02 March, 2000

Mr. Frank Coperich
FCC Application Processing Branch

Re: Questions from the FCC

FCC ID: **OQKSAT550**
Correspondence Reference Number: **11310**
731 Confirmation Number **EA95507**
Date of Original E-Mail: **01/04/2000**

Dear Mr. Coperich:

Pursuant to your e-mail concerning Telit Mobile Terminals S.p.A.'s SAT 550 Globalstar systems phone, I am forwarding to you our responses to the items 1-8 and 10-11. The relevant portions of the FCC's e-mail follow with our responses inserted in the appropriate place:

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> -----Original Message-----
> From: Frank Coperich
> fcoperic@fcc.gov
> FCC Application Processing Branch
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> Re: FCC ID OQKSAT550
> Applicant: Telit Mobile Terminals S.p.A.
> Correspondence Reference Number: 11310
> 731 Confirmation Number: EA95507
> Date of Original E-Mail: 01/04/2000
>
> This is a Part 25 handset from Telital for Globalstar systems, EA
> 95507 –
>
> 1. Section 3 of the SAR report describes a 4 dB helical antenna on
> the left top side of the handset, which does not seem to be the
> satellite antenna considered for this filing, please clarify.
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You are correct. The description of the transmitting antenna and its location on page 4 of the SAR report was mixed up with the GSM antenna on the left-hand side of the top of the handset. The Globalstar antenna in on the back of the phone, which is evident from the photographs, included in Appendix B of the SAR report. The GSM antenna is for operation in Europe on their GSM band.

> 2. Please clarify the antenna IN, OUT, LEFT and RIGHT tilt positions
> with respect to the device positions allowed by the Uni-Head phantom
> and the positions supported by a regular head phantom, such as those
> previously used by the test lab; especially towards the top and back
> portions of the head(or) top side-wall of the Uni-Head phantom) where
> relatively higher SAR during normal use would generally be suspected.
> We need to determine if the Uni-Head phantom is appropriate or
> acceptable for testing this phone.

Figures 1 through 4 show the Globalstar phone in the four test positions originally used with the UniHead phantom and the CRS robot. In this orientation we can scan 3 cm horizontally into the curved part of the head. (See item 6 below for pictures with the IDX system).

Figure 2.1. Antenna In (Stored)

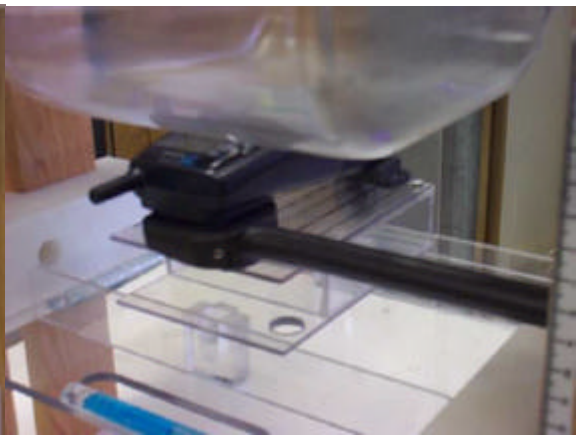

Figure 2.2. Antenna Out

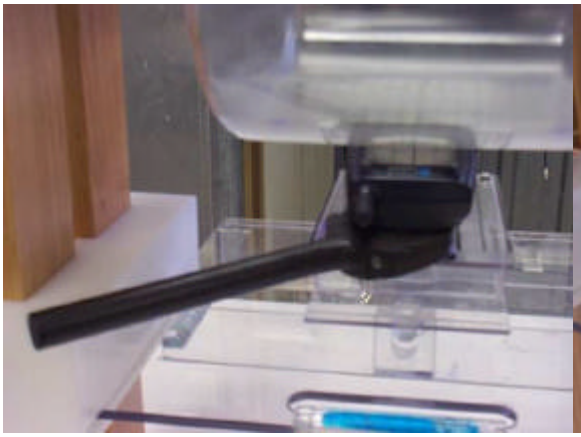

Figure 2.3. Antenna Tilted Right

Figure 2.4. Antenna Tilted Left

> 3. Based on the photos in the filing, the pivoting point for the
> satellite antenna is along the center line of the phone which should
> allow symmetrical antenna positioning for left and right tilts. The
> symmetry is not reflected in the SAR data indicated in section 6.2(4)
> of the SAR report for left and right tilt, please clarify.

Even though the external antenna can be aligned symmetrically with the handset it doesn't not represent the complete radiating structure. The metalization within the handset participates in the RF performance of the device. When the antenna is rotated to the right it is on the same side of the phone as the GSM antenna. This alone may be sufficient to explain the asymmetric SAR results observed.

> 4. Photos in figures 1 and 2 of appendix A in the SAR report are not
> clear,probably due to re-scanning of the original SAR report. Please
> re-submit,at least figure 1, to show the satellite antenna
> positioning during the SAR tests.

The original photos for Figures 1 and 2 are shown below:

Figure 4.1.

Figure 4.2.

Figure 1 shows the phone with the antenna extended and tilted left (relative to looking at the front of the phone) with the UniHead phantom and CRS robot. Figure 2 shows the phone with the antenna stored (in) from above the UniHead phantom, with the liquid removed to increase the clarity of the pictures. Figure 3, below, shows the complete setup that was used for the original measurements, with the external power supply and laptop used to control the operation of the phone. Note that the antenna is extended and tilted to the left. This testing arrangement had been discussed with your

Kwok Chan before the testing and he agreed to accept this data since the device could not at that time (9 months ago) operate on its own under battery power.

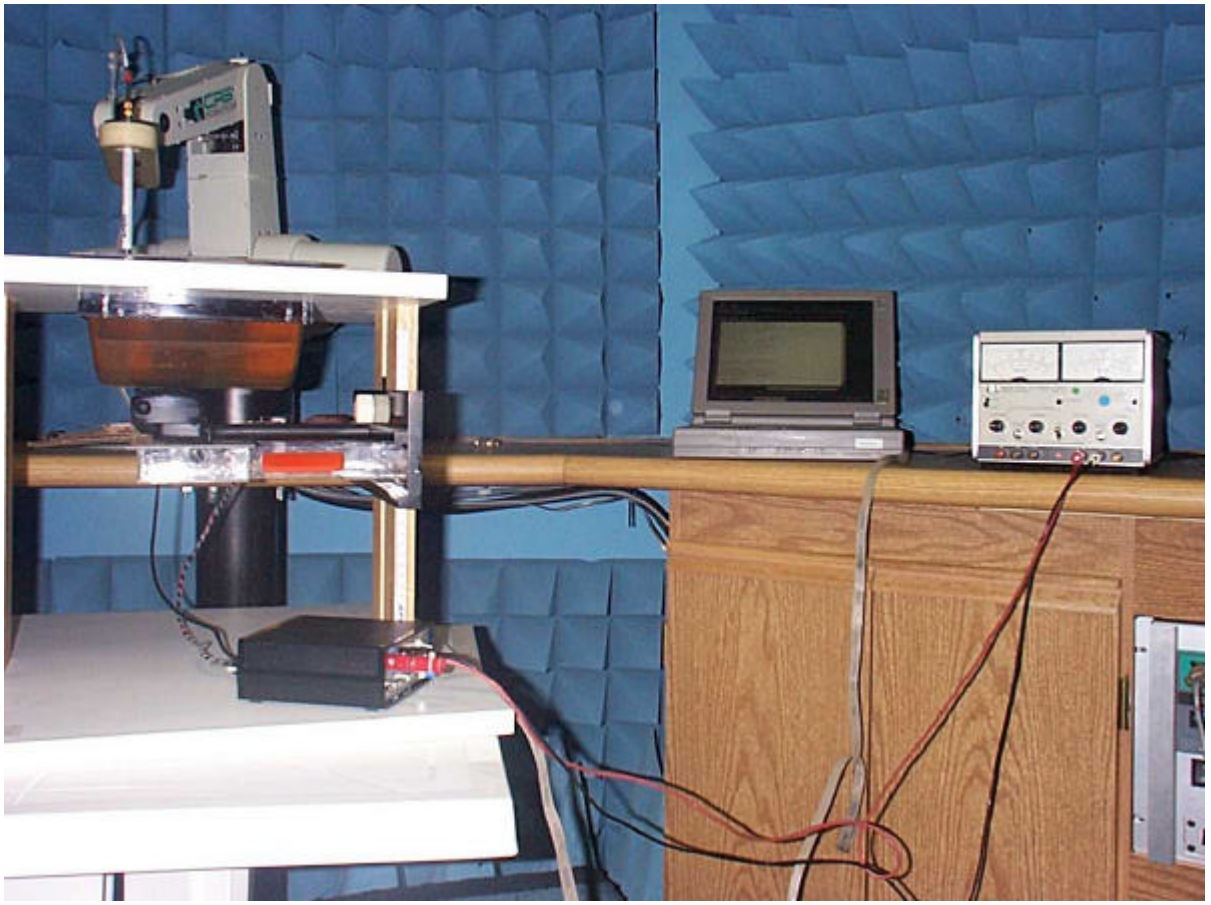

Figure 4.3.

> 5. The peak SAR location indicated in figure 7 of the SAR report is
> towards the lower half of the handset. It is not clear whether this
> SAR could be associated with using an external DC power supply
> instead of regular battery,RF currents around the keypad regions of
> the handset or due to the satellite antenna on the back side of the
> phone that is further away from the phantom.
>
> If the phone cannot communicate to the satellite with the antenna
> fold-back behind the handset, this may not be the test position or
> data needed for demonstrating compliance. For normal use, with the
> antenna tilted for use on the left or right side of the head to
> provide line-of-sight view to the satellite, exposure locations of
> interest are top and back side of the head due to the antenna, ear-
> piece and display or other regions of the phone due to RF current.

The peak SAR location is not associated with using an external DC power supply instead of a regular battery. The peak location in both cases is towards the lower half of the handset.

The phone can communicate with the satellite with the antenna folded back behind the handset. TUV Product Services (now BABT Product Services), prime on this project, confirmed this with a sample they tested which did transmit in the stored position and set up a conversation link with a Globalstar Anritsu Test Equipment.

> 6. For SAR purposes, the device should be tested under normal
> operating conditions with its regular battery. Please provide at
> least one set of data representing worst case exposure for normal
> use, with the regular battery,after taking into account above issues.

As your Kwok Chan was made aware at the time this was not possible. Today, 9 months later, it now is. Consequently, a sample of the Globalstar phone was recently supplied to us that has the capability of operating without the external connections that were required for the original measurements. We have therefore repeated the complete set of measurements with the UniHead phantom that we normally use to identify the worst case operating mode. These are summarized in the following table.

Channel	**Highest SAR (W/kg)**			
	Antenna Position			
	In (Stored)	**Out**	**Tilt-Right**	**Tilt-Left**
Low	0.15	0.018	0.012	0.017
Middle	0.17	0.022	0.010	0.007
High	0.13	0.017	0.011	0.006

Comparing these results to those presented in the original SAR report it is clear that the SAR is significantly lower when the phone is operated from a battery pack. The highest SAR again occurs with the antenna in the stored position, is one third of the previously reported value, and at least eight times the SAR with the antenna in one of the extended positions. The resulting maximum one gram SAR would then be about 10% of the limit.

An additional set of measurements were performed on our IDX system with both the UniHead phantom and left fiberglas phantom supplied by IDX. These are summarized in the following table. The phantoms were tilted as much as possible to explore the SAR higher up at the top of the head (see pictures below).

Channel	Antenna Position	1g SAR (W/kg)	
		IDX with UniHead Phantom	IDX with Fiberglas Phantom
Middle	Stored	0.081	0.028
Low	Tilt-Left	0.002	-
Low	Tilt-Right	-	0.012

The 1g SAR values determined with the IDX system for the Globalstar phone with an extended antenna, are extremely low, as was seen with the CRS system. The 1g SAR with the antenna in (stored) is higher with the UniHead because it is not possible to scan as far in the chin area of a conventional phantom (fiberglas) as a result of its irregularities.

Figure 6.1. IDX system with tilted "conventional phantom and Globalstar phone with antenna tilted-right

Figure 6.2. Antenna tilted right with tape measure

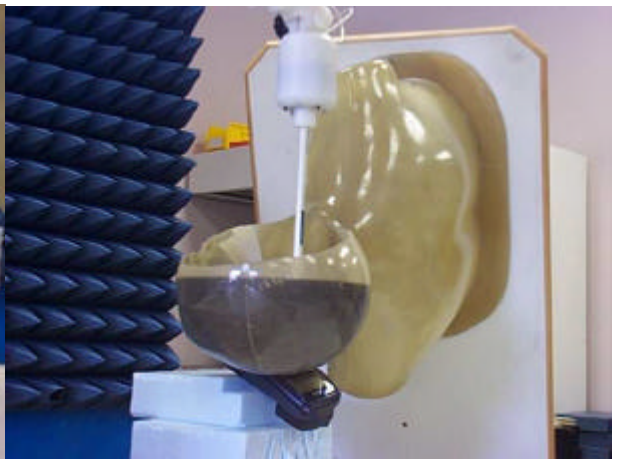

Figure 6.3. Antenna in

Figure 6.4 UniHead tilted for IDX

Figure 6.5 Antenna tilted-right with tape measure

The phantoms were both rotated as much as possible while retaining a reasonable depth of fluid in them. Notice that the separation from the phantoms to the end (active) of the antenna is 12-13 cm for both phantoms when the antenna is extended and tilted right.

> 7. The tissue ingredients indicated in Appendix D of the SAR report
> do not seem to match the dielectric parameters that would generally
> be provided by this formula.

The following table shows our history of tissue calibrations at this frequency. The 1 June 99 conductivity does stick out from the rest as you are pointing out. We have checked the original lab-book recording of the data against the data included in the SAR report and there are no errors. The engineer who performed this measurement in no longer with us and had been with us for less than 1

month at the time of this measurement. We cannot explain why this value was so out of line in this one instance. We keep a closer eye on these parameters since last summer so this should not happen in the future.

Date	Dielectric Constant			Conductivity [S/m]			Tissue Batch
	e			s			
	Brain	IEEE	FCC	Brain	IEEE	FCC	
26-Mar-99	40.02	-2.2%	-8.76%	1.51	32.5%	42.5%	9811125-MB
19-May-99	39.33	-3.8%	-10.33%	1.50	31.6%	41.5%	9811125-MB
1-Jun-99	39.63	-3.1%	-9.64%	1.33	16.7%	25.5%	9811125-MB
16-Jul-99	38.18	-6.7%	-12.95%	1.49	30.7%	40.6%	9811125-MB
29-Jul-99	42.45	3.8%	-3.21%	1.49	30.7%	40.6%	9811125-MB
22-Feb-00	40.99	0.2%	-6.54%	1.44	26.3%	35.8%	000221-B

We have recently mixed a new batch of this tissue type and used it for the new measurements detailed above. Our current target is to be within 5% of the FCC value for dielectric constant at 1900 MHz while ensuring that the conductivity is higher than the FCC value. The deviations with respect to the nominal FCC values at other frequencies are then simply used without further attempts to fine-tune the mixture.

> 8. The slopes of temperature rises and compensated voltages in the
> plot for E-field probe calibration are quite different than the lines
> indicated on the plot for output levels less than about 1.5 W.
> Please re-fit the data so that it is more appropriate for the
> operating range of this phone and revise the tissue conversion factor
> and SAR accordingly.

The thermal conversion factor data was re-fit as a function of the maximum RF power delivered to the dipole antenna. The results are summarized in the following table. The choice of range has little impact on the final tissue conversion factor (3rd column), nor on the final SAR value (4th column). Using only the data below 1.5 W would result in an 8% increase to the originally reported SAR value.

# data sets	Max RF Power (W)	Tissue Conversion Factor (g)	Relative SAR
13	9.62	5.6	100%
12	7.55	5.5	102%
11	6.31	5.0	112%
10	5.43	5.1	110%
9	4.29	5.4	104%
8	3.44	5.4	104%
7	2.72	5.3	106%
6	2.19	5.4	104%
5	1.73	5.4	104%
4	1.38	5.2	108%

> 9. Please clarify if the car-kit option indicated in the operators
> manual would allow the use of vehicle-mount antennas, if so, MPE
> requirements should be addressed - to determine categorical exclusion
> is allowed or evaluation is needed?

To be answered presumably by BABT.

> 10. Please clarify if the 400 mW output indicated in the SAR report
> is conducted, at the antenna terminal, or radiated etc.

The phone does not have an RF port, or a removable antenna, from which the conducted RF power could be measured. APREL Laboratories was subcontracted only to provide SAR measurements to BABT. BABT informed us that the output power was 400mW at the time of the testing. BABT will have to comment further on this issue if required.

> 11. (FYI) - please be advised that head phantom models and
> procedures currently discussed by the IEEE SCC-34 standards committee
> will most likely be required in the near-future for demonstrating SAR
> compliance for wireless handsets. Other head models that are
> different than the proposed model may not be accepted for testing
> handsets in the future.

No response required.

> Note: SAR performed at 400 mW, not sure it is conducted or radiated,
> and cannot find other measurements in exhibit 6 to match that.

See item 10 above.