

A STUDY ON PHOTOPHONES

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Abstract

Apart from limited military applications, optical telephony remained a relatively impractical form of communication from the invention of the photophone in 1880, to the development of semiconductor light sources and detectors in the 1960s. While optical fibres have become a major component of modern telecommunications, and infra-red remote controls are incorporated in many domestic appliances, optical communication has been largely ignored by radio amateurs. Construction projects for photophones have been published from time to time over the last 60 years, but there have been few reviews of optical communication and its potential as a medium for amateur voice and data communication. This article is a mixture of history, theory and personal experience, written with the intention of introducing optical communication to the general body of radio amateurs and possibly stimulating further experimentation in the oldest branch of wireless. The invention of the selenium cell in 1872 and the telephone in 1876, made it possible to detect modulated light, and Mr A.C. Brown of London is generally credited with the first transmission of articulate speech over a light beam in 1878. Much of the pioneer work in optical telephony was carried out by Alexander Graham Bell and Charles Sumner Tainter during 1879 and 1880, which was presented in a paper¹, read by Bell to the American Association for the Advancement of Science in August 1880. The Bell photophone (Figure 1) used a flexible plane mirror mounted at the end of a speaking tube, so that the sound pressure caused the mirror to change shape, modulating the beam intensity of the reflected light. The receiver was a selenium cell mounted at the focus of a parabolic reflector, and coupled to a battery and telephone receiver. Using this apparatus, Bell transmitted speech over a distance of 213 metres using sunlight, and shorter ranges were covered using various lamps as a light source.