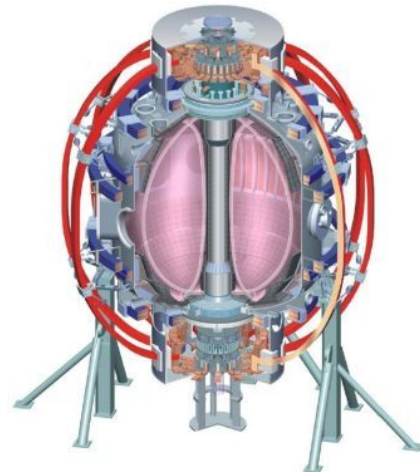


Field Line Angles In the NSTX-U Divertor

SPG

Simple Comments on $q_{||}$ and Field Line Angles in the NSTX Upgrade Divertor

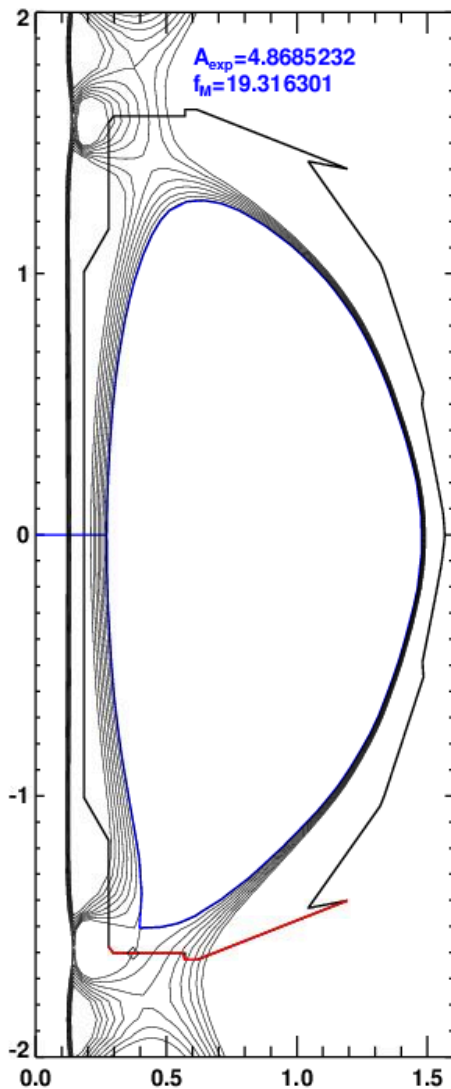
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CompX
General Atomics
FIU
INL
Johns Hopkins U
LANL
LLNL
Lodestar
MIT
Nova Photonics
New York U
ORNL
PPPL
Princeton U
Purdue U
SNL
Think Tank, Inc.
UC Davis
UC Irvine
UCLA
UCSD
U Colorado
U Illinois
U Maryland
U Rochester
U Washington
U Wisconsin*



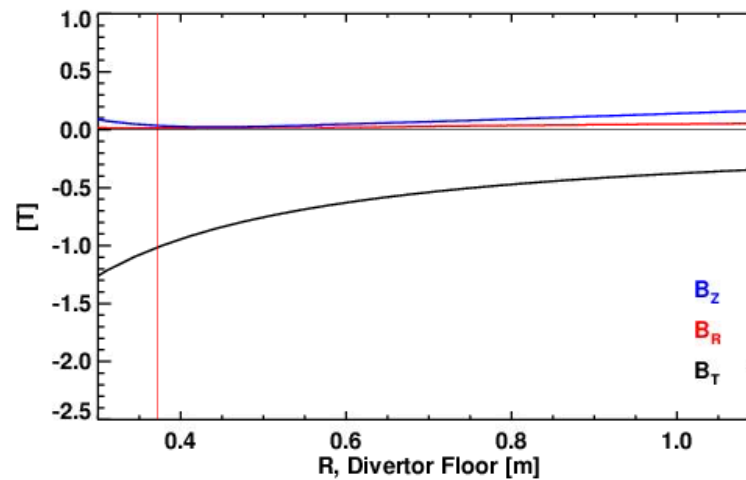
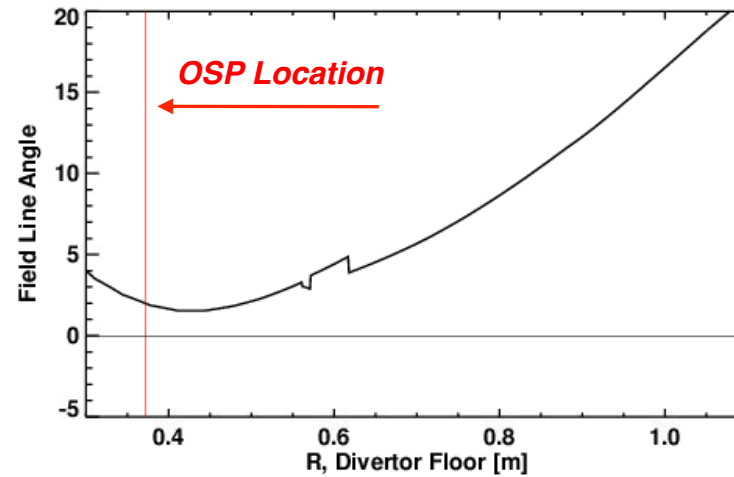
*Culham Sci Ctr
U St. Andrews
York U
Chubu U
Fukui U
Hiroshima U
Hyogo U
Kyoto U
Kyushu U
Kyushu Tokai U
NIFS
Niigata U
U Tokyo
JAEA
Hebrew U
Ioffe Inst
RRC Kurchatov Inst
TRINITI
NFRI
KAIST
POSTECH
ASIPP
ENEA, Frascati
CEA, Cadarache
IPP, Jülich
IPP, Garching
ASCR, Czech Rep*

NSTX Example: 1.2 MA LSN Shot (I)

This is a well analyzed discharge (next slide)...



/p/nstxsdev/NSTXU/EquilibriumStudies/ISOLVERgFiles/DivertorStudies/g128797.00599.EFIT02.mds.uncorrected.qscale_1.00000



NSTX Example: 1.2 MA LSN Shot (II)

is proportional to the safety factor). To the lowest order, this provided a quantitative explanation for the q_{pk} dependence on P_{SOL} and a qualitative explanation for the I_p trend. Because of $q_{||} = P_{SOL}/A_{\perp} = P_{SOL}/(4\pi R(B_p/B_{tot})\lambda_q)$, the discharges with $I_p = 1.0\text{--}1.2\text{ MA}$ and $P_{NBI} = 6\text{ MW}$ result in the highest SOL parallel heat flux, estimated to be $q_{||} \simeq 50\text{--}80\text{ MW m}^{-2}$. The radiative divertor technique employed

*Soukhanovskii, et al,
NF 49*

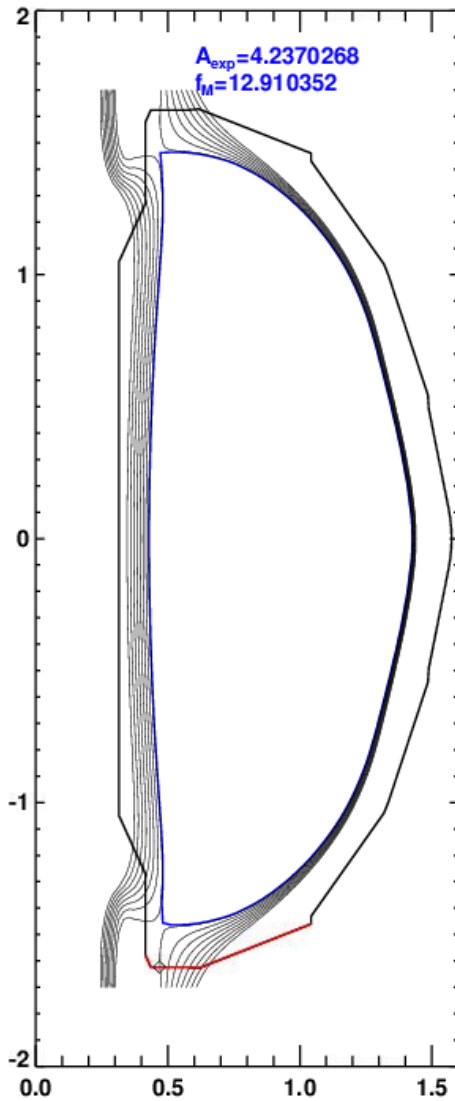
For NSTX, ~3 degree field line and 4-6 MW/m², the inferred $q_{||}$ is ~5/sin(3 π /180)~90 MW/m², consistent with above number.*

Note: Some recent shots (at 6 MW input power and higher current) have $q_{||}$ ~150-200 MW/m² (R. Maingi...)

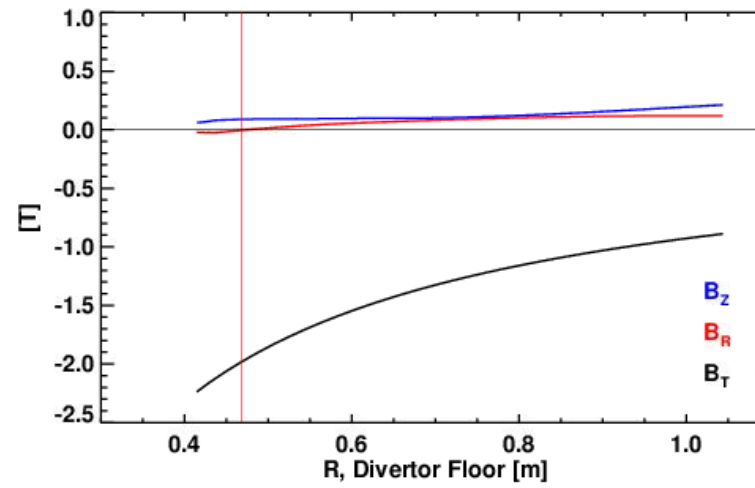
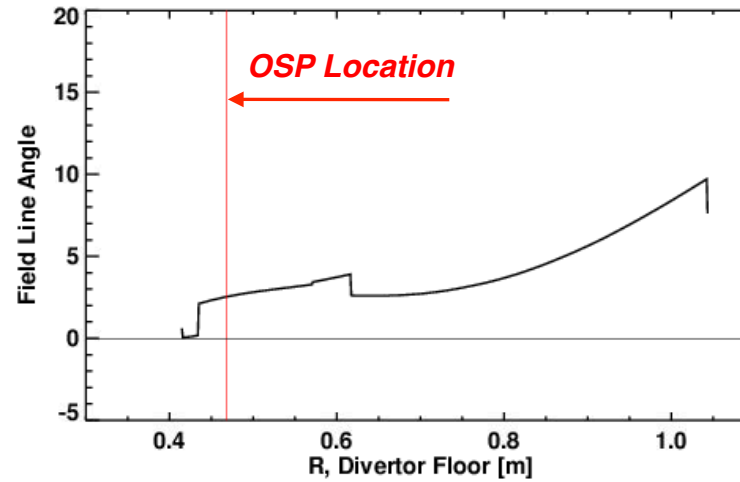
Use DN to cancel the doubling of input power; if other physics does not come into play, then $q_{||}$ ~150-200 MW/m² (or more?) may be anticipated.

Note: this is strongly influenced by SOL perpendicular transport, which is I_p dependent and not well understood. Also divertor radiation. Need more analysis to get this all correct.

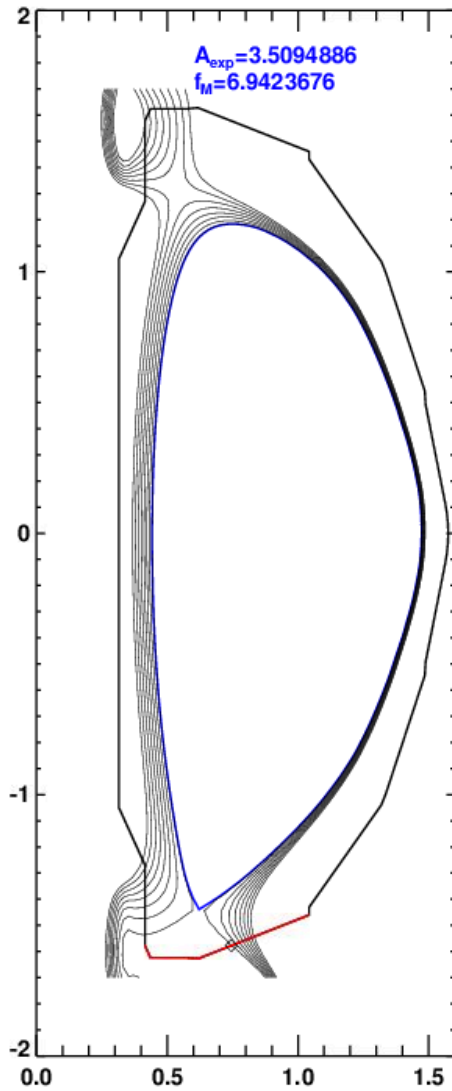
NSTX-U Example 1: Standard DN, 15 cm outer gap



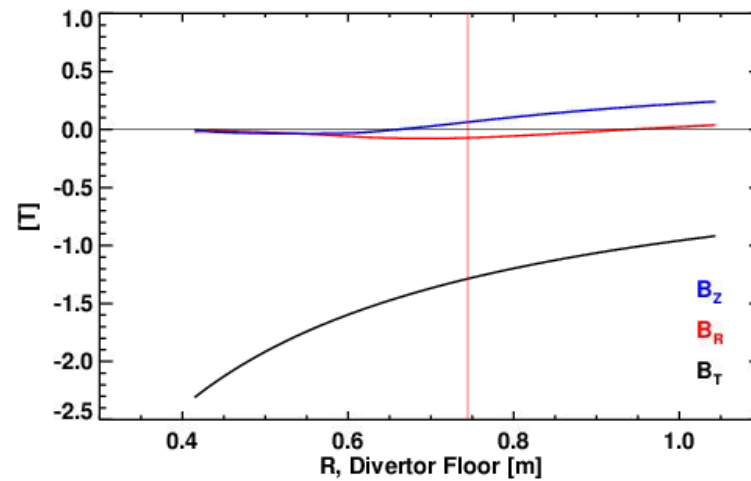
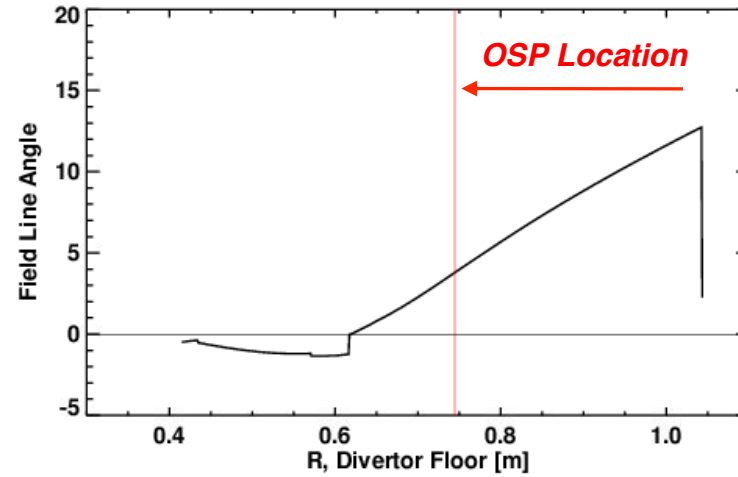
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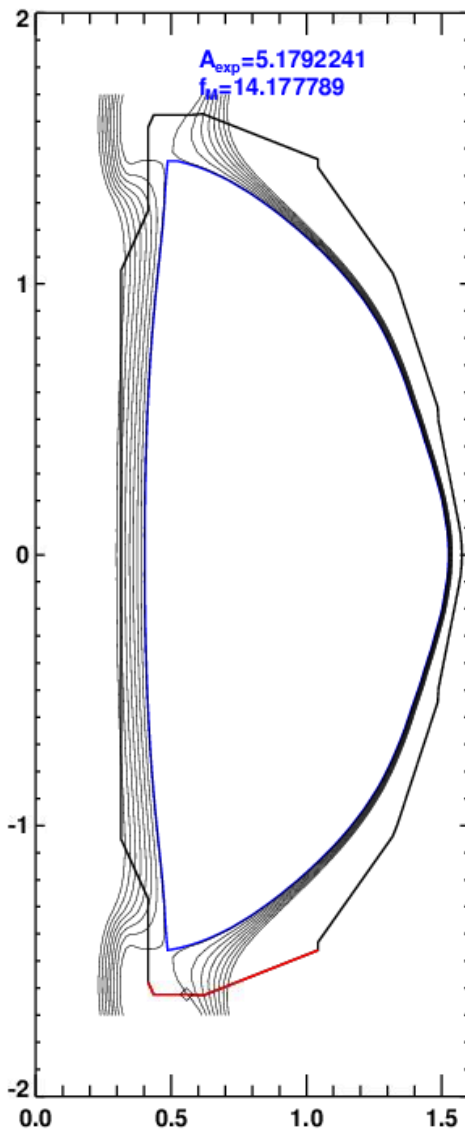
NSTX-U Example 2: LSN Divertor Configuration



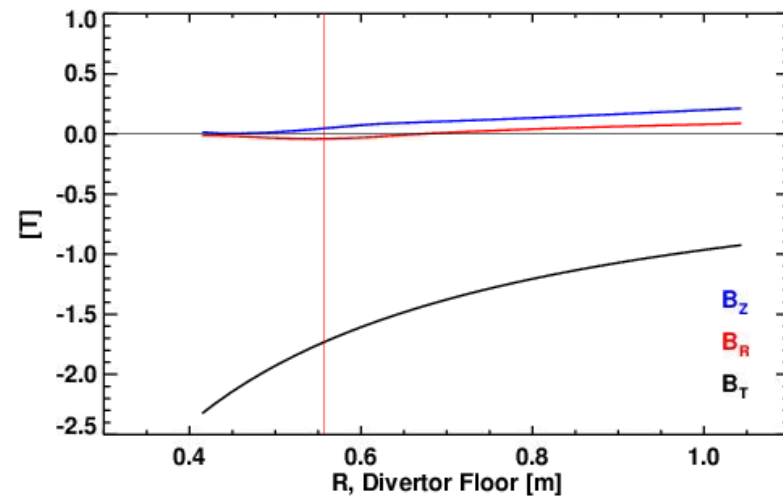
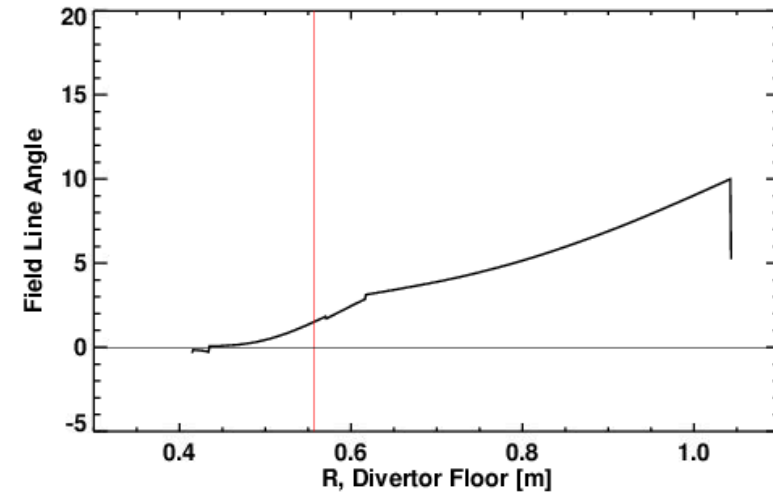
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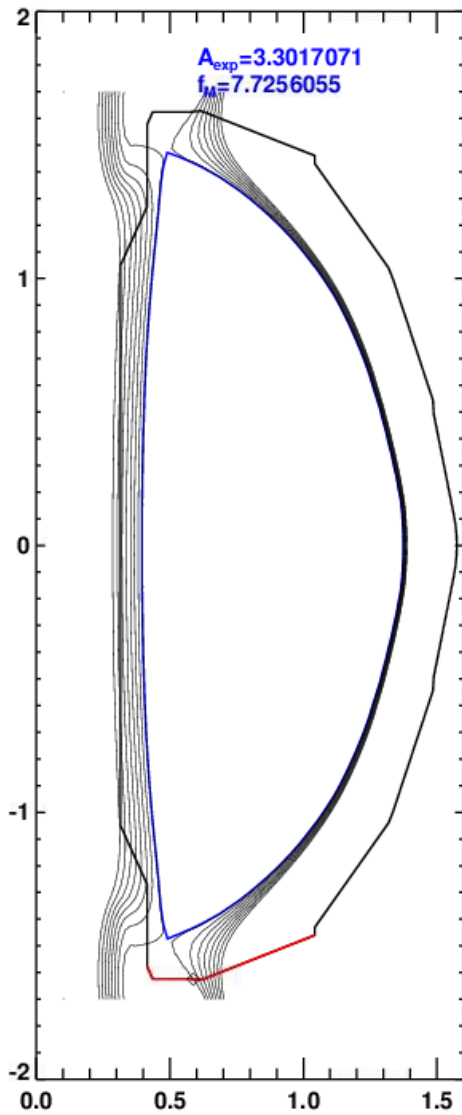
NSTX-U Example 3: DN With Small Outer Gap



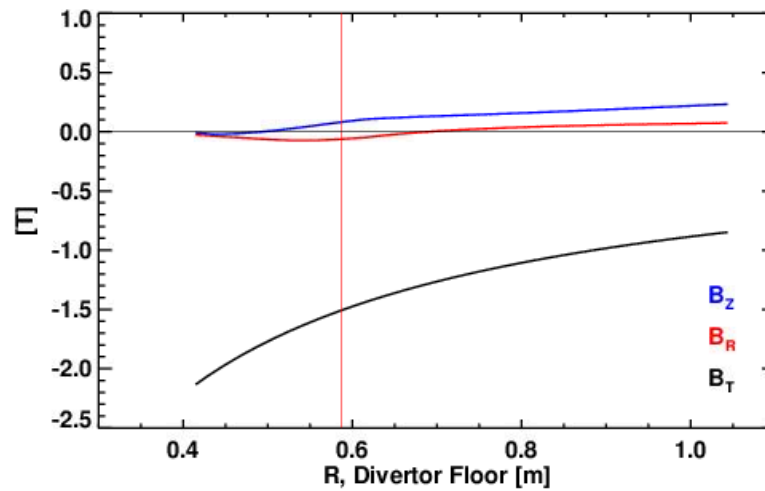
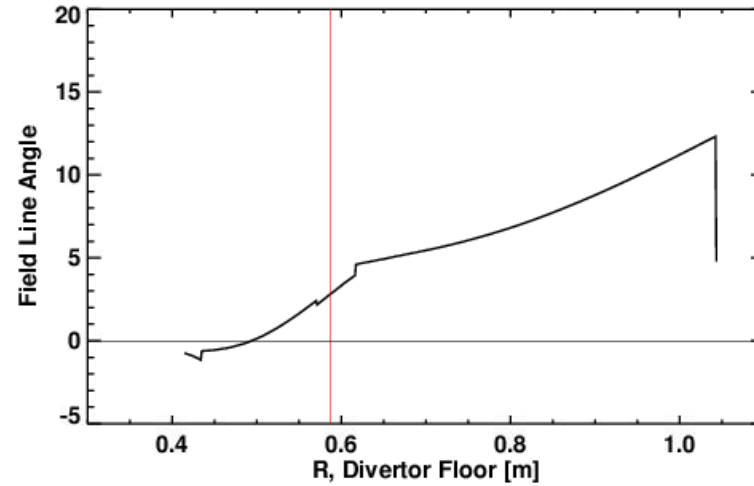
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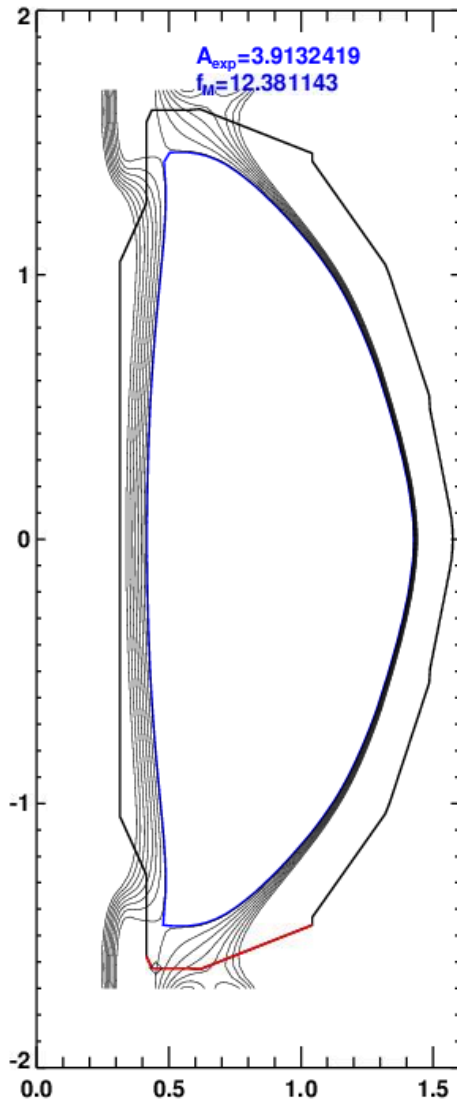
NSTX-U Example 4: DN With Large Outer Gap



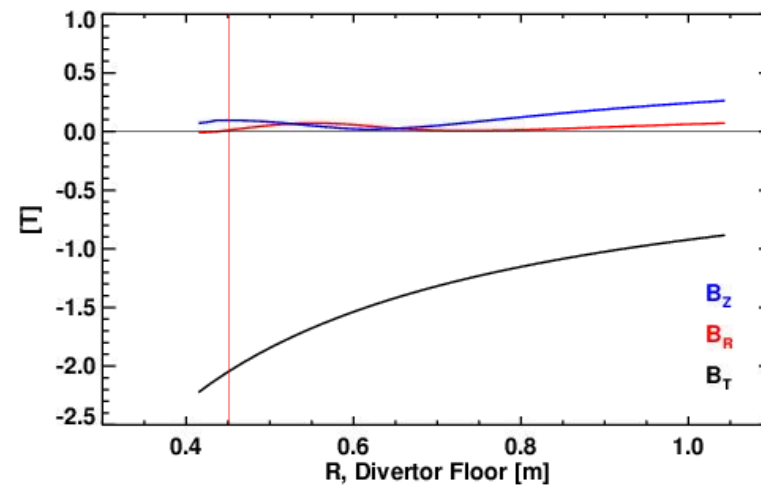
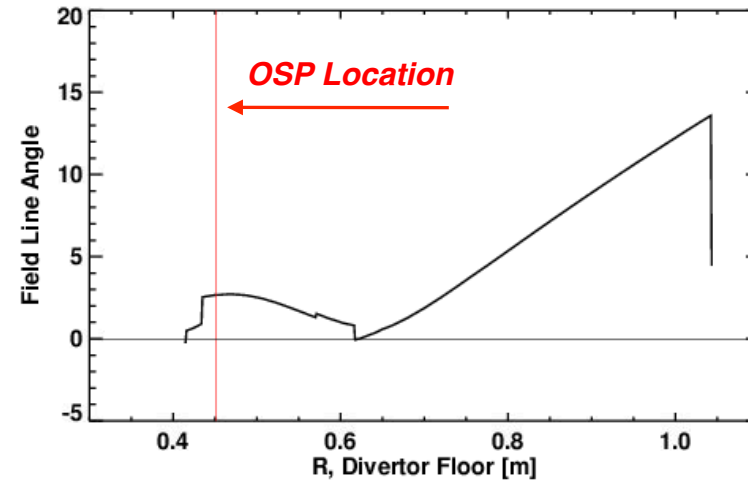
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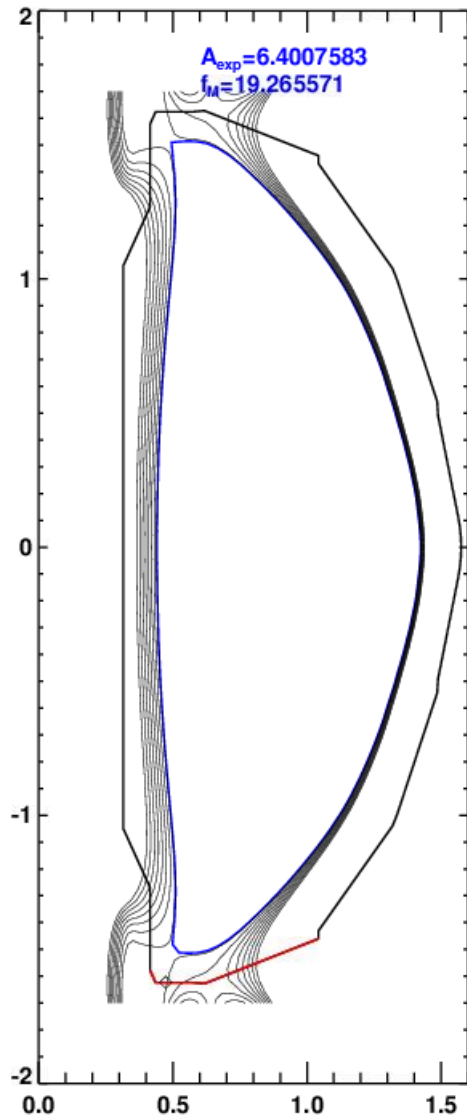
NSTX-U Example 5: Snowflake With X-point Beneath the Divertor Floor, Elongation of 2.9



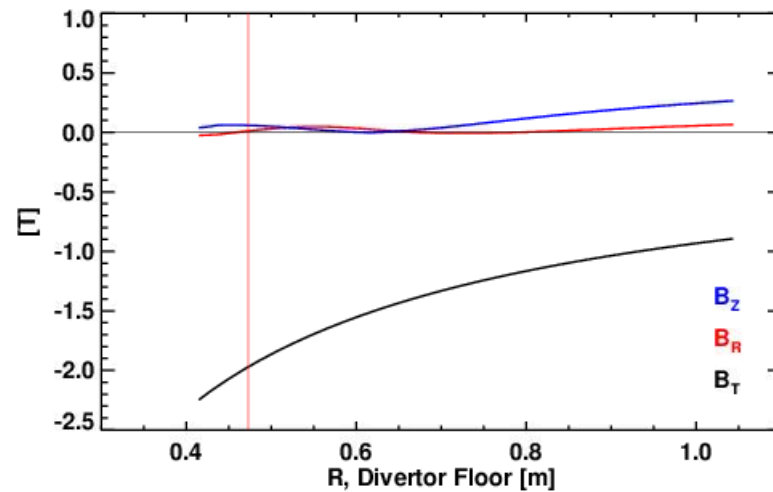
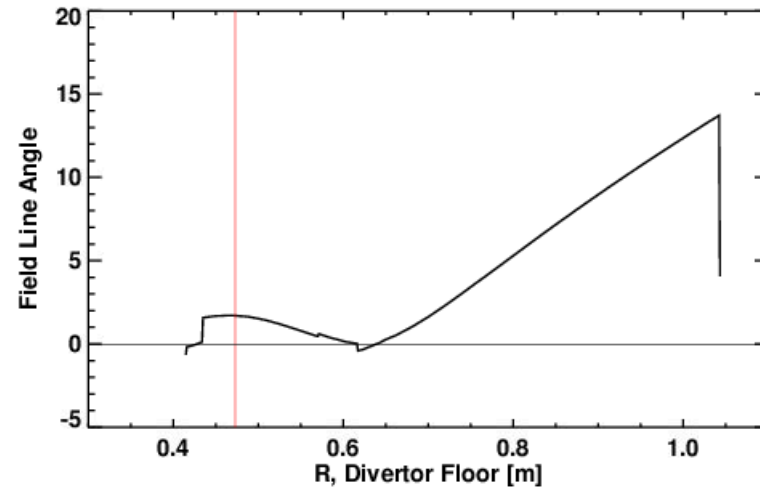
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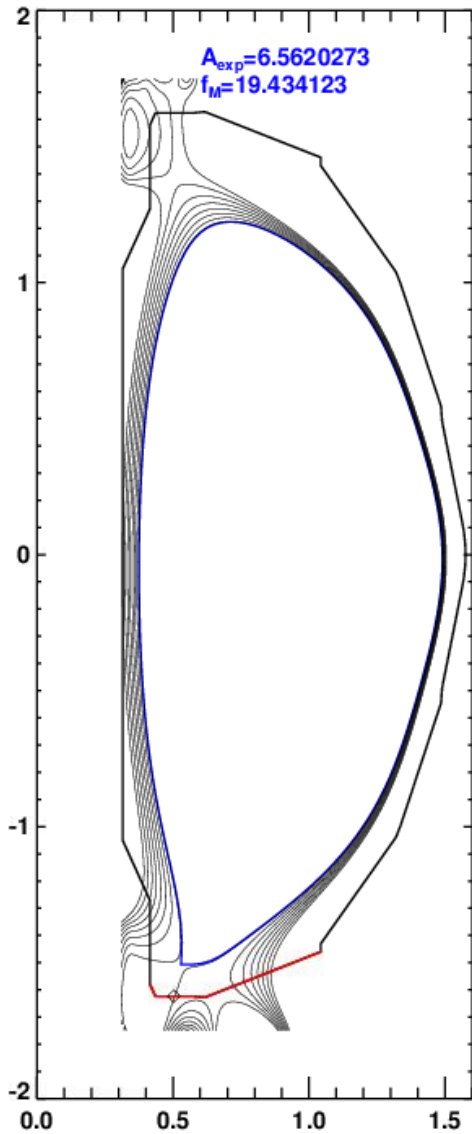
NSTX-U Example 6: Snowflake With X-point Beneath the Divertor Floor, Elongation of 3.1



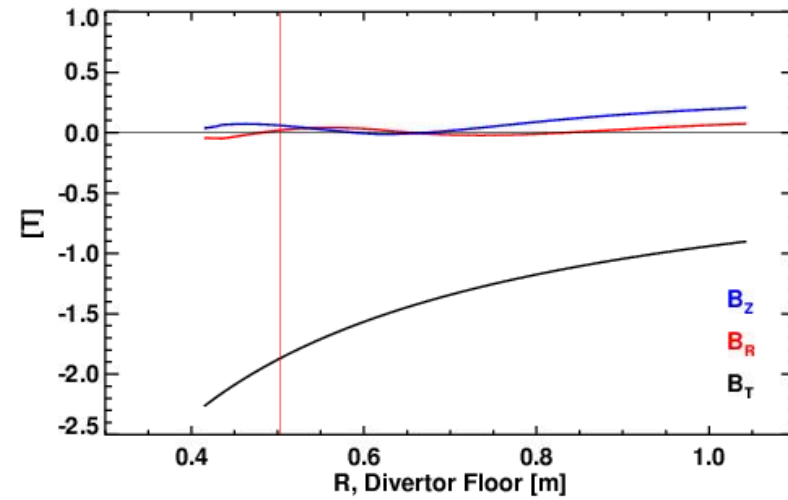
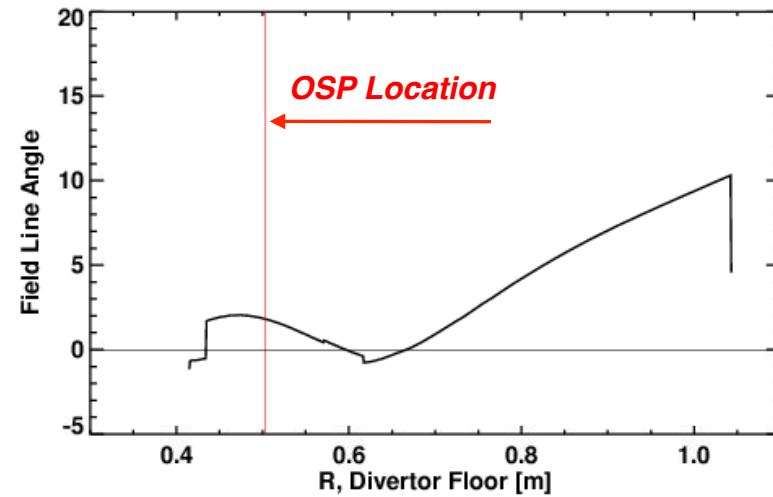
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NSTX-U Example 7: SFD at the Bottom Only (From JEM)

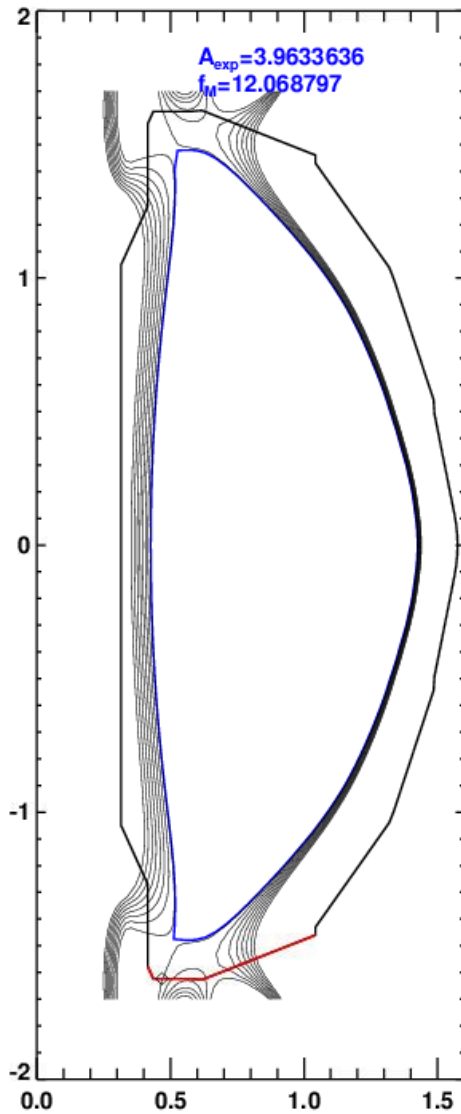


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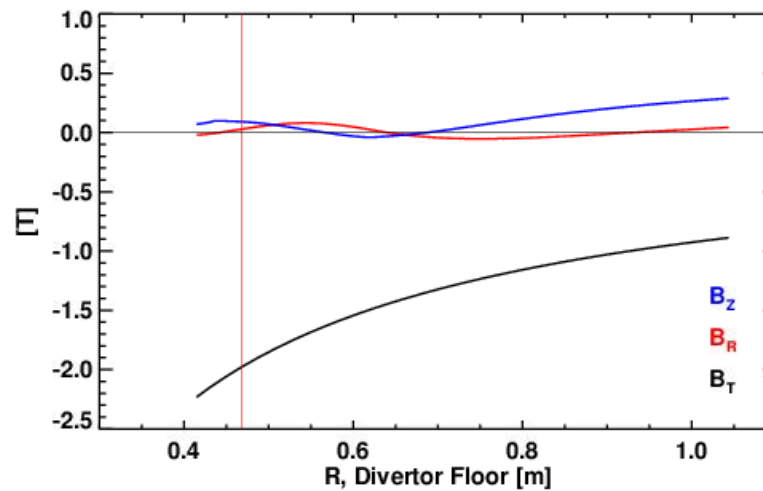
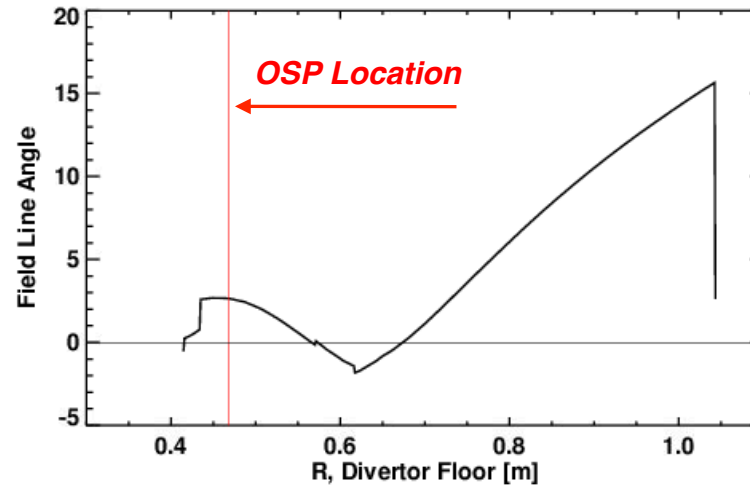


Other NSTX-U Divertors (Backup!)

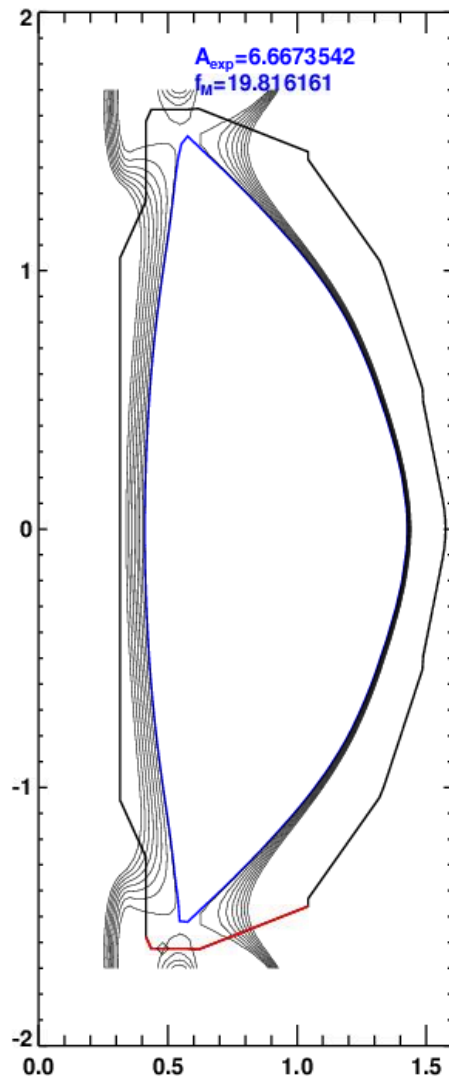
Snowflake Plus Divertor with X-Point Just Above Divertor Floor Pushing with PF-1C Leads to Angle Changing Sign



/p/nstxsdev/NSTXU/EquilibriumStudies/ISOLVERgFiles/DivertorStudies/
NSTXU_135111_600_-6_10.0kG_A1.86_kappa2.95_SFD



Snowflake Minus Also Shows Angle Reversal



/p/nstxsdev/NSTXU/EquilibriumStudies/ISOLVERgFiles/DivertorStudies/
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