4:00pm - 4:30pm (Invited)
WCC2

High Bandwidth Polymer Modulators

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The measurements of our ultra-fast travelingwave modulators made from electrooptic polymer materials have now been extended to over 110 GHz. A laser heterodyne system using both YAG lasers and tunable semiconductor lasers was used in these measurements which were limited only by the contacts to the device. These contacts were made using commercial coplanar probes to make the transition from waveguide to coplanar and then to the microstrip of the modulator.

Response as a function of frequency for these devices is shown in figure 1 and was virtually flat from 75 to 113 GHz. These results combined with our previous measurements up to 60 GHz indicate that these devices have a remarkable broadband capability. In figure 2 we show a spectrum analyzer display of mixing at 105 GHz where the signal to noise ratio is beginning to drop off.

In order to form more interesting devices at these frequencies we have designed a configuration which uses integrated microwave transitions from waveguide to microstrip. These transitions use a anti-podal fin line approach on mylar and have been tested at W-band frequencies. A newly fabricated version of these lines is shown in figure 3 with a dozen of these phase modulators. In this particular case the units are to be separated and mounted individually with the straight portion representing the travelling wave optical region.

This effort is now looking into new circuits and systems at these frequencies. These involve the use of Mach-Zehnders in both series and parallel configurations. The major losses in these materials are in the coupling in and out from fibers. Therefore complex arrays capable of performing interesting signal processing roles are feasible, and because of the simplicity in fabrication potentially extremely low in cost.

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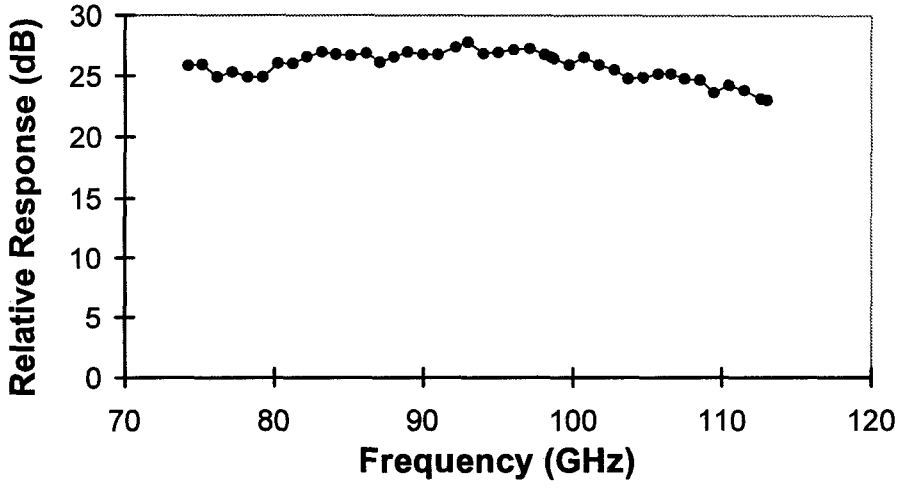

Figure 1. Modulator frequency response from 74 GHz to 113 GHz.

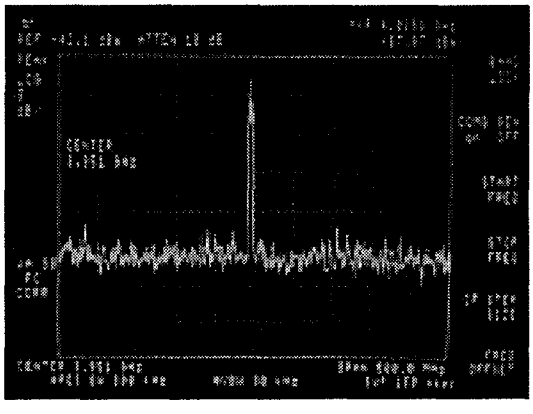

Figure 2. Modulator optical response at 105.8 GHz, optically down converted to 3.9 GHz. The device was driven by a W-band backward wave oscillator.

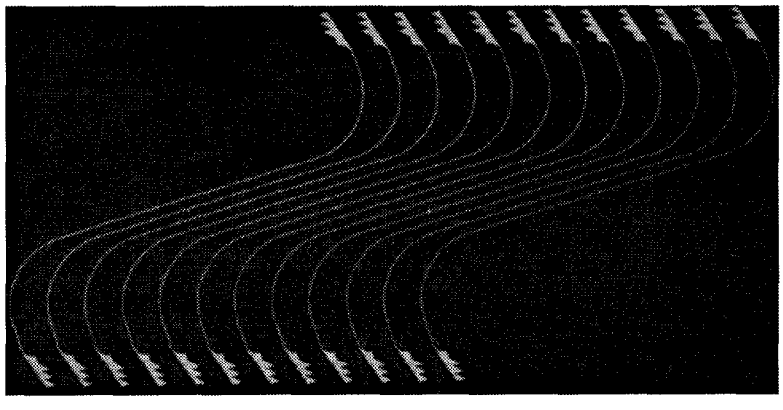

Figure 3. Top view of twelve W-band polymer modulators with integrated fin line transitions.