بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

السلام عليكم ورحمة الله وبركاته

Reduction The Clutter By using Genetic Algorithm

By:
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Contents:

1)What is the clutter?

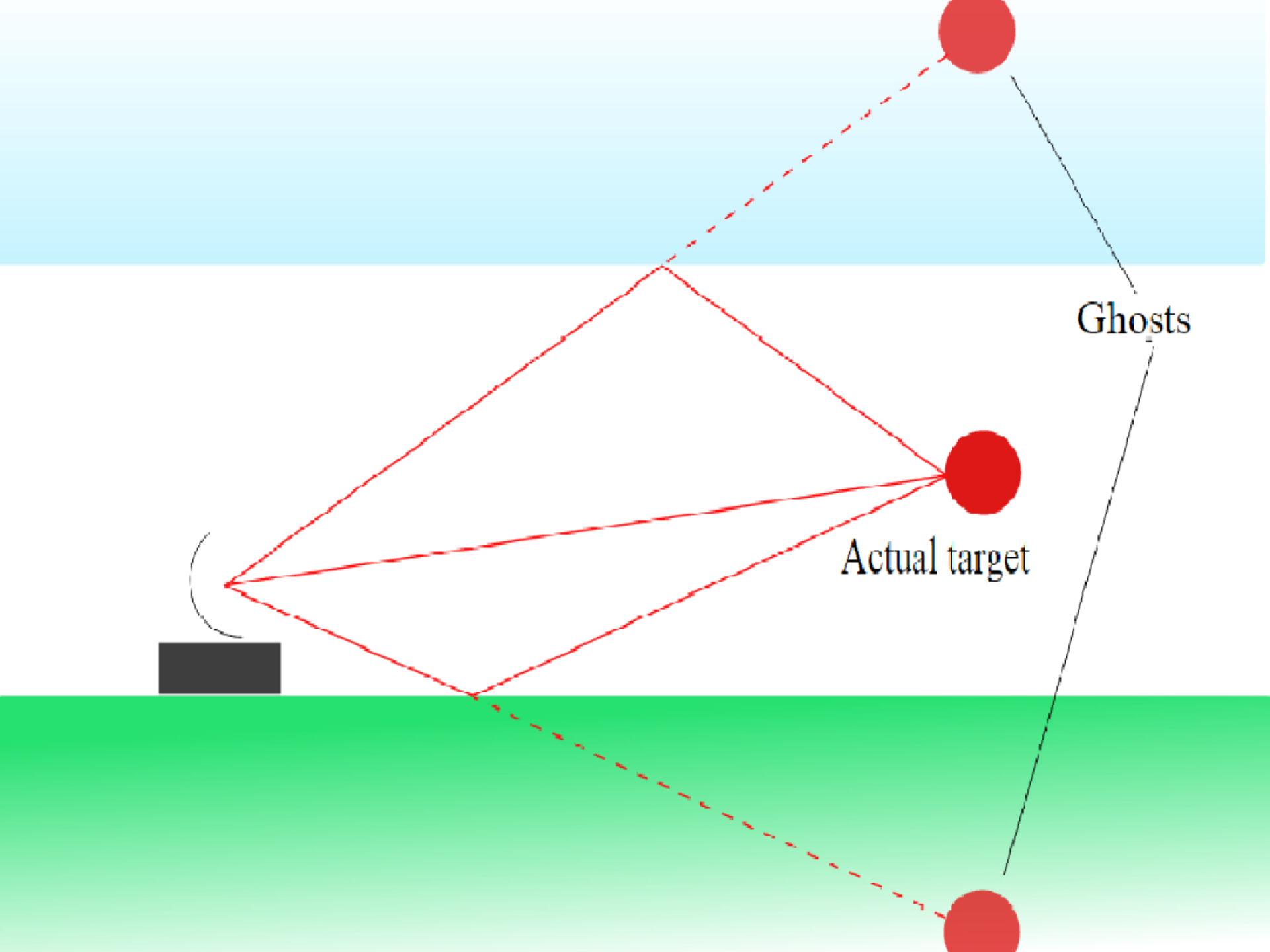
2)Why we must reduce the clutter effects of signals?

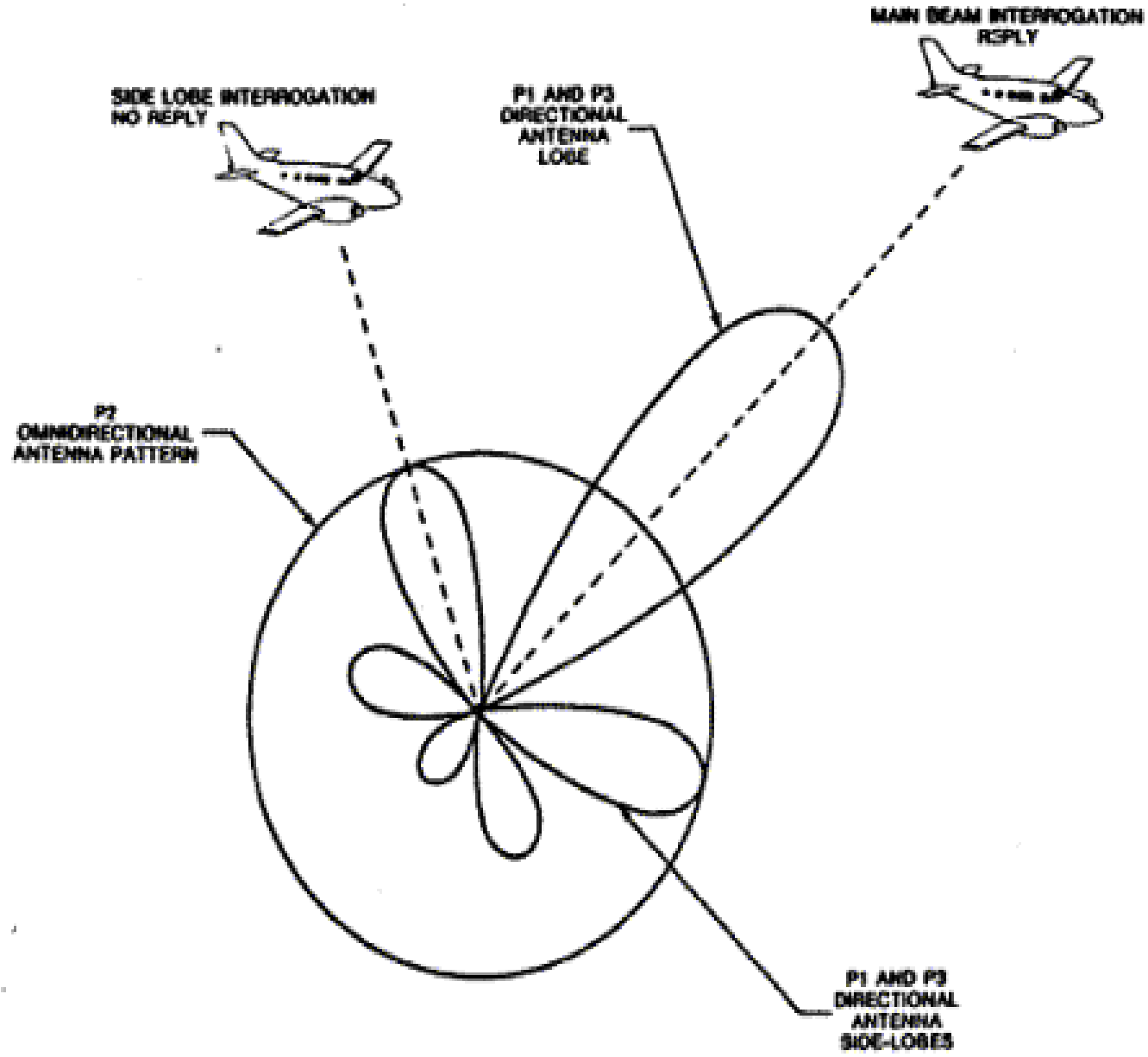
3)Explain the proposed technique (Genetic Algorithm) that use to reduce it?

4) benefits

INTRODUCTION

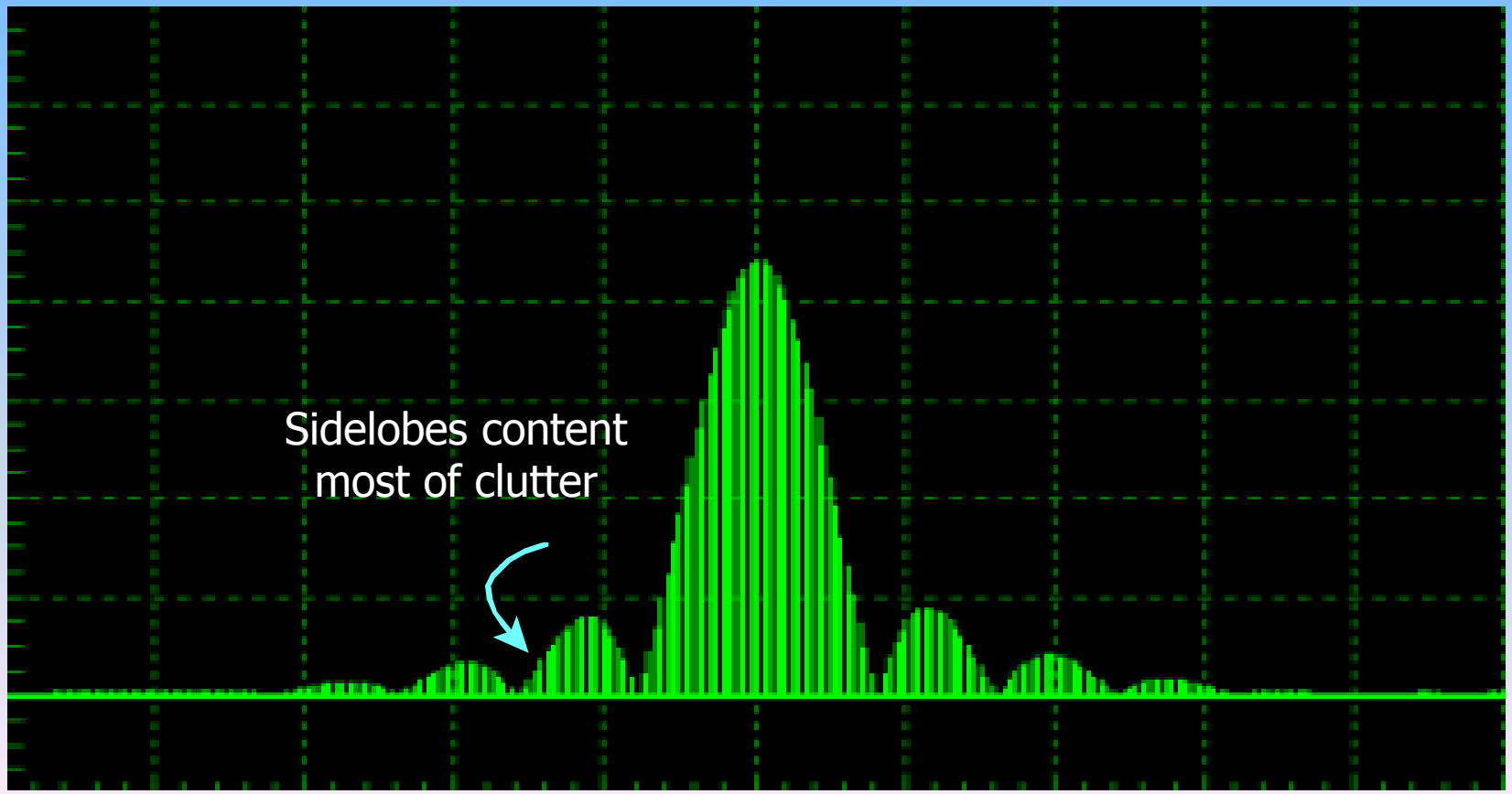
Clutter refers to radio frequency (RF) echoes returned from targets which are uninteresting to the radar operators. Such targets include natural objects such as ground, sea, precipitation (such as rain, snow or hail), sandstorms, animals (especially birds), atmospheric turbulence, and other atmospheric effects, such as ionosphere reflections, meteor trails. Clutter may also be returned from man-made objects such as buildings and, intentionally, by radar countermeasures such as chaff.


Ghosts
Actual target


MAIN BEAM INTERROGATION
REPLY
SIDE LOBE INTERROGATION
NO REPLY
P1 AND P3
DIRECTIONAL
ANTENNA
LOBE
P2
OMNIDIRECTIONAL
ANTENNA PATTERN
P1 AND P3
DIRECTIONAL
ANTENNA
SIDE-LOBES

Limitations of Pulse Compression

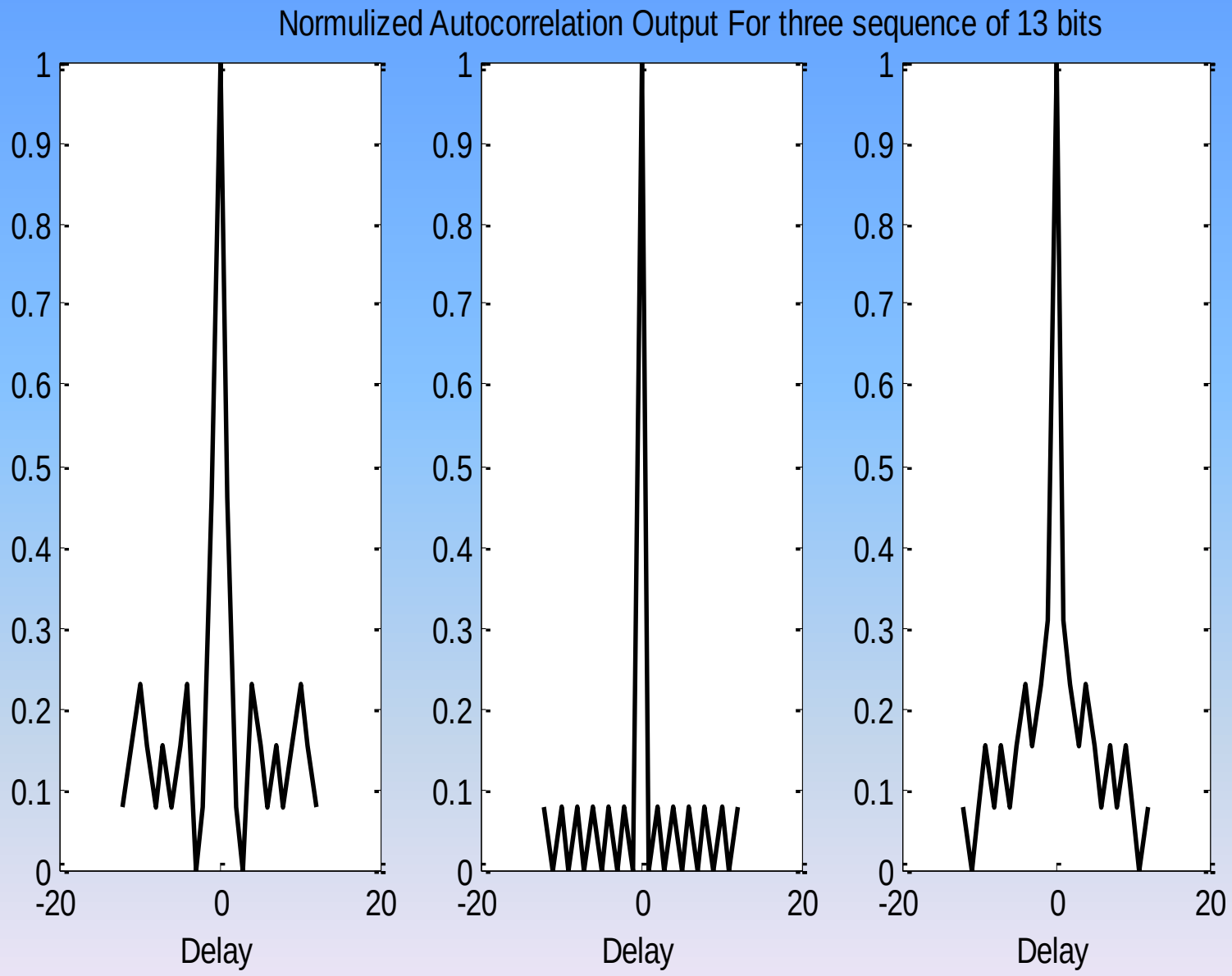
The time sidelobes accompanying the compressed pulse are objectionable since they mask desired targets or create false targets.



Global Search of any Binary Phase Codes Consist of *N* bits is:

2^N Sequences

For Example:
For The Code length Consist of 10 bits ,the global Search is = 2^{10}=1024 sequences


Normulized Autocorrelation Output For three sequence of 13 bits
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
-20
0
20
Delay
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
-20
0
20
Delay
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
-20
0
20
Delay

Genetic Algorithm (GA):

- ***Genetic algorithm is one of the intelligent computing techniques, So it is a method mainly used to find the global optimization of complex system. It searches from a set of possible solutions in parallel. It uses, the fitness function as a mean of discriminating among different sets of possible solutions. GA is based on generation of new possibly improving population among the previous population.***

Genetic Algorithm (GA):

- ***Such reduction is implemented by generation the optimum binary codes with length up to 105 bits, using genetic algorithm (GA) with a minimum peak sidelobe of the aperiodic autocorrelation function for a given length as a criteria.***

Operators of genetic algorithm (GA):

There are three most important parts :

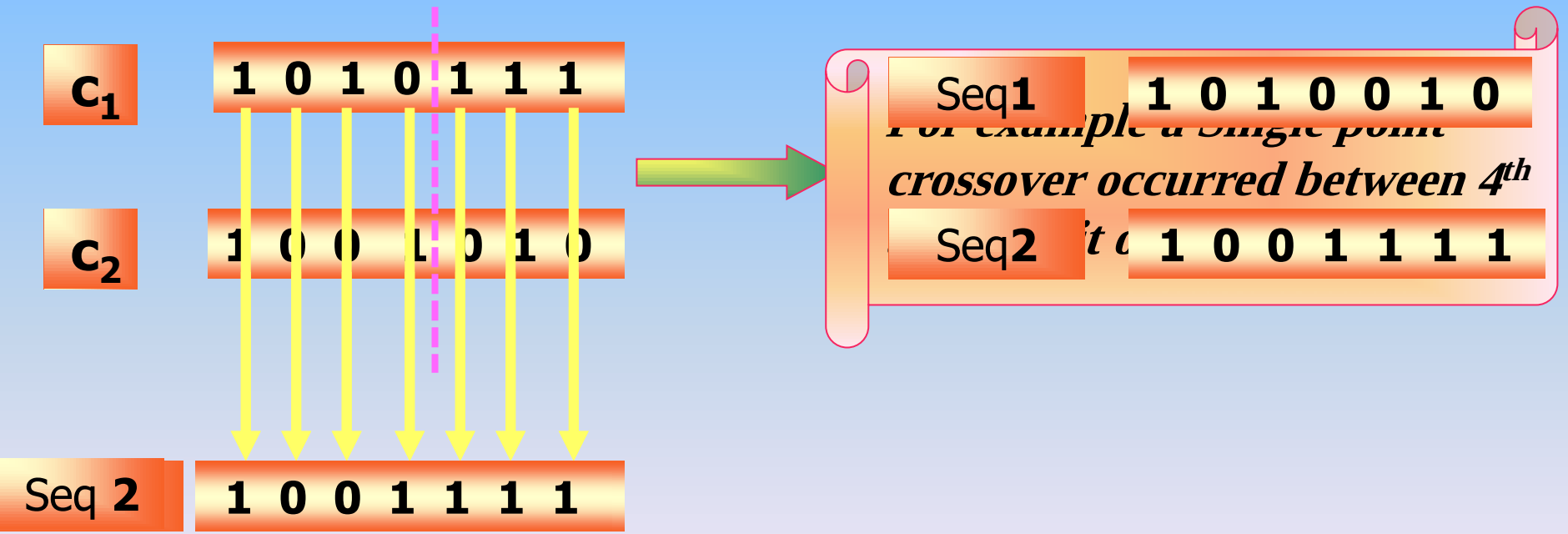
Roulette Wheel Selection

Crossover

Mutation

Implementation of Crossover operation

Crossover of string binary phase consist of 7-bits



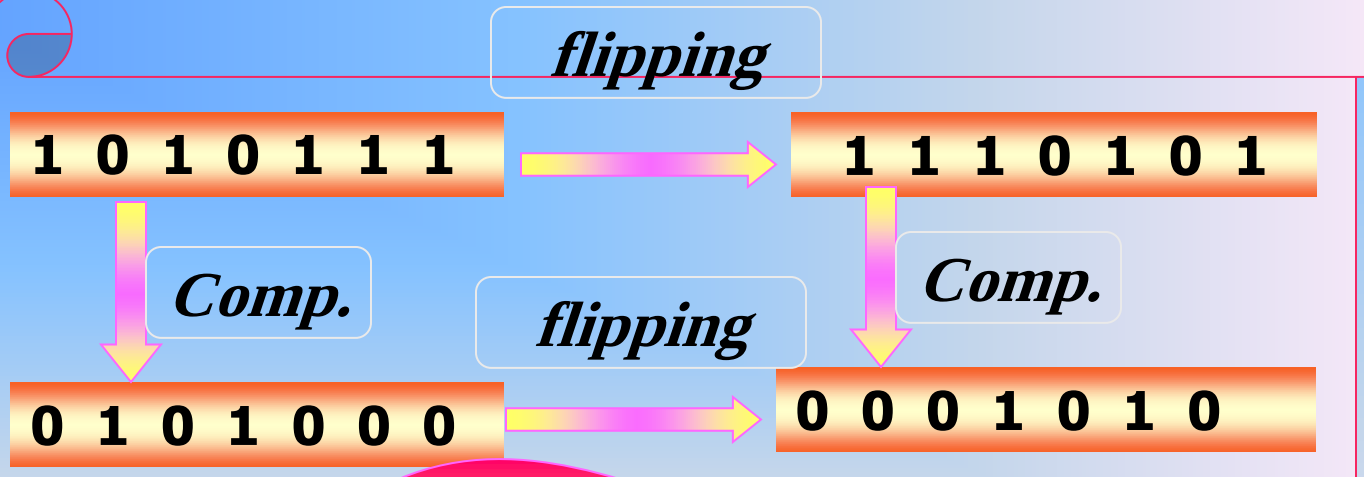
Some Procedure for Reduction Search Space

Eliminating the Allomorphic Forms:

Each binary sequence can be stated in four forms in terms of Autocorrelation Function (ACF), all of which have the same correlation characteristics. So, to reduce the search space must eliminating the three forms of each code.

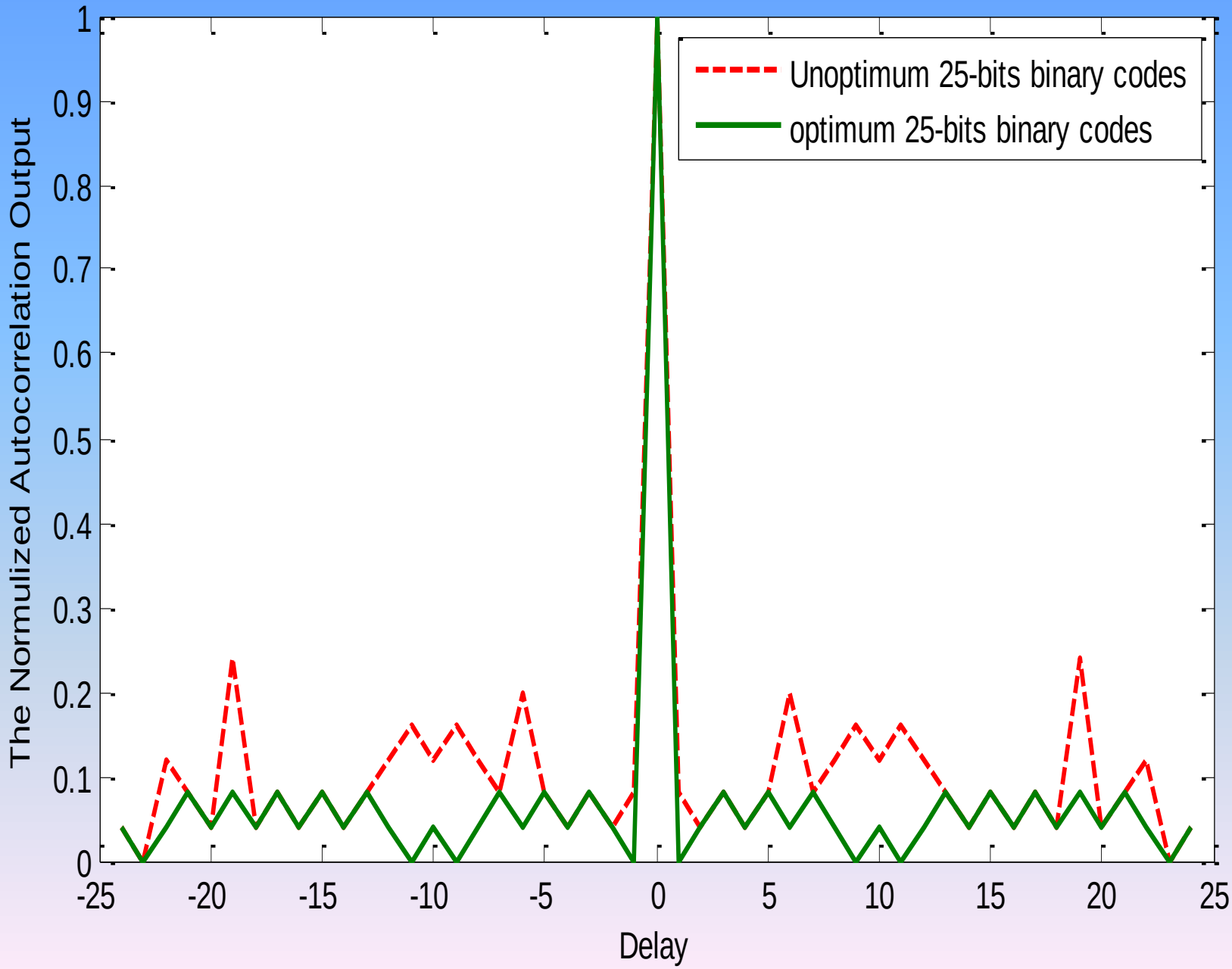
Some Procedure for Reduction Search Space

Eliminating the Allomorphic Forms:

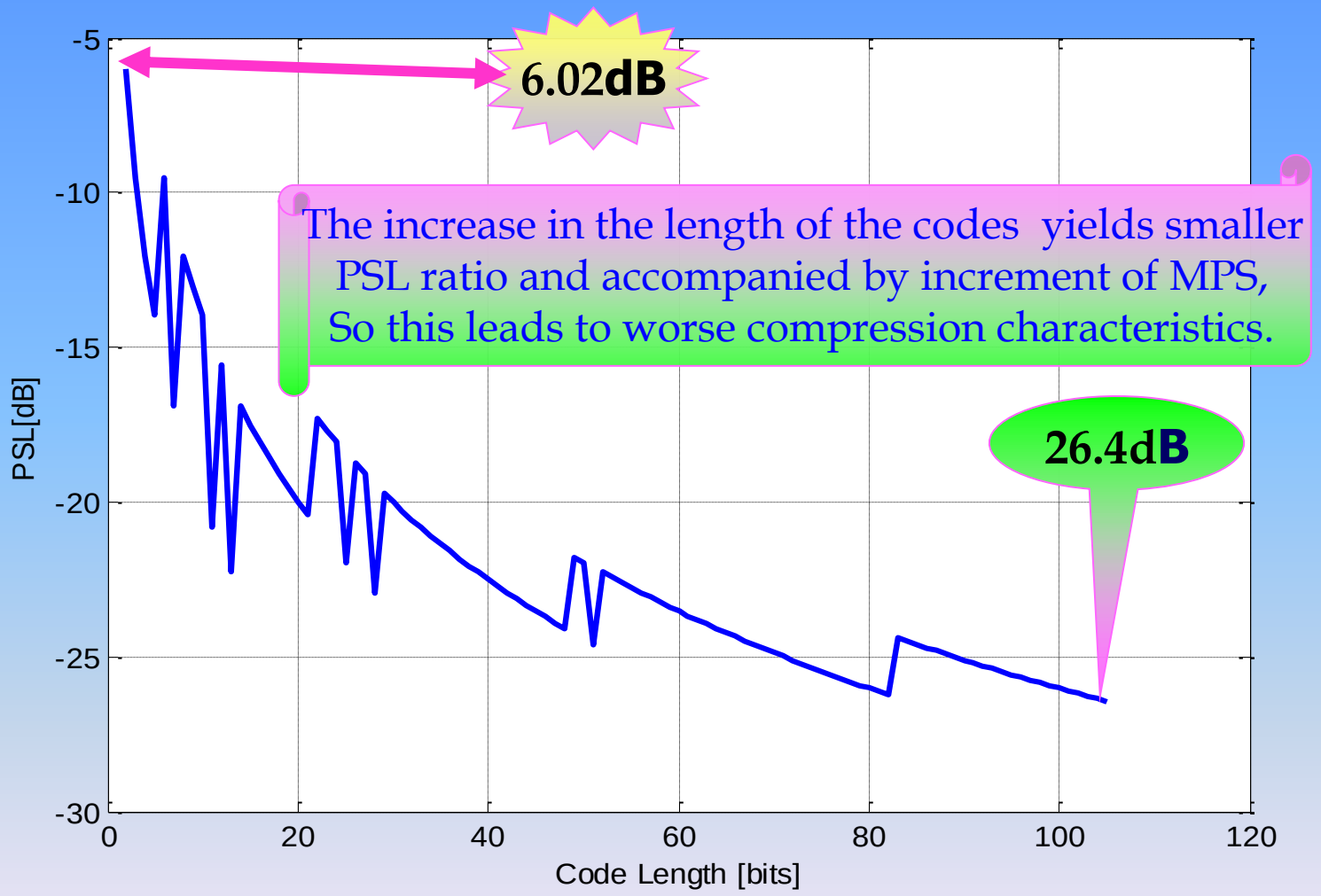


All of which have the similar correlation characteristics

Code Length (N)	MSL	Sequence
4	1	1110
10	2	0101100111
30	3	100011000101010010010000001111
25	2	10010010101000000111001111
25	6	10010010101000000111001100
55	4	0000100110000100110101010100001111000110010010001101111
70	4	0110100001001100111011010011100011000010010011111011011101010101111110
70	7	0000100001001100111011010011100011000010010011111011011101000111110
99	5	1110010111001101101101101101010011101011110011010101001111010000001111100001000010001100111011101111


Unoptimum 25-bits binary codes
optimum 25-bits binary codes
The Normulized Autocorrelation Output
Delay
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
-25
-20
-15
-10
-5
0
5
10
15
20
25

Optimum Binary Phase Codes generated by GA. To length 105



Thank You

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