Department of Health and Human Services
Food and Drug Administration
Center for Devices and Radiological Health
Office of Device Evaluation

DATE: August 1, 2011

TO: File

CC: [redacted] (Consultant Reviewer, Software)

[redacted] (Office of Compliance)

Mitchell Shein (Branch Chief)

FROM: [redacted] (Lead Reviewer)

SUBJECT: P880006 / S071 / 180-Day PMA Supplement

P880086 / S203, P910023 / S264, P970013 / S040, P030035 / S083, P030054 / S189

St. Jude Medical – Model 3330 programmer software version 10.1.2

(modifications to the pacing lead impedance feature to correct an anomaly in the pacing lead impedance feature)

OVERALL RECOMMENDATION

Based on my review of the submission text, discussions with supporting reviewers, interactions with the sponsor prior to and during the meeting, as well as my review and approval of the meeting minutes, **I recommend approval of the submission**.

Signature	*Date*	*Signature*	*Date*
[redacted]		Mitchell Shein	
Scientific Reviewer		Branch Chief	
(Lead Reviewer)		(Management Oversight)	

PURPOSE OF SUBMISSION

The company is requesting approval for Model 3330 programmer software version 10.1.2, which includes modifications to the pacing lead impedance feature. This change was originally submitted on April 17, 2011 in a Real Time Review request. This RTR request was rejected because the change included modifications to the programmer software intended to address issues in the hardware, which resulted in clinical consequences including device explants.

The company explains the rationale for the change on page 3 of the submission:

> *The PLI feature used in the Accent DR and Anthem CRT-P devices is being modified to improve accuracy and robustness of measurements (see Table 3). This feature is diagnostic in nature; its purpose is to trigger a notification (programmer, audible patient notifier, etc.) when daily measurements of pacing lead impedance are identified as out-of-range (nominally <200 O and >2000 O). The improvements to the PLI feature are limited to programmer software/report generator modifications to increase the frequency of impedance measurements from daily to hourly (as shown in Table 3). Any triggered notifications and report trend frequency will remain unchanged and are*

based only on the daily measurement of pacing lead impedance. There are no changes to Accent/Anthem device firmware or hardware.

DEVICE DESCRIPTION

The programmer software allows the user to program and interact with the implanted pulse generators (pacemakers, CRT-P devices, ICDs, and CRT-D devices).

INDICATIONS FOR USE

There were no changes relevant to this issue. This section is not applicable to this submission.

SOFTWARE VERIFICATION AND VALIDATION

was asked to review the software documentation included in the submission. The company indicated that this software is a major level of concern. An overview of the requirements for the modifications to the software is described in Appendix J: Merlin PCS Software Requirements Specification. The following bullets summarize her review.

- Software/Firmware description: the sponsor has provided a description of the changes made to address the issue described above in the device description. The sponsor has changed the programmer software such that the new device setting is programmed to the device when the device is interrogated. This device setting (running impedance every hour) will be the default setting for all new devices.

- Device Hazard Analysis: The sponsor has included the situation which caused the changes to the programmer software in the hazard analysis. The information provided is adequate. The information provided in the hazard analysis is adequate from a software perspective. It is not clear if the affect of the change on device longevity has been considered as it does not appear to have been included in the software information. Since this is outside the software area, the lead reviewer will be made aware but it will not be covered further in this review.

- Software Requirements Specifications: The sponsor did not provide the full specification. They did provide the information that is pertinent to this release. This is a small and understandable change with limited impact on other functions. The basic premise (lead impedance checks) is not new. It is only the frequency of the test that is new. For this application and this particular change, this documentation is acceptable.

- Architecture Design Chart: The changes are identified above in the traceability chart. The software change is only to the frequency by which a measurement is taken. The information provided for this change in this application is adequate.

- Design Specifications: The sponsor has provided a design document which involves the setting of parameters. In addition, the architecture information provided contains information which is appropriate for the changes to the design of the software for this change. The information provided is adequate.

- Traceability Analysis/Matrix: The sponsor has provided the traceability for this change as documented above this table.

- Development: The development environment is the same as was used for Version 10.1.1. The documentation provided by the sponsor on this item is adequate.

- Verification & Validation Testing: The sponsor has provided both verification and validation testing results to demonstrate that the changes described in the submission were effective and appropriate. The sponsor has indicated which version was used for testing, described the testing performed, traced the tests to the requirements, and provided the results of the testing. The information provided for this submission is adequate.

- Revision level history: The sponsor provided a revision level history. The information provided is appropriate for this release and indicates what versions were used for development and what testing was done on each.

- Unresolved anomalies: The sponsor has indicated that there are no unresolved anomalies associated with the changes to the software.

did not identify any deficiencies and recommended that the submission could be approved, from a software perspective. I concur with 's review. The sponsor conducted appropriate testing relevant to the change. I have no concerns regarding the testing completed or the results of the tests.

LABELING

Appendix M of the submission includes updated labeling. The sponsor updated the presentation of the longevity tables for all of the devices. In Section 2.3 Summary of Testing, the company states, "Assessments of device longevity were also performed to confirm that there would not be a significant impact to longevity due to the additional impedance measurements and the results are detailed in Appendix E: Accent and Anthem Pacer Longevity Report." The results presented in Appendix E show small differences in the calculated device longevity. The changes identified in Appendix M of the labeling on pages 220-223 show small changes (0.1 year differences) in the DR and CRT-P models. This modification does not affect the longevity of the SR models because of the reasons described in the hardware testing section below. I have no concerns regarding the proposed labeling.

HARDWARE TESTING

There were no changes relevant to this issue. However, the programmer software is being modified in order to address a problem with the circuit in the implanted pulse generator. The company provided an explanation of the issue on pages 3 and 4 of the submission.

> *The changes are being implemented to mitigate field complaints of inaccurate PLI measurements. It has been reported that pacemaker alerts of low, out-of-range PLI measurements have been found to be false when verified in clinic. The readings are determined to be false since in-clinic measurements are in range and there are no identifiable common causes (lead damage, connection issues, etc.) for the previous out-of-range reading.*
>
> *Analysis of returned devices has shown that there is potential for charge buildup on a single capacitor in the circuit that handles lead impedance checking for the device. This charge buildup can potentially impact PLI measurements, but there is no effect on other device functions such as pacing/sensing. As charge builds on the capacitor, it interferes with generation of the impedance pulse and distorts the output impedance pulse morphology. The result is artificially low lead impedance measurements. Additional impedance pulses remove this residual charge, restoring the expected pulse waveform and*

thus providing accurate PLI measurements. Therefore, by increasing the frequency of impedance measurements (from daily to hourly), the circuit is exercised more often and the impact to daily PLI measurements is mitigated.

The changes are being implemented for Accent DR and Anthem CRT-P devices only. The current PLI feature only delivers impedance pulses under refractory, to provide additional assurance that they are not sensed and thus affect pacer timing. Most refractory periods are long enough to allow sufficient numbers of charge-balancing impedance pulses to be delivered, thus exercising the impedance checking circuit so that daily PLI measurements are not impacted. However, Anthem CRT-P devices with short refractories (ex: 20 ms V-V Interval) have fewer charge-balancing impedance pulses that are issued and therefore may have potential for false out-of-range measurements. Accent DR devices may also be affected if programmed to a short AV delay (ex: 25 ms). By design, Accent SR is unaffected since it always has sufficiently long refractory periods.

The company has evaluated the effect of the more frequent pacing impedance measurements on the device longevity. The effects of this change are described in the labeling.

CLINICAL

There were no changes relevant to this issue. However, the submission includes a list of Medical Device Reports (MDRs) in Appendix A and an updated Risk Analysis in Appendix C. The company states:

As of January 31, 2011, the occurrence of field complaints for this issue for Anthem CRT-P is 2.41% (out of (b) (4) *devices worldwide) and 0.0084% (out of* (b) (4) *devices worldwide) for Accent DR. There have been 9 MDRs related to this complaint (Please see Appendix A).*

The Risk Analysis in Appendix C includes additional information regarding the number and probability of the event. For example, the company reports that there have been 153 reported cases of false pacing lead impedance out of range patient notifications on Anthem devices through February 22, 2011. I have no further questions regarding the MDRs as part of this pre-market review of the submission.

EMC / EMI TESTING

There were no changes relevant to this issue. This section is not applicable to this submission.

BIOCOMPATIBILITY

There were no changes relevant to this issue. This section is not applicable to this submission.

STATISTICAL

There were no changes relevant to this issue. This section is not applicable to this submission.

ANIMAL TESTING

There were no changes relevant to this issue. This section is not applicable to this submission.

PACKAGING, STERILIZATION, AND SHELF-LIFE

There were no changes relevant to this issue. This section is not applicable to this submission.

POST-MARKET REQUIREMENTS

There were no changes relevant to this issue. This section is not applicable to this submission.

QUESTIONS FOR THE SPONSOR

There are no remaining open questions.

INTERACTIONS WITH OTHER FDA PERSONNEL AND SPONSOR

The primary contact for the sponsor is Jennifer Wong (818-493-2761, JWong03@sjm.com).

Due to the limited scope of changes, there were no interactions with the sponsor.

The Office of Compliance was notified during the review of this file, because this change is a corrective action intended to address problems observed in the field.