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**Yury J Ionin\*** (yury.ionin@cmich.edu). *Binary Representations of Regular Graphs.*

For any 2-distance set  $X$  in the  $n$ -dimensional binary Hamming space  $H_n$ , let  $\Gamma_X$  be the graph with  $X$  as the vertex set and with two vertices adjacent if and only if the distance between them is the smaller of the two nonzero distances in  $X$ . The binary spherical representation number of a graph  $\Gamma$ , or  $bsr(\Gamma)$ , is the least  $n$  such that  $\Gamma$  is isomorphic to  $\Gamma_X$  where  $X$  is a 2-distance set lying on a sphere in  $H_n$ . It is shown that if  $\Gamma$  is a connected regular graph, then  $bsr(\Gamma) \geq b - m$ , where  $b$  is the order of  $\Gamma$  and  $m$  is the multiplicity of the least eigenvalue of  $\Gamma$ , and the case of equality is characterized. In particular, if  $\Gamma$  is a connected strongly regular graph, then  $bsr(\Gamma) = b - m$  if and only if  $\Gamma$  is the block graph of a quasi-symmetric 2-design. (Received September 11, 2010)