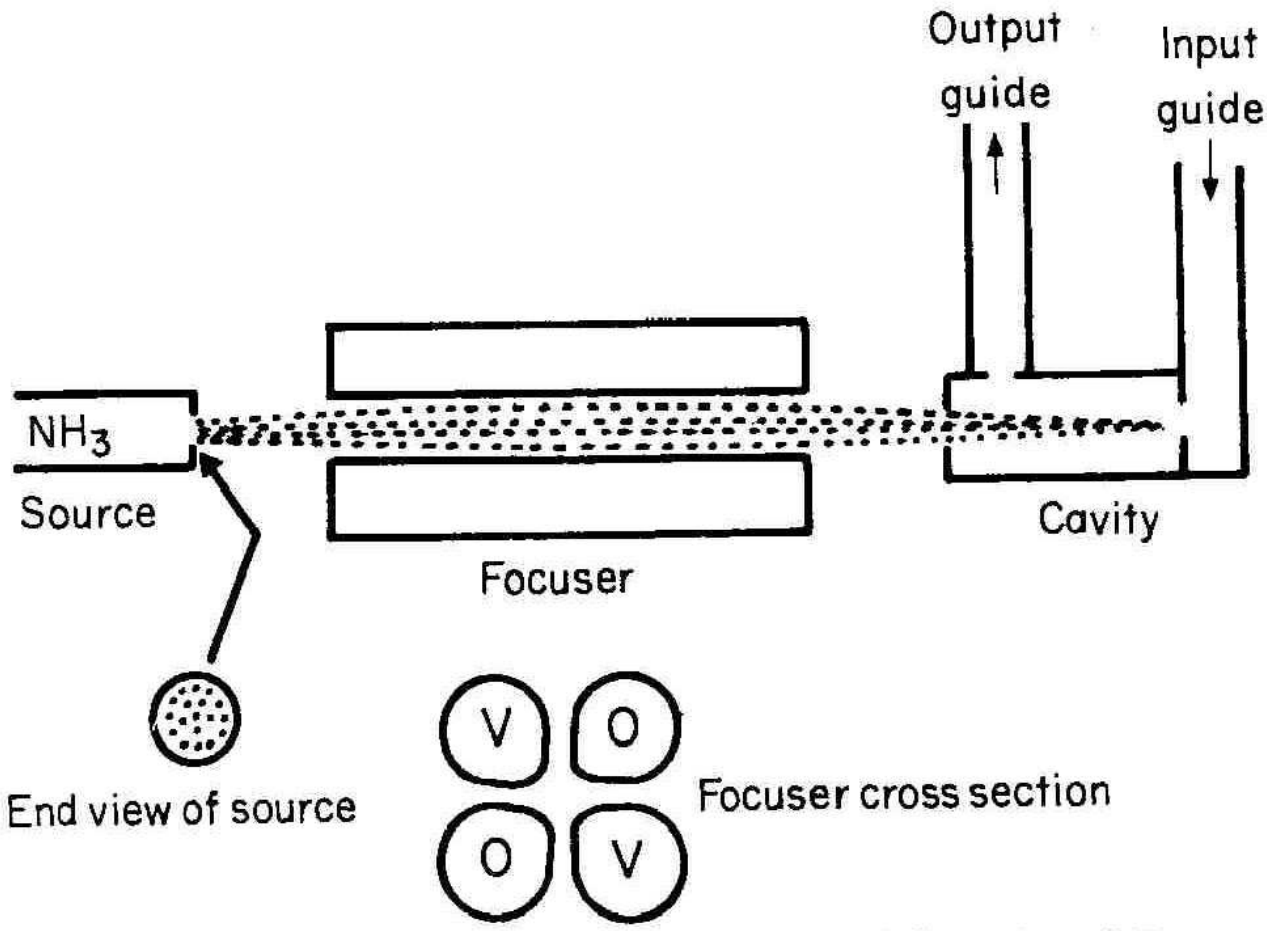
The first laser May 16, 1960





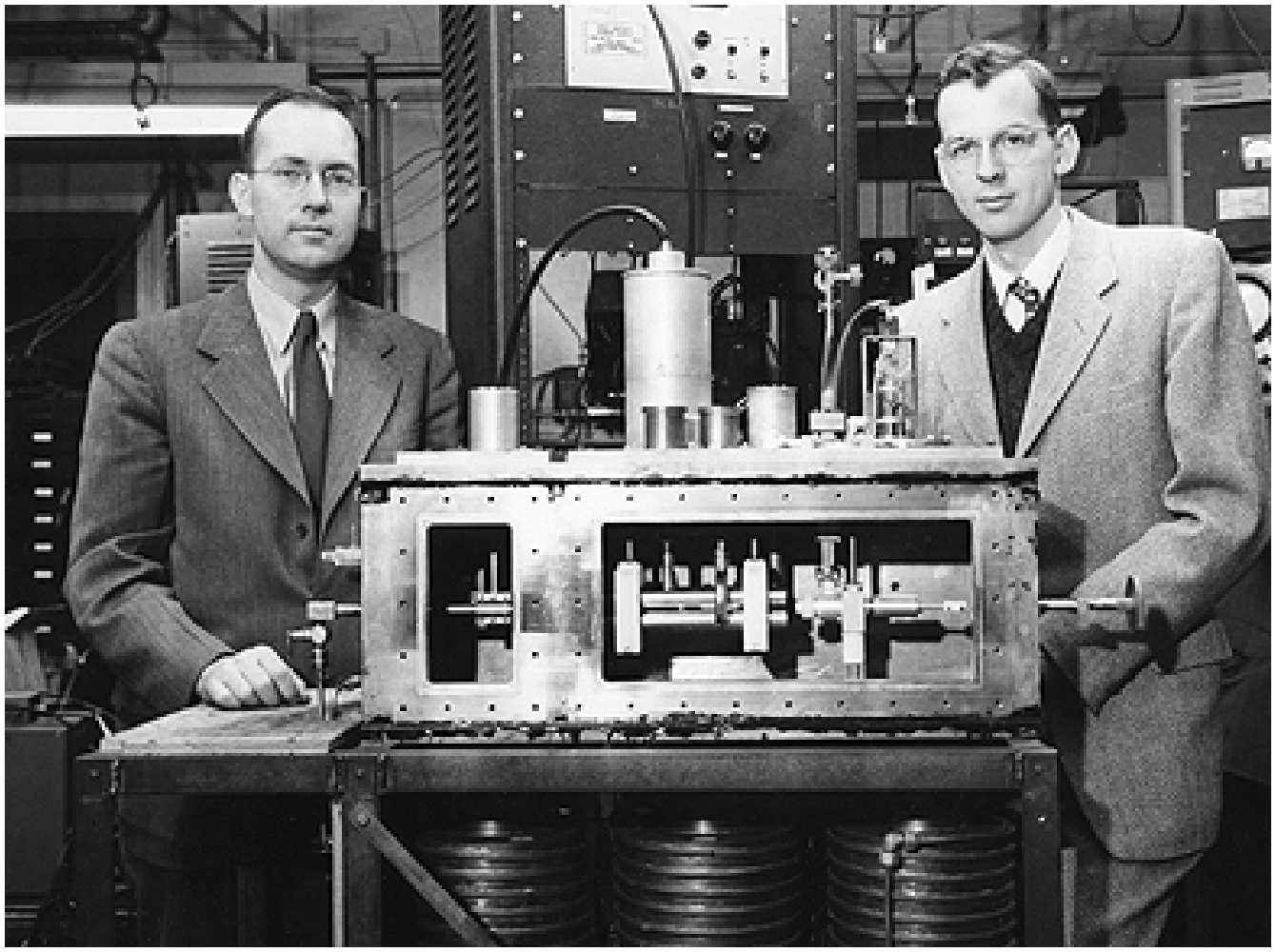
Theodore Maiman

The ammonia beam maser concept 1951
Charles Townes



The maser 1954

J. P. Gordon, H. J. Zeiger and C. H. Townes



Charles Townes and James Gordon

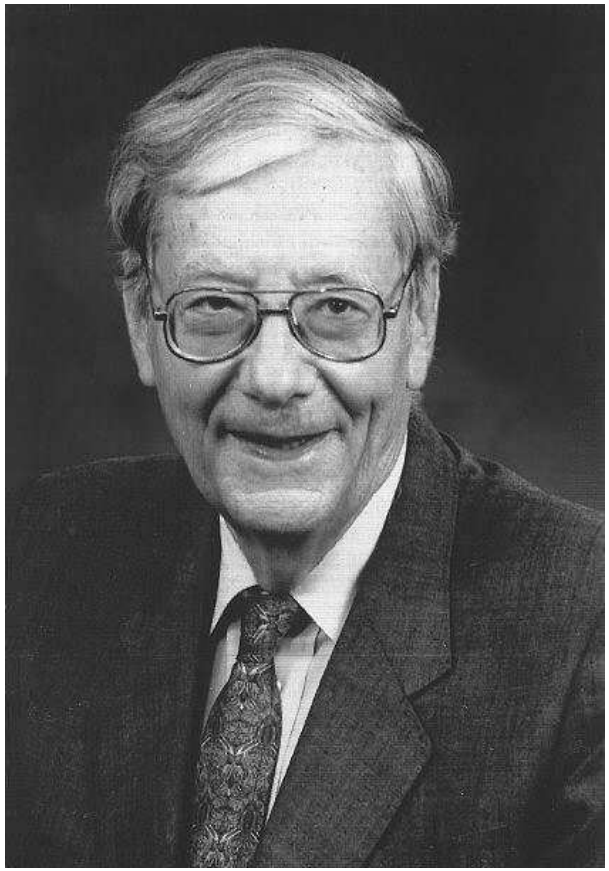
Maser proposal 1954

Nikolai Basov

Alexandr Prokhorov

3-level solid state masers 1956

N. Bloembergen, H. E. D. Scovil, C. Kikuchi



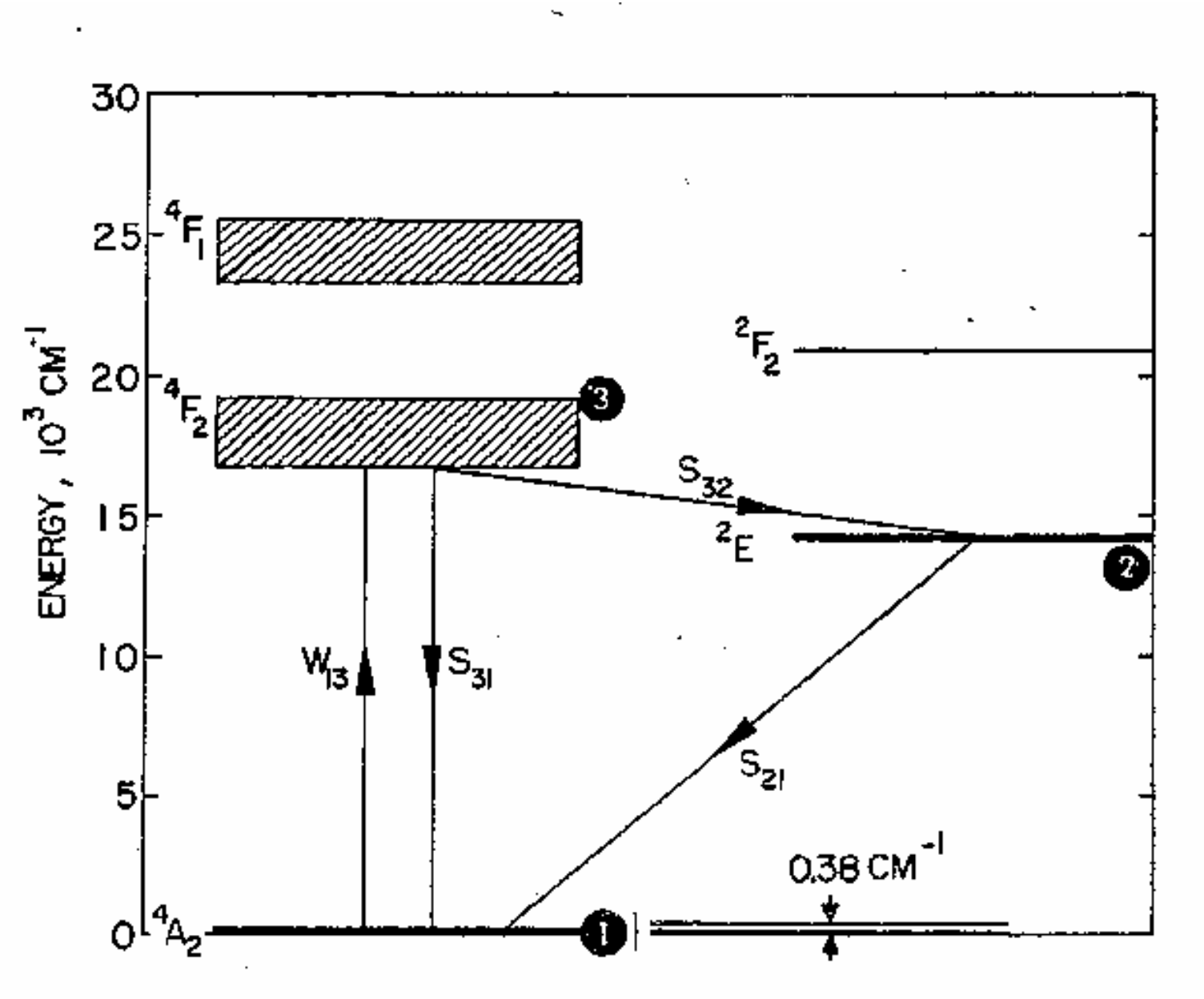
Nicolaas Bloembergen

Optical maser proposal 1958

Charles Townes

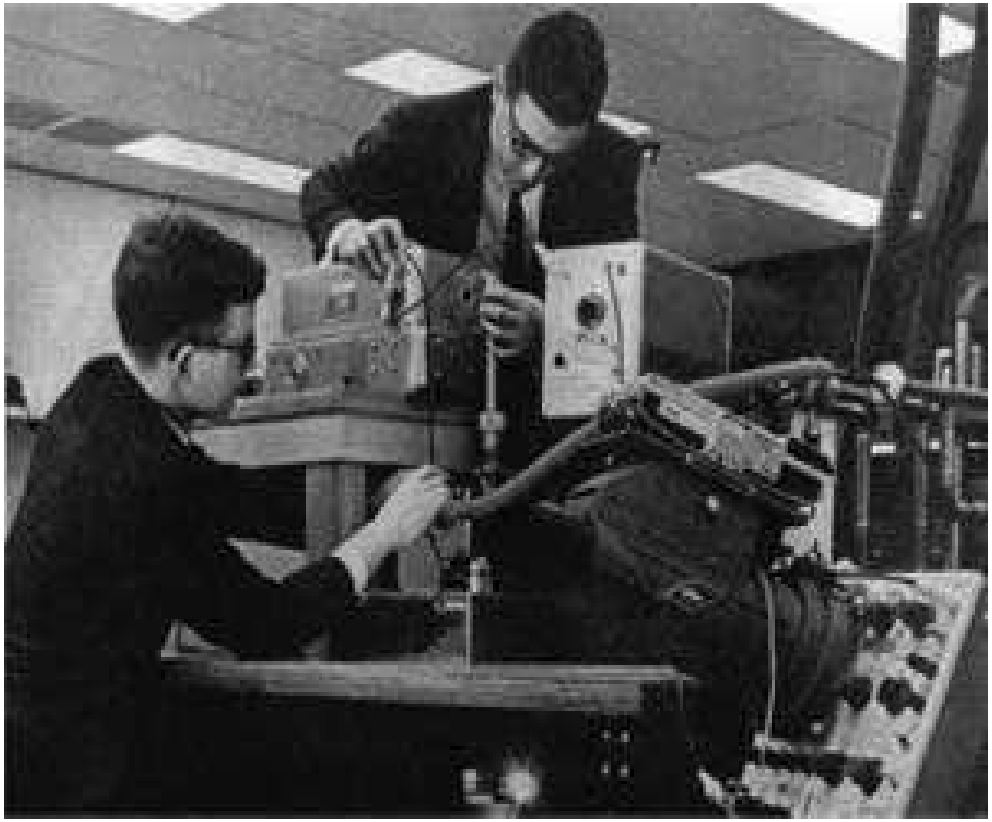
Arthur Schawlow

Cr^{+3} levels in pink ruby



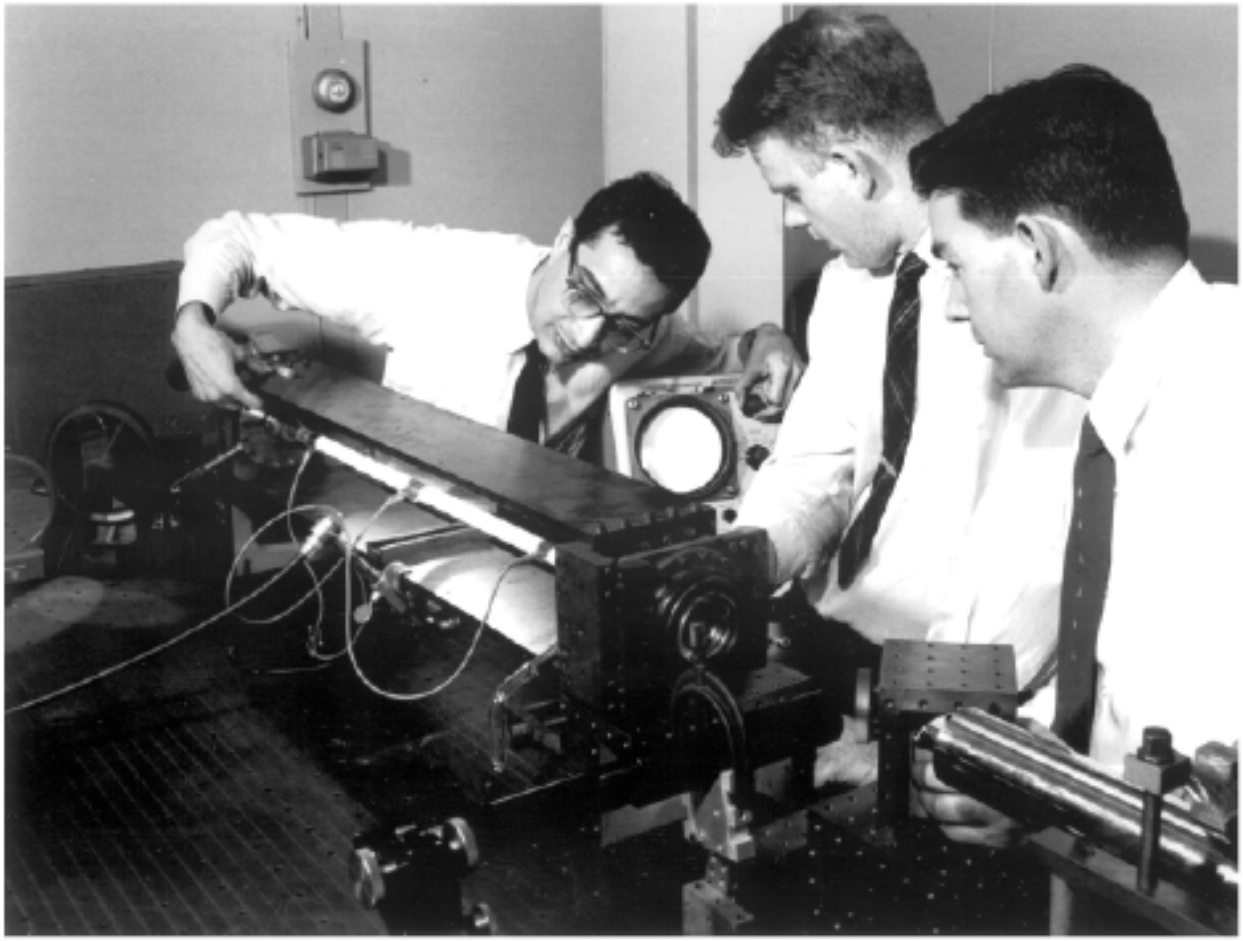
New solid state lasers 1960

Sorokin, Stevenson; Schawlow; Wieder



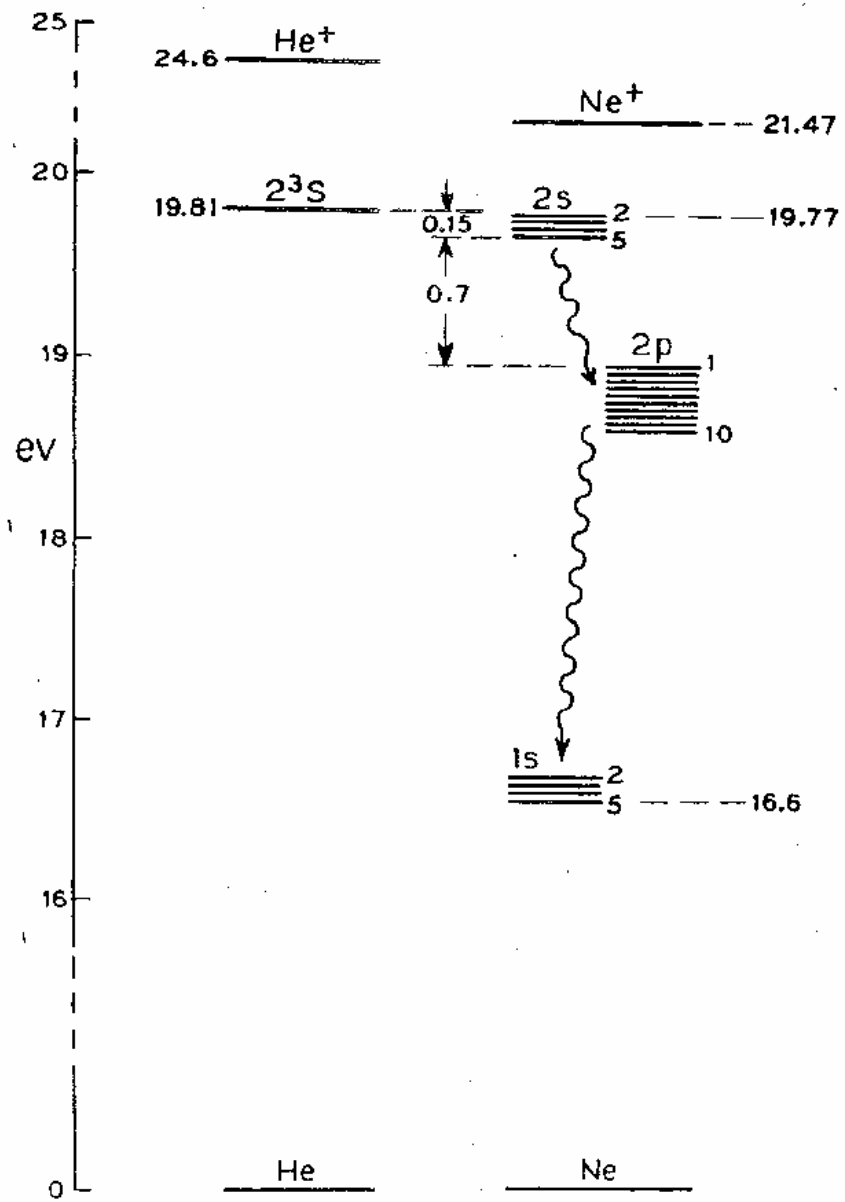
Peter Sorokin and Mirek Stevenson

The helium neon laser 1960



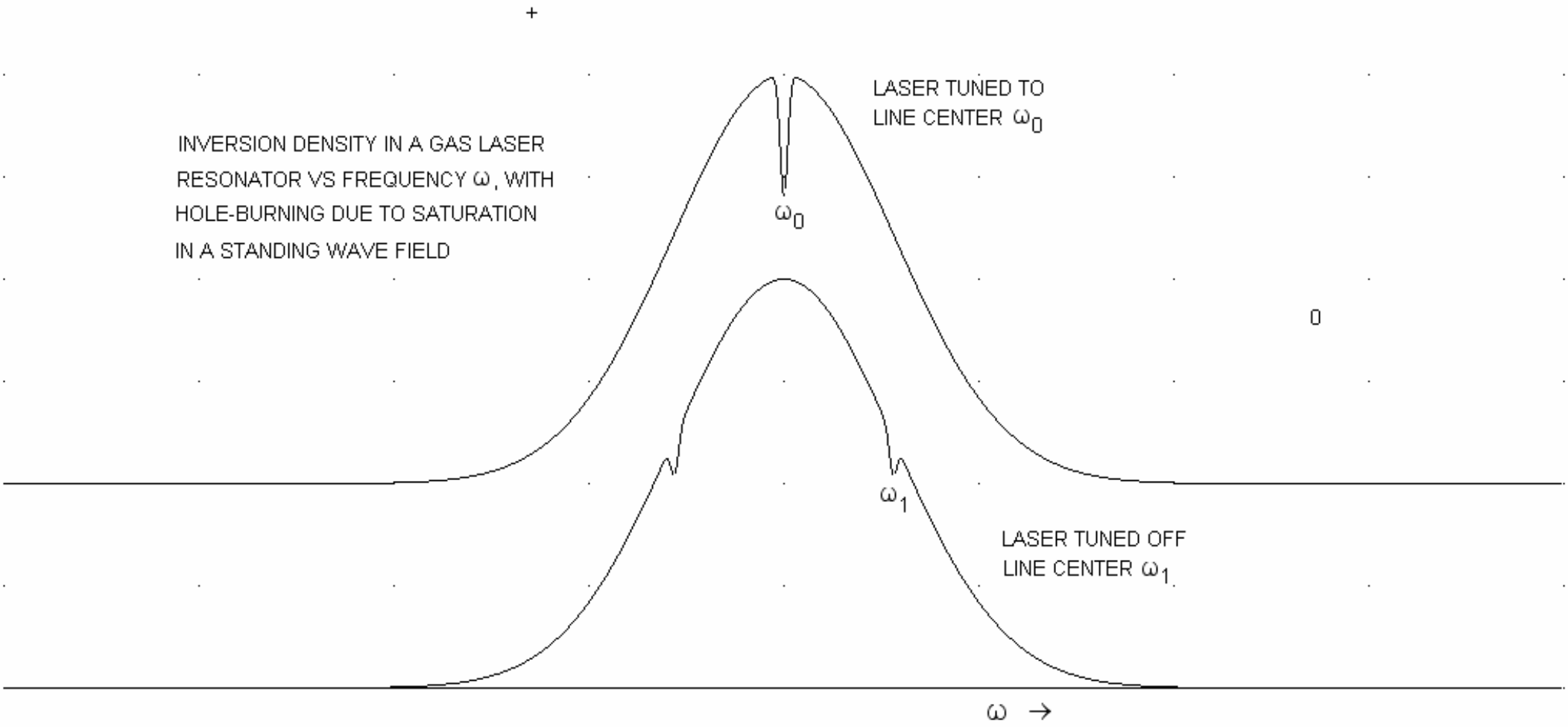
Ali Javan, William Bennett, Jr. and Donald Herriott

Neon and helium energy levels



Hole burning and the Lamb dip

W. Bennett, Jr. 1961

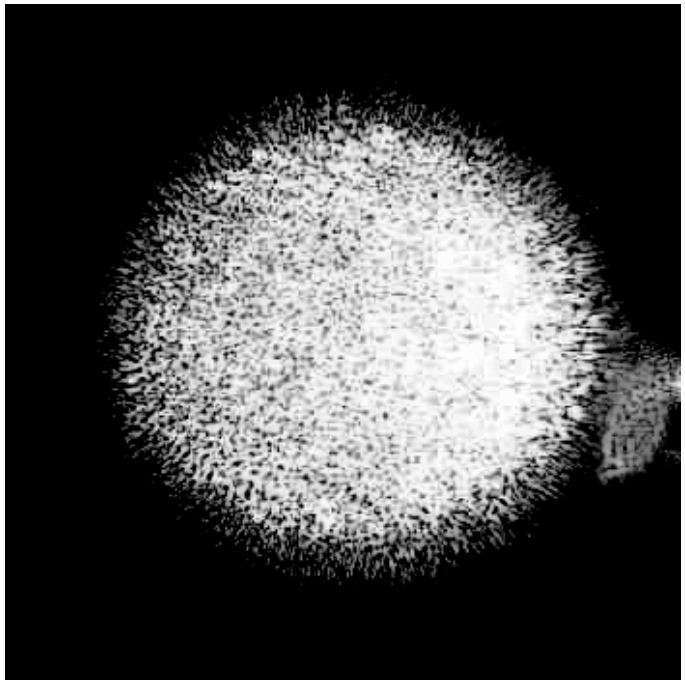


Visible helium neon laser 1962

A. D. White and J. D. Rigden

Granularity of scattered laser light 1962

J. D. Rigden and E. I. Gordon



Laser speckle

Nonlinear optics: Optical second harmonic generation 1961

Peter Franken

Gabriel Weinreich

Nonlinear optics: Two-Photon Transitions 1961

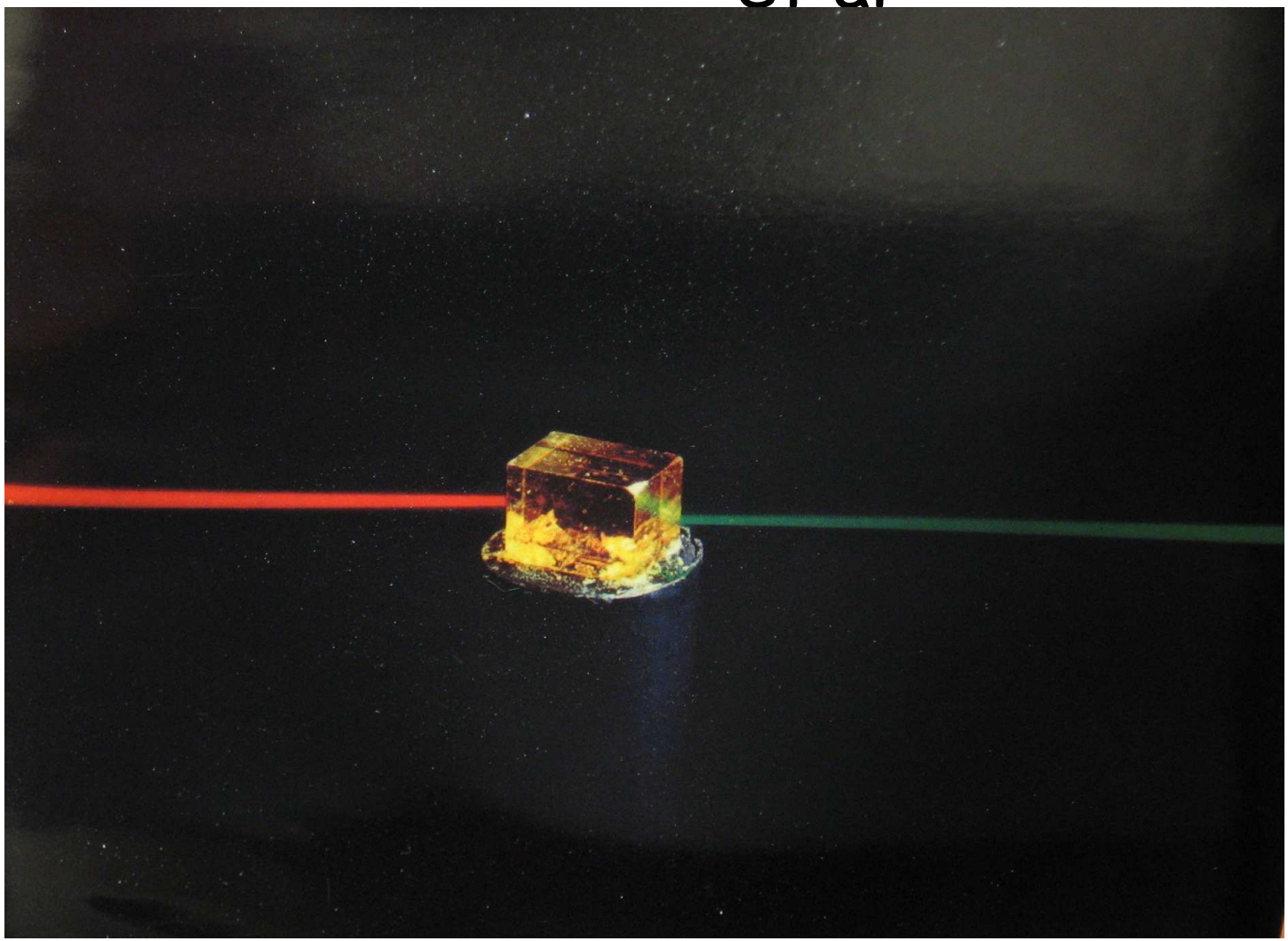
Wolfgang Kaiser

Geoffrey Garrett

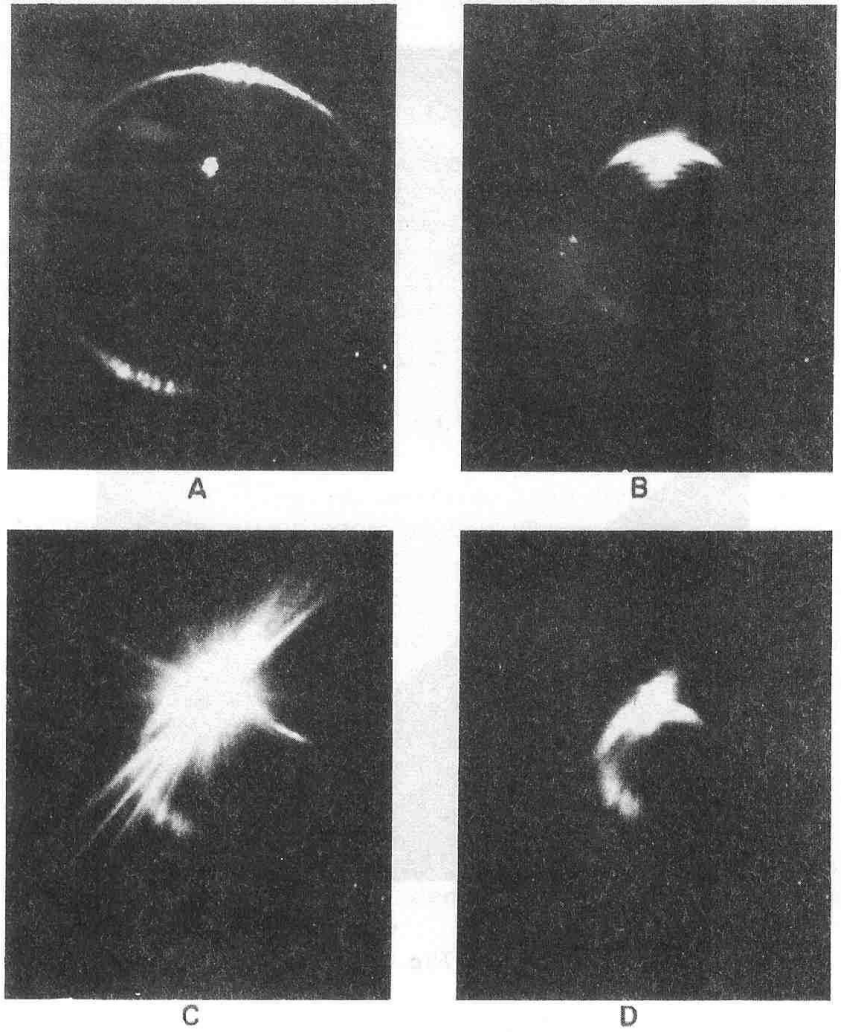
Phase matching in nonlinear optics

1961

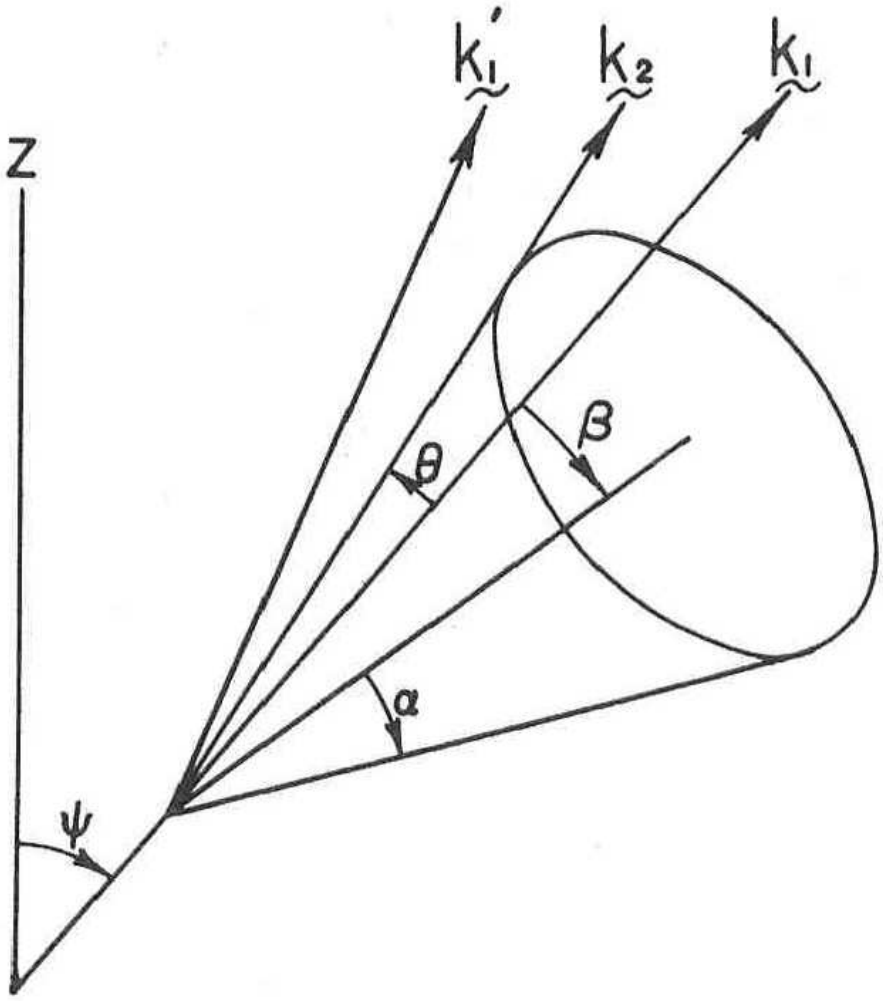
J. Giordmaine / P. Maker, R. Terhune et al



Optical Second Harmonic Generation in Anisotropic Crystals 1961



Phase Matching in optical second harmonic generation 1961



Incident fundamental beam $\mathbf{k}_1$ and diffuse scattering $\mathbf{k}_1'$ generate phase matched second harmonic light on the cone $\mathbf{k}_2$ with

$$\underline{\mathbf{k}}_1 + \underline{\mathbf{k}}_1' = \underline{\mathbf{k}}_2$$

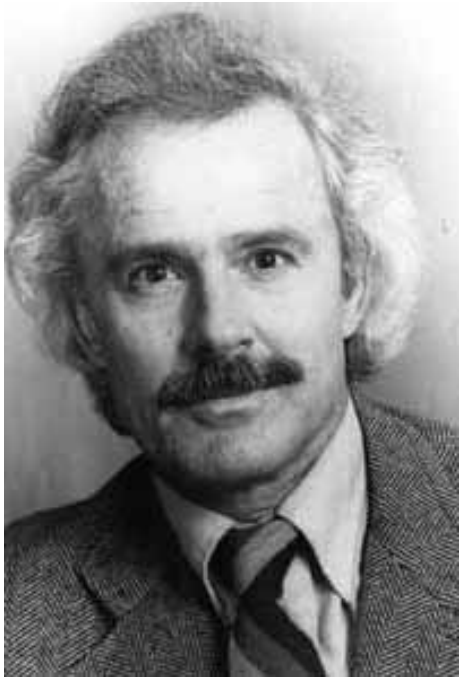
The Q-switch laser 1961

R. Hellwarth and F. McClung

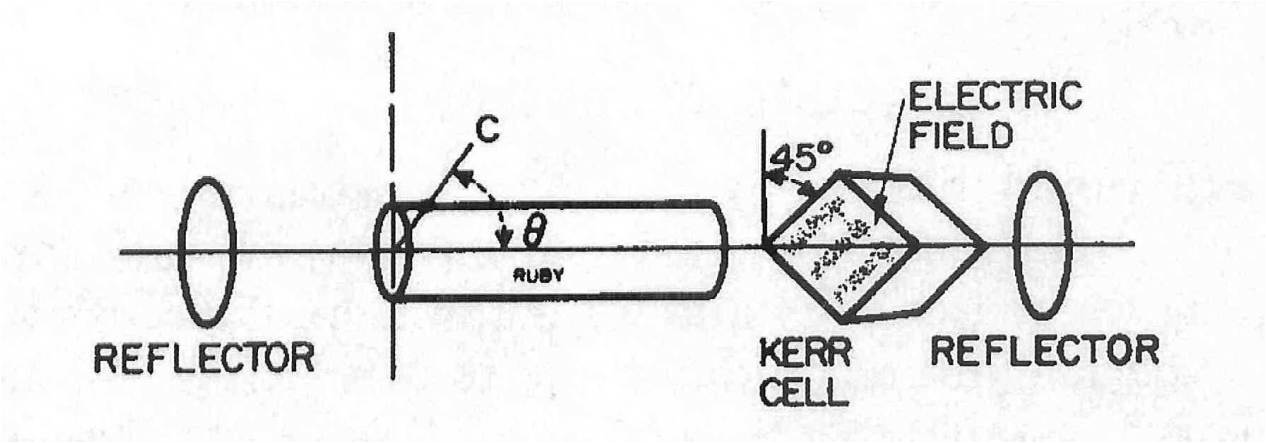
Stimulated Raman scattering

1962

E. Woodbury, W. Ng, G. Eckhardt,
R. Hellwarth, F. McClung et al



Robert Hellwarth



General formulation of three- and four-wave light mixing 1962

J. Armstrong, N. Bloembergen, J. Ducuing and P. Pershan

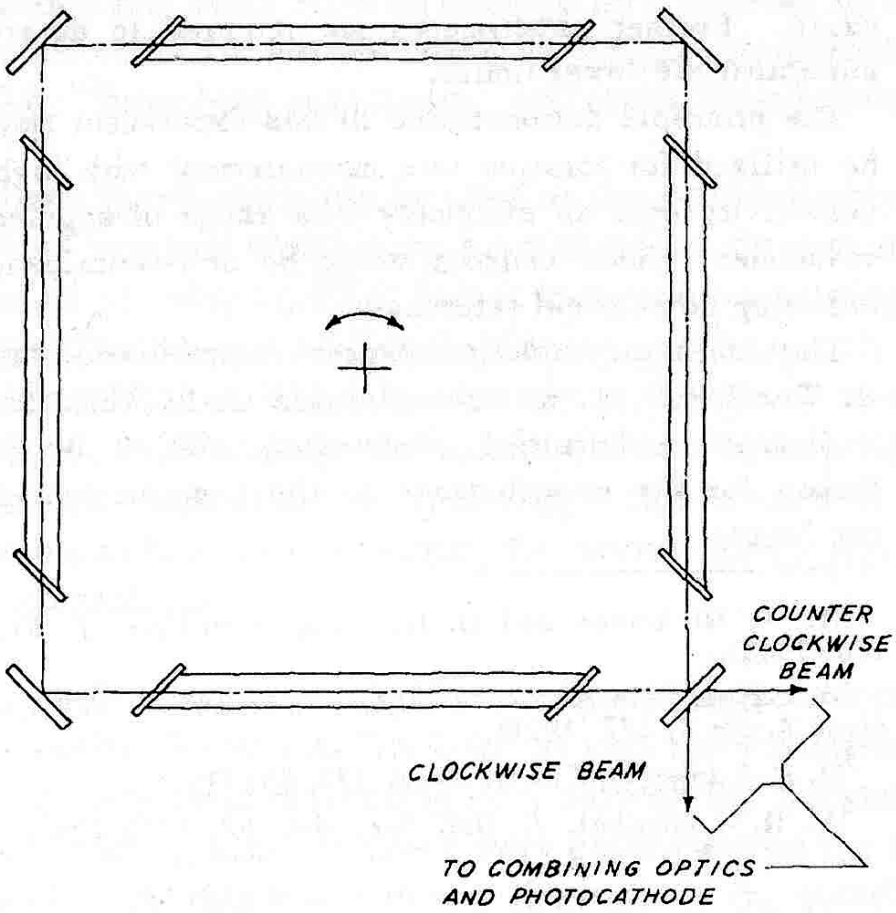
Nicolaas Bloembergen

Optical parametric amplification proposals R. Kingston, N. Kroll, R. Khokhlov and S. Akhmanov 1962

Rem Khokhlov, N. Bloembergen, S. A. Akhmanov

The Ring Laser Gyroscope – Laser Rotation Rate Sensing 1962

W.M. Macek and D. T. M. Davis, Jr.



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Slides 2, 4-7, 9-10, 19-21: AIP Emilio Segrè Visual Archives

3: Gordon, Zeiger and Townes, Phys. Rev. **95**,282L (1955)

8: Maiman, Phys. Rev. Letters **4**, 564 (1960)

11: Javan, Bennett and Herriott, PRL **6**, 106 (1961)

13:Adapted from Jurvetson, http://flickr.com/photos/44124348109@N01/42066452

14: left, AIP ESVA; right, courtesy of G. Weinreich

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16: Laudise, Bell Laboratories Record, January, 1968 courtesy of AT&T Archives and History Center

17: Giordmaine, Phys. Rev. Letters **8**, 19 (1962)

22: Macek and Davis, Appl. Phys. Letters, 2, 67 (1963)