```
switch_inv_plus_normal  THM

⊢  ∀E:TaggedEventStruct, P:TraceProperty(E).
|  MCS(E)(P) ⇒
|  (P refines (Causal(E) ∧ No-dup-deliver(E))) ⇒
|  (((switch_inv(E) ∧ AD-normal(E)) ∧ No-dup-send(E)) fuses P)
| by Unfolds ``str_trace trace_property`` 0 THEN Auto

|    THEN Try (Fold `trace_property` 0 THEN Complete Auto)

|    THEN Try (Unfold `trace_property` 0 THEN Complete Auto)

|    THEN BackThruLemma `no-dup-fusion` THEN Auto

|    THEN Try (Fold `trace_property` 0 THEN Auto)
|
|
1. E : TaggedEventStruct
2. P : (|E| List)→Prop
3. MCS(E)(P)
4. P refines (Causal(E) ∧ No-dup-deliver(E))
⊢  ((switch_inv(E) ∧ AD-normal(E))
|  ∧ No-dup-send(E)
|  ∧ Tag-by-msg(E)
|  ∧ Causal(E)
|  ∧ No-dup-deliver(E)) fuses P
| by BackThruLemma `M-C-S induction` THEN Auto

|    THEN Try (Unfold `trace_property` 0 THEN Auto)

|    THEN Try (Fold `trace_property` 0 THEN Auto)
|
|\
| 1. E : TaggedEventStruct
| 2. P : (|E| List)→Prop
| 3. MCS(E)(P)
| 4. P refines (Causal(E) ∧ No-dup-deliver(E))
| ⊢  safetyR(E) preserves (switch_inv(E) ∧ AD-normal(E))
|    ∧ No-dup-send(E)
|    ∧ Tag-by-msg(E)
|    ∧ Causal(E)
|    ∧ No-dup-deliver(E)
|   by Repeat (BackThruLemma `and_preserved_by`
|
|      ...
| THEN Easy
|
.\
. 1. E : TaggedEventStruct
. 2. P : (|E| List)→Prop
. 3. MCS(E)(P)
. 4. P refines (Causal(E) ∧ No-dup-deliver(E))
. ⊢  ((switch_inv(E) ∧ AD-normal(E))
.    ∧ No-dup-send(E)
.    ∧ Tag-by-msg(E)
```

```
.    ∧ Causal(E)
.    ∧ No-dup-deliver(E))
.    refines single-tag-decomposable(E)
.   by InstLemma ‘strong_switch_inv_decomposable‘ [E] THENA Auto
.
.      THEN InstLemma ‘switch_decomp_implies_single_tag_decomp‘ [E
.      ] THENA Auto
. THEN All (Unfold ‘tr_refines‘)
. THEN Auto
.
.      THEN Try (Fold ‘trace_property‘ 0 THEN Auto)
.
.      THEN BackThruSomeHyp THEN Auto
.
.      ...
END
```