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Extraordinary Engineering Impacts on Society

August 19, 2022


November 1967

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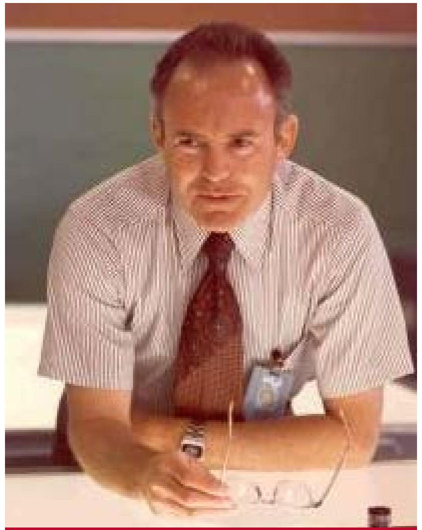

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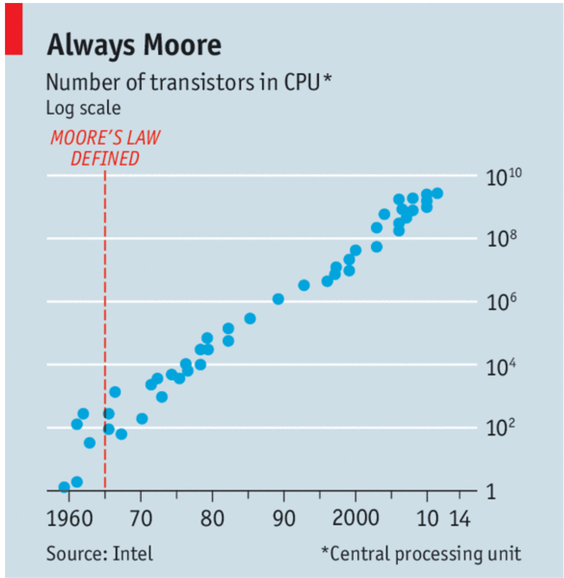
founder of Intel



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Optical Network Synthesis Using Birefringent Crystals.* I. Synthesis of Lossless Networks of Equal-Length Crystals

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(Received 7 May 1964)

A procedure for the synthesis of birefringent networks having arbitrarily prescribed transfer functions is presented. The basic network configuration consists of n identical cascaded birefringent crystals between an input and an output polarizer. The crystals are cut with their optic axes perpendicular to their length. The variables determined by the synthesis procedure are the angles of the optic axes of the crystals and the angle of the output polarizer. Any transfer function which is periodic with frequency and whose corresponding impulse response is real and causal can, in theory, be realized. A network of n crystals allows the approximation of a desired function by (n+1) terms of a Fourier exponential series. Bandwidths of less than 1 Å appear possible.

I. INTRODUCTION

THE advent of the laser has made possible various types of optical systems. This has produced a need for optical elements or networks whose transfer functions can be arbitrarily prescribed as a function of frequency. In a manner analogous to that used at radio frequencies, such optical networks could be utilized as discriminators and ratio detectors, equalizers and compensators, frequency selective hybrids, and delay networks, to name just a few. Of particular importance is the possibility of realizing very narrow-band filters having prescribed transmission characteristics.

The purpose of this paper is to present a basic network configuration and synthesis procedure whereby optical networks having arbitrary transfer functions can be constructed using a set of cascaded birefringent crystals. Although synthesis procedures exist for other types of optical devices,[1-4] the very narrow bandwidths and tunability of birefringent devices make them particularly attractive for the above-mentioned applications. The type of network to be considered is shown in Fig. 1. In simplest form, it consists of a number of identical birefringent crystals placed between two polarizers. Although Fig. 1 pictures a network containing four stages (four birefringent crystals), any number can be used. In principle, either uniaxial or biaxial[5] crystals may be employed, but for simplicity we will assume uniaxial crystals are used. Each crystal is cut with its optic axis perpendicular to its length and with end faces which are flat and parallel. The S's and F's in Fig. 1 denote the crystals' "slow" and "fast" axes, respectively. If a negative crystal is used, the fast axis will be the optic axis, while for a positive crystal the slow axis will be the optic axis. The variables to be determined by the synthesis procedure are the angles to which the crystals are rotated, the angle of the output polarizer, and the length L of the crystals used. In the following sections, we will show that by properly choosing these variables, it is possible, in theory, to synthesize any desired transfer function, subject only to the restrictions that it be periodic with frequency and that it satisfy the usual requirements imposed by the necessity for a real and causal impulse response. The basic periodicity of the network response is determined by the type and length of birefringent crystals used. For example, if calcite crystals 1 cm in length are used, the basic period of

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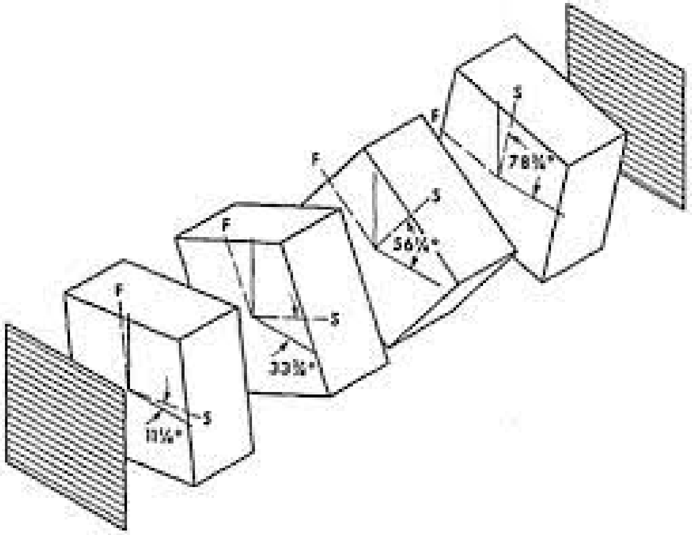
[1] H. Pohlack, Jenaer Jahrbuch, 1962, p. 181 (in German).



Harris, Ammann, and Chang

Noel Clark
University of Colorado

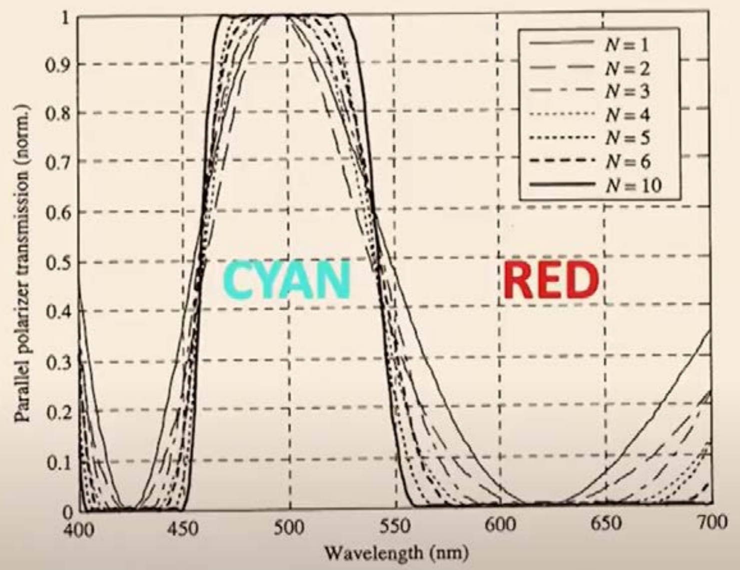


Figure 6.5 Parallel polarizer spectra for *RC* color RSFs with 1, 2, 3, 4, 5, 6, and 10 retarders each with retardance 1.5 waves at 620 nm

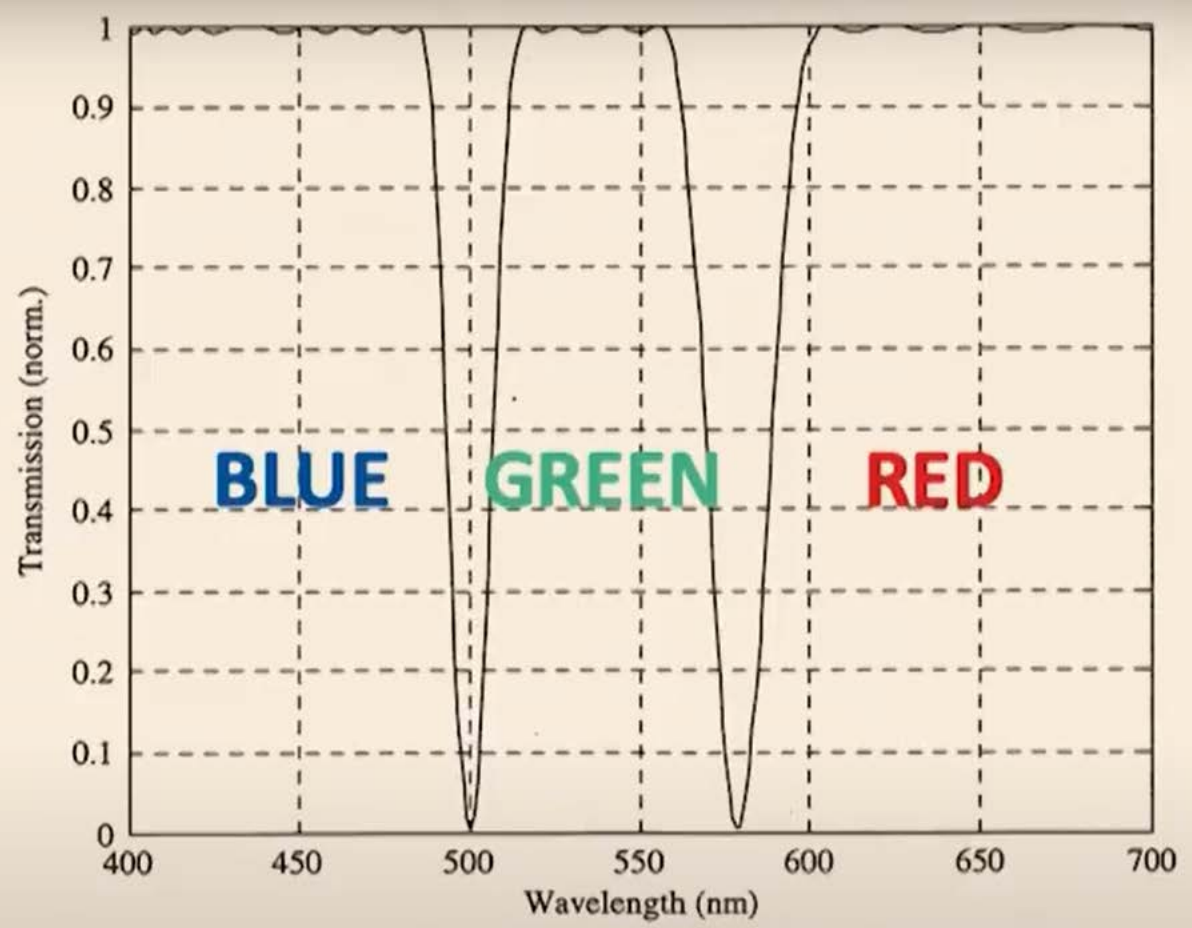


Figure 6.6 Theoretical spectrum of double notch RSF

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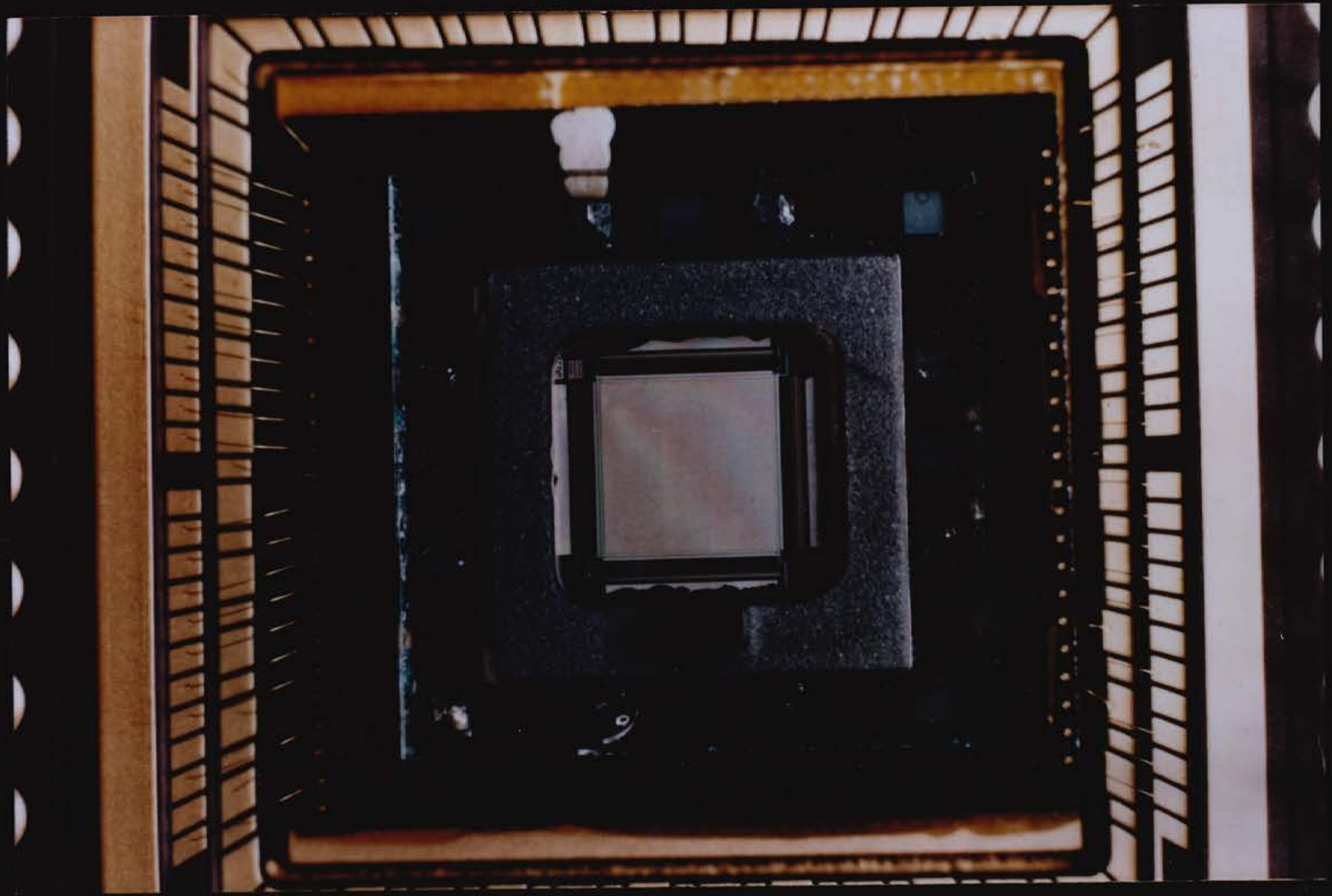

Philips Prism Assembly

Dr. Lambertus Hesselink

Professor of Electrical Engineering

and Applied Physics

NEW

Product Information

Thin Type LCD Rear Projection Display for Entertainment PC

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AngelsSoho 33

(Advanced, Next Generation, Limited Space display for Small Office Home Office)

This is a new 33-inch, high-resolution (XGA), thin type LCD rear-projection display. The overall depth is only 38cm, as deep as a 14-inch CRTs. The weight is only 25kg.

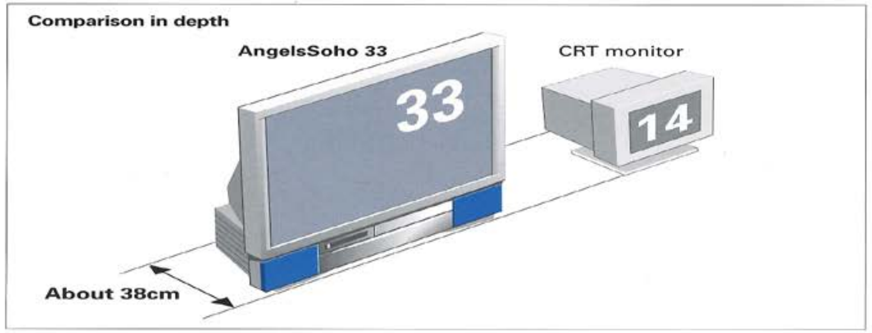
*Display inset images are simulated.

Features

- 33-inch flat screen with about 38cm in depth (as deep as a 14-inch CRT) and 25kg in weight
- This is expected to be pervasive in the SOHO (Small Office Home Office) age.
- Unaffected by electromagnetic noises
- Recycled more easily than CRT monitors (Suitable for LCA)

Specifications (Tentative)

Model	AngelsSoho 33
Screen Size	33 inches
Grade	XGA
LCD Panel	1.3 inches, 3 panels
Brightness	200cd/m²
Light Source	Metal-halide lamp
Power Consumption	200W

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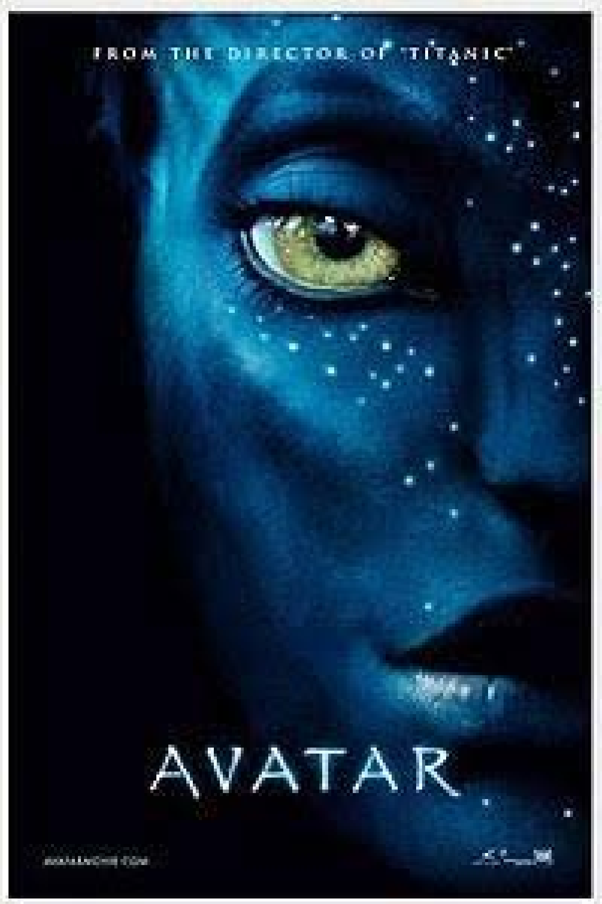
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Thank you