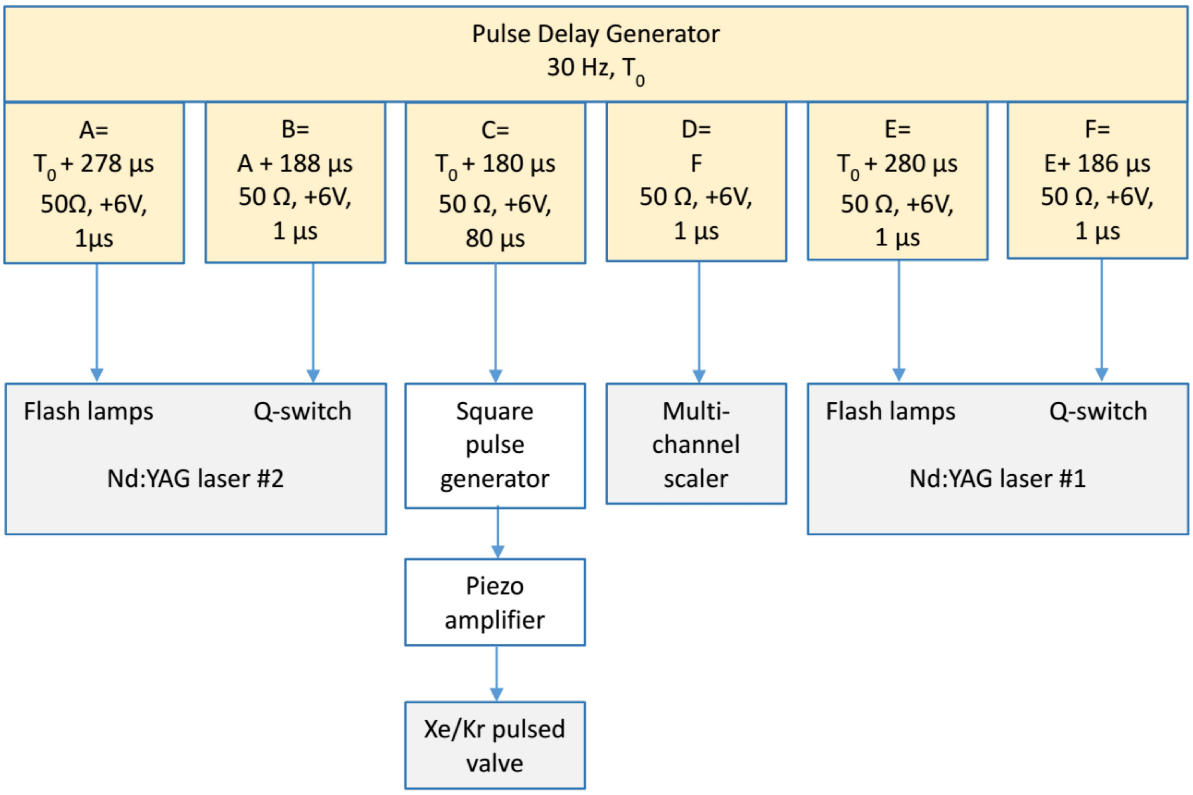

Figure S1. Pulse sequence for the experiments employing two-photon resonance enhanced four wave mixing VUV generation.

Table S1. Parameters of the two-photon resonance enhanced VUV generation.

VUV energy,* eV		10.21	9.80	9.14	7.93
(wavelength, nm)		(121.4)	(126.5)	(135.5)	(157.0)
Photons per pulse**		1.7×10^{10}	1.5×10^{10}	2.8×10^{10}	3.8×10^{10}
ω_2	Nd:YAG laser wavelength, nm	532	355	532	532
	pulse energy, mJ	67	67	50	50
	dye #2/	R610/R640	C503	R610/R640	R610/R640
	concentration, g/l	0.17/0.04	0.4	0.17/0.04	0.17/0.04
	λ_2, nm	606	505	620	620
	pulse energy, mJ	8	6	6	5
ω_1	Nd:YAG laser wavelength, nm	532	532	355	355
	pulse energy, mJ	167	167	60	50
	dye #1/	R610/R640	R610/R640	C450	C503
	concentration, g/l	0.17/0.04	0.17/0.04	0.2	0.4
	dye laser wavelength, nm	606.948	606.948	445.132	505.988
	pulse energy, mJ	43	47	5	5
	frequency converted wavelength, nm	202.316 (tripling)	202.316 (tripling)	222.566 (doubling)	249.628 (doubling)
Rare gas		Krypton	Krypton	Xenon	Xenon
background pressure, Torr		1.5×10^{-4}	8×10^{-5}	1.4×10^{-4}	1.4×10^{-4}
Resonant upper state		$4s^2\ 4p^5(^2P_{1/2})5p^1$	$4s^2\ 4p^5(^2P_{3/2})5p^1$	$5s^2\ 5p^5(^2P_{1/2})6p^1$	$5s^2\ 5p^5(^2P_{3/2})6p^1$

*all energies are defined within less than 0.001 eV bandwidth.

**assuming 5% copper photocathode efficiency.