Faculty:	**FAKULTI KEJURUTERAAN ELEKTRIK**	
Subject : **MAKMAL KEJURUTERAAN ELEKTRIK** Subject Code : **SET 3742**		Review : **1** Release Date : **2017** Last Amendment : **2017** Procedure Number : **PK-UTM-FKE-(0)-10**

SKEE 3742

FAKULTI KEJURUTERAAN ELEKTRIK
UNIVERSITI TEKNOLOGI MALAYSIA
KAMPUS SKUDAI
JOHOR

BASIC MICROWAVE LABORATORY

Electromagnetics

Prepared by	: Dr Noor Asniza Murad PM. Dr. Mohd Haniff Ibrahim Dr. Nor Hafizah Ngajikin Dr. Nik Noordini Nik Abd Malik Dr. KY You Dr. Ahmad Sharmi Abdullah Dr. Mona Riza Mohd Esa Dr. Mohd Fairus Mohd Yusoff Dr. Omar Bin Abdul Aziz	Approved by	: **Head of Department**
		Name	: Prof. Madya Dr. Mohd Haniff Ibrahim
Signature	:	Signature	:
Stamp	:	Stamp	:
Date	:	Date	:

Introduction (Case 1):

Stretch film is a transparency film which is made by resin as shown in Figure 1(a). The film is used to wrap factory product (product packaging) in order to prevent scratches as demonstrated in Figure 1(b).

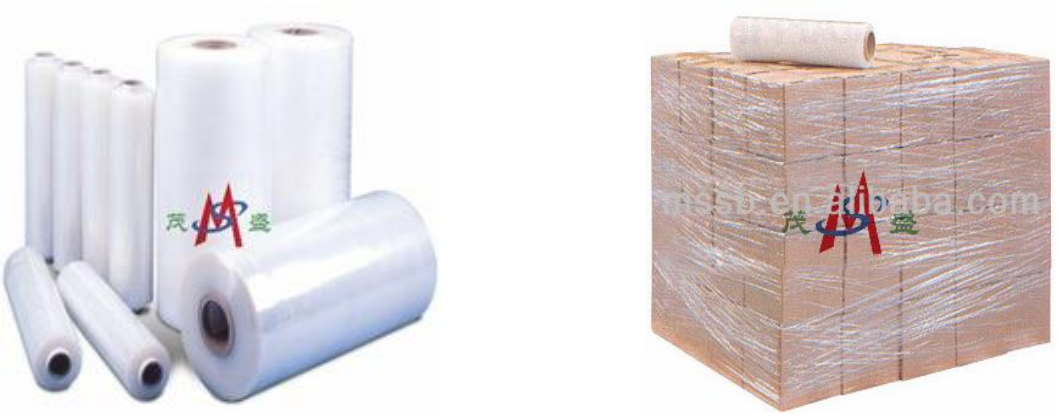

Figure 1 (a) Stretch film reel. (b) The factory product wrapped by stretch film.

It is important to note that the stretch film cannot be placed near to semiconductor components. Induced electrostatic charges on the surface of the stretch film can sufficiently damage these sensitive electronic components, especially semiconductor chips. Many electronic manufacturers are dubious whether a small piece of stress film can cause damages to a volume of electronic chips. Hence, they have taken the precaution steps to prohibit the presence of any stretch film within their factories vicinities. In this work, we will be investigating the induced charges on the surface of a small piece of stretch film.

Problem statements (Case 1):

You will be given a piece of stretch film. You are then required to find the induced charges on the film without any rubbing and record the average induced charges (within 30 seconds). Next, you will need to rub the aforementioned film with a cloth gently for 3 minutes and record again the induced charges on the film. You will need to provide a clear explanation on how the charges could cause damage to electronic chips and describe whether an unrubbed film can cause damage to electronic chips or not. Please provide detail justification on your answers.

Introduction (Case 2):

Hair loss has become a common health issue that can affect both men and women. It is influenced by age, health problems, nutrition deficiency and a wide variety of other factors. Recently, the interest in hair building fiber products as shown in Figure 2 has increases due to the simplicity of applying these products and getting quick results. It is claimed that hair losses can be concealed in just 30 seconds after spreading the fibers onto user hair. The fibers will be tied to every existing individual strand of hair based on electrostatic principles, resulting in the illusion of a more voluminous hair. In the market, there are a number of hair fiber brands that are formulated to create an intense bond between the fibers and hair strands. Each brand has its own set of properties. The performance of each hair fiber product is measured based on its charge density, which allow fiber to strongly attach to real human hair. In actual, the total amount of charges in the fibers are not fixed and depend on not only the fibers, but environmental conditions as well. It is suggested that the amount of charges on the fibers can be increased by shaking the fibers in their container before applying them. In this work, a measurement technique needs to be proposed for identifying electrostatic properties of these hair fibers in order to discover the best product.

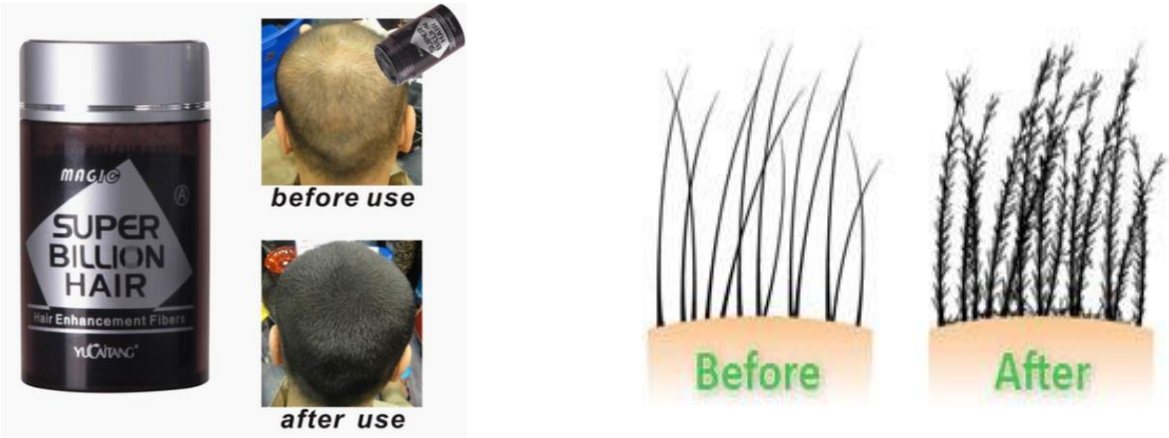

Figure 2 (a) Hair fiber. (b) The hair fibers attached on the surface of the actual human hair.

Problem statements (Case 2):

You will be given two different brands of hair fiber products and are required to discover the more effective hair loss solution based on electrostatic charge density. Find the charge density and the dielectric permittivity of the fibers and discuss your findings. You are provided with a capacitor cavity as the instrument to measure the fiber charge density.
Additionally, you are also required to analyze the magnetic properties of the hair fibers through solenoid based experiment. Consequently, a setup with input current flow need to be designed in order to find the induced magnetic field with the different fiber brands as the core.

Since results may vary as stated earlier, it is advisable to conduct the investigations more than once. This will allow a better understanding of consistency and repeatability as well as the possibility to make justification based on averages of several results compare to merely one experiment result. Attention should be given towards ensuring that the set up conditions must be made consistent for all attempted repetition of experiments.

Trigger

1. Literature study on hair loss fiber, electrostatic and magnetic properties.

2. Understand of issues and designing a methodology and setup with available measurement kits and sensors.

3. Measurement of differential voltage and capacitance for fibers using capacitor cavity.

4. Computation of relative charge density and prediction of relative permittivity for the fibers.

5. Measurement of magnetic properties for fibers as core in solenoid-based experiment.

6. Analysis of results.