Integrative Structure Validation Report

October 09, 2025 - 04:37 PM PDT

The following software was used in the production of this report:

IHMValidation Version 3.0
Python-IHM Version 2.5

PDB ID	8ZZL | pdb_00008zzl
PDB-Dev ID	PDBDEV_00000021
Structure Title	Structure of complement C3(H2O) revealed by quantitative cross-linking/mass spectrometry and modeling
Structure Authors	Chen, Z.A.; Pellarin, R.; Fischer, L.; Sali, A.; Nilges, M.; Barlow, P.N.; Rappsilber, J.
Deposited on	2018-06-06

This is a PDB-IHM Structure Validation Report.

We welcome your comments at helpdesk@pdb-ihm.org

A user guide is available at https://pdb-ihm.org/validation_help.html with specific help available everywhere you see the ? symbol.

List of references used to build this report is available here.

1. Overview

1.1. Summary

This entry consists of 4 model(s). A total of 4 dataset(s) were used to build this entry.

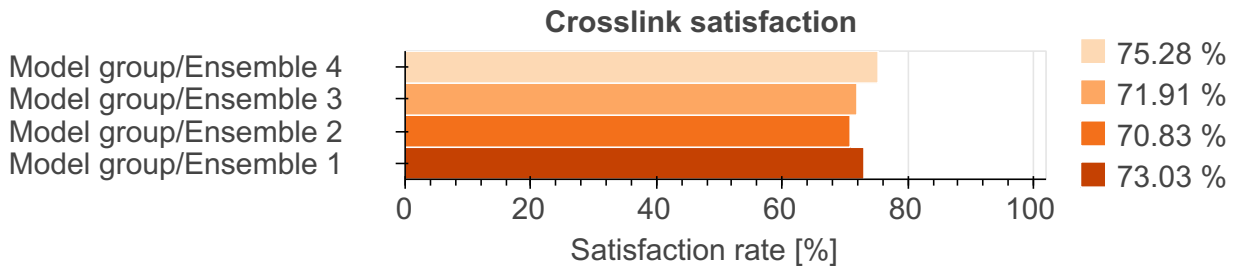
Name	Type	Count
Crosslinking-MS data	Experimental data	1
Mass Spectrometry data	Experimental data	1
Experimental model	Starting model	2

1.2. Overall quality

This validation report contains model quality assessments for all structures, data quality and fit to model assessments for SAS and crosslinking-MS datasets. Data quality and fit to model assessments for other datasets and model uncertainty are under development. Number of plots is limited to 256.

Model Quality: Excluded Volume Analysis

Fit to Data Used for Modeling



2. Model Details

2.1. Ensemble information

This entry consists of 4 distinct ensemble(s).

2.2. Representation

This entry has 1 representation(s).

ID	Model(s)	Entity ID	Molecule name	Chain(s) [auth]	Total residues	Rigid segments	Flexible segments	Model coverage/ Starting model coverage (%)	Scale

ID	Model(s)	Entity ID	Molecule name	Chain(s) [auth]	Total residues	Rigid segments	Flexible segments	Model coverage/ Starting model coverage (%)	Scale
1	1-4	1	beta	A	645	1-73, 80-289, 292-643	74-79, 290-291, 644-645	100.00 / 98.45	Coarse-grained: 1 residue(s) per bead
		2	alpha	B	992	2-70, 80-96, 97-155, 158-261, 264-312, 315-457, 464-618, 621-680, 683-824, 827-992	1, 71-79, 156-157, 262-263, 313-314, 458-463, 619-620, 681-682, 825-826	100.00 / 97.18	Coarse-grained: 1 residue(s) per bead

2.3. Datasets used for modeling

There are 4 unique datasets used to build the models in this entry.

ID	Dataset type	Database name	Data access code
1	Experimental model	PDB	pdb_00002a73
2	Experimental model	PDB	pdb_00002i07
3	Mass Spectrometry data	PRIDE	PXD003486
4	Crosslinking-MS data	Zenodo	10.5281/zenodo.1285940

2.4. Methodology and software

This entry is a result of 3 distinct protocol(s).

Step number	Protocol ID	Method name	Method type	Method description	Number of computed models	Multi state modeling	Multi scale modeling
1	1	Sampling	Replica exchange monte carlo	Not available	200000	True	True
1	2	Sampling	Replica exchange monte carlo	Not available	200000	True	True
1	3	Sampling	Replica exchange monte carlo	Not available	200000	True	True

There are 2 software packages reported in this entry.

ID	Software name	Software version	Software classification	Software location
1	Integrative Modeling Platform (IMP)	develop-0a5706e202	integrative model building	https://integrativemodeling.org
2	IMP PMI module	67456c0	integrative model building	https://integrativemodeling.org

3. Data quality

3.2. Crosslinking-MS

At the moment, data validation is only available for crosslinking-MS data deposited as a fully compliant dataset in the PRIDE Crosslinking database. Correspondence between crosslinking-MS and entry entities is established using pyHMMER. Only residue pairs that passed the reported threshold are used for the analysis. The values in the report have to be interpreted in the context of the experiment (i.e. only a minor fraction of in-situ or in-vivo dataset can be used for modeling).

Crosslinking-MS dataset is not available in the PRIDE Crosslinking database.

3.4. Mass Spectrometry

Validation for this section is under development.

4. Model quality

For models with atomic structures, MolProbity analysis is performed. For models with coarse-grained or multi-scale structures, excluded volume analysis is performed.

4.1a. Excluded Volume Analysis

Excluded volume satisfaction for the models in the entry are listed below. The Analysed column shows the number of particle-partice or particle-atom pairs for which excluded volume was analysed.

Model ID	Analysed	Number of violations	Excluded Volume Satisfaction (%)
1	1339066	3677	99.73
2	1216020	3514	99.71
3	1339066	3754	99.72
4	1339066	3684	99.72

5. Fit to Data Used for Modeling Assessment

5.2. Crosslinking-MS

5.2.1. Restraint types

This table summarizes information about crosslinker(s) used for data generation, and how crosslinking information was translated into actual modeling restraints. Restraints assigned "by-residue" are interpreted as between CA atoms. Restraints between coarse-grained beads are indicated as "coarse-grained". Restraint group represents a set of crosslinking restraints applied collectively in the modeling.

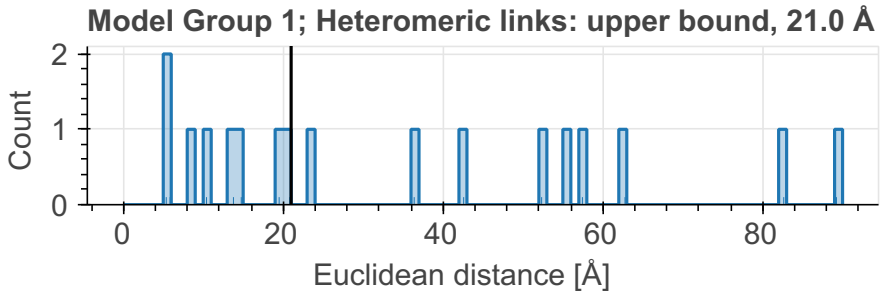
There are 115 crosslinking restraints combined in 115 restraint groups.

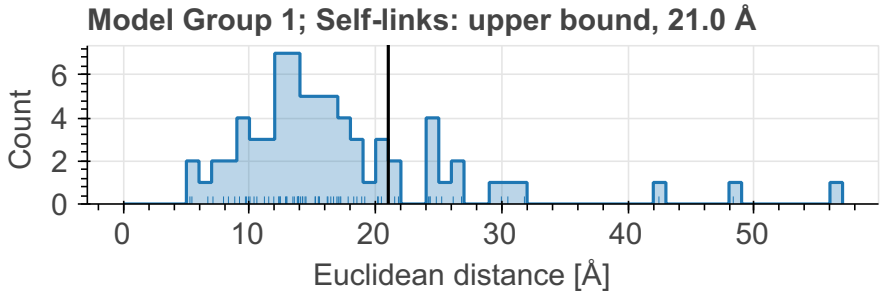
Linker	Residue 1	Atom 1	Residue 2	Atom 2	Restraint type	Distance, Å	Count
BS3	LYS	CA	LYS	CA	upper bound	21.00	78
BS3	LYS	CA	SER	CA	upper bound	21.00	21
BS3	SER	CA	SER	CA	upper bound	21.00	4
BS3	LYS	CA	TYR	CA	upper bound	21.00	5

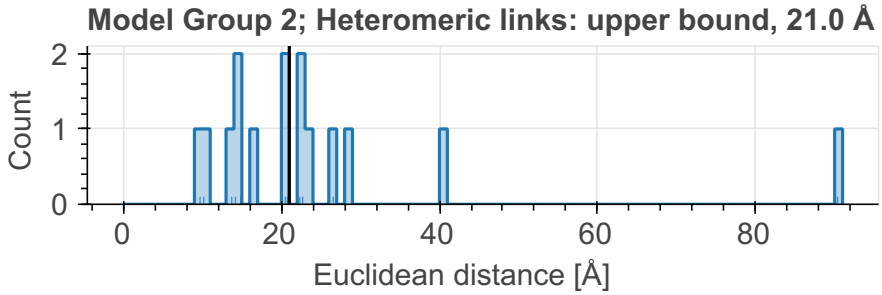
Linker	Residue 1	Atom 1	Residue 2	Atom 2	Restraint type	Distance, Å	Count
BS3	SER	CA	TYR	CA	upper bound	21.00	3
BS3	LYS	CA	THR	CA	upper bound	21.00	3
BS3	THR	CA	THR	CA	upper bound	21.00	1

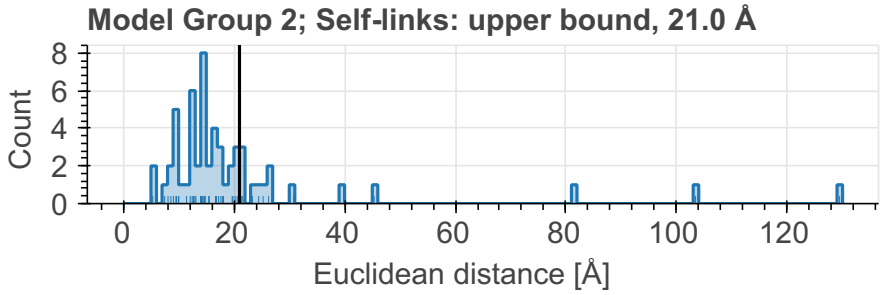
Distograms of individual restraints

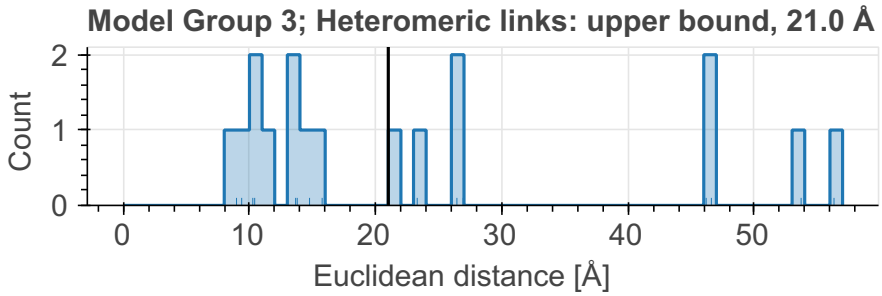
Distograms (i.e., histogram plots of distances) provide an overview of distributions of distances between residues for which chemical crosslinks were identified. The shift of the distogram relative to the threshold value may indicate a poor model. Restraints with identical thresholds are grouped into one plot. Only the best distance per restraint per model group/ensemble is plotted. Inter- and intramolecular (including self-links) restraints are also grouped into one plot. Distance for a restraint between coarse-grained beads is calculated as a minimal distance between shells; if beads intersect, the distance will be reported as 0.0. A bead with the highest available resolution for a given residue is used for the assessment.

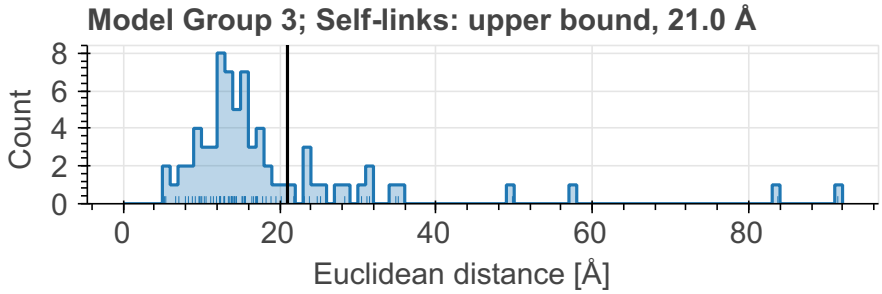


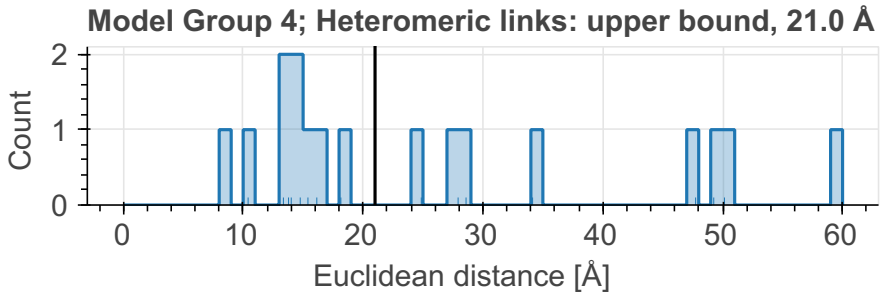


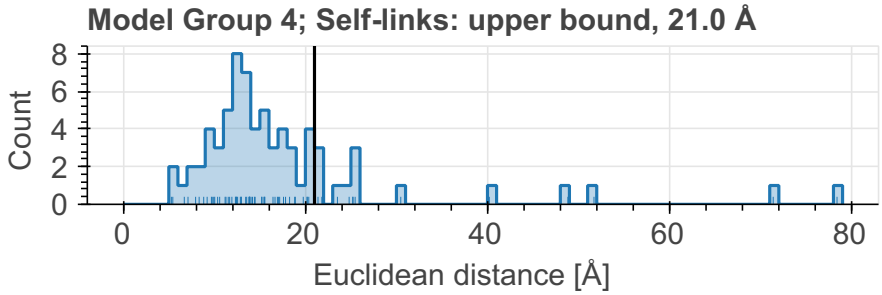












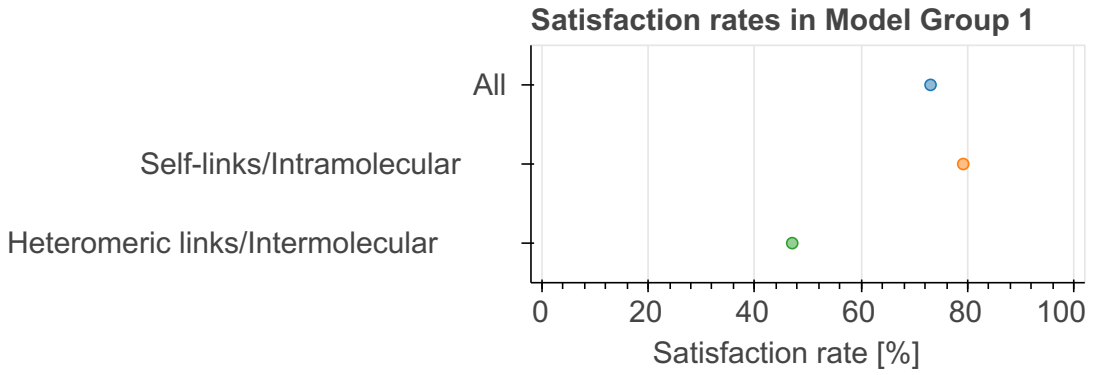
5.2.2. Satisfaction of restraints

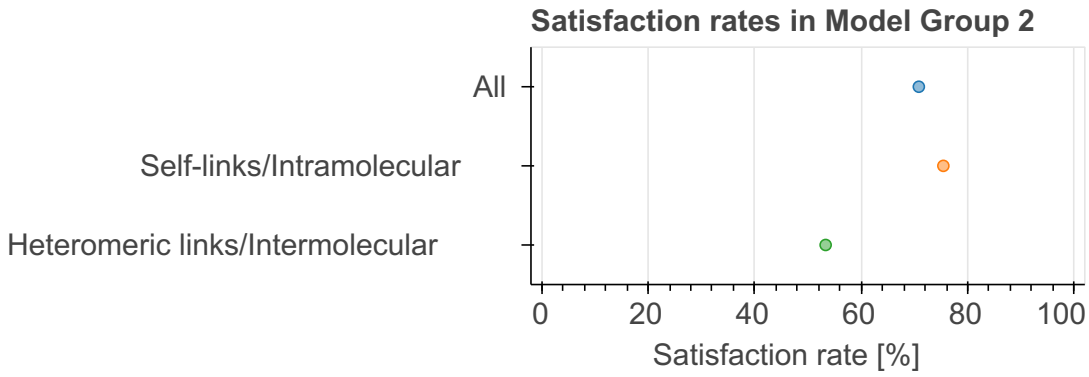
Satisfaction of restraints is calculated on a restraint group (a set of crosslinking restraints applied collectively in the modeling) level. Satisfaction of a restraint group depends on satisfaction of individual restraints in the group and the conditionality (all/any). A restraint group is considered satisfied, if the condition was met in at least one model of the model group/ensemble. The number of measured restraints can be smaller than the total number of restraint groups if crosslinks involve non-modeled residues. Only deposited models are used for validation right now.

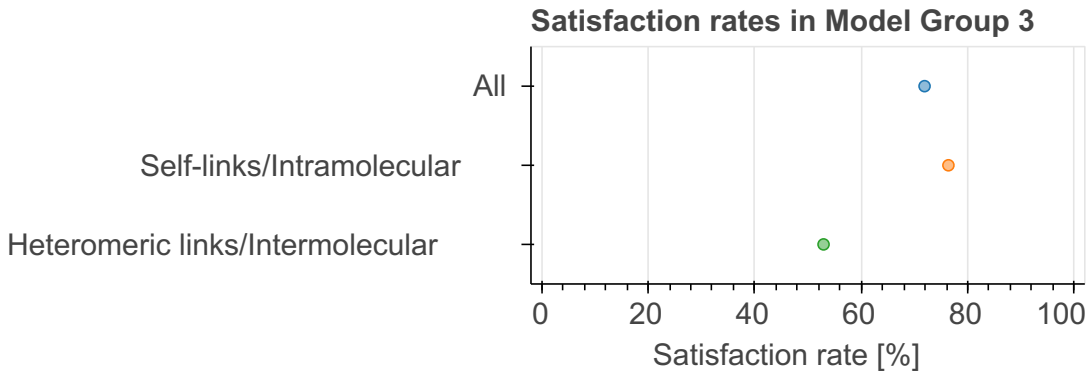
State group	State	Model group	# of Deposited models/Total	Restraint group type	Satisfied (%)	Violated (%)	Count (Total=115)
1	1	1	1/200	All	73.03	26.97	89
				Self-links/ Intramolecular	79.17	20.83	72
				Heteromeric links/ Intermolecular	47.06	52.94	17
1	2	2	1/200	All	70.83	29.17	72
				Self-links/ Intramolecular	75.44	24.56	57
				Heteromeric links/ Intermolecular	53.33	46.67	15
1	3	3	1/89	All	71.91	28.09	89
				Self-links/ Intramolecular	76.39	23.61	72
				Heteromeric links/ Intermolecular	52.94	47.06	17
1	3	4	1/111	All	75.28	24.72	89
				Self-links/ Intramolecular	80.56	19.44	72
				Heteromeric links/ Intermolecular	52.94	47.06	17

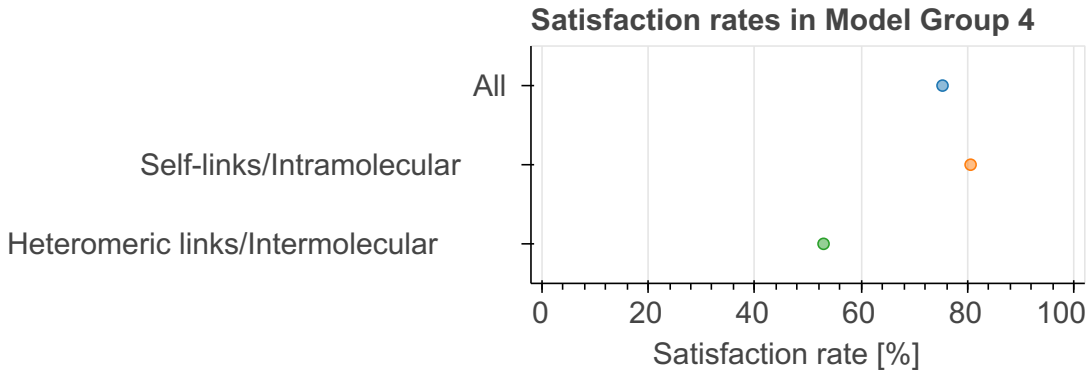
Per-model satisfaction rates in ensembles

Every point represents one model in a model group/ensemble. Where possible, boxplots with quartile marks are also plotted.









5.4. Mass Spectrometry

Validation for this section is under development.

6. Fit to Data Used for Validation Assessment

Validation for this section is under development.

Acknowledgments

The development of integrative model validation metrics, implementation of a model validation pipeline, and creation of a validation report for integrative structures are funded by NSF awards to the PDB-IHM team (DBI-1756248, DBI-2112966, DBI-2112967, DBI-2112968, and DBI-1756250) and awards from NSF, NIH, and DOE to the RCSB PDB (DBI-2321666,

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