Subject: Re: REMINDER: Tue 1/7 9-11am PT, review of the PSL outer-loop ISS"
From: Benno Willke <benno.willke@aei.mpg.de>
Date: 1/16/2014 9:27 AM
To: Peter Fritschel <pf@ligo.mit.edu>
CC: Rich Abbott <abbott@ligo.caltech.edu>, Dennis Coyne <coyne@ligo.caltech.edu>, Eric Gustafson <egustafs@ligo.caltech.edu>, Peter King <pking@ligo.caltech.edu>, Rick Savage <richard.savage@ligo.org>, Daniel Sigg <sigg_d@ligo.caltech.edu>, Calum Torrie <torrie_c@ligo.caltech.edu>, Valery Frolov <vfrolov@ligo-la.caltech.edu>, Jan Hendrik Poeld <Jan.Poeld@aei.mpg.de>

Hi,
as promised I have asked Patrick Kwee for the Optocad design file of the ISS photodiode array. He used a well collimated input beam and in that case the difference in beam diameter on the 4 photodiodes in one bank was less than 20%.
I had to learn Optocad to modify the incoming beam and make it similar to the one used in aLIGO. The attached file shows the Optocad plot. The photodiodes are in the plane indicated by the black line no13. The purple and green flag indicate where the beam waist in sagittal and tangential plane would be. From the text output one can infer:
- The difference in optical path towards the diodes of one bank can be seen in collum tpp below. The maximum difference is 25mm.
- The difference in beam radius on the diodes in the sagittal plane is small (colum w1s): less than 8um
- I was very surprised to see a strong difference in the waist positions in sagittal and tangential plane for some beams. This effect is strongest on PD2. The difference in beam radius on PD2 are 270um vs 681um (including the sqrt(2) effect due to the angle of incidence on the diode).

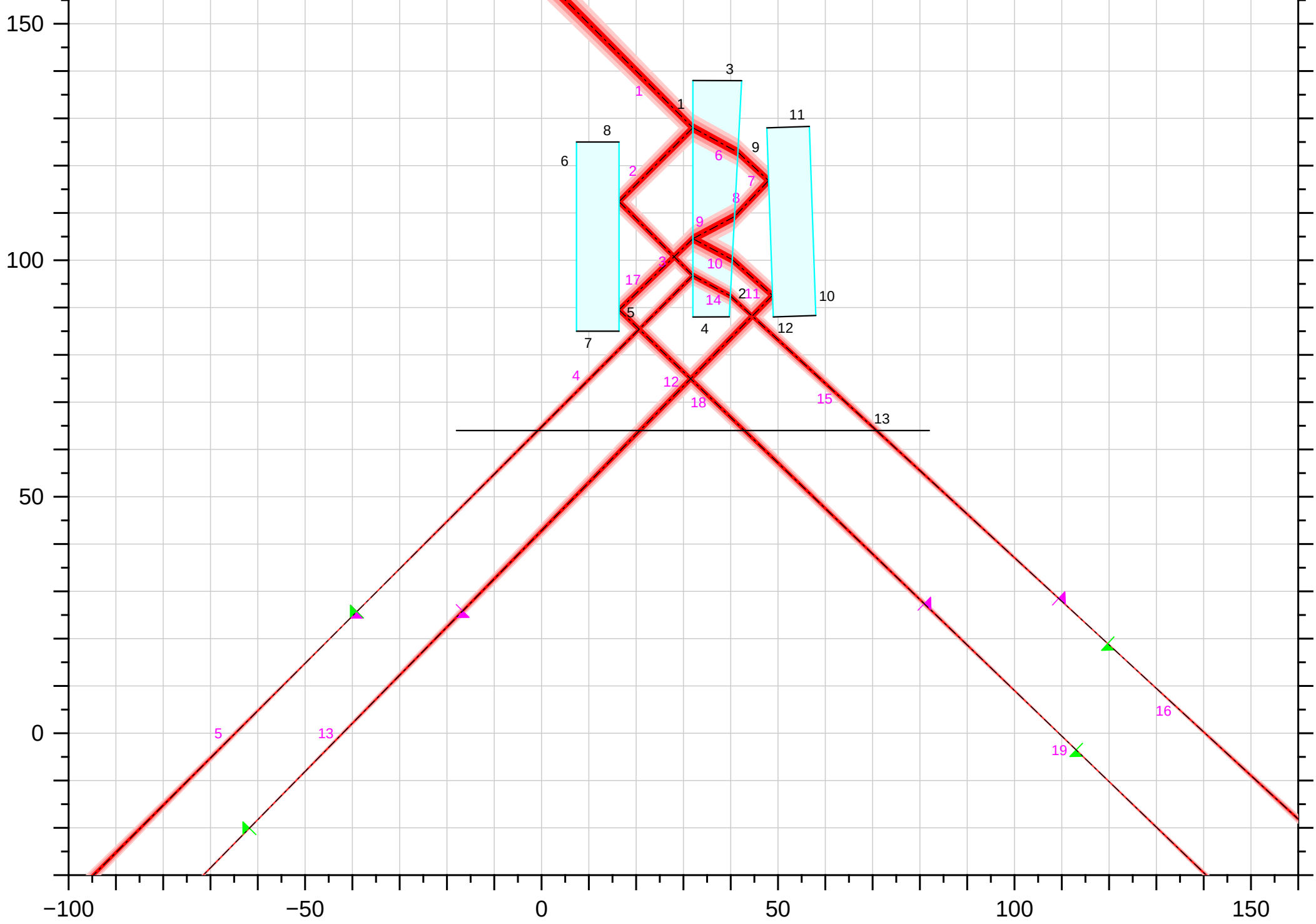
I'm new to Optocad. So someone should check these numbers. If they are true we need to take the factor of three in account when talking about pointing-RIN coupling via clipping at the PD edge.

Benno

PD		accumulated path to PD	distance PD-waist (sagittal)	distance PD-waist (tangential)	beam radius (sagittal) on PD	beam radius (tangential) on PD	w1t*sqrt(2)
	beam segment	tpp[mm]	z1s[mm]	z1t[mm]	w1s[mm]	w1t[mm]	
1	4	135.8E+0					
1	5		-54.24E+0	-54.24E+0	272.6E-3	2,73E-01	0,38551462
2	12	160.7E+0					
2	13		-53.57E+0	-117.9E+0	269.5E-3	4,82E-01	0,68150952
4	15	144.8E+0					
4	16		-52.48E+0	-66.60E+0	264.4E-3	3,14E-01	0,44420448
3	18	153.8E+0					
3	19		-52.89E+0	-97.47E+0	266.3E-3	4,22E-01	0,59679812

Attachments:

PDARRAY_aLIGO.pdf 10.1 KB



bewill, 16 Jan 2014, PDARRAY.ps