Analysis of CURIE Non-Interference with 902-928 MHz band

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Scope

Through analysis, show that the CURIE space service at 916 MHz does not interfere with protected land base station services in the 902-928 MHz band.

Protection Criteria for the IMT Systems

For non-interference, space services require field strength below the following values:

TABLE 1

Field strength to be protected for land mobile service systems

System to be protected	Class of station	Frequency (MHz)	Noise Figure (dB)	Feeder Loss (dB)	Receiving antenna gain (dBi) at 90⁰	Field strength to be protected (dBµV/m)			Receiving antenna height (m)
						200 kHz GSM-R	200 kHz GSM	5 MHz LTE	
GSM or LTE system	Receiving base station	880-915	5	3	-1.5* (G_{max} = 15)	16	19	33	30
	Receiving mobile station	925-960	9	0	0 (GSM-R and GSM) -3 (LTE)	15	18	35	1.5

* -1.5 dB of omnidirectional vertical antenna gain at the elevation angle of 90 degree as the worst case is used for calculation. (See *recommends* 2.2 of Recommendation ITU-R F.1336-4).

Both the Receiving Base Stations as well as the Receiving Mobile Stations are outside the frequency band of the CURIE transmitter, which is 916 MHz with 200 kHz bandwidth. The closest band 880-915 MHz for the Receiving Mobile Stations allow minimum field strength of 16 dBµV/m. Although outside of CURIE's transmitter bandwidth we perform an interference analyis below.

Analysis

From Recommendation ITU-R P.525-3, the field strength is calculated as

$$e = \frac{\sqrt{(30p)}}{d} \qquad (1)$$

where:
e : r.m.s. field strength (V/m)
p : equivalent isotropically radiated power (EIRP) of the transmitter in the direction of the point in question (W)
d : distance from the transmitter to the point in question (m).

From the CURIE FCC filing, there are two satellites, both with a radio operating at 916 MHz, with the same ERP. The ERP is 5.6 W, and converting from ERP, the EIRP, p, is 9.2 W. The distance, d, is 500 km.

The electric field strength, e, can then be calculated as: $e = 3.32 \cdot 10^{-5}\,\text{V/m} = 15.2\,\text{dB}\mu\text{V/m}$.

Conclusion

For the CURIE spacecraft parameters, the electric field strength is calculated to be $15.2\,\text{dB}\mu\text{V/m}$ at the land mobile service system. This value is below the non-interference requirement of $16\,\text{dB}\mu\text{V/m}$ for Receiving Base Stations, and also outside of Receiving Base Stations frequency band. Therefore, the CURIE spacecraft will not interfere with Receiving Base Stations in the 902-928 MHz band or the Receiving Mobile Stations in the 925-960 MHz band.