

DARK CURRENT OF RF GUNS

MEASUREMENTS AT FERMILAB

GUN	DARK CURRENT FOR $E_{\text{cathode}} = 35 \text{ MV/m}$	COMMENTS	
GUN A (RETROFITTED FOR Cs_2Te CATHODE) Ag-COATED SPRING	1-2 mA	ICT MEASUREMENT, SAME FOR Cu, Mo (POLISHED OR NOT), Cs_2Te CATHODES $\beta \approx 240$	
GUN 3 (BEFORE SHIPMENT TO DESY) Be-Cu SPRING	50 μA	Mo CATHODE	FARADAY CUP MEAS.
	40 μA	Cs_2Te CATHODE	
GUN 4 (NOW INSTALLED AT FERMILAB) Be-Cu SPRING	30 μA	Mo CATHODE	FARADAY CUP MEAS.
	50-100 μA	Cs_2Te CATHODE	

DARK CURRENT FOR GUN A

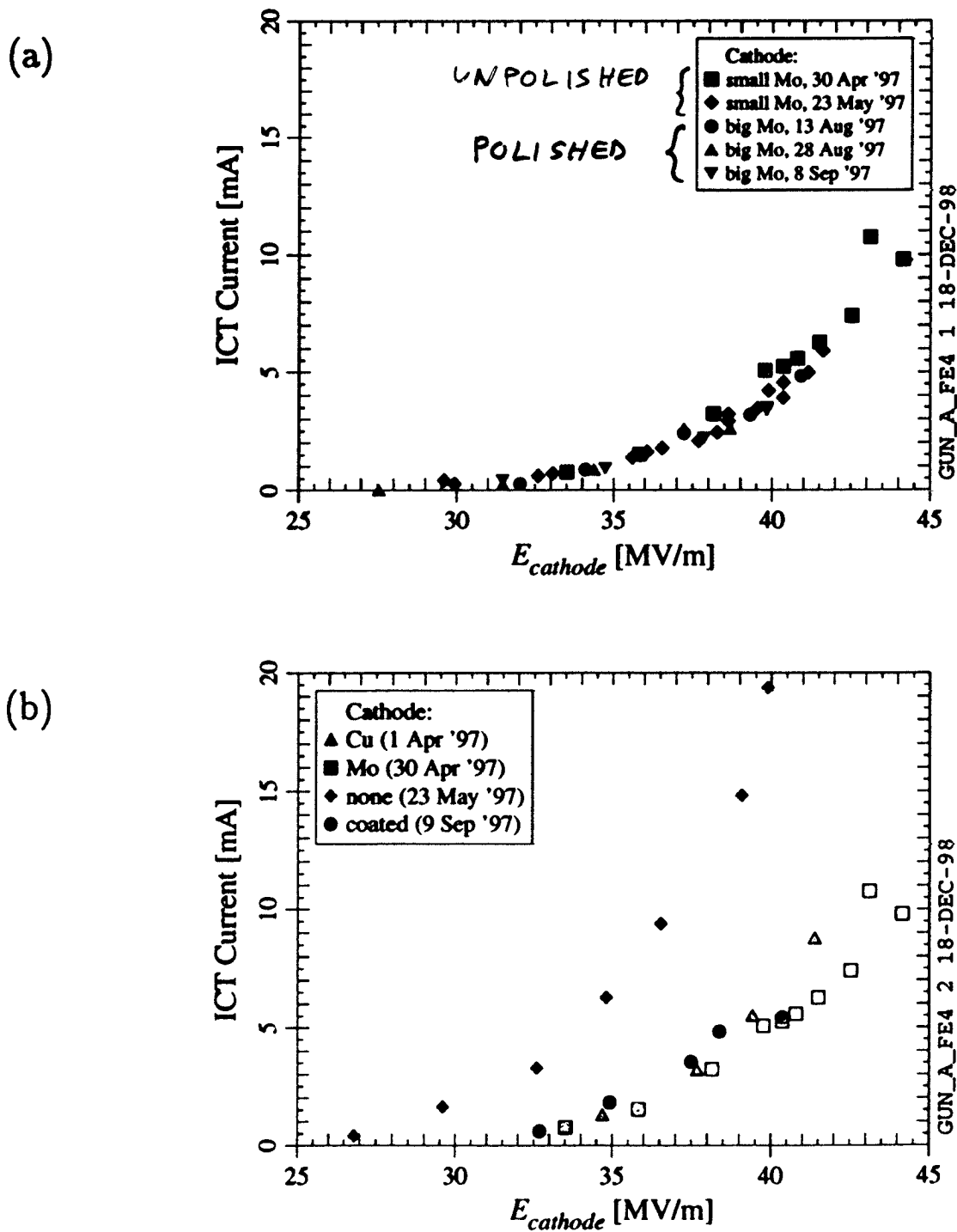
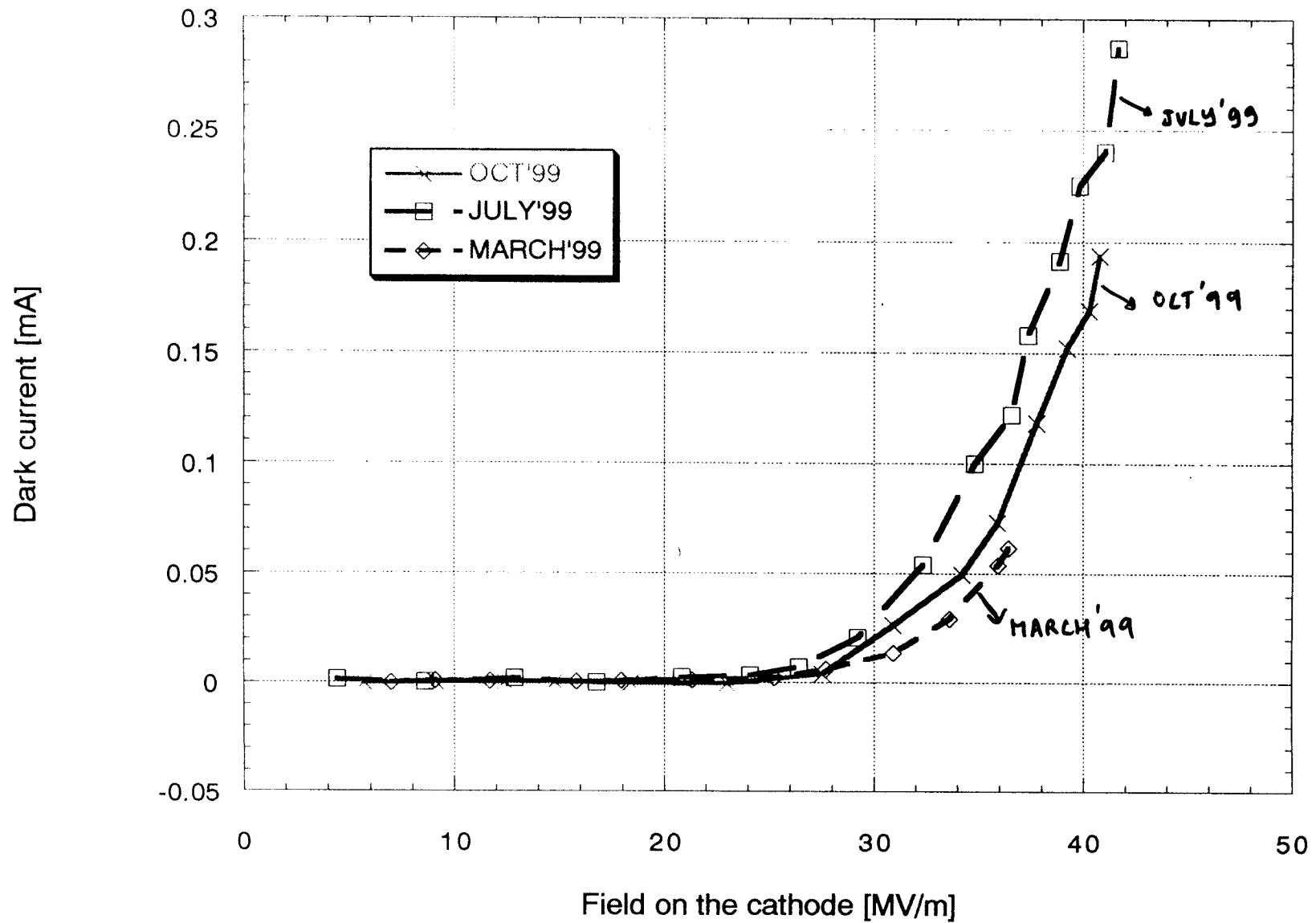


Figure 11.1. Comparison of dark current measurements (a) on Mo cathodes of different diameters and (b) on cathodes of different materials.

Dark current G4 with Cs2Te cathode 100 micro-second RF pulse, solenoides off



DARK CURRENT CONCLUSION

- STRONG DARK CURRENT IN PROTOTYPE GUN, POSSIBLY DUE TO MACHINING FOR CATHODE RETROFIT OR Ag-COATED SPRING.
- LESS DARK CURRENT IN PRODUCTION GUNS. DUE TO BETTER CLEANLINESS? BETTER SPRING?
- OBSERVE NOT MUCH CONDITIONING OR DE-CONDITIONING WITH TIME.

ADDITIONAL NOTES

- WITH SOLENOIDS ON, SEE MULTIPACTING IN GUN DURING FILL AND DECAY OF RF PULSE (NOT STUDIED SO FAR).
- FIELD EMISSION FROM CAPTURE CAVITY: CANNOT OBSERVE ON ICT'S OR FARADAY CUPS. DID SEE IMAGE ON CHROMOX FLAG (UPSTREAM) WITH IRIS OF VIDEO CAMERA OPEN WIDE.