Signal distortion category:

Probabilistic category:

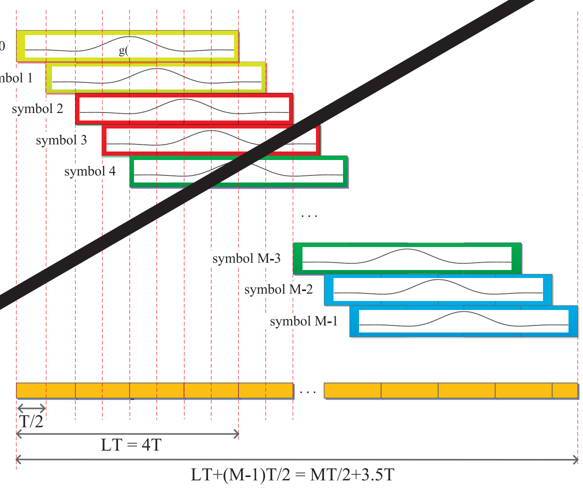
Hybrid category:

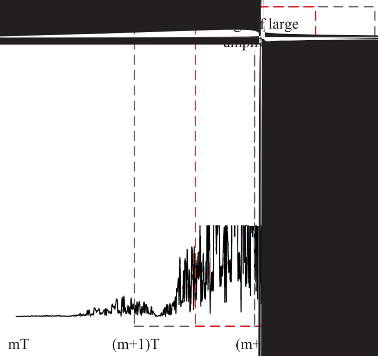
Notations:

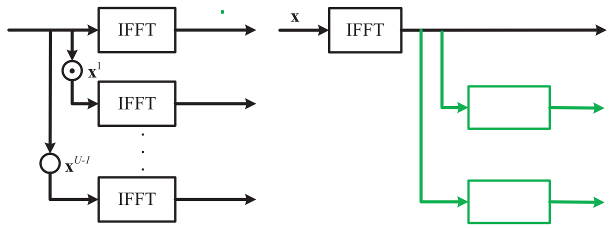
A. Expressing an FBMC/OQAM Signal With an Overlapping Structure

$$d_n^m = \begin{cases} a_n^{m/2}, & m = 0, 2, 4, \dots, M-2 \\ b_n^{(m-1)/2}, & m = 1, \dots, M-1 \end{cases} \quad (1)$$

$$s(t) = \sum_{m=0}^{M-1}\sum_{n=0}^{N-1} d_n^m \underbrace{e^{j\frac{\pi}{2}(m+n)} e^{j2\pi n t/T} g\left(t - m\frac{T}{2}\right)}_{g_{m,n}(t)} \quad (2)$$




f large
mT
(m+1)T


IFFT
IFFT
IFFT
IFFT
x
x1
xU-1

$$
\mathbf{C}^3 = 0.5 \times \begin{pmatrix}
1 & 0 & 0 & 0 & j & 0 & 0 & 0 & 1 & 0 & 0 & 0 & -j & 0 & 0 & 0 \\
0 & 1 & 0 & 0 & 0 & j & 0 & 0 & 0 & 1 & 0 & 0 & 0 & -j & 0 & 0 \\
0 & 0 & 1 & 0 & 0 & 0 & j & 0 & 0 & 0 & 1 & 0 & 0 & 0 & -j & 0 \\
0 & 0 & 0 & 1 & 0 & 0 & 0 & j & 0 & 0 & 0 & 1 & 0 & 0 & 0 & -j \\
-j & 0 & 0 & 0 & 1 & 0 & 0 & 0 & j & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\
0 & -j & 0 & 0 & 0 & 1 & 0 & 0 & 0 & j & 0 & 0 & 0 & 1 & 0 & 0 \\
0 & 0 & -j & 0 & 0 & 0 & 1 & 0 & 0 & 0 & j & 0 & 0 & 0 & 1 & 0 \\
0 & 0 & 0 & -j & 0 & 0 & 0 & 1 & 0 & 0 & 0 & j & 0 & 0 & 0 & 1 \\
1 & 0 & 0 & 0 & -j & 0 & 0 & 0 & 1 & 0 & 0 & 0 & j & 0 & 0 & 0 \\
0 & 1 & 0 & 0 & 0 & -j & 0 & 0 & 0 & 1 & 0 & 0 & 0 & j & 0 & 0 \\
0 & 0 & 1 & 0 & 0 & 0 & -j & 0 & 0 & 0 & 1 & 0 & 0 & 0 & j & 0 \\
0 & 0 & 0 & 1 & 0 & 0 & 0 & -j & 0 & 0 & 0 & 1 & 0 & 0 & 0 & j \\
j & 0 & 0 & 0 & 1 & 0 & 0 & 0 & -j & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\
0 & j & 0 & 0 & 0 & 1 & 0 & 0 & 0 & -j & 0 & 0 & 0 & 1 & 0 & 0 \\
0 & 0 & j & 0 & 0 & 0 & 1 & 0 & 0 & 0 & -j & 0 & 0 & 0 & 1 & 0 \\
0 & 0 & 0 & j & 0 & 0 & 0 & 1 & 0 & 0 & 0 & -j & 0 & 0 & 0 & 1
\end{pmatrix} \quad (14)
$$

TABLE 1 ... $\tilde{\mathbf{p}}^u$ ... $\tilde{\mathbf{c}}^u$

Index	Phase rotation vector tuple	Conversion vector tuple
1	$\tilde{\mathbf{p}}^1$ = [1 1 1 1]	$\tilde{\mathbf{c}}^1$ = [1 0 0 0]
2	$\tilde{\mathbf{p}}^2$ = [-1 1 1 1]	$\tilde{\mathbf{c}}^2$ = [1 -1 -1 -1]
3	$\tilde{\mathbf{p}}^3$ = [1 -1 1 1]	$\tilde{\mathbf{c}}^3$ = [1 -j [illegible] j]
4	$\tilde{\mathbf{p}}^4$ [illegible]	[illegible]

$\mathbf{C}^u$ (1)-(20)

$$\mathbf{p}^u = \Bigg[\underbrace{(\tilde{\mathbf{p}}^u)^T \ (\tilde{\mathbf{p}}^u)^T \quad (\tilde{\mathbf{p}}^u)^T}_{ON}\Bigg]^T \in \mathbb{C}^{1\times} \quad (1\ )$$

$$\mathbf{c}^u = \{\mathbf{p}^u\} \in \mathbb{C}^{1\times} \quad (1\ )$$

$$\mathbf{C}^u = \Big[(\mathbf{c}^u)^{\langle 0\rangle} \ (\mathbf{c}^u)^{\langle 1\rangle} \quad (\mathbf{c}^u)^{\langle ON-1\rangle}\Big] \in \mathbb{C} \ \times \quad (20)$$

$u \in \{1\ 2 \quad U\}$

$\tilde{\mathbf{p}}^u$ (1),

2) *Conversion Vector-Based Modulation:* $O-1\ N$

$\mathbf{x}$, $\mathbf{x} = x_1\ x_2 \quad x_{\frac{N}{2}}\ 0\ 0 \quad 0\ 0\ x_{\frac{N}{2}+1}\ x_{\frac{N}{2}+2} \quad x_N$, $\mathbf{k}$ $\mathbf{s}^1$ O $U-1$ $\mathbf{s}$

$$\mathbf{s}^u = \mathbf{C}^u \cdot \mathbf{s}^1 \in \mathbb{R}^{1\times} \quad u = 2 \quad U \quad (21)$$

$\mathbf{s}^u$ L g

$$\mathbf{s}^u_L = \Bigg[\underbrace{(\mathbf{s}^u)^T \ (\mathbf{s}^u)^T \quad (\mathbf{s}^u)^T}\Bigg]^T \in \mathbb{R}^{1\times} \quad (22)$$

$$\mathbf{s}^u_m = \mathbf{s}_L \cdot g \in \mathbb{R}^{1\times} \quad (2\ )$$

$$\mathbf{s}^u\ t = \underbrace{\sum_{m'=1}^{m-1} \mathbf{s}^{u^{m'}_{min}}_{m'}} + \underbrace{\mathbf{s}^u_m} \quad (2\ )$$

$m' \in \{1\ 2 \quad M-1\}$, $\mathbf{s}^{u^{m'}_{min}}_{m'}$ U

) *PAPR Calculation:* $\mathbf{s}^u\ t$ T_o,

$$PAPR^u_{T_0} = \frac{{}_{t\in T_0}|\mathbf{s}^u\ t\ |^2}{\frac{1}{T_0}\int_{T_0}|\mathbf{s}^u\ t\ |^2 dt} \quad u \in \{1\ 2 \quad U\} \quad (2\ )$$

T_o $T_0 = mT\ mT + T$ T,

) *Selection:* U u_{min}

$$u_{min} = \underset{0\le u\le U-1}{} PAPR^u_{T_0} \quad (2\ )$$

) *Update:*

$$\mathbf{s}^{u^{m'+1}_{min}}_{m'+1} = \mathbf{s}^{u_{min}}\ t \quad (2\ )$$

	Number of Multiplications	Number of Additions
DSLM scheme	$UM\frac{ON}{2}\log_2(ON)$	$UMON\log_2(ON)$
C-DSLM scheme	$M\frac{ON}{2}\log_2(ON)$	$MON\log_2(ON) + 3(U-1)MON$

u_{min} **SI**

$$\mathbf{SI} = \mathbf{SI}\ u_{min} \quad (2\ )$$

, $m = m + 1$, **Step 2** $m = M$.

C. Complexity Evaluation

$$= \left(1 - \frac{}{}\right) \times 100\% \quad (2\ )$$

N $\frac{N}{2}$ $_2N$ N $_2N$ $\mathbf{k}$, $U-1$ O ON, M $\mathbf{k}$ $M)$ $M\frac{ON}{2}$ $_2$ ON MON $_2$ ON ON ON

$\{1\ -1\}$. $M\frac{ON}{2}$ $_2$ ON MON $_2$ ON + $U-1$ MON

$\mathbf{k}$ U $UM\frac{ON}{2}$ $_2$ ON $UMON$ $_2$ ON

N, $\mathbf{k}$ M, , 100, ,

	$U = 4$		$U = 8$		$U = 16$	
	Number of Multiplications	Number of Additions	Number of Multiplications	Number of Additions	Number of Multiplications	Number of Additions
DSLM scheme	409600	819200	819200	1638400	1638400	3276800
C-DSLM scheme	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

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