ULTRAVIOLET SYNCHROTRON ORBITAL RADIATION PROJECT(UVSOR) OF INSTITUTE FOR MOLECULAR SCIENCE

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Since 1974, an electron storage ring dedicated to ultraviolet synchrotron orbital radiation research of molecular science and related fields has been proposed at Institute for Molecular Science. This is a 600 MeV storage ring, the injector of which is a 600 MeV synchrotron with a 12 MeV linac. The photon in the 10 - 2000 Å region is mainly utilized. The photon flux distribution is shown in Fig. 1. Since the storage ring is dedicated to synchrotron radiation (SOR) research, it is designed so as to have advantages of small emittance and small beam size at bending sections, and so that the wigglers can be installed at long straight sections, where the dispersion function is 0 and the horizontal beam divergence is small. The design parameters are shown in Table 1.

The plane view of the UVSOR storage ring is shown in Fig. 2. It is composed of eight bending magnet sections, and four long and four short straight sections. From one bending section, two outlets of the SOR are available. To each outlet, two optical instruments are attached. The SOR of 10 mrad (horizontal angle) is utilized by each optical instrument. At both long and short straight sections, two doublets of quadrupoles are installed. The electrons are injected from the inside of the ring at S_1 section. The RF cavity is located at S_5 section. The RF frequency is ~100 MHz, which is equal to that of the synchrotron. The harmonic number is 16. One bunch operation for getting pulsed light (width ~0.5 nsec, interval ~170 nsec) is possible. The long straight sections, S_3 and S_7 are reserved for two wigglers.

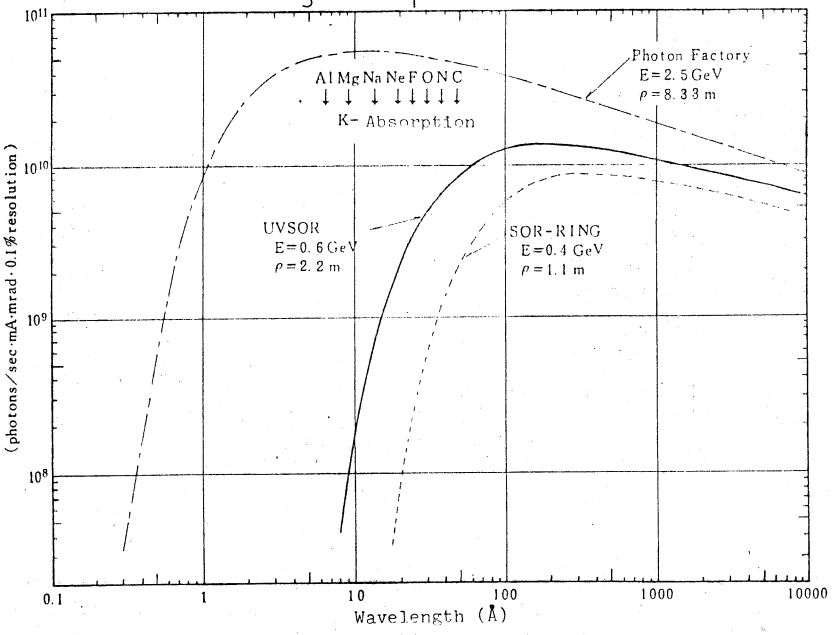

Fig. 1. Photon flux distribution of the UVSOR storage ring.

Table 1. Design Parameters of the UVSOR Storage Ring

Energy	600 MeV	Emittance ε_x	$6\pi \times 10^{-8}$ m·rad
Critical Wavelength	56.9 Å	ε_z	$6\pi \times 10^{-9}$ m·rad*
Current	500 mA	Beam Size at Bending Section	
No. of Electrons	5.2×10^{11}	σ_x	0.3 mm
Lifetime	1h (500 mA)	σ_z	0.2 mm
Circumference	~ 50 m	RF Frequency	~ 100 MHz
Bending Magnet		Harmonic Number	16
No.	8	Radiation Loss/turn/el.	5.21 KeV
Radius	2.2 m	Radiation Loss/sec	2.6 kW (500 mA)
Central Field	9.09 kgauss	RF Voltage	50 kV
n-value	0.5	RF Power (Amplifier)	20 kW
Quardrupole Magnet		Pressure (500 mA)	1×10^{-9} Torr
No.	32	Total Pumping Speed	2×10^4 l/sec
Length	0.25 m	Radiation Damping Time	
Field Gradient	1.5 kgauss/cm	$\tau_{\beta x}$	38.6 msec
Sextupole Magnet		$\tau_{\beta z}$	38.6 msec
No.	16	τ_ε	19.3 msec
Length	0.1 m	Injection Frequency	1 ~ 3 Hz
Betatron Number	$\nu_x = 3.25$		
	$\nu_z = 2.75$	* 10 % coupling is assumed.	

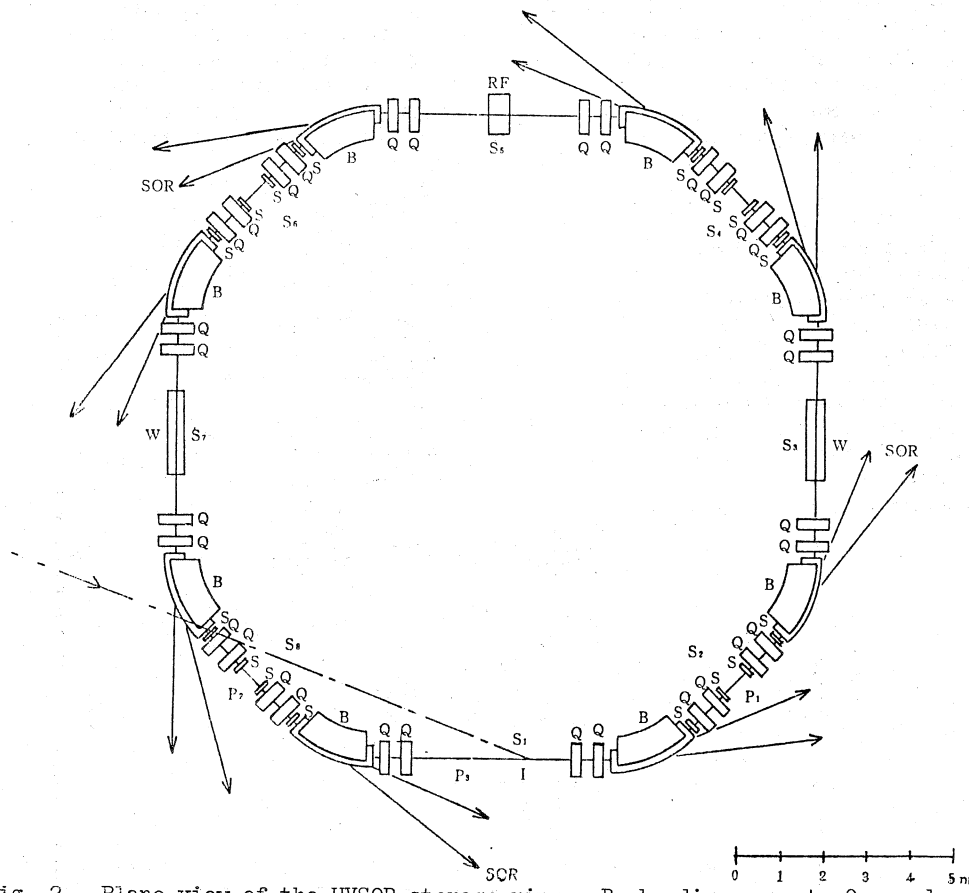

Fig. 2. Plane view of the UVSOR storage ring. B: bending magnet, Q: quadrupole, S: sextupole, S_1 ~ S_8: straight sections, RF: RF cavity, I: inflector, P_1 ~ P_3: purturbators, and W: wiggler.