**NEW YORK CITY COLLEGE OF TECHNOLOGY**

**THE CITY UNIVERSITY OF NEW YORK**

Plasmonics in Optical Communications:

Optimization of Coupling Efficiency

ELECTRICAL AND TELECOMMUNICATIONS ENGINEERING TECHNOLOGY DEPARTMENT

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By definition plasmonics, is coupling of photons to free electron oscillation at the interface between the thin film of a conductor and a dielectric. Prof. Mynbaev, explains that coupling creates two-dimensional electromagnetic waves called surface Plasmon polarations (SSPs). SSPs can be seen as a new optical carrier of information that allows signal manipulation at the scale below diffraction limit. Plasmonics has the potential to combine the best properties of both electronic and photonic worlds. Furthermore, allowing for the reducing light manipulation from three to two dimensions and can lead to creation of integrated photonic circuits, in which Prof. Mynbeav explains optical communication is in dire need.

However, one of the main problems of application of plasmonics in optical communications is the efficiency of coupling of light into a metal due to the tremendous loss that light experiences in a metal film. Coupling efficiency shapes the total efficiency of any plasmonic device. Efficiency is determined by the properties of the metal, and the best coupling has been achieved with silver and gold due to their beneficial permittivity in this range of wavelengths.

In conclusion, Prof. Mynbeav states that optical fiber however operates in infrared segment of the spectrum and there are no experimental or theoretical results indicating which metal could provide the optimum coupling. Through his research he was able to find out the reflection coefficients, the strength of resonance fields and optimal thickness of a set of natural metals widely used in plasmonics. He determined the fundamental limitations imposed on the application of these metals in plasmonic devices in optical communications.