The link between the Wiener-Hopf and the Sommerfeld Malyuzhinets methods

Instructors:

Sommerfeld Malyuzhinets method: J.M.L. Bernard, CEA-DIF, France

Wiener-Hopf Technique: G. Lombardi, Politecnico di Torino, Italy

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POLITECNICO DI TORINO

The link between the Wiener-Hopf and the Sommerfeld Malyuzhinets methods

Inspired by J.B. Keller:

The Sommerfeld Malyuzhinets (SM) method and the Wiener Hopf (WH) technique are different but closely related methods. In particular in the paper "Progress and Prospects in The Theory of Linear Waves Propagation" SIAM SIREV vol.21, No.2, April 1979, pp. 229-245, J.B. Keller posed the following question "What features of the methods account for this difference?".

Furthermore J.B. Keller notes "it might be helpful to understand this in order to predict the success of other methods".

We agree with this opinion expressed by the giant of Diffraction.

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Furthermore we think that SM and WH applied to the same problems (for instance the polygon diffraction) can determine a helpful synergy.

In the past the SM and WH methods were considered disconnected in particular because the SM method was traditionally defined with the angular complex representation while the WH method was traditionally defined in the Laplace domain.

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AIM OF THE COURSE

In this course we show that the two methods have significant points of similarity when the representation of problems in both methods are expressed in terms of difference equations.

The two methods show their diversity in the solution procedures that are completely different and effective.

Both similarity and diversity properties are of advantage in "Progress and Prospects in The Theory of Linear Waves Propagation".

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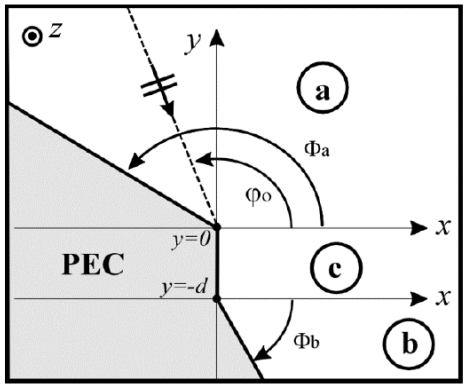
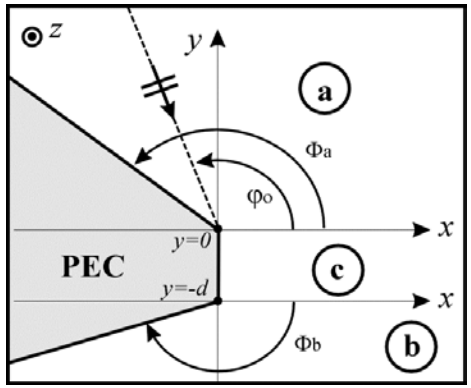
A NOVEL CANONICAL PROBLEM WITH BOTH METHODS

Moreover both methods have demonstrated their efficacy in studying particularly complex problems, beyond the traditional problem of scattering by a wedge: in particular the scattering by a three part polygon that we will present.





Starting from PEC

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RECENT PROGRESS IN BOTH METHODS

One of the most relevant recent progress in SM is the derivation of functional difference equations without the use of Maliuzhinets inversion theorem.

One of the most relevant recent progress in WH is transformation of WH equations into integral equations for their effective solution.

Lecture 1	
7th August 2019 10:30 to 11:45	Jean-Michel Bernard and Guido Lombardi First 10 mins: dedicated to the introduction of the mini-course Guido Lombardi [1h05min]: WH and transformation to integral equations
Lecture 2	
8th August 2019 10:30 to 11:45	Jean-Michel Bernard [1h15:min]: Introduction to SM

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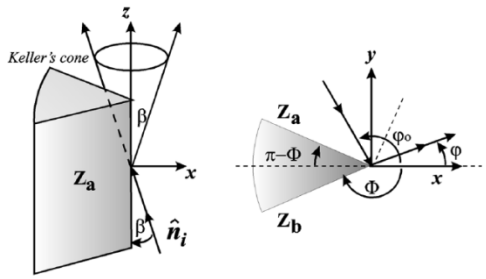
Lecture 3		
8th August 2019 14:15 to 15:30	Jean-Michel Bernard [35min]: Classical wedge problems in SM Guido Lombardi [40min]: Classical wedge problems and GWHE	

Lecture 4		
9th August 2019 10:30 to 11:45	Jean-Michel Bernard [30min]: three part polygon in SM Guido Lombardi [30min]: three part polygon in WH Comparison [10min] Conclusion [5min]