



## Instrument design and development of the Venus Emissivity Mapper (VEM) for VERITAS and EnVision

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This paper presents the Venus Emissivity Mapper (VEM) onboard NASAs Venus Emissivity, Radio science, InSAR, Topography, And Spectroscopy (VERITAS) and ESAs (EnVision) Venus orbiter missions. The VEM instrument, on EnVision called VenSpec-M, is a multispectral push-broom imager for mapping of the Venus surface and its lower atmosphere. By observation through narrow-band atmospheric windows present in the near-infrared spectral region around 1  $\mu\text{m}$ , VEM will provide a global Venus coverage of >70%. The instruments SNR is on the order of 100 and allows for the detection of thermal emissions like surface rock composition, volcanic activity, water abundance and cloud formation.

We present the current VEM design and development status. The VEM instrument employs a telecentric optical system, which focuses images taken on the Venus nightside on a multilayered, narrow-band filter array. It splits the signal into 14 spectral bands, ranging from 790 nm to 1510 nm. Each filter band is imaged onto an InGaAs detector with integrated thermoelectric cooler. The optical system including detector and proximity electronics is mounted on top of an electronics box, which includes the instrument controller and power supply. An optically transmissive turn window mechanism is mounted in front of the entrance optics to protect VEM against contamination and during the aerobraking phase. In addition, a two-stage baffle prevents VEM from scattered light.

The delivery of the VEM instrument flight models is currently foreseen in 2028 for VERITAS and 2029 for EnVision. First VEM data obtained from Venus are expected in the 2030s.