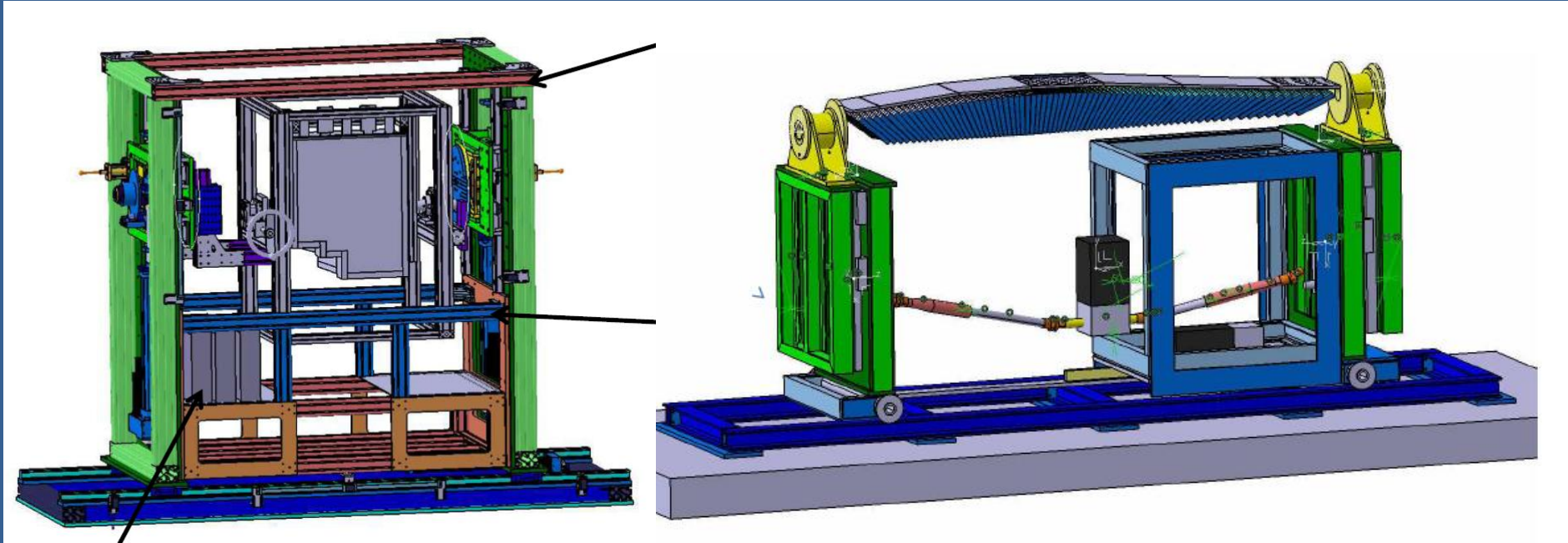


- **Status on PROTO 120**
 - assembly session @GI end of April



- **Mounting tools in D**
- **Alveoli on the way to CERN ?**
- **detector mechanics from Orsay in April**
- **design of gluing set-up, APD gluing @CERN**
- **APDs mostly ready**
- **PC boards and ASICs to be completed**

- **delayed test run of PROTO60 @ ELSA**
- **limited support from GSI (electronics)**
 - **final design for Barrel?**
- **no concept for contracts for the missing crystals, competition?**
- **problems with APD (complete funding)**
 - **delay in VPTT-preproduction**
- **updated Risk-sheets**

PWO-Crystal production for the years 2015

Risk name	PWO-Crystal production for the years 2015
Risk description and cause	Due to the bankruptcy of the Russian crystal producer BTCP and the presently still missing funding 8358 crystals of all geometries are missing for the Barrel. The start of the assembly of the 16 slices requires an equal quantity of all 22 shapes.
Risk Identifier	FD-04-EXP-015
Risk Category	P-EXP-PANDA
Risk impact	Considering SICCAS(Shanghai, China) as manufacturer, the assembly of the EMC-Barrel is extremely delayed. Including 6 months of a pre-production phase, the complete production including quality control will require at least 3 years starting with a signed contract.
max. potential damage	moderate (mo) The assembly of the EMC-Barrel is extremely delayed. Therefore, an partial installation at the test facility at Jülich appears impossible. With respect to the complete installation of the Target Spectrometer at FAIR, the Barrel section has to be in place for the mechanical support of the inner tracking detectors.
Entry probability	possible (po) <30 %
REV	5
Mitigating Actions	A subset of prototype detectors from SICCAS was delivered and tested (report in preparation). As an important result, SICCAS can be considered as capable producer.
Validity and effectiveness of the mitigating action(s) and expected results	SICCAS is a highly specified manufacturer, in full operation and has experience with large-scale crystal production. Based on the recently tested full-size crystals, more than 80% of the samples fulfill the quality limits defined for the PANDA-EMC. In a first step, there is immediate need for funding to start the pre-production phase.
Directors, Project Lead, Subproject Leader Review	PANDA -EMC
Risk Owner	For the PANDA Collaboration: R.W. Novotny

3.5.1. Large Area Avalanche Photo Diodes (LAAPD) price increase and slow delivery

Risk name	LAAPD price increase, missing funding and limited delivery
Risk description and cause	The development of a new version of large area avalanche photo diodes (LAAPD) in collaboration with the company Hamamatsu has been completed. The quality also with respect to radiation hardness meets the requirements and is ready for mass production. However, there is an increase of the price due to exchange rate fluctuations. In addition, there are problems with the production yield of the manufacturer and the verification of the present performance due to minor changes in the production line.
Risk Identifier	FD-04-EXP-016
Risk Category	P-EXP-PANDA
Risk impact	The ~ 30.000 LAAPDs can be manufactured with a maximum rate up to 1000 samples per month. There is a starting period after signing the contract. Due to the high performance limits all diodes have to be characterized at room and operating temperature of -25°C . In addition, all have to be irradiated with a high dose of gamma rays to ensure the radiation hardness. The whole procedure will take at least 3 years from the start of delivery. Since the LAAPDs have to be sorted, a large quantity is necessary before detector assembly.
max. potential damage	moderate (mo) The assembly of the EMC barrel and parts of both endcaps will be extremely delayed.
Entry probability	possible (po)
REV	5
Mitigating Actions	Presently, depending on the final price, about 40% of the needed sensors are financed today. To reduce the overall costs and to fix the timelines, funding for the remaining part is needed to sign the overall contract.
Validity and effectiveness of the mitigating action(s) and expected results	Due to the limited production and testing rate, the availability of LAAPDs in larger quantities is crucial for the assembly of the Barrel-EMC. The production of LAAPDs as well as of the PWO-crystals is closely linked to guarantee the requested timeline for the Target Spectrometer in total.
Directors, Project Lead, Subproject Leader Review	PANDA -EMC
Risk Owner	For the PANDA Collaboration: R.W. Novotny

Parameter	Unit	Limit
light yield LY measured at T=18°C, polished crystal	phe/ MeV	16.0
LY(100ns)/LY(1μs) light yield integrated over 100ns and 1μs		> 0.9
optical transmission T @ 360nm	%	≥ 35
optical transmission T @ 420nm	%	≥ 60
optical transmission T @ 620nm	%	≥ 70
homogeneity Δλ @ T=50%	nm	≤ 3.0
induced absorption coefficient Δk measured at RT, integral dose: 30Gy	m⁻¹	1.0
mean value of Δk determined for each lot of delivery	m⁻¹	<0.75

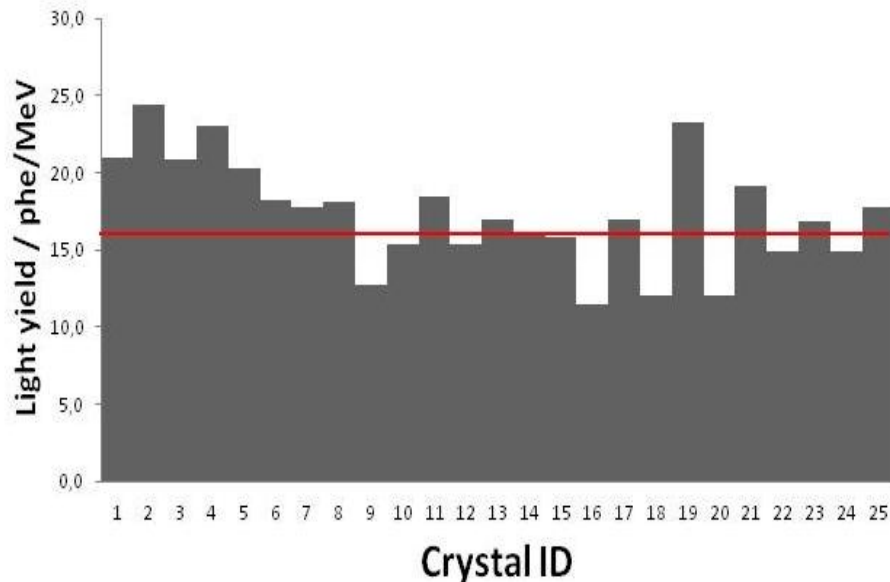
**PANDA-EMC requirements (BTCP contract,
Czochralsky-technique)**

Quality tests of 25 PWO crystals from SICCAS

delivery: September 2012 (5)
December 2012 (20)

• Light yield

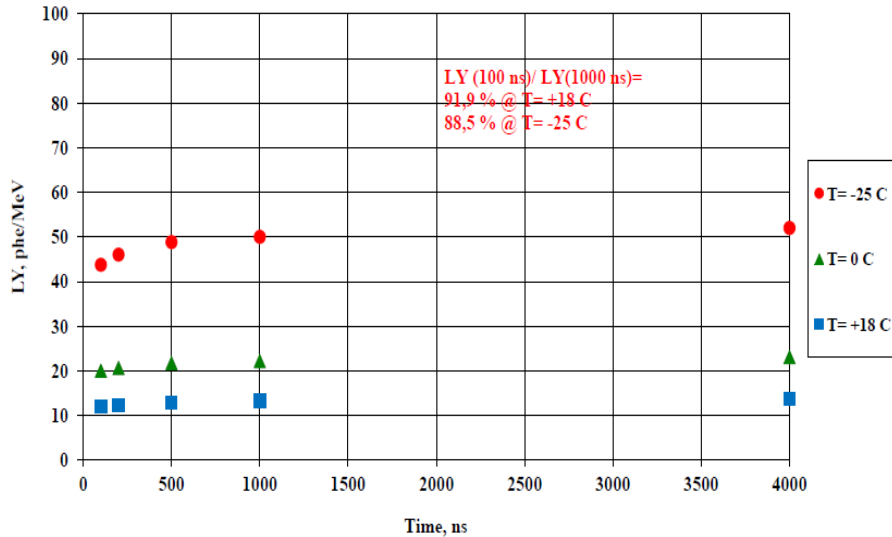
Light yield at T=+18C



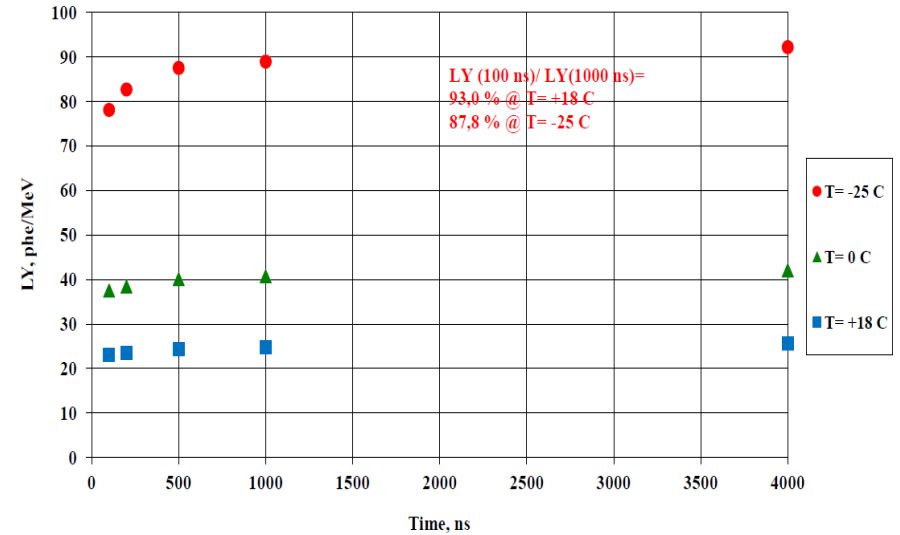
ID	crystal ID (SICCAS)	LY(+18 C) phe/MeV	LY(100ns)/LY1000ns %
1	120901	21,0	93,7
2	120902	24,4	93,4
3	120903	20,9	92,9
4	120904	23,0	93,0
5	120905	20,3	92,8
6	120906	18,2	91,7
7	120907	17,8	90,9
8	120908	18,1	90,1
9	120909	12,7	91,3
10	120910	15,3	89,2
11	120911	18,5	92,0
12	120912	15,4	90,3
13	120913	17,0	92,4
14	120914	16,0	90,5
15	120915	15,8	91,9
16	120916	11,5	90,3
17	120917	16,9	91,5
18	120918	12,0	90,4
19	120919	23,2	91,4
20	120920	12,0	90,5
21	120921	19,1	90,6
22	120922	14,9	89,6
23	120923	16,8	91,2
24	120924	14,9	90,7
25	120925	17,7	91,7

• Light yield: temperature dependence

SICCAS 120920



SICCAS 120904



	I(100ns)/I(1μs) +18 deg	I(100ns)/I(4μs) +18 deg	I(100ns)/I(1μs) -25 deg
mean	91,0	88,0	88,3
Max	93,4	94,1	89,9
Min	89,2	85,8	86,8
mean (accepted)	91,0	87,7	88,3
mean (rejected)	91,2	88,5	88,4

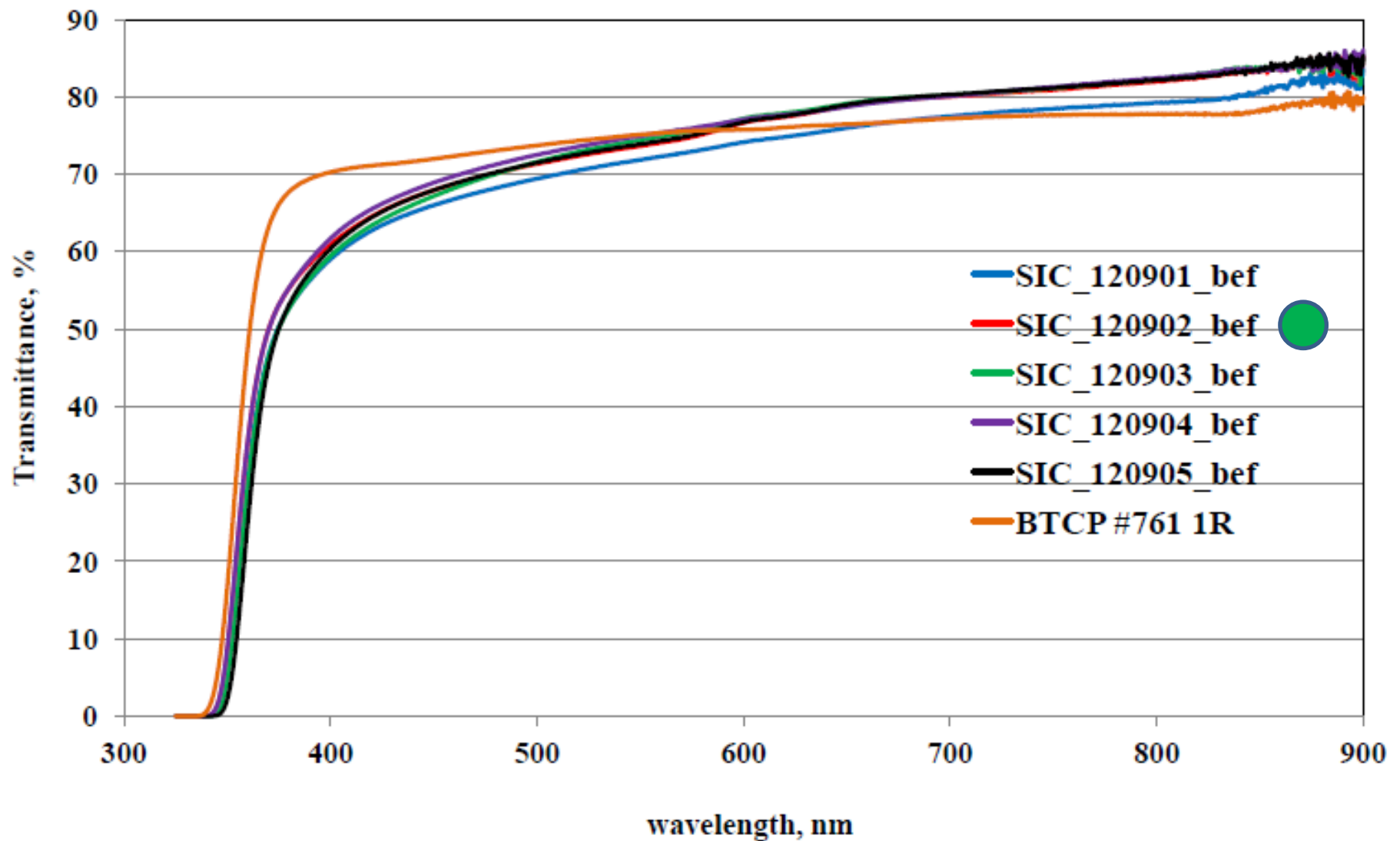
- optical quality

brownish coloring
bubbles

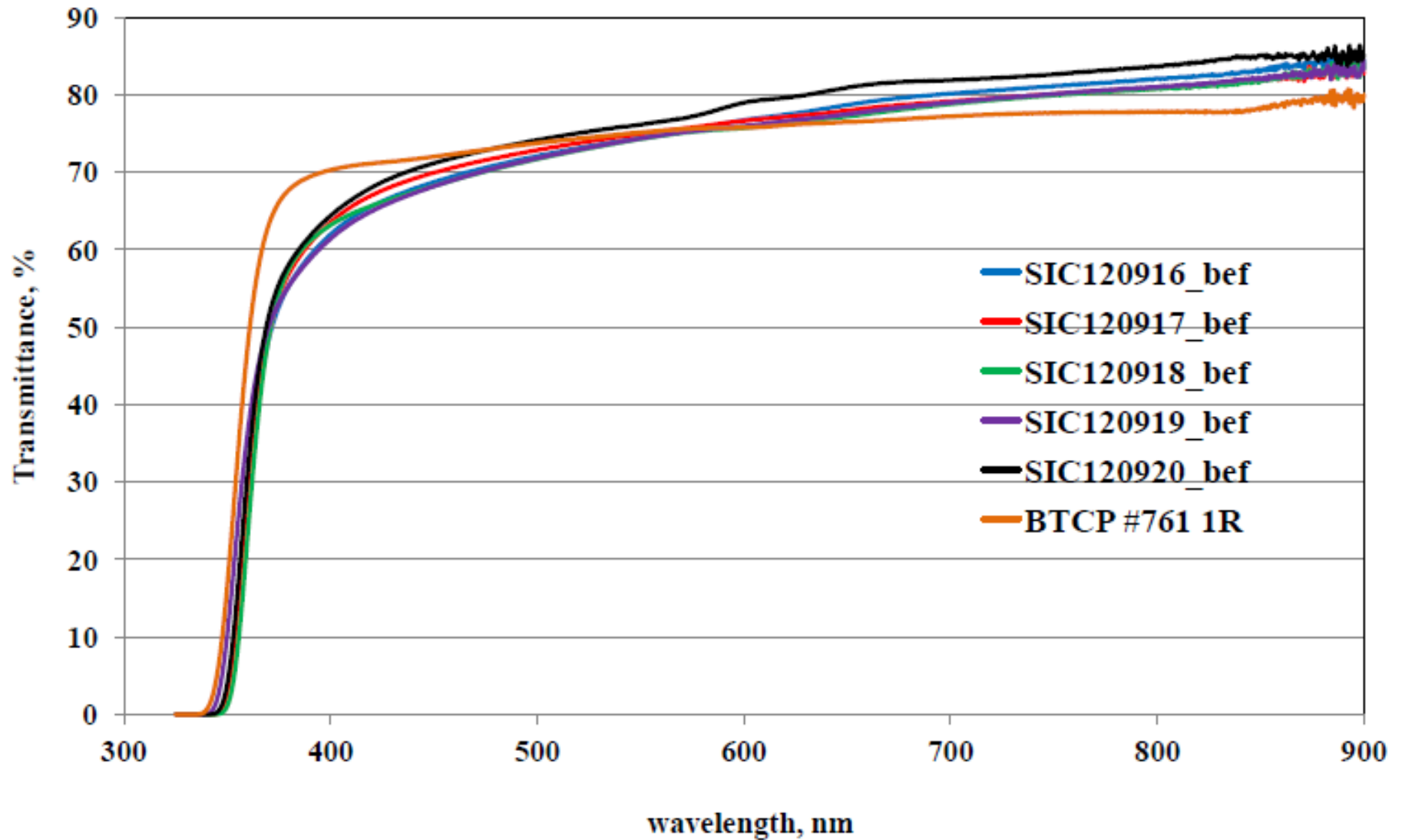
3 samples
1 sample

120901	11R	2012	30,8	62,7	74,8
120902	11R	2012	35,7	64,6	77,4
120903	11R	2012	29,9	63,4	77,9
120904	11R	2012	35,7	65,5	77,7
120905	11R	2012	25,3	64,4	77,5
120906	11R	2012	31,5	65,4	79,0
120907	11R	2012	27,1	69,0	81,2
120908	11R	2012	30,2	66,4	79,6
120909 (bubbles)	11R	2012	20,0	55,5	72,6
120910	11R	2012	31,0	70,3	82,3
120911	11R	2012	30,0	66,1	79,1
120912	11R	2012	25,3	68,0	80,8
120913	11R	2012	27,4	67,1	80,2
120914	11R	2012	29,6	67,5	78,5
120915	11R	2012	34,9	65,2	77,3
120916 (brownish)	11R	2012	29,2	65,6	77,4
120917	11R	2012	26,9	67,1	77,1
120918 (brownish)	11R	2012	23,7	65,7	76,3
120919	11R	2012	36,8	65,0	76,6
120920 (brownish)	11R	2012	31,8	68,0	79,6
120921	11R	2012	34,1	66,4	79,7
120922	11R	2012	27,9	66,4	78,6
120923	11R	2012	28,1	68,7	80,3
120924	11R	2012	21,5	68,3	78,4
120925	11R	2012	27,5	69,9	80,6

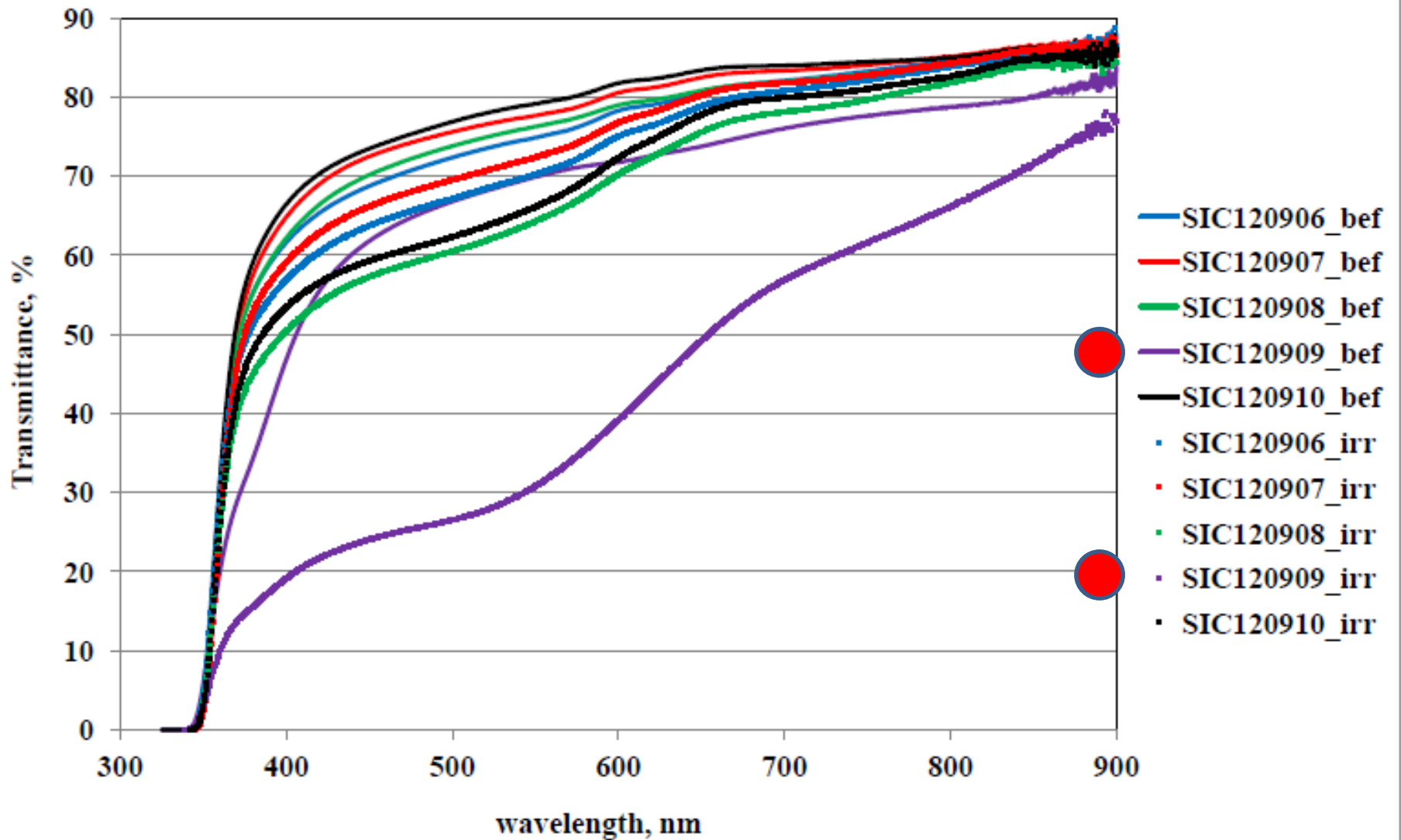
Transmittance spectra before irradiation



Transmittance spectra before irradiation



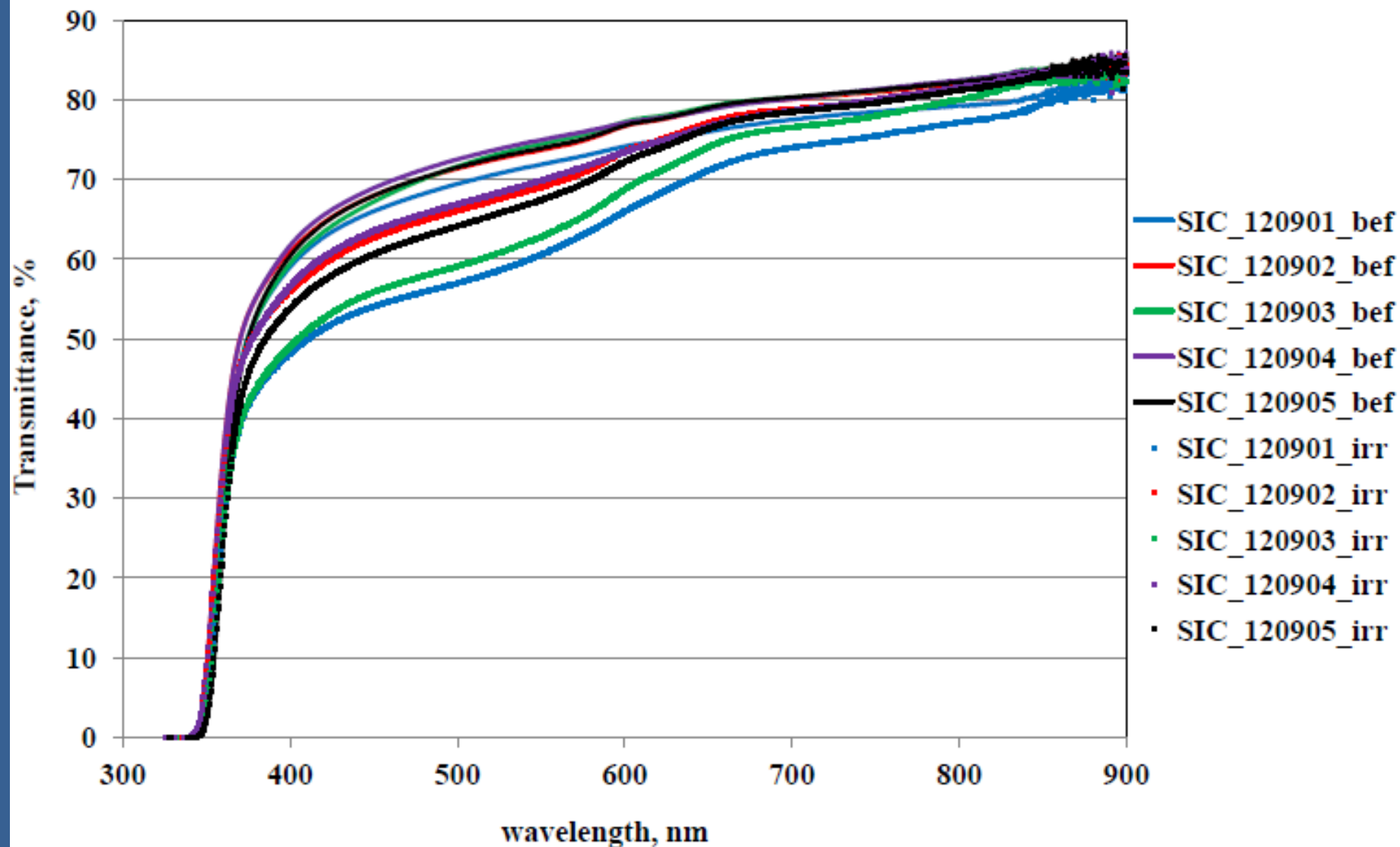
Transmittance spectra



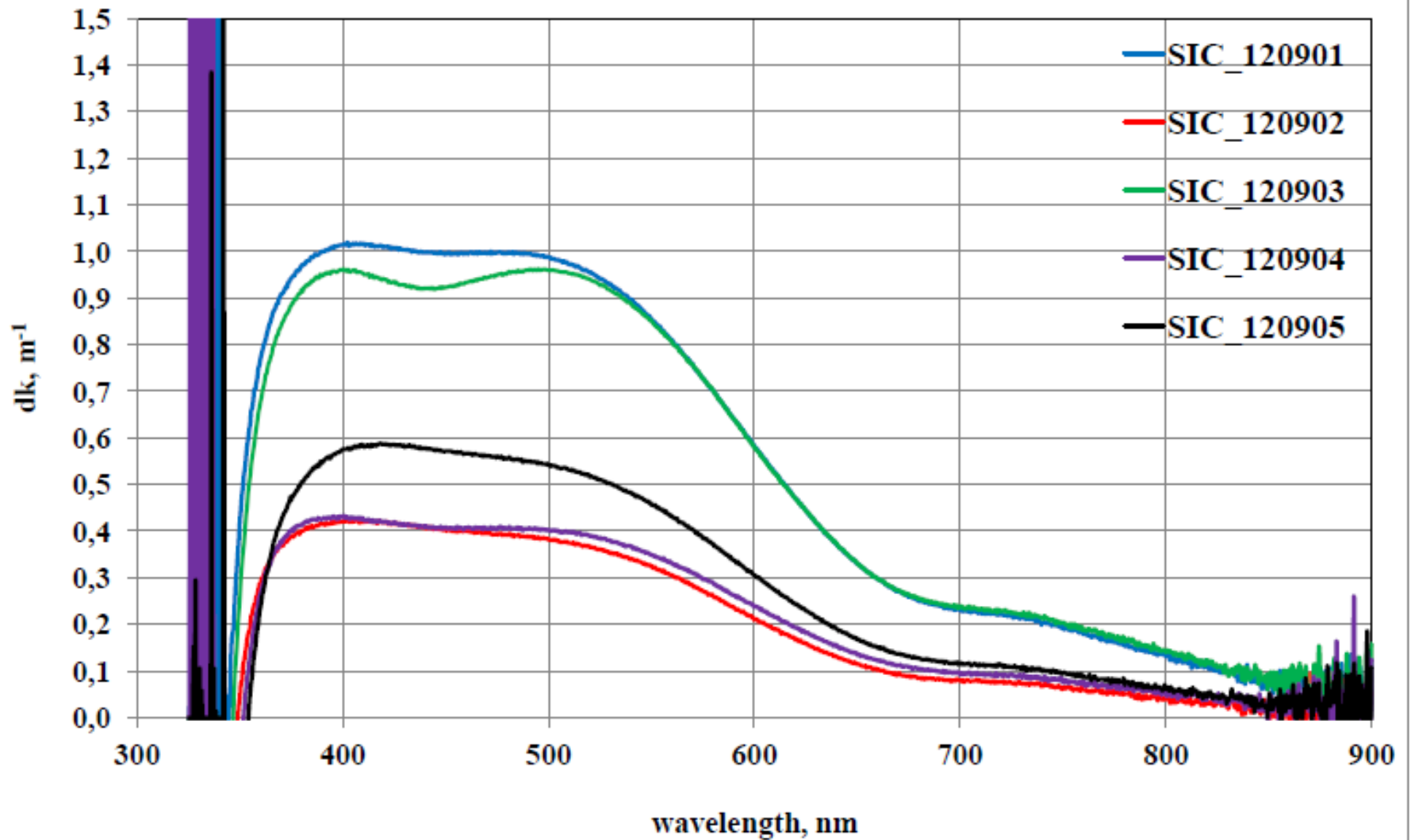
- radiation hardness (^{60}Co , 30Gy, RT)

120901	11R	2012	1,01
120902	11R	2012	0,42
120903	11R	2012	0,94
120904	11R	2012	0,42
120905	11R	2012	0,59
120906	11R	2012	0,39
120907	11R	2012	0,47
120908	11R	2012	1,04
120909 (bubbles)	11R	2012	4,70
120910	11R	2012	1,09
120911	11R	2012	0,63
120912	11R	2012	0,68
120913	11R	2012	0,81
120914	11R	2012	0,65
120915	11R	2012	0,77
120916 (brownish)	11R	2012	1,25
120917	11R	2012	0,53
120918 (brownish)	11R	2012	0,79
120919	11R	2012	0,63
120920 (brownish)	11R	2012	1,16
120921	11R	2012	0,70
120922	11R	2012	0,62
120923	11R	2012	0,67
120924	11R	2012	0,62
120925	11R	2012	0,64

Transmittance spectra



Radiation induced absorption coefficient.



Conclusions:

- **optical transparency not fully comparable to BTCP: technology**
but: sufficient LY (even Type 11)
- **light yield: sufficient, if *good* crystals**
slow components slightly stronger
better selection of raw material
- **radiation hardness no problem for clean crystals**
- **for completeness: test with ACCOS**
- **considerable manufacturer**