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AFDELING ZUIVERE WISKUNDE
(DEPARTMENT OF PURE MATHEMATICS)

ZN 71/77 FEBRUARI

M.R. BEST

A(11,4,4) = 35 OR SOME NEW OPTIMAL CONSTANT WEIGHT CODES

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$A(11,4,4) = 35$ or some new optimal constant weight codes

by

M.R. Best

ABSTRACT

We give all 11 constant weight codes containing 35 words of length 11, weight 4, and minimal Hamming distance 4. These codes are optimal.

KEY WORDS & PHRASES: *constant weight code, packing, sphere packing.*

By means of exhaustive search by computer it was found that there exist exactly 11 non-isomorphic binary constant weight codes containing 35 words of length 11, weight 4, and minimal Hamming distance 4. It follows from the Johnson bound that these codes are optimal, so

$$A(11,4,4) = 35$$

This implies that there exists a sphere packing in Euclidean 11-space with contact number 582, which was doubted before (cf. [1]).

The codewords are given as the columns of the following matrices. The permutations next to each matrix form a set of generators for the automorphism group acting on the rows (numbered from above by 1 to 11).

```

111111111110000000000000000000000000
1110000000001111111100000000000000
1001100000001100000001111110000000
00000111000010111000011100001110000
00010000110010000111000011001111000
00001100101000100100110010101000110
0100101000010001001000100101100110
00100001100100010001100101100100101
0010001001100100110001000001010101
10000100010100001010100110010010011
01010001001001100001001000100011011

```

(1,2,3)(4,6,8)(5,7,9)

```

1111111111100000000000000000000000
1110000000001111111100000000000000
1001100000001100000001111110000000
00000111000010111000011100001110000
00010000110010000111000011001111000
00001100101000100100110010101000110
0100101000010001001000100101100110
00100010011000001010100110010100101
00100001100101100001001000100101101
01010001001001001100010000010011011
10000100010100010001100101100010011

```

(1,2,3)(4,6,8)(5,7,9)

```

1111111111100000000000000000000000
1110000000001111111100000000000000
0001110000001100000011111000000000
00010011000010011100011000011110000
10001000100000010011010110011001100
10000010011001001000010001100101110
01000100110000010000101101000111001
00001001010101000110101000010000111
00100001101000101010000011001010011
01010000001100100101000100101100101
00100110000110000001100010110011010

```

(1,2,3)(4,7,9)(5,6,8)

