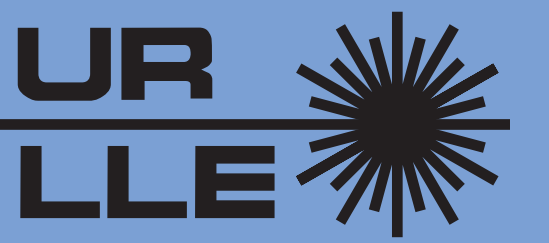


OMEGA EP Short-Pulse Ratiometer



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Summary

A diagnostic has been developed to characterize transmission losses in the OMEGA EP short-pulse transport paths

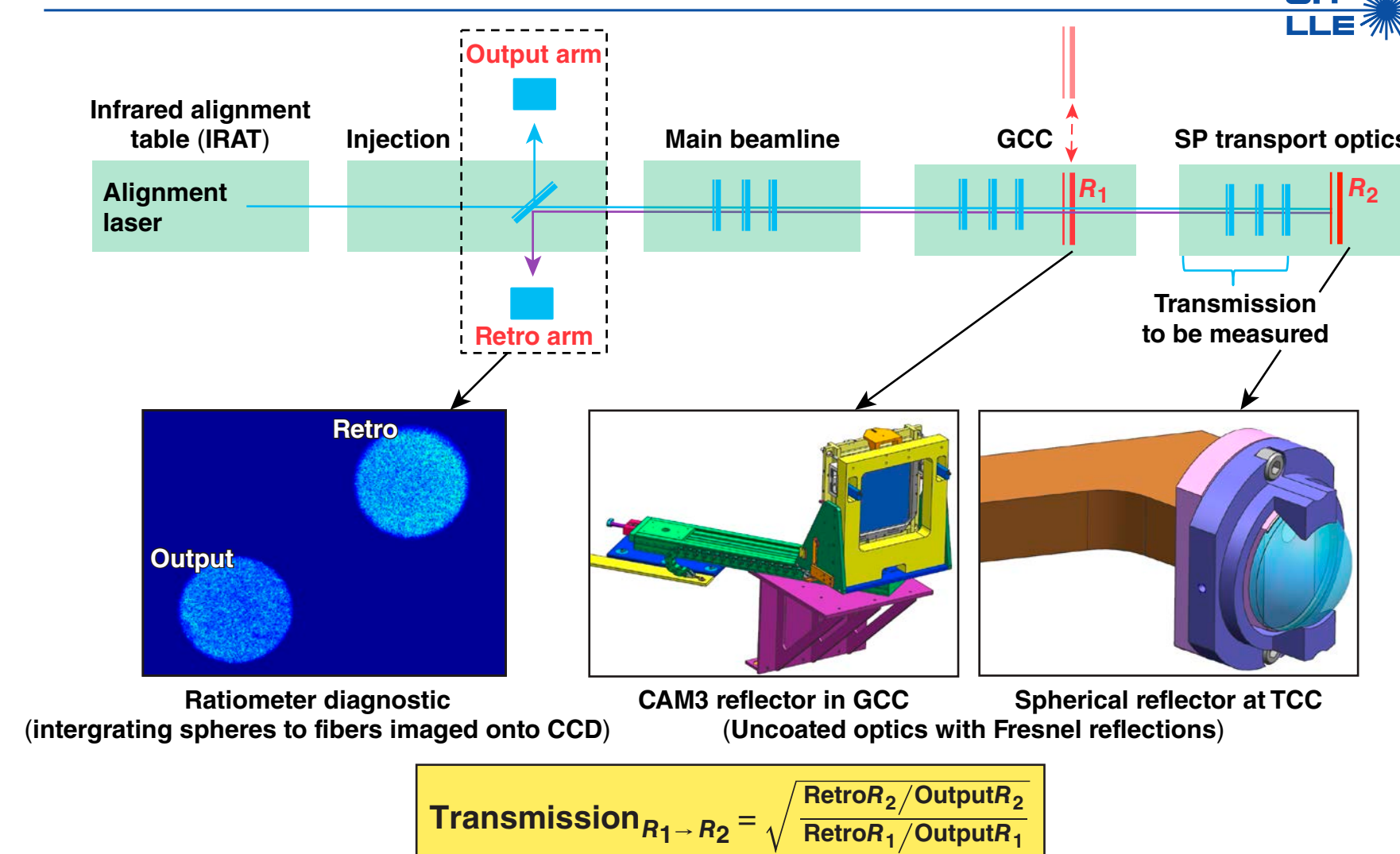


- As a result of pickoff location, on-shot energy diagnostics cannot measure losses from damage or target debris in the final transport mirrors and the off-axis parabolas (OAP's)
- The short-pulse ratiometer diagnostic was designed to provide accurate measurement and tracking of transmission performance through the final optics
- This diagnostic provides more-accurate on-target energy reports and for a more-deterministic method of specifying disposable debris shield usage

Transmission measurements are now acquired before and after all short-pulse target shot days.

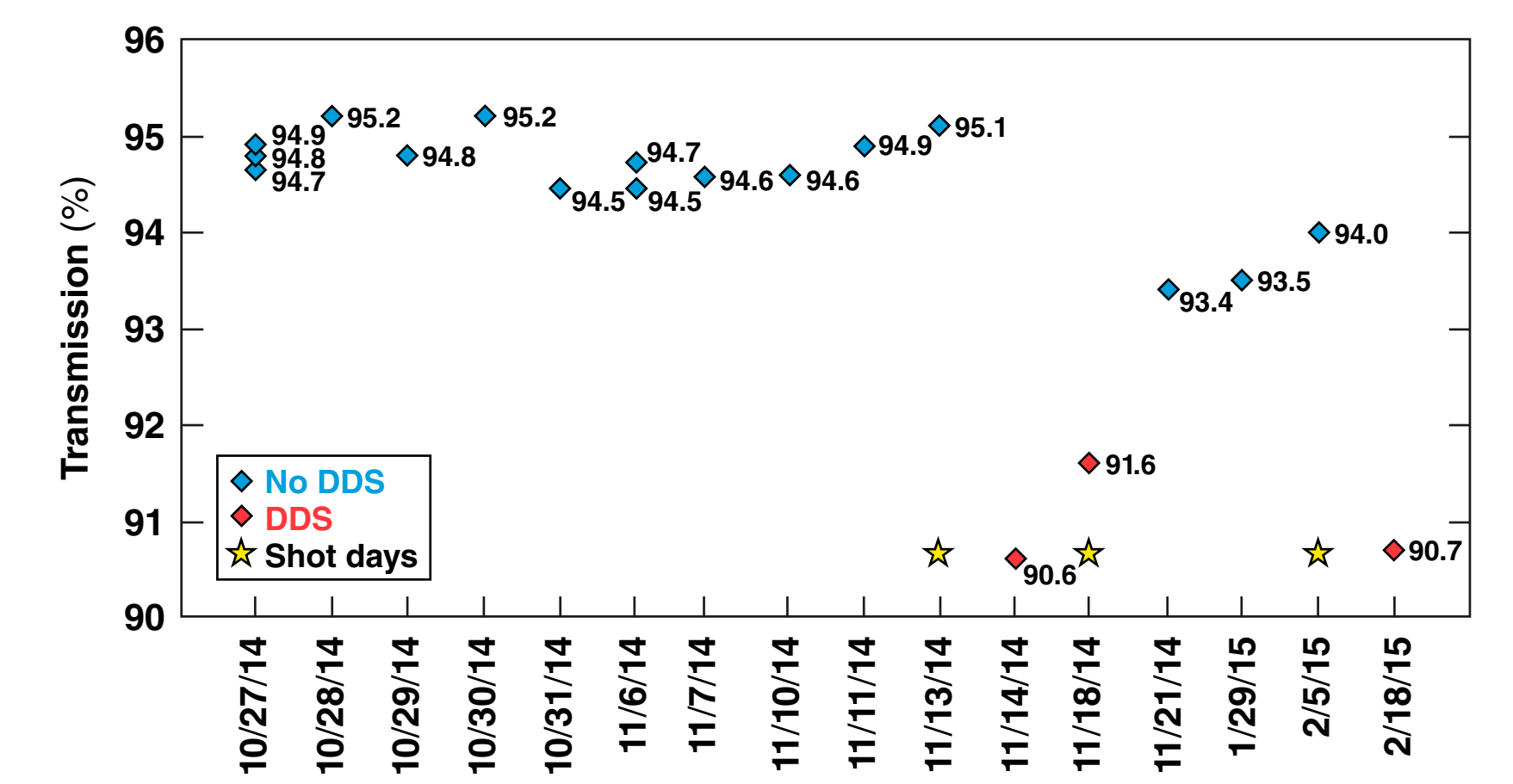
E23891a

A ratiometer technique has been implemented to characterize transmission through the final OMEGA EP short-pulse optics



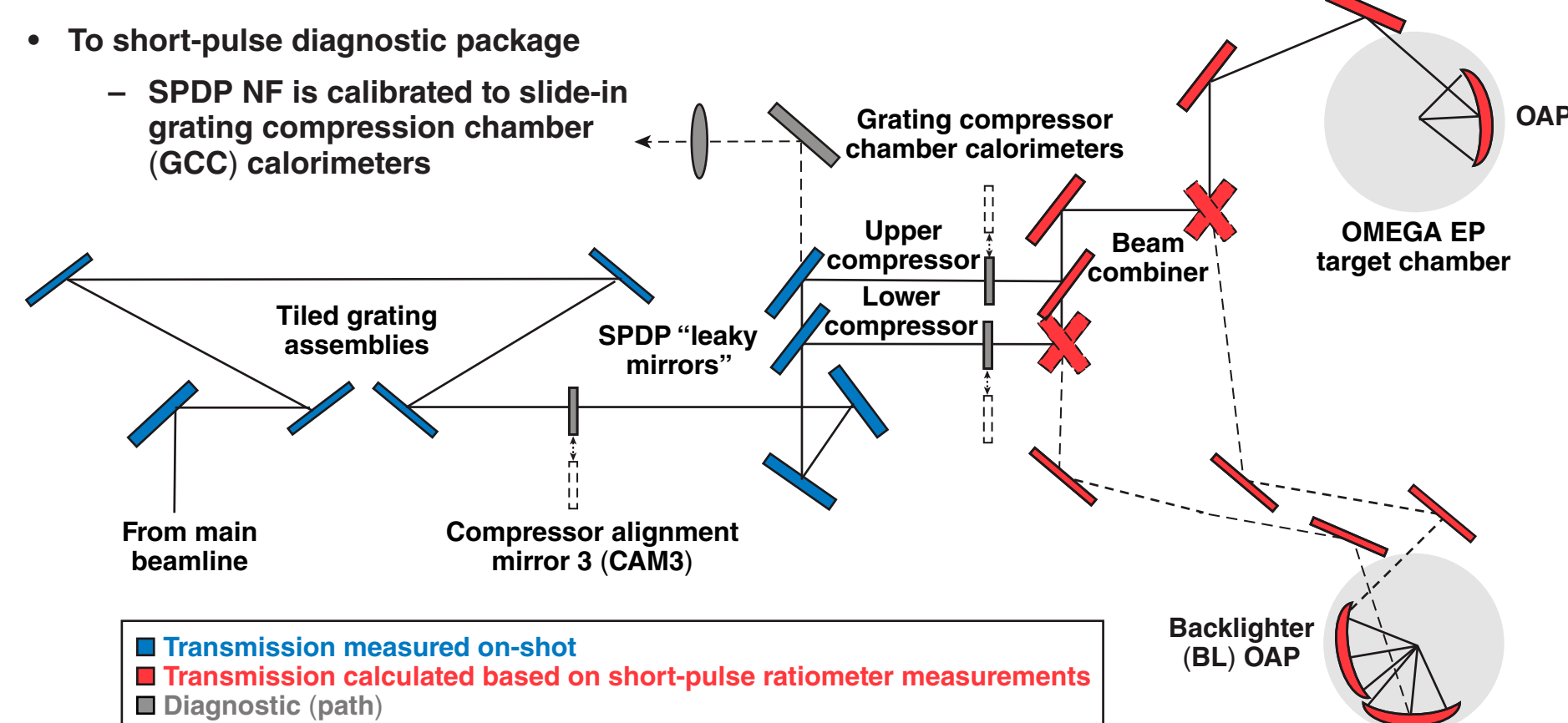
E23894c

OMEGA EP sidelighter measurements



E23897a

Reported on-target energy is determined by the short-pulse diagnostic package near-field (SPDP NF) charge-coupled device (CCD)



E23892a

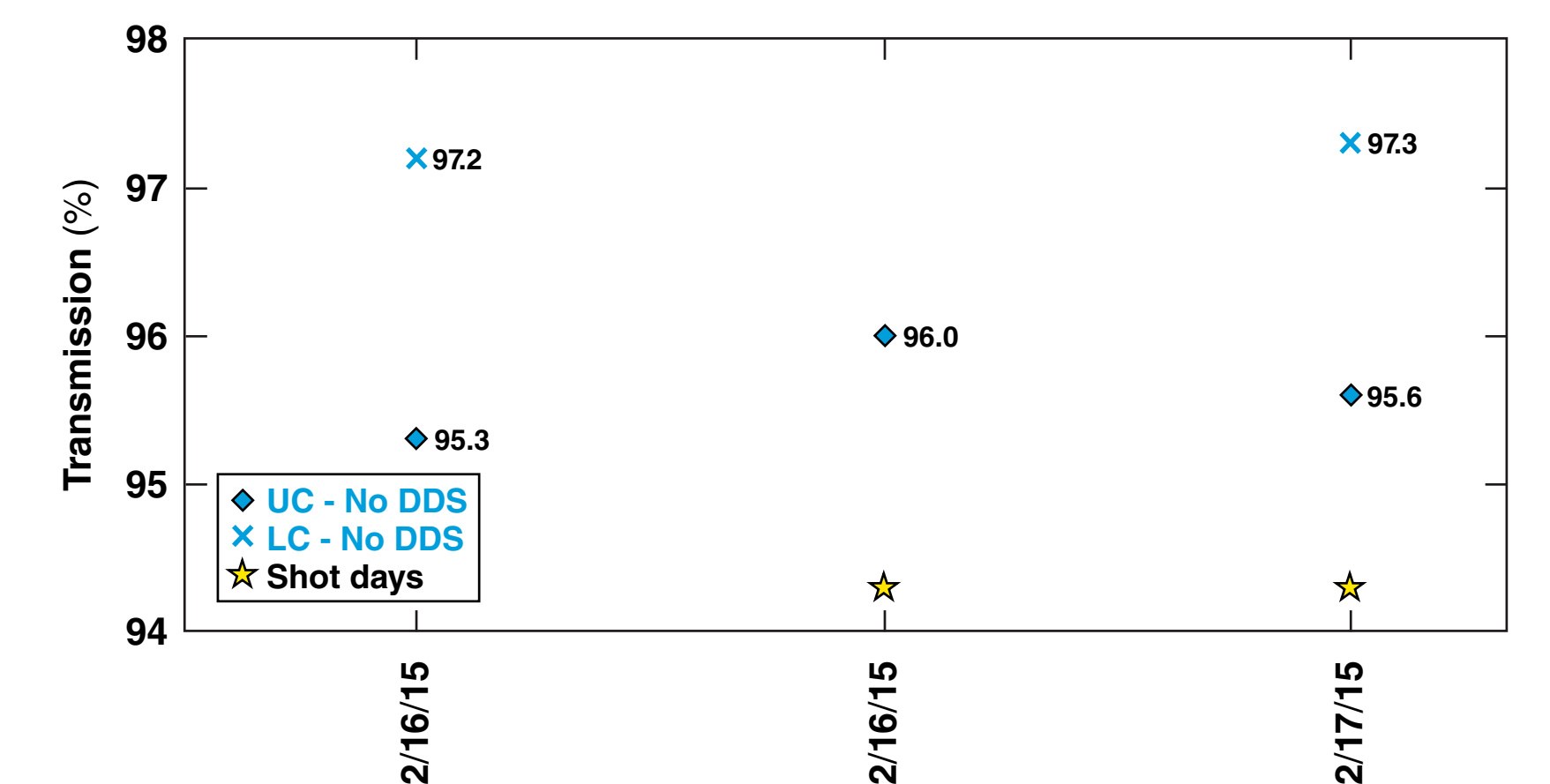
Short-pulse ratiometer measurements are now acquired for all target campaigns



- Initial measurements are acquired in advance of shots as part of short-pulse transport and focusing process
- Measurements are taken after all target shot days – process takes ~45 min after conclusion of shots
- Additional measurements required before and after disposable debris shield (DDS) installation/removal

E23895a

OMEGA EP to OMEGA (joint shot) measurements



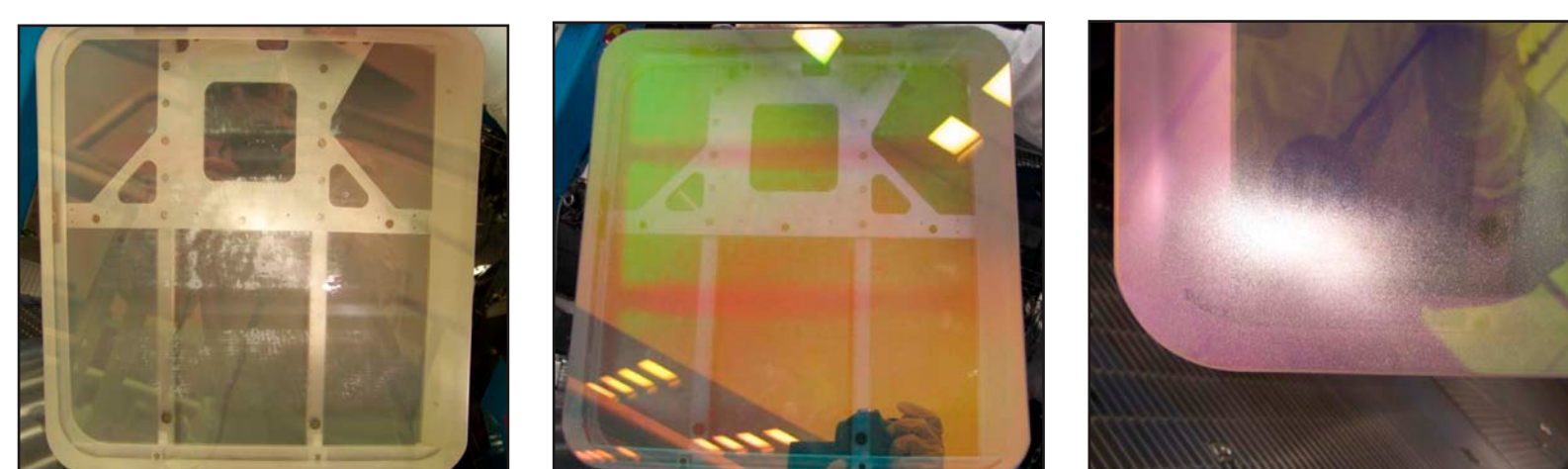
E23898a

Laser damage and target debris can significantly impact transmission of the final optics



- This is of particular concern on the OAP's because of their close proximity to target chamber center (TCC)

Images of off-axis parabolas in use on OMEGA EP



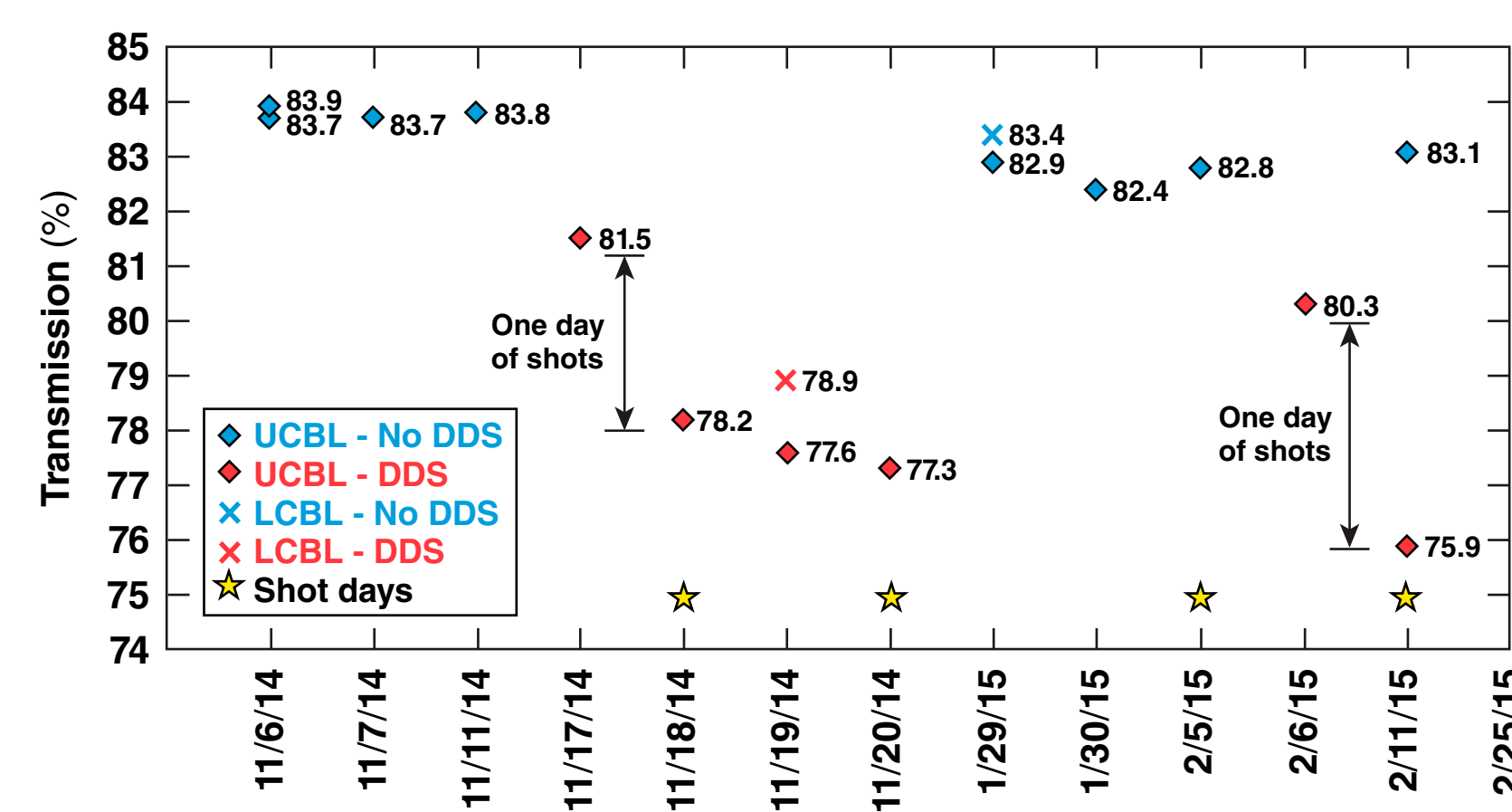
Laser damage to coating

Imprint from "laser-cleaning" effect

Contamination from target shot debris

E23893a

OMEGA EP backlighter measurements



E23896a

UCBL: upper-compressor backlighter
LCBL: lower-compressor backlighter

Transmission data is now used to provide more-accurate on-target energy estimates and assess campaign impact on short-pulse optics



- Transmission data are stored in shot database tables
- Results are applied to reported "SP on target" energy
- DDS use requirements for follow-up campaigns will be derived from this data

Beamline Energy Report				
Log Number:	20051	as	10-Feb-2015	17:40:00
Beam	1	2	3	4
Shot Type	4	7	4	4
DIAG ED	44.1 mJ	285.5 mJ	11.8 mJ	76.5 mJ
DIAG SF	68.0 mJ	241.8 mJ	11.5 mJ	72.0 mJ
DIAG BF	-170.0 J	1217.0 J	824.0 J	11381.2 J
SPDP SF	.....	526.6 J	.....	.....
SPDP BF	.....	589.1 J	.....	.....
SP On Target	2464.2 J	.....	470.4 J	2863.6 J
RED TSHL	2464.0 J	.....	470.0 J	2862.0 J
RED S	758.0 J	.....	332.2 J	796.4 J
RED D	38.0 J	.....	15.4 J	46.0 J
RED S	1482.0 J	.....	122.8 J	1719.8 J
SP SF	.....	.....	112.2 J	1877.6 J
SP On Target	1549.2 J	.....	110.4 J	1570.0 J

A similar diagnostic for OMEGA EP UV beams is in development.

E24004a

Summary

A diagnostic has been developed to characterize transmission losses in the OMEGA EP short-pulse transport paths

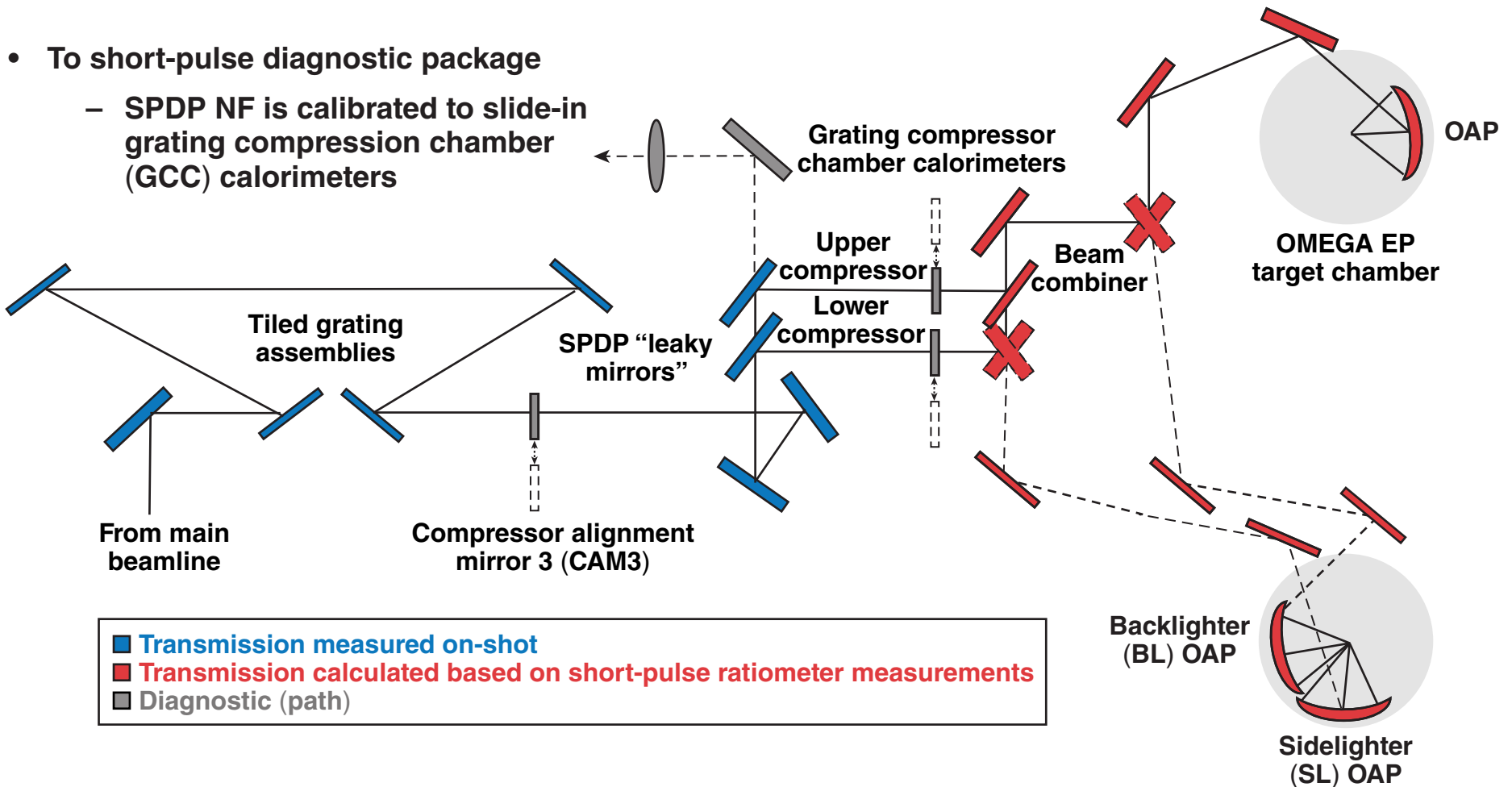


- **As a result of pickoff location, on-shot energy diagnostics cannot measure losses from damage or target debris in the final transport mirrors and the off-axis parabolas (OAP's)**
- **The short-pulse ratiometer diagnostic was designed to provide accurate measurement and tracking of transmission performance through the final optics**
- **This diagnostic provides more-accurate on-target energy reports and for a more-deterministic method of specifying disposable debris shield usage**

Transmission measurements are now acquired before and after all short-pulse target shot days.

Reported on-target energy is determined by the short-pulse diagnostic package near-field (SPDP NF) charge-coupled device (CCD)

- To short-pulse diagnostic package
 - SPDP NF is calibrated to slide-in grating compression chamber (GCC) calorimeters

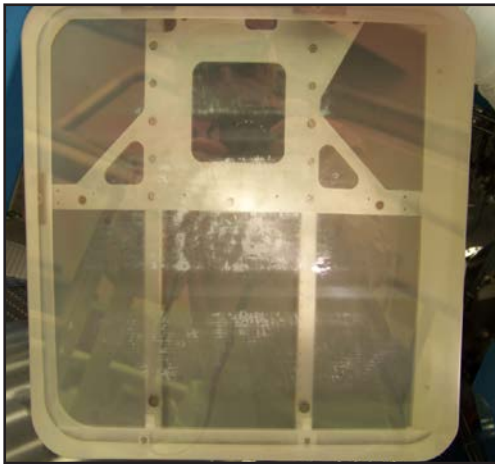


Laser damage and target debris can significantly impact transmission of the final optics

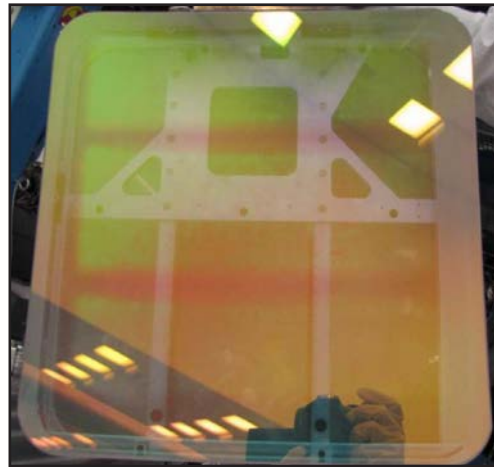


- This is of particular concern on the OAP's because of their close proximity to target chamber center (TCC)

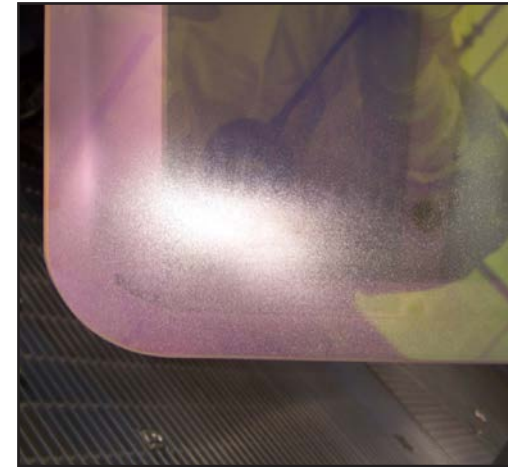
Images of off-axis parabolas in use on OMEGA EP



Laser damage to coating

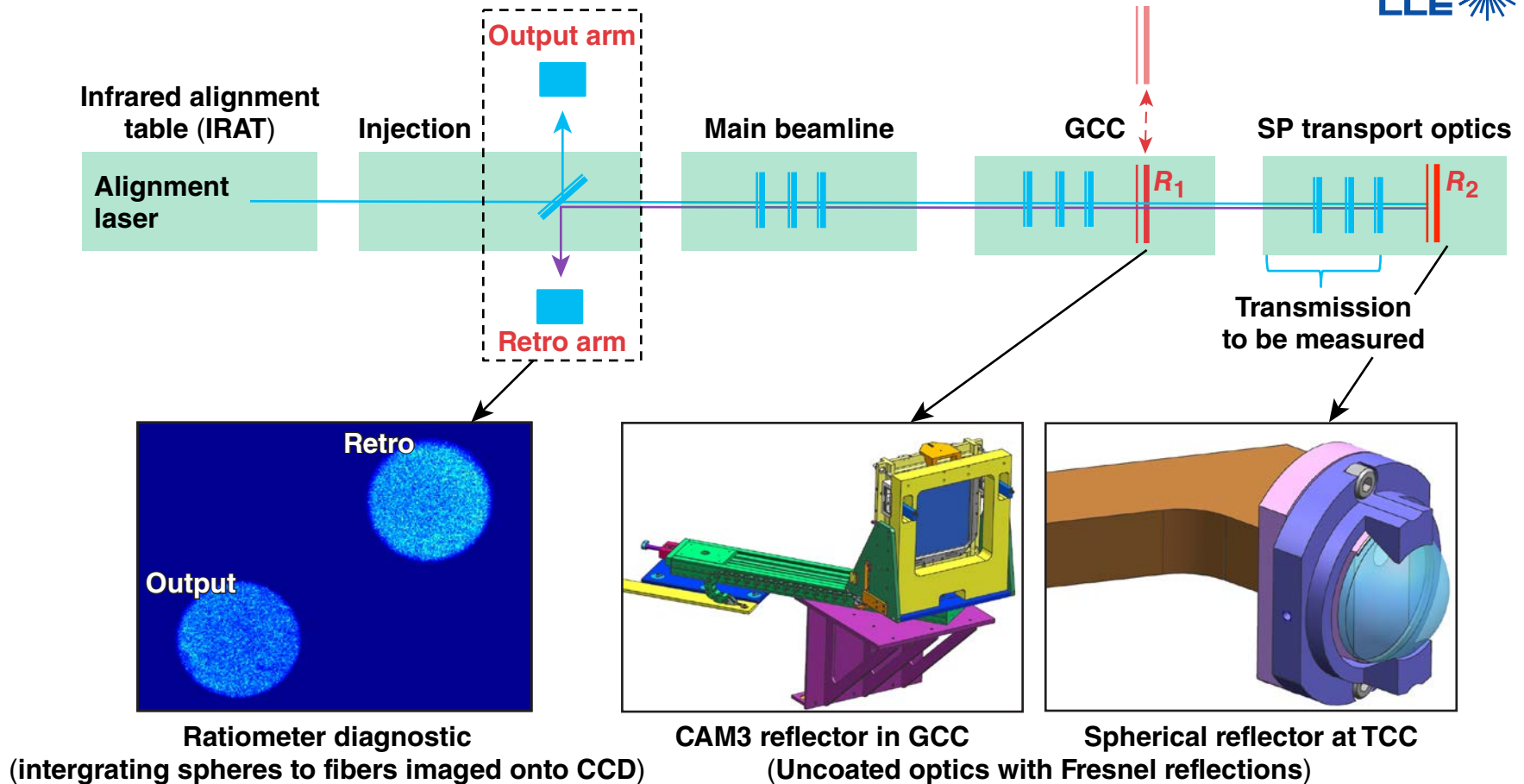


Imprint from "laser-cleaning" effect



Contamination from target shot debris

A ratiometer technique has been implemented to characterize transmission through the final OMEGA EP short-pulse optics



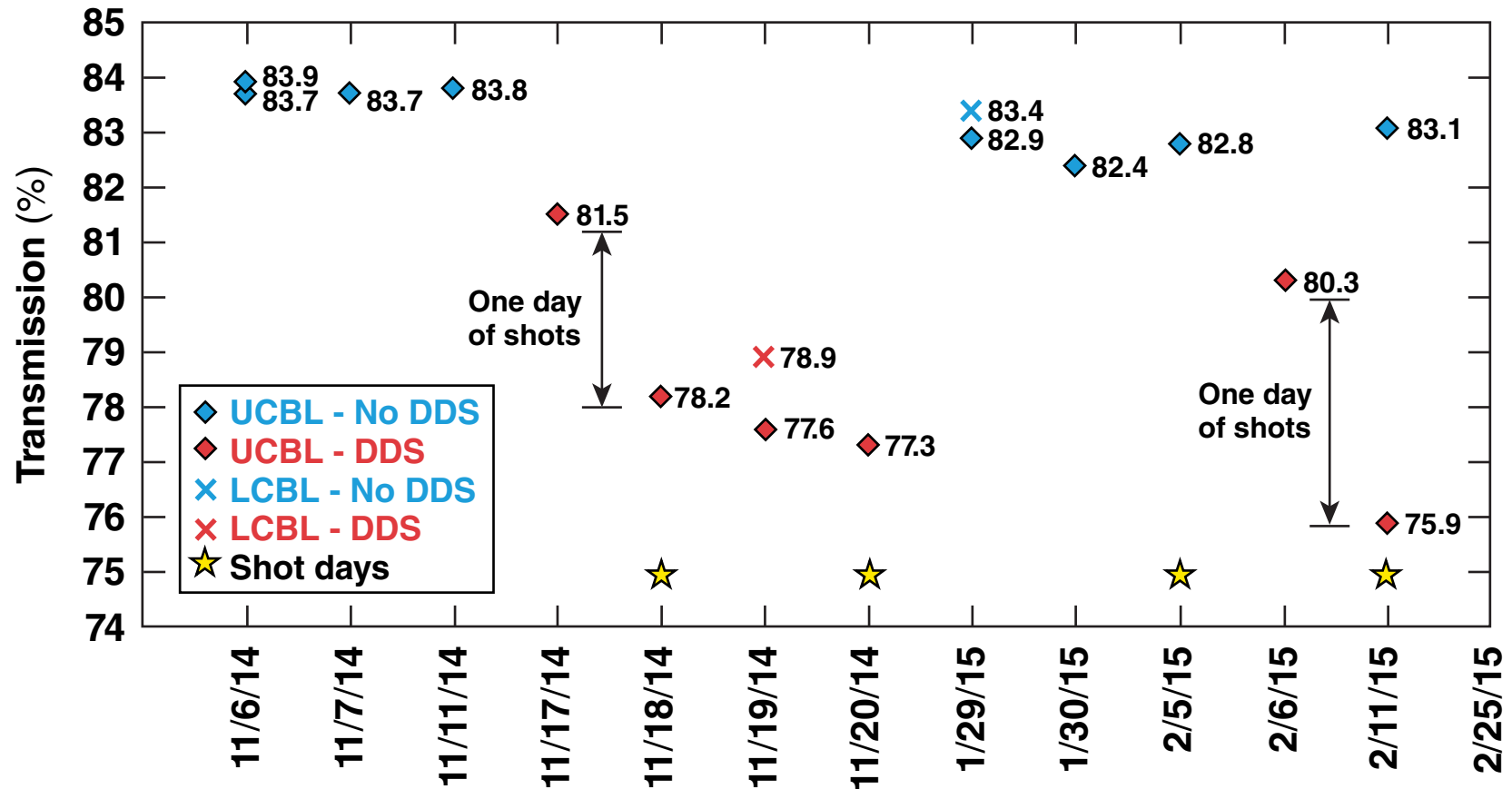
$$\text{Transmission}_{R_1 \rightarrow R_2} = \sqrt{\frac{\text{Retro}R_2 / \text{Output}R_2}{\text{Retro}R_1 / \text{Output}R_1}}$$

Short-pulse ratiometer measurements are now acquired for all target campaigns



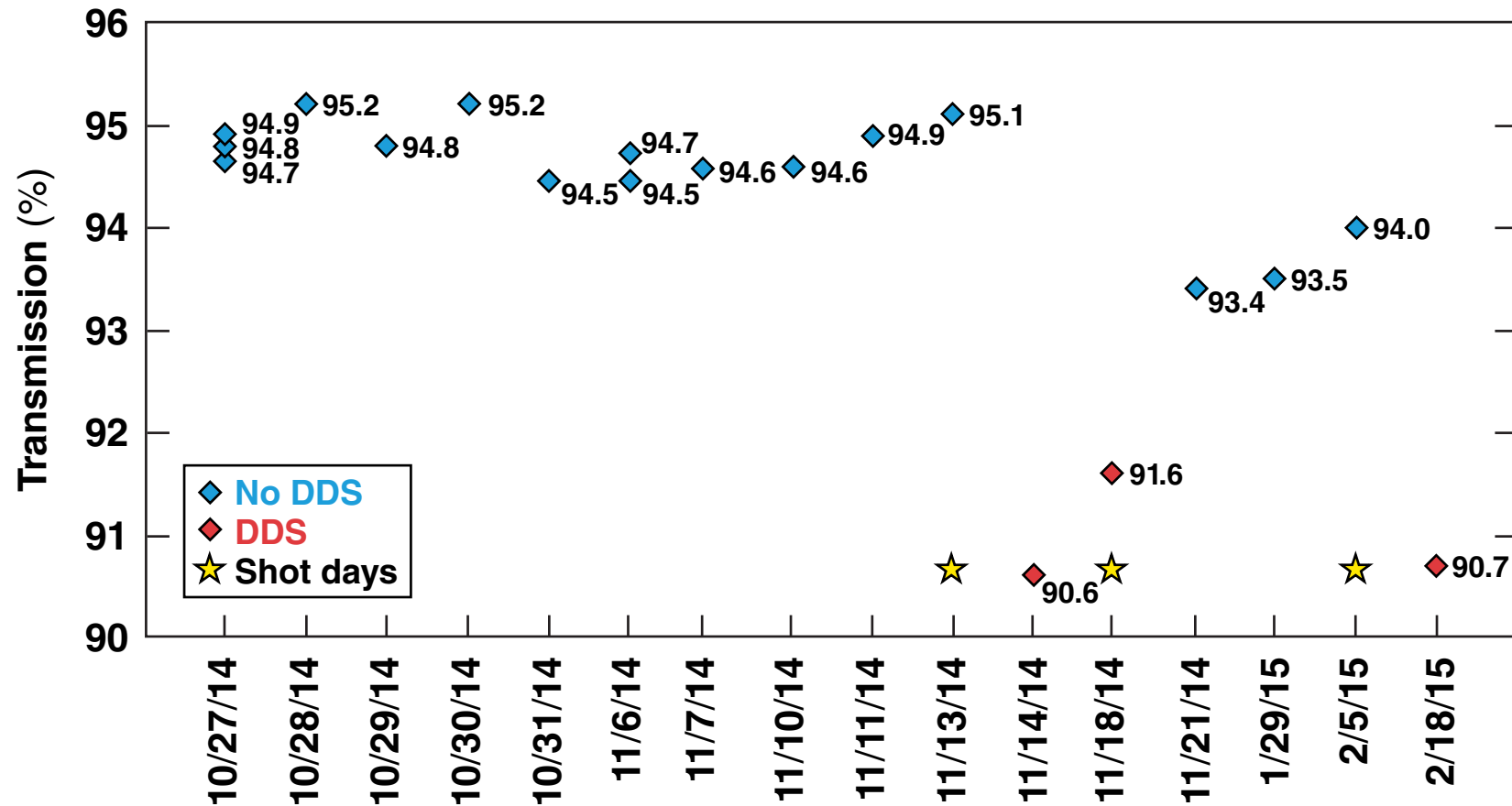
- **Initial measurements are acquired in advance of shots as part of short-pulse transport and focusing process**
- **Measurements are taken after all target shot days**
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- **Additional measurements required before and after disposable debris shield (DDS) installation/removal**

OMEGA EP backlighter measurements

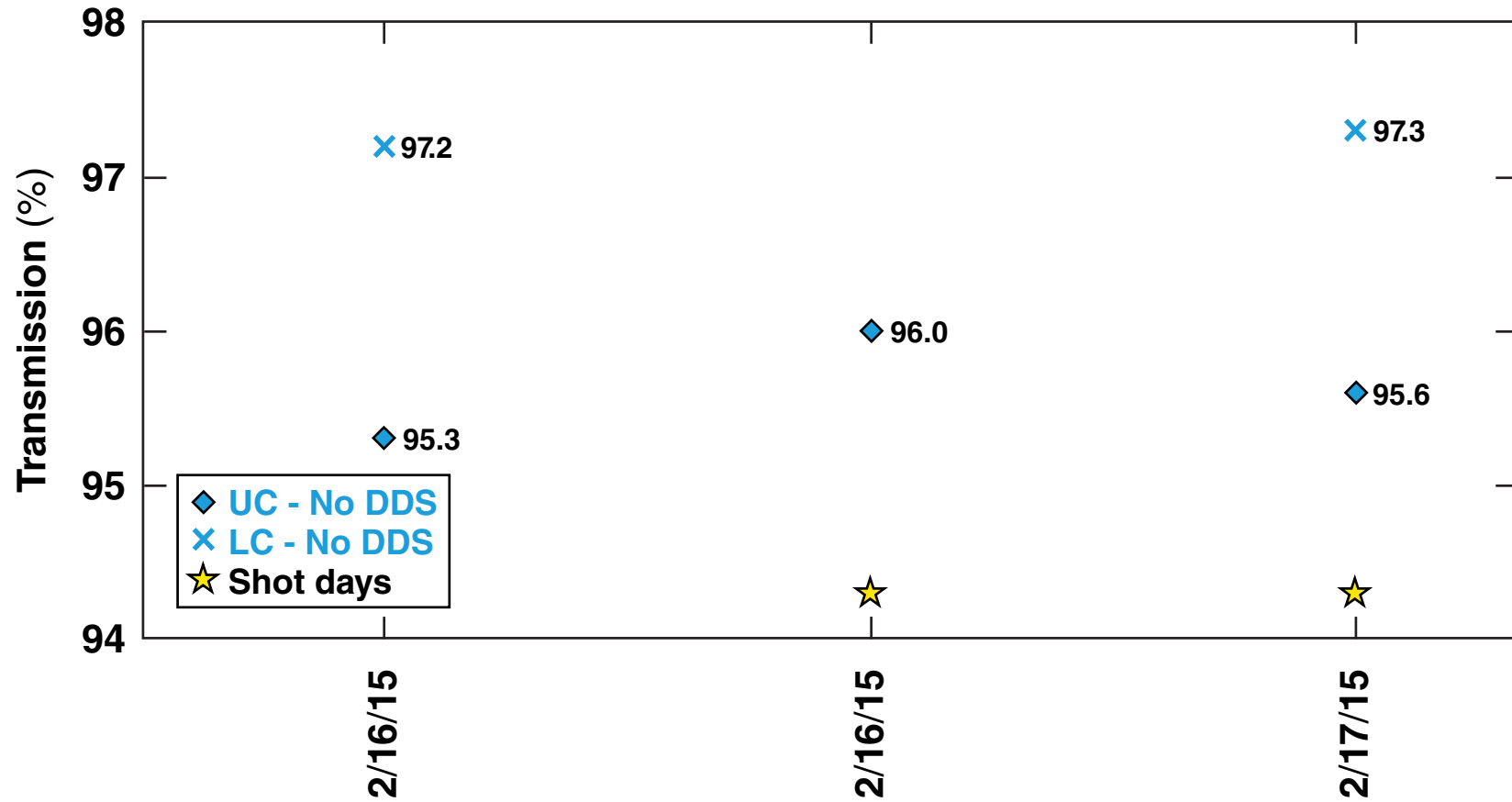


UCBL: upper-compressor backlighter
 LCBL: lower-compressor backlighter

OMEGA EP sidelighter measurements



OMEGA EP to OMEGA (joint shot) measurements



Transmission data is now used to provide more-accurate on-target energy estimates and assess campaign impact on short-pulse optics



- Transmission data are stored in shot database tables
- Results are applied to reported “SP on target” energy
- DDS use requirements for follow-up campaigns will be derived from this data

Beamline Energy Report				
Log Number: 20301		at 10-Feb-2015 17:40:03		
Beam	1	2	3	4
Shot Type	6	7	6	6
	Energy Units	Energy Units	Energy Units	Energy Units
Inj. ED	48.1 mJ	265.5 mJ	11.8 mJ	70.7 mJ
Inj. NF	68.0 mJ	241.6 mJ	11.0 mJ	72.0 mJ
IRDP NF	-370.8 J	1017.3 J	526.5 J	13381.2 J
SPDP NF	-----	826.4 J	-----	-----
HCD Energy	-----	589.1 J	-----	-----
UV Cal	2664.2 J	-----	470.4 J	2563.6 J
HED Total	2486.8 J	-----	472.5 J	2523.0 J
HED R	758.0 J	-----	332.2 J	756.4 J
HED G	36.1 J	-----	19.4 J	46.6 J
HED B	1692.8 J	-----	120.9 J	1719.9 J
UV NF	-----	-----	121.2 J	1677.6 J
SP On Target	-----	801.6 J	-----	-----
UV On Target	1545.3 J	-----	110.4 J	1570.0 J

A similar diagnostic for OMEGA EP UV beams is in development.