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Given an integral domain  $D$  with quotient field  $K$  and a semistar operation  $\star$  on  $D$ , we say that a valuation overring  $V$  of  $D$  is a  $\star$ -valuation overring of  $D$  provided  $F^\star \subseteq FV$ , for each nonzero finitely generated fractional ideal  $F$  of  $D$ . Let  $b(\star)$  be the a. b. semistar operation on  $D$  defined by  $E^{b(\star)} := \bigcap \{EV \mid V \text{ is a } \star\text{-valuation overring of } D\}$ , for each nonzero  $D$ -submodule  $E$  of  $K$ . Clearly, if  $d$  is the identity operation,  $b(d)$  coincides with the classical  $b$ -operation.

In this talk, I will present some results on integral domains that can be characterized by using the  $b$ -operation or, more generally, the  $b(\star)$ -operation in connection with other distinguished (semi)star operations like the  $v$ -, the  $t$ - or the  $w$ -operation.

Some of these results are obtained in joint works with A. Loper and G. Picozza:

[1] M. Fontana - K.A. Loper, *Cancellation properties in ideal systems: a classification of e.a.b. semistar operations*, J. Pure Appl. Algebra **213** (2009), 2095-2103.

[2] M. Fontana - G. Picozza,  *$b$ -Noetherian domains and other classes of domains defined by e.a.b. semistar operations* (tentative title), work in progress. (Received September 03, 2009)