Fig. 1: Tomographic measurement setup of the enhanced SnowScat device at the SLF test site in Davos, Switzerland, in winter 2014/2015. The SnowScat device is moveable along a tilted rail to create a synthetic aperture in elevation direction to also obtain a high resolution perpendicular to the mean line of sight through SAR focusing. The close-up shows a tomographic test target made of 8 metal spheres mounted on a carbon tube. The test target is used to validate the tomographic processing.
Fig. 2. Example of a tomographic profile of a snowpack including the tomographic test target (Fig.1) at the test site in Davos, Switzerland, during winter 2014/2015.

Top row, left: The 1-look image was obtained from 50 measurements along the rail. Aperture synthesis was performed by a time-domain back-projection approach taking into account a simple refraction model.

Top row, right: Phase of the complex polarimetric coherence between the co-polar channels HH and VV, displayed in combination with the HH intensity in a HSV color scheme. Hue: phase of the complex polarimetric coherence. Saturation: is unaltered and set to full saturation. Value: brightness varies according to the measured intensity in decibel.

Acquisition date: 03. March 2015, acquisition time: 21:01h - 23:43h, snow height measured (at SLF2 station): ca. 60 cm, air temperature: -4°C – 3°C (below melting point).

Bottom row: On the left, a vertical profile of mean intensity averaged over 1 m horizontally (blue rectangle) is shown. A comparison of the 1-D vertical profile with the in-situ snow profile measurements shown on the right-hand side indicate that two of the three main melt-freeze crusts/ice layers and also the ground level can be identified in the tomographic snow profile obtained by SnowScat.