



RF Modifications For L01/L02 Input Coupler

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LCLS Week 04/05/2005



Outline



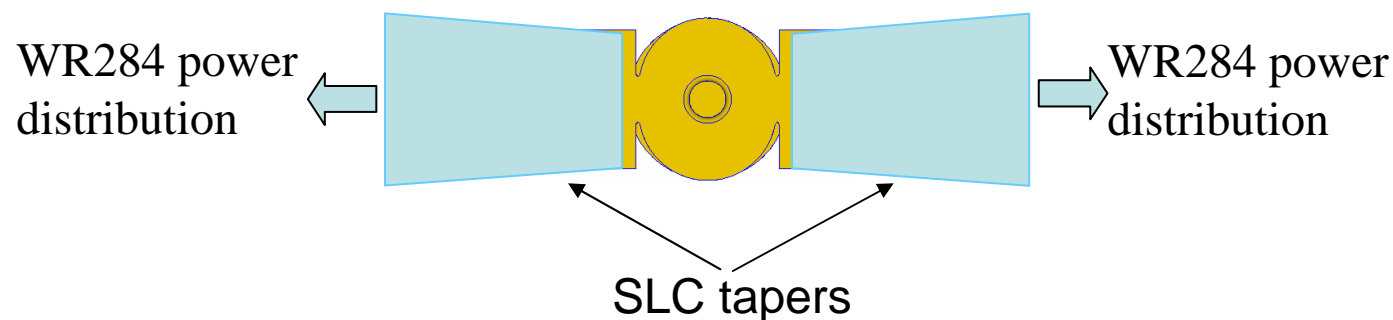
- Original dual-feed design
- New design with WR284 port and waveguide
- RF field comparison
- Coupler bandwidth
- Waveguide components for dual-feed

Old Version Dual-feed Coupler

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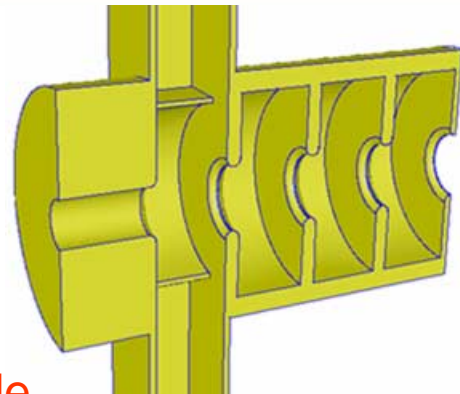
Design considerations:

- Minimize dipole and quadrupole fields
 - Dual feed
 - Racetrack cell profile
- Re-use the SLC structure parts if possible
- Modify the coupler cell only

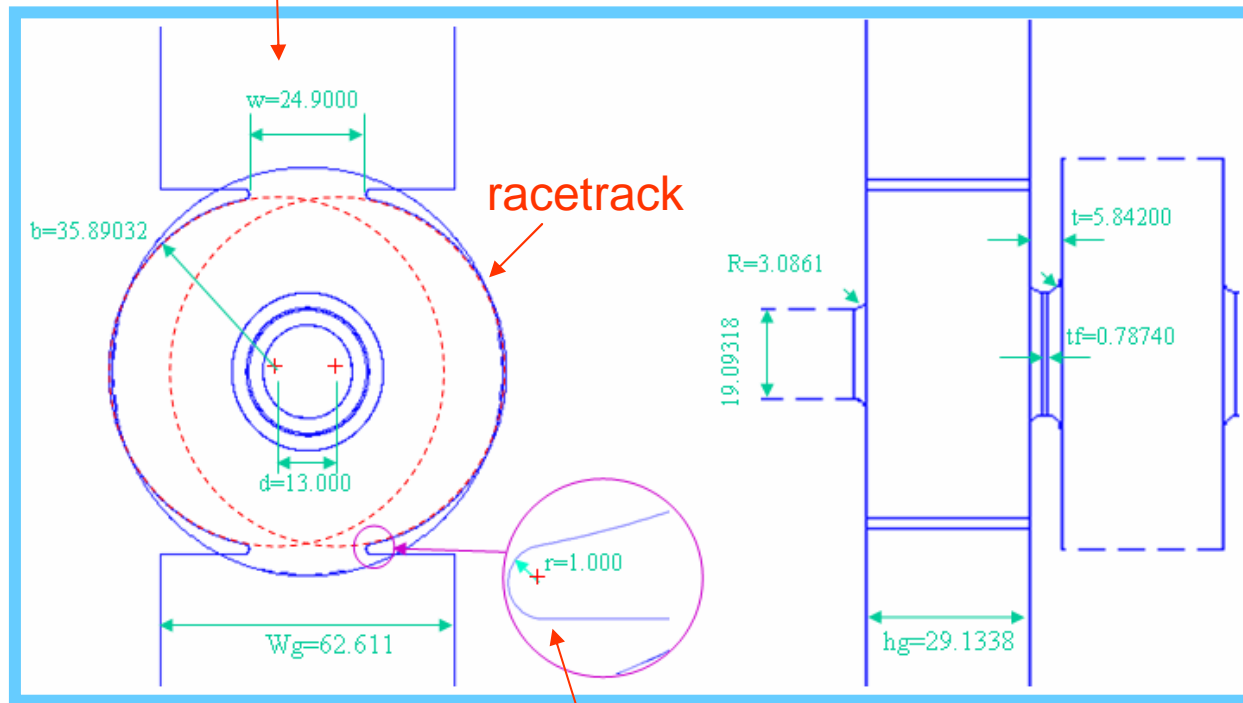


Old Design With Small Coupler Port

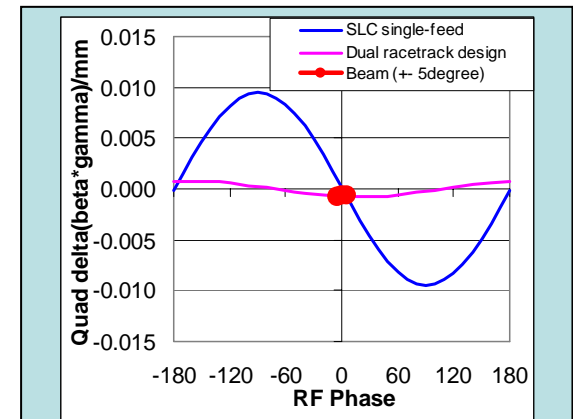
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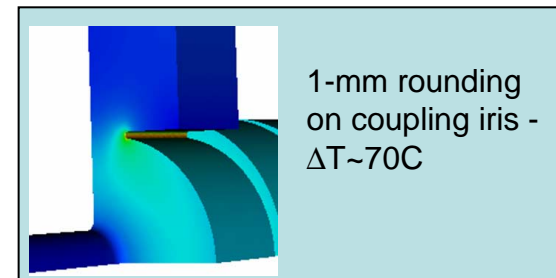
62-mm waveguide



rounded iris



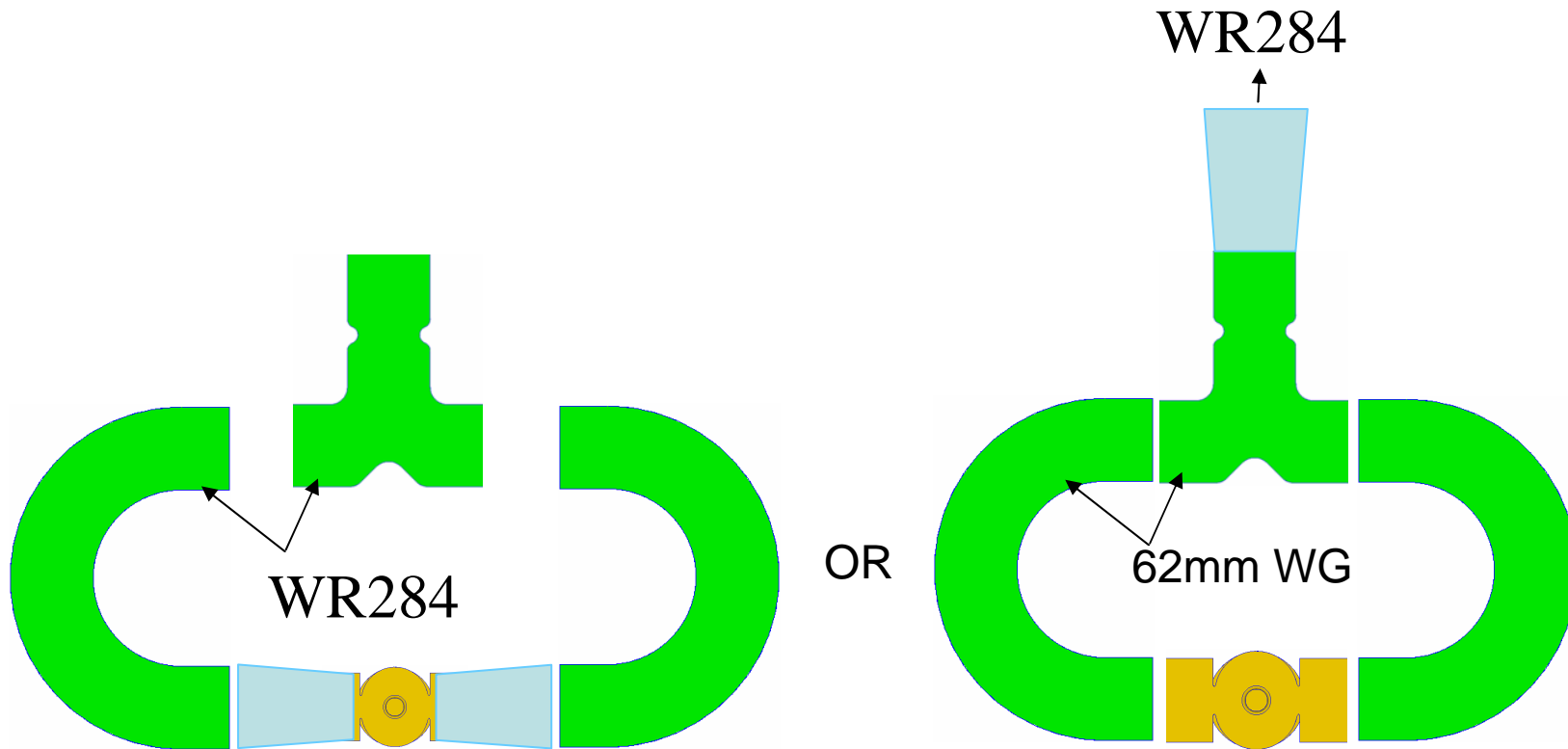
Quad head-tail $\Delta(\gamma\beta_{\perp})/m$ for 10 Degree bunch		
	$\Delta(\gamma\beta_{\perp})/m$	HT angle $\Delta\theta$ (rad/m)
Single feed	0.78	0.078
Dual racetrack	0.04	0.004



1-mm rounding on coupling iris - $\Delta T \sim 70C$

Old Design Waveguide Option

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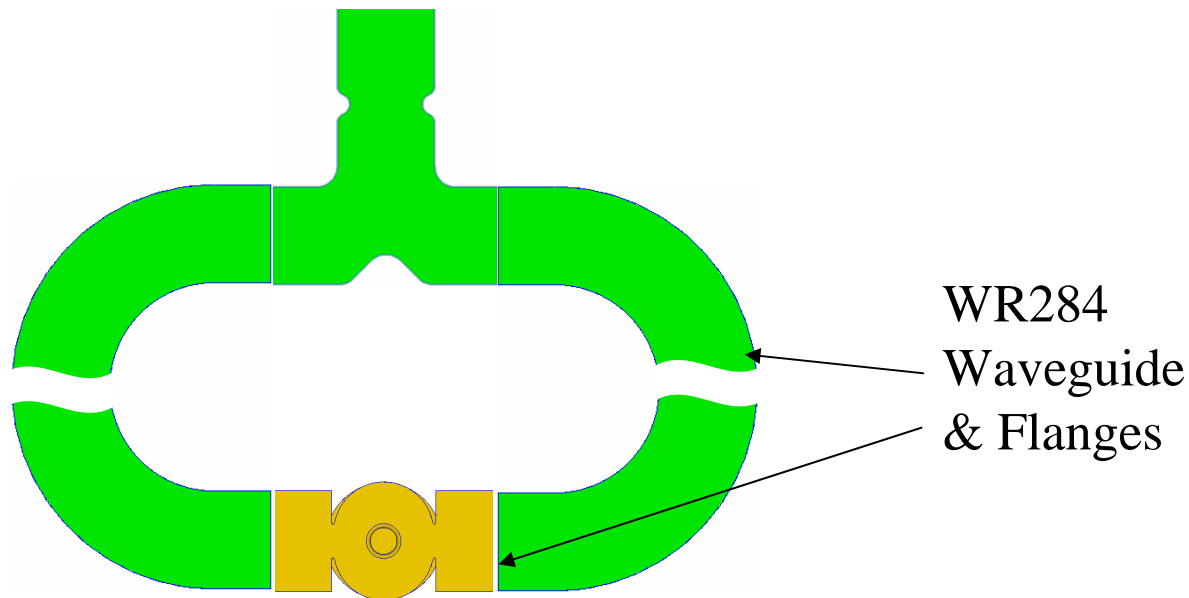


- Existing SLC taper is long
- “Bulky”

- Taper to WR284 after the “T”
- Bend narrow 62-mm waveguide

New & Present WR284 Design

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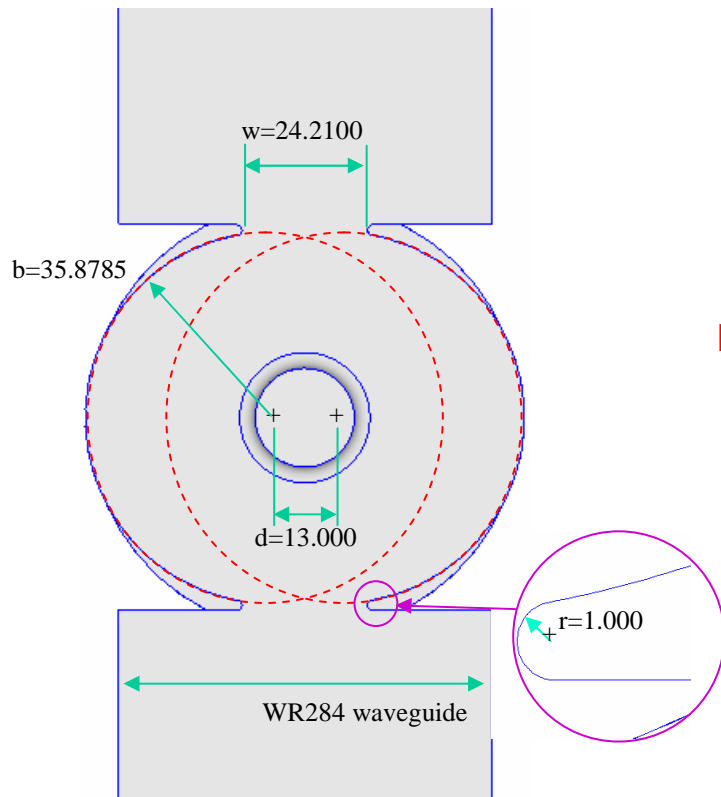


- Eliminate all tapers
- Standard WR284 parts: flanges & waveguides
- Monolithic bend can be made from bending standard WR284
- **Coupler need to be re-designed**
 - Coupler cell height: increased to the WR284 height
 - Coupler port: WR284 dimensions

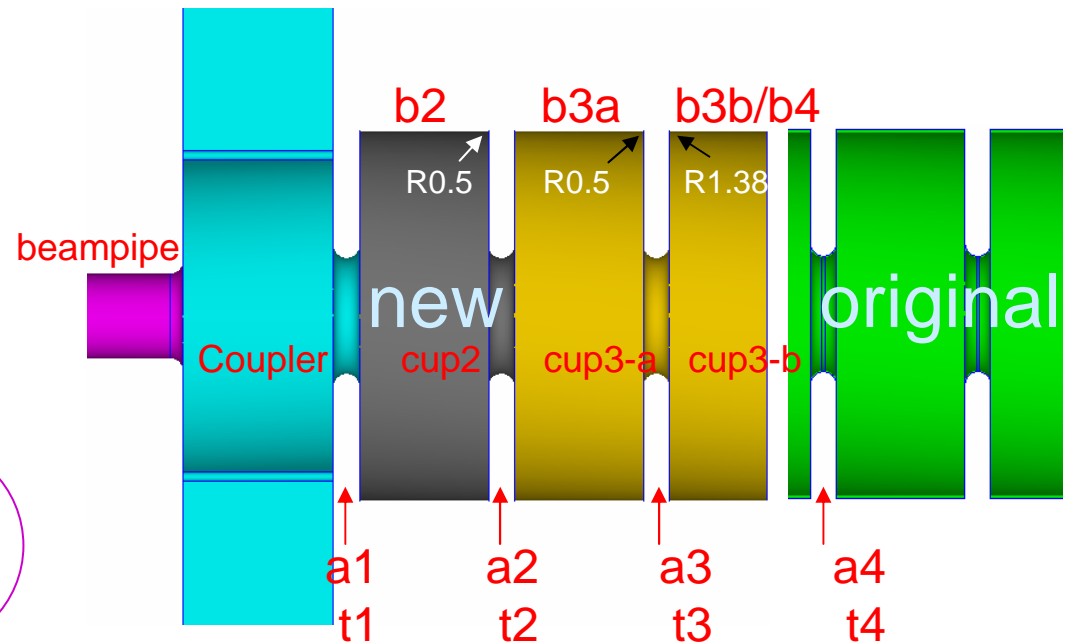
New L01/L02 Dual-feed Input Coupler Design



- New design changes:
 - WR284 port
 - Long coupler cell
 - Standard DLWG cell for cup1-3b
 - Dimensions provided for mechanical design



Z.Li ACD/SLAC

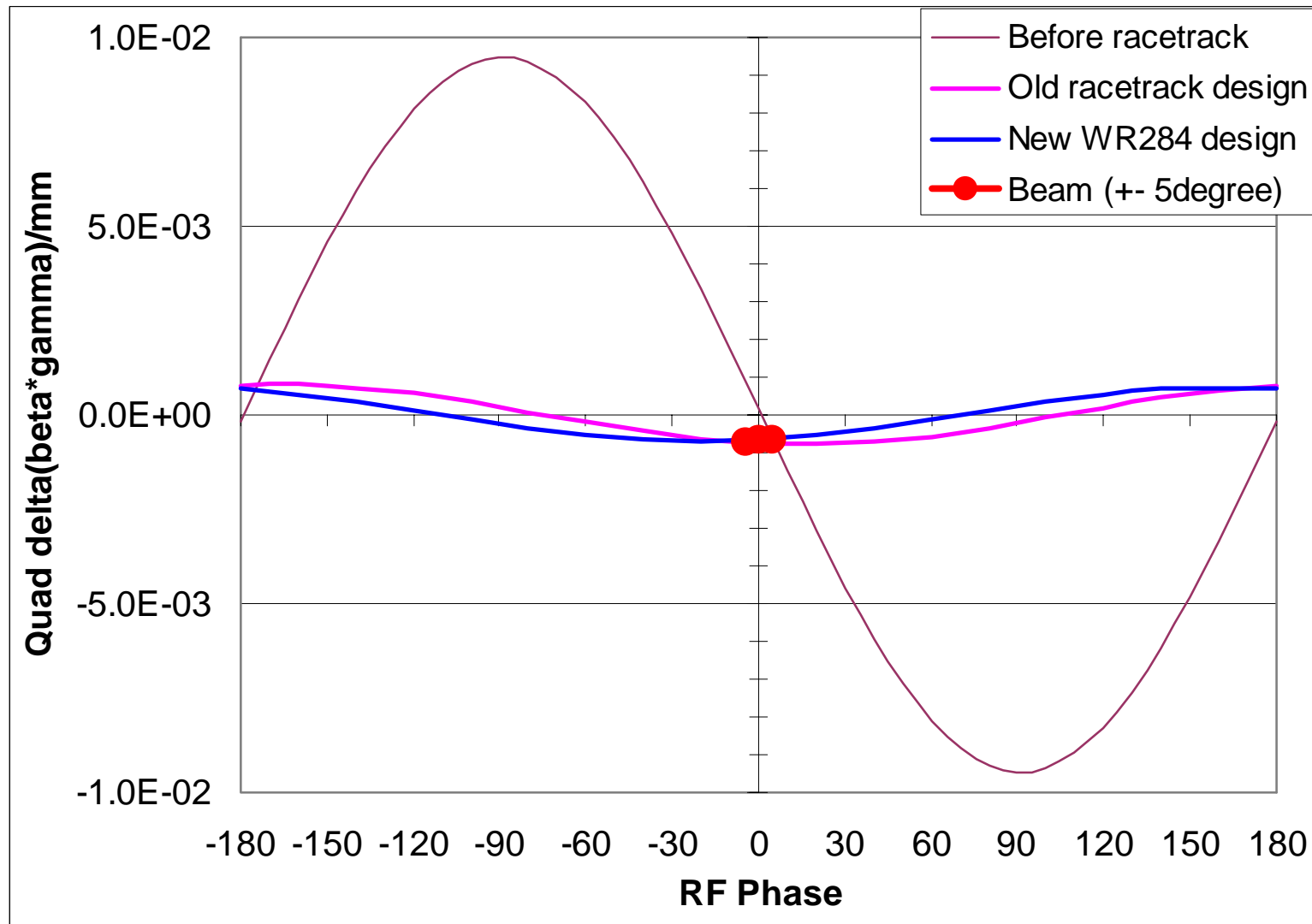


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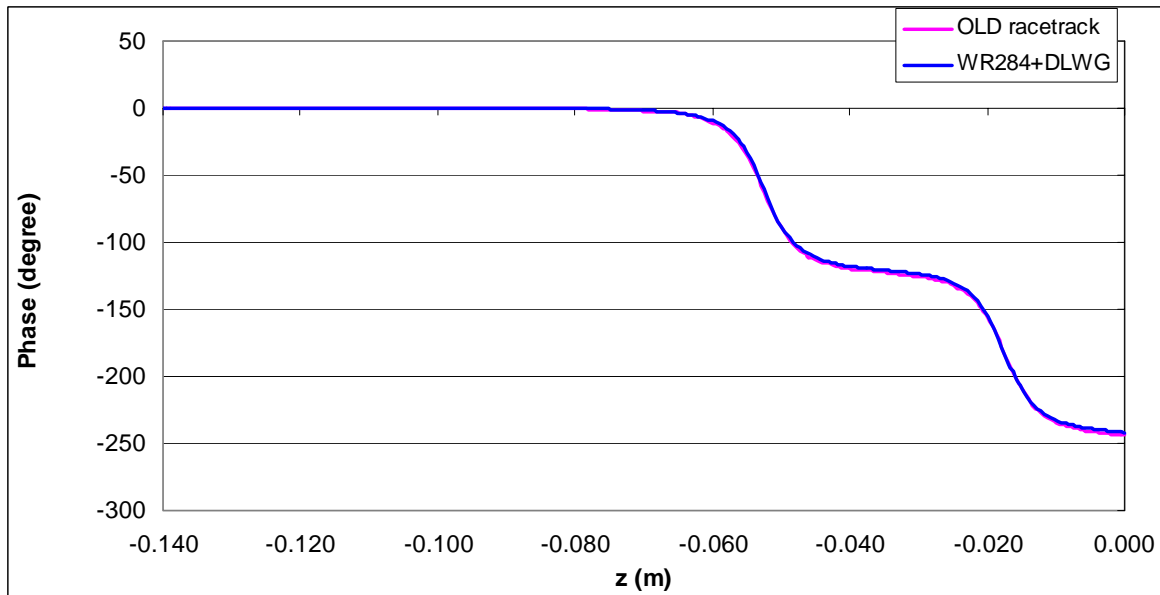
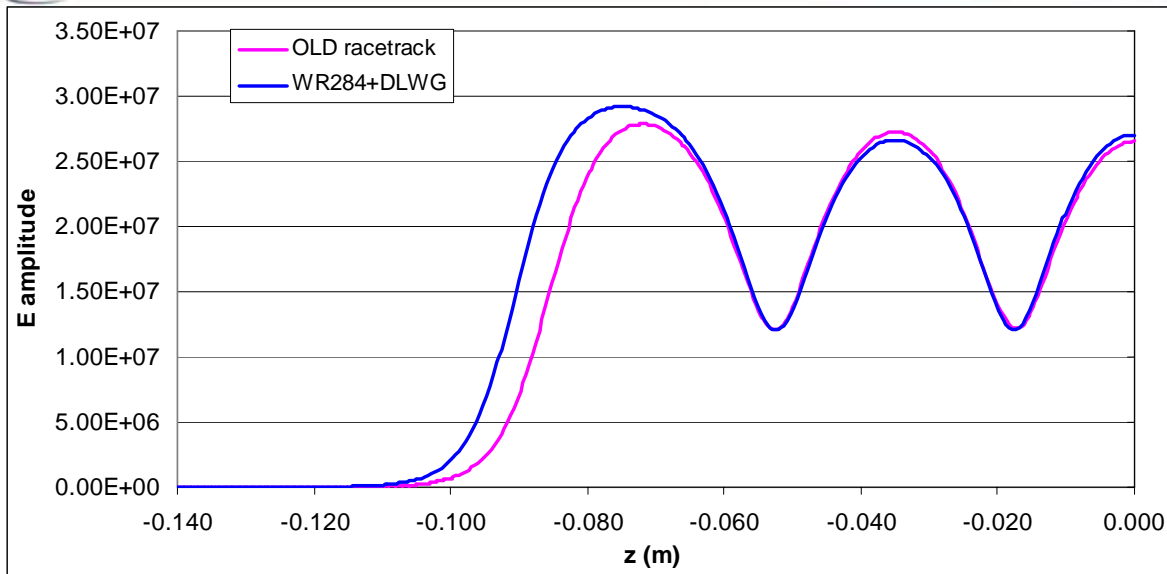
Quadrupole Field

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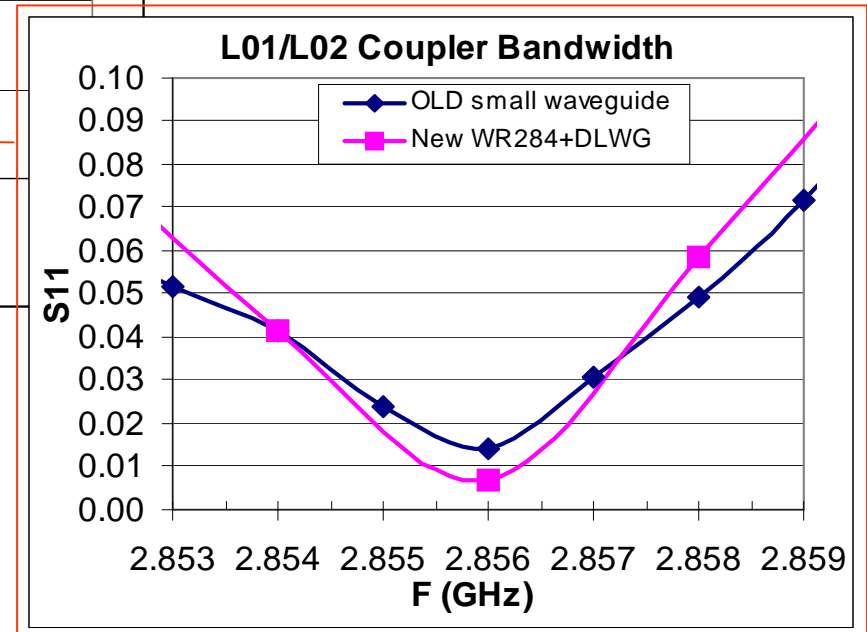
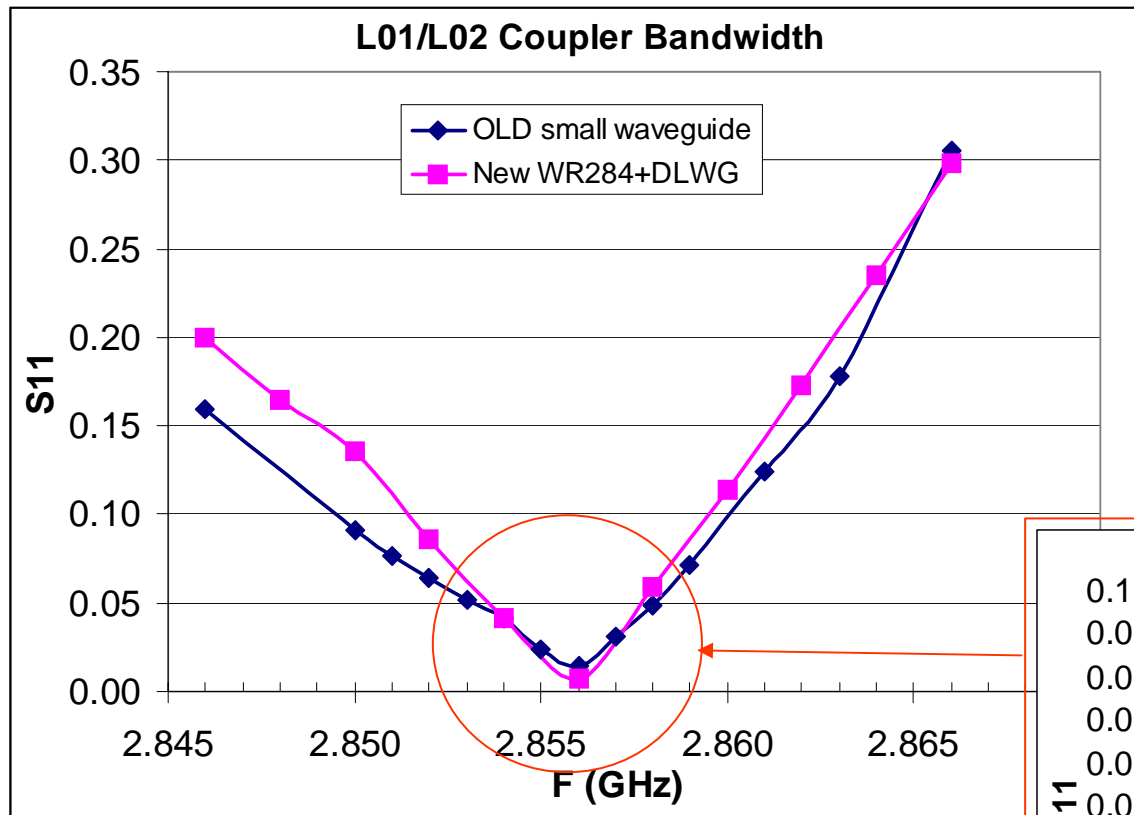
Field – phase & amplitude

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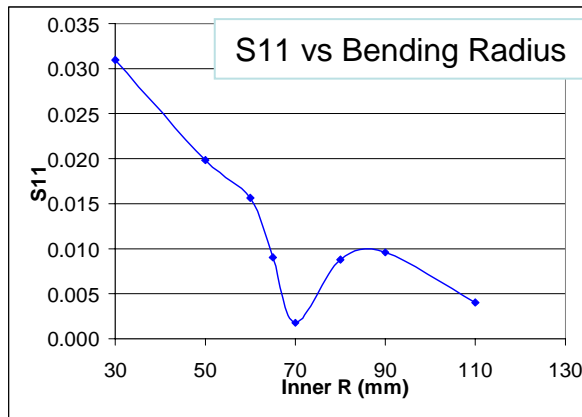
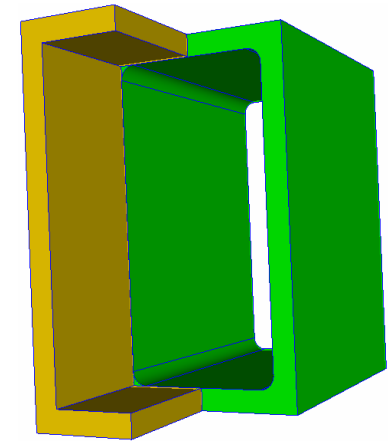
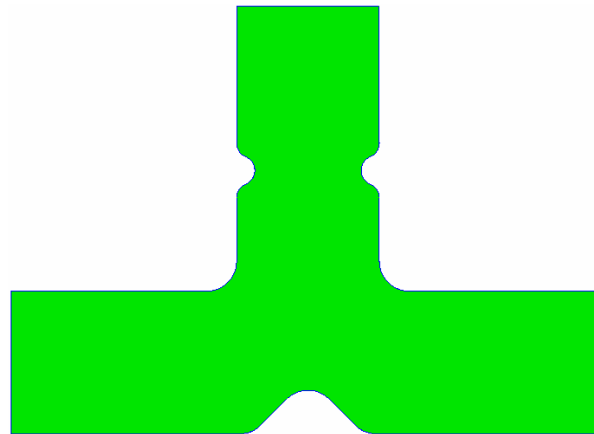
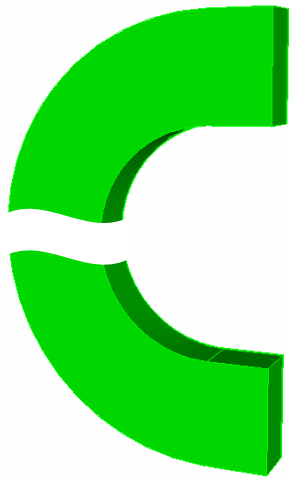
L01/L02 Input Coupler Bandwidth

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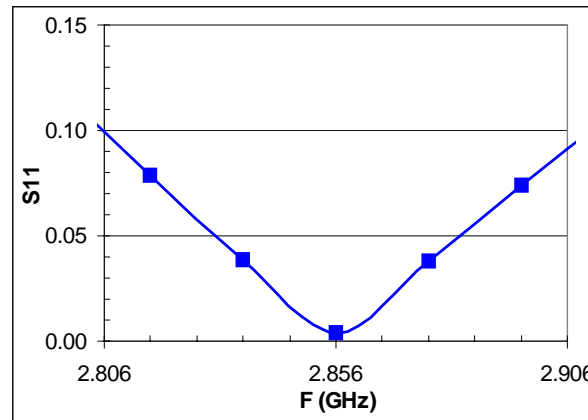


Dual-feed Waveguide Components

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Large bending radius to reduce reflection



WR284 junction:
Sharp to R=1/8" cornered
Reflection: 0.002

Structure:
Input Power = 33 MW
Gradient = 20 MV/m
 $E_s = 8$ MV/m