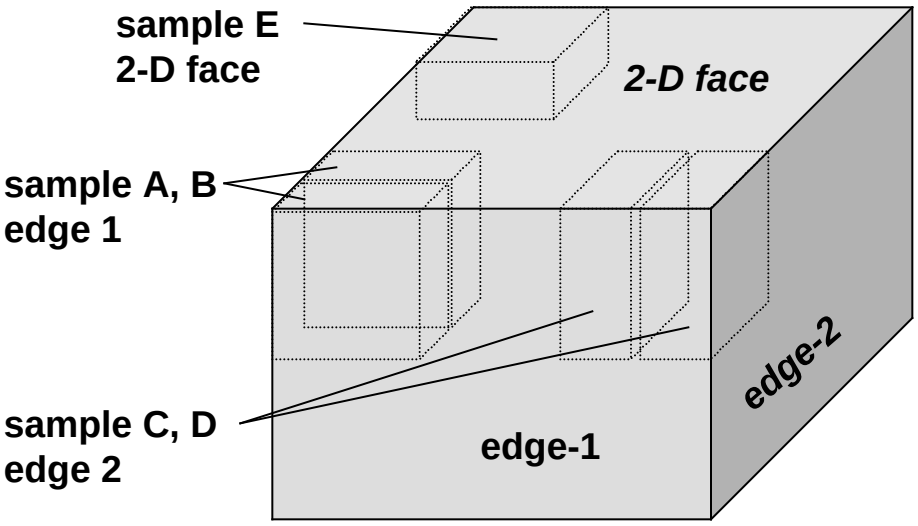
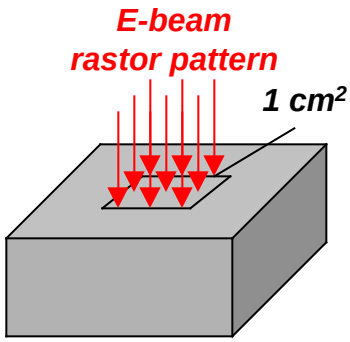
NSTX Armor High Heat Flux (HHF) Tests

performed September 1998

Richard Nygren, Sandia National Laboratories

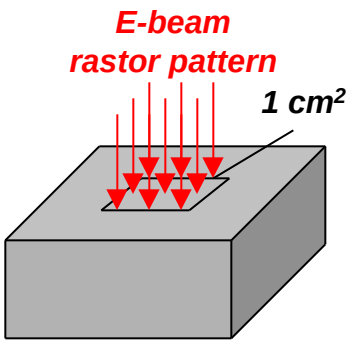
Result: no apparent damage for exposures to 120 MW/m^2 for 1.5 s.
We know that CFCs are tough materials.





2-D carbon fiber composite
Allied Signal (Type 865-19-4)

NSTX armor HHF Tests

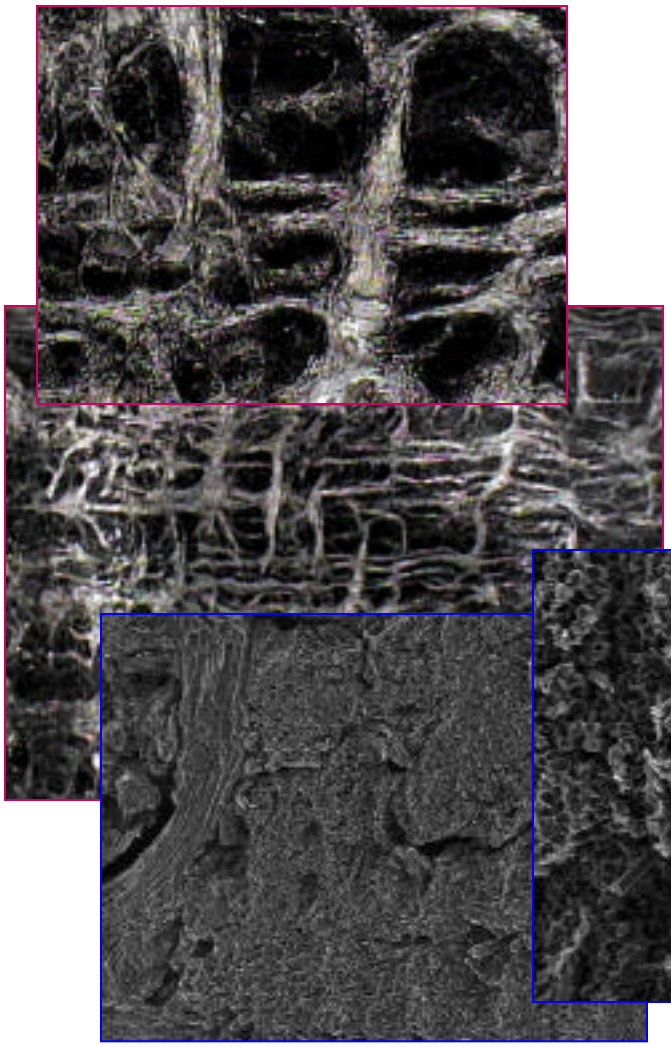


ID	Energy	Wt. loss
A	377 kJ	0.0018 g. (*Low*
B	494	0.0063
C	356	0.0066
D	285	0.0095
E	271	0.0027 (*face, n*

case	heat flux	comment
1-6	5-35 MW/m^2	All samples OK, all shots 1.5 s
7-9	50-140	Short shots (P,T trips), calorimetry
9 rerun	100	All OK, New TC, refocus beam
10	120	All OK
11	60	Longer shots, >2 s until T trip ends

NSTX-C after test

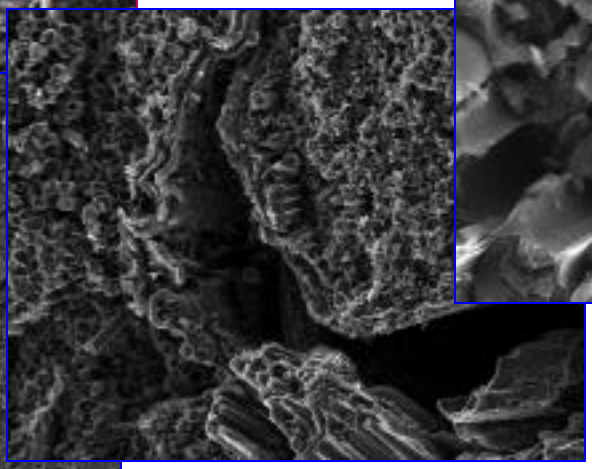
Physical evidence of change is subtle.
Surface has darker “matt” appearance.
Microcracks are numerous before test.



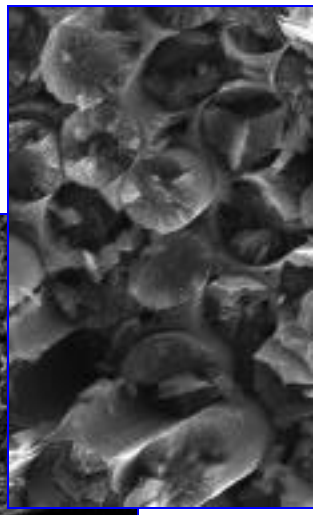
~50X CCD

~10X CCD

~50X SEM



~250X SEM



~1500X SEM

NSTX Armor High Heat Flux Tests

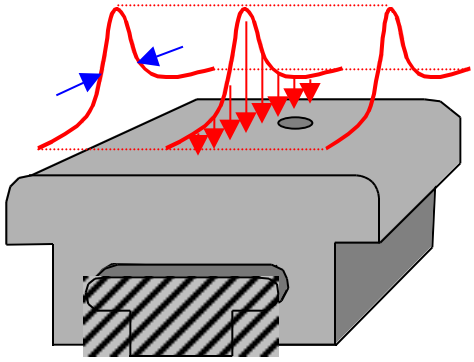
Richard Nygren (Sandia), Brad Nelson (ORNL)

Objectives:

1. IR views - simulate various λ_q values
2. Data - benchmark thermal analyses

Schedule TBD

(winter 2000)



Outboard divertor tile with peaked heating profile in Sandia electron beam test

- Prototypic test with mounted tiles
  (e.g., proper torque on bolts)
- Uniform heat fluxes, and
- Peaked heating profiles to simulate various λ_q values