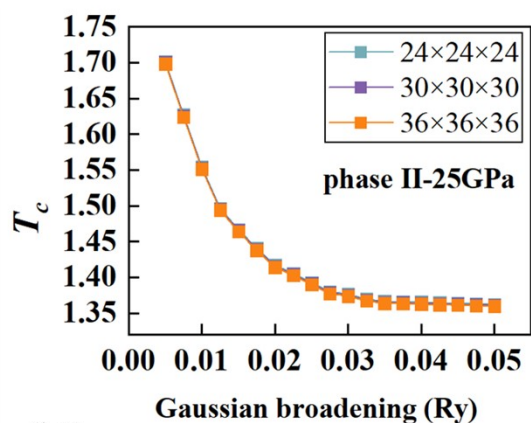


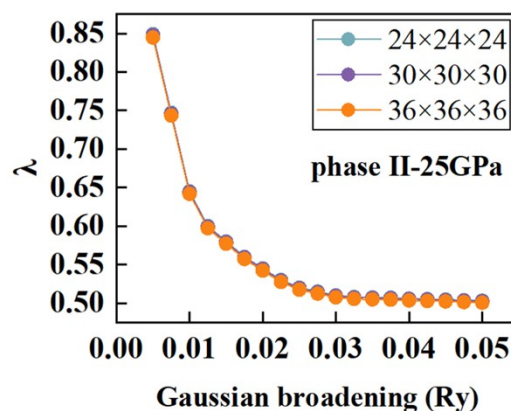
## Supporting information

### Compressed Sr superconducting transition temperature up to 17.65 K

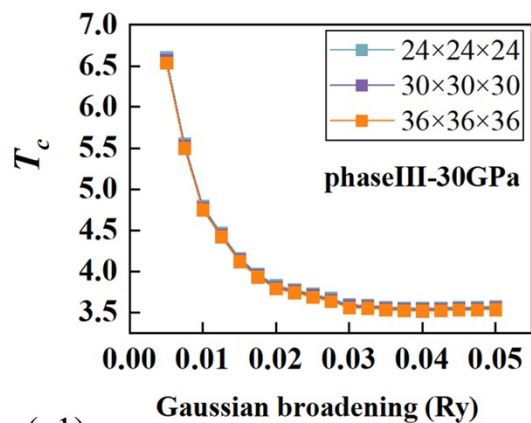
(a1)



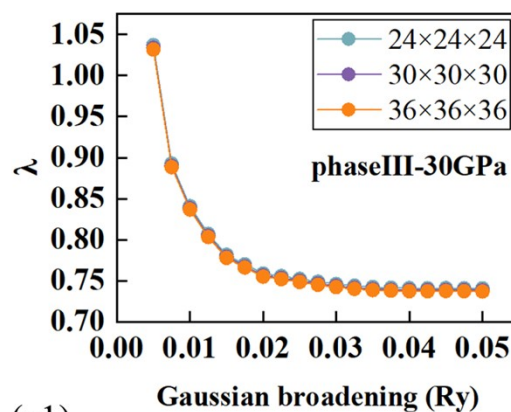
(a2)



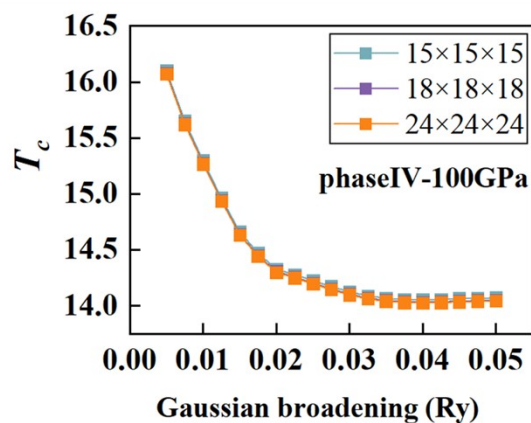
(b1)



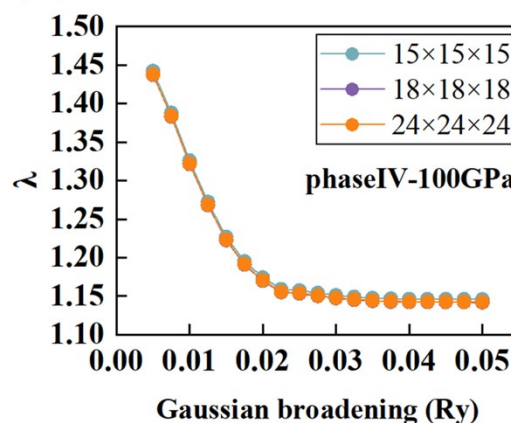
(b2)



(c1)



(c1)



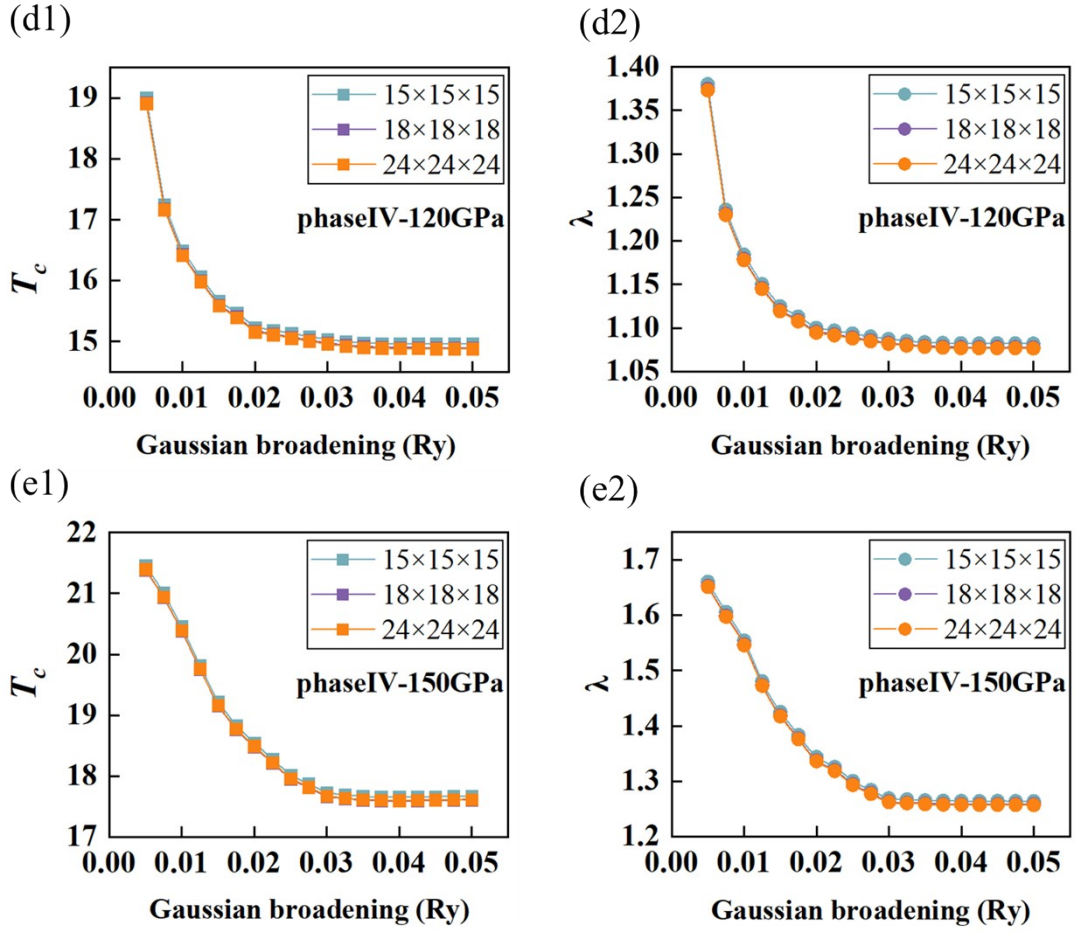
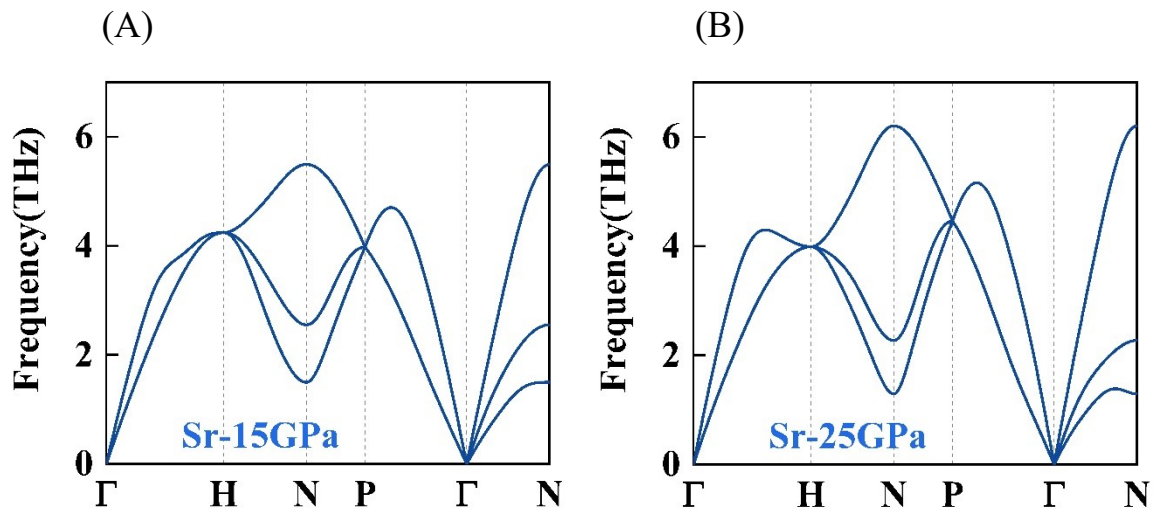


Figure S1 electron-phonon coupling constant  $\lambda(\mathbf{q})$  at different pressures as well as  $T_c$  as a function of the Gaussian broadening  $\sigma$ . In phases II and III, the  $24 \times 24 \times 24$  k-grid is considered to converge to the desired accuracy, while the converged k-grid for phase IV is  $15 \times 15 \times 15$ .



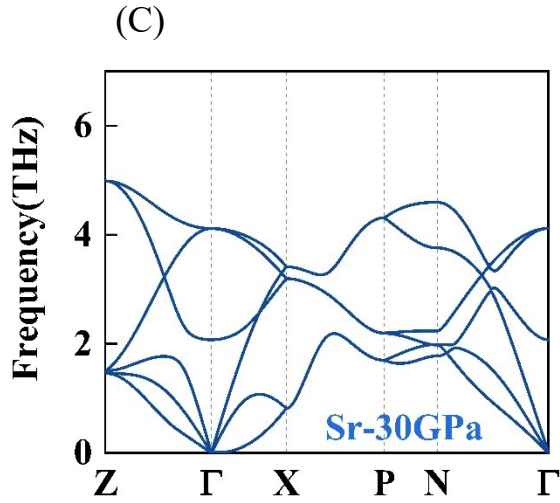


Figure S2 Phonon dispersion diagram of Sr under different pressures (A) 15GPa; (B) 25GPa; (C) 30GPa.

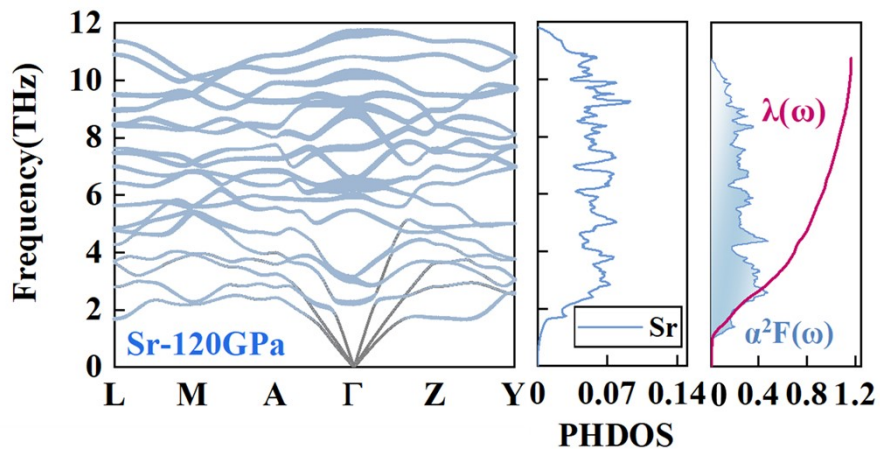


Figure S3 Phonon spectrum, phonon density of states, Eliashberg spectral function, and EPC constant  $\lambda$  of Sr at 120GPa, where the size of the blue circle in the phonon spectrum is proportional to the size of the electron-phonon coupling strength  $\lambda_{qv}$ .

Table S1 The lattice constants and atomic coordinates of the different phases of Sr.

Phase	Pressure (GPa)	Lattice parameters		Coordinates		
$Fm\bar{3}m$	3.5	a = 5.605 Å	Sr	0.000	0.000	0.000
$Im\bar{3}m$	25	a = 3.741 Å	Sr	0.000	0.000	0.000
$I4_1/amd$	38	a = 5.43 Å	Sr	0.000	0.000	0.000
		c = 2.96 Å	Sr	0.750	0.250	0.500
$C2/c$	50	a = 5.636 Å	Sr	0.121	0.431	0.318
		b = 7.932 Å	Sr	-0.070	1.048	-0.008
		c = 5.253 Å	Sr	0.546	0.856	-0.334
		$\alpha = 90^\circ$	Sr	0.931	0.621	-0.181
		$\beta = 97.64^\circ$	Sr	1.548	0.430	-0.508
		$\gamma = 90^\circ$	Sr	1.356	1.046	-0.834

Table S2 Relevant parameters of Sr superconducting properties under different pressures

	Pressure (GPa)	This work					Ref.
		$N(E_f)$	$\mu^*$	$\lambda$	$\omega_{log}$ (K)	$T_c$ (K)	$T_c$ (K)
Sr	15	0.2955	0.1	0.307	110.426	0.067	1.2
	25	0.3505	0.1	0.500	111.842	1.36	2.2
	30	1.22	0.1	0.741	89.702	3.56	2.3
	38	3.8	0.1	0.826	114.344	5.788	3.2
	50	4.965	0.1	1.009	125.699	8.871	4
	100	4.195	0.1	1.164	166.381	14.335	--
	120	4.105	0.1	1.082	191.299	14.962	--
	150	4.65	0.1	1.264	185.341	17.657	--