**Analitical results:**

**Coaxial setup with differents materials**

# **Introduction**

In order to analyze the variation of the permittivity of a coaxial cell culture inside when applied to a microwave beam must first determine if our network analyzer have sufficient sensitivity.  
To obtain the sensitivity to be measured, the S parameters of the coaxial have been analyzed when the interior has different medium. The mediums that will be analyzed are the following:

• Vacuum  
• Distilled water  
• Sea water  
• Cultivation water  
• Cell culture (P = 0.1)

# **Experiment**

//Cal definir els parametres de matlab

# **Expressions**

Expressions only valid for

In general



# **Results**

## Scattering parameters for differents mediums

**S21 Vacuum **

**S21 Culture Medium without Cells**

**S21 Culture Medium with 0.1% Cells**

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**S21 Distilled Water**

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**S21 Sea Water**

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|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Material **(1GHz, Δz=3mm)** |  | σ |  | α | β |  |  |
| **Distilled Water** | 81 | 0.0002 | 0.023 | 0.0042 | 188.5 | **0.99998740**  -0.00011 dB | -32.401 |
| **Fresh Water** | 81 | 0.0325 | 3.671 | 0.6807 | 188.5 | **0.99795998**  -0.0177 | -32.401 |
| **Sea Water** | 81 | 4.0 | 451.77 | 83.78  (287.9218 exact) | 188.5 | **0.77775789**  -2.1831 dB  -7.5025 dB | -32.401 |
| **Culture Liquid** | 81 | 0.35 | 39.53 | 7.33 | 188.5 | **0.97825002**  -0.1910 dB | -32.401 |

As you can see, the analog results and those of matalab at the 1GHz frequency are the same

## Sensitivity

**Vacuum – Destilled Water**

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**Vacuum – Sea Water**

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**Vacuum – Culture Medium Without Cells**

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**Vacuum – Culture Medium (P=0.1)**

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**Culture Medium without cells – Destilled Water**

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**Culture Medium without cells – Sea Water**

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**Culture Medium without cells - Culture Medium (P=0.1)**

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**Culture Medium (P=0.1) – Destilled Water**

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**Culture Medium (P=0.1) – Sea Water**

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