30 GHz Copper-Structure High-Power Test Results

J. Alberto Rodriguez

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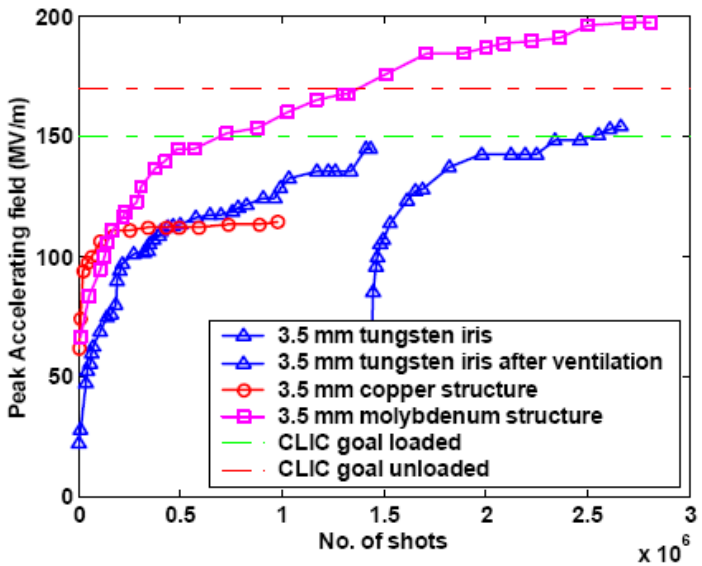
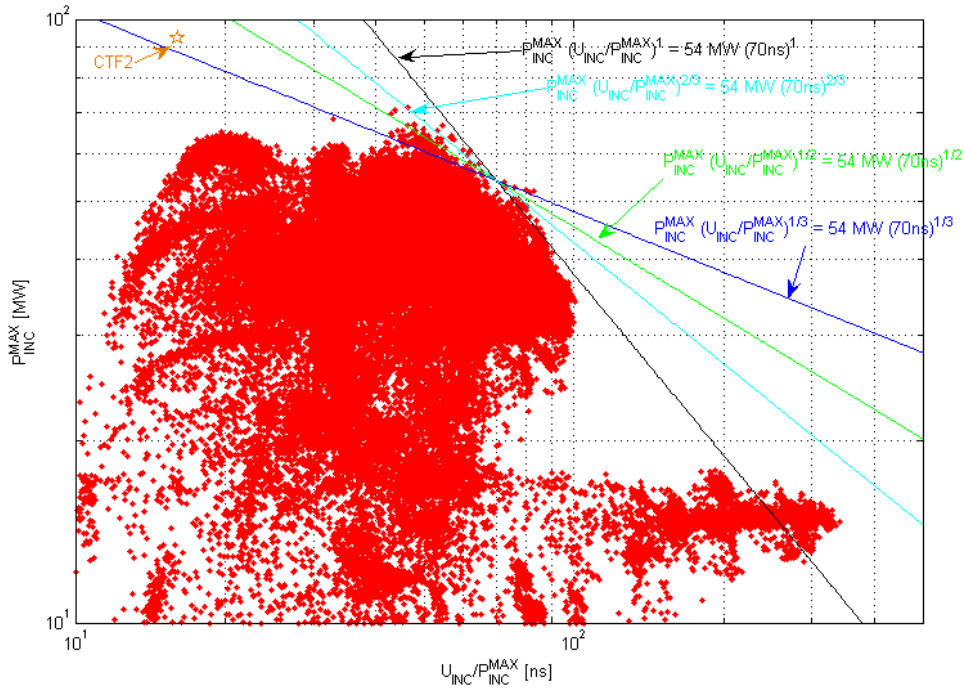
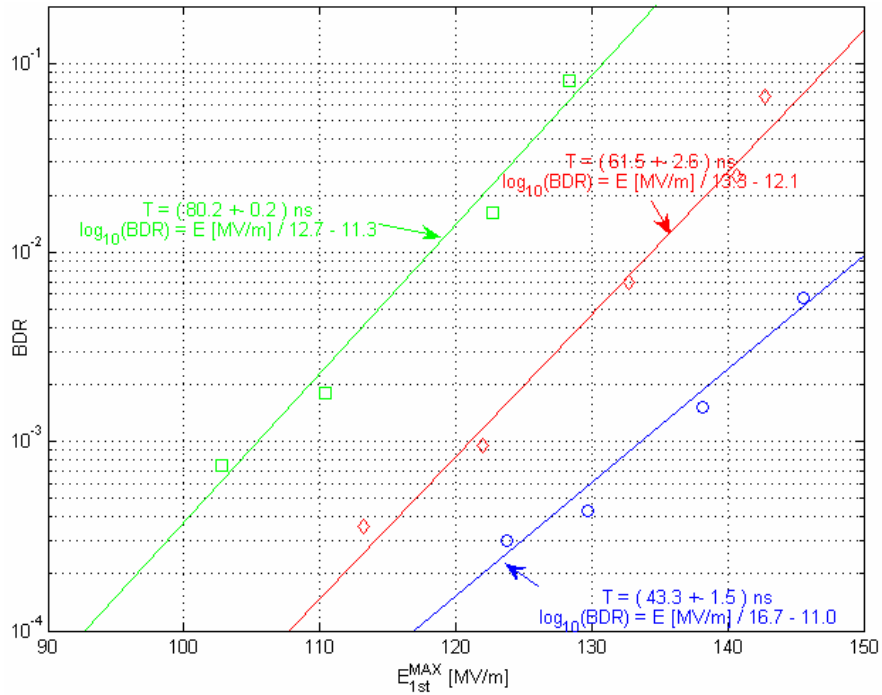
Introduction



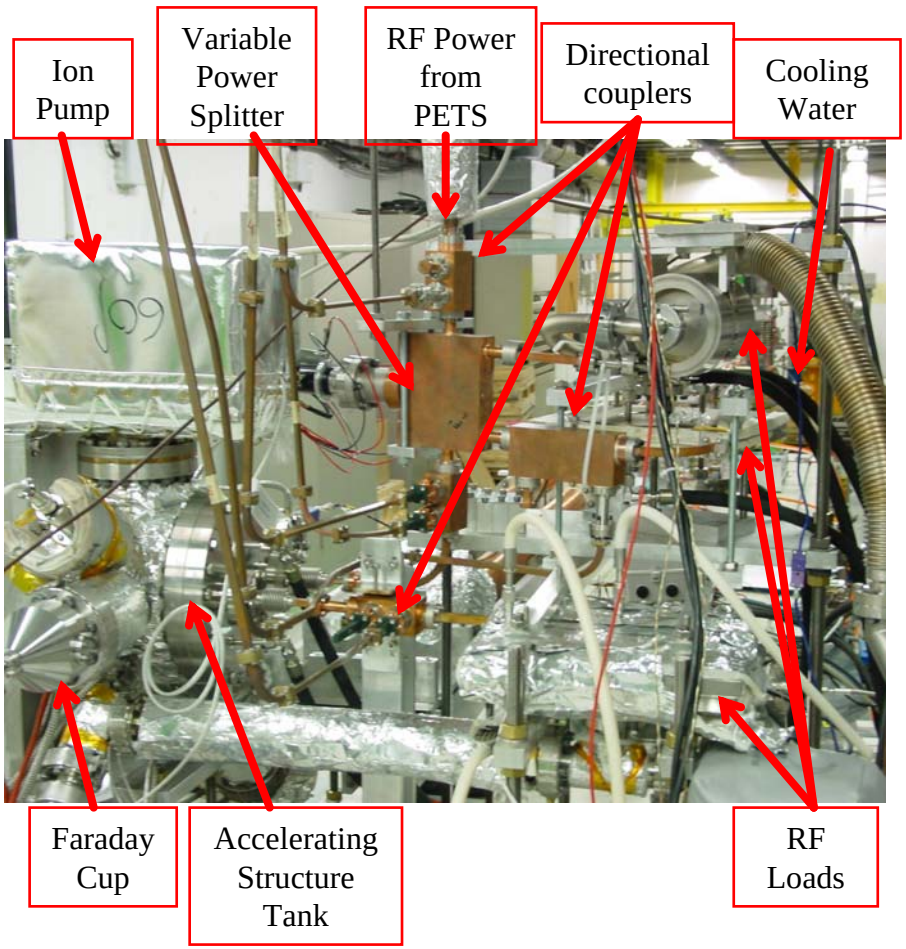
Frequency	29.984 GHz
Number of cells	30
Phase advance	2π/3
Beam aperture	3.5 mm
Group velocity	4.6% of c
Fill time	8.3 ns
E_{SURF} / E_{ACC}	2.2
Power needed for E_{ACC} = 150 MV/m	54 MW

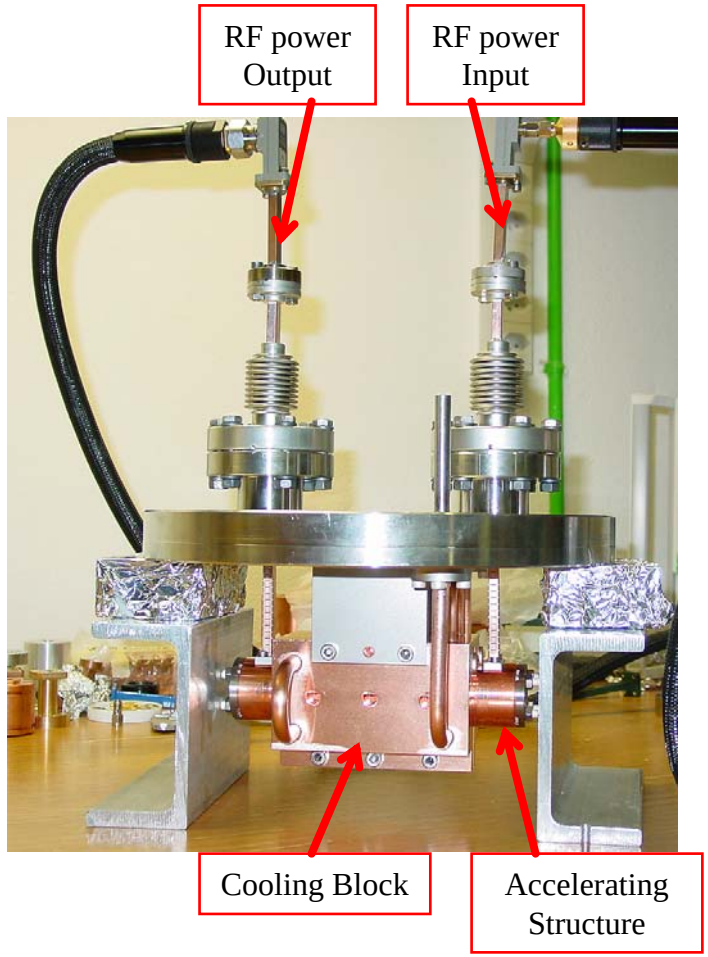
Introduction



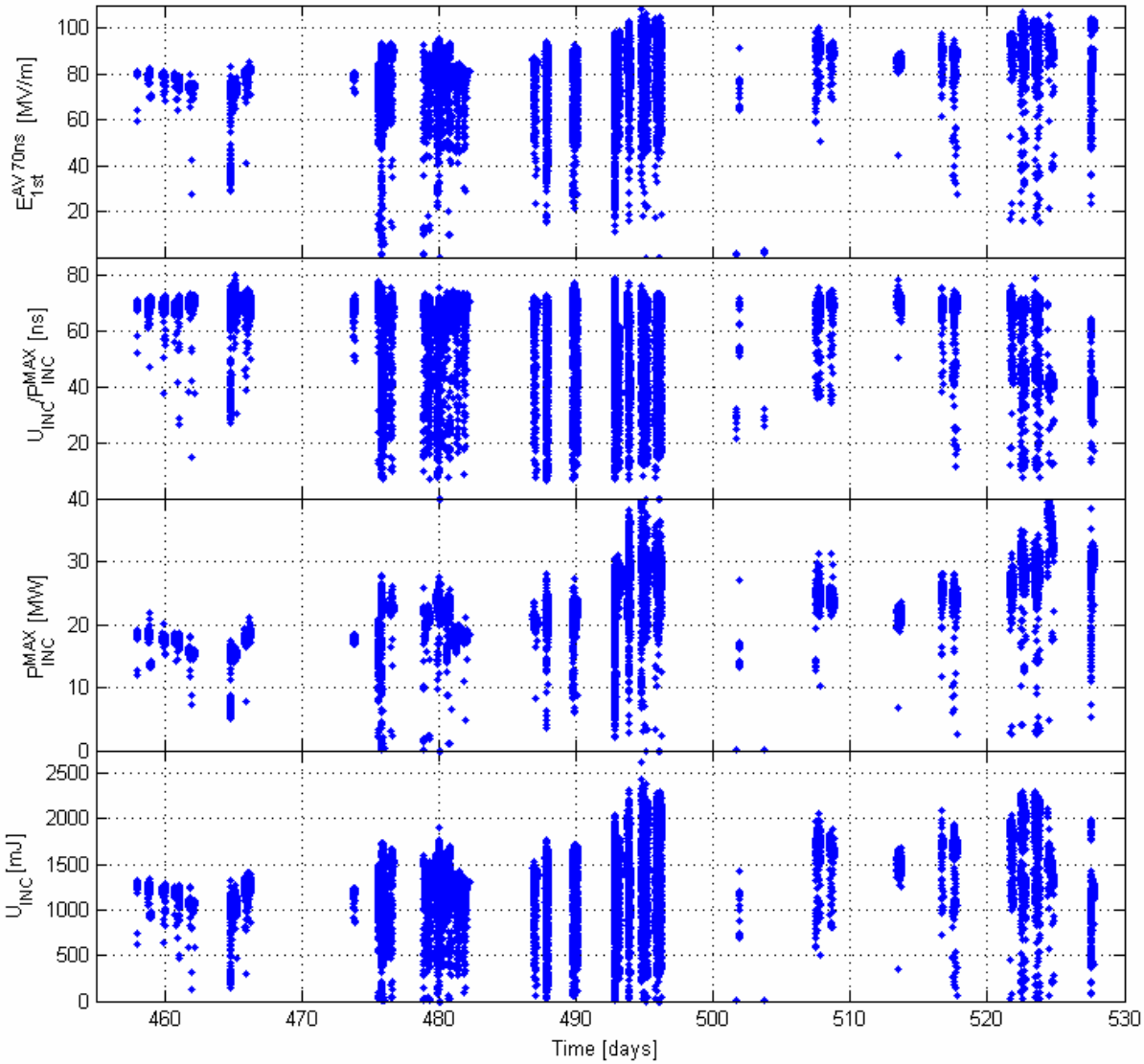


Experimental Setup

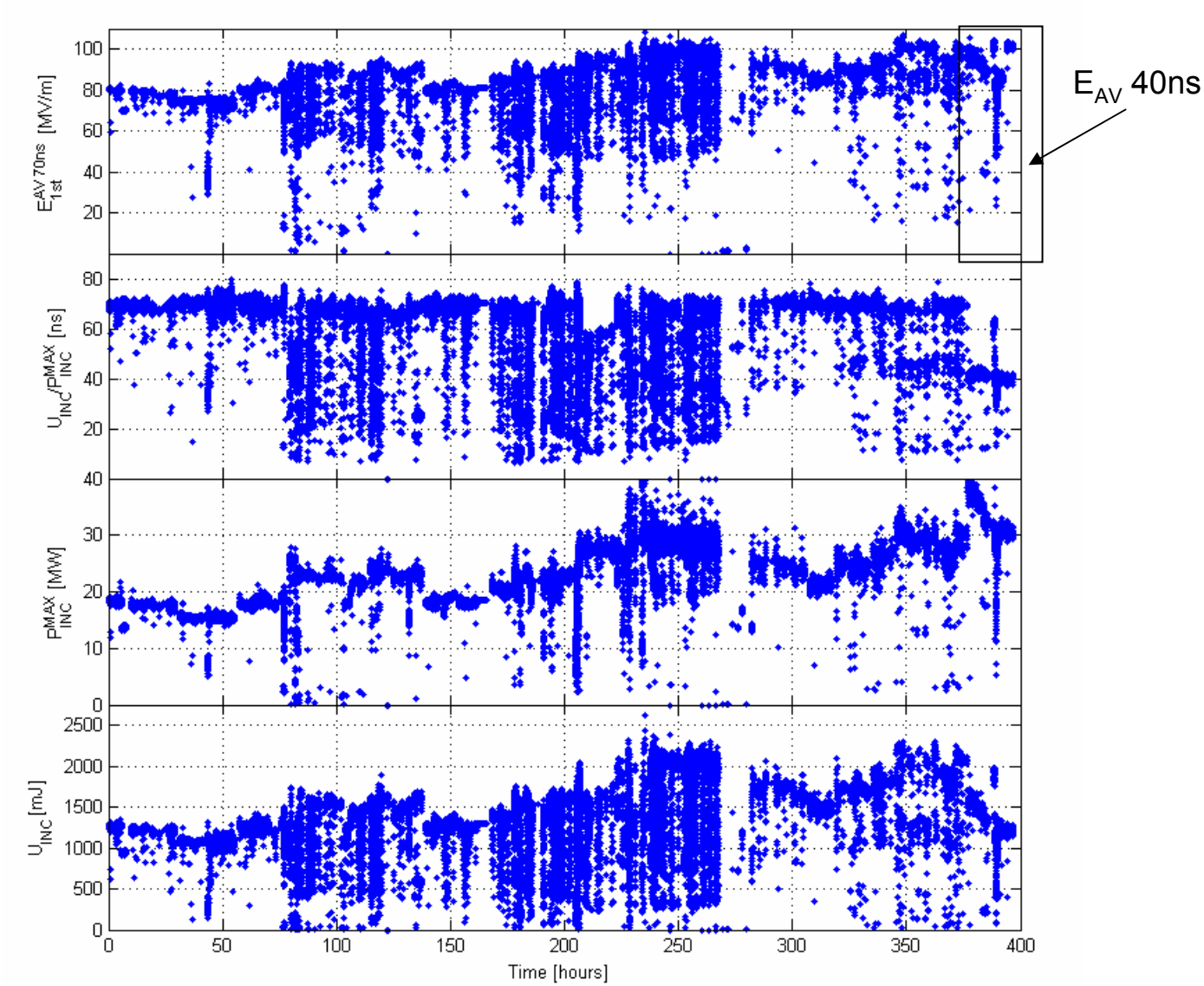




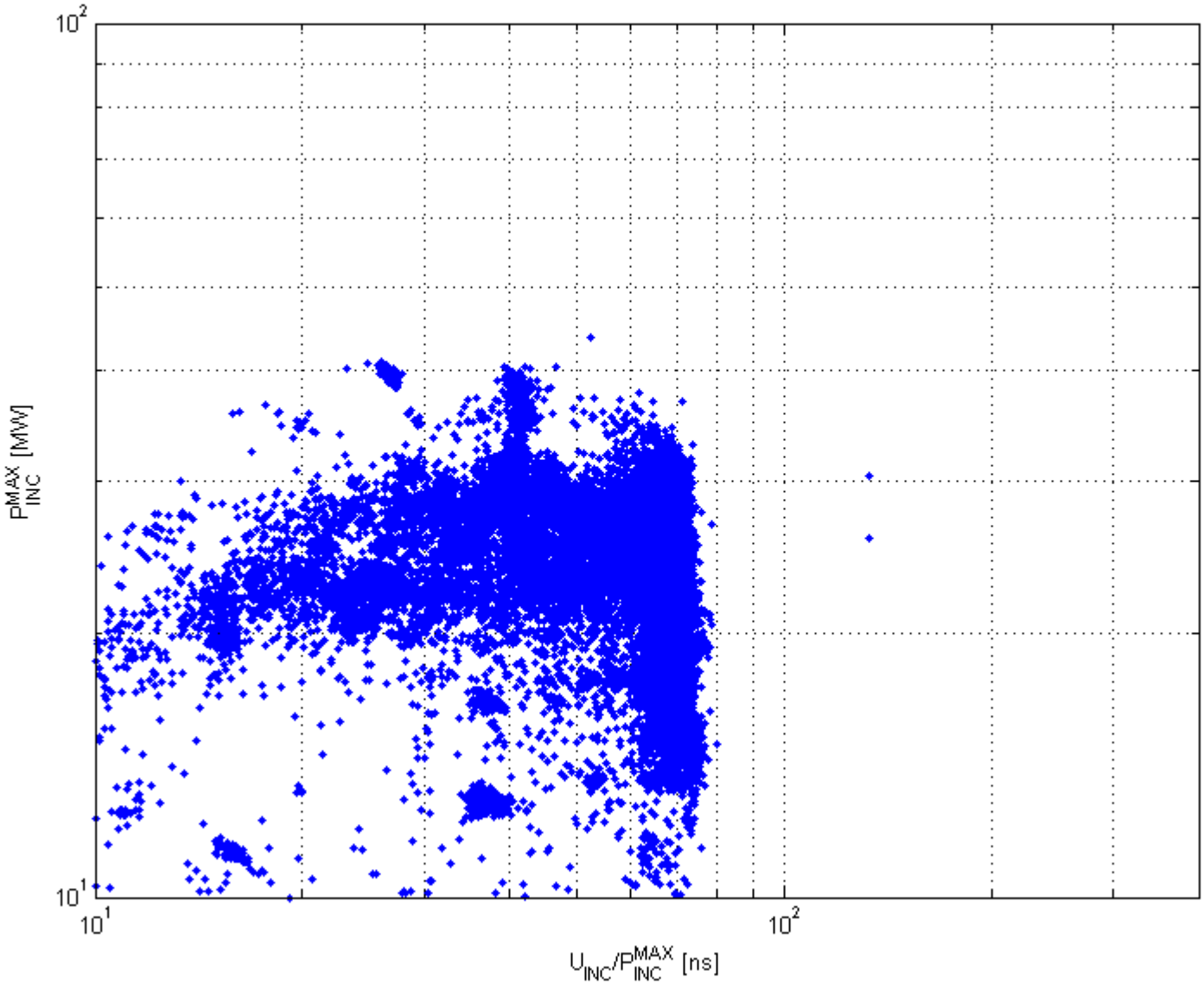
“Conditioning” History



“Conditioning” History



Peak power vs. Pulse Length



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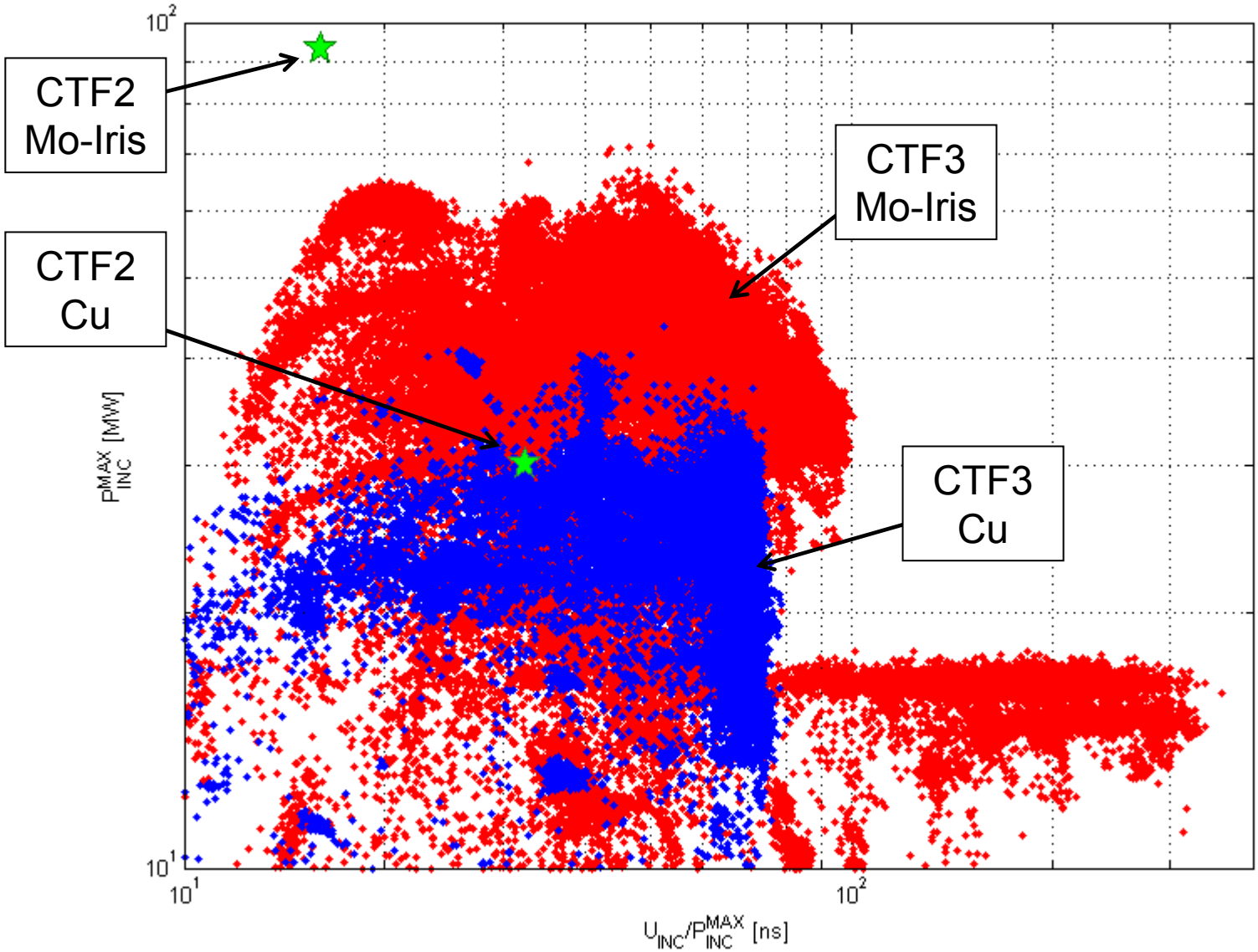
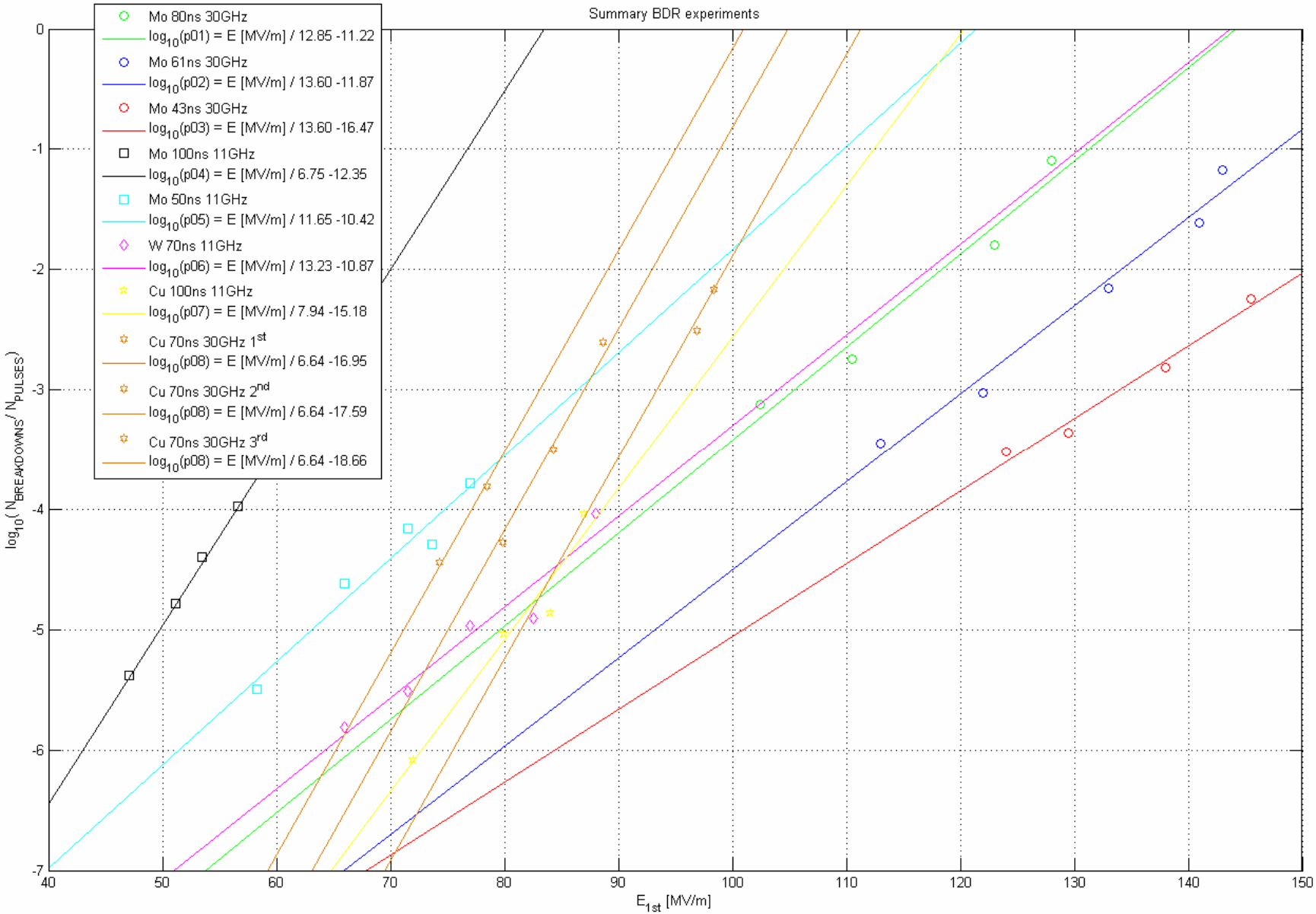
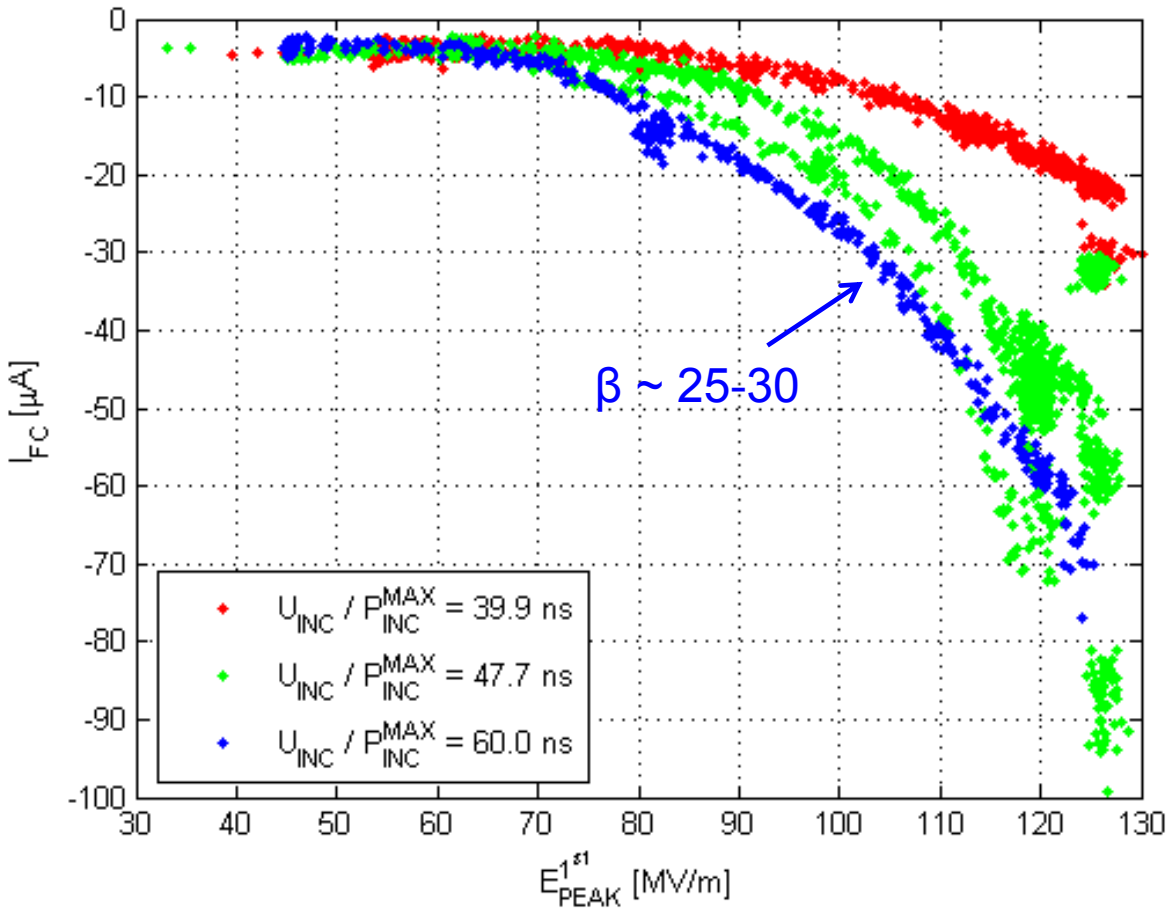


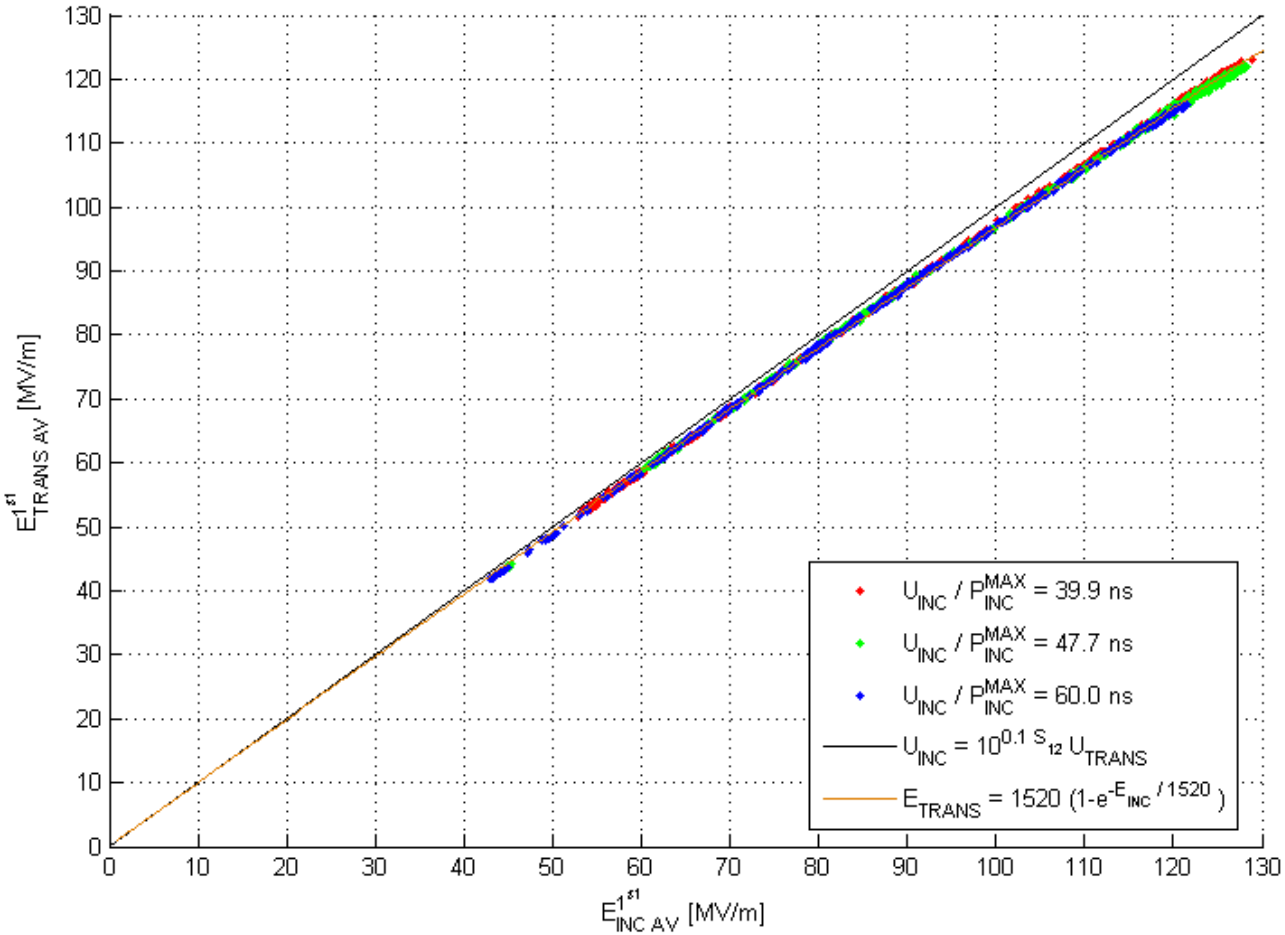
Breakdown Rate Measurements



Dark current vs. gradient



Incident pulse vs. Transmitted pulse



Conclusions

- This structure performed significantly better than a similar one in CTF2. Damage may not be as severe. But, surface inspection should be complete.
- Conditioning time was much shorter than in the Mo-iris structure.
- Slope of the breakdown rate as a function of gradient in this structure is steeper than in Mo-iris and consistent with other Cu structures.
- At the low breakdown rates needed for CLIC, the maximum gradient usable with Cu and Mo so far seems similar.
- The β factor at the end of the conditioning is of the order of 30. Dependency on pulse length is not clear.
- Discrepancy between measurements using incident pulse and transmitted pulse are not as large as in the Mo-iris structure tested previously.