Table 2. Some bounds for $MinD(n, M, 3, t)$, $MaxD(n, M, 3, t)$ and $CR(n, M, 3, t)$ for some small values of n, M and t.

Strength t	Cardinality M	Length n	Minimum distance bounds	Covering radius bounds	Fazekas-Levenshtein bounds
t	3^t	$t+1$	2^{c0}	1	
t	3^{t+1}	$t+1$	1^{c1}	1	1
2	9	4	3^{c0}	2	2
2	18	3	1^{c1}	1	1
2	18	4	1-2^{c1}	2	2
2	18	5	1-3^{c1}	2	2.67
2	18	6	3-4^{c1}	3	3.33
2	18	7	4^{c2}	4	4
2	27	4	1-2^{c1}	1^*	2
2	27	5	1-3^{c1}	2	2.67
2	27	6	1-3^{c2}	3	3.33
2	27	7	2-4^{c2}	4	4
2	27	8	3-5^{c2}	4	4.67
2	27	9	4-6^{c2}	5	5.33
2	27	10	5-6	5^*	6
2	27	11	6-7	6	6.67
2	27	12	8	7	7.33
2	27	13	9	7^*	8
2	36	3	1^{c0}	1	1
2	36	4	1-2^{c1}	2	2
2	36	5	1-2^{c2}	2	2.67
2	36	6	1-3^{c2}	3	3.33
2	36	7	1-4^{c2}	4	4
2	36	8	1-4	4	4.67
2	36	9	2-5	5	5.33
2	36	10	3-6	6	6
2	36	11	4-7	6	6.67
2	36	12	5-8	7	7.33
2	36	13	6-8	7	8
2	36	14	7-9	8	8.67

Strength t	Cardinality M	Length n	Minimum distance bounds	Covering radius bounds	Fazekas-Levenshtein bounds
2	36	15	8-10	9	9.33
2	36	16	8-10	10	10
3	54	4	1^{c1}	1	1.54
3	54	5	1-2^{c1}	2	2.09
3	81	5	1-2^{c1}	1^{*}	2.09
3	81	6	1-3^{c1}	2	2.67
3	81	7	1-3^{c2}	3	3.24
3	81	8	2-4^{c2}	3	3.82
3	81	9	3-5^{c2}	4	4.40
3	81	10	4-6^{c2}	5	5
4	243	6	1-2^{c1}	1^{*}	2.09
4	243	7	1-2^{c2}	2	2.67
4	243	8	1-3^{c1}	2^{*}	3.24
4	243	9	3-4^{c1}	3	3.82
4	243	10	5^{c1}	4	4.40
4	243	11	6^{c1}	5	5
5	729	7	1-2^{c1}	1^{*}	2.21
5	729	8	1-2^{c2}	2	2.72
5	729	9	1-3^{c2}	2^{*}	3.24
5	729	10	3-4^{c2}	3	3.77
5	729	11	5^{c2}	2^{*}	4.30
5	729	12	6^{c2}	3^{*}	4.85
6	2187	8	1-2^{c1}	2	2.21
6	2916	7	1^{c1}	1	1.71
6	2916	8	1-2^{c1}	2	2.21
6	2916	9	1-2^{c2}	2	2.72
6	2916	10	1-3^{c2}	3	3.24
6	2916	11	2-4^{c2}	3	3.77
7	6561	9	1-2^{c1}	1^{*}	2.32

Remark. The single value in the column with minimum distance bounds shows that lower and upper bounds coincide, i.e. every OA with the corresponding M, n, q, and t has this minimum distance and, therefore, $MinMD(M,n,q,t) = MaxMD(M,n,q,t)$ in such cases. For example, $MinMD(128,15,3,4) = MaxMD(128,15,3,4) = 6$.

The results are compared to Theorems IV.2 and IV.5 [1] for the minimum distance problem, while the covering radius bounds are compared to Fazekas-Levenshtein bounds [13, Theorem 2]. In all completed cases we obtain the same or better bound.

The cases where the bounds from Section 4 in [1] are obtained are marked as follows:

– $c0$ obtained by (10);

– $c1$ obtained by Corollary IV.4;

– $c2$ obtained by Corollary IV.6;

– $*$ the case where our bound is better than the Fazekas-Levenshtein bound.

The results in the Table 2 are extracted from the database below.

REFERENCES

[1] Silvia Boumova; Peter Boyvalenkov; Maya Stoyanova, Bounds for the minimum distance and covering radius of orthogonal arrays via their distance distributions, submitted.

[2] Fazekas, G.; Levenshtein, V.I. On upper bounds for code distance and covering radius of designs in polynomial metric spaces. *Journal of Combinatorial Theory Ser. A*, 70, 267–288, 1995.