

# Code Integration for Efficient Divertor Design

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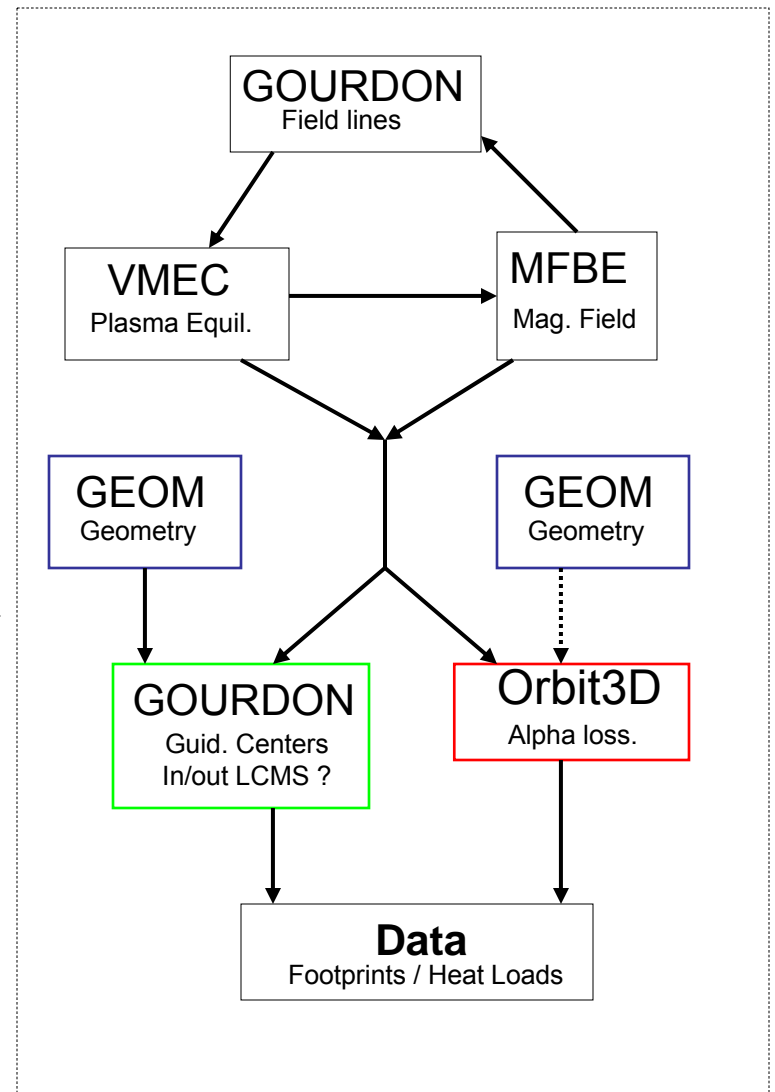
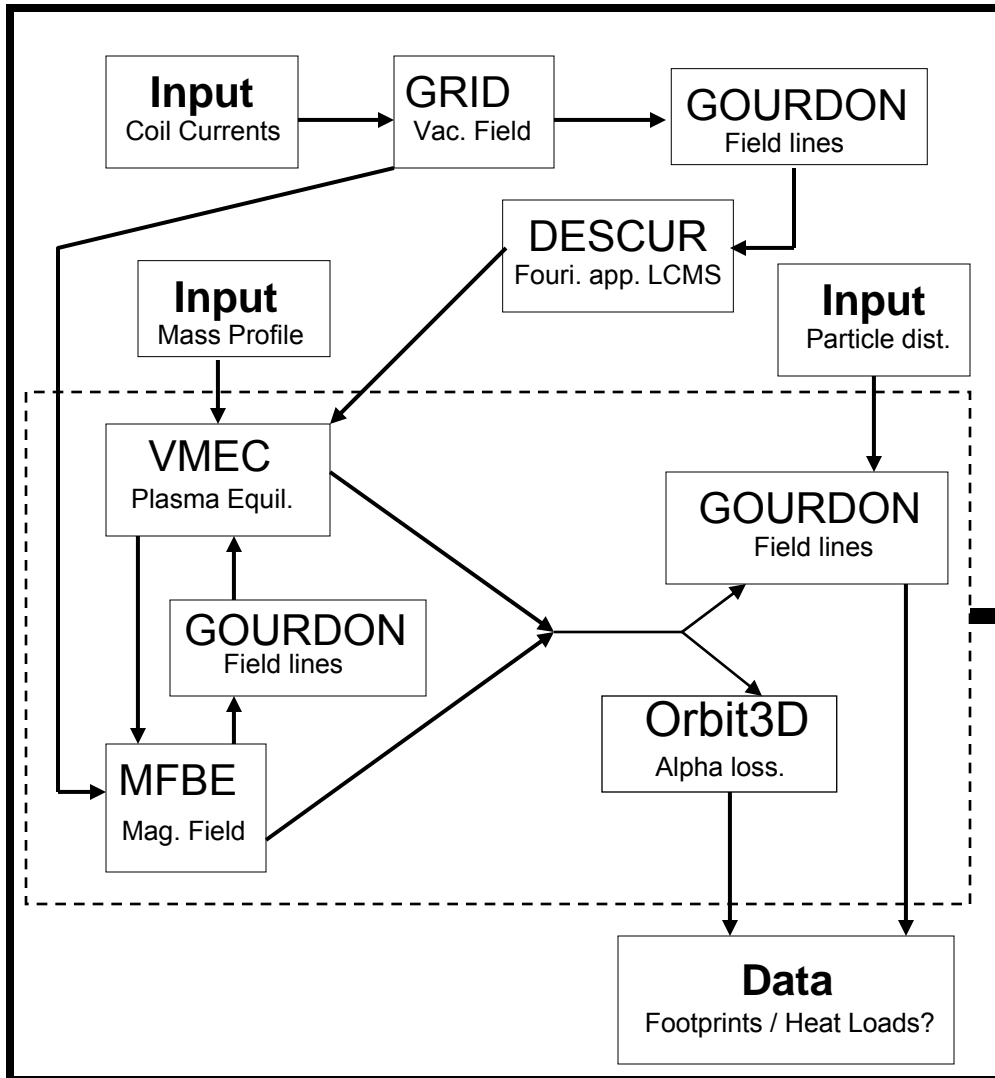
Rensselaer Polytechnic Institute

ARIES project meeting

UCSD, Nov 4-5 2004



# Code System



# Future Capabilities



## GOURDON

- Parallized version → Many more lines
- Capable of tracing guiding centers → ??
- Utilize GEOM → Faster run times, simple intersection data
- T3E version → X1 at ORNL, Convert?

## ORBIT3D

- Inclusion of gyro radius → more accurate description of  $\alpha$  loss
- Utilize GEOM also?

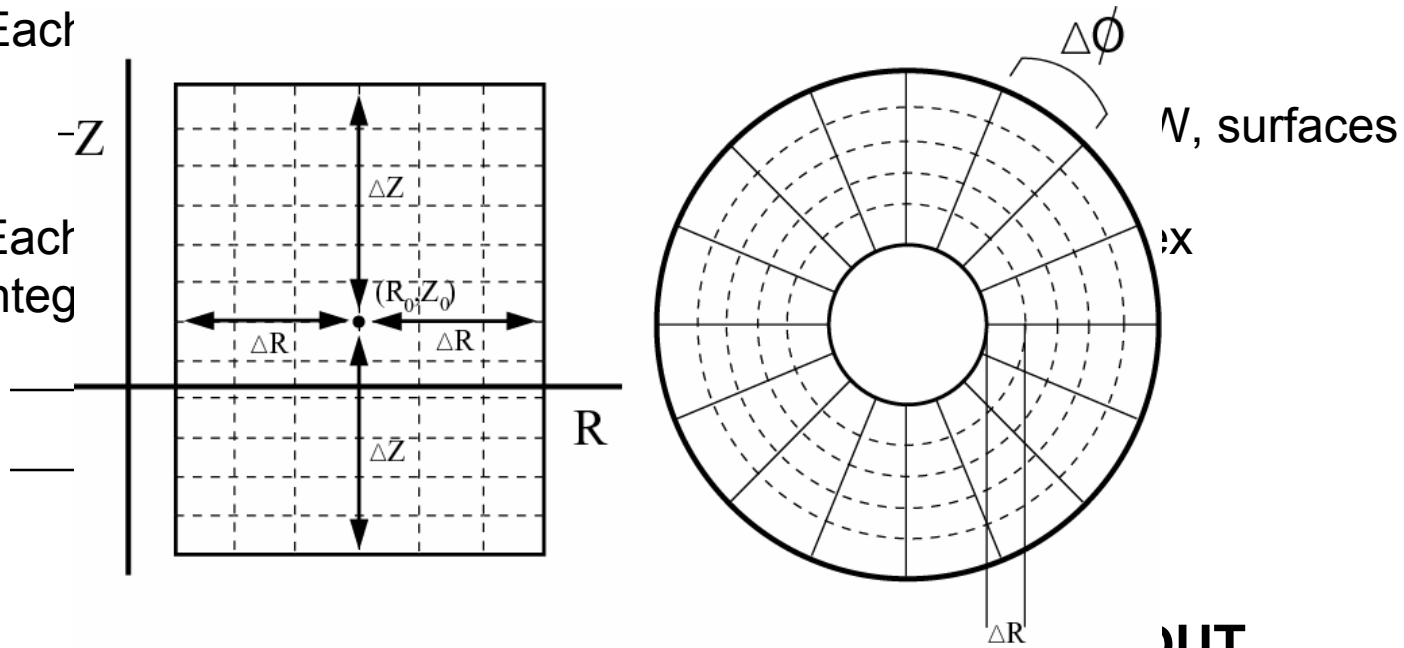
## GEOM

- Input PFC, FW, LCMS geometry → Tagged map of geometry

# The GEOM Code

- GEOM = GEOMETRIC Mapping
- Like MFBE, divides ROI into grid ( $N_\phi$ ,  $N_R$ ,  $N_z$ )
- Each

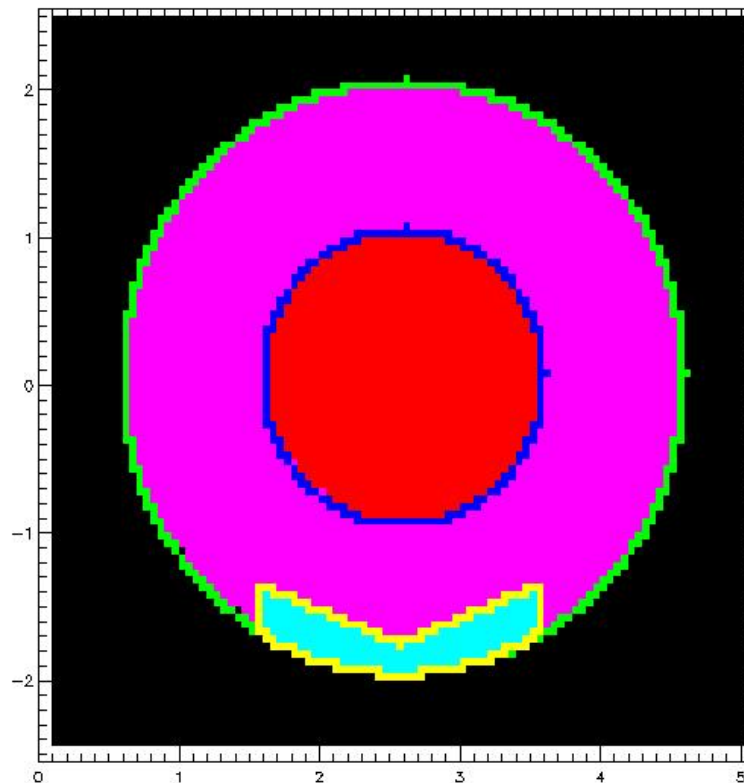
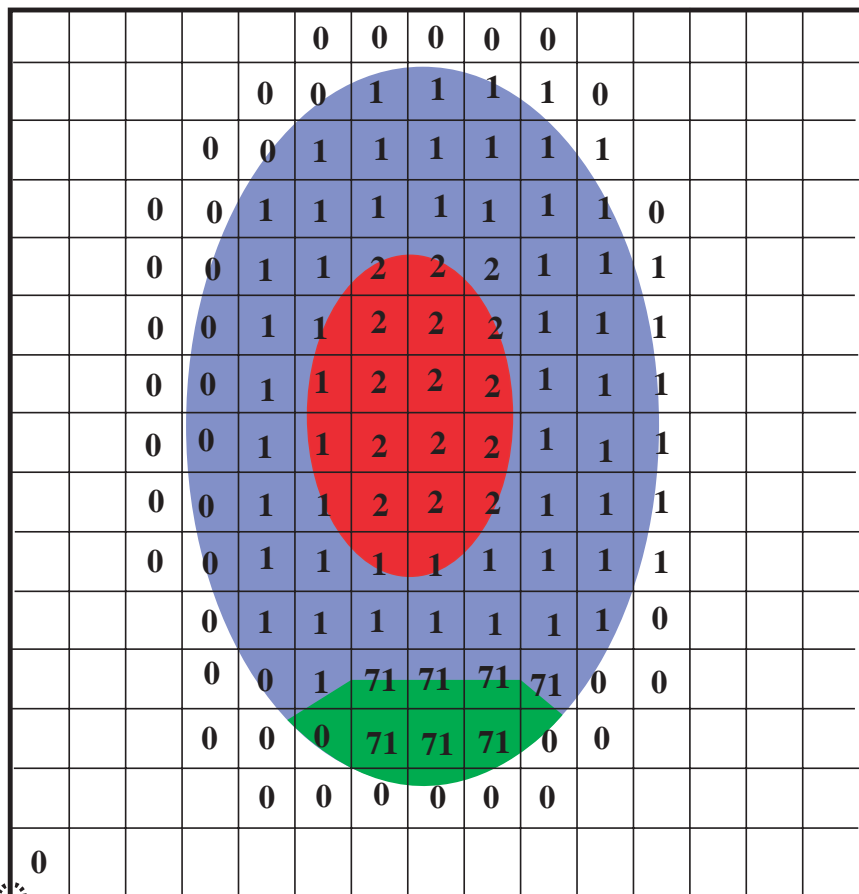
- Each integ



Geometry of PFCs, FW, LCMS

"Tagged" 3D array of geometry

# GEOM Conintued



# GEOM/GOURDON Interface



- GOURDON reads in GEOM tagged mapping
- Every integration step, it queries the tag cell
  - If appropriate tag, GOURDON does expensive location calculation
  - GEOM introduces no error
- Saves time, easy to track intersection with PFC/FW (even LCMS)
- Can be used to find intersection data for arbitrarily shaped surface.

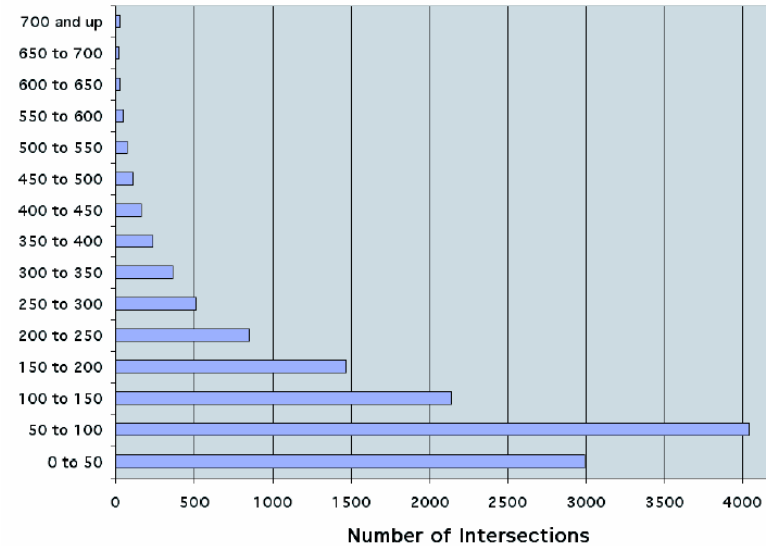
# GOURDON Output

- Current GOURDON traces fieldlines
- Use  $L_c$  to find approx. for heat flux

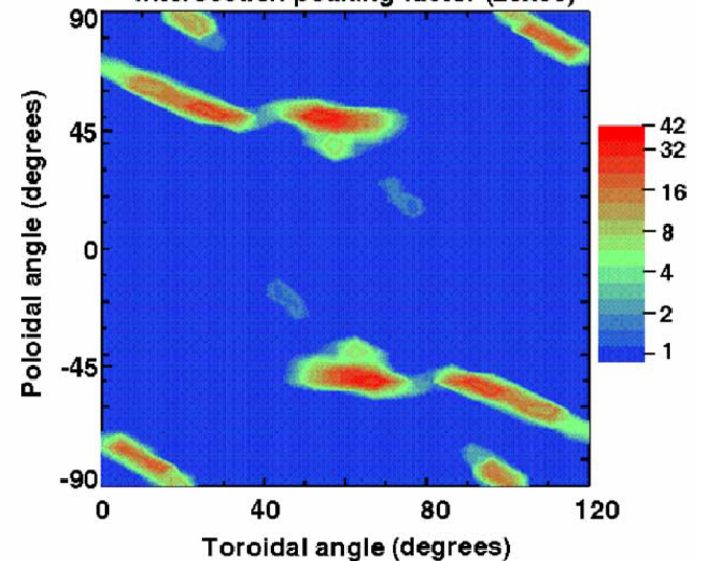
$$T_{et} \propto L_c^{-4/7}$$

- Heat Loads, Peaking factors, etc

Diffused Field-Line Length (m)



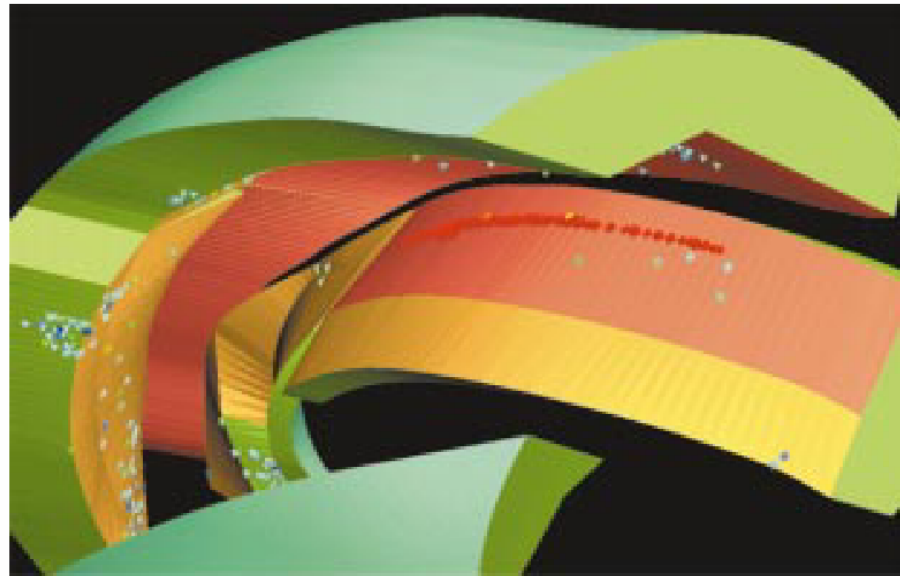
Intersection peaking-factor (25x50)



# Long Lc? Guiding centers...



- What if Lc is too long for analytic model?
- Trace guiding centers instead...
  - Directly find energy deposited by particles





# Conclusion



- New codes will be introduced to help in divertor design
  - GEOM: Simple geometry input, speeds up GOURDON
  - GOURDON: Parallelized, guiding centers
  - ORBIT3D: gyro-radius, GEOM?
- Need more advanced codes for final design?