

The parameters in the table below provide an approximate estimate of the photon and particle properties a system like kBELLA could provide.

Some of these sources would be intrinsically available, others would need minor setup configuration stages, while yet others would require more dedicated design and planning.

Pulse durations of order few-fs.

Generation mechanism	Photon (or particle) type	Photon (or particle) energy	Energy spread	Photons (or particles) per shot	Notes
Base facility (approximate parameters)					
Drive laser for kBELLA	NIR photons	~eV	few %	3 Joule on target	100 TW peak power
Laser-plasma acceleration (LPA) in gas	Electrons	100-1000 MeV	few %	10-100 pCoulomb	Leemans et al. Nat. Phys. 2, 696 (2006)
LPA-beam-driven betatron radiation	Hard X-rays	2-50 keV	broad	1e7-1e9 photons	Hussain et al. Sci. Rep. 9, 3249 (2019)
Additional opportunities based on user interest (approximate parameters)					
LPA-beam-driven undulator radiation	XUV/soft X-rays	10 - 500 eV	few %	1e5-1e7 photons	Fuchs et al. Nat. Phys. 5, 826 (2009)
LPA-beam-driven Free Electron Laser	XUV photons	10-100 eV	sub-%	1e9-1e11 photons (Under development)	Maier et al. PRX 2, 031019 (2012)
LPA-beam-driven Thomson/Compton scattering	Gamma rays	0.1 - 10 MeV	few %	1e7-1e9 photons	Phuoc et al. Nat. Phot. 2, 308 (2012) 308 (z)
Laser - solid acceleration	Protons	1 - 15 MeV	broad	1e8-1e10 protons	H. Daido, M. Nishikuchi, and A. S. Prozhkov. Rep. Prog. Phys. 75, 056401 (2012).
Laser - solid acceleration	Ions (i.e. Carbon)	1 - 90 MeV	broad	1e7-1e9 carbon ions	H. Daido, M. Nishikuchi, and A. S. Prozhkov. Rep. Prog. Phys. 75, 056401 (2012).
Laser - gas interaction (gas HHG)	XUV photons	10 - 100 eV	broad	0.1 - 1 microJ per harmonic from multi-mJ drive laser	Suzuki et al. Opt. Lett. 31, 3306 (2006)
Laser - gas interaction (gas HHG)	Soft X-rays	100 - 500 eV	broad	1e7 photons in 100 eV bandwidth	Fu et al. Commun. Phys. 3, 92 (2020)
Laser - solid interaction (solid HHG ROM)	XUV / soft X-rays	10 - 2000 eV	broad	>1e9-1e12 photons from multi-J drive laser	Dromey et al. PRL 99, 085001 (2007)
Laser - gas interaction (two-color on plasma)	THz	4-40 meV (1-10 THz)	broad	0.01-0.1 mJoule from multi-mJ drive laser	Oh et al. APL 105, 041103 (2014)
Laser - solid interaction (optical rectification)	THz	4-40 meV (1-10 THz)	broad	0.01-0.1 mJoule from multi-mJ drive laser	Huang et al. OL 38, 796 (2014)
LPA-beam-driven transition radiation	THz	4-40 meV (1-10 THz)	broad	0.01-1 mJoule	Wu et al. RSI 84, 022701 (2013)