NSTX

Supported by

U.S. DEPARTMENT OF ENERGY | Office of Science

College W&M
Colorado Sch Mines
Columbia U
Comp-X
General Atomics
INEL
Johns Hopkins U
LANL
LLNL
Lodestar
MIT
Nova Photonics
New York U
Old Dominion U
ORNL
PPPL
PSI
Princeton U
Purdue U
SNL
Think Tank, Inc.
UC Davis
UC Irvine
UCLA
UCSD
U Colorado
U Maryland
U Rochester
U Washington
U Wisconsin

RMP threshold of ELM modifications at different q_{95}

J.-K. Park[1], J. E. Menard[1], J.-W. Ahn[2], R. Maingi[2], J. M. Canik[2]

1) Princeton Plasma Physics Laboratory, USA

2) Oak Ridge National Laboratory, USA

NSTX Research Forum

December 1, 2009

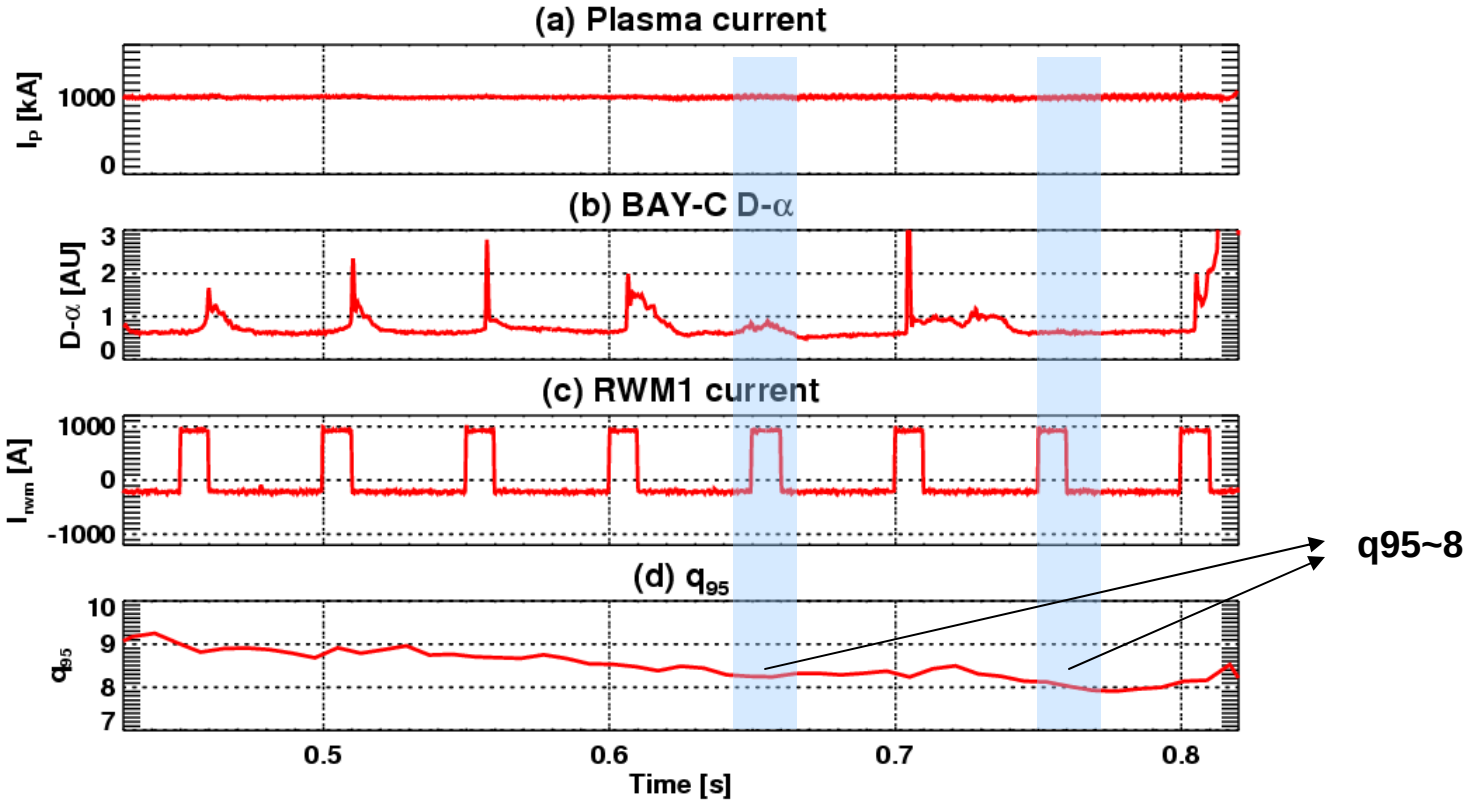
Culham Sci Ctr
U St. Andrews
York U
Chubu U
Fukui U
Hiroshima U
Hyogo U
Kyoto U
Kyushu U
Kyushu Tokai U
NIFS
Niigata U
U Tokyo
JAEA
Hebrew U
Ioffe Inst
RRC Kurchatov Inst
TRINITI
KBSI
KAIST
POSTECH
ASIPP
ENEA, Frascati
CEA, Cadarache
IPP, Jülich
IPP, Garching
ASCR, Czech Rep
U Quebec

RMP works differently in devices

- RMP can stabilize ELMs in DIII-D, but can trigger ELMs in NSTX
- NSTX RMP does not meet DIII-D conditions for ELM suppression
  - Vacuum Chirikov is much larger than 1 at sqrt(ψ_N)=0.914
  - Pitch-alignment is not satisfied
  - Spectra is mostly non-resonant
- ELM triggering conditions are also required for extrapolation
  - RMP thresholds to trigger ELMs?
  - q_{95} window?
  - Corresponding pitch or non-resonance conditions?

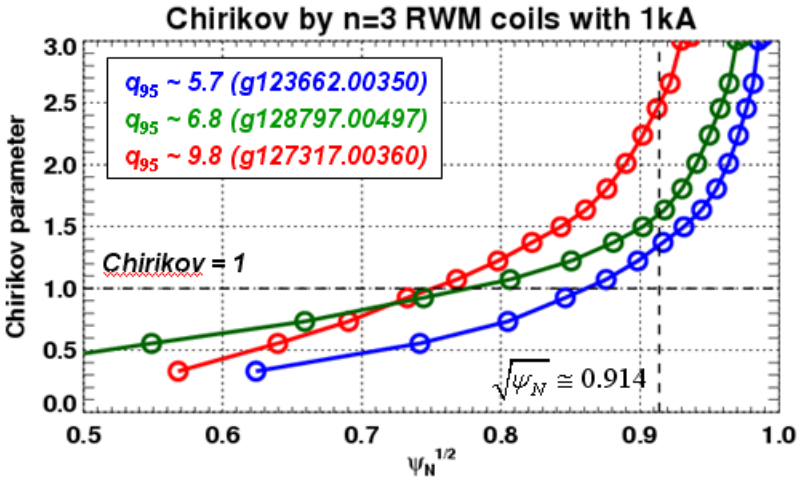
RMP threshold may change depending on q_{95}

- RMP threshold ~ 900A has been observed at q_{95}~9 (XP809)
- ELM frequency increases along with RMP strength, above the threshold
- RMP threshold may change as a function of q_{95}

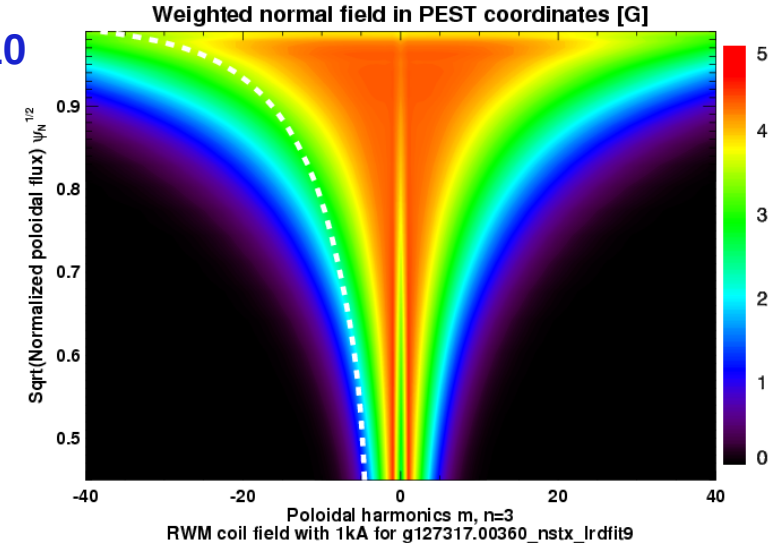


RMP functions may change depending on q_{95}

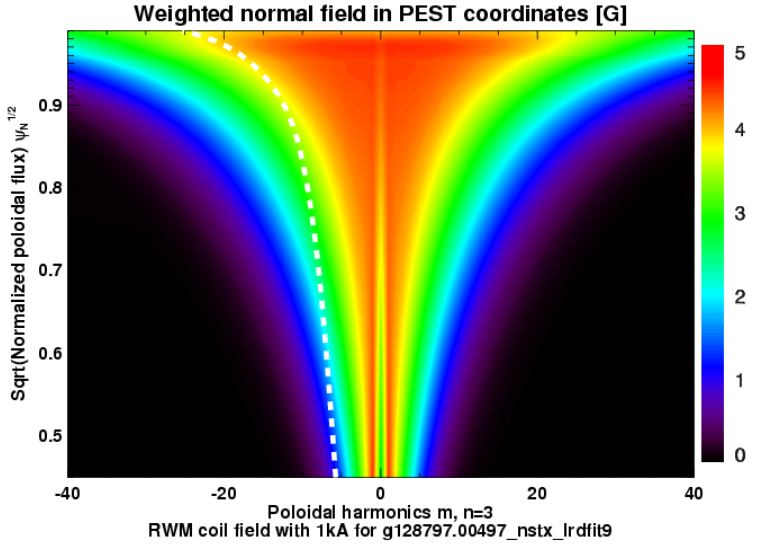
- RMP characteristics change largely along with q95
- RMP at lower q95 approaches to ELM suppression conditions
  - Chirikov profiles become milder
  - Non-resonant components become smaller



q_{95}~10

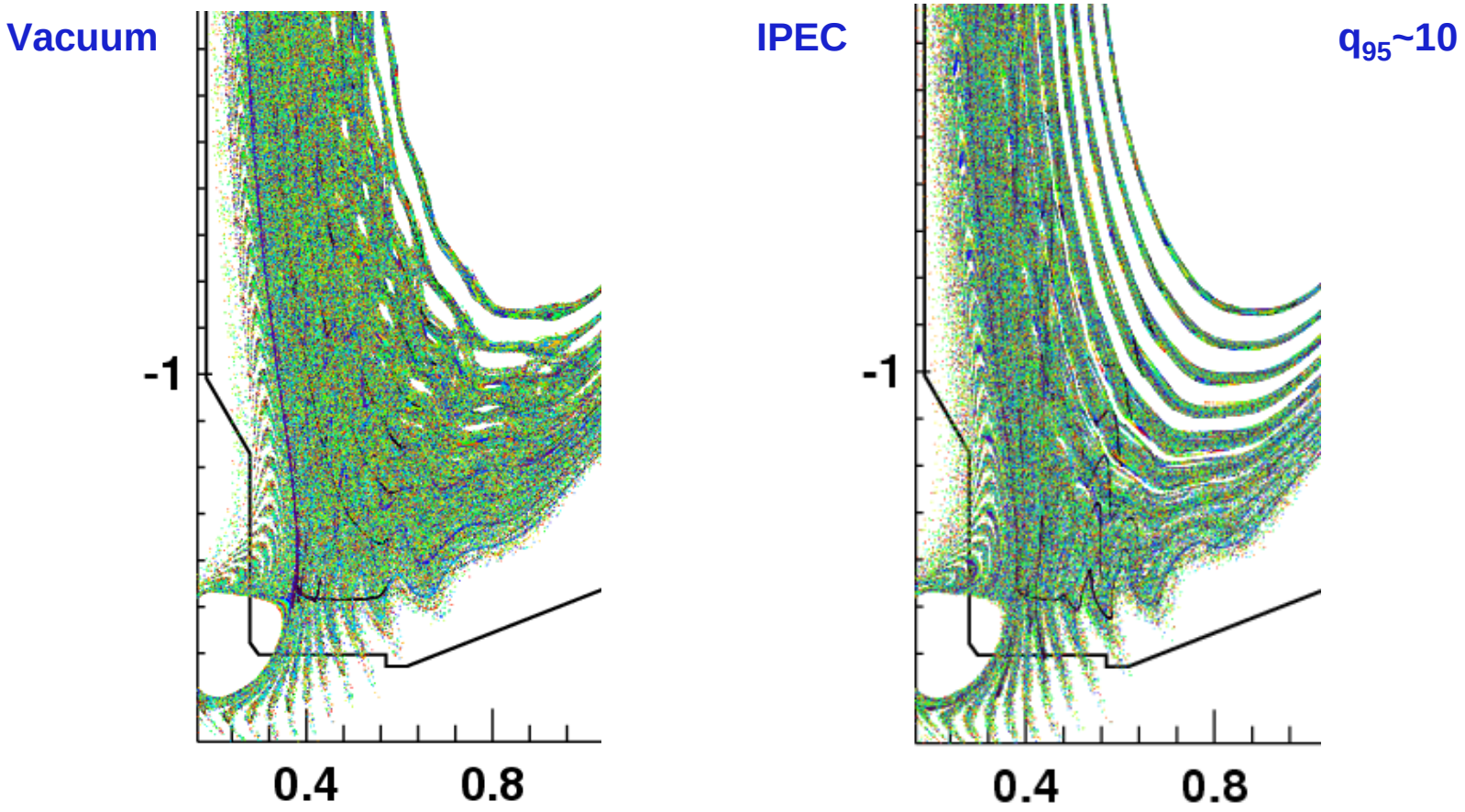


q_{95}~6



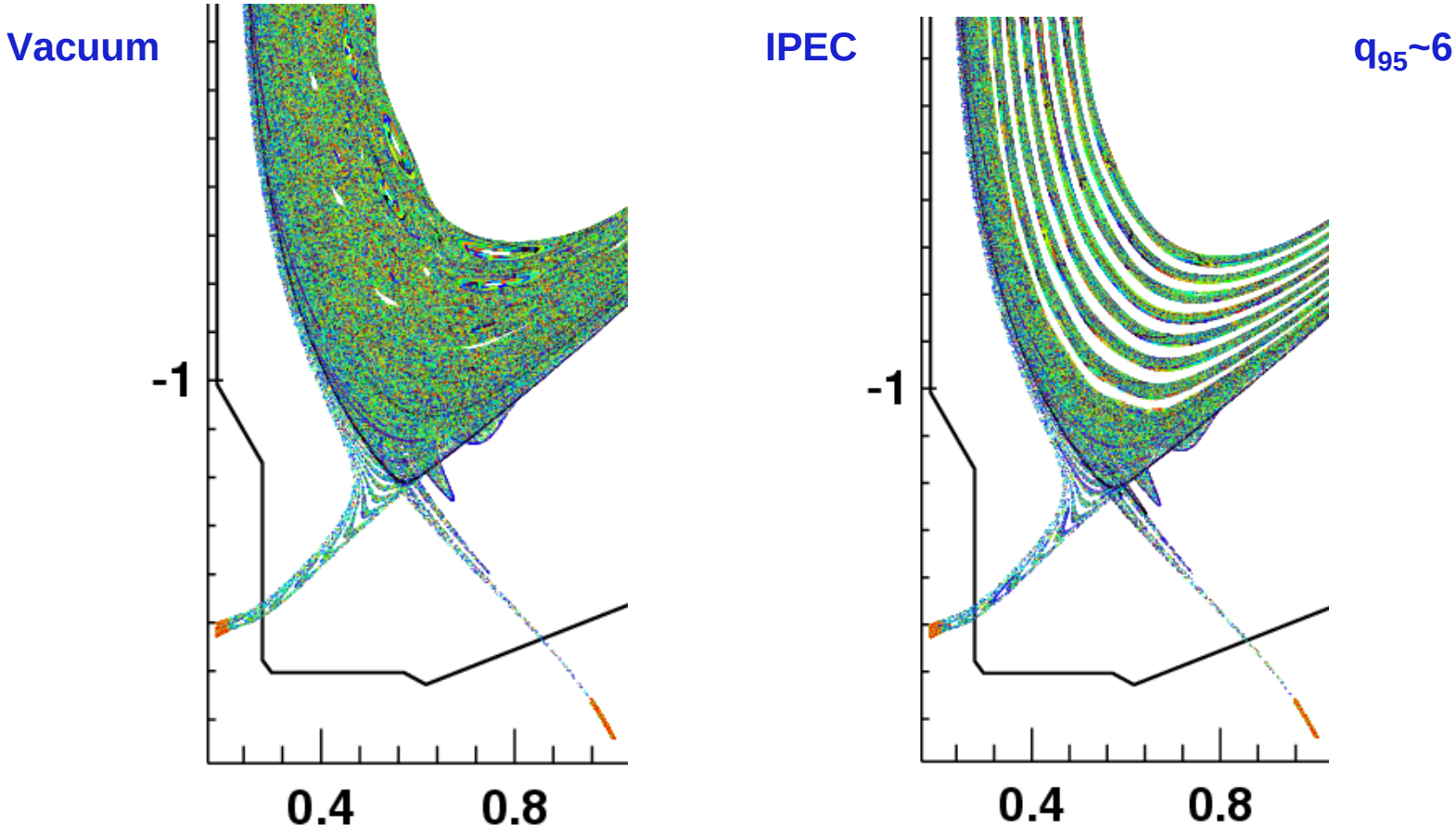
Divertor particle or heat flux patterns are found in both experiment and theory

- Many peaks of lobe structures are found from measurements and also field-line tracing calculations **[*J.W.Ahn, J. M. Canik*]**



Divertor particle or heat flux patterns depending on q95 can be obtained through XP

- Strike point spitting is very different depending on q_{95}



Shot plan (0.5 day)

- Investigate RMP threshold for ELM triggering vs. q_{95}
  - Ramp up n=3 RMPs for q_{95}~11, 9, 7 and investigate ELM triggering characteristics
  - Use n=3 RMP on-offs to evolving plasmas where q_{95} is decreased from q_{95}~11, 9, 7
  - Investigate any reliable q_{95} window of ELM triggering
  - Investigate particle and heat fluxes vs. q_{95}

- Try RMP for ELM suppression to q_{95}~6 ELMy plasmas
  - Revise and complete XP818
  - Try this only if target is available and reproducible
  - Try this only if low q_{95} threshold for ELM triggering exists