

LF 134 kHz vs. HF 13.56 MHz for Livestock Identification.

SEVERAL COMMON FREQUENCIES ARE UTILIZED WORLDWIDE FOR RFID SYSTEMS. THE CHOSEN FREQUENCY IS DICTATED BY THE AVAILABILITY OF THE SPECTRUM (NO CONFLICT WITH OTHER USERS) AND THE PHYSICAL PERFORMANCE CHARACTERISTICS INHERENT TO THE FREQUENCY BAND. EACH AVAILABLE OPERATING FREQUENCY HAS ITS OWN STRENGTHS AND WEAKNESSES; NO SINGLE FREQUENCY IS PERFECT FOR ALL APPLICATIONS.

Recently some suppliers have heralded the superiority of the “new wave” of 13.56 MHz RFID systems for use in livestock applications.

Firstly there is nothing particularly “new” about 13.56 MHz RFID! It has been readily available and widely deployed in many industries for almost 10 years. Applications include ticketing, access control, library book identification and electronic payment. Texas Instruments is one of the pioneers and leading suppliers of 13.56 MHz RFID technology.

However 13.56 MHz has not been deployed en masse for animal/livestock identification because it does have some serious technical deficiencies in these applications.

LF 134 KHz RFID technology has the following advantages over HF 13.56 MHz in Livestock Applications:

1. Read range: LF 134 kHz RFID systems deliver superior read-range performance using single antenna systems. HF 13.56 MHz read-range is typically 20 to 40% less. Adequate read range is crucial for reliable automatic data capture with moving animals.
2. System performance: LF 134 kHz reader systems are typically more robust to external influences. HF 13.56 MHz systems are easily detuned and more difficult to install and maintain at peak performance levels in typical agricultural environments.
3. Tag cost: In high volumes, LF and HF tags of equivalent performance and robustness levels do not vary greatly in cost. HF tags may be slightly cheaper, but this is offset by reduced read-range and high packaging costs due to large tag size.

4. Tag size, robustness and retention: HF 13.56 MHz ear tags need to be approx 4 to 6 times the size of LF 134 kHz tags, and even then still achieve only 60 to 80% of the read-range performance! Large tag size with HF equates to low retention rates under practical farm and feedlot conditions. It is not possible to make small HF glass capsule type transponders. LF glass capsule devices are widely used for animal identification.

HF livestock ear tags are not in volume production and have not been exposed to extensive field trials. The long term robustness of the proposed “low cost” HF tags in agricultural applications is therefore totally unproven.

5. Ability to read through body tissue: One of the primary reasons that LF RFID technology was selected for use with animals is its ability to read through body tissue and other materials containing water. HF tag signals are attenuated by body tissue, leading to reduced performance and missed tag reads. Rumen tags, considered essential in some applications for high security and fraud prevention, are not feasible with HF RFID tags.

6. Read speed: In theory HF tags can read much faster than LF tags. However in practice, due to the robustness of the LF communications and the inherently longer read range, the advantage is minimal.

7. Anti-collision or Multi-tag read capability: Most HF systems incorporate anti-collision. However the current ISO and Aust/NZ standards for livestock RFID do not specify anti-collision capability. This feature can be implemented with LF systems if required in future. Typically it is not deemed necessary as the read-range of most readers is not sufficient to capture several large animals simultaneously.

8. Read/write capability: Current LF tags conforming to the ISO and Australian standards are “read-only”. That is they contain a unique, unalterable ID which is referenced back to the individual animal info information in a secure, central database. In addition farmers and breeders may store relevant management data in their own personal databases. Read/write LF tags are available and this capability is being assessed for possible “future use” by the respective ISO technical working group.

One of the claimed advantages of HF tags is the larger read/write memory and faster write speeds. However there are several potential risks with storing animal history on the tag which have not yet been addressed by the industry.

If stored on the ear tag an animal's history could easily be lost, manipulated or corrupted, meaning that a central database would still be necessary to confirm the legitimacy of the read/write data on the tag.

Reading and writing large amounts of data to the ear tags also would add complexity to the hardware and software required in the field.