Table S1. Statistics of CryoEM Data Collection, Classification, and Refinement for the Diheteromeric GluN1/GluN2A at pH 7.4. Related to Figures 1, 2 and 4

	DiNMDAR	DiNMDAR	DiNMDAR	DiNMDAR
[Glutamate] (mM)	1.0	1.0	1.0	1.0
[Glycine] (mM)	1.0	1.0	1.0	1.0
[EDTA] (mM)	1.0	0	0	3.0
[ZnCl$_2$] (µM)	0	1.0	1,000	1,000
pH	7.4	7.4	7.4	7.4
Antagonist Used for Expression	Memantine	Memantine	Memantine	Memantine
Data Collection/Processing				
Microscope	Krios (Janelia)	Krios (OHSU)	Krios (OHSU)	Krios (OHSU)
Voltage (kV)	300	300	300	300
Defocus Range (µm)	-1.3 – -2.5	-1.3 – -2.6	-1.2 – -2.4	-1.2 – -2.2
Exposure time (s)	10	22	22	22
Dose rate (e^-/Å^2/s)	5.5	2.5	2.4	2.4
Pixel Size (Å)	1.32	1.71	1.71	1.71
Number of Frames	50	80 – 96	88	88
Micrographs	2,667	1,653	1,068	714
Particles Processed (Reference Free)	695,027	491,476	248,810	286,226
Particles Processed (Template-Based)	1,256,436	950,166	468,703	427,834
Combined Particles after 2D Cleanup	181,664	270,711	105,778	84,260
3D Classification				
Class 1 Name Refined Particles Masked Resolution	2 Knuckle Sym 88,979 6.23 Å	2 Knuckle Asym 52,489 7.14 Å	Extended 2 23,049 8.21 Å	2 Knuckle Sym 47,313 5.13 Å
Class 2 Name Refined Particles Masked Resolution		1 Knuckle 64,045 6.08 Å	Splayed Open 9,129 8.93 Å	
Class 3 Name Refined Particles Masked Resolution		Extended 47,299 6.84 Å	Super Splayed 6,081 16.5 Å	

Table S2. Statistics of CryoEM Data Collection, Classification, and Refinement for the Diheteromeric GluN1/GluN2A at pH 8.0 and pH 6.1. Related to Figures 2 and 4

	DiNMDAR	DiNMDAR	DiNMDAR
[Glutamate] (mM)	1.0	1.0	1.0
[Glycine] (mM)	1.0	1.0	1.0
[EDTA] (mM)	0.1	0	0
[ZnCl$_2$] (µM)	0	1.0	1.0
pH	8.0	8.0	6.1
Antagonist Used for Expression	MK-801	MK-801	Memantine
Data Collection/Processing			
Microscope	Krios (OHSU)	Krios (OHSU)	Krios (OHSU)
Voltage (kV)	300	300	300
Defocus Range (µm)	-1.0 – -2.5	-1.0 – -2.5	-0.8 – -2.6
Exposure time (s)	20	20	22
Dose rate ($e^-/Å^2/s$)	2.6	2.6	2.4
Pixel Size (Å)	1.71	1.71	1.71
Number of Frames	80	80	88
Micrographs	1,841	1,605	2,163
Particles Processed (Reference Free)	466,631	618,512	1,228,202
Particles Processed (Template-Based)			1,284,550
Combined Particles after 2D Cleanup	183,139	314,419	326,255
3D Classification			
Class 1 Name Refined Particles Masked Resolution	2 Knuckle Sym 84,793 6.88 Å	2 Knuckle Sym 104,520 7.51 Å	1 Knuckle 94,934 5.97 Å
Class 2 Name Refined Particles Masked Resolution			Extended 86,310 6.31 Å
Class 3 Name Refined Particles Masked Resolution			Super Splayed 10,238 12.7 Å

Table S3. Statistics of CryoEM Data Collection, Classification, and Refinement for the Triheteromeric GluN1/GluN2A/GluN2A* at pH 7.4. Related to Figures 2 and 3

	TriNMDAR	TriNMDAR
[Glutamate] (mM)	1.0	1.0
[Glycine] (mM)	1.0	1.0
[EDTA] (mM)	1.0	0
[ZnCl$_2$] (μM)	0	1.0
pH	7.4	7.4
Antagonist Used for Expression	Memantine	Memantine
Data Collection/Processing		
Microscope	Krios (OHSU)	Krios (OHSU)
Voltage (kV)	300	300
Defocus Range (μm)	-1.2 – -2.4	-1.1 – -2.6
Exposure time (s)	22	22
Dose rate (e^-/Å^2/s)	2.4	2.4
Pixel Size (Å)	1.71	1.71
Number of Frames	88	88
Micrographs	690	1,891
Particles Processed (Reference Free)	275,599	720,692
Particles Processed (Template-Based)	416,121	1,523,115
Combined Particles after 2D Cleanup	52,342	244,286
3D Classification		
Class 1 Name Refined Particles Masked Resolution	2 Knuckle Sym 33,349 5.38 Å	2 Knuckle Sym 58,461 6.20 Å
Class 2 Name Refined Particles Masked Resolution		2 Knuckle Asym 68,275 5.30 Å (ECD 4.71 Å)
Class 3 Name Refined Particles Masked Resolution		1 Knuckle 32,232 7.46 Å
Class 4 Name Refined Particles Masked Resolution		Extended 40,881 6.99