Table 1. Electron Source Performance Comparison

Cathode Material	**W**	**LaB_6**	**W (310)**	**ZrO/W (100)**
Emitter type	thermionic	thermionic	cold FE	Schottky FE
Operating Temperature (K)	2800	1900	300	1800
Cathode radius (nm)	60,000	10,000	≤100	≤1,000
Effective source radius (nm)	15,000	5000	2.5 (virtual source)	2.5 (virtual source)
Emission Current Density (A/cm^2)	3	30	17,000	5300
Total emission current μA	200	30	5	200
Normalized brightness ($A/cm^2 \cdot sr \cdot kV$)	1×10^4	1×10^5	2×10^7	1×10^7
Maximum probe current (na)	1000	1000	0.2	>20
Energy spread at the cathode (eV)	0.59	0.40	0.26	0.31
Energy spread at the gun exit (eV)	1.5-2.5	1.3-2.5	0.3-0.7	0.5-0.07
Beam noise (%)	1	1	5-10	1
Emission current drift (%/h)	0.1	0.2	5	≤0.5
Cathode life (h)	20	1000	2000	2000
Cathode regeneration	not req'd	not req'd	every 6 to 8 hrs	not req'd
Sensitivity to external influence	minimal	minimal	high	low

(Courtesy: Leo)