

Ioffe Photocathode Acquisition Plans

- Decide on type of structure that is of highest interest
- Purchase 2 identical wafers now and test
- Once test results are digested, purchase remaining 4 (or so) wafers, each wafer having a variation of one or more parameters
- Note: share wafers with SPTU

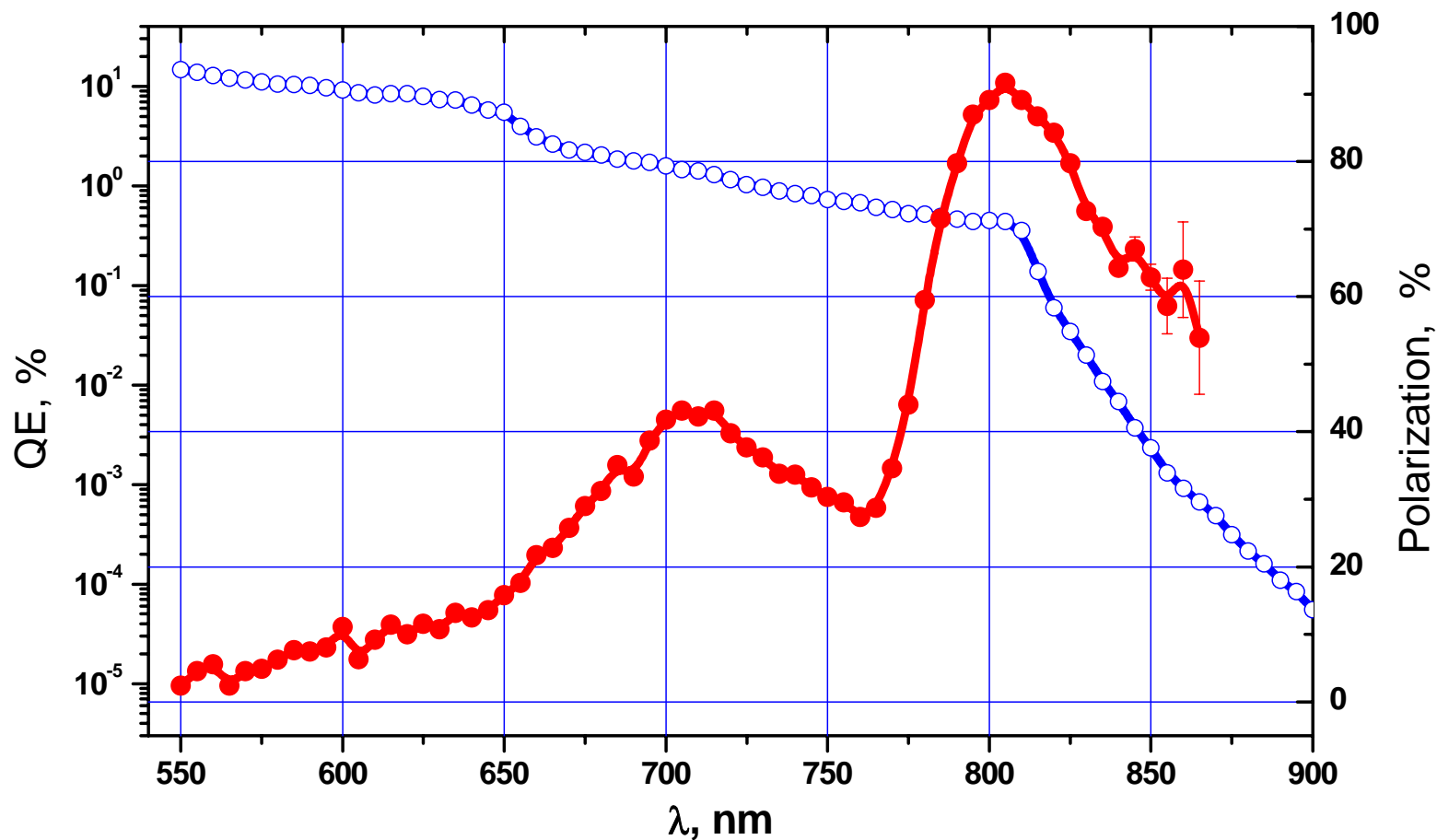
AlInGaAs/AlGaAs strained-well SL

- Maximum VB splitting
- Maybe less problem with surface charge limit
- At SPIN06, noted by Mamaev in presentation to be the best prospect, but not discussed in any detail in the contributed paper
- Xmas '06 (7-307): $P_e=91.5\%$, $QE=0.85\%$ @ 830 nm

SL $\text{In}_{0.155}\text{Al}_{0.2}\text{Ga}_{0.645}\text{As}(5.1\text{nm})/\text{Al}_{0.36}\text{Ga}_{0.64}\text{As}(2.3\text{nm})$, 4 pairs

—○— QE

—●— Polarization

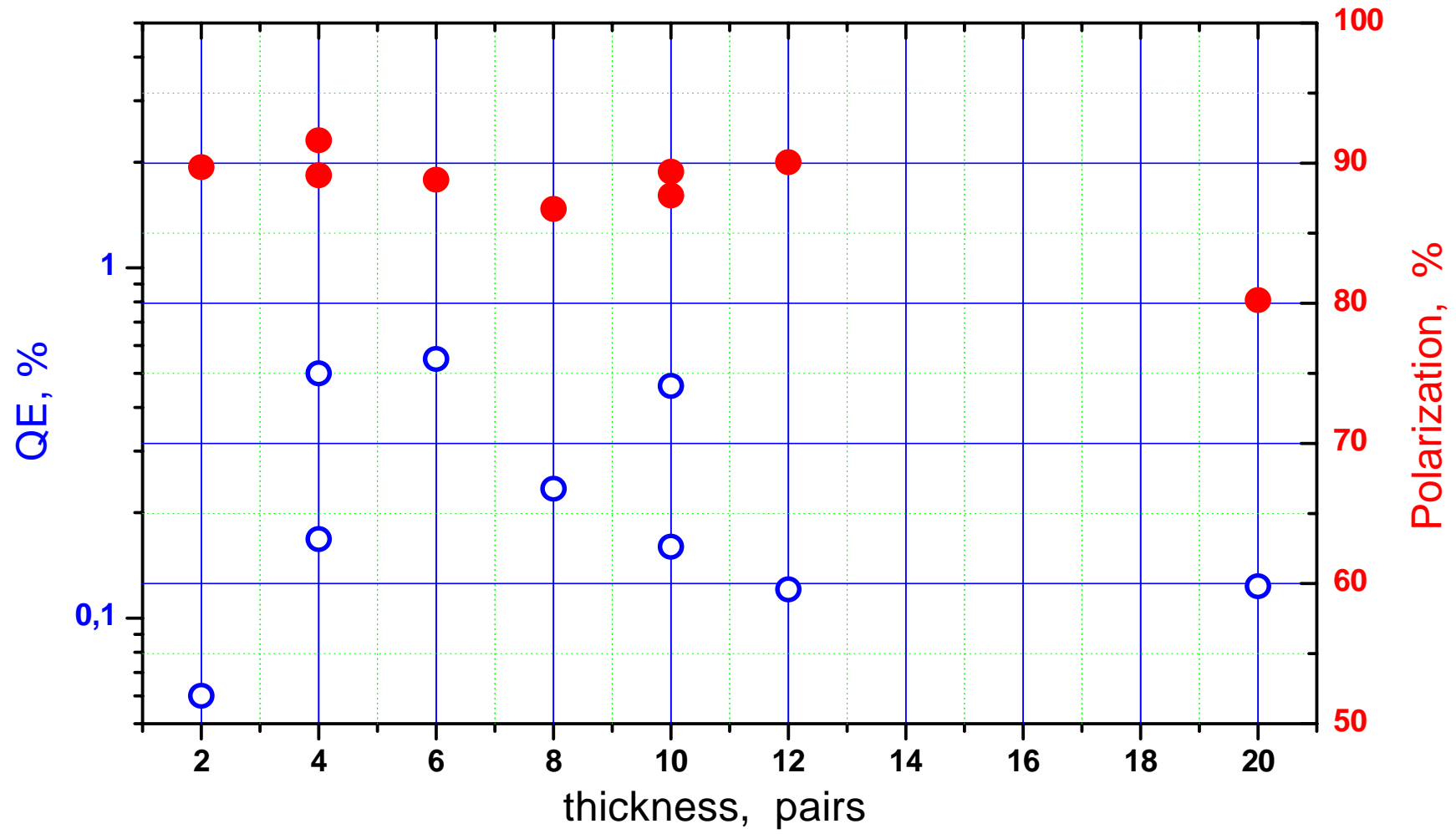


Spectra of electron emission: Polarization **P** and Quantum Efficiency **QE**

SL $\text{In}_{0.155}\text{Al}_{0.2}\text{Ga}_{0.645}\text{As}(5.1\text{nm})/\text{Al}_{0.36}\text{Ga}_{0.64}\text{As}(2.3\text{nm})$

○ QE

● P

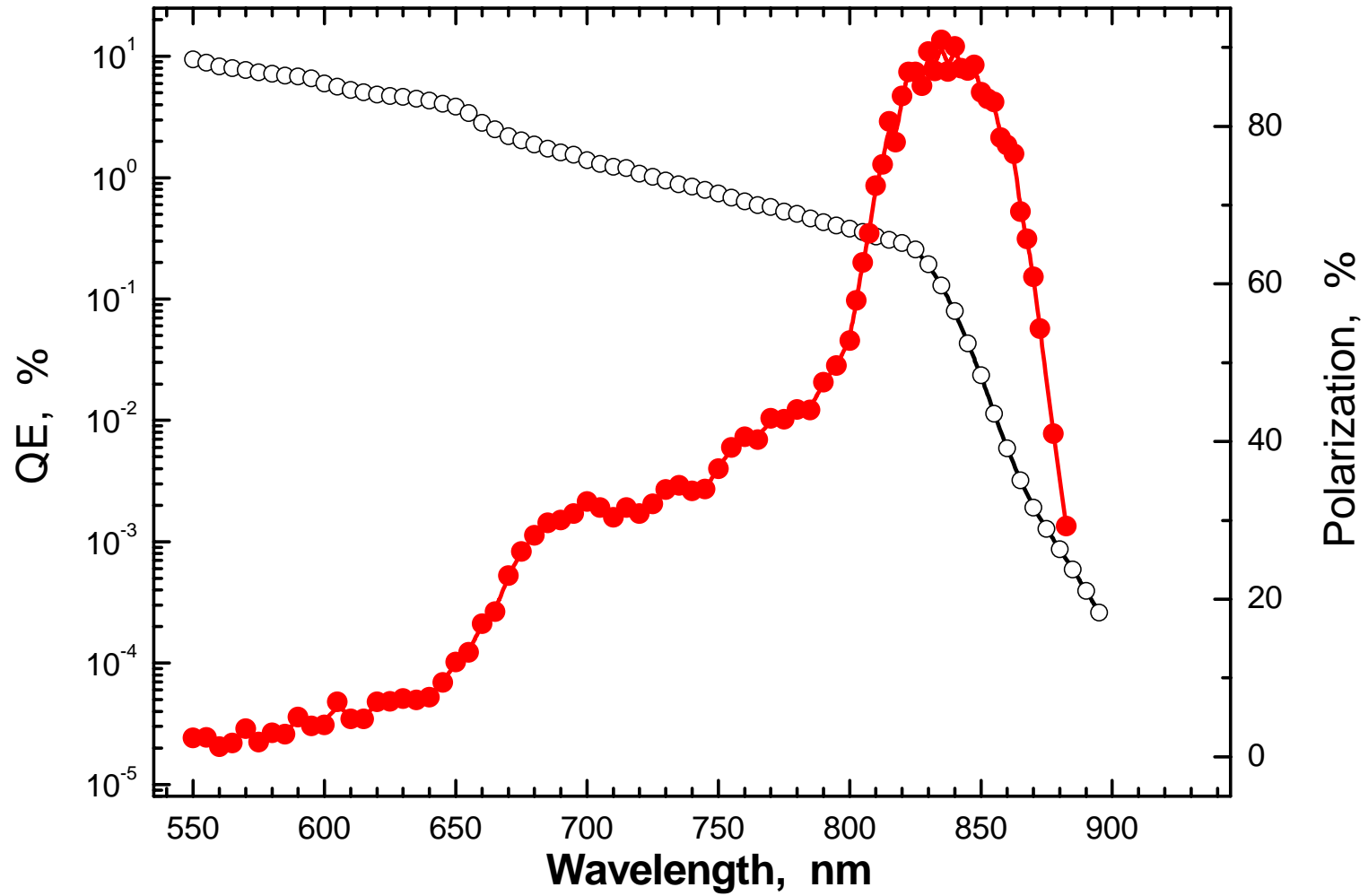


AllnGaAs/GaAs strained-barrier with minimal CB offset

- High vertical e- mobility and low spin relaxation rate
- Problem with surface charge limit?

- PESP04: $P_e=91\%$, $QE=0.3\%$ @ ~ 827 nm (HC at 450°C)
- SPIN06: $P_e=91\%$, $QE=0.5\%$

**18.5 periods of SL: In_{0.2}Al_{0.23}Ga_{0.67}As (4nm)/Ga As(1.5nm);
Room temperature**



In_xAl_yGa_{1-x-y}As/GaAs SLs

Barrier heights: for electrons $U_c = E_{c2} - E_{c1}$, heavy holes $U_{hh} = E_{vh2} - E_{vh1}$ and light holes $U_{lh} = E_{vl2} - E_{vl1}$. Negative values of U_c imply that, for electrons, the GaAs layer is a barrier and the In_xAl_yGa_{1-x-y}As layer is a well. The splitting energy $\Delta E_{hh-lh} = E_{hh1} - E_{lh1}$. The band gap of the superlattice $E_g = E_{e1} - E_{hh1}$. B is the emission probability

##	x	y	Thickness		U_c	U_{hh}	U_{lh}	ΔE_{hh-lh}	E_g	ϵ_{max}	P_{max}	QE @ ϵ_{max}	B
			a Quantum well	b barrier									
	In	Al	angstr	angstr	meV	meV	meV	meV	eV	eV	%	%	
5-777	20	23	15	36	-3	79	157	60	1.471	1.485	91	0.14	0.028
6-296	20	22	15	40	-43	52	128	59	1.426	1.432	86	0.05	0.014
6-330	25	27	11	40	-8	90	180	77	1.482	1.494	88	0.57	0.089
6-405	26	31	11.3	30	19	111	202	76	1.51	1.521	89	0.5	0.11
6-444	26	37	11.3	30	73	145	236	79	1.569	1.6	84	0.65	0.13

Goals for growth

- Reduce γ and δ by minimizing fluctuations of the heterolayer composition
- Precise modulation doping
- With which structure do the loffe people believe they can do the best growth job?

Testing at SLAC

- Effect of low temperature heat cleaning on P_e
 - Using As cap
 - Using AHC (restore to CTS)
- Surface charge limit