POSTERS PRESENTED AT THE 1984 LONDON IAEA MEETING

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Plasma Studies

University of Wisconsin

IAEA-CN-44/A-VI-2

EFFECTS OF q AND HIGH BETA ON TOKAMAK STABILITY

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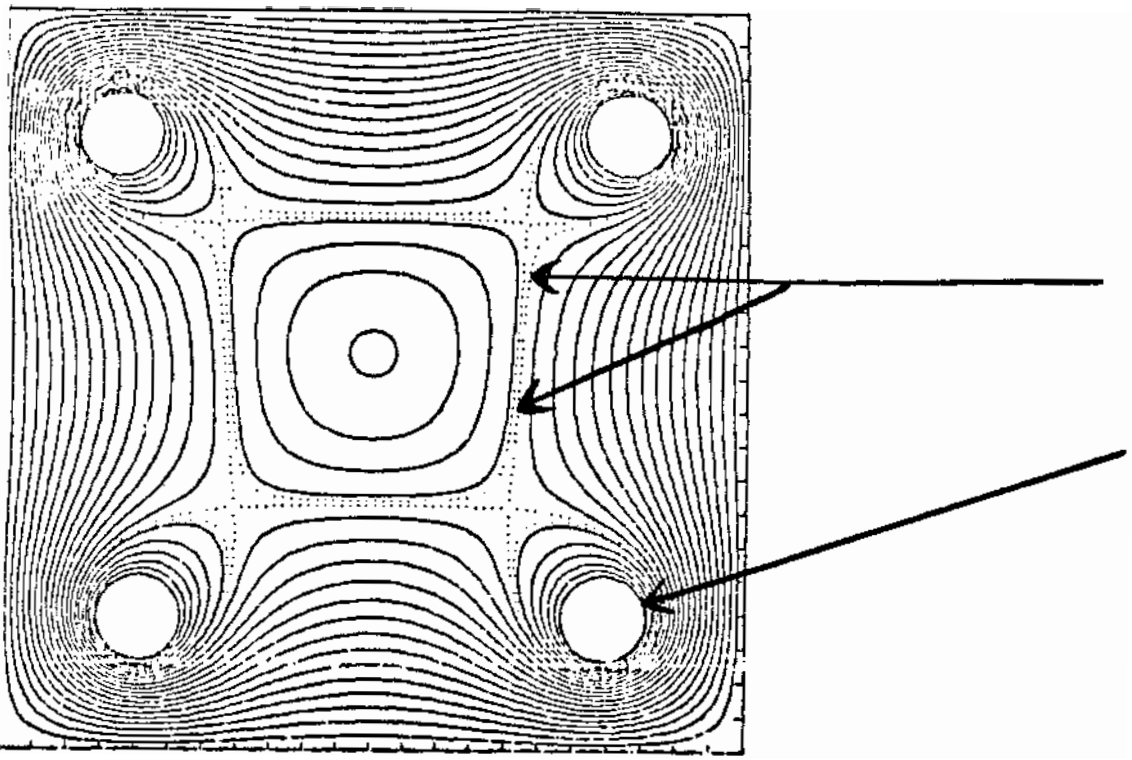
J.C. Sprott and E. Uchimoto

(Combined with Columbia University)

Stability of a Poloidal Divertor Tokamak in Various q - Regimes



PURPOSE :

1. STABILITY VS. q ($0.4 < q < 3$)

2. ROLE OF SEPARATRIX BOUNDARY :

   -ELIMINATES MATERIAL LIMITER

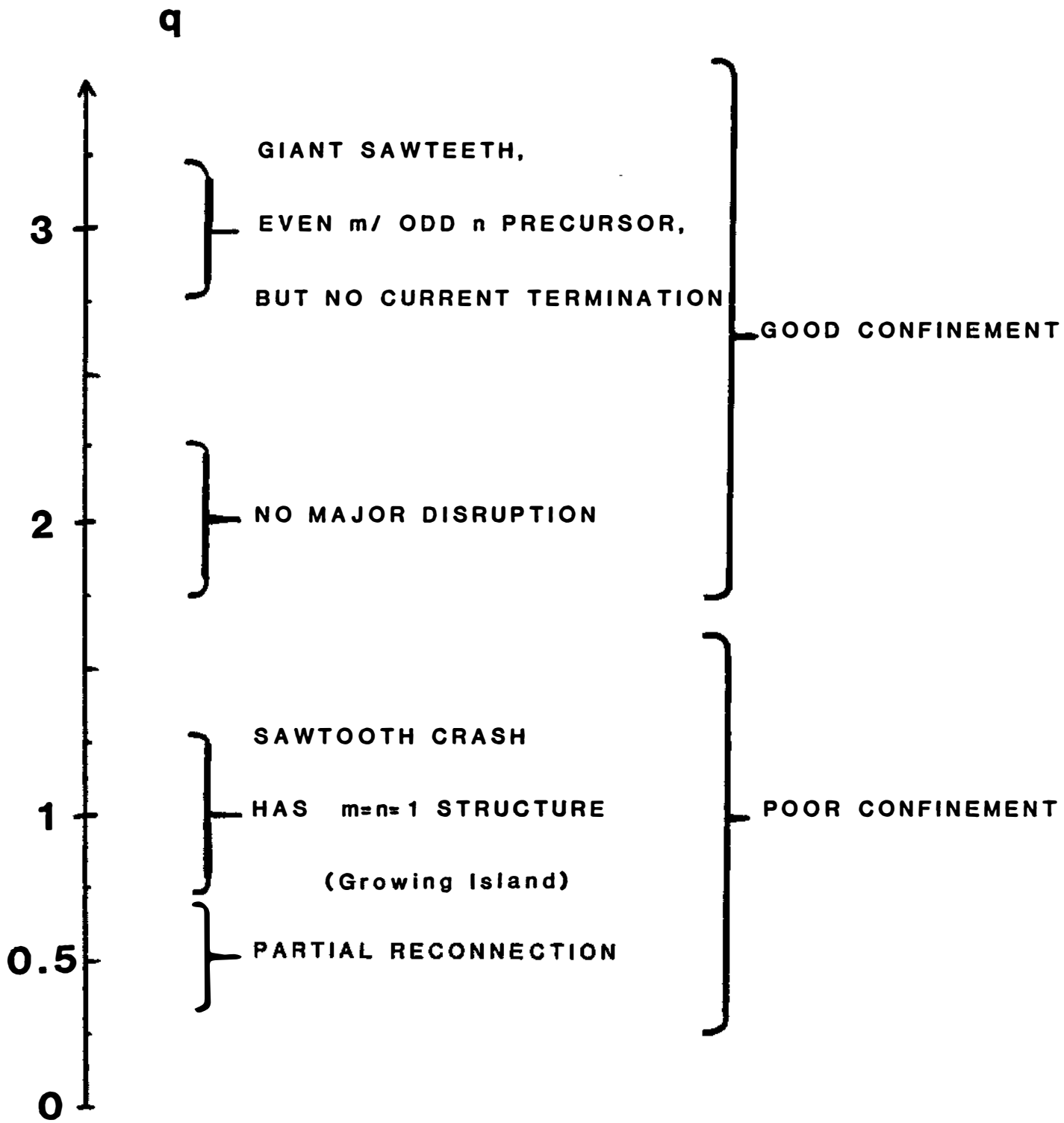
   -AFFECTS MAGNETIC ISLAND GROWTH

   -ALLOWS CONDUCTING PLASMA IN SCRAPE-OFF REGION

   -RIGIDLY POSITIONS PLASMA

   -ALLOWS FLATTER CURRENT PROFILES

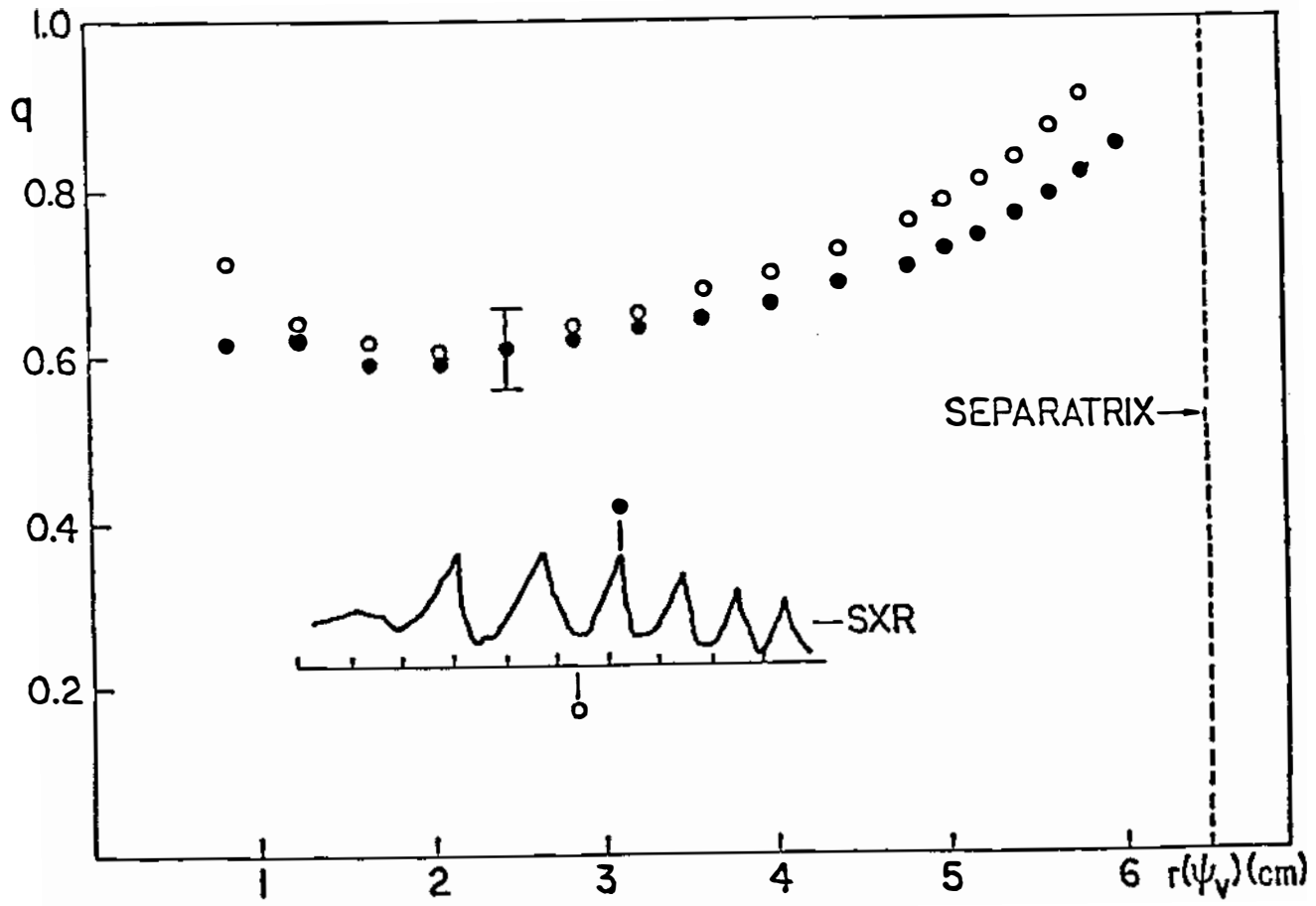
KEY FEATURES :



q<1 PLASMAS

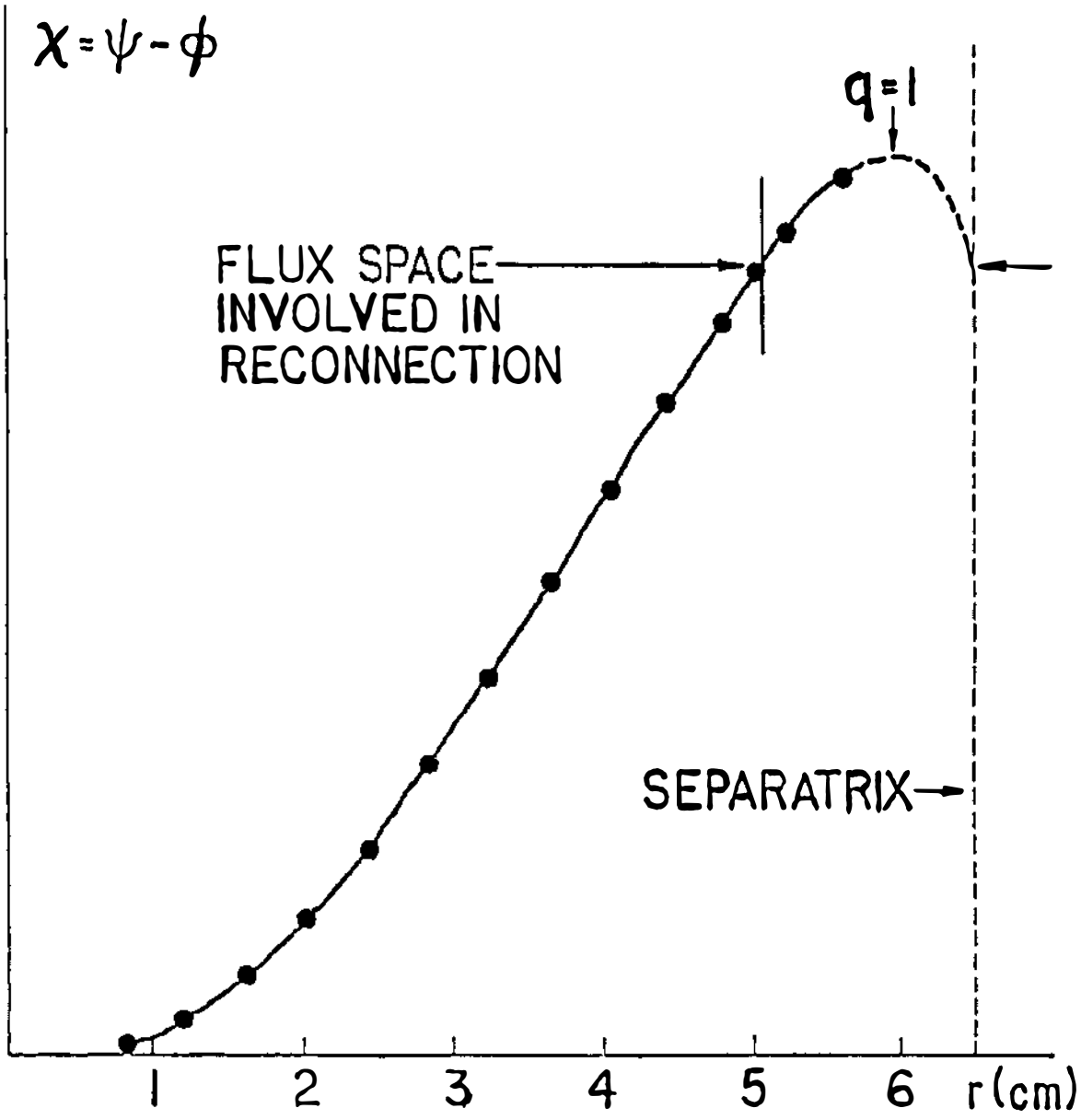
q AT THE EDGE (NEAR q=1)

FLUCTUATES DURING SAWTOOTH PERIOD



IMPLIES PARTIAL RECONNECTION

HELICAL FLUX FUNCTION



Nonlinear Resistive MHD Code Results

(HIB code, Princeton ; W. Park, R. Izzo, D. Monticello)

PURPOSE:

Study magnetic island growth in

poloidal divertor configuration

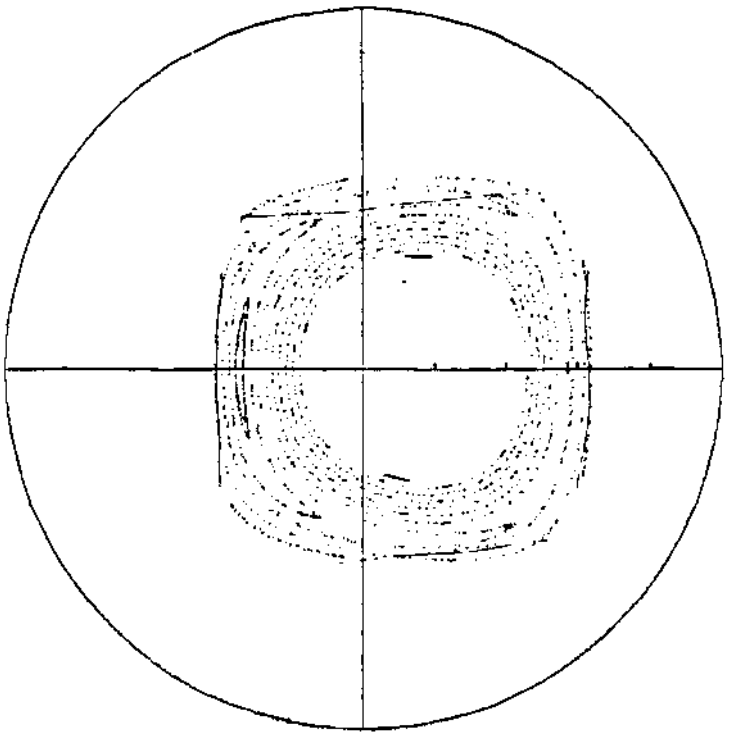
RESTRICTIONS OF EQUILIBRIUM INPUT:

1. **$j \to 0$ outside separatrix**

2. **circular conducting boundary**

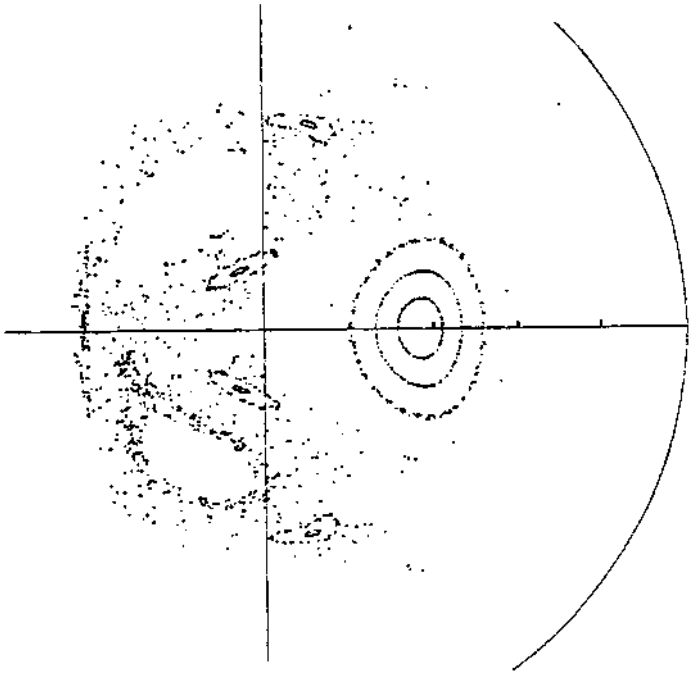
$t = 10\ T_A$

Small island at edge does not greatly change q at the center.



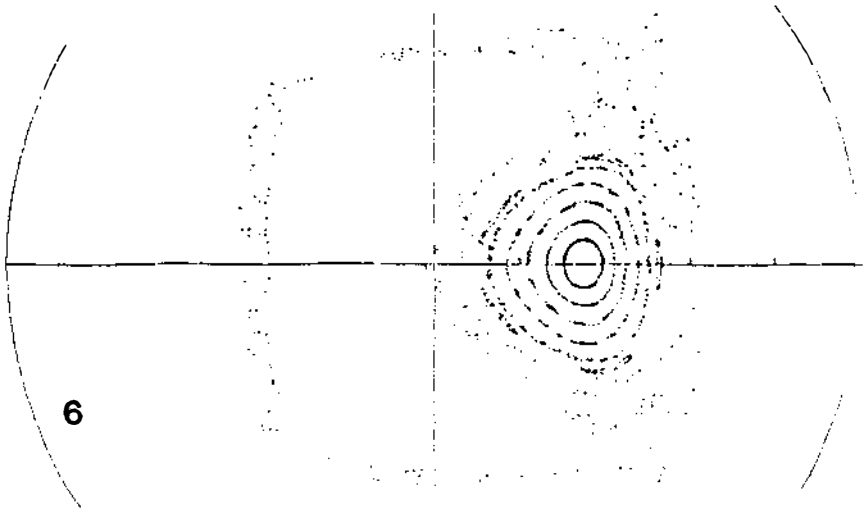
$t = 30\ T_A$

Ergodicity develops (approximately on island contact with separatrix)



$t = 130\ T_A$

Large island structure raises $q \gtrsim 1$ everywhere

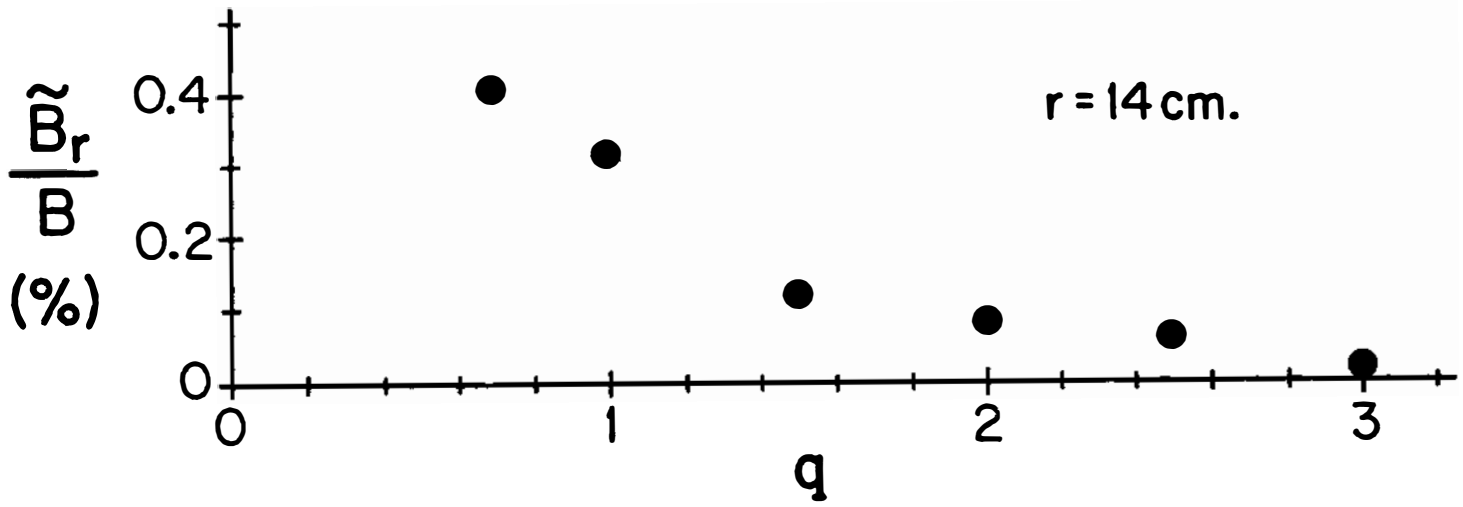


$q < 1$ PLASMAS

Plasmas are Mercier stable.

Confinement is poor ($\tau_E \sim 50\,\mu S$)

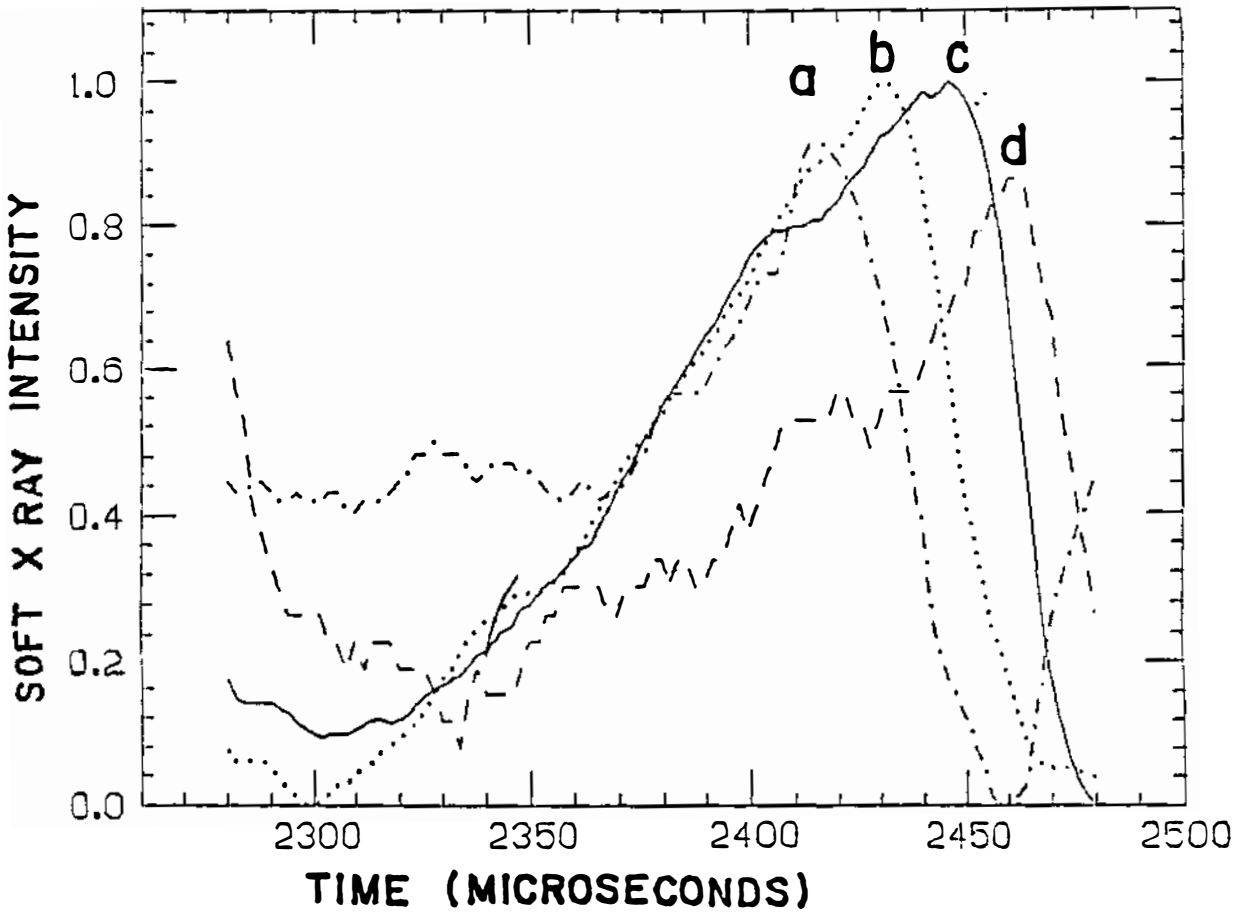
Magnetic fluctuations are large.



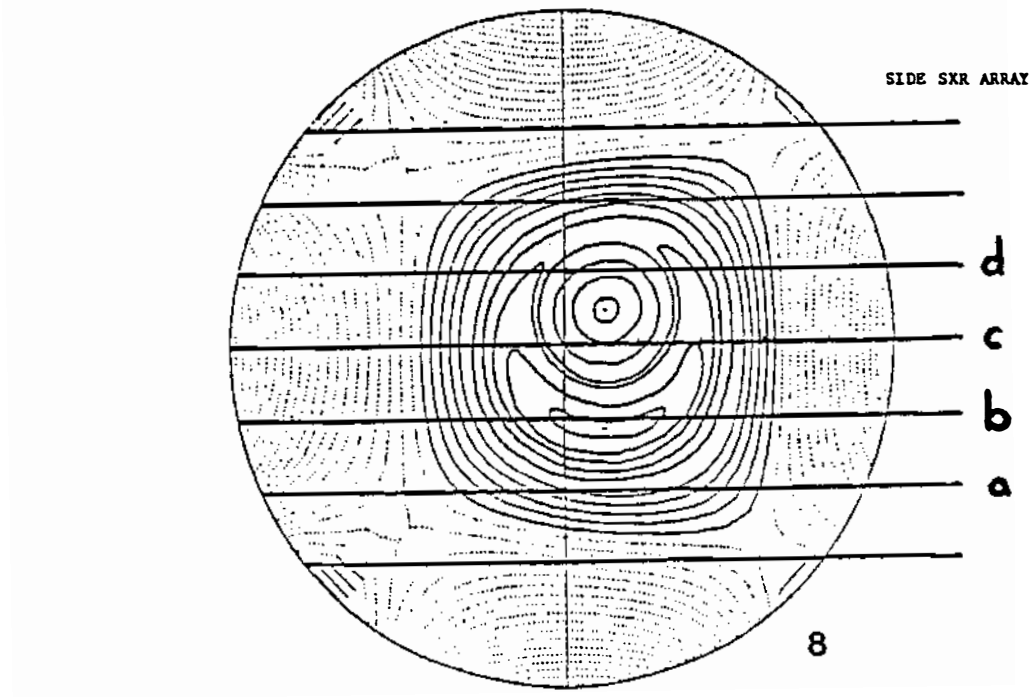
q ~ 1 PLASMAS

SXR SAWTOOTH CRASH HAS VERTICAL TIME DELAY.

(NOT AXISYMMETRIC)



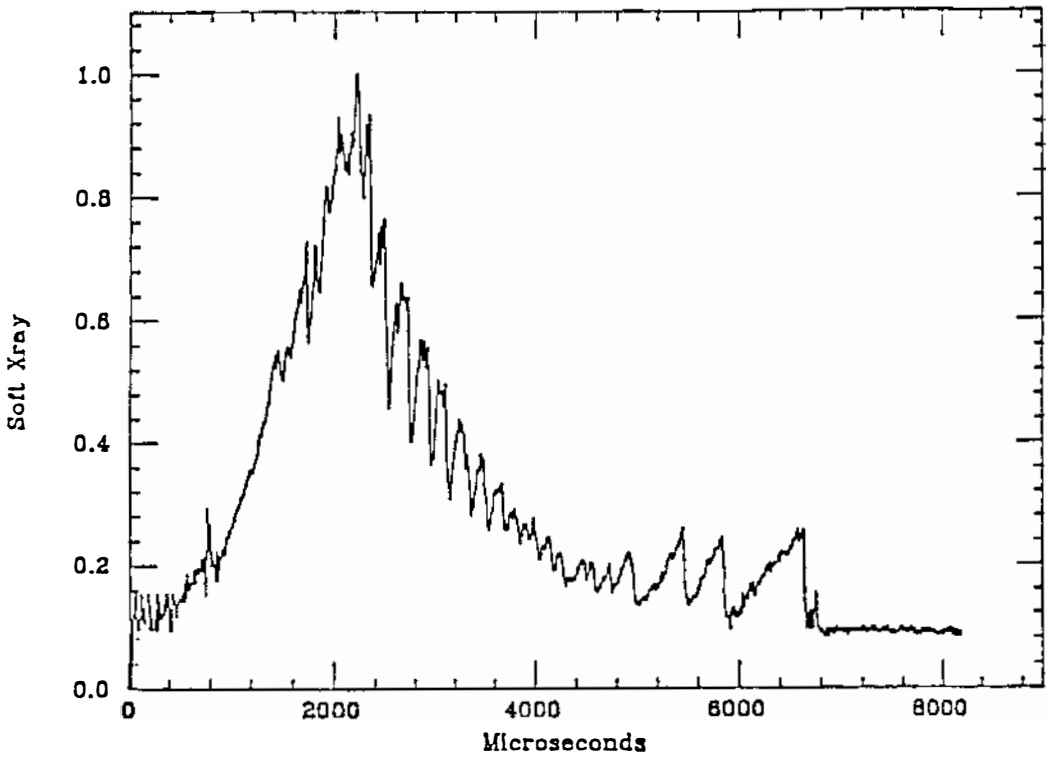
OBSERVATION IS CONSISTENT WITH A STATIONARY GROWING MAGNETIC ISLAND



q ~ 2 PLASMAS

CONFINEMENT IS GOOD ($\tau_E \sim 500\,\mu S$)

SMALL SAWTEETH OCCUR



m = n = 1 Precursor is observed.

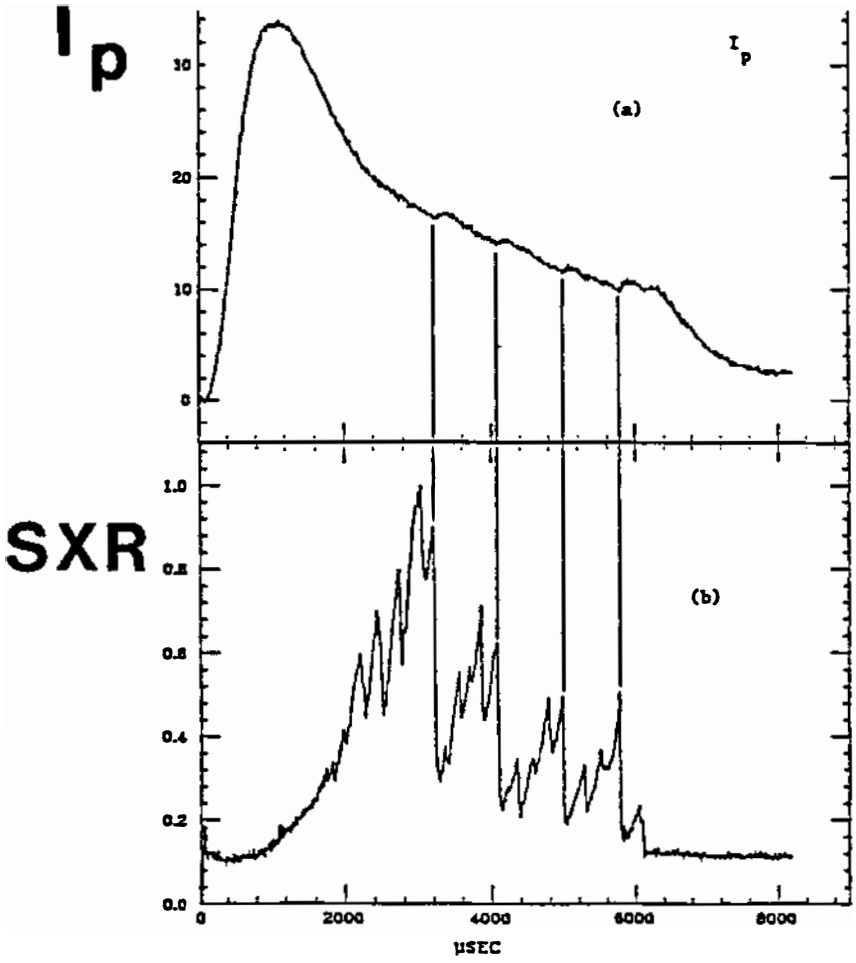
$$(\omega \sim \omega^*; \tau \sim \tau_g)$$

No magnetic precursors are observed.

No major disruption is observed.

q ~ 3 PLASMAS

SMALL AND GIANT SAWTEETH OBSERVED



Plasma has features of major disruption except no current termination.

Plasma does not contact a material limiter.

IAEA-CN-44/F-IV-1

ICRF AND ALFVÉN WAVE HEATING EXPERIMENTS IN MACROTOR AND TOKAPOLE II TOKAMAKS

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J.C. Sprott, F.D. Witherspoon and S.Y. Zhu

(Combined with UCLA)