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**MWIR tunable polarimetric scatterometry applied to a fishnet structure** STEPHEN NAUYOKS, MICHAEL MARCINIAK, Air Force Institute of Technology — Understanding how light is scattered by a material, such as a metamaterial, which is engineered to have specific optical properties is necessary for a better understanding of the design parameters and for refining designs. Because of their high irradiance and small spot size, lasers are an ideal light source for these scatter measurements. However, lasers are highly monochromatic and it can be very difficult to manufacture metamaterials to resonate at such specific wavelengths. By modifying a Schmitt Measurement System's Complete Angle Scatter Instrument (CASI) with the addition of 6 external cavity Quantum Cascade Lasers by Daylight Solutions we were able to have a tunable laser light source from 4.35 to 9.71  $\mu\text{m}$  with a small exclusion from 6.54 to 7.40  $\mu\text{m}$ . The CASI system was further modified with the addition of a dual rotating retarder which allows the full Mueller matrix to be calculated for both specular scatter and off specular scatter. This makes the system unique to commercially available systems like Woollam's IR-VASE which can only measure the Mueller matrix elements for the specular reflection. This unique system was used to measure a fishnet structure at both resonate and off resonate frequencies. The fishnet sample was also measured using an IR-VASE system to compare specular results.

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