A Divertor Imaging Radiometer (DIR) Diagnostic is being Studied to Measure Spatially and Spectrally Resolved P_{\phi}(\lambda) in the Tokamak Divertor

The radiated power balance is underdiagnosed in many tokamak divertors:
- For example, in NSTX, with increased lithium injection, radiated power to the divertor increases and heat load to the divertor (PDE) decreases.
- Total radiated power is currently measured with a bolometer, heat load with the divertor calorimeter, and impurities are identified with only one measurement.
- The assumed P_{\phi}(\lambda) in divertor simulations is the power balance moderated by the unknown divertor radiative loss.
- True DIRs could provide both information.

A Dual Transmission Grating Design can Produce P_{\phi}(\lambda) Measurements with Coarse Spectral Resolution over a Broad Wavelength Range

Possible views of a divertor include:
- Diverter port, with a multilayered view of the plasma
- Divertor port, with a multi-spectral view of the plasma path
- Off-divertor port, with view obscured by plasma volume.
- Multi-angle view from NSTX divertor.

A Dual Transmission Grating Design can Produce P_{\phi}(\lambda) Measurements with Coarse Spectral Resolution over a Broad Wavelength Range

<table>
<thead>
<tr>
<th>Parameter</th>
<th>VUV Range</th>
<th>XUV Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wavelength (\AA)</td>
<td>1860</td>
<td>461</td>
</tr>
<tr>
<td>Emission lines</td>
<td>2s22p3</td>
<td>2s22p4</td>
</tr>
<tr>
<td>Transition</td>
<td>6•10^{-18}</td>
<td>1•10^{-18}</td>
</tr>
<tr>
<td>Detector coverage</td>
<td>1000 and 5000 line-pairs/mm</td>
<td></td>
</tr>
</tbody>
</table>

A Divertor Imaging Radiometer (DIR) Diagnostic is being Studied to Measure Spatially and Spectrally Resolved P_{\phi}(\lambda) in the Tokamak Divertor

The radiated power balance is underdiagnosed in many tokamak divertors:
- For example, in NSTX, with increased lithium injection, radiated power to the divertor increases and heat load to the divertor (PDE) decreases.
- Total radiated power is currently measured with a bolometer, heat load with the divertor calorimeter, and impurities are identified with only one measurement.
- The assumed P_{\phi}(\lambda) in divertor simulations is the power balance moderated by the unknown divertor radiative loss.
- True DIRs could provide both information.

A Dual Transmission Grating Design can Produce P_{\phi}(\lambda) Measurements with Coarse Spectral Resolution over a Broad Wavelength Range

Possible views of a divertor include:
- Diverter port, with a multilayered view of the plasma
- Divertor port, with a multi-spectral view of the plasma path
- Off-divertor port, with view obscured by plasma volume.
- Multi-angle view from NSTX divertor.

A Divertor Imaging Radiometer (DIR) Diagnostic is being Studied to Measure Spatially and Spectrally Resolved P_{\phi}(\lambda) in the Tokamak Divertor

The radiated power balance is underdiagnosed in many tokamak divertors:
- For example, in NSTX, with increased lithium injection, radiated power to the divertor increases and heat load to the divertor (PDE) decreases.
- Total radiated power is currently measured with a bolometer, heat load with the divertor calorimeter, and impurities are identified with only one measurement.
- The assumed P_{\phi}(\lambda) in divertor simulations is the power balance moderated by the unknown divertor radiative loss.
- True DIRs could provide both information.

A Dual Transmission Grating Design can Produce P_{\phi}(\lambda) Measurements with Coarse Spectral Resolution over a Broad Wavelength Range

Possible views of a divertor include:
- Diverter port, with a multilayered view of the plasma
- Divertor port, with a multi-spectral view of the plasma path
- Off-divertor port, with view obscured by plasma volume.
- Multi-angle view from NSTX divertor.

The radiated power balance is underdiagnosed in many tokamak divertors:
- For example, in NSTX, with increased lithium injection, radiated power to the divertor increases and heat load to the divertor (PDE) decreases.
- Total radiated power is currently measured with a bolometer, heat load with the divertor calorimeter, and impurities are identified with only one measurement.
- The assumed P_{\phi}(\lambda) in divertor simulations is the power balance moderated by the unknown divertor radiative loss.
- True DIRs could provide both information.

A Dual Transmission Grating Design can Produce P_{\phi}(\lambda) Measurements with Coarse Spectral Resolution over a Broad Wavelength Range

Possible views of a divertor include:
- Diverter port, with a multilayered view of the plasma
- Divertor port, with a multi-spectral view of the plasma path
- Off-divertor port, with view obscured by plasma volume.
- Multi-angle view from NSTX divertor.

The radiated power balance is underdiagnosed in many tokamak divertors:
- For example, in NSTX, with increased lithium injection, radiated power to the divertor increases and heat load to the divertor (PDE) decreases.
- Total radiated power is currently measured with a bolometer, heat load with the divertor calorimeter, and impurities are identified with only one measurement.
- The assumed P_{\phi}(\lambda) in divertor simulations is the power balance moderated by the unknown divertor radiative loss.
- True DIRs could provide both information.

A Dual Transmission Grating Design can Produce P_{\phi}(\lambda) Measurements with Coarse Spectral Resolution over a Broad Wavelength Range

Possible views of a divertor include:
- Diverter port, with a multilayered view of the plasma
- Divertor port, with a multi-spectral view of the plasma path
- Off-divertor port, with view obscured by plasma volume.
- Multi-angle view from NSTX divertor.

The radiated power balance is underdiagnosed in many tokamak divertors:
- For example, in NSTX, with increased lithium injection, radiated power to the divertor increases and heat load to the divertor (PDE) decreases.
- Total radiated power is currently measured with a bolometer, heat load with the divertor calorimeter, and impurities are identified with only one measurement.
- The assumed P_{\phi}(\lambda) in divertor simulations is the power balance moderated by the unknown divertor radiative loss.
- True DIRs could provide both information.

A Dual Transmission Grating Design can Produce P_{\phi}(\lambda) Measurements with Coarse Spectral Resolution over a Broad Wavelength Range

Possible views of a divertor include:
- Diverter port, with a multilayered view of the plasma
- Divertor port, with a multi-spectral view of the plasma path
- Off-divertor port, with view obscured by plasma volume.
- Multi-angle view from NSTX divertor.

The radiated power balance is underdiagnosed in many tokamak divertors:
- For example, in NSTX, with increased lithium injection, radiated power to the divertor increases and heat load to the divertor (PDE) decreases.
- Total radiated power is currently measured with a bolometer, heat load with the divertor calorimeter, and impurities are identified with only one measurement.
- The assumed P_{\phi}(\lambda) in divertor simulations is the power balance moderated by the unknown divertor radiative loss.
- True DIRs could provide both information.

A Dual Transmission Grating Design can Produce P_{\phi}(\lambda) Measurements with Coarse Spectral Resolution over a Broad Wavelength Range

Possible views of a divertor include:
- Diverter port, with a multilayered view of the plasma
- Divertor port, with a multi-spectral view of the plasma path
- Off-divertor port, with view obscured by plasma volume.
- Multi-angle view from NSTX divertor.

The radiated power balance is underdiagnosed in many tokamak divertors:
- For example, in NSTX, with increased lithium injection, radiated power to the divertor increases and heat load to the divertor (PDE) decreases.
- Total radiated power is currently measured with a bolometer, heat load with the divertor calorimeter, and impurities are identified with only one measurement.
- The assumed P_{\phi}(\lambda) in divertor simulations is the power balance moderated by the unknown divertor radiative loss.
- True DIRs could provide both information.

A Dual Transmission Grating Design can Produce P_{\phi}(\lambda) Measurements with Coarse Spectral Resolution over a Broad Wavelength Range

Possible views of a divertor include:
- Diverter port, with a multilayered view of the plasma
- Divertor port, with a multi-spectral view of the plasma path
- Off-divertor port, with view obscured by plasma volume.
- Multi-angle view from NSTX divertor.

The radiated power balance is underdiagnosed in many tokamak divertors:
- For example, in NSTX, with increased lithium injection, radiated power to the divertor increases and heat load to the divertor (PDE) decreases.
- Total radiated power is currently measured with a bolometer, heat load with the divertor calorimeter, and impurities are identified with only one measurement.
- The assumed P_{\phi}(\lambda) in divertor simulations is the power balance moderated by the unknown divertor radiative loss.
- True DIRs could provide both information.

A Dual Transmission Grating Design can Produce P_{\phi}(\lambda) Measurements with Coarse Spectral Resolution over a Broad Wavelength Range

Possible views of a divertor include:
- Diverter port, with a multilayered view of the plasma
- Divertor port, with a multi-spectral view of the plasma path
- Off-divertor port, with view obscured by plasma volume.
- Multi-angle view from NSTX divertor.

The radiated power balance is underdiagnosed in many tokamak divertors:
- For example, in NSTX, with increased lithium injection, radiated power to the divertor increases and heat load to the divertor (PDE) decreases.
- Total radiated power is currently measured with a bolometer, heat load with the divertor calorimeter, and impurities are identified with only one measurement.
- The assumed P_{\phi}(\lambda) in divertor simulations is the power balance moderated by the unknown divertor radiative loss.
- True DIRs could provide both information.

A Dual Transmission Grating Design can Produce P_{\phi}(\lambda) Measurements with Coarse Spectral Resolution over a Broad Wavelength Range

Possible views of a divertor include:
- Diverter port, with a multilayered view of the plasma
- Divertor port, with a multi-spectral view of the plasma path
- Off-divertor port, with view obscured by plasma volume.
- Multi-angle view from NSTX divertor.

The radiated power balance is underdiagnosed in many tokamak divertors:
- For example, in NSTX, with increased lithium injection, radiated power to the divertor increases and heat load to the divertor (PDE) decreases.
- Total radiated power is currently measured with a bolometer, heat load with the divertor calorimeter, and impurities are identified with only one measurement.
- The assumed P_{\phi}(\lambda) in divertor simulations is the power balance moderated by the unknown divertor radiative loss.
- True DIRs could provide both information.

A Dual Transmission Grating Design can Produce P_{\phi}(\lambda) Measurements with Coarse Spectral Resolution over a Broad Wavelength Range

Possible views of a divertor include:
- Diverter port, with a multilayered view of the plasma
- Divertor port, with a multi-spectral view of the plasma path
- Off-divertor port, with view obscured by plasma volume.
- Multi-angle view from NSTX divertor.

The radiated power balance is underdiagnosed in many tokamak divertors:
- For example, in NSTX, with increased lithium injection, radiated power to the divertor increases and heat load to the divertor (PDE) decreases.
- Total radiated power is currently measured with a bolometer, heat load with the divertor calorimeter, and impurities are identified with only one measurement.
- The assumed P_{\phi}(\lambda) in divertor simulations is the power balance moderated by the unknown divertor radiative loss.
- True DIRs could provide both information.