1. In contrast to most systems of groups 1 and 2, these systems can be designed fail safe, so malfunction of the equipment leads to a more restrictive indication in the cab.
2. The train continuously receives the newest information in each position of the way. This prevents the driver from forgetting signal aspects and enables an immediate reaction of the system if signal aspects change.

However, an important safety-reducing disadvantage is that, unless the length of the track circuits is standardised or additional transmitters for length information are provided, calculation of an adjusted braking curve is not possible. To improve this, some systems with continuous transmission by coded track circuits are used together with intermittent transmission systems (e. g. System SAUT, chapter 8.3.5.3).

8.3.4.1 ALSN of Former Soviet Union

ALSN is used on almost 100 thousand kilometres in the countries of former Soviet Union or more than 10 percent of world railways. This system is installed on main lines but applied basically as additional equipment which supplements, and not replaces trackside signals in most cases. If there is a disagreement between trackside and cab signals, the driver has to obey the trackside signal.

The system was developed in the 1930s in the Soviet Union with use of experience of the first coded track circuits in the USA. In 1937 this system had received a medal at the International exhibition in Paris, but its introduction has been interrupted by war and has proceeded only after 1949 (Vlasenko 2006).

There are three codes displayed in the cab signal corresponding with the aspect of the trackside signal ahead. In case of three-aspect-signalling (chapter 7.3.3.2), these codes are (figure 8.25):

- red signal ahead (results in cab signal red-yellow)
- yellow signal ahead (results in cab signal yellow)
- green signal ahead (results in cab signal green)

The section beyond a signal at Stop is not coded, therefore the train will be emergency stopped (cab signal red). This is in accordance with the fail-safe-principle. Passage of a

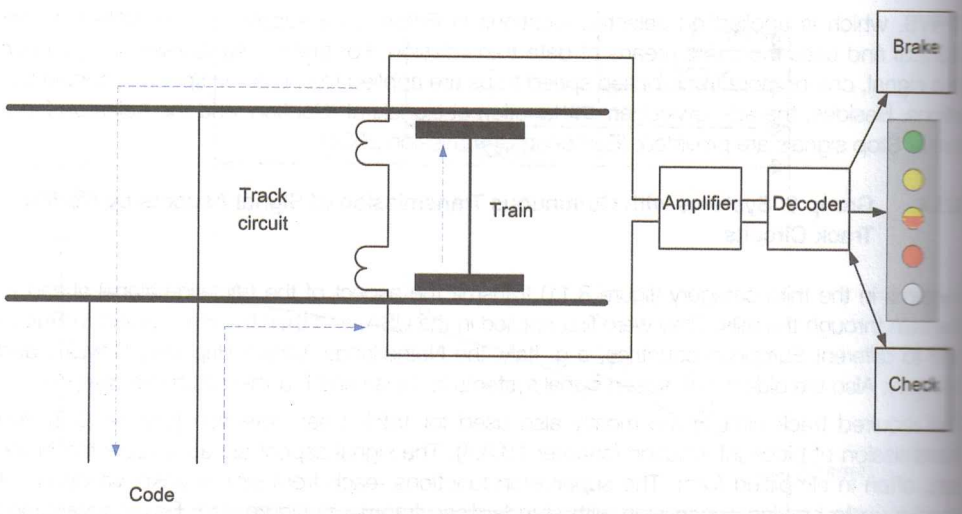

Figure 8.25: Code transmission from track circuits to the locomotive equipment

Stop signal can be authorised
figure 8.26).

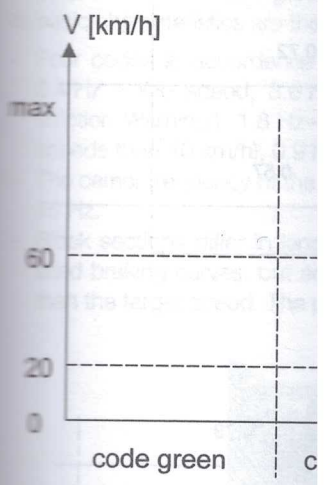

Figure 8.26: Braking supervision

As the number of signal aspec
simple rule. If the train approxir
tion for which can be between
elements (chapter 6.1.2.3)) or t
clear, the speed restriction afte
driver has to select the proper
sections are clear and the first
the following signal is red or aux

To distinguish the passage of
(e. g. secondary tracks in statio
vious code. No code after the
the emergency brake comman
ALSN is switched off) and requi

The period of the code transmi
assignment of the two periods
The carrier frequency depends
fluences with low frequency ofte
This means that the new cab si
reaction time also applies if a tra

System ALSN itself (without the
formation about distance to the
to 2500 meters depending on
ALSN (without any additional tra
knowledgement check by the c
the change of a cab signal to lo
to confirm this by an acknowle
is limited to 60 km/h. The speed