1. Equation 1
2. Equation 2
3. Equation 3
4. Equation 4
5. Equation 5
6. Equation 6
7. Equation 7
8. Equation 8

Equation 1

$$\hat{x}_m[v] = \mathcal{F}(u_m[v]) = \frac{1}{\sqrt{2}}\{sgn(Re\{u_m[v]\}) + j.sgn(Im\{u_m[v]\})\}$$

with the signum function $sgn\{a\} = \pm 1$ for $\mathbb{R} \ni a \gtrless 0$.

Equation 2

$$\mathbf{w}_{m,i}[v] = \mathbf{w}_{m,i}^{(CM)}[v] + \mathbf{w}_{m,i}^{(DD)}[v]$$

CM Algorithm – Concurrent Constant ModulusAlgorithm
DD Algorithm – Decision Directed Algorithm
where $\mathbf{w}_{m,i}^{(CM)}[v]$ will be updated by a CM algorithm
$\mathbf{w}_{m,i}^{(DD)}[v]$ is adjusted in DD mode, with $m \in \{1, 2, ...40\}$ being the subcarrier index

Equation 3

$$\nu_m[v] = \sum_{i=0}^{2} \mathbf{w}_{m,i}^H[v]\mathbf{y}_{m,i}[v]$$

where $\mathbf{y}_{m,i}[v]$ is a tap-delay-line vector containing a data window of the polyphase signal $\mathbf{y}_{m,i}[v]$ in Fig.8,such that

$$\mathbf{y}_{m,i}[v] = \begin{pmatrix} y_{m,i}[v] \\ y_{m,i}[v-1] \\ . \\ . \\ . \\ y_{m,i}[v - L_{m,i} + 1] \end{pmatrix}$$

Equation 4

If we neglect carrier frequency and phase offsets, then the subcarrier output is given by

$$\hat{x}_m[v] = \mathcal{F}(u_m[v])$$

Equation 5

$$\mathbf{w}_{m,i}^{(CM)}[v+1] = \mathbf{w}_{m,i}^{(CM)}[v] + \Delta \mathbf{w}_{m,i}^{(CM)}[v]\mathbf{y}_{m,i}[v]$$

Equation 6

$$\Delta \mathbf{w}_{m,i}^{(CM)}[v] = \mu_{CM}(1- \mid \nu_m[v]^2)\nu_m^*[v]\mathbf{y}_{m,i}[v]$$

Equation 7

$$\nu_m^{(CM)}[v] = \sum_{i=0}^{2} (\mathbf{w}_{m,i}^{(CM)}[v] + \Delta \mathbf{w}_{m,i}^{(CM)}[v])^H \mathbf{y}_{m,i}[v]$$

Equation 8

$$\mathbf{w}_{m,i}^{(DD)}[v+1] = \mathbf{w}_{m,i}^{(DD)}[v] + \mu_{CM}.\delta(\hat{x}_m[v] - \mathcal{F}(u_m[v])).(\mathcal{F}(u_m[v]) - \nu_m[v])^* \mathbf{y}_{m,i}[v$$

where,

$$\delta(a) = \begin{cases} 1 & a = 0 \\ 0 & a \neq 0 \end{cases}$$