Results of the Joint Mode-Stability Experiment

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To check for rotation/circular polarization of and excitations of parasitic modes.
- To analyze mode purity after transmission loss
- To measure transmission loss
- To demonstrate our ability to launch modes purely w/ launchers

In particular, our goals were the TE1 mode. In particular, our goals were the transmission of power in the TE1 mode as well as the transmission of power in the TE2 mode. With the KEK ATF Injector tunnel to gain experience with high-ordered delayed line assembled with “shock” things.

Purpose: Experiments were done with a 55m WCE75 (47.8 cm)
only for illustration purposes.
This is done for backwall shorting plate.
The picture does not have the model shown in the physical converter. The physical wrap-around mode.
HFSS simulation results for the wrap around mode converter. The color shades represent the magnitude of the electrical field. (a) is a cut plane through the slots, (b) is a cut plane in the circular guide 2.5 cm away from the slots.
at 11.424 GHz. The device is optimized back to back. The two wrap-around mode converters measured transmission coefficient for frequency (GHz):

Frequency (GHz): 11.24, 11.34, 11.44, 11.54, 11.64

Transmission Coefficient S12 (dB): 0, -0.2, -0.4, -0.6, -0.8.
A cutaway view of the structure.
Simulated performance of the TE^{10}_0 (rectangular) to TE^{12}_0 (circular) mode converter. Simulations are done using HP-HFSS.
Measured frequency response of two TE₁₂ mode transducers connected back to back.
The Mode Analyzer

Using a ball joint connected to the moving stages, the middle waveguide is measured in magnetic field being measured. Component of the surface waveguide determines the orientation of the rectangular.
Rectangular waveguide calibration measurements
The Mode analyzer being Aligned
Mode Launcher, a spacer for the mode rotator, nonlinear taper and transport line.
The end of the mode analyzer and transport line is terminated by a multi-mode load.
Measured Mode Spectrum of the TE_{01} mode transducer.
The mode is launched using SLAC's TE_{10} mode converter.
SLAC's TE₁₂ mode launcher
The mode is launched using SLAC's TE12 mode converter. Mode Spectrum after the 5.5 meter of Waveguide.
Stability of measurements over time
the \(\text{TE}_{12}\) mode

discontinuity when an incident mode is

The scattering of modes due to the step

The \(\text{TE}_{10}\) mode

discontinuity when an incident mode is

The scattering of modes due to the step
Two TE$_{01}$ mode converters back to back including up tapers to 4.75" diameter
Launchers (two $T_E^{10}$ mode transducers plus two arc-tapers).

Time domain response of the transport line plus the mode.
diameter
back including up tapers to 4.75
Two TE12 mode converters back to
Freq GHz

1.399 1.411 1.424 1.4365 1.449

0

dB
horizontal polarization

Converter: The TE12 was launched and received with meter of WGC475 Waveguide and a receiving TE12 Mode Transmission Measurement through a TE12 mode launcher 55.
to each other

Figure the two mode transducers were always aligned with respect
launchers (two mode transducers plus two arc-tapers). In this
Time domain response of the transport line plus the mode
The effect of rotating one of the mode $T_{12}$ mode transducer with respect to the other.
Losses of the TE\textsuperscript{12} mode is 4.5\% to 5\%, theory is 2.8\%.

Over the 5\,\textmu\text{m} of WGa75 losses of the TE\textsuperscript{10} mode is 1.08\%, theory is 1.1\%.

Rotator for the TE\textsuperscript{12} mode.

and the TE\textsuperscript{10} mode. Finally, we showed how to design and implement a polarization
modified waveguides. We also reported a technique for efficiently exciting the TE\textsuperscript{12} mode
mode waveguides. We reported a novel technique for measuring the modal content of a high-hybrid

We showed that resonant changes and waveguides could be used to propagate either

We compared our results for TE\textsuperscript{12} with those of the low-loss TE\textsuperscript{10}. In this process
modes, this paves the way for developing a multi-mode system where different signals

were loaded over different modes. This was shown that resonant changes and waveguides could be used to propagate either

were small, the conversion levels

eliminated all cross-polarization mode mixing. Nonetheless, we observed some

were small and compared relatively well with theory.

The waveguide used in the experiments were extruded oxygen-free high-conductivity

were small. However, the conversion levels

circular waveguides as a means of low-loss transport of rf signals. The over all losses

We have demonstrated the possibility of using the TE\textsuperscript{12} mode in high-hybrid over-mode

Conclusion