Electromagnetic Cloaking

Fantasy or reality?

Albert Einstein, David Hilbert
Formulation of general relativity and general covariance.

Karl Schwarzschild
Metric tensor of a simple black hole.

John Pendry, Ulf Leonhardt, David Schurig, David Smith
Cloaking based on coordinate transformation with a "black hole-like" metric.

Star Trek
Episode "The Enterprise Incident" introduces a "cloaking device".

J. R. R. Tolkien
The book of Hobbit introduces the One Ring the bearer of which can disappear.

J. K. Rowling
Harry Potter uses the invisibility cloak.

Where is the catch?
Inevitable losses, limited material contrast, bandwidth, unknown incident field.

Did You Know?
Due to reciprocity, a perfectly cloaked object does not see the outside world.

There are two different versions of cloaking.

Scattering cancellation
Uncloaked: the object breaks the incident field and can easily be detected.

Field-zeroing
Fundamental bound: theoretical lower limit of extinction cross-section.

Topology optimization:
computer-aided design with the best realized performance.

Try to hide this object from a plane wave.

1937
J. R. R. Tolkien
The book of Hobbit introduces the One Ring the bearer of which can disappear.

1915
Albert Einstein, David Hilbert
Formulation of general relativity and general covariance.

1916
Karl Schwarzschild
Metric tensor of a simple black hole.

1968
Star Trek
Episode "The Enterprise Incident" introduces a "cloaking device".

1997
J. K. Rowling
Harry Potter uses the invisibility cloak.

2000
John Pendry
Advent of metamaterials.

2006
John Pendry, Ulf Leonhardt, David Schurig, David Smith
Cloaking based on coordinate transformation with a "black hole-like" metric.

2015
Fantasy or reality?

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