

## 1) Properties of Maximum length Sequence

\* Balance property

\* Run property

\* Correlation property.

Balance Property :

\* In each period of max-length sequence the no. of 1's is always more than the no. of 0's then this property is called balance property.

\* If the number of 1's =  $1 + \text{no. of 0's}$   
Then the Balance property is verified.

Run-property.

Among the runs of 1's and 0's in each period of max-length sequence and one half the runs of each kind are of length three and so on long as these functions represent meaningful number of one's. This property is called run-property.



Correlation property:

\* The auto correlation function of a maximum length sequence is periodic and binary valued. This property is called correlation property.

\* Let binary symbols 0 and 1 be represented by -1 volt and +1 volt respectively

$$R_c(k) = \frac{1}{N} \sum_{n=1}^N c_n c_{n-k}$$

$N \rightarrow$  length of period of sequence

$k \rightarrow$  lag of the auto correlation sequence.

3-) Expression for spread spectrum process gain.

\* It can be defined as the ratio of the bandwidth occupied by the spectrum signal to the bandwidth of the original narrow band signal.

$$\text{Processing Gain (PG)} = \frac{\text{Bandwidth of spread signal (Bs)}}{\text{Bandwidth of unspread signal (Bv)}}$$

Bandwidth of unspread signal (Bv)



⇒ where  $PG =$  Spread Spectrum processing gain

$B_S =$  BW of Spread Spectrum signal

$B_W =$  BW of original narrowband signal.

2) Benefits of Spread Spectrum Communication :

- \* Resistance to Interference.

- \* Enhanced Security

- \* Increased Capacity

- \* Improved Robustness to multipath fading

- \* Co-existence with other systems

- \* Improved Signal quality

- \* Low probability of Intercept (LPI).



#### 4) DSSS (Direct Sequence Spread Spectrum)

Direct Sequence Spread Spectrum (DSSS) works somewhat differently with DSSS, the data is divided into and simultaneously transmitted as many frequencies as possible within a particular

frequency band. DSSS adds redundant bits of data known as chips to the data to represent binary 0's and 1's. The ratio of chips to

data is known as Spreading ratio. The higher the ratio, the more immune to interference the signal is because if part of the transmission is corrupted, the data can still be recovered from the remaining part of the spreading code.