

$$\begin{array}{ccccc}
X' & \xrightarrow{i_X} & X & \xrightarrow{p_X} & X' \\
\downarrow a' \text{ Cofib} & & \downarrow a_{tc} \text{ TCofib} & & \downarrow a' \text{ TCofib} \\
& & E & \xrightarrow{k} & P \\
& \nearrow s & \downarrow a_{tf} \text{ TFib} & & \searrow l \\
Y' & \xrightarrow{i_Y} & Y & \xrightarrow{p_Y} & Y'
\end{array}$$

A commutative diagram illustrating a relationship between various objects and maps. The diagram is organized into two rows of objects, with maps connecting them and a central square.

- Top Row:** Objects  $X'$ ,  $X$ , and  $X'$  are connected by maps  $i_X$  and  $p_X$ .
- Bottom Row:** Objects  $Y'$ ,  $Y$ , and  $Y'$  are connected by maps  $i_Y$  and  $p_Y$ .
- Vertical Maps:**
  - From  $X'$  to  $Y'$ : A solid vertical arrow labeled  $a'$  and **Cofib**.
  - From  $X$  to  $E$ : A solid vertical arrow labeled  $a_{tc}$  and **TCofib**.
  - From  $E$  to  $Y$ : A solid vertical arrow labeled  $a_{tf}$  and **TFib**.
  - From  $P$  to  $Y'$ : A dashed diagonal arrow labeled  $l$ .
  - From  $X'$  to  $P$ : A dashed diagonal arrow labeled **TCofib**.
- Central Square:** A square with vertices  $E$ ,  $P$ ,  $Y$ , and  $Y'$ . The maps are  $k$  (from  $E$  to  $P$ ),  $l$  (from  $P$  to  $Y'$ ),  $a_{tf}$  (from  $E$  to  $Y$ ), and  $a_{tc}$  (from  $X$  to  $E$ ).
- Other Maps:**
  - A curved dashed arrow labeled  $s$  from  $Y'$  to  $E$ .
  - A solid vertical arrow labeled  $a'$  from  $X'$  to  $Y'$ .
  - A solid vertical arrow labeled  $a'$  from  $X'$  to  $Y'$ .