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The bright dust scattering X-ray rings of GRB 221009A

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X-ray rings produced by scattering on interstellar dust grains can be observed around transient bright sources in the direction of the Galactic Plane. The study of the rings emission, allows us to derive with extraordinary precision the details of the X-ray burst producing them (fluence and the spectral shape) and - at the same time - to characterize the dust properties along the line of sight. The intensity of the scattered radiation depends - indeed - not only on the flux of the source but also on the dust distribution along the line of sight and the properties of the grains. On 2022 October 9 an extraordinarily bright gamma-ray burst (GRB221009A) was observed behind the Galactic Plane. The first imaging X-ray instrument to react to the explosion was onboard the Swift satellite which discovered 9 bright expanding rings about one day after the GRB. Soon after that, the rings were observed by the ESA satellite XMM-Newton. Thanks to the XMM large effective area and the long exposure time, we obtained the spectrum of the rings with unprecedented statistics. This allows us to discriminate between dust models (e.g. different grain compositions and size distributions) and constrain the Soft X-Ray emission, not directly observed by any instruments.

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