

The San Marino Scale

Introduced by Iván Almár

Disclaimer

The San Marino Scale, first proposed in 2005, is a work in progress. Information presented on this web page is intended to be used by members of the IAA SETI Permanent Committee for purposes of discussion, criticism, refinement, and further development of this analytical tool. Users should expect that this San Marino Scale page, and the San Marino Scale Calculator linked from this page, will change from time to time.

Introduction

While SETI, the Search for Extra-Terrestrial Intelligence, is a widely accepted science, the reciprocal activity sometimes called METI, Messaging to Extra-Terrestrial Intelligence, remains a controversial area, and receives much discussion and debate within the SETI community. It has been argued that a civilization which hopes to detect radio evidence of other civilizations in the cosmos is obligated to reveal its own presence. Others maintain that it is suicidal to shout in the jungle. Heretofore, there has been no analytical tool to quantify the impact of transmissions from Earth. The authors of the San Marino Scale, while not particularly endorsing either side of the transmission debate, propose a tool to give such discussions a modest analytical basis.

History

Nearly everyone is familiar with the Richter Scale for quantifying earthquake severity. Can we similarly quantify the potential impact of active SETI, that is, transmitting signals into space from Earth? The San Marino Scale is an attempt to do just that. It is an ordinal scale between one and ten, used to quantify the potential exposure of employing electromagnetic communications technology to announce Earth's presence to our cosmic companions, or replying to a successful SETI detection.

Go To [San Marino Calculator](#)

Value	Potential Hazard
10	Extraordinary
9	Outstanding
8	Far-reaching
7	High
6	Noteworthy
5	Intermediate
4	Moderate
3	Minor
2	Low
1	Insignificant

Interpreting San Marino Values

The concept was first proposed in the Republic of San Marino (hence its name) by Iván Almár in the paper [Quantifying Consequences Through Scales](#), presented to the 6th World Symposium on the Exploration of Space and Life in the Universe, in March, 2005. Under Prof. Almár's leadership, members of the IAA SETI Permanent Committee have continued working to refine and perfect it, in order to bring some objectivity to the otherwise subjective interpretation of the impact of interstellar transmission.

Precedents

In many ways, it has been suggested, the consequences of transmitting signals from Earth into space could be similar to the approach toward Earth of a large asteroid. Published in 1997, the so-called Torino Scale quantifies the significance of such a potential threat. The two-dimensional Torino Scale takes into account both the potential damage from such an asteroid impact, and the probability that it will collide with Earth.

The [Rio Scale](#) adopted by the IAA SETI Permanent Committee in 2003 borrows heavily on the design of the Torino Scale. It attempts to quantify the relative importance of a rare event (in that case the detection of a candidate SETI signal) in terms of both its potential societal impact and the credibility of the evidence presented.

Similar to both of these indices, the San Marino scale is intended to quantify the potential impact not of reception (of either asteroid impact or incoming electromagnetic signals), but rather the transmission from Earth of messages into space. It uses mathematics similar to its predecessors, the Torino and Rio scales, to permit alternative transmission scenarios to be evaluated, contrasted, and compared.

- [Link to Torino Scale website](#)
- [Link to Rio Scale website](#)

Structure

In its most recent iteration, the San Marino Index is mathematically defined as:

$$\text{SMI} = \text{I} + \text{C}$$

where **SMI** is the numeric San Marino Index, on an integer scale of 1 to 10,

I is a logarithmic measure of signal strength or intensity, relative to our Sun's background radiation intensity at the same frequency and over the same bandwidth,

and **C** represents a characteristic of the transmission related to its information content.

It should be noted that the San Marino Scale is a tool for dynamic, rather than static, analysis. Throughout the life of any transmission program, as power levels and transmission characteristics change, the event's potential impact will change. Thus, the San Marino Scale value assigned to any METI (Messaging to Extra-Terrestrial Intelligence) experiment, or other transmission from Earth, can be expected to change significantly (either upward or downward) over time.

Adoption

At its September, 2007 meetings in Hyderabad, India, the IAA SETI Permanent Committee endorsed and adopted the San Marino scale, by the following resolution (which underscores its dynamic nature):

Resolved: that the SETI Permanent Committee of the International Academy of Astronautics hereby adopts the San Marino Scale, as it now exists or may be modified in the future, as an accepted tool for analysis of transmissions from Earth.

Regulatory Implications

The SETI community has for years been engaged in ongoing policy and protocol discussions, dealing with the possibility or advisability of issuing either binding or voluntary restrictions or prohibitions against deliberate transmissions from Earth. The proponents of the San Marino Scale recognize that not all such transmissions imply the same level of exposure, and thus, we oppose the formation of blanket policies that fail analytically to differentiate between individual transmissions. We urge the international SETI community to consider using the San Marino Scale as a tool for helping to define two thresholds: one, below which no prior consultation may be required in the event of a transmission from Earth; and another, above which regulation of transmissions may be considered appropriate. Between these two levels, we suggest, transmission activities should be considered on a case-by-case basis.

San Marino Scale Calculator

If you are using a JavaScript-enabled browser, you may follow this [Link](#) to an interactive San Marino Scale Calculator. Radio buttons enable the user to quickly enter the particulars of any transmission (hypothetical or actual) being analyzed. The calculator software then computes the resulting San Marino Scale value for the event under study. We invite members of the scientific community and the press to use this tool for estimating San Marino index values during analysis of candidate transmissions from Earth, and to assign San Marino Scale values in quantifying their estimates of the potential hazard associated with any active SETI project.

References

Click on the links below to obtain copies of various papers related to the development of the San Marino Scale. These documents (provided in Portable Document Format) are copyright © by the International Academy of Astronautics, and their respective authors.

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- San Marino Scale [Intensity Term Calculator](#) (Excel spreadsheet)
- Shuch and Almár, 2007, [Quantifying Past Transmissions Using The San Marino Scale](#)
- Shuch and Riggs, 2008, [Correcting for Interdependence of Terms in the San Marino Scale](#)
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