

Coupler Design for LCLS Injector L01 S-band Structure

Zenghai Li

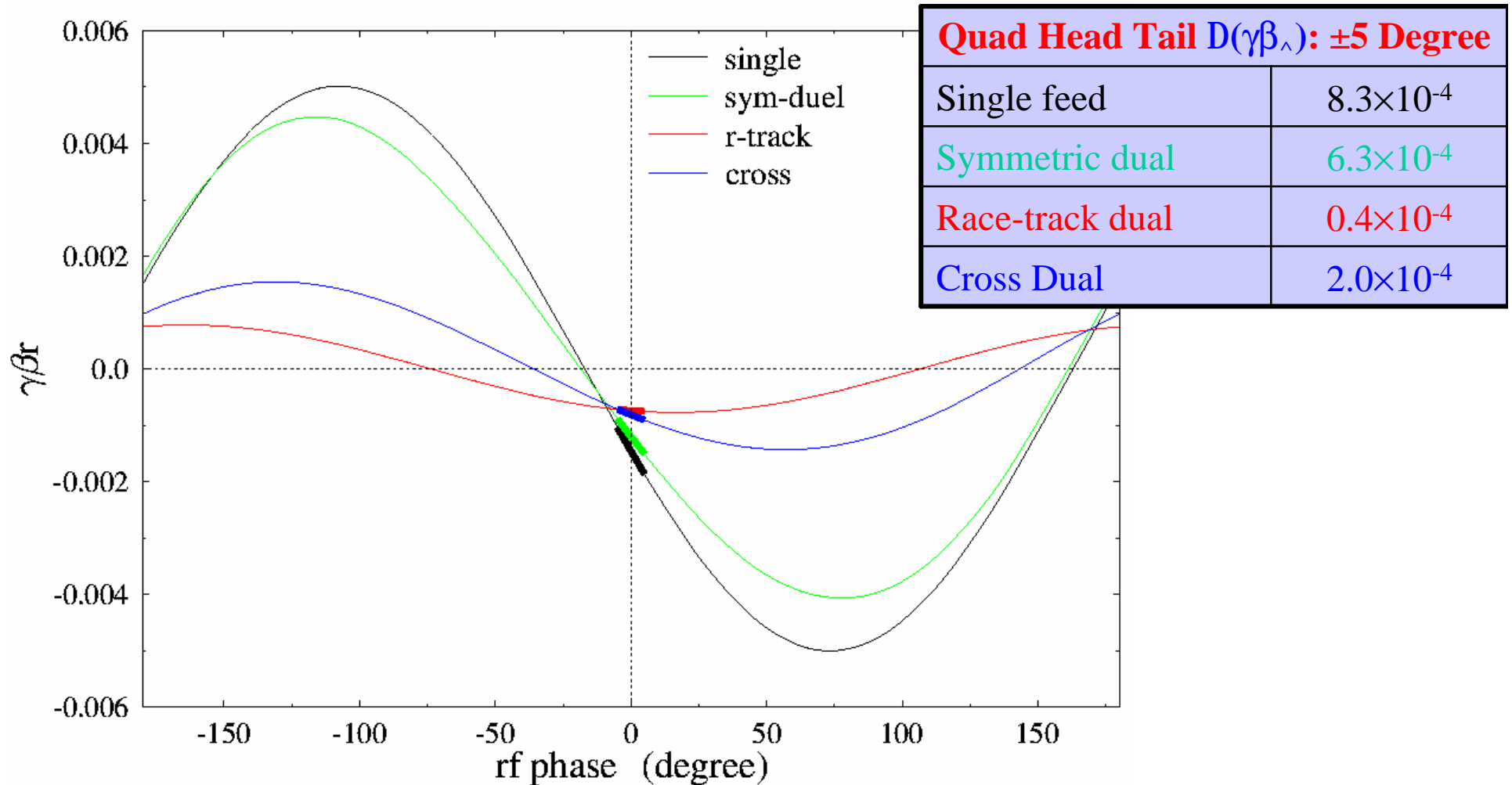
04/13/04

Head-Tail Effect

- Bunch spans ± 5 degrees in RF phase, on crest
- Input coupler single-feed – original design - $\gamma \approx 10$
 - Dipole: $\Delta(\gamma\beta_{\perp})=0.0025$; $\Delta(\gamma\beta_{\perp})/\gamma = 0.00025$ rad
 - Quad: $\Delta(\gamma\beta_{\perp})=0.00075/\text{mm}$; $\Delta(\gamma\beta_{\perp})/\gamma = 0.075$ rad/m
- Output coupler single-feed – original design - $\gamma \approx 100$
 - Dipole: $\Delta(\gamma\beta_{\perp})=0.0011$; $\Delta(\gamma\beta_{\perp})/\gamma = 0.000011$ rad
 - Quad: $\Delta(\gamma\beta_{\perp})=0.00044/\text{mm}$; $\Delta(\gamma\beta_{\perp})/\gamma = 0.0044$ rad/m
- Cecile's head-tail requirement
 - quad: 0.075rad/m
 - Dipole: ?
- Q: which emittance matters? normalized or geometric?
 - If normalized, then $\Delta(\gamma\beta_{\perp})$ counts, not $\Delta(\gamma\beta_{\perp})/\gamma$.

Coupler Comparison

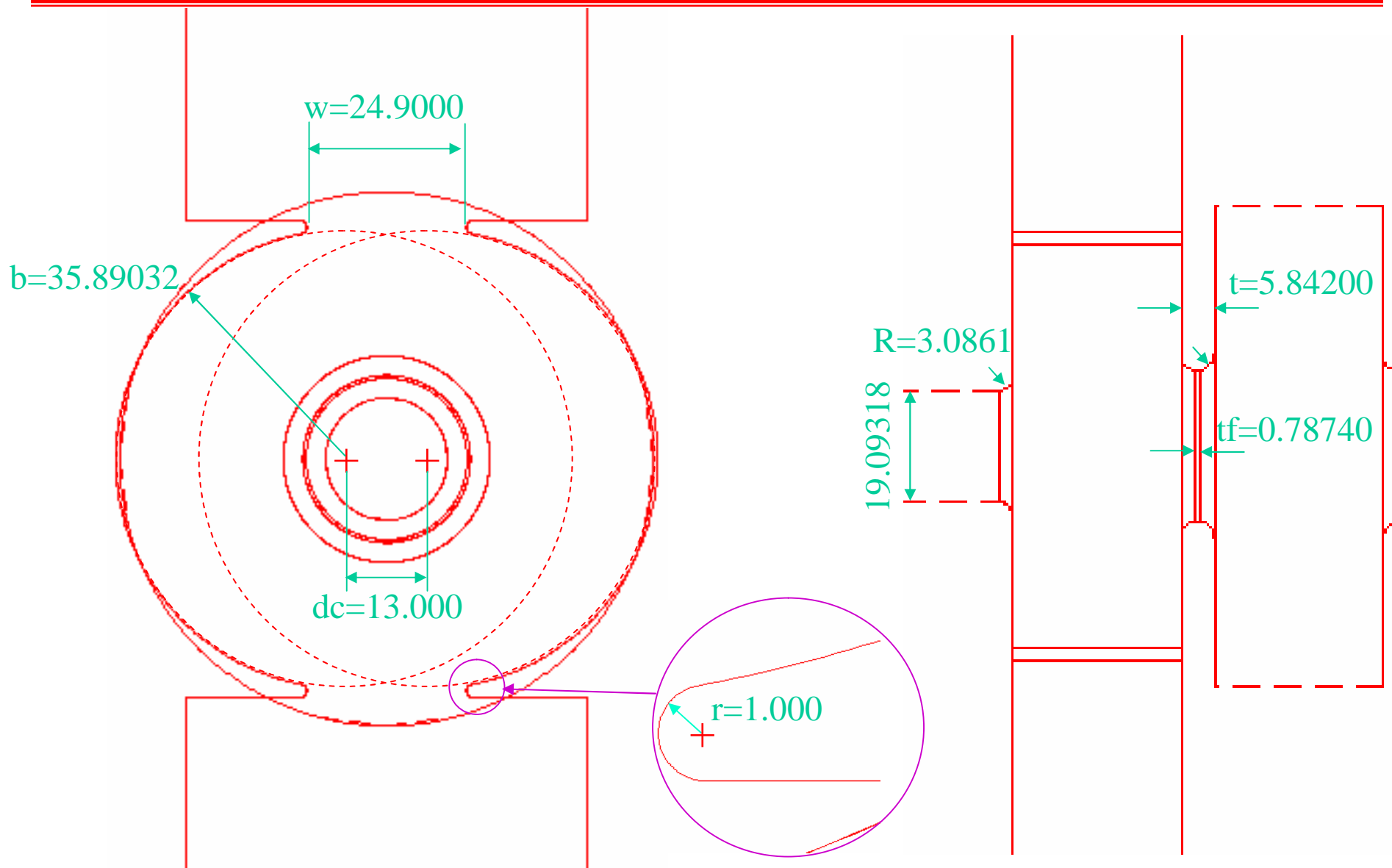
S-band Input Coupler: Quadrupole v.s. RF Phase



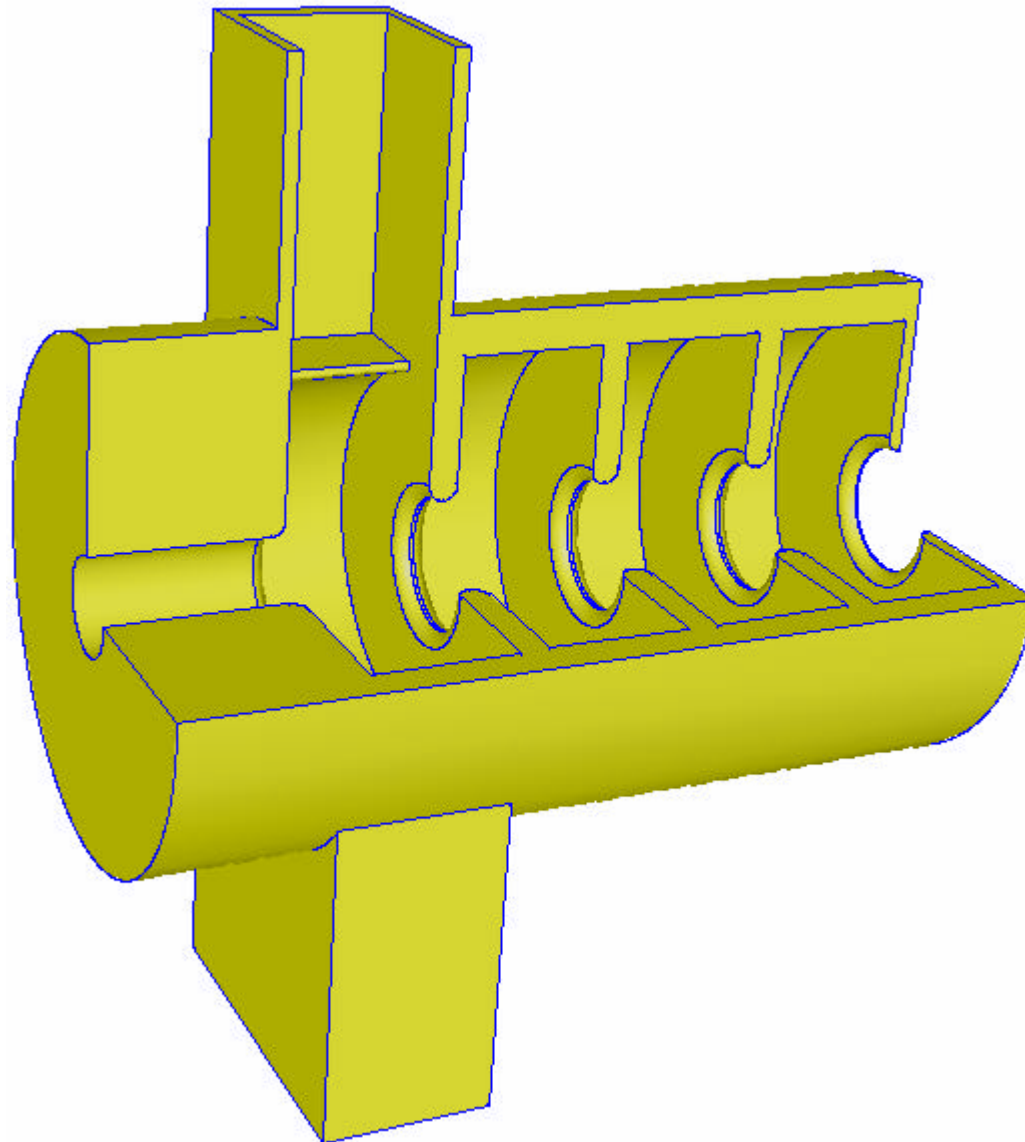
Racetrack Fat-lip Duel Input Coupler



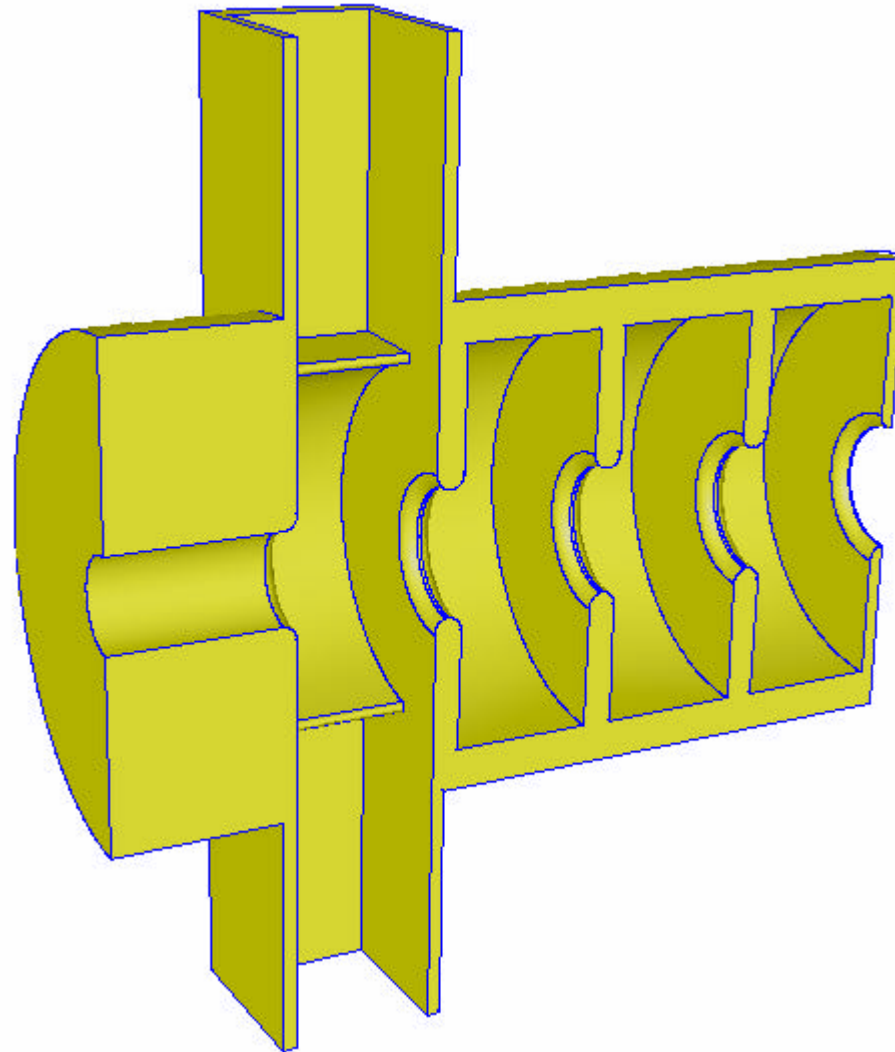
skin and fillet not corrected, operating temperature



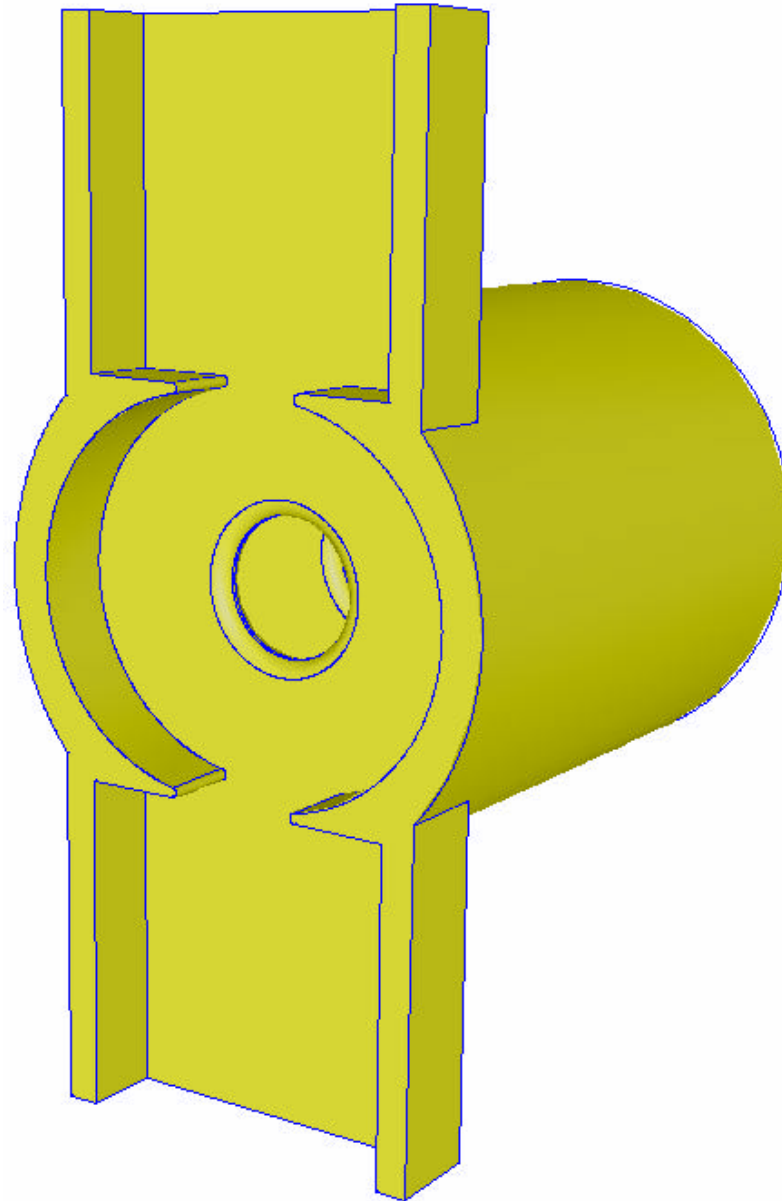
Fat-lip Coupler Part-A



Fat-lip Coupler Part-B

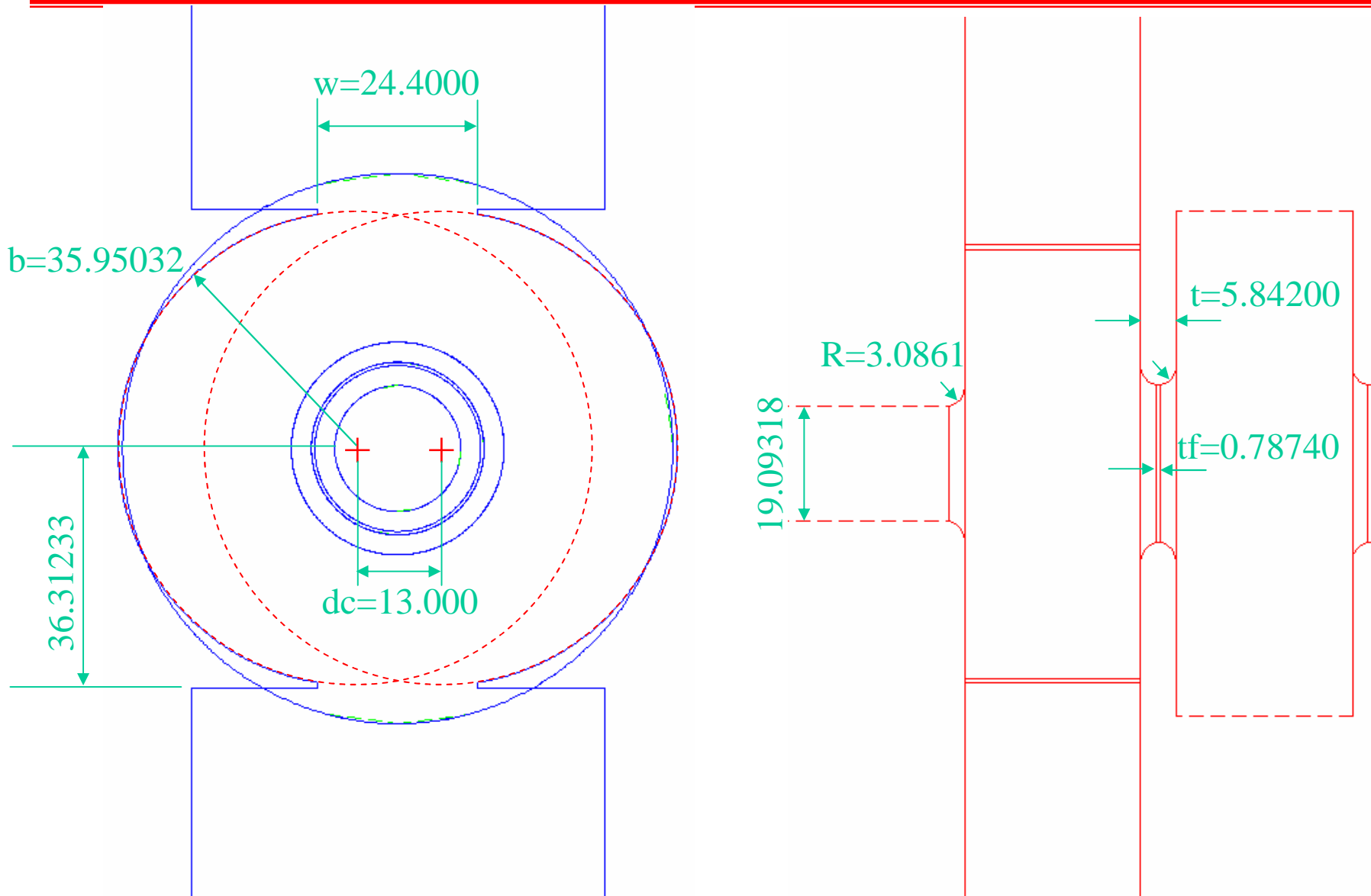


Fat-lip Coupler Part-C



Racetrack Duel Input Dimensions

rough dimensions: skin and fillet not corrected, operation temperature



Racetrack Duel Input Matching Sensitivity

