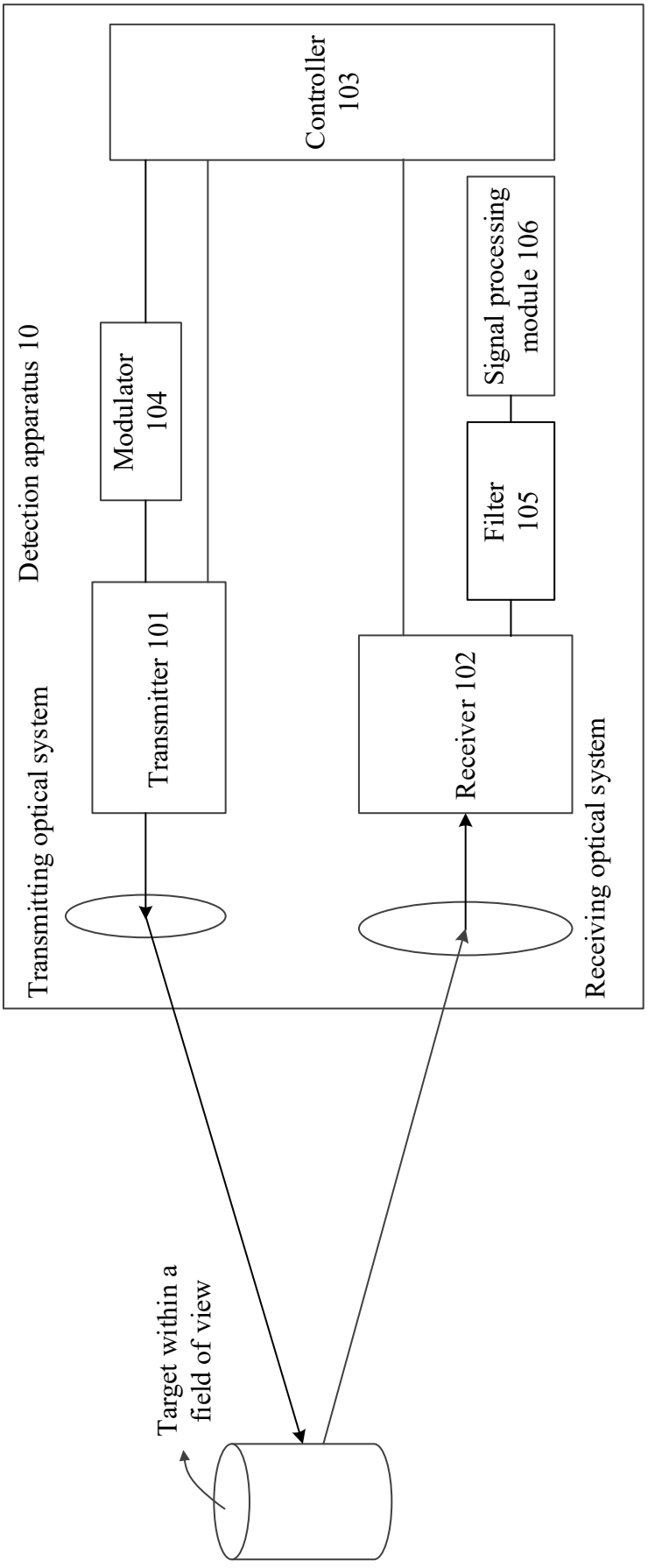

Detection apparatus 10
Controller 103
Modulator 104
Signal processing module 106
Filter 105
Transmitter 101
Receiver 102
Transmitting optical system
Receiving optical system
Target within a field of view

FIG. 1

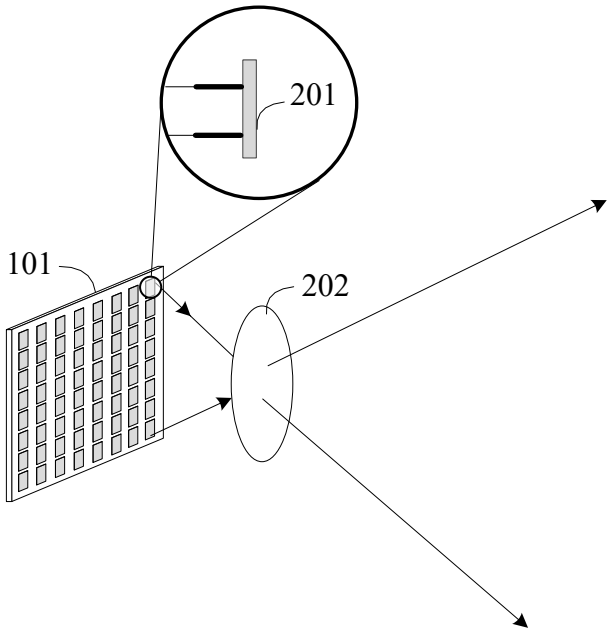

201
101
202

FIG. 2

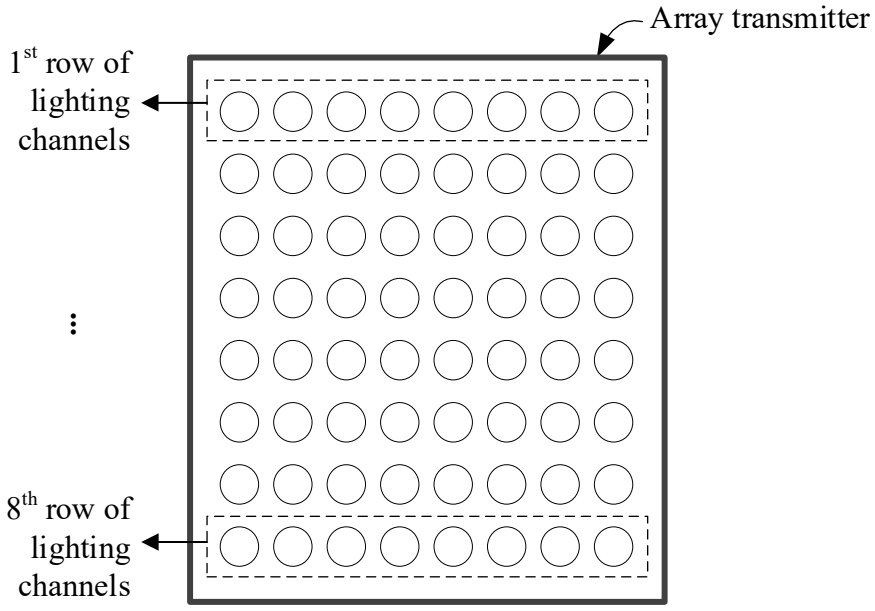

Array transmitter
1st row of lighting channels
8th row of lighting channels

FIG. 3

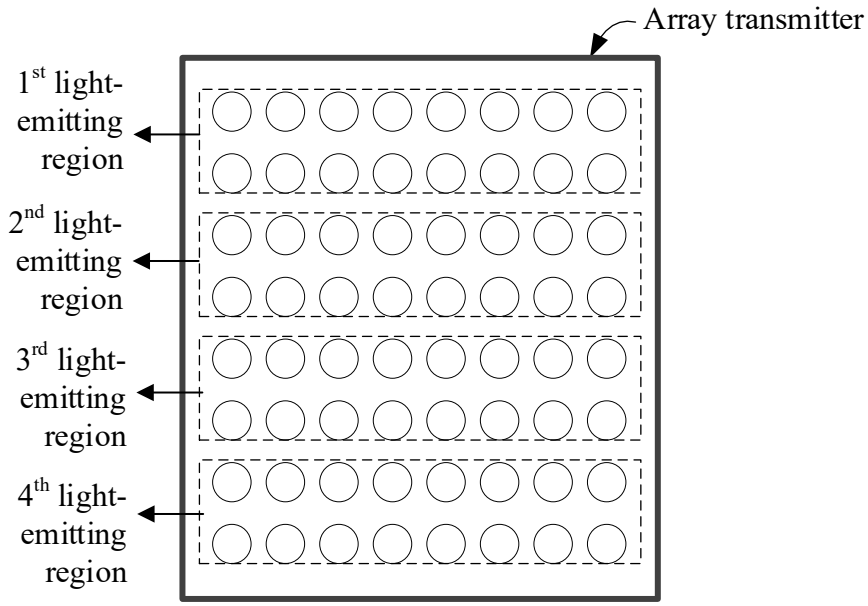

Array transmitter
1st light-emitting region
2nd light-emitting region
3rd light-emitting region
4th light-emitting region

FIG. 4

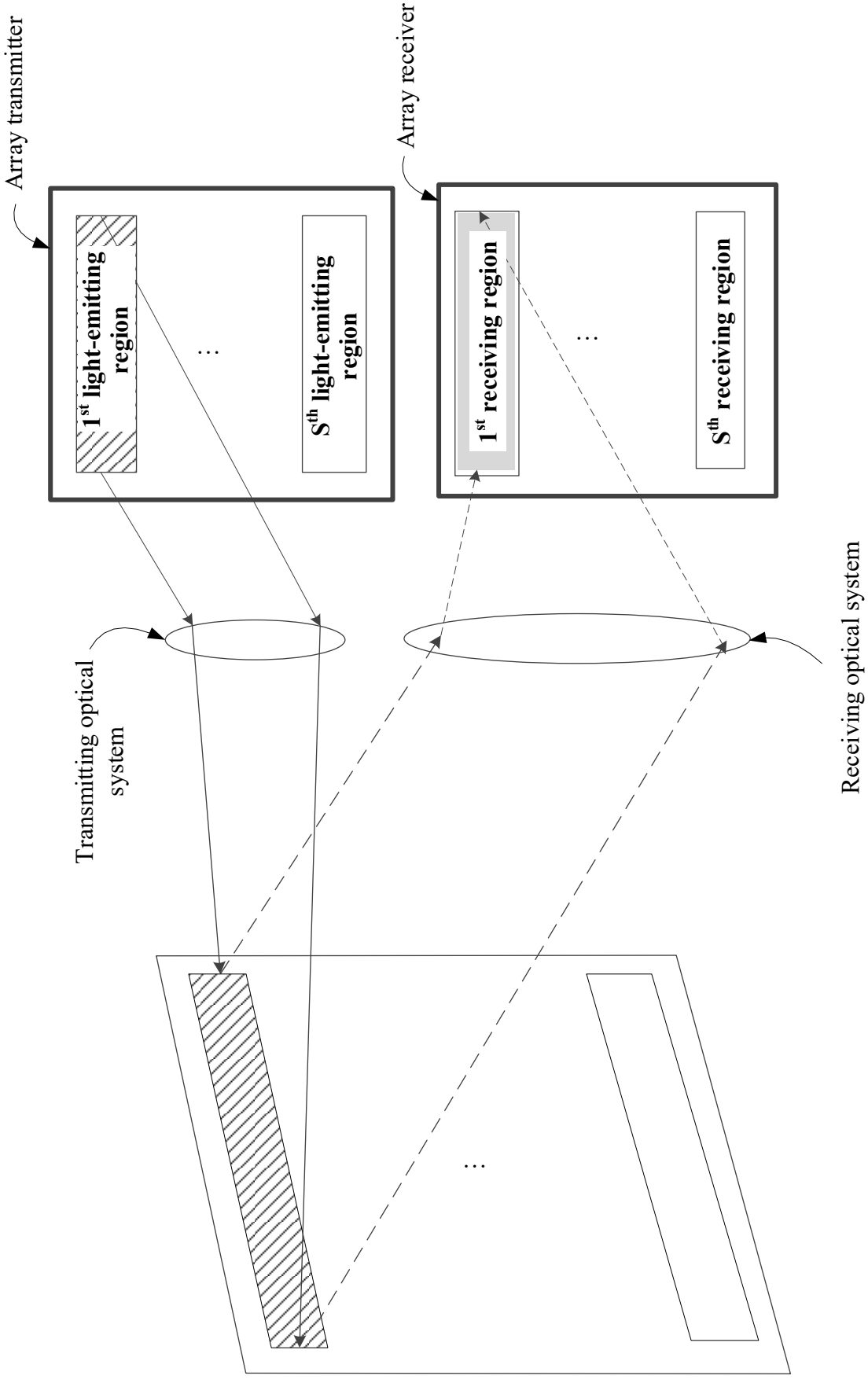

Array transmitter
Array receiver
1st light-emitting region
Sth light-emitting region
1st receiving region
Sth receiving region
Transmitting optical system
Receiving optical system

FIG. 5A

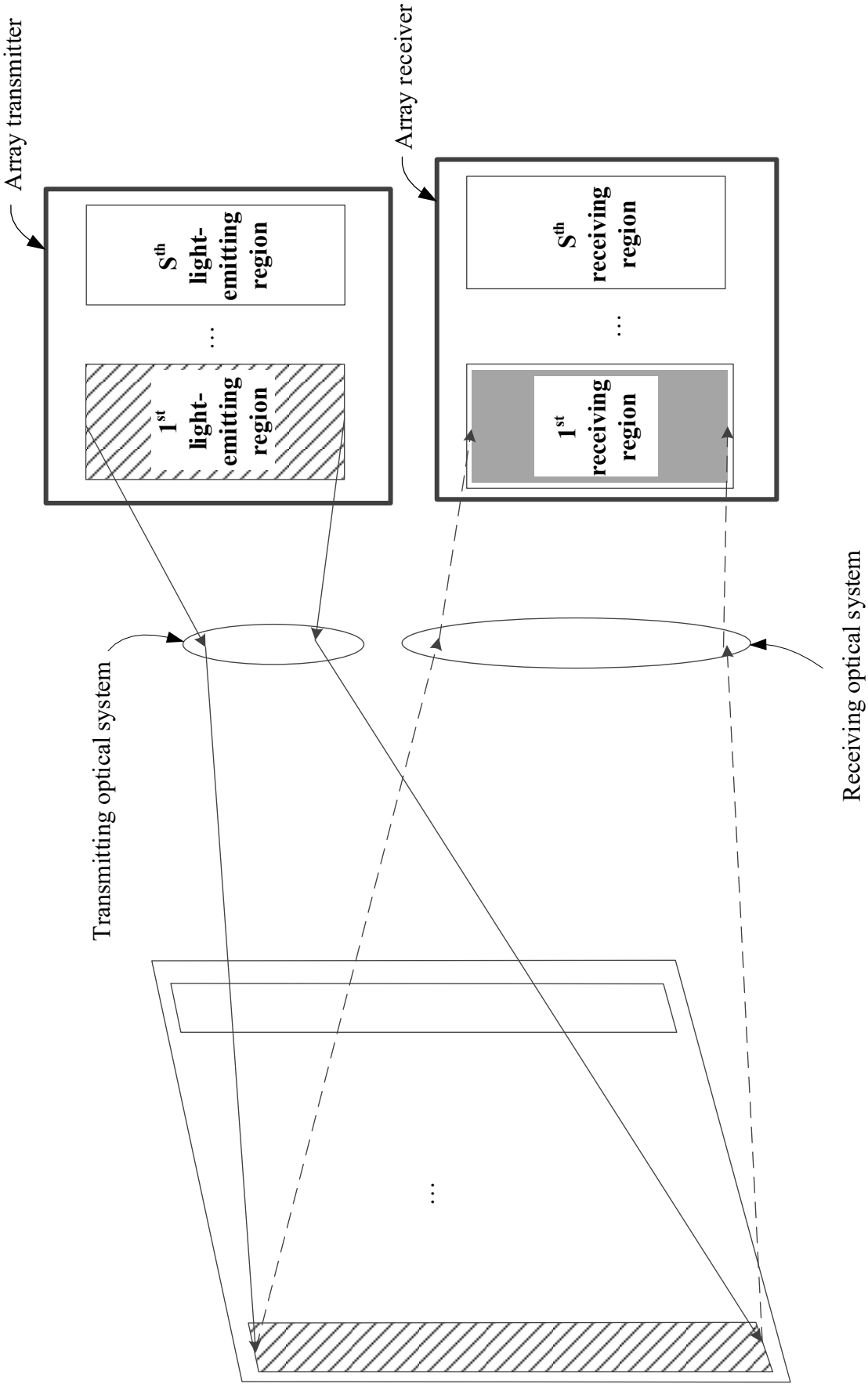
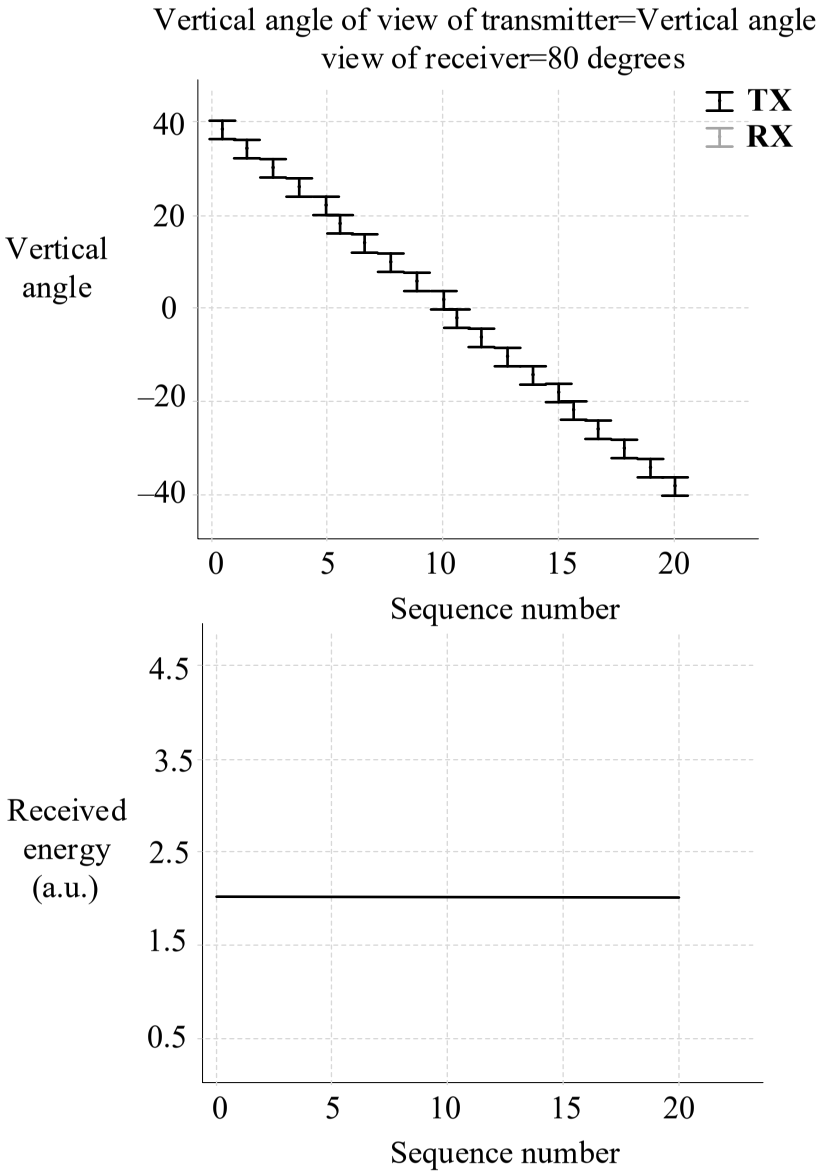

Array transmitter
Array receiver
S^th light-emitting region
1st light-emitting region
S^th receiving region
1st receiving region
Transmitting optical system
Receiving optical system

FIG. 5B



Sequence number i	Row sequence number of a lighting channel in an ith light-emitting region	Row sequence number of a receiving channel in an ith receiving region
1	1, 2	1, 2
2	3, 4	3, 4
3	5, 6	5, 6
4	7, 8	7, 8
5	9, 10	9, 10
6	11, 12	11, 12
7	13, 14	13, 14
8	15, 16	15, 16
9	17, 18	17, 18
10	19, 20	19, 20
11	21, 22	21, 22
12	23, 24	23, 24
13	25, 26	25, 26
14	27, 28	27, 28
15	29, 30	29, 30
16	31, 32	31, 32
17	33, 34	33, 34
18	35, 36	35, 36
19	37, 38	37, 38
20	39, 40	39, 40

FIG. 6

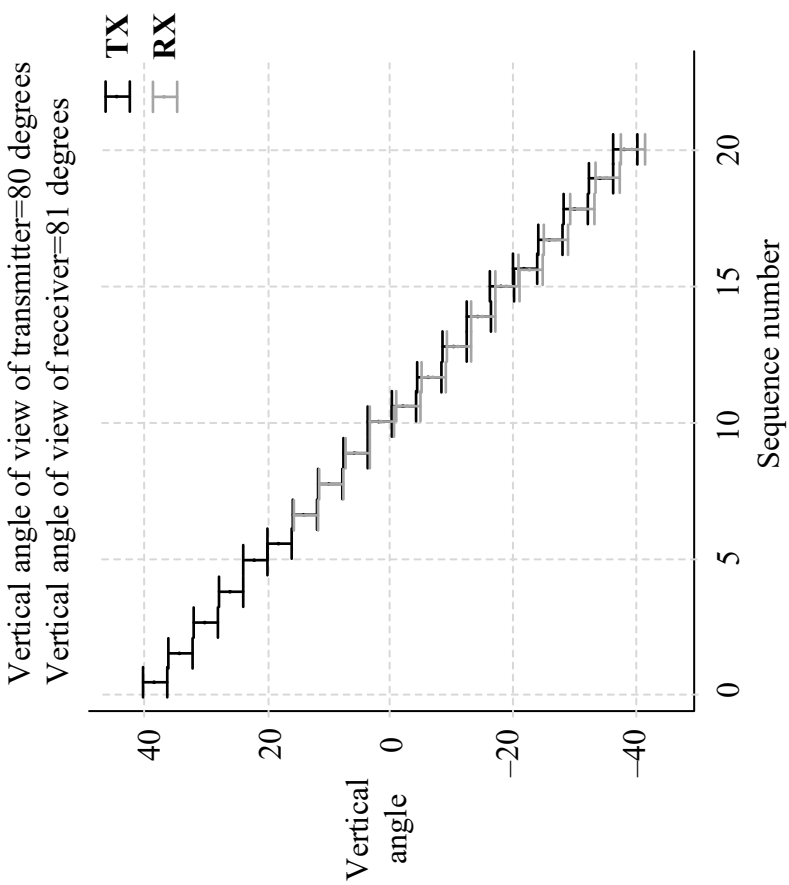

Vertical angle of view of transmitter=80 degrees
Vertical angle of view of receiver=81 degrees
TX
RX
40
20
0
−20
−40
Vertical angle
0
5
10
15
20
Sequence number

FIG. 7(2)

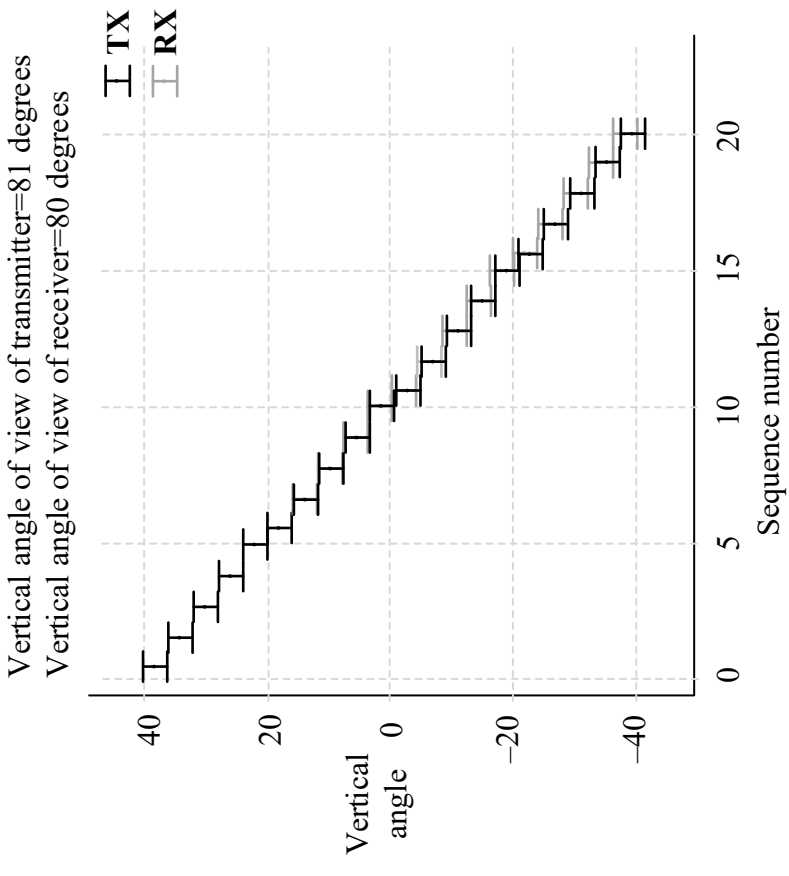

Vertical angle of view of transmitter=81 degrees
Vertical angle of view of receiver=80 degrees
TX
RX
40
20
0
−20
−40
Vertical angle
0
5
10
15
20
Sequence number

FIG. 7(1)

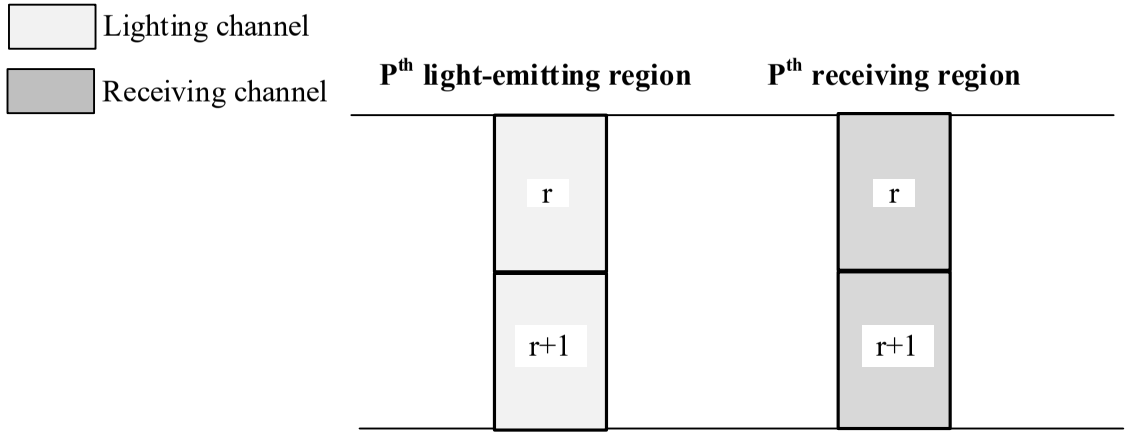


FIG. 8(1)

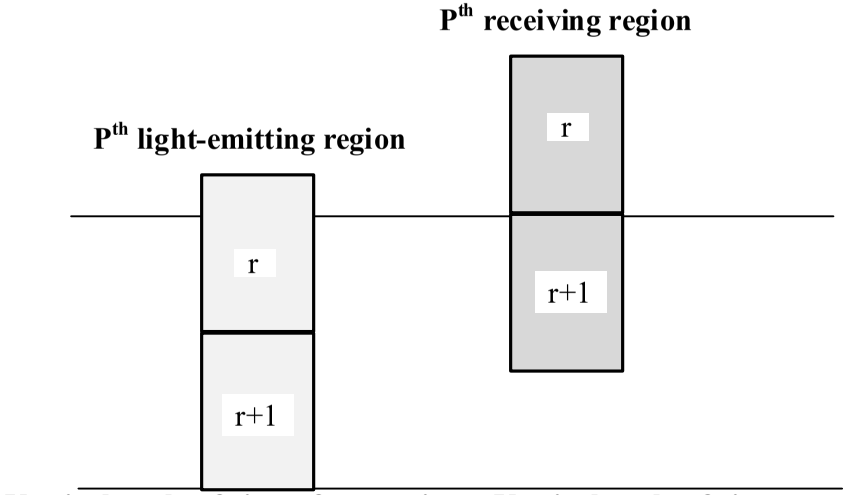


FIG. 8(2)

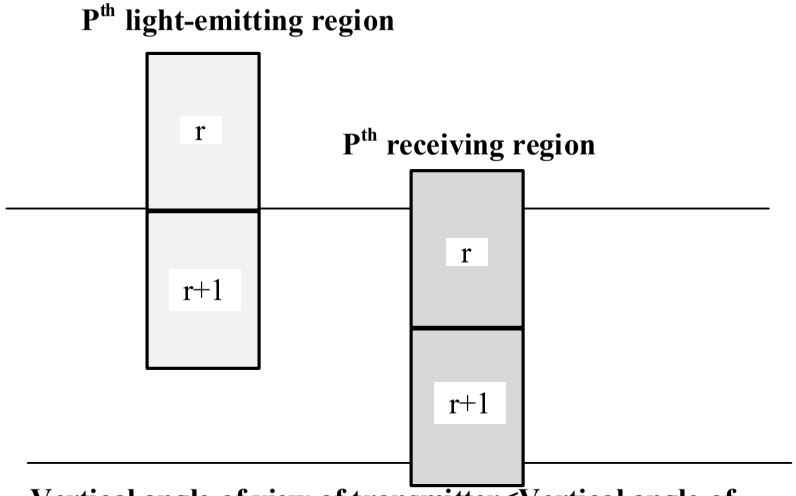


FIG. 8(3)

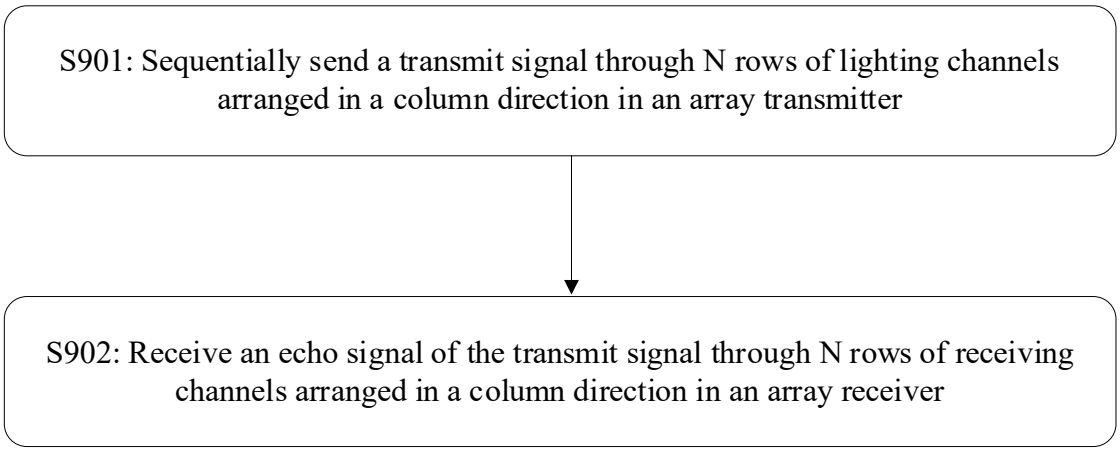
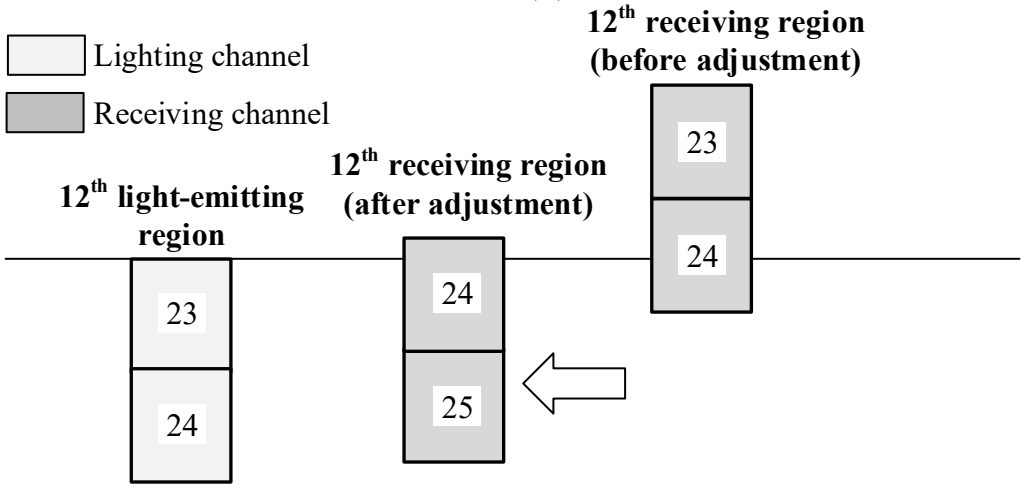

S901: Sequentially send a transmit signal through N rows of lighting channels arranged in a column direction in an array transmitter
S902: Receive an echo signal of the transmit signal through N rows of receiving channels arranged in a column direction in an array receiver

FIG. 9

Sequence number i	Row sequence number of a lighting channel in an ith light-emitting region	Row sequence number of a receiving channel in an ith receiving region	
		After adjustment	Before adjustment
1	1, 2	1, 2	1, 2
2	3, 4	3, 4	3, 4
3	5, 6	5, 6	5, 6
4	7, 8	7, 8	7, 8
5	9, 10	9, 10	9, 10
6	11, 12	11, 12	11, 12
7	13, 14	13, 14	13, 14
8	15, 16	15, 16	15, 16
9	17, 18	17, 18	17, 18
10	19, 20	19, 20	19, 20
11	21, 22	21, 22	21, 22
12	23, 24	24, 25	**23, 24**
13	25, 26	26, 27	25, 26
14	27, 28	28, 29	27, 28
15	29, 30	30, 31	29, 30
16	31, 32	32, 33	31, 32
17	33, 34	34, 35	33, 34
18	35, 36	36, 37	35, 36
19	37, 38	38, 39	37, 38
20	39, 40	39, 40	39, 40

FIG. 10(1)

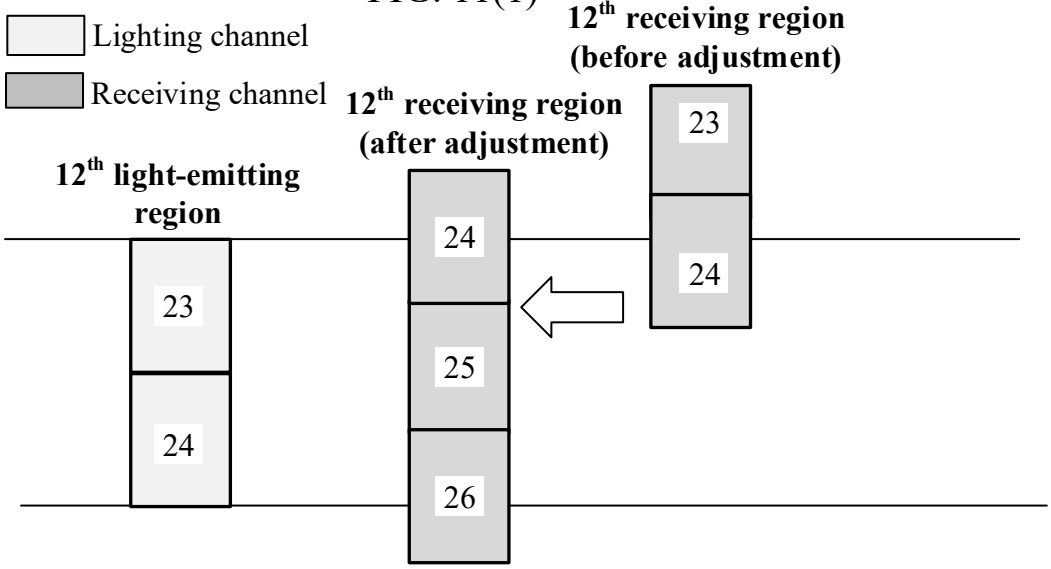


Adjustment when a vertical angle of view of a transmitter is greater than a vertical angle of view of a receiver

FIG. 10(2)

Sequence number i	Row sequence number of a lighting channel in an ith light-emitting region	Row sequence number of a receiving channel in an ith receiving region	
		After adjustment	Before adjustment
1	1, 2	1, 2	1, 2
2	3, 4	3, 4	3, 4
3	5, 6	5, 6	5, 6
4	7, 8	7, 8	7, 8
5	9, 10	9, 10	9, 10
6	11, 12	11, 12	11, 12
7	13, 14	13, 14	13, 14
8	15, 16	15, 16	15, 16
9	17, 18	17, 18	17, 18
10	19, 20	19, 20	19, 20
11	21, 22	21, 22	21, 22
12	23, 24	24, 25, 26	**23, 24**
13	25, 26	26, 27, 28	25, 26
14	27, 28	28, 29, 30	27, 28
15	29, 30	30, 31, 32	29, 30
16	31, 32	32, 33, 34	31, 32
17	33, 34	34, 35, 36	33, 34
18	35, 36	36, 37, 38	35, 36
19	37, 38	38, 39, 40	37, 38
20	39, 40	38, 39, 40	39, 40

FIG. 11(1)

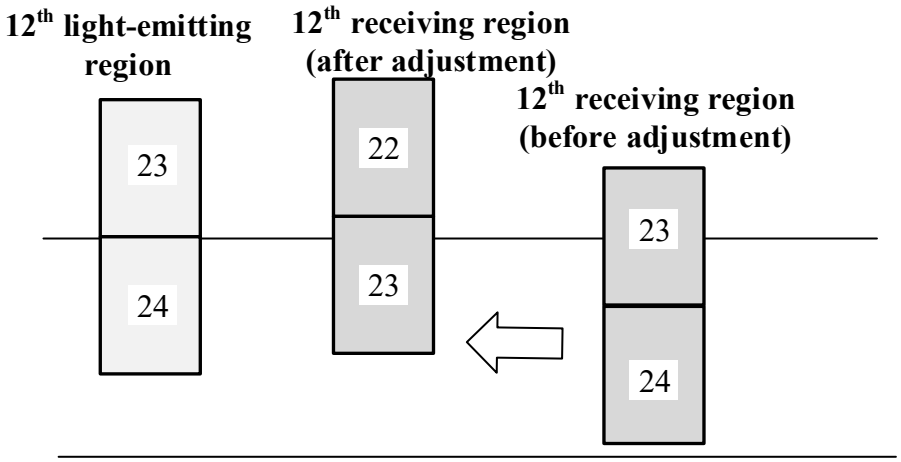


Adjustment when a vertical angle of view of a transmitter is greater than a vertical angle of view of a receiver

FIG. 11(2)

Sequence number i	Row sequence number of a lighting channel in an ith light-emitting region	Row sequence number of a receiving channel in an ith receiving region	
		After adjustment	Before adjustment
1	1, 2	1, 2	1, 2
2	3, 4	3, 4	3, 4
3	5, 6	5, 6	5, 6
4	7, 8	7, 8	7, 8
5	9, 10	9, 10	9, 10
6	11, 12	11, 12	11, 12
7	13, 14	13, 14	13, 14
8	15, 16	15, 16	15, 16
9	17, 18	17, 18	17, 18
10	19, 20	19, 20	19, 20
11	21, 22	21, 22	21, 22
12	23, 24	22, 23	**23, 24**
13	25, 26	24, 25	25, 26
14	27, 28	26, 27	27, 28
15	29, 30	28, 29	29, 30
16	31, 32	30, 31	31, 32
17	33, 34	32, 33	33, 34
18	35, 36	34, 35	35, 36
19	37, 38	36, 37	37, 38
20	39, 40	38, 39	39, 40

FIG. 12(1)

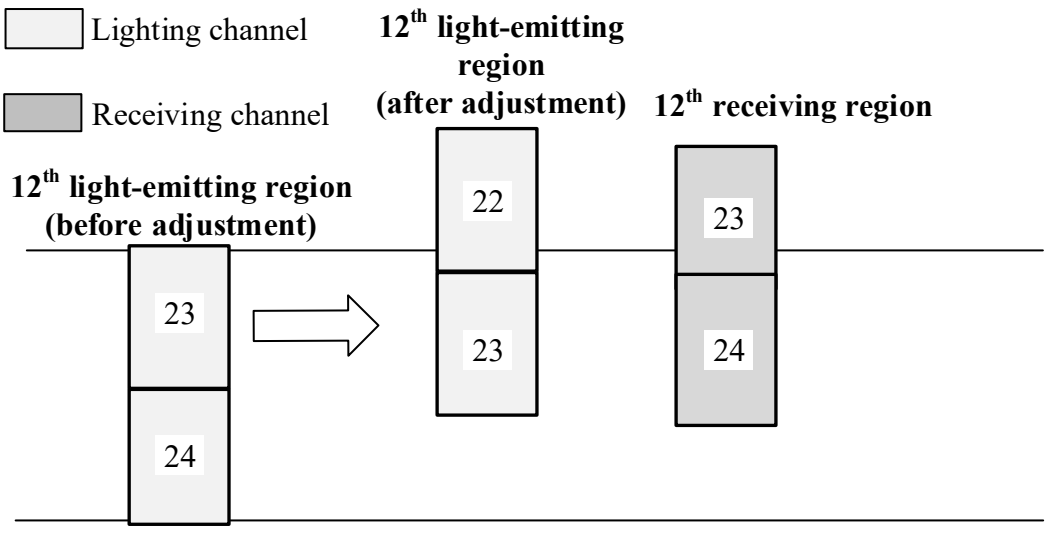


Adjustment when a vertical angle of view of a transmitter is less than a vertical angle of view of a receiver

FIG. 12(2)

Sequence number i	Row sequence number of a lighting channel in an i-th light-emitting region		Row sequence number of a receiving channel in an ith receiving region
	Before adjustment	After adjustment	
1	1, 2	1, 2	1, 2
2	3, 4	3, 4	3, 4
3	5, 6	5, 6	5, 6
4	7, 8	7, 8	7, 8
5	9, 10	9, 10	9, 10
6	11, 12	11, 12	11, 12
7	13, 14	13, 14	13, 14
8	15, 16	15, 16	15, 16
9	17, 18	17, 18	17, 18
10	19, 20	19, 20	19, 20
11	21, 22	21, 22	21, 22
12	**23, 24**	22, 23	23, 24
13	25, 26	24, 25	25, 26
14	27, 28	26, 27	27, 28
15	29, 30	28, 29	29, 30
16	31, 32	30, 31	31, 32
17	33, 34	32, 33	33, 34
18	35, 36	34, 35	35, 36
19	37, 38	36, 37	37, 38
20	39, 40	38, 39	39, 40

FIG. 13(1)

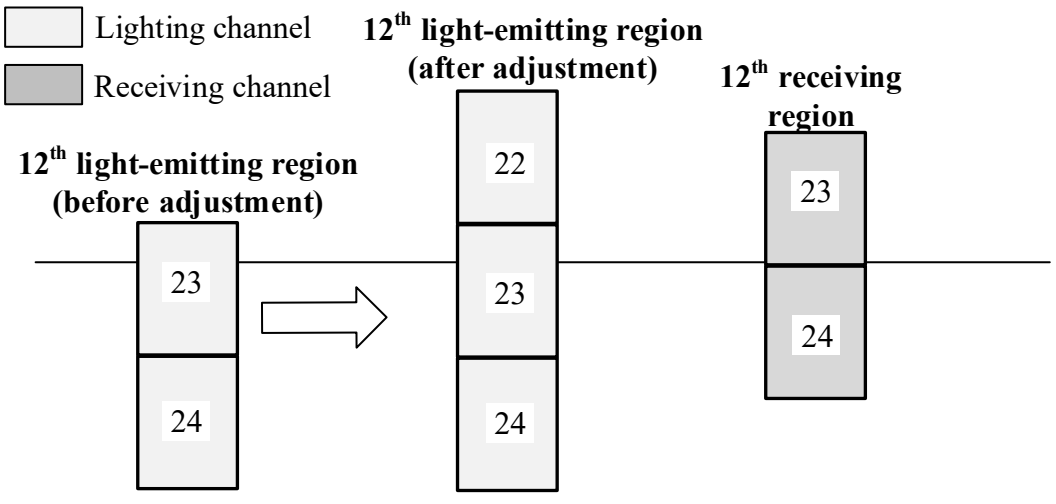


Adjustment when a vertical angle of view of a transmitter is greater than a vertical angle of view of a receiver

FIG. 13(2)

Sequence number i	Row sequence number of a lighting channel in an ith light-emitting region		Row sequence number of a receiving channel in an ith receiving region
	Before adjustment	After adjustment	
1	1, 2	1, 2	1, 2
2	3, 4	3, 4	3, 4
3	5, 6	5, 6	5, 6
4	7, 8	7, 8	7, 8
5	9, 10	9, 10	9, 10
6	11, 12	11, 12	11, 12
7	13, 14	13, 14	13, 14
8	15, 16	15, 16	15, 16
9	17, 18	17, 18	17, 18
10	19, 20	19, 20	19, 20
11	21, 22	21, 22	21, 22
12	**23, 24**	22, 23, 24	23, 24
13	25, 26	24, 25, 26	25, 26
14	27, 28	26, 27, 28	27, 28
15	29, 30	28, 29, 30	29, 30
16	31, 32	30, 31, 32	31, 32
17	33, 34	32, 33, 34	33, 34
18	35, 36	34, 35, 36	35, 36
19	37, 38	36, 37, 38	37, 38
20	39, 40	38, 39, 40	39, 40

FIG. 14(1)

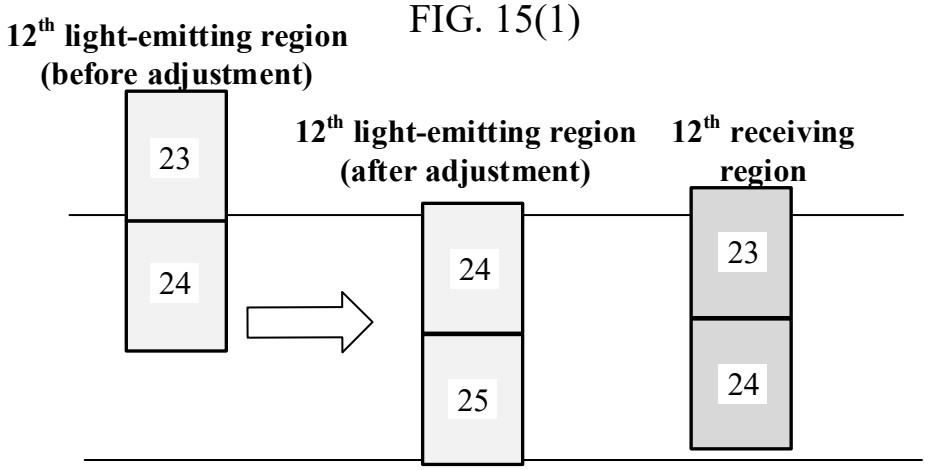


Adjustment when a vertical angle of view of a transmitter is greater than a vertical angle of view of a receiver

FIG. 14(2)

Sequence number i	Row sequence number of a lighting channel in an ith light-emitting region		Row sequence number of a receiving channel in an ith receiving region
	Before adjustment	After adjustment	
1	1, 2	1, 2	1, 2
2	3, 4	3, 4	3, 4
3	5, 6	5, 6	5, 6
4	7, 8	7, 8	7, 8
5	9, 10	9, 10	9, 10
6	11, 12	11, 12	11, 12
7	13, 14	13, 14	13, 14
8	15, 16	15, 16	15, 16
9	17, 18	17, 18	17, 18
10	19, 20	19, 20	19, 20
11	21, 22	21, 22	21, 22
12	**23, 24**	24, 25	23, 24
13	25, 26	26, 27	25, 26
14	27, 28	28, 29	27, 28
15	29, 30	30, 31	29, 30
16	31, 32	32, 33	31, 32
17	33, 34	34, 35	33, 34
18	35, 36	36, 37	35, 36
19	37, 38	38, 39	37, 38
20	39, 40	39, 40	39, 40

FIG. 15(1)



Adjustment when a vertical angle of view of a transmitter is less than a vertical angle of view of a receiver

FIG. 15(2)

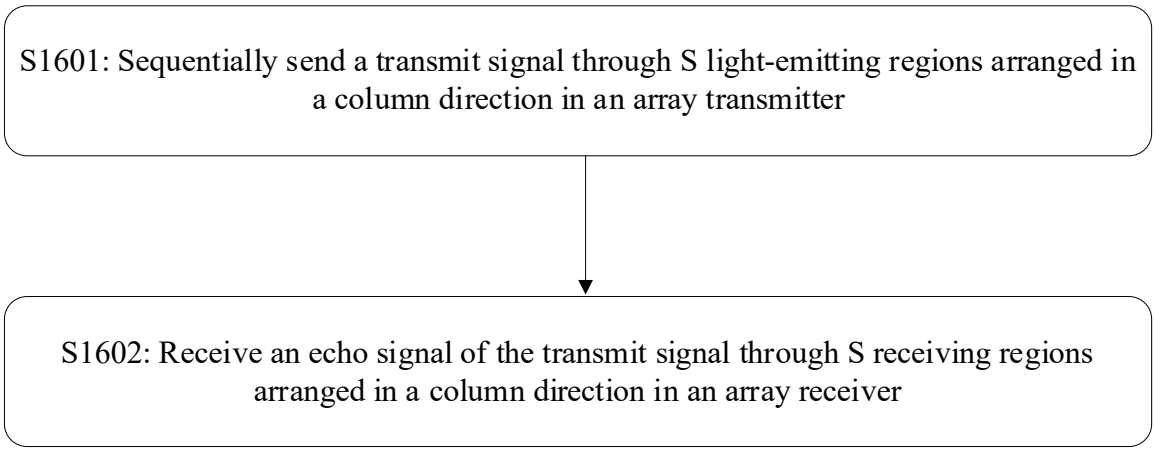


FIG. 16

Sequence number i	Row sequence number of a lighting channel in an ith light-emitting region	Row sequence number of a receiving channel in an ith receiving region
1	1, 2, 3, 4	1, 2
2	2, 3, 4, 5	3, 4
3	4, 5, 6, 7	5, 6
4	6, 7, 8, 9	7, 8
5	8, 9, 10, 11	9, 10
6	10, 11, 12, 13	11, 12
7	12, 13, 14, 15	13, 14
8	14, 15, 16, 17	15, 16
9	16, 17, 18, 19	17, 18
10	18, 19, 20, 21	19, 20
11	20, 21, 22, 23	21, 22
12	22, 23, 24, 25	23, 24
13	24, 25, 26, 27	25, 26
14	26, 27, 28, 29	27, 28
15	28, 29, 30, 31	29, 30
16	30, 31, 32, 33	31, 32
17	32, 33, 34, 35	33, 34
18	34, 35, 36, 37	35, 36
19	36, 37, 38, 39	37, 38
20	37, 38, 39, 40	39, 40

FIG. 17

Sequence number i	Row sequence number of a lighting channel in an ith light-emitting region	Row sequence number of a receiving channel in an ith receiving region
1	1, 2	1, 2, 3, 4
2	3, 4	2, 3, 4, 5
3	5, 6	4, 5, 6, 7
4	7, 8	6, 7, 8, 9
5	9, 10	8, 9, 10, 11
6	11, 12	10, 11, 12, 13
7	13, 14	12, 13, 14, 15
8	15, 16	14, 15, 16, 17
9	17, 18	16, 17, 18, 19
10	19, 20	18, 19, 20, 21
11	21, 22	20, 21, 22, 23
12	23, 24	22, 23, 24, 25
13	25, 26	24, 25, 26, 27
14	27, 28	26, 27, 28, 29
15	29, 30	28, 29, 30, 31
16	31, 32	30, 31, 32, 33
17	33, 34	32, 33, 34, 35
18	35, 36	34, 35, 36, 37
19	37, 38	36, 37, 38, 39
20	39, 40	37, 38, 39, 40

FIG. 18