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PRIMES WHICH ARE REGULAR FOR ASSOCIATIVE H-SPACES

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This note summarizes some results on associative H-spaces with the homotopy type of a finite CW-complex. Such spaces are called *finite-dimensional* associative H-spaces. The main theorem generalizes a result of Serre [**5**] for the simple classical groups.

A well-known theorem of Hopf [**2**] states that the rational cohomology $H^*(X, \boldsymbol{Q})$ of a finite-dimensional H-space is an exterior algebra $\Lambda(X_{2N_1-1}, \ldots, X_{2N_K-1})$, where the dimension of X_{2N_i-1} is $2N_i - 1$ and $N_1 \leqq \cdots \leqq N_K$. With this in mind, suppose that X is a finite-dimensional associative H-space with

$$H^*(X, \boldsymbol{Q}) = \Lambda(X_{2N_1-1}, \ldots, X_{2N_K-1}), \quad \text{where } N_1 \leqq \cdots \leqq N_K.$$

Form the space

$$Y = S^{2N_1-1} \times \cdots \times S^{2N_K-1}.$$

One says that a prime p is *regular* for X if there is a function $f: Y \to X$ which induces an isomorphism in cohomology with $\boldsymbol{Z}/p\boldsymbol{Z}$ coefficients. The following theorem is due to Serre [**5**].

THEOREM. *If X is a simply connected, simple, compact, connected classical group with rational cohomology as above, then p is regular for X if and only if $p \geqq N_K$.*

Such groups are of the form SU(N), Sp (N) or Spin(N). Serre's proof is a case by case study of these groups. Various generalizations of this theorem have appeared in the literature. Kumpel [**3**], for example, verified that the conclusion of Serre's theorem is true for the exceptional Lie groups, G_2, F_4, E_6, E_7 and E_8. I am announcing a result which generalizes Serre's to finite-dimensional associative H-spaces. Needless to say, certain mild restrictions are necessary. For example, certain assumptions about primitive generation are necessary.

Suppose that X is an H-space with multiplication

$$X \times X \xrightarrow{\mu} X.$$

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