11. CLASSICAL MAXWELL ELECTRODYNAMIC EQUATIONS
CHARACTERISTICS FROM OBSERVER’S MATHEMATICS
POINT OF VIEW

Observer’s Mathematics consider classical Maxwell equations \((M1), (M2), (M3)\) and \((M4)\) as the first approach.

So, we have in coordinates \((t, x, y, z)\):

\[(M1)\]

\[
\begin{align*}
\frac{\partial E_z}{\partial y} - n \frac{\partial E_y}{\partial z} &= -\frac{1}{c} \times_n \frac{\partial H_x}{\partial t} \\
\frac{\partial E_x}{\partial z} - n \frac{\partial E_z}{\partial x} &= -\frac{1}{c} \times_n \frac{\partial H_y}{\partial t} \\
\frac{\partial E_y}{\partial x} - n \frac{\partial E_x}{\partial y} &= -\frac{1}{c} \times_n \frac{\partial H_z}{\partial t}
\end{align*}
\]

We assume that all elements of these equalities belong to \(W_n\).

**Theorem 11.1.** We assume that \(n > 10\) and

\[c = 0.33 \times_n 10^{-8}\]

If

\[
\frac{\partial H_x}{\partial t} = \pm0.0...0 a_{n-7}...a_{n-8}
\]

where \(a_{n-7}, ..., a_n \in (0, 1, 2, 3, 4, 5, 6, 7, 8, 9)\), then

\[
\frac{\partial E_z}{\partial y} = \frac{\partial E_y}{\partial z}
\]

**Theorem 11.2.** We assume that \(n > 10\) and

\[c = 0.33 \times_n 10^{-8}\]

If

\[
\frac{\partial H_z}{\partial t} = \pm0.0...0 b_{n-7}...b_{n-8}
\]

where \(b_{n-7}, ..., b_n \in (0, 1, 2, 3, 4, 5, 6, 7, 8, 9)\), then

\[
\frac{\partial E_y}{\partial x} = \frac{\partial E_x}{\partial y}
\]
Theorem 11.3. We assume that $n > 10$ and
\[ c = 0.33 \times n \times 10^{-8} \]
If 
\[ \partial H_y / \partial t = \pm 0.0 \ldots 0 d_{n-7} \ldots d_n \]
where $d_{n-7}, \ldots, d_n \in (0, 1, 2, 3, 4, 5, 6, 7, 8, 9)$, then
\[ \partial E_x / \partial z = \partial E_z / \partial x \]

Theorem 11.4. We assume that $n > 10$ and
\[ c = 0.33 \times n \times 10^{-8} \]
If $H$ is enough slowly changes by time, then
\[ \partial E_z / \partial y = \partial E_y / \partial z \]
\[ \partial E_y / \partial x = \partial E_x / \partial y \]
\[ \partial E_x / \partial z = \partial E_z / \partial x \]

We have in coordinates $(t, x, y, z)$:

(M3)
\[ \partial H_z / \partial y - n \partial H_y / \partial z = \frac{1}{c} \times n \partial E_x / \partial t + n \frac{4 \times n \pi}{c} \times n j_x \]
\[ \partial H_x / \partial z - n \partial H_z / \partial x = \frac{1}{c} \times n \partial E_y / \partial t + n \frac{4 \times n \pi}{c} \times n j_y \]
\[ \partial H_y / \partial x - n \partial H_x / \partial y = \frac{1}{c} \times n \partial E_z / \partial t + n \frac{4 \times n \pi}{c} \times n j_z \]

Let’s remind the number $\pi$ here is a standard $\pi$, but with only $n$ digits in the decimal part of the fraction:
\[ \pi = 3.14 \ldots n \]

We assume that all elements of these equalities belong to $W_n$.

Theorem 11.5. We assume that $n > 10$ and
\[ c = 0.33 \times n \times 10^{-8} \]
If
\[ \frac{\partial E_x}{\partial t} = \pm 0.0 \ldots 0 f_{n-7} \ldots f_n \]
where \( f_{n-7}, \ldots, f_n \in (0, 1, 2, 3, 4, 5, 6, 7, 8, 9) \),
and
\[ j_x = \pm 0.0 \ldots 0 g_{n-6} \ldots g_n \]
where \( g_{n-6}, \ldots, g_n \in (0, 1, 2, 3, 4, 5, 6, 7, 8, 9) \),
then
\[ \partial H_z/\partial y = \partial H_y/\partial z \]

**Theorem 11.6.** We assume that \( n > 10 \) and
\[ c = 0.33 \times n \times 10^{-8} \]
If
\[ \frac{\partial E_z}{\partial t} = \pm 0.0 \ldots 0 h_{n-7} \ldots h_n \]
where \( h_{n-7}, \ldots, h_n \in (0, 1, 2, 3, 4, 5, 6, 7, 8, 9) \),
and
\[ j_z = \pm 0.0 \ldots 0 k_{n-6} \ldots k_n \]
where \( k_{n-6}, \ldots, k_n \in (0, 1, 2, 3, 4, 5, 6, 7, 8, 9) \),
then
\[ \partial H_x/\partial y = \partial H_y/\partial z \]

**Theorem 11.7.** We assume that \( n > 10 \) and
\[ c = 0.33 \times n \times 10^{-8} \]
If
\[ \frac{\partial E_y}{\partial t} = \pm 0.0 \ldots 0 l_{n-7} \ldots l_n \]
where \( l_{n-7}, \ldots, l_n \in (0, 1, 2, 3, 4, 5, 6, 7, 8, 9) \),
and
\[ j_y = \pm 0.0 \ldots 0 m_{n-6} \ldots m_n \]

where \( m_{n-6}, \ldots, m_n \in (0, 1, 2, 3, 4, 5, 6, 7, 8, 9) \),
then
\[ \partial H_x / \partial z = \partial H_z / \partial x \]

**Theorem 11.8.** We assume that \( n > 10 \) and
\[ c = 0.33 \times n \times 10^{-8} \]
If \( E \) is enough slowly changes by time and \( j \) is small enough, then
\[ \partial H_z / \partial y = \partial H_y / \partial z \]
\[ \partial H_y / \partial x = \partial H_x / \partial y \]
\[ \partial H_x / \partial z = \partial H_z / \partial x \]

**Theorem 11.9.** We assume that \( n > 10 \) and
\[ c = 0.33 \times n \times 10^{-8} \]
If
\[ \partial E_z / \partial y = \partial E_y / \partial z \]
then
\[ \partial H_x / \partial t = \pm 0.0 \ldots 0 a_{n-7} \ldots a_n \]
where \( a_{n-7}, \ldots, a_n \in (0, 1, 2, 3, 4, 5, 6, 7, 8, 9) \) are the random variables.

**Theorem 11.10.** We assume that \( n > 10 \) and
\[ c = 0.33 \times n \times 10^{-8} \]
If
\[ \partial E_y / \partial x = \partial E_x / \partial y \]
then
\[ \partial H_z / \partial t = \pm 0.0 \ldots 0 b_{n-7} \ldots b_n \]
where \( b_{n-7}, \ldots, b_n \in (0, 1, 2, 3, 4, 5, 6, 7, 8, 9) \) are the random variables.

**Theorem 11.11.** We assume that \( n > 10 \) and
\[ c = 0.33 \times n \times 10^{-8} \]
If
\[ \frac{\partial E_x}{\partial z} = \frac{\partial E_z}{\partial x} \]
then
\[ \frac{\partial H_y}{\partial t} = \pm 0.0\ldots0d_{n-7}\ldots d_n \]
where \( d_{n-7}, \ldots, d_n \in (0,1,2,3,4,5,6,7,8,9) \) are the random variables.

**Theorem 11.12.** We assume that \( n > 10 \) and
\[ c = 0.33 \times n \ 10^{-8} \]
If
\[ \frac{\partial E_z}{\partial y} = \frac{\partial E_y}{\partial z} \]
\[ \frac{\partial E_y}{\partial x} = \frac{\partial E_x}{\partial y} \]
\[ \frac{\partial E_x}{\partial z} = \frac{\partial E_z}{\partial x} \]
then \( H \) is a random vector enough slowly changes by time (randomness starts from \((n - 7)^{th}\) digit in the decimal part of the each coordinate fraction)

**Theorem 11.13.** We assume that \( n > 10 \) and
\[ c = 0.33 \times n \ 10^{-8} \]
If
\[ \frac{\partial H_z}{\partial y} = \frac{\partial H_y}{\partial z} \]
and if \( \frac{\partial E_x}{\partial t} \) and \( j_x \) have the same sign, then
\[ \frac{\partial E_x}{\partial t} = \pm 0.0\ldots0f_{n-7}\ldots f_n \]
where \( f_{n-7}, \ldots, f_n \in (0,1,2,3,4,5,6,7,8,9) \) are the random variables, and
\[ j_x = \pm 0.0\ldots0g_{n-6}\ldots g_n \]
where \( g_{n-6}, \ldots, g_n \in (0,1,2,3,4,5,6,7,8,9) \) are the random variables.

**Theorem 11.14.** We assume that \( n > 10 \) and
\[ c = 0.33 \times n \ 10^{-8} \]
If
\[ \frac{\partial H_z}{\partial y} = \frac{\partial H_y}{\partial z} \]
and if
\[ \frac{\partial E_x}{\partial t} = \pm 0.0\ldots0f_{n-7}\ldots f_n \]
where $f_{n-7}, \ldots, f_n \in (0, 1, 2, 3, 4, 5, 6, 7, 8, 9)$,

then

$$j_z = \pm 0.0 \ldots 0 g_{n-6} \ldots g_n$$

where $g_{n-6}, \ldots, g_n \in (0, 1, 2, 3, 4, 5, 6, 7, 8, 9)$ are the random variables.

**Theorem 11.15.** We assume that $n > 10$ and

$$c = 0.33 \times n \times 10^{-8}$$

If

$$\partial H_z/\partial y = \partial H_y/\partial z$$

and if

$$j_z = \pm 0.0 \ldots 0 g_{n-6} \ldots g_n$$

where $g_{n-6}, \ldots, g_n \in (0, 1, 2, 3, 4, 5, 6, 7, 8, 9)$,

then

$$\partial E_x/\partial t = \pm 0.0 \ldots 0 f_{n-7} \ldots f_n$$

where $f_{n-7}, \ldots, f_n \in (0, 1, 2, 3, 4, 5, 6, 7, 8, 9)$ are the random variables.

**Theorem 11.16.** We assume that $n > 10$ and

$$c = 0.33 \times n \times 10^{-8}$$

If

$$\partial H_y/\partial x = \partial H_x/\partial y$$

and if $\partial E_z/\partial t$ and $j_z$ have the same sign, then

$$\partial E_z/\partial t = \pm 0.0 \ldots 0 h_{n-7} \ldots h_n$$

where $h_{n-7}, \ldots, h_n \in (0, 1, 2, 3, 4, 5, 6, 7, 8, 9)$ are the random variables,

and

$$j_z = \pm 0.0 \ldots 0 k_{n-6} \ldots k_n$$

where $k_{n-6}, \ldots, k_n \in (0, 1, 2, 3, 4, 5, 6, 7, 8, 9)$ are the random variables.

**Theorem 11.17.** We assume that $n > 10$ and

$$c = 0.33 \times n \times 10^{-8}$$
If
\[ \frac{\partial H_y}{\partial x} = \frac{\partial H_x}{\partial y} \]
and if
\[ \frac{\partial E_z}{\partial t} = \pm 0.0 \ldots 0 h_{n-7} \ldots h_n \]
where \( h_{n-7}, \ldots, h_n \in (0, 1, 2, 3, 4, 5, 6, 7, 8, 9) \), then
\[ j_z = \pm 0.0 \ldots 0 k_{n-6} \ldots k_n \]
where \( k_{n-6}, \ldots, k_n \in (0, 1, 2, 3, 4, 5, 6, 7, 8, 9) \) are the random variables.

Theorem 11.18. We assume that \( n > 10 \) and
\[ c = 0.33 \times n \times 10^{-8} \]
If
\[ \frac{\partial H_y}{\partial x} = \frac{\partial H_x}{\partial y} \]
and if
\[ j_z = \pm 0.0 \ldots 0 k_{n-6} \ldots k_n \]
where \( k_{n-6}, \ldots, k_n \in (0, 1, 2, 3, 4, 5, 6, 7, 8, 9) \), then
\[ \frac{\partial E_z}{\partial t} = \pm 0.0 \ldots 0 h_{n-7} \ldots h_n \]
where \( h_{n-7}, \ldots, h_n \in (0, 1, 2, 3, 4, 5, 6, 7, 8, 9) \) are the random variables.

Theorem 11.19. We assume that \( n > 10 \) and
\[ c = 0.33 \times n \times 10^{-8} \]
If
\[ \frac{\partial H_x}{\partial z} = \frac{\partial H_z}{\partial x} \]
and if \( \partial E_y/\partial t \) and \( j_z \) have the same sign, then
\[ \frac{\partial E_y}{\partial t} = \pm 0.0 \ldots 0 l_{n-7} \ldots l_n \]
where \( l_{n-7}, \ldots, l_n \in (0, 1, 2, 3, 4, 5, 6, 7, 8, 9) \) are the random variables,
\[ j_y = \pm 0.0\ldots0 m_{n-6} \ldots m_n \]

where \( m_{n-6}, \ldots, m_n \in \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\} \) are the random variables.

**Theorem 11.20.** We assume that \( n > 10 \) and
\[
c = 0.33 \times n \times 10^{-8}
\]
If
\[
\partial H_x / \partial z = \partial H_z / \partial x
\]
and if
\[
\partial E_y / \partial t = \pm 0.0\ldots0 l_{n-7} \ldots l_n
\]
where \( l_{n-7}, \ldots, l_n \in \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\} \), then
\[ j_y = \pm 0.0\ldots0 m_{n-6} \ldots m_n \]

where \( m_{n-6}, \ldots, m_n \in \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\} \) are the random variables.

**Theorem 11.21.** We assume that \( n > 10 \) and
\[
c = 0.33 \times n \times 10^{-8}
\]
If
\[
\partial H_x / \partial z = \partial H_z / \partial x
\]
and if
\[ j_y = \pm 0.0\ldots0 m_{n-6} \ldots m_n \]
where \( m_{n-6}, \ldots, m_n \in \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\} \), then
\[
\partial E_y / \partial t = \pm 0.0\ldots0 l_{n-7} \ldots l_n
\]
where \( l_{n-7}, \ldots, l_n \in \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\} \) are the random variables.

**Theorem 11.22.** We assume that \( n > 10 \) and
\[
c = 0.33 \times n \times 10^{-8}
\]
If
\[
\partial H_z / \partial y = \partial H_y / \partial z
\]
\[
\partial H_y / \partial x = \partial H_x / \partial y
\]
\[ \frac{\partial H_x}{\partial z} = \frac{\partial H_z}{\partial x} \]

and if we have corresponding "smallest" conditions of theorems 5.13 - 5.21 above, then

\( E \) is a slow changing random vector (randomness starts from \((n - 7)^{th}\) digit in the decimal part of the each coordinate fraction), or \( j \) is a small random vector (randomness starts from \((n - 6)^{th}\) digit in the decimal part of the each coordinate fraction), or both \( E \) and \( j \) are the slow changing random vectors.